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# THE HIDDEN RULES OF WORD ORDER VARIATIONS

***Abstract.*** *The present article addresses the question of cross-linguistic word order variation, considering the partial regularities found in the languages of the world and the non-existence of certain expected orders. It proposes that movement is at the basis of a restrictive theory of word order variation.*

***Keywords:*** *word order, cross-linguistic variation, regularities, movement*

***Резюме.*** *В статията се разглежда въпросът за словоредните различия между езиците и се обсъждат частичните съвпадения между словоредните модели, както и причините, поради които някои словоредни редици са теоретично възможни, но никога не се реализират в естествения език. Предлага се обяснение от гледна точка на генеративния синтаксис под формата на рестриктивна теория за словоредните различия, в основата на която стои движението на централния конституент на всяка изреченска проекция.*

***Ключови думи:*** *словоред, междуезикови различия, съвпадения между словоредните модели, движение на централния конституент*

## 1. Introduction

The principal goal of the present article is to sketch a restrictive theory of the variation in word order that is found across languages.[1]

For example, a Japanese sentence like (1)b. appears to differ dramatically in the order of words from the corresponding Bulgarian sentence ((1)a.); and this despite the virtual identity in meaning between the two sentences:

(1)a. Bulgarian (SVO – Iliyana Krapova, pers. comm.)

   Az kazah [   če   toj može da napravi tova dobre]
   I    said   [COMP he   can     do      that well]

  b. Japanese (SOV – Endo Yoshio, pers. comm.)

   Watasi-wa [kare-ga sore-o zyoozuni  okona-e-ru   to] it-ta.
   I-Top [he-Nom it-Acc well do-Mod-Present COMP] say-Past
   'I said that he can do it well.'

Apart from the position of the subjects of the main and the embedded clause, which are initial in their respective clauses in both languages, in Bulgarian the finite complement clause follows the matrix verb, is introduced by an initial subordinator, has a modal which precedes the embedded verb, which in turn precedes its object and the manner adverb, while the Japanese matrix verb follows its finite complement clause, which is introduced by a final subordinator, has the modal following the embedded verb, itself preceded by its object and manner adverb: an almost complete mirror image of Bulgarian.

To give another example of the bewildering variation in word order that is found cross-linguistically without any meaning difference, consider some of the different orders of the four elements demonstrative, numeral, adjective and noun, which will be taken up later in more detail:

(2) **Demonstrative Numeral Adjective Noun**          (Bulgarian)
   *tezi    tri hubavi kotki*          (Iliyana Krapova: pers. comm.)
   'these three nice cats'

(3) **Noun Adjective Numeral Demonstrative**
                                   (Mbum – Niger-Congo)
   *yóŋ        im  húnáké dóà  àí*          (Hagège 1970: 238)
   calebasse beer   big     two these
   'these two big calebasse beers'

(4) **Noun Demonstrative Numeral Adjective**
                                   (Abu' Arapesh – Papuan)
   *ba-kuh a-kuha bia-kuh afu-kuhi*          (Lynch 1998: 171)
   stick-CLASS this-CLASS two-CLASS good-CLASS
   'these two good sticks'

(5) **Demonstrative Noun Adjective Numeral**
                                   (Burmese – Sino-Tibetan)
   *dí     lú     jî   θôun yawʔ*          (Jones 1970: 5)

these person big  three   clf.
'these three big persons'

(6) **Demonstrative Noun Numeral Adjective**

(Maasai – Nilo-Saharan)

*kulɔ́    payaní oáre   tasát'í*                    (Payne 2020: 330)
these    men  two     old
'these two old men'

When referring to word order one must distinguish *canonical*, or *neutral*, orders (those which do not require special linguistic contexts and can be uttered 'out of the blue') from orders which are used to highlight a specific constituent (to put it in focus, or to make it the topic of the discussion). For example, in Bangla (Syed 2015) and Chinese (Zhang 2015), which have, like Bulgarian, Demonstrative > Numeral > Adjective > Noun as a neutral order, adjectives can also appear before the demonstrative for emphatic/focus reasons. See (7):

(7)a. [**joghonyok**  oi  du-To  biskut     (Bangla – cf. Syed 2015: 337)
        disgusting  those two-Cla biscuit
        'those **disgusting** two biscuits.'

   b. **hong yanse de**  na  si  ge panzi    (Chinese – Zhang 2015: 378)
        red    color DE that four CL plate
        'those four **red** plates'

These orders should not be considered, as they are not neutral orders. Now, the question is: are there principled limits on the variation of the canonical, neutral orders?

To start, one can observe the existence of partial regularities (see §2 below), and, even more importantly, the non-existence of certain orders (see §3) (both have been prominently pointed out by Joseph Greenberg).

## 2. Partial regularities

Greenberg (1963), and, after him, Dryer (1992) and Sheehan, Biberauer, Roberts, and Holmberg (2017), among others, have shown the existence of partial correlations between the order of the verb with its complements and the order of other pairs. These are stronger within the same extended projection (see (8) to (10))[2]

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[2] Cf. Dryer (1992: 94, 100, 103).

(8) a. OV and V modal: 29 genera
    b. VO and modal V: 42 genera
    c. OV and modal V: 10 genera
    d. VO and V modal: 4 genera

(9) a. OV and VAux: 36 genera
    b. VO and AuxV: 28 genera
    c. OV and AuxV: 3 genera
    d. VO and VAux: 4 genera

(10) a. OV and IP Subordinator: 38 genera
    b. VO and Subordinator IP: 59 genera
    c. OV and Subordinator IP: 17 genera
    d. VO and IP Subordinator: 1 genus

and weaker across different extended projections (see, for example, (11)):

(11) a. OV and GEN N: 434 languages
    b. VO and N GEN: 352 languages
    c. VO and GEN N: 113 languages
    d. OV and N GEN: 30 languages

In certain languages the extended projections of the verb (the clause) and that of the noun (the nominal phrase) behave in opposite ways. In the Papuan language Bargam (Hepner 2006: §4.1) the clause is head-final (AdvP Subj PP Obj V) while the nominal phrase is head-initial (N AP NumP DemP). The Mayan language Tzutujil (Dayley 1981: §8.2.3 and §8.1.1) shows the converse situation. The clause is head-initial (V Obj Subj AdvP PP) while the nominal phrase is head-final (DemP NumP AP N).

One should also add that consistent head-final and head-initial languages are actually a minority among the languages of the world, and never totally consistent. Possibly each language differs from every other language in word order type.

## 3. Non attested orders

Consider now the non-existence of certain orders. In Greenberg (1963) only languages with the orders degree adverb Adj N ((12)a.) (11 langs), N Adj degree adverb ((12)b.) (8 langs) and N degree adverb Adj ((12)c.) (2 langs) are reported as attested (cf. his table 7 and Universal 21).

The order Adj degree adverb N ((12)d.) is also attested, even if rarely (Davies 2020: §2.2), but the others (12)e. and f. are not attested:

(12)a. degree adverb **A N** (English,..)   (e.g. *very tall men*)
   b. **N A** degree adverb (Daai Chin (Sino-Tibetan),..) *aang-ki boo:k sa:* 'Lit. shirt  white very') (So-Hartmann 2009: 113)
   c. **N** degree adverb **A** (Italian,..) (*un uomo molto alto* 'Lit. a man very tall')
   d. **A** degree adverb **N** (Sakha (Turkic),..)(*bu kïrakïj baɣajï deriebine-tten*) 'Lit. this tiny very village-ABL' (Stapert 2013: 244)[3]

   e. ***A N degree word**
   f. ***degree word N A**

Another case, observed by Greenberg (1972: 185), concerns the attested orders of N(oun), Num(eral), and Numeral Classifier (CLF). Of the six potential orders (factorial of 3 = 6), only four are attested:

(13)a. Num **CLF N**  (Chinese,..) (*san ben shu* 'three CLF book' (Her 2017a: ex.(1))
   b. **N CLF** Num (Tetun Dili (Austronesian),..)(*feto na'in neen* 'Lit. woman CLF.HUM  six')
        (van Engelenhoven and Williams-van Klinken 2005: 758)
   c. **N** Num **CLF** (Lɨɨ (Tai-Kadai),..) (*paa saam too* 'Lit. fish three CLF') (Conklin 1981: 108)
   d. **CLF** Num **N** (Rongga (Austronesian),..) (*esa zhua mbo* 'CLF two house') (Arka 2008: 2)

   e. ***CLF N Num**
   f. ***Num N CLF**

We will see other such cases of non-attested orders.

The task of a theory of word order variation is to derive the possible (attested/attestable) word orders, both when they maximally conform to the "head-final" or "head-initial" types and when they depart from them to

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[3] Also see Chuluu (1994: 29) for an example from the Mongolic language Monguor, and Davies 2020: §2.2 for few more languages that instantiate it.

varying degrees; **and this without deriving the impossible (unattested/unattestable) ones.**

The value of a theory is not how much it allows, but how much it disallows (without excluding what is actually found).

The first step in developing a theory of word order is to see what could be at the basis of it. I argue that the driving force responsible for the different word orders attested is **movement.**

## 4. An argument that movement is at the basis of word order variation.

The adjective order in the languages of the world has been argued to respect a particular semantic/cognitive hierarchy: adjectives that denote more **absolute** (Martin 1969, Frawley 1992), or **objective** (Hetzron 1978; Scontras, Degen, & Goodman 2017), or **inherent** (Dryer 2018: 816f, and references cited there), properties occur closer to the noun.[4]

Consider the three adjective classes of **color, size and value** (the term 'value' used here corresponds to what others call 'subjective comment' – Scott 2002 – or 'quality'):

(14) $A_{value}$ $A_{size}$ $A_{color}$ **N**
     English (Plank 2003: 11)
     *A beautiful big red ball*

(15) **N** $A_{color}$ $A_{size}$ $A_{value}$
     Indonesian (Plank 2003: 11)
        *bola merah besar tjantik*
     'Lit. ball   red    big beautiful'

These orders, which respect the principle of relative distance of the distinct adjectives ($A_{color}$ $A_{size}$ $A_{value}$) from the noun, pre- or post-nominally, are by far the most frequent (listed here are only few of the many languages instantiating these orders):

**$A_{value}$ $A_{size}$ $A_{color}$ N**

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[4] Hetzron (1978) phrases it as follows: "the major rule is to place the more objective and undisputable qualifications closer to the noun, and the more subjective, opinion-like ones farther away." (p. 178).

I abstract away here from the questions of how to establish the precise degree of objectivity/subjectivity of each adjectival class, of why this particular hierarchy/order should hold and what principles it could be made to follow from.

**Bangla** (Syed 2015:337); **Hungarian** (Hetzron 1978:70,73); the Papuan languages **Awa** (Loving 1973:§4.2), **Gimi** (McBride and McBride 1973:83), **Kewapi** (Yarapea 2006:154); the Tibeto- Burman language **Magar (**Grunow-Hårsta 2008:364), **Turkish** (Bayırlı 2018:§2), etc.

**N A$_{color}$ A$_{size}$ A$_{value}$**

The Austronesian language **Javanese** (Ishizuka 2008:§3.3); **Basque** (Artiagoitia 2006:§1); the Kwa language **Akan** (Afriyie 2014:§4.2); the Papuan languages **Golin** (Bunun 1974: §2.2.1.1), **Maybrat** (Dol 1999:142f), **Urim** (Hemmilä and Luoma (1987:122); the Semitic languages **Soqotri** (Makhashen, Shuib and Che Lah. 2008:13), **Zahrani Arabic** (Alzahrani 2015:234); the Tibeto-Burman language **Lolo** (Fu 1997:191); the Kam-Tai language **Tai Phake** (Morey 2005:260); the Niger- Congo language **Yorùbá** (Ajíbóyè 2005:16); the language isolate **Trumai** (Guirardello 1999:17), etc.

Nonetheless there are few languages with post-nominal adjectives that seem to violate this principle (see (16)). This was noted by the eminent typologist Frans Plank, who also noted that this principle (which is never violated pre-nominally (see (17)) could be retained if one assumed movement of the noun, as shown in (18):

(16) **N A$_{value}$ A$_{size}$ A$_{color}$**
    Maltese (Plank 2003:12)[5]
        *balloon    sabiħ   kbir aħmar*
    'Lit. ball   beautiful big   red'

(17)\*A$_{color}$ A$_{size}$ A$_{value}$ **N** (Plank 2003:12)

(18) N A$_{value}$ A$_{size}$ A$_{color}$ ~~N~~

"It is only on such an abstract analysis that the iconic explanation of the relative distance of semantic classes of adjectives from nouns can be upheld." (Plank 2003:13).
    Of course the movement approach involved in the derivation of these different orders must be constrained to derive the actually attested

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[5] This order is also found in the Niger-Congo, Kwa, language Leteh (Akrofi Ansah 2014:12).

orders without deriving the unattested ones (such as the *A$_{color}$ A$_{size}$ A$_{value}$ N of (17) above, or other orders, like the unattested pre-nominal orders: *A$_{size}$ A$_{color}$ A$_{value}$ N, or *A$_{value}$ A$_{color}$ A$_{size}$ N.

The restriction on movement which appears to discriminate between the possible (attested) from the impossible (unattested) orders is that only the Head of the constituent, the 'engine' of the movement, here the N, can move, along the hierarchy which respects the relative distance from the noun:

(19)

A$_{value}$

A$_{size}$

A$_{color}$

N
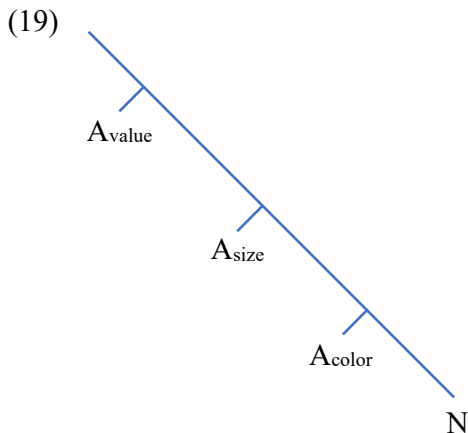
If the adjectives could move independently of the N we would get unattested orders, like

*A$_{color}$  A$_{value}$  A$_{size}$ __ N
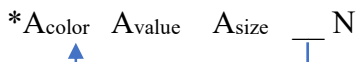
If only the Head of the nominal constituent, the N, can move, what are the possible ways it can move?

From *wh*-movement (the movement of a relative or interrogative category) we know that the 'engine' of the movement, here the *wh*-category, can move by itself, as in (20)a., or by dragging along a constituent containing non-*wh*-material below the N, as in (20)b., or above it, as in (20)c.:

(20)a. Aylan, [who] you have certainly seen [pictures of [ __ ]],..
   b. Aylan, [[whose] pictures] you have certainly seen [ __ ],..
   c. Aylan, [pictures of [whom]] you have certainly seen [ __ ],..

The movements in (20)b. and c. are called pied pipings (recalling the pied piper of Hamelin): *whose-pictures* and *pictures-of-whom* pied piping, respectively.

N can move likewise: by itself, of via one of the pied piping modes.

If it moves to the top of the hierarchy by itself (without pied pipings), as in (21), the order that is obtained is the order of Maltese: N $A_{value}$ $A_{size}$ $A_{color}$:
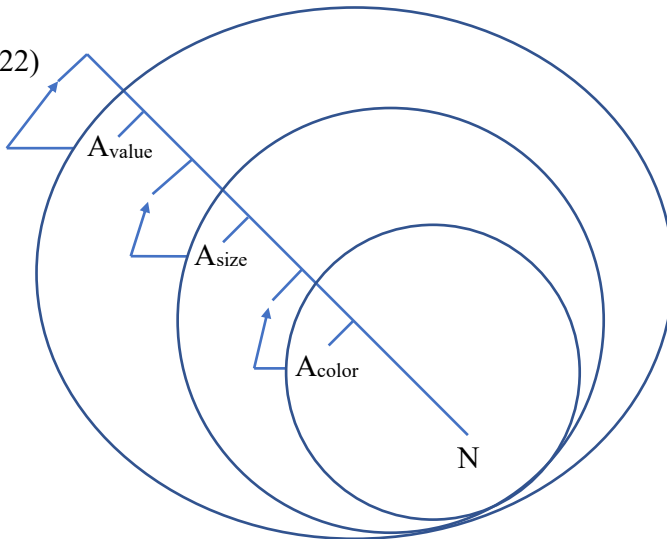
(21)
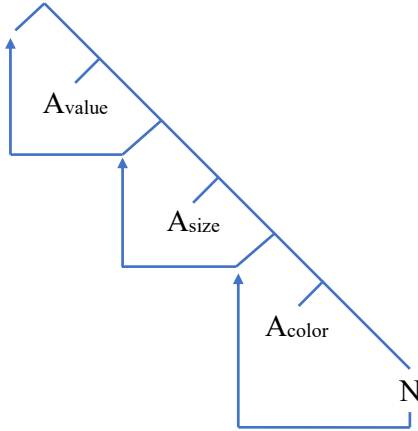


If it moves in the *pictures-of-whom* pied piping mode, whereby the noun drags along material immediately above it (see (22)), the order that is obtained is the order of Bangla and other head-final languages: $A_{value}$ $A_{size}$ $A_{color}$ N, in which the relative scope, and order, of the different adjectives is not altered.

If the noun moves in the *whose-pictures* pied piping mode, as in (23), the order that is obtained is N $A_{color}$ $A_{size}$ $A_{value}$, the mirror-image of the order of Bangla and other consistent head-final languages, in which the order of the different adjectives is altered (this is apparently the most frequent order):

(23)

$A_{value}$

$A_{size}$

$A_{color}$

N
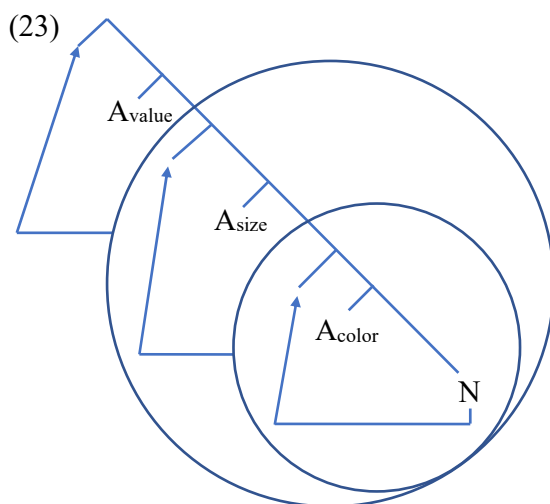
The picture is actually more complex, but in ways that do not affect the conclusion drawn above.

While pre-nominally only one order is possible ($A_{value}$ > $A_{size}$ > $A_{color}$ > N), post-nominally more than two orders are actually possible. In addition to N > $A_{value}$ > $A_{size}$ > $A_{color}$ and N > $A_{color}$ > $A_{size}$ > $A_{value}$ other orders are found, which can only be derived by movement if we want to retain the principle of relative distance of the adjectives from the noun, just as we have seen with the Maltese order N $A_{value}$ $A_{size}$ $A_{color}$.

For example the order **N $A_{size}$ $A_{color}$ $A_{value}$** of the Austronesian language Tatana' (Dunn and Peck 1988:211)[6] (as well as of the Niger-Congo, Gur, language Kasem – Danti 2007:122, and Welsh –Flanagan 2014:§8.2.2) can be derived by first moving the noun by itself, without pied piping, above $A_{color}$ and above $A_{size}$, and then moving the whole constituent [N $A_{size}$ $A_{color}$] above $A_{value}$ via the *whose-pictures* pied piping option:

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[6] "Any change in the order of modifiers was quickly rejected by speakers of the language, indicating that they had a definite order for the adjectives." (Dunn and Peck 1988:211).

(24)
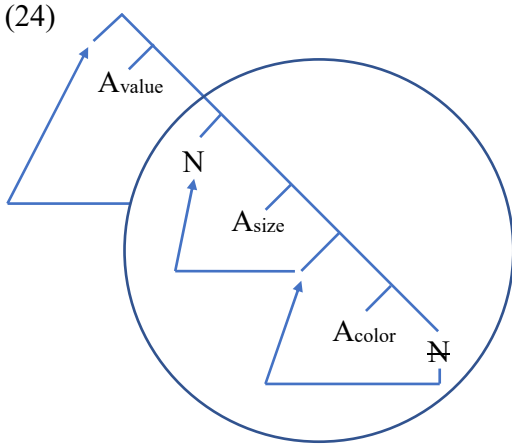


The order **N A_color A_value A_size** of Selepet (Papuan, Finisterre-Huon – McElhanon1972: 81; Dixon 1982: 26fn27) and of the West Caucasian language Abkhaz (Hewitt 1989: 59), as well as the order **N A_value A_color A_size** of Umbu-Ungu (Papuan, Chimbu – Head 1976: 67) are two more orders which must be derived by movement if we want to retain the principle of relative distance of A_value A_size A_color from the noun.

For the order **N A_color A_value A_size** the noun moves above A_color and then the whole constituent [N A_color] moves by itself, without pied piping, above A_size and A_value (see (25)a.):

(25)a.

For the order **N A$_{value}$ A$_{color}$ A$_{size}$** the noun must move step-wise with the *whose-pictures* pied piping mode above A$_{color}$ and A$_{size}$, reversing their order, and then move by itself above A$_{value}$ (see (25)b.):

(25)b.

A$_{value}$

N A$_{color}$

A$_{size}$

~~N~~

~~A$_{color}$~~

~~N~~

This approach to word order variation in the cross-linguistic ordering of adjectives may appear not to be the only account possible, but there are several considerations that support it:

**First:** It allows to derive all of the attested orders from one and the same hierarchy that respects the semantic/cognitive principle of relative distance of modifiers from the Head (Frans Plank's point).

**Second:** With the important restriction that only the Head of the projection, here the Noun, can move, in one of the possible ways that movement can take place, it allows the discrimination of possible from impossible orders.

**Third:** The movement options that it involves are, as we have seen, independently motivated by other clear cases of movement (like *wh-*movement).

**Fourth (and foremost):** The movement approach naturally carries over to the different syntactic domains that display the same pattern of possible and impossible orders (one order to the left and several orders to the right of a Head).

Other domains displaying the same pattern (of a single order to the left of the Head, and (at least) two orders to the right of the Head) are, for

example, the order of adverbs (see (26)), and that of circumstantial PPs (see (27)):

**Order of adverbs**: (Cinque1999: 42f; Rackowski and Travis 2000; Pearson 2000)

(26)a.   $Adv_{no\ longer} > Adv_{always} > Adv_{completely} > V$   (English, Chinese,..)

b.   $*Adv_{completely} > Adv_{always} > Adv_{no\ longer} > V$  0

c.   $V > Adv_{no\ longer} > Adv_{always} > Adv_{completely}$   (Italian,        (main clause) German,..)

d.   $V > Adv_{completely} > Adv_{always} > Adv_{no\ longer}$ (Malagasy, Niuean,..)

Limiting ourselves to circumstantial Time, Place and Manner PPs, whose order has been investigated from a cross-linguistic perspective by Boisson (1981), and Lu and Wen (2022) (also see Hinterhölzl 2001, Schweikert 2005, Cinque 2006), we find exactly the same pattern:[7]

**Order of circumstantial PPs**

(27)a.   Time > Place > Manner> **V** (Basque – Lu and Wen 2022:399)[8]

b.   *Manner > Place > Time > **V** 0

c.   **V** > Time > Place > Manner (Otomi (Oto-Manguean) – Boisson 1981:76)[9]

d.   **V** > Manner > Place > Time (Vietnamese, Yorùbá – Lu and Wen 2022:399)

The same pattern is also attested in the order of Demonstrative, Numeral, Adjective, and Noun (Greenberg 1963; Cinque 1996, 2005, 2023, among many others)[10]

(28)a. Dem > Num> A > N       (English, Malayalam,..)

b. *A > Num> Dem > N       0

c. N> Dem > Num>A       (Abu' Arapesh, Kikuyu,..)

d. N > A > Num> Dem       (Gungbe, Thai,..)

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[7] On the irrelevant interference of focus on the canonical order of circumstantial PPs and possible diagnostics for the canonical order, see Schweikert (2005), Cinque (2006), Lu and Wen (2022: fn3).

[8] Another language displaying this order is Nambikuára (Nambiquaran, Brazil – Kroeker 2001:3)

[9] Another language displaying this order is Tanga (Melanesian – Bell 1977:x)

[10] For additional domains in which one finds the same pattern I refer to Cinque (2009).

This case is even more telling as we have exhaustive evidence of all the possible and impossible combinations of these four elements (from a sample of over 2200 languages).

Out of the 24 mathematically possible orders (factorial 4) only 14 are actually attested (Cinque 2005, 2023).[11] See (29):

| (29) | [languages] | [genera] |
|---|---|---|
| **a. N A Num Dem** | **631** | **136** |
| **b. Dem Num A N** | **446** | **115** |
| c. Dem N A Num | 204 | 89 |
| d. Dem Num N | 186 | 76 |
| e. Num N A Dem | 242 | 50 |
| f. N A Dem Num | 103 | 35 |
| g. N Num A Dem | 70 | 34 |
| h. Dem N Num A | 52 | 29 |
| i. Dem A N Num | 50 | 27 |
| **l. N Dem Num A** | **83** | **25** |
| m. Num A N Dem | 55 | 21 |
| n. N Dem A Num | 33 | 17 |
| o. A N Num Dem | 33 | 13 |
| p. A N Dem Num | 21 | 9 |
| Tot: | 2.209 | |

The boldfaced orders (29)a., b., l are derived in the same way as the orders seen above of N $A_{color}$ $A_{size}$ $A_{value}$, $A_{value}$ $A_{size}$ $A_{color}$ N, and N $A_{value}$ $A_{size}$ $A_{color}$. The remaining 11 orders of the 14 attested ones (those not in boldface in (29)) are derivable via different combinations of the three possible movement options seen above. See Cinque (2005, 2023).

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[11] Dryer (2018) claims that some of the orders that Cinque's (2005) account of Greenberg's (1963) Universal 20 ruled out are actually attested in at least few languages. But this does not appear to be right as these languages also have orders which are among the 14 allowed in Cinque's (2005) account. A real counterexample would be a language with only one order which is not among the 14 admitted. See Cinque (forthcoming) for relevant discussion.

Crucially, the 10 orders which are unattested (those in (30)) are underivable under the condition that only the Head N(P) can move (by itself or in one of the two pied piping modes):

(30)a. *Dem A Num N
    b. *Num A Dem N
    c. *A Num Dem N
    d. *Num Dem A N
    e. *A Dem Num N
    f. *A Num N Dem
    g. *A Dem N Num
    h. *Num Dem N A
    i. *Num N Dem A
    l. *N Num Dem A

The restriction that only the Head of the projection can move within its projection thus proves instrumental in deriving the 14 attested orders (out of the 24 potential ones) of demonstrative, numeral, adjective and noun without deriving the 10 unattested ones.[12]

The restriction that **only** the Head of a projection can move within its projection can also account for the two missing orders of Degree Adverb A N and Numeral Classifier N ((12) and (13), seen above, and repeated here without examples and references as (31) and (32)), under the plausible assumptions that Degree Adverb and A and Numeral and Classifier form constituents that modify the N:[13]

(31)a. [[degree adverb **A**] **N**]
    b. [**N** [**A** degree adverb]]
    c. [**N** [degree adverb **A**]]
    d. [[**A** degree adverb]**N**]

    e. *A N degree adverb
    f. *degree adverb N A

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[12] As already noted, adjectives, numerals and demonstratives cannot move by themselves, except, irrelevantly, for focus reasons (or for scope reasons, as with the movement of English APs to a superlative high position in front of numerals, as in *The black\*(est) two dogs that I've (ever) seen* – Kayne 2008:fn15).
[13] For the case of Numeral and Numeral Classifier see Greenberg (1975:29).

(32)a. [[Numeral **Classifier**] **N**]
    b. [**N**[**Classifier** Numeral]]
    c. [**N** [Numeral **Classifier**]]
    d. [[**Classifier** Numeral] **N**]

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    e. *Classifier N Numeral
    f. *Numeral N Classifier

A movement approach to word order also promises to shed light on the numerosity of certain orders and the rarity of other orders. Recall the three modes in which the noun can move: by itself and via the *whose-pictures* and the *pictures-of-whom* pied pipings.

That the *pictures-of-whom* pied piping mode is more marked than the *whose-pictures* pied piping mode is shown, for example, by the following contrasts in English *wh*-interrogatives and restrictive relatives:

(33)a. Whose pictures do you keep in your wallet?
    b. *?Pictures of whom do you keep in your wallet?

(34)a. I wonder whose pictures they published yesterday.
    b.*I wonder pictures of whom they published yesterday.

(35)a. Here is someone whose pictures have always appealed to her.
    b. *Here is someone pictures of whom have always appealed to her.

This may be at the basis of the fact that orders derived by the *whose-pictures* pied piping mode are more frequent than the orders derived by the *pictures-of-whom* pied piping mode. See for example the fact that the languages and genera of the order N A Num Dem (which is derived via a consistent application of the same *whose-pictures* pied piping mode) outnumber those with the order Dem Num A N (derived with a consistent application of the same *pictures-of-whom* pied piping mode). See (29) above.[14]

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[14] The orders that mix the three different modes in which N(P) moves (the non-boldfaced orders of (29)) are progressively rarer, possibly depending on the different costs associated with the various types of mixtures (movement without pied piping appears to be the most marked option).

This is plausibly also at the basis of the fact that orders derived through a change from a *whose-pictures* pied piping (the less marked one) in an inner projection to a *pictures-of-whom* pied piping (the more marked one) in an outer projection is more costly (hence rarer) than changing mode in the opposite direction (from a *pictures-of-whom* to a *whose-pictures* pied piping mode).

In the orders of degree adverb Adj and N seen above, there is a decline in numerosity. (36)a., with a consistent application of the *whose-pictures* pied piping and (36)b., with a consistent application of the *pictures-of-whom* pied piping are more frequent; then follows (36)c., which involves a change from a *pictures-of-whom* pied piping to the less marked *whose-pictures* pied piping. (36)d., which involves a switch from a *whose-pictures* pied piping to the more marked *pictures-of-whom* pied piping, is the absolute rarest (recall that Greenberg did not record its existence):

(36)a. [[**N** [**Adj** degree adverb] (both Adj and N move with the *whose-pictures* pied piping)

b. [[degree adverb **Adj**] **N**](both Adj and N move with the *pictures-of-whom* pied piping)

c. [**N** [degree adverb **Adj**]] (Adj moves with the *pictures-of-whom* pied piping in the inner projection and N moves with the *whose-pictures* pied piping in the outer projection)

d. [[**Adj** degree adverb] **N**] (Adj moves in the inner projection with the *whose-pictures* pied piping and in the outer projection N moves with the *pictures-of-whom* pied piping)

The same is true with the orders of Numeral, Classifier, and N:

(37)d. which involves a change from a *whose-pictures* pied piping mode (the unmarked one) to a *pictures-of-whom* pied piping mode (the marked one), is the absolute rarest.

(37)a. [[Num **CLF**] **N**] (both N and CLF move with *pictures-of-whom* pied piping mode)

b. [**N** [ **CLF** Num]] (both N and CLF move with *whose-pictures* pied piping mode)

c. [**N** [ Num **CLF**]] ((CLF moves in the inner projection with the *pictures-of-whom* pied piping mode and N in the outer projection with the *whose-pictures* pied piping mode)

d. [[**CLF** Num] **N**] ((CLF moves in the inner projection with the *whose-pictures* pied piping mode and N in the outer projection with the *pictures-of-whom* pied piping mode)

Change of mode from the less marked to the more marked pied piping may also explain the extreme rarity of the exceptions to two well-known constraints discussed in the literature, the Final-Over-Final Condition (Holmberg 2000 and Sheehan, Biberauer, Roberts, and Holmberg 2017) and the Head-Final Filter (Williams 1982), which display the exact same pattern.

The Final-Over-Final Condition was proposed to disallow structures where a head-initial phrase is contained in a head-final phrase in the same projection, though certain exceptions exist (see (38)d., (39)d. and fns.15 and 16, 17.

(38)a. [[O **V**] **AUX**] (Hindi, Turkish, Yukaghir, etc.)
b. [**AUX** [**V** O]] (English, Italian, Niuean, etc.)
c. [**AUX** [O **V**]] (Guébie, Tunen, West Flemish, etc.)
d. *%[[V O] AUX]* (Gumuz, Kokama-Kokamilla)[15]

(39)a. [[O **V**] **COMP**] (Japanese, Malayalam, Marathi, etc.)
b. [**COMP** [**V** O]] (Arabic, English, Italian, etc.)
c. [**COMP** [O **V**]] (German, Georgian, Hindi, etc.)
d. *%[[V O] COMP]* (Hkongso[16]; East !Xóõ[17])

The same holds for the Head-Final Filter, which was proposed to rule out cases like (40)d., ungrammatical in English.[18] But that case is not unattested. It is only extremely rare cross-linguistically (note that we have here exactly the same pattern as the one seen so far):

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[15] For references and discussion see Cinque (2023:§5.2). The 4 genera which are reported as instantiating VOAux in Dryer (1992:100) should also be looked at.

[16] "The sole instance in my database of a VO language with final complementizer is Hkongso, a Tibeto-Burman language of Burma." (Dryer 2012:76fn8).

[17] Güldemann (2004:7) reports a sentence that exemplifies the order V O C, confirming in personal communication (January 16, 2010) that "the language indeed is an exception to the supposed universal SVO → initial complementizer".

[18] Williams' (1982) original proposal was meant to rule out in English cases like *[*a* [*proud of his children*] *man*], which is "unacceptable because the prenominal modifier (*proud of his children*) does not end in its head (*proud*)." (p.160) [as opposed to the corresponding Dutch case (40)b., which is grammatical]. Other names for the phenomenon are the "recursion restriction" (Emonds1976), the "consistency principle" (Giorgi and Longobardi 1991), the "adjacency requirement" (van Riemsdijk 1998), and the "edge effect" (Haider 2000).

(40)a.  [ **N** [**A** PP]] (a [man [proud of his children]])    (English)

   b.  [[PP **A**] **N**] (een [[op zijn vader] trotse] man])
                              (Dutch) (Neeleman 1994:233)

         'Lit. A        of his father proud       man'

   c.  [ **N** [ PP **A** ]] madar-an-e  [[be farzand-an-e   xod] moftaxar]
                              (Persian)

         'Lit. mother-PL-LNK [in child-PL-LNK own] proud]'
         (from Alexeyenko and Zeijlstra 2021:53 after Zahra
         Mirrazi, p.c.)

   d.  [[ **A** PP ] **N**] [gordiyat [săs     svoeto    dete]] băsta]
                              (Bulgarian) (Iliyana Krapova, p.c.)
         'Lit. proud.the with SELF.the child father'
         'the father proud of his child'

## 5. A restrictive theory of word order variation.

In the end, let me sketch how the requirement that only the Head of a projection can move within its projection (by itself or with pied piping) may contribute to build a restrictive theory of (canonical) word order (recall that a restrictive theory is measured in how much it excludes without excluding what is actually found).

Consider the addition of a fifth element, the numeral classifier, to the elements demonstrative, numeral, adjective and noun.

Factorial 5 (demonstrative, numeral, numeral classifier, adjective and noun) is 1x2x3x4x5 = 120 possible combinations. But if only 14 orders of demonstrative, numeral, adjective and noun are possible (as we saw in (29) and (30) above), and we multiply this number by two, due to the possibility for each of the 14 orders to vary according to whether the numeral classifier Head comes to precede or to follow its modifier (the numeral), we get not 120 but just 28 possible orders.

See (41) below, where only two of the 28 expected orders are not (yet) documented, no other order being found distinct from those in (41), as far as I could ascertain. (I refer to Cinque 2023 for reference to the relevant sources for each language mentioned).

(41)a. Dem Num CLF A N (Mandarin and Cantonese - Sinitic)
    a' Dem CLF Num A N (Upper Necaxa Totonac - Totonacan)

   b. Dem Num CLF N A (Yao - Hmong-Mien)

b' Dem CLF Num N A (Nêlêmwa and Zuanga - Oceanic)

c. Dem N Num CLF A (Lahu - Sino-Tibetan)
c' Dem N CLF Num A (Hakha Chin - Sino-Tibetan)

d. N Dem Num CLF A (Stiêng - Mon-Khmer)
d' N Dem CLF Num A (Kiriwina - Oceanic)

e. A N Dem Num CLF (Yunnan Bai - Sino-Tibetan)
**e' A N Dem CLF Num(?)**

f. N A Dem Num CLF (Kayan Lahta - Sino-Tibetan)
f' N A Dem CLF Num (Awara and West Makian - Papuan)

g. Dem A N Num CLF (Newari and Dulong - Sino-Tibetan)
g' Dem A N CLF Num (Mising and Nyishi - Sino-Tibetan)

h. Dem N A Num CLF (Burmese and Maru - Sino-Tibetan)
h' Dem N A CLF Num (Apatani - Sino-Tibetan)

i. N Dem A Num CLF (Nias Selatan – Malayo-Polynesian)
i' N Dem A CLF Num (Diola-Fogny – Atlantic-Congo)

l. Num CLF A N Dem (Tojolab'al – Mayan)
l' CLF Num A N Dem (Q'anjob'al – Mayan)

m. Num CLF N A Dem (Vietnamese – Austro-Asiatic)
m' CLF Num N A Dem (Rongga – Malayo-Polynesian)

n. N Num CLF A Dem (Kele and Lele – Oceanic)
n' N CLF Num A Dem (Buglere and Teribe – Chibchan)

**o. A N Num CLF Dem (?)**
o' A N CLF Num Dem (Galo and Mising-Sino-Tibetan)

p. N A Num CLF Dem (Thai and Lao-Tai-Kadai)
p' N A CLF Num Dem (Abun – Papuan; Sudest-Oceanic)

The addition of another element, by taking Num to be a complex cardinal numeral (e.g. 'three hundred'), composed of a multiplier ('three') and a base ('hundred'), would yield 720 possible combinations (factorial 6). Yet, if the multiplier and base form a constituent (cf. Kayne 2005: §9, and others), and if only the base can move within its constituent as it is the

Head of that constituent, at most 56 (rather than 720) orders are expected to be attested (the 28 possibilities of (41) multiplied by the two possible orders between base and multiplier in each of the 28 orders). This expectation awaits to be documented.

The factorial numbers stemming from the combinations of *n* elements (which with 10 elements arrive at over three and a half millions of possible orders if no restrictions are introduced) are drastically reduced (to less than one thousand) if word order variation is confined within each projection, and if only the Head of that projection can move within it in one of the possible ways.

### 6. Conclusion: the hidden rules of word order variation.

The hidden rules of word order variation to which I have referred in the title can thus be summarized in the following three points:

(42)a.  (Canonical) word order variation is a function of movement, in one of the forms that movement can take place (with or without pied piping).

   b.  The Head, and only the Head, of each (sub-)projection (N(P), A(P), V(P), CLF(P), Num(P), etc.) can move within its projection.

   c.  Kayne's (1994) Linear Correspondence Axiom, which applies to hierarchies (linearizing higher constituents to the left of lower ones).

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