WHEN YOU DO *NOT* LINEARIZE. SIMULTANEOUS PRODUCTION IN SIGN LANGUAGES CHALLENGE THE THEORIES OF LINEARIZATION

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A. In sign languages, different articulators (i.e., the facial expression and the two hands) can simultaneously represent different characters involved in the same action. After showing that these cases of simultaneity are not peripheral or extra-grammatical, we offer a unified syntactic account to reconcile these massive cases of simultaneity with theories of linearization, which up to now have been mostly based on spoken languages.

B. Our starting point will be the observation that proficient bimodal bilinguals can produce fully grammatical utterances in a sign language and a spoken language at the same time (Emmorey et al. 2008). This demonstrates that the human language faculty can sustain parallel grammatical encoding and production when articulatory channels are independent (Branchini & Donati 2016). Our main move in this paper is to extend this insight to monolingual sign language production, proposing that similar mechanisms allow signers to simultaneously produce two or more linguistic categories within a single language, if these categories convey different aspects of the same complex conceptual message. Crucially, these categories will be shown to remain syntactically independent up to the point of spell-out, rather than being combined through incorporation or other morphosyntactic operations. We will discuss in detail two empirical cases before drawing some general theoretical conclusions: (i) simultaneous production of two propositional units and (ii) simultaneous production of two constituents internal to the same clause.

C. The case of simultaneous production of two propositional units can be illustrated by situation in which someone is fired by a handgun. The two hands simultaneously express the firing action and the victim's falling, as shown below:

Importantly, the two co-uttered events must have the same temporal (and aspectual) specifications. For example, if the gun is a cannon instead of a handgun, the two hands cannot simultaneously express the firing action and the victim's falling, plausibly because in real life a temporal lag is perceived between the two events. That the two events must occur at the same time can be explained if it is assumed that the co-articulated units are two *v*Ps and not full TPs. If so, they are embedded under the same functional layer expressing tense. This is why the same temporal placement is imposed onto the events expressed by the co-articulated *v*Ps.

D. The case of simultaneous production of two constituents internal to the same clause will be illustrated by what is called Action Role Shift in the sign language literature (Lillo Martin 2012 and Schlenker 2017). These are sentences where the signer uses their body to show *how* an action has been performed (for example, reproducing the facial expression of the person who performed or underwent the action). Informally, the signer 'becomes' a character involved in the action, either the agent (*Subject* Action Role Shift) or the patient (*Object* Action Role Shift). We will analyze Action Role Shift as a structural configuration in which a verb is articulated simultaneously with one of its arguments, yielding perspective shift effects (without invoking context-shifting operators). More specifically, we propose that in Action Role Shift the sentence presents a case of simultaneous production of the verb and of sign IX pointing to the locus associated with the subject or the object. As a reflex of this coarticulation between the verb and a pointing sign IX, the signer moves their body towards the locus of the external

or internal argument (the position where IX points to). We will develop an empirical argument for this approach to subject Action Role Shift: according to our approach, a subject pronoun IX is structurally present, although invisible, in Action Role Shift sentences because it is coarticulated with the verb. This means that there is no room for the insertion of an explicit pronoun IX. We will show that this prediction is borne out (and similarly for the parallel case concerning object Action Role Shift).

E. Crucially, we will situate these empirical findings within the broader theoretical discussion of how hierarchical syntactic structures are linearized. We argue that simultaneity can be understood as the partial suspension of linearization: constituents that are hierarchically related need not be ordered with respect to each other when the modality allows them to be realized simultaneously. As this perspective raises concerns of overgeneration (unconstrained suspension of linear order would predict unattested configurations), we propose that simultaneous production is subject to strict structural constraints. A central generalization we will defend is that simultaneously produced categories must stand in a relation of mutual c-command. This condition captures a wide range of attested cases while excluding impossible ones. For example, the verb mutually c-commands its internal argument within the VP, allowing simultaneous production of object and verb in Object Action Role Shift. The subject and T′ mutually c-command each other, allowing simultaneous production of subject and verb in Subject Action Role Shift. Coordinated *v*Ps under a shared functional layer can also be treated as symmetric structures whose members mutually c-command, accounting for simultaneous multi-event depictions like the handgun case. Conversely, aberrant configurations (such as the hypothetical case where the subject and the object are produced simultaneously but the verb is not) are correctly ruled out, as they lack the requisite of structural symmetry.

E. We will confront the findings emerging from sign languages with competing theories of linearization. On Kayne's (1994) antisymmetric approach, linear order is inherently encoded in the hierarchical structure, in principle banning simultaneity. However, in Kayne's system it is *asymmetric* c-command that determines linear order. This opens the possibility of weakening the antisymmetric approach to make it compatible with sign language cases of simultaneity, which involve only *mutual* c-command. By contrast, the sign language facts are fully consistent with the Chomsky's (1995 to 2019) view that core syntax is purely hierarchical and unordered, with linearization imposed only at the interface by externalization constraints. Overall, simultaneous production of different linguistic categories provides empirical support for theories in which linear order is an interface phenomenon rather than an inherent property of syntactic structure.

F. Finally, we resist the stronger claim that the language faculty is fundamentally multidimensional and that linearization is merely an accident of spoken modality. Although sign languages can exploit three-dimensional space, simultaneity is always optional: we will show that all constructions that can be simultaneous can be produced also sequentially. These considerations support a conservative conclusion: linearization is the default outcome of grammar, but one that can be selectively suspended under specific structural and articulatory conditions. In summary, sign language data provide crucial evidence for interface-based theories of linearization and invite a re-evaluation of how syntactic hierarchy maps onto linear—or multidimensional—phonological realization across modalities.

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