**Polysemy and degree scales in Logoori**

Margit Bowler (University of Manchester) & John Gluckman (University of Kansas)

**Overview.** We discuss a striking case of polysemy in Logoori (Luyia, Bantu, JE 41). The Logoori verb *kudoka* can function as: (i) a predicate meaning 'to arrive (at)'; (ii) a degree expression meaning 'enough'; and (iii) a marker of necessity modality, i.e., 'must.' Our paper explores the connections between these three seemingly unrelated meanings. We suggest that all three uses can be explained by proposing that *kudoka* expresses a relation between degrees. We follow other authors (von Stechow 2006, Lewis 1973, a.o.) in treating both modals and expressions referring to spatial "paths" (e.g. 'to arrive (at)') as being associated with abstract scales of measurement. In this sense, these expressions can be treated as akin to gradable predicates like *tall*, which have a long history of being analyzed as being associated with degree scales (Cresswell 1976, a.m.o.).

**Data.** The verb *kudoka* (glossed KD) has three functions in Logoori, which we label SPATIAL (1), MODAL (2), and DEGREE (3). In its modal use, *kudoka* can express all flavors of necessity modality (Gluckman et al., 2017). (We largely ignore the morphosyntactic differences in this abstract.)

(1) *Sira* ***a-dok-i*** *(Nairobi)*
1Sira 1SM-KD-FV Nairobi
'Sira **arrived** (at Nairobi).'

(2) *(ku maragoo)* ***kudoka*** *Sira a-zi-e yeeng'o*
to 6law 15KD 1Sira 1SM-go-SBJV home
'(According to the law), Sira **must** go home.'

(3) *Sira a-v-e na vutambe* ***vu-dok-an-a*** *(kulola)*
1Sira 1SM-COP-FV with 13height 13SM-KD-PL-FV 15see
'Sira is tall **enough** (to see, e.g. over the fence).'

Informally, we propose that *kudoka* asserts that the degree of some measurable property meets or exceeds some contextually determined, "sufficient" degree. In (3), Sira's height reaches a sufficient degree on the scale of height; in (1), Sira's location reaches a sufficient degree with respect to his path to Nairobi; in (2), the proposition "Sira goes home" reaches a sufficient degree on a scale of "goodness." In the formal analysis, we attempt to cash out this intuition by adopting the assumption that both locations and propositions can be ordered on degree scales.

**Ingredients.** Our analysis has three components, which are realized as separate syntactic heads: (i) *kudoka*; (ii) a measure function $\mu_\Sigma$; and (iii) a contextual restrictor C. We posit that *kudoka* expresses a relation between degrees, as in the denotation in (4).

(4) $[\![ \text{kudoka} ]\!] = \lambda C_d \lambda d.\ d \geq C$

The second degree argument of *kudoka* in (4) (i.e., $\lambda$d) can be the output of the measure function $\mu_\Sigma$, which optionally applies when *kudoka* lacks a second argument of type $d$. We define $\mu_\Sigma$ as in (5). $\mu_\Sigma$ is of type $\langle \alpha, d \rangle$, where $\alpha$ is of type $\langle l, t \rangle$, or $\langle s, t \rangle$. $\mu_\Sigma$ applies to a property of locations or worlds, and outputs the degree of those properties of locations or worlds on a contextually specified scale $\Sigma$ (of e.g. location with respect to Nairobi, goodness according to the law, etc.).

(5) $[\![ \mu_\Sigma ]\!] = \lambda \alpha.$ a degree of $\alpha$ on a scale $\Sigma$

The first argument of *kudoka* is a contextual restrictor C of type $d$. C provides a degree which the second degree argument (e.g. the output of $\mu_\Sigma$) must meet or exceed (cf. Bierwisch 1989). In (1), C is a degree that counts as being located in Nairobi. In (2), C is a degree of "goodness" (according to the law) that the proposition must reach. In (3), C is the degree of height Sira must have in order to see above the fence. C can be realized overtly, as indicated by parentheses in (1)-(3).

**DEGREE use.** We treat nominals like *vutambe* 'height' in (3) as extents, i.e., portions of degree scales (Meier, 2003). *Vutambe* denotes a set of ordered degrees of height; it is of type $\langle d,t \rangle$. (We confirm that Logoori has degrees in its semantic ontology due to the availability of e.g. differential comparatives and measure phrases, following the Beck et al. 2009 questionnaire.)

(6) ⟦ vutambe ⟧ = $\lambda$d. d is a degree of height

Syntactically, *vutambe* 'height' in (3) is the subject of *vudukana* and the head of a relative clause. (3) literally means 'Sira is with a height that arrives.' We assume that relative clause formation involves movement of *vutambe* and lambda-abstraction over degrees. Since ⟦ vudukana C ⟧ combines with the trace of *vutambe* (of type *d*), $\mu_\Sigma$ does not apply. We give an informal semantics for the relative clause in (7).

(7) ⟦ vutambe $\lambda 1$ $t_1$ vudukana C ⟧ = $\lambda$d. d is an extent of height & d ≥ C

We adopt the idea of possessive predication from Francez and Koontz-Garboden (2015). Given this assumption, the informal truth conditions for (3) are as in (8).

(8) ⟦ (3) ⟧ = 1 iff Sira "possesses" an extent of height d which is greater than or equal to a contextually sufficient degree C (with respect to seeing over the fence)

**SPATIAL use.** We take a path between two locations to be understood as an ordered set of locations of type *l* (von Stechow, 2006; Hohaus, 2012). Given this assumption, *kudoka*'s meaning extends directly to its SPATIAL use: It asserts that the degree of an individual's location along a path reaches or exceeds a contextually specified location. We assume a spatial trace function $\tau$ of type $\langle e, \langle l, t\rangle\rangle$ in (9) that lifts an individual to the set of locations of that individual (cf. Hohaus 2012 for a similar idea). The measure function $\mu_\Sigma$ (in its $\langle\langle l, t\rangle, d\rangle$ use) then applies to this property of locations. In (10), $\mu_\Sigma$ applied to the output of the spatial trace function applied to Sira returns the degree of Sira's location on a path with respect to Nairobi. We give informal truth conditions for (1) in (10); *kudoka* asserts that the degree of Sira's location meets or exceeds a degree that "counts as" being in Nairobi.

(9) ⟦ $\tau$ ⟧ = $\lambda$x$\lambda$l. l is a location of x

(10) ⟦ [ [ [ Sira $\tau$ ] $\mu_\Sigma$ ] adoki C ] ⟧ = 1 iff the degree of Sira's location d is greater than or equal to a contextually sufficient degree C (with respect to Nairobi)

**MODAL use.** We adopt the idea that propositions can be ordered in terms of "goodness" (in cases of deontic modality) or "likelihood" (in cases of epistemic modality) (Lassiter, 2014; Kratzer, 1991). Assuming a deontic modal base, we contextually define a scale of goodness. Propositions can then be assigned a degree on this scale of goodness depending on how well they conform to the laws of a relevant individual. We can think of necessity modality in the following way: $\mu_\Sigma$ (in its $\langle\langle s, t\rangle, d\rangle$ use) applied to a proposition *p* returns the degree d of *p*'s goodness. *p* is a necessity if the degree of *p*'s goodness meets a sufficiently high degree on the contextual scale of goodness; in our analysis, this degree of goodness is supplied by C. *Kudoka* then asserts that the degree of *p*'s goodness meets or exceeds C; i.e., *p* is a necessity. We give informal truth conditions for (2) in (11).

(11) ⟦ (2) ⟧ = 1 iff the degree of goodness of Sira's going home is greater than or equal to a contextually sufficient degree C (with respect to obeying the law)

**Against accidental polysemy.** It's unlikely that this is simply a case of accidental polysemy. First, we find the same three-way polysemy in all languages in the Luyia subfamily, even those with non-cognate verbs. Second, we identify unrelated languages with similarly polysemous lexical items (e.g. Tatar (Turkic)). Finally, we note that previous authors have made a similar connection between sufficiency and necessity modality (Bierwisch 1989; Melis 2014; among others).

**Selected references.** Francez, I. and Koontz-Garboden, A. (2015). Semantic variation and the grammar of property concepts. *Language* | Hohaus, V. (2012). Directed motion as comparison: Evidence from Samoan. SULA 6 | Meier, C. (2003). The meaning of *Too, Enough* and *So...that.* NLS | Melis, C. (2014). The modal category of sufficiency. | von Stechow, A. (2006). Spatial prepositions in interval semantics.