Markedness and the morphosemantics of binary number

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This paper argues that the zero-analysis of binary number in (2), coupled with modification of the pragmatic account inspired by Krifka (1989), explains the **Marked Plural** generalization in (1), aligning semantic and morphological markedness, contrary to Krifka's claim and the consensus in the extensive subsequent literature. An interesting result, however, is that Jakobson's classical conception of privative markedness cannot be retained (at least for number).

(1)   **Marked Plural**: In languages with a binary number system, singular nouns are never more overtly marked than plural nouns.

(2)   **Zero-analysis of binary number**: plural morphology denotes Link's pluralization operator $*$, singular nouns denote sets, plural nouns denote their closure under $\oplus$.

Background: Jakobson (1957/1984) formulated an important morphosemantic principle of marking contrasts: "Semantically, the [morphologically] marked category is characterized by the presence of some property P, while the corresponding unmarked category entails nothing about the presence or absence of P but is used chiefly (although not exclusively) to indicate the absence of P". (1) (a corollary of Greenberg's Universal 36) raises the recalcitrant question of the relation between morphological and semantic markedness in binary number systems. Given (1), plurals, which are morphologically more complex than singulars and hence morphologically marked, should be semantically marked as well, indicating the presence of some semantic property which singulars are silent about. A Jakobsonian analysis of binary number, however, has proven difficult to construct. The dilemma, introduced in passing by Krifka (1989, fn. 4), is that if singular nominals range over atoms and plurals range over atoms and their sums, then singulars are semantically marked in the sense that their denotation is a subset of that of plurals. This is the conception of semantic markedness that Farkas and de Swart (2010) (FdS) call *denotational markedness*. This "strong singular" analysis was developed by Sauerland (2003; 2005), who assumes that singular ϕ-features carry an atomicity presupposition, and plural ϕ-features carry no presuppositions. This analysis derives the correct readings, but predicts the opposite pattern, leaving (1) entirely unexplained.

Farkas and de Swart (2010) attempt to develop a "strong plural" analysis in which plurals are semantically marked. Their analysis builds on Spector (2007), but avoids employing his notion of "higher order implicature". They replace denotational markedness with the Jakobsonion notion of *semantic complexity*. An item i is less semantically complex than an item i' iff i' is associated with a semantic requirement that is lacking in i. They associate the privative plural feature [pl] with a semantic constraint requiring plural forms to allow sum witnesses, whereas singulars come with no constraints, making plurals marked. An optimization process that favors pairing (un)marked forms with (un)marked meanings is claimed to derive the distribution of readings. Plurals on their analysis have marked meanings because their extensional domain includes sums, invoking another sense of semantic markedness which they call *conceptual markedness*. An item i is conceptually simpler than an item i' iff the meaning of i' is constructed from, and hence presupposes and is dependent on, the meaning of i. The existence of sums is dependent on the existence of atoms, but not vice versa.

Proposal: I argue that FdS' analysis is essentially correct, but not as implemented, and that it leads to different conclusions than the ones they draw. First, since they follow Krifka and Sauerland in assuming that lexical nouns have number neutral denotations, their analysis does not actually associate a meaningful constraint with the presence of [pl]. They assign singular and plural nouns the denotations in (3a) and (3b) respectively (Farkas and de Swart 2010, fn. 13), but these are, in fact, the same number neutral denotation, and nothing distinguishes

singular from plural nouns.

(3) a. Meaning of a singular nominal: $\lambda x[P^*(x)]$
     b. Meaning of a plural nominal: $\lambda x[x \in \text{Sum} \cup \text{Atom} \wedge P^*(x)]$

This problem is easily fixed by assuming the zero-analysis of plurals in (2), which associates singular nouns with standard $\langle e, t \rangle$ denotations (sets of individuals) rather than number neutral one. This produces the analysis of markedness that FdS intend. Plural morphology derives number neutral denotations, which include sums, from singular noun denotations which don't, making plurals conceptual complex and semantically marked. This move entails, however, that semantic markedness for number does not come from semantic complexity. There is no semantic property that plurals specify and singulars are "silent" about. In the same way that plurals have sums in their extension and can therefore be used to refer to sums, singulars do not have sums in their extensions and cannot be used to refer to them. The Jakobsonian principle of privative markedness cannot, therefore, be maintained (at least for number). Instead, what is involved is a weaker principle that Francez and Koontz-Garboden (2017) call TRANSPARENCY, and says that *morphologically derived forms are semantically derived from the meaning of their source*. Nothing guarantees that semantic derivation will lead to semantic markedness, and it often doesn't. TRANSPARENCY, however, which is just compositionality at the morphological level, anticipates the generalization (1) on two reasonable assumptions. The first, built into the zero-analysis in (2), is that languages tend to lexicalize properties of individuals. The second is that, contra Sauerland and much of the literature but according with surface morphology, plurals are morphologically derived from singulars. On these assumption, TRANSPARENCY entails that plurals cannot be conceptually simpler that their source. An interesting empirical question is whether the stronger generalization holds, that morphological derivation never leads to conceptual markedness.

Semantically, the main difficulty for a "strong plural" analysis has been explaining the distribution of atomic and sum reference of nominals. Plural indefinites are generally interpreted as making reference to sums in upward monotone environments, but to either sums or atoms in downward or non-monotone ones. For example, (4-a) is usually taken to communicate that Anna sent you more than one postcard (sum reference) whereas (4-b) communicates that she sent one (atomic reference), and (4-c) asks if she sent any (atomic or sum reference). Why can't (4-a) be used to communicate that Anna sent you one postcard?

(4) a. Anna sent you postcards.
     b. Anna sent you a postcard.
     c. Did Anna send you a postcard / postcards?

On Sauerland's "strong singular" account, this data is explained in terms of the principle of MAXIMIZE PRESUPPOSITION. If a speaker intends to refer to atoms, and can do so using more than one form, she should use the form that has the stronger satisfiable presupposition, which, on that analysis, is the singular. On FdS's analysis, this patterns is explained by a combination of their bi-directional optimization process, which associates plurals with exclusively sum reference and singulars with exclusively atomic reference in upward entailing environments. The *Strongest Meaning Hypothesis* ensures that plurals do not receive exclusive sum reference in downward and non-monotone environments. Krifka (1989) explains the fact that (4-a) has sum reference as an implicature arising from the pragmatic rule (5), which combines Quantity and Manner.

(5) Pragmatic Rule I: If two expressions α, β are (i) both applicable, (ii) α is more specific than β (iii) α is not more complex than β, then choose α.

I propose a pragmatic explanation that does not involve quantity, generating manner implica-

tures based on the hearer's reasoning about context, the speaker's knowledge state, and the motivations for their lexical choices. First, note that, on their literal sense, (4-a) and (4-b) are mutually entailing. If there is a sum or atom of postcards Anna sent you, there is also an atom, and if there is an atom she sent, there is also an atom or sum. Consequently, the negation of (4-a) entails the negation of (4-b) and vice versa. This explains why, in (4-c), as in all downward and non-monotone environments, the number distinction is neutralized. In (4-c), the speaker is presumed to be ignorant about, and to want to know, whether any postcards were sent, atoms or sums. Using the singular and the plural would in this case yield the same partition of worlds, into those in which there is at least one postcard Anna sent and those in which there are none. (4-b) is similarly unproblematic, receiving its literal interpretation. The speaker is assumed to know whether Anna sent a sum or an atom, asserts that she sent an atom, and the hearer concludes that atomic reference is intended (though (4-b) is still true if Anna sent a sum of postcards). (4-a) is the interesting case. Because (4-a) and (4-b) are mutually entailing with non-collective predicates, the falsity of (4-b) is not a scalar implicature of an assertion of (4-a). The speaker is again presumed to know whether Anna sent an atom or a sum of postcards. In a context in which which it is common knowledge that this information is irrelevant, (4-a) will communicate its literal meaning, namely that Anna sent at least one postcard ("inclusive sum" reading). For example, a speaker who is asked which of several mail services Anna used during the year can utter (4-a) and communicate 'one or more', even though they are taken to know how many. In more common contexts, the question of how many is not presumed to be irrelevant, and speakers are presumed to convey everything they know about it. In that case the defeasible reasoning process in (6) is triggered, leading to the communication of sum reference. Step (c) amounts to FdS's result that singulars are optimal for atomic reference.

(6)   —   The speaker chose the complex plural form, asserting that Anna sent either an atom or a sum of postcards.
         —   The speaker knows whether Anna sent an atom or a sum, and does not intend to communicate ignorance.
         —   The speaker did not choose the complex form in order to convey atomic reference (as there is a simple form that does that).
         ⤳   The speaker intends to communicate sum reference.

Conclusions and consequences: This paper shows that the zero-semantics proposed by Link (1983) derives the **Marked Plural** generalization if semantic markedness is conceived of as semantic complexity. If the proposal is correct, then the elegant Jakobsonian principle of privative markendness cannot be maintained, and is reduced to TRANSPARENCY: morphological complexity leads to semantic derivation. Semantic derivation may, but need not, result in semantic markedness in one of the several senses of this term. However, semantic derivation can never lead to semantic unmarkedness relative to a base form. The distribution of sum, atomic and number neutral readings is not determined by scalar reasoning, but, as argued by Farkas and de Swart (2010), by reasoning about the motivation for a speaker's choice of expressions that stand in a semantic markedness relation.

References

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