Quantized degrees in Ktunaxa and a crosslinguistic ontology of degrees

Summary: In Ktunaxa, a language isolate spoken in the Kootenay River basin (Canada, USA), scalar meanings denoting property-scales like *e.g.* 'big' and 'small' are incompatible with degree questions like *e.g. how tall* (DegQs) and measurement constructions like e.g. *this tall*/*6 feet* tall (MCs). I argue that property scales introduce quantized degrees. Because DegQs and MCs require non-trivial degree intervals (Kennedy, 2001; Abrusán and Spector, 2011; Schwarzschild 2005), they are incompatible with Ktunaxa property-scales. Expanding on the Beck et al's (2009) typology and building on the formal literature on DegQs and MCs, I propose a typology of degrees based on their ontological properties and the constructions they instantiate. The paper contributes novel documentation on scalarity and a first foray into quantized meanings in Ktunaxa.

Theoretical and empirical challenge: Within Beck et al's (2009) typology of languages based on scalar meanings, Ktunaxa and English are both [+DSP, +DAP, +DegPP] (Bertrand, 2022). Yet, the two languages differ in empirically salient ways: whereas English possesses DegQs and MCs targeting both property-scales and cardinality scales, Ktunaxa only allows DegQs and MCs targeting cardinality-scales (1). Property scales are incompatible with the grammatical resources used to build property DegQs and MCs (2), and Ktunaxa otherwise lacks the resources making property DegQs and MCs available.

(1) a. K=ʔa-q-sa-ɬ ha-nut-i ʔinɸuk-s?
C=Q-q-SA-ADV ASP-chase-IND mouse-OBV
'How many mice did s/he chase?'

b. Nas q-sa-ɬ ha-nut-i ʔinɸuk-s.
DEM.OBV Q-SA-ADV ASP-chase-IND mice-OBV
'S/he chased this many mice.'

(2) a.*/#K=ʔa-q-sa-ɬ ɸiɬ-nut-i ʔinɸuks?
C=Q-q-qsaɬ fast-chase-IND mouse-OBV
Intended: 'How many mice did she chase quickly?'

b. *nas qsaɬ ɸiɬ-nut-i ʔinɸuk-s.
DEM.OBV qsaɬ fast-chase-IND mouse-OBV
Intended: 'S/he chased mice this fast.'

Description: In Ktunaxa, scalar meanings are introduced as prefixes that morphologically bind verbal roots (3a) and as preverbal modifiers (preverbs) (3b). The current analysis focuses on scalar prefixes, but it extends to the semantics of preverbs.

(3) a. **wiɬ**-wum-ni
big-have.belly-IND
'S/he has a big belly.'

b. **wiɬ**-iɬ ʔik-ni
big-ADV eat-IND
'S/he ate a lot.'

Scalar prefixes like *wiɬ-* 'big' and *ɸ̓iɬ-* 'fast' form a natural morphosyntactic class with numeral prefixes: they occur in a verb-initial position which must be obligatorily filled by a prefix to license the verbal root (2), and they are in complementary distribution (3).

(4) a. *(xaɸa)-nut-i ʔinɸuks.
four-chase-IND mouse-OBV
'S/he chased mice four mice.'

b. *(ɸ̓iɬ)-nut-i ʔinɸuks
four-chase-IND mouse-OBV
'S/he chased mice quickly mice.'

(5) a. *xaɸa-ɸiɬ-nut-i ʔinɸuks
three-quick-chase-IND mouse-OBV
Intended: 'S/he chased three mice quickly.'

b. *ɸiɬ-xaɸa-nut-i ʔinɸuk-s
quick-three-chase-IND mouse-obv
'S/he chased three mice quickly.'

Numeral prefixes binding transitive roots introduce quantification over the theme argument of the verb. In (2a), the VP *xa¢anuti ʔin¢uks* refers to an eventuality of chasing 4 mice. As such, it introduces quantized meaning over the eventuality introduced in the VP. *Xa¢anuti ʔin¢uks* holds true only of the maximal event of chasing four mice, it does not hold true of subevents that involve fewer than four mice. I hypothesize that Ktunaxa scalar prefixes have the same effect, they introduce quantized, non-divisible degrees denoting maximal properties of eventualities.

Analysis: The traditional degree-based analysis for scalar predicates is that they introduce a relationship between a degree (or degree interval) *d* on a scale *σ* and an entity *x*, as in (4) where *Pσ* stands for scalar predicates like *e.g. tall* (Kennedy, 1997; Heim, 2001, *i.a.*). Because scales are monotonic, we assume that if an entity *x* holds a property P_σ to a degree *d*, it holds the property P_σ to degrees smaller than *d*. Under that view, scalar meanings are inherently divisible and non-quantized. I propose that in Ktunaxa, prefixes denoting property scales have a semantics as in (5) which provides a lexical entry for *¢̓iɬ-* 'fast'. When combining with a verbal root denoting a property of eventualities, scalar prefixes relate an eventuality *e* to a degree *d* on a scale *σ*, and *d* is the maximal and only degree to which the eventuality holds the scalar property, thus enforcing quantized, numeral-like meaning. A predicate like *¢̓iɬnut,* which involves the prefix *¢̓iɬ-* and the eventive root *nut* 'chase' (defined in (8)), thus relates a chasing event to *d*, its maximal degree of fastness as in (9). Parts of the event that are not *d-fast* do not count as events of fast-chasing.

(6) $[\![P_\sigma]\!]=\lambda d\lambda x.\sigma(x)=d$ (7) $[\![¢̓iɬ]\!]= \lambda P_{<v,t>}\lambda d\lambda e.P(e)$ & fast(e)=d & ∀d'[d'<d →¬fast(e)=d']

(8) [[nut]]=λe.chase(e) (9) [[¢̓iɬnut]]=λdλe.chase(e) & fast(e)=d & ∀d'[d'<d →¬fast(e)=d']

Why quantization matters: It has been argued that DegQs and MCs require degree intervals (Kennedy, 2001; Abrusán and Spector, 2011; Schwarzschild 2005). Quantized degrees, which lack non-trivial proper parts and behave as point-like (atomic) degrees, are thus expected to be incompatible with DegQs and MCs. To capture variation within [+DSP, +DAP, +DegPP], I propose the typology of degree ontologies in table 1 which shows for different types of degrees the constructions they instantiate.

	Degree Comparatives	Subcomp, clausal stand	DegQs	MPs
Deg Intervals	✓	✓	✓	✓
Quant. degs	✓	✓	✗	✗

Table 1. A typology of degree ontologies

The typology is agnostic about whether languages and single scalar predicates uniformly denote degree intervals or quantized degree points. Preliminary evidence based on English suggests that a single scalar predicate may introduce degree intervals or degree points depending on its syntactic context. In compounded deverbal adjectives, English scalar predicates exhibit the same distributional restrictions as their Ktunaxa counterparts, even when they are otherwise compatible with DegQs and MCs. Hence *long* in *long-legged* is in complementary distribution with numerals (10), it resists MCs (11), and it resists DegQs targeting the scale of length as it applies to (the state of having) *legs* (12).

(10) a. The table is three-legged. b. The table is long-legged. c. *The table is three-long-legged.

(11) a. The legs are 70 cm long. b. *The table is 70cm-long-legged.

(12) Q:**?**How long-legged is the table? A': **?**70 cm
A': Like this (showing the height of the whole table).

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