Person, animacy and null subjects

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Licensing of null subjects can be contingent on person and animacy specification. For example, Hebrew allows null subjects if they are first or second person, but not if they are third person. This follows from a general typology that is based on the universal person/animacy hierarchy: if a subject of a certain person or animacy specification may be null, then every subject higher on the hierarchy may be null as well. The above typology, in turn, follows from the general way abstract hierarchies interact in the grammar: elements that appear on the high end of one hierarchy and the low end of another give rise to marked configurations. The mechanism of *alignment* in Optimality Theory gives a formalization of these universal properties of hierarchies.

1. Introduction

This work investigates the effects that person and animacy can have on the licensing of null subjects, for example in Hebrew, which only allows null subjects for first and second person arguments. The claim made here is that these effects can be derived from universal principles, specifically from the person/animacy hierarchy and the way it interacts with other hierarchies. The theory is one of markedness, and the crucial observation is that markedness results from the relationship between different hierarchies: a marked configuration emerges when an element ranks high on one scale but low on another.

A hierarchy of person and animacy has been proposed by various authors to account for different grammatical phenomena. For instance, Morolong and Hyman (1977, p. 202) use such a hierarchy to determine the object status of arguments, and Silverstein (1976, p. 122) uses it in a typology of split ergativity systems. The exact characterization of the hierarchy varies from author to author; the following is the version proposed by Aissen (1998).

(1)   1st/2nd Person > Proper Noun 3rd > Human 3rd > Animate 3rd > Inanimate 3rd

In addition to person/animacy, various other hierarchies have been proposed in the literature. Examples of other hierarchies are thematic role in (2) (this specific formulation taken from Choi 1996) and grammatical function in (3) (this formulation taken from Aissen 1998).

(2)   Agent > Beneficiary > Experiencer/Goal > Instrument > Patient/Theme
         > Locative

(3)   Subject > Object

The scales in (1)–(3) can be used to impose a markedness measure on syntactic configurations. As noted above, the co-occurrence of an element from the high end of one scale with an element from the low end of another scale is marked. It is not that themes are more marked than agents or that agents are more marked than themes, but it is more marked to have a theme as subject than to have an agent as subject; it is also more marked to have a theme as a subject than to have a theme as object. The markedness relations derived from the abstract hierarchies enable us to incorporate the effects of the hierarchies into the grammar, by excluding marked configurations in favor of less marked ones.

A technical means for capturing the idea that high ends of hierarchies tend to go together with other high ends, and low ends with low ends, has been developed by Prince and Smolensky (1993) in their definition of *alignment*. The domain of their theory is syllable structure, and the two scales are positional prominence within the syllable (peak vs. margin) and sonority prominence. By aligning these two prominence scales, Prince and Smolensky derive the result that the least marked syllable is one in which the peak is most sonorous and the margins are least sonorous.

Aissen (1997, 1998) applies the alignment technique to hierarchies such as (1)–(3) above, and derives a typology of voice systems. She shows how aligning different scales with the grammatical function scale (3) yields voice systems conditioned by various factors such as person or prominence. In Artstein (1998) I use a similar method to capture other effects of person and animacy, such as person-conditioned *pro*-drop or restrictions on clitics.

In this paper I show how the prominence scales yield an account of person effects on the licensing of null subjects. The markedness measures determined by the prominence scales give a typology of languages, where if a language allows null subjects of a certain type, it must also allow null subjects of any type higher on the scale; this seems to be a correct prediction for natural languages. I start by presenting the data in Hebrew, where it is person specification that licenses null subjects.

2. Null subjects in Hebrew

Hebrew past and future tense verbs show a person inflection. The ability to have a sentence without an overt subject ('*pro*-drop') depends on the person specification of the subject: an overt subject is optional if the subject is first or second person, but obligatory when it is third person (in the following paradigm, the pronouns in parentheses are optional, those without parentheses are obligatory).

(4)
1.sg	(ani)	axal-ti	/ ʔ-oxal
2.m.sg	(ata)	axal-ta	/ t-oxal
2.f.sg	(at)	axal-t	/ t-oxl-i
3.m.sg	hu	axal	/ y-oxal
3.f.sg	hi	axl-a	/ t-oxal
1.pl	(anaxnu)	axal-nu	/ n-oxal
2.m.pl	(atem)	axal-tem	/ t-oxl-u
2.f.pl	(aten)	axal-ten	/ t-oxal-na
3.m.pl	hem	axl-u	/ y-oxl-u
3.f.pl	hen	axl-u	/ t-oxal-na
	pronoun	ate-infl	/ infl-will.eat-infl

The future tense shows clear evidence that it is person specification and not just morphological form that conditions *pro*-drop in Hebrew. Ritter (1995, p. 432) observes that null subjects are possible with a future second person singular masculine verb but not with a third person singular feminine verb, despite the fact that the two verb forms are homophonous.

(5)   maxar (ata) toxal et ha-banana   'tomorrow you$_{m.sg}$ will eat the banana'
            maxar hi toxal et ha-banana   'tomorrow she will eat the banana'

     Under the analysis I develop here, the availability of null subjects is tied to the universal person/animacy scale (1). I thus derive the following implication: if a language has a *pro*-drop system conditioned by person, it must work in the same direction as in Hebrew. A null argument which is a first or second person pronoun will always be less marked than a null argument which is a third person pronoun, while an overt NP that is first or second person will be more marked than an overt NP that is third person. Consequently, the following implications are derived.

(6)   If a language allows null arguments in the third person, it will also allow them in first and second persons;

(7)   If a language requires first and second person arguments to be overt, it will also require third person arguments to be overt.

These implications form part of a more general typology that takes into account the entire person/animacy hierarchy.

(8)   If in a certain language null subjects are possible for an argument at some point on the person/animacy scale (1), then everything higher on the scale may also be realized as null; conversely,
        if arguments at a certain point on the hierarchy are required to be overt, then anything lower will be overt as well.

The idea works as follows: it is more harmonic, that is less marked, for an element to be on the same end of two prominence scales than for it to be on different ends of the two scales; elements on the opposite ends of scales thus tend to have contrastive grammatical realizations. Optimality Theory uses the mechanism of alignment (Prince & Smolensky 1993) to derive a measure of markedness when there is such an inverse relation between two scales. In the case at hand, the inverse relation is between person and grammatical realization: elements higher on the person/animacy scale tend to be realized as null subjects, while those lower on the scale tend to be realized overtly. We thus need to align the person/animacy scale with the following reduction scale (cf. Bresnan 1998, or the DROPTOPIC constraint of Grimshaw & Samek-Lodovici 1998).

(9)   Null > Overt

This will allow grammars that conform to the generalizations in (6)–(8), while disallowing grammars that do not conform to them. Grimshaw and Samek-Lodovici (1998) point out that the preference for null subjects in Italian is limited to topics; in Hebrew too I feel that null subjects in first and second person are not truly 'optional', rather their distribution is dependent on discourse status in a way that is yet to be precisely characterized. So the reduction scale can be thought of as a scale pertaining to topics (Bresnan 1998 also ties null pronouns to topichood).

3. Developing a typology of grammars

We derive a typology of null subject systems by applying the mechanism of alignment to the scales in (1) and (9) (this is similar to how Aissen 1997, 1998 derives a typology of voice systems). The following is the formal definition of alignment (Prince & Smolensky 1993, p. 136).

(10)   Suppose given a binary dimension D_1 with a scale $X > Y$ on its elements
        $\{X, Y\}$, and another dimension D_2 with a scale $a > b > \cdots > z$ on its
        elements. The *harmonic alignment* of D_1 and D_2 is the pair of Harmony
        scales:

        H_X: X/a › X/b › $\cdots$ › X/z   [more harmonic › $\cdots$ › less harmonic]
        H_Y: Y/z › $\cdots$ › Y/b › Y/a

        The *constraint alignment* is the pair of constraint hierarchies:

        C_X: *X/z $\gg \cdots \gg$ *X/b $\gg$ *X/a   [more marked $\gg \cdots \gg$ less marked]
        C_Y: *Y/a $\gg$ *Y/b $\gg \cdots \gg$ *Y/z

Alignment of (1) and (9) yields the following harmony scales, where
configurations to the left are more harmonic (i.e. less marked) than those on the
right.

(11)   **more harmonic › $\cdots$ › less harmonic**
        H_{null}:   null/1,2 › null/3.human › $\cdots$ › null/3.inanimate
        H_{overt}: overt/3.inanimate › $\cdots$ › overt/3.human › overt/1,2

These are markedness scales, where the least marked items appear on the top of
each scale. In Optimality Theory, marked structure results in violations of
markedness constraints. Constructions that are highly marked will be punished
by high-ranking markedness constraints. The harmony scales thus translate into
the following Optimality Theory constraint rankings, where dominating
constraints show configurations that are more marked.

(12)   **more marked $\gg \cdots \gg$ less marked**
        C_{null}:   *NULL/3.INANIMATE $\gg \cdots \gg$ *NULL/3.HUMAN $\gg$ *NULL/1,2
        C_{overt}: *OVERT/1,2 $\gg$ *OVERT/3.HUMAN $\gg \cdots \gg$ *OVERT/3.INANIMATE

    In the above rankings, the constraint *NULL/3.INANIMATE dominates all the
other constraints of the form *NULL/X, while the constraint *NULL/1,2 is
dominated by all other constraints of this form; the most marked null subject is
thus an inanimate one, while the least marked is first or second person. The
opposite is true for overt subjects—first or second person is the most marked,
while inanimates are the least marked overt subjects. These markedness
relations are universal.
    How do we get from here to the typology in (8)? All the constraints in C_{null}
punish null subjects. Suppose now that there were a single constraint against
overt subjects that was ranked somewhere in the middle of this hierarchy: the
result would be a split system, with elements high in animacy being null and
low ones being overt.

(13)   *NULL/3.INANIMATE $\gg \cdots \gg$ ***OVERT** $\gg \cdots \gg$ *NULL/1,2

The same result would obtain if we had a single constraint against null subjects that was ranked somewhere between the constraints of C_{overt}.

(14)   *OVERT/1,2 $\gg$ $\cdots$ $\gg$ ***NULL** $\gg$ $\cdots$ $\gg$ *OVERT/3.INANIMATE

We don't even need a designated constraint against null subjects or against overt subjects: merely interleaving the two subhierarchies C_{null} and C_{overt} gives us exactly the same result, that is a system with a single split, where elements high in animacy are null and elements low in animacy are overt. This follows from the Affinity Cut Theorem (Prince & Smolensky 1993, p. 141; see appendix for proof).

   One core assumption of Optimality theory is that constraints can be freely reranked to produce different languages. Free reranking would allow all permutations of the constraints in the subhierarchies C_{null} and C_{overt}. However, we have established that the ordering within each subhierarchy is universally fixed: free reranking is not allowed within the subhierarchies. Constrained in this way, free reranking predicts that a particular grammar can have these two subhierarchies interleaved, as long as each subhierarchy keeps its own order. The fixed order of constraints within the subhierarchies thus causes the system to have a single split, conforming to the typology in (8).

4. The Hebrew case

We are now ready to look in detail into the Hebrew example, where the split is between first/second person and third person. The crucial thing to notice is that for every element X, its realization is determined by the relative ranking of *NULL/X and *OVERT/X, which are found on different subhierarchies. The following tableaux demonstrate what a grammar for Hebrew will have to look like.

(15)

'I ate'	*OVERT/1,2	*NULL/1,2
☞ *pro* axalti		*
ani axalti	*!	

(16)

'he ate'	*NULL/3	*OVERT/3
pro axal	*!	
☞ hu axal		*

Two rankings are necessary to account for Hebrew: *OVERT/1,2 $\gg$ *NULL/1,2 and *NULL/3 $\gg$ *OVERT/3; these are consistent with the subhierarchies in (12). The opposite however would be inconsistent, as the following arguments show.

(17) Suppose third person subjects are null.
      Therefore, *OVERT/3 >> *NULL/3.
      From (12), *OVERT/1,2 >> *OVERT/3 >> *NULL/3 >> *NULL/1,2.
      Hence, first/second person subjects are also null.

(18) Suppose first/second person subjects are overt.
      Therefore, *NULL/1,2 >> *OVERT/1,2.
      From (12), *NULL/3 >> *NULL/1,2 >> *OVERT/1,2 >> *OVERT/3.
      Hence, third person subjects are also overt.

These are exactly the implications of (6) and (7), which have now been successfully derived. With respect to the contrast between first/second and third person, we see that the system allows three possible grammars:

(19) 1/2 person null; 3 person null   (e.g. Italian)
      1/2 person null; 3 person overt   (e.g. Hebrew)
      1/2 person overt; 3 person overt   (e.g. English)

The fourth possibility is excluded, namely a grammar where first and second person subjects are overt but third person subjects are null. There is just no way to get a ranking that is consistent with the subhierarchies in (12), where *NULL/1,2 dominates *OVERT/1,2 while *OVERT/3 dominates *NULL/3. So the prediction that the hierarchies make is that if a language is to make a distinction based on person as to which subjects do not have to be phonetically realized, then it will be the first and second persons that are dropped. In addition to Hebrew, some Italian dialects follow the same pattern: whereas standard Italian allows null subjects for all person specifications, the Trentino dialect (Brandi & Cordin 1989, p. 113) requires overt pronouns for third person subjects while allowing null subjects in the first and second person (with the exception of second person singular).

Since the entire person/animacy hierarchy aligns with the reduction scale, we predict that there should also be languages that show a split between null and overt subjects at a point lower on the scale than Hebrew, for instance a language that allows a null realization for human subjects but prohibits it from non-humans and inanimates. In two special cases there will be no split at all: these are predicted by the system to occur when the subhierarchies are ranked in such a way that one is completely subordinate to the other. In this case we get a language where all subjects are overt (as in English), or all are null (as in Italian).

(20) C_{null} >> C_{overt}
      For all X, *NULL/X >> *OVERT/X
      Hence, all X are overt.

(21) $C_{overt} \gg C_{null}$
        For all X, *OVERT/X $\gg$ *NULL/X
        Hence, all X are null.

5. Null expletives

The person-based implications from section 2 hold only for thematic subjects, not for expletive ones. While expletive subjects often take the form of a third person pronoun, they are more easily omitted than thematic subjects. In Hebrew, for instance, an expletive (normally the demonstrative pronoun *ze*) may be absent even in places where all thematic subjects (including first and second persons) are required, as in nominal constructions or in the present tense (where the verb is not inflected for person). Indeed, in a survey of constructions without overt subjects in Hebrew, Berman (1980, fn. 2) makes a distinction between null first and second pronouns, which she considers to be real pronouns, and constructions such as expletives which she considers truly subjectless.

But expletive elements also show behavior similar to what we have seen so far. Travis (1984, ch. 5) suggests that there is a hierarchy of expletives, and shows that if a language allows null expletives on a certain point in the hierarchy, it will also allow null expletives in all the points higher up.

(22)   Argumentless Passives and Unaccusatives > Expletives of Displaced NPs > Expletives of Displaced CPs (S′) > Weather Predicates > Referential NPs

Travis's system is exactly what we get if we align the above hierarchy with the reduction scale of (9); given the hierarchy proposed by Travis, the mechanism developed here yields the correct typology.

Travis's hierarchy (22) includes referential NPs as its bottom element. This automatically accounts for the generalization of Jaeggli and Safir (1989, p. 19), that 'While every language that permits null thematic subjects also permits null expletive subjects, it is not the case that every language that permits null expletive subjects permits null thematic subjects.' We could even go further, and propose that the expletive hierarchy is a continuation of the person/animacy hierarchy in (1). Such an analysis would give us a continuum of languages, from those that only allow certain null expletive subjects to those that allow some null thematic subjects based on a person or animacy distinction and finally to those that allow all subjects to be null. The problem with viewing the expletive hierarchy as a continuation of the person/animacy scale is that person and animacy manifest themselves in various other parts of the grammar, while the only evidence so far for the expletive scale comes from the work on *pro*-drop.

6. Morphologically conditioned pro-drop

An instance where it is not the hierarchies that determine the availability of null subjects is when null subjects are dependent on the morphology. An example is Irish: McCloskey and Hale (1984, p. 491) point out that 'there is in Irish an absolute complementarity between the appearance of person-number morphology on the verb, and the appearance of an independent phonologically-expressed subject.' The existence of agreement morphology on the verb varies with tense and with different person-number specifications, and seems to be the result of morphological accident rather than principled reasons. The person and animacy analysis does not generalize to Irish.

We seem to be dealing here with a system that is inherently different from that of Hebrew. Though both systems have certain configurations which lack a separate word expressing the subject (and have thus been analyzed as having null *pro* in subject position), they do show substantial differences. For instance, *pro*-drop in Irish, when possible, is obligatory in all discourse settings, as opposed to the case in Italian or Hebrew where null pronouns are licensed in certain discourse configurations but not in others. The two kinds of '*pro*-drop' are therefore not the same phenomenon, so they warrant different treatment. The Irish pattern seems to be characteristic of VSO languages: a similar pattern is attested in Classical Arabic; Doron (1988) even draws parallels between Irish and the (relatively marked) postverbal subjects in Hebrew.

Yet even in a system like Irish there is a residual effect of person specification. While standard Irish requires that there be no overt subject when the verb is inflected for subject agreement, Doron (1988, p. 216) gives examples from West Munster dialects of Irish, where it is possible to have an overt subject together with an inflected verb, but only in the third person. Once again we see that the prediction of the person hierarchy works in the right direction: if there is an effect of person, then first and second persons are more likely to be dropped.

Morphology plays a role in Hebrew too, at least in certain constructions. It has already been mentioned that in the present tense and in nominal constructions no null subjects are available, and this must be tied to the fact that in these cases there is never any agreement morphology on the predicate. There are morphological effects even in the future tense. In non-standard (but very commonplace) colloquial Hebrew, the first person singular form has been suppleted by the third person singular masculine. In this case null subjects are impossible, though they are possible for the standard first person form (Borer 1989; Ritter 1995).

(23)   Standard: (ani) ʔoxal et ha-banana   'I will eat the banana'
         Colloquial: ani yoxal et ha-banana   'I will eat the banana'
             cf.:   hu yoxal et ha-banana   'he will eat the banana'

This dependence on the morphological form of the verb is in striking contrast to the examples in (5) above, where the availability of null subjects is dependent

on the person specification of the verb alone. The explanation for this lies in the fact that the suppletion of the first person singular by the third person form is a relatively new innovation in Hebrew; it is triggered by surface phonetics (a glottal stop [ʔ] changes to a glide [y] in the intervocalic context [i_o]); and it is restricted to the more familiar or colloquial registers. On the other hand, the homophony of the future tense second person masculine singular with the third person feminine singular is much more established: it appears in all registers, has existed since the earliest stages of the language, and is characteristic of many other Semitic languages. A possible interpretation is that the null pronoun in the colloquial Hebrew construction is in fact a third person pronoun, which is an unfaithful parse of a first person input (cf. Grimshaw 1997 for a treatment of clitic features in terms of faithfulness to the input).

7. Previous analyses

A different analysis for the person effects in the Hebrew *pro*-drop system is given by Ritter (1995). Her analysis invokes morphology, not of the verb forms but rather of the subject pronouns themselves: Ritter analyzes the person effects as stemming from different licensing conditions on first and second person pronouns as opposed to third person pronouns, the ultimate source being a difference in structure between the two kinds of pronouns (first and second person pronouns are DPs while third person pronouns are NumPs). Ritter gives reference to literature indicating that a difference in the behavior of the two classes of pronouns is attested in various languages. Yet, the particular structures she proposes for the pronouns are specific to Hebrew; it should thus be possible under her account for a language to have opposite structural specifications, and thus show a pattern opposite to the Hebrew paradigm in (4) above. Under the analysis I have developed here, the null subject paradigm of Hebrew is one of the options allowed by the universal person/animacy scale; a system opposite to Hebrew is predicted to be impossible.

Another account of *pro*-drop phenomena, couched within Optimality Theory, is given by Grimshaw and Samek-Lodovici (1998). It treats the realization of subject pronouns as a result of the tension between faithfulness to underlying specification and the tendency to eliminate topics. Thus, a null pronoun in the surface form incurs a violation of the constraint PARSE, while an overt pronoun that is coreferent with the topic violates the constraint DROPTOPIC. The relative ranking of these constraints will determine whether a language allows null subjects (for instance, Italian) or if it requires all subjects to be overt (English). This analysis treats all pronouns alike, regardless of their person specification, and consequently it does not deal with person-conditioned systems like Hebrew.

A possible extension of Grimshaw and Samek-Lodovici's account would be to parameterize the constraint DROPTOPIC. If we assume that, universally, DROPTOPIC/1,2 dominates DROPTOPIC/3, then the faithfulness constraint PARSE could appear in three positions with respect to the other two, resulting in three

types of languages: Italian (PARSE is dominated by both DROPTOPIC constraints), English (PARSE dominates both constraints), and Hebrew (PARSE appears between the two). Notice the similarity between the proposed universal ranking of DROPTOPIC and the subhierarchy C_{overt} from (12).

(24)   DROPTOPIC/1,2 >> DROPTOPIC/3
      C_{overt}:   *OVERT/1,2 >> *OVERT/3

The difference between my analysis and the extension of Grimshaw and Samek-Lodovici's is in how the subhierarchy is derived. In the present proposal the subhierarchy is derived from the universal person hierarchy through alignment of scales, so in addition to the constraints governing overt subjects the theory gives a pair of constraints on null subjects. What follows, then, is a theory of surface markedness, not of a conflict between markedness and faithfulness. Under the proposed extension to Grimshaw and Samek-Lodovici's theory, the reason why the subhierarchy in (24) should be universal remains obscure.

8. The direction of alignment

I end this paper by returning to the alignment operation that we performed in (11)–(12). In these examples it is crucial that we align the person/animacy scale along the reduction scale, and not the other way around. If we aligned reduction along the person scale we would get the following as the universal harmony and markedness scales.

(25)   **more harmonic › less harmonic**
      $H_{1/2}$:   null/1,2 › overt/1,2
      H_3:   overt/3 › null/3

(26)   **more marked >> ⋯ >> less marked**
      $C_{1/2}$:   *OVERT/1,2 >> *NULL/1,2
      C_3:   *NULL/3 >> *OVERT/3

The prediction would be that null first and second person pronouns should be better than overt ones, while overt third person pronouns should be better than null ones. This is a particular grammar which determines the optimal form for each person specification. However, if alignment should be thought of as universal, then its purpose is to constrain the typology, not to derive a particular grammar. So we are not asking what is the best realization for a specific person, rather the question we are asking is what makes a good null or overt pronoun. This way the grammar imposes a markedness relation on null pronouns and a different markedness relation on overt pronouns, and the various ways of combining these relations yield the set of possible languages.

It seems that in general, then, alignment does not take an element and find the best realization for it, but rather looks at the grammatical realization and determines what elements would fill it best. Previous applications of alignment have also aligned the inherent specification along the grammatical realization: sonority is aligned with syllable position (Prince & Smolensky 1993), and person, thematic role and discourse prominence are aligned with grammatical function (Aissen 1997, 1998). The grammatical realization scale I have used in this work is the reduction scale of (9). We can make a general prediction about what happens when a prominence scale aligns with the reduction scale.

(27)   Whenever a hierarchy aligns with the reduction scale, the resulting typology is the set of languages with a split such that all the elements above the split are null, and those below it are overt.

This is a more general form of the typology in (8), and is derived in a similar way using the mechanism of alignment (a formal proof appears in the appendix).

9. Conclusion

The function of hierarchies such as person/animacy is to constrain the possible range of grammars. Not all null subject systems are alike. But every such system that makes a distinction based on person or animacy must conform to the typology laid out by the hierarchies, as in the generalizations (8) and (27). Hebrew is an example of such a null subject system, where first and second person subjects may be null but third person subjects must be overt. Additional systems are possible where the split lies somewhere else along the hierarchy, or where all subject pronouns show the same behavior regardless of their person or animacy specification. The theory developed in this paper predicts that there can not be a grammar that goes against the direction of the person/animacy hierarchy, that is one where lower elements are null but higher elements must be overt. Every grammar must be in accord with the hierarchies, so the abstract hierarchies themselves are universal.

Appendix: The typology of alignment

This appendix contains a formal proof for the following theorem (which is the same in essence as the Affinity Cut Theorem from Prince & Smolensky 1993, p. 141).

(28) **Theorem:** If a prominence scale $a_n > \cdots > a_1$ is aligned with the reduction scale Null > Overt (9), then the resulting typology contains all and only the languages where for some integer i, $0 \leq i \leq n$:
a. all the instances of a_j such that $j > i$ are realized as null;
b. all the instances of a_j such that $j \leq i$ are realized as overt.

That is, every language will have a cutoff point where elements higher in the hierarchy will be null, while elements lower in the hierarchy will be realized overtly.

   Proof: Alignment as defined in (10) yields the following harmony scales and constraint rankings:

(29)   Harmony scales:
       H_{null}: null/a_n › $\cdots$ › null/a_1
       H_{overt}: overt/a_1 › $\cdots$ › overt/a_n

(30)   Constraint rankings:
       C_{null}: *NULL/a_1 ≫ $\cdots$ ≫ *NULL/a_n
       C_{overt}: *OVERT/a_n ≫ $\cdots$ ≫ *OVERT/a_1

The subhierarchies in (30) are predicted to be universal; language variation is due to the different ways these subhierarchies can merge into one ranking. What determines if an element a_i is realized as null or overt is the relative ranking of the constraints *NULL/a_i and *OVERT/a_i. The following observations follow from the transitivity of the dominance relationship ≫.

(31)   If for an integer i, *OVERT/a_i ≫ *NULL/a_i, then for all integers j, $j > i$, it is the case that *OVERT/a_j ≫ *NULL/a_j.
       That is: if a_i is realized as a null element, then all elements *higher* in the hierarchy will also be null.

(32)   If for an integer i, *NULL/a_i ≫ *OVERT/a_i, then for all integers j, $j \leq i$, it is the case that *NULL/a_j ≫ *OVERT/a_j.
       That is: if a_i is realized as an overt element, then all elements *lower* in the hierarchy will also be overt.

Since every grammar has all the constraints ranked with respect to one another (a *total ordering*), we know that for every integer i, $0 \leq i \leq n$, it must be that either *NULL/a_i ≫ *OVERT/a_i or *OVERT/a_i ≫ *NULL/a_i. We can now prove that every grammar has exactly one point in the hierarchy, above which elements are realized as null and below which elements are realized as overt.

   Let C be a particular grammar, that is a total ordering of the two subhierarchies C_{null} and C_{overt} in (30). Let i be the highest integer such that *NULL/a_i ≫ *OVERT/a_i in C, or zero if there is no such integer. Because of the way i was chosen, any element higher in the hierarchy than a_i will be null; any

element a_i will be realized overtly, and from (32) it follows that any element lower in the hierarchy will also be realized overtly.

This concludes the proof of the theorem in (28). In the limiting cases, all the elements of the hierarchy will be null, or all will be overt; otherwise, a split will occur, with elements higher on the hierarchy being null, and the lower ones overt.

Acknowledgments

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