Linguistic Zero in Asia: from Pāṇini to Pro-Drop

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As a tigress carries her cubs between her two rows of teeth, taking care lest they be dropped or bitten, so should one pronounce the Vedic speech-sounds with care, lest sounds be improperly be dropped or too strongly enunciated.

From the Pāṇiniyaçikṣa.

1. Introduction

This tigress, one assumes, would be acting according to her innate bioprogram but what of the officiant chanting Vedic speech sounds? And what can be said about linguistic material "improperly dropped" in other language situations?1

As the tigress is careful not to drop her cubs, some languages seem more careful not to drop their linguistic elements than others. Traditionally, some of this this difference has been accounted for by typological categorizations: in phonology or morphophonemics, by general mechanisms of elision subject to various constraints; or more recently in syntax, by a Pro-drop Parameter whose settings young children determine on the basis of rather "impovershed" input from their native language. Recent work in the minimalist generative framework, for example, discusses a "pro-module" presumably subject to such parameterised principles (Chomsky 1992:28).

What follows may seem like a questionable interweaving of two quite disparate modes of analysis. One strand below is the empirical status of grammaticality judgments—of what could be called "starring behavior" as it relates to syntactic argumentation referring to zero elements. Focus is on how latent judgments can be masked, following a suggestion of Comrie (1984). A second strand is the historical development of how zero has come to play a role in such syntactic argumentation. At least in Asian language situations like the Thai one, the intertwined nature of these strands a matter of some significance to typology and universals.

2. "Starring behavior" and the bioprogram

Grammaticality judgments in linguistic argumentation typically have the status of "givens"—of methodolical primitives. For example, they have typically played a central role in providing empirical evidence for morphological and syntactic investigations of type in which zero elements have commonly been postulated. Speakers "star" phrase structures or sentences, one account goes, as ungrammatical if they fail to comply with structural descriptions of the language. These in turn are

1Some parts of this paper were presented in a 1994 seminar series at the Faculty of Asian Studies, Australian National University organised by Dr Ann Kumar. I am indebted to the Departments of Linguistics at Chulalongkorn, Thammasat and Mahidol Universities for academic hospitality during a study leave period in 1993, facilitated by the Thai National Research Council. Some ideas here were developed there. Dr Wilaiwan Khaititantan and Dr Dhirawit Lagsanaging are among many Thai scholars to whom I owe particular thanks for discussions.
grounded in a language faculty, one component of which includes autonomous syntactic computational procedures relying crucially on configurational notions such as X-bar Theory and c-command and its variants. The poverty of stimulus argument then suggests that, like the tigress above, speakers have an innate endowment crucially accounting for their highly intricate behavior.

Of course not all "starring behavior" would need relate directly to autonomous syntax. General conceptual issues might enter into starring behavior, as could contextual-pragmatic ones. Someone might star a sentence like [*Every tigress has teeth] because there might be toothless tigresses or even [*Every Vedic officiant makes his offerings] because it uses a sexist pronoun. However, for Chomsky and others who share the view of autonomous language suggested above, it seems unproblematic that, given language in this sense of competence in computational procedures, "we can distinguish the language from a conceptual system and a system of pragmatic competence" (Chomsky 1992:1; see also Roeper and Williams, 1987:xi).

But can we always do so? —Especially when it comes to method and practice? Sections below propose that Asian languages in particular stand to provide critical input into current discussions of typology and universals relating to this important issue. Pending a Pan-Asian critique, gross parametric claims relating to null elements seem hasty with respect to finding any direct evidence of bioprogram organization. We return to this strand below, but in the next section we attend to how null elements found their way into linguistic argumentation in the first place.

3. Zero elements in Pāṇini's Āstādhāyi

Linguistic zero has its deepest roots in Asia. It harks back to the tradition of formal linguistic analysis in ancient India—preeminent in comparison to other early traditions of language study. Panini's Astadyayi (or 'eight books') written before 300 BC and probably refining centuries of earlier scholarship has served as the foundation of Indic grammatical study for over two millennia. "The Paninian tradition has always remained the central tradition of Indian linguistics" (Staal 1974:69); or in the words of Rosane Rocher, "all branches of ancient Indian linguistics are overshadowed by grammar and its grand master, Panini" (1992:143).

An important probable precursor to Panini was the Siva-sutras, an ingenious linear organization of Sanskrit phonemes presupposed by the later grammars and facilitating the citation of particular sets of sounds in linguistic rules. Afterwards, the Paninian principles and issues were further elaborated and commented on by the "triad of sages" (munitraya): Katyayana, 250-300 BC?; Patanjali, 200 BC?; Bhartrhari, c. 450 AD; and by many subsequent followers.3

Among the eight books of Panini's Astjadhayi and its nearly four thousand verses are a number of features now standard in modern linguistic analysis, including the following:

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2 I am indebted to my teachers Professors B. van Nooten, J. Gair and Ram Sharma for introducing me to Panini's work and to Tamara Dietrich for valuable discussions. The exact date of Panini's work is contentious, but possible references to Greek writing (Yavanani) suggest a time slightly after Alexander's appearance in the Indus valley (about 325 BC).

3 Panini's followers, especially Bhartrhari, developed theories of sound-meaning relationships, nested constituent structure and of the contextual determination of certain semantic features.
a. careful distinction of roots, bases and affixes and classification by morphological function;
b. recognition of voicing and vocalic ablaut;
c. analysis of abstract semantic case relations (karakas) and their effect on syntax;
d. interest in rule form, ordering, and economy of statement;
e. organization of rules by principles of default ("elsewhere rules"); application and rule precedence, covered by metarules (paribhasa; e.g., 'if two rules conflict, apply the later one'; 1.4.2);
f. algebraic representation of linguistic constants and variables, which undergo substitutions by various subsequent rules;
g. zero operators.

In the Astadyayi, an important subclass of algebraic elements consists of linguistic zero operators. As we see below, these zeros were of practical interest to Bloomfield; they were treated in some detail in an overview of Allen (1955). For purposes here, it is sufficient merely to document that the Paninian tradition recognizes four distinct zero elements, each with a different function. The names of these operators are (1) lopa, (2) luk, (3) lup, (4) slu. (1) and (2) are illustrated in the following examples based on work of Abhyankar & Shukla (1986) and of Cardonna (1988); see also Kiparsky (1982:119).

For lopa-zero, the most common item, Abhyankar & Shukla (1986:337) describe it thus: "This disappearance in the case of an affix is tantamount to its notional or imaginary presence, as operations caused by it do take place, although the word element has disappeared." (1) shows that adjustments in the course of the Sanskrit 'cowboy' derivation are triggered by the lopa-zero (after Cardonna 1988:53); (2), on the other hand, contrasts the operation of the luk-zero, where such adjustments are blocked. (3) and (4) are used for more specialized cases.

(1) Lopa-zero application: post-deletion adjustments triggered

<table>
<thead>
<tr>
<th>input:</th>
<th>1</th>
<th>go-</th>
<th>'cow'</th>
<th>2</th>
<th>go + mat + su</th>
<th>'one having cows' + [DECLENSIONAL ENDING]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>gomat + e[LOPA]</td>
<td>sutra number</td>
<td>6.1.68</td>
<td>(su dropped)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>gomatsa</td>
<td>operation</td>
<td>6.4.14</td>
<td>(vowel lengthened)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>gomantə</td>
<td>adjustment</td>
<td>7.1.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>output:</td>
<td>6.</td>
<td>goman</td>
<td>(adjustment)</td>
<td>8.2.23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2) Luk-zero application: post-deletion adjustments blocked

<table>
<thead>
<tr>
<th>input:</th>
<th>1</th>
<th>gomat + su + priya</th>
<th>'a person to whom someone with cows is dear'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>gomat + e[LUK] + priya</td>
<td>2.4.71</td>
</tr>
<tr>
<td>output:</td>
<td>3</td>
<td>gomaptiyya</td>
<td>1.1.63</td>
</tr>
</tbody>
</table>

(3) Lup-zero application: affix is deleted, but gender and number features copied (e.g. Astadhayi 1.2.51; 4.2.81).

(4) Slu-zero application: elision of marker triggers reduplication in selected roots, the reduplicated syllable then being protected from further changes. (e.g. Astadhayi 2.4.75, 3.1.10, 3.4.76; 6.1.10).
To put the development of linguistic zero operations in a larger context, Staal has observed that it "seems certain that linguistics originated in India because of the requirements of the ritual. As far as language is concerned, these requirements were twofold. First of all, the textual material needed for the ritual had to be transmitted. Secondly, rules had to be given which enabled the priests to convert this material into ritually more effective forms" (1974:66). It is likely then that interest in linguistic accuracy for the sake of ritual effectiveness may have been the key stimulus for developing a rule system of such complexity that zero elements were adopted.

4. Socio-historical / psycholinguistic contexts of early zero rules

The transmission of Paninian grammar, including its zero functions, for centuries must have been largely a matter of oral transmission and, in the first stages of study at least, rote memorisation. As Rocher notes, "That it was supposed to be orally transmitted is clear from its use of metalinguistic accents and nasalizations... That it was meant to be memorized is evident from its cross-referencing system... Both metalanguage and extensive 'dittoing' (anuvritti) aim at conciseness, an ideal which some later grammarians carried to the extreme." (1992:142).

There is also direct testimony of the way in which this grammar was learned. Nearly a millennium after Panini and from a site far from the Ganges heartland we find an excellent description of how Paninian grammar was typically mastered. The account comes from the Chinese Buddhist pilgrim, I-ts'ing, who travelled to the Buddhist center of Nalanda in India in about 650 AD. Lingering for many years en route between China and India in the Summatra-based Kingdom of Srivijia, he observed there how young pupils learned their Sanskrit grammar. At the age of six they memorized the Siva-sutras. By eight, they were learning 1000 of the Paninian sutras by heart. Only after the rule corpus had been memorized were rules applied could the serious business of grammatical analysis begin (I-ts'ing 1966:172).

I-ts'ing's account would have been accurate for the tradition of Sanskrit grammatical study at other times and in other places. The general method was extended to other sorts of learning:

"The techniques so successfully applied to the study of language, especially the concept of economy of method and the adoption of a technical terminology, were taken over by several other disciplines. This occurred naturally since Sanskrit has always been the medium of Indian scientific writing, so any young scholar had first of all to undergo a rigorous training in grammar before moving to his chosen speciality" (Wujastyk 1981).

A similar point, but emphasising content rather than method of acquisition, was made by Staal: "Fruitful exchanges developed between the grammatical tradition on the one hand and ritual studies, philosophy, logic, poetics and numerous other disciplines on the other." (1974:69).

Earlier, a traditional text of uncertain date, the Paniniyaçiksa, had made these connections more metaphorically through a personification of the Veda: "...First, Metrics which is the two legs of the Veda and the Kalpa [regulated passage of time] which is its two hands. Astronomy is its eyes and the study of Etymology is its