

## Count, mass, and part structure of Dëne Sų́łné nouns\*

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This paper has three goals. First, to analyze the nature of count and mass nouns in Dëne Sų́łné. I will argue that Dëne Sų́łné has a semantic (rather than a grammatical) distinction between count and mass nouns, which needs to be expressed in terms of atomicity: count nouns are atomic, mass nouns are not. The second goal is to integrate the Dëne Sų́łné countability system into a larger typology. I will propose that all countability systems operate on a universal semantic distinction between count(able) versus mass nouns, and that variation has two sources—nouns *and* numerals—rather than just nouns, as widely assumed. Numerals usually contain an atom-selecting function. If they don't, the language has obligatory classifiers. Finally, in keeping with the theme of the conference, I examine the expression of quantization in Dëne Sų́łné, arguing that quantization is expressed not in nouns, but in verbs in Dëne Sų́łné.

### 1 Semantics of count and mass nouns

#### 1.1 Quantization vs. cumulativity

Intuitively, count nouns, or noun phrases, such as *a blanket, five pencils* denote a “specified quantity” or a “bounded unit”, while mass nouns such as *milk, cattle* denote an “unbounded entity”. This intuition is usually formalized in terms of quantization versus cumulativity, in a lattice model based on the sum operation  $\oplus$  and the (proper) part relation  $\subset$ :

- (1) Quantization:  
A predicate  $P$  is quantized iff no proper part of an instance of  $P$  also is an instance of  $P$ .  
 $\forall P[QUA(P) \leftrightarrow \forall x,y [P(x) \wedge P(y) \rightarrow \neg y \subset x]]$  (Krifka 1992:32)

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- (2) Cumulativity:  
 A predicate  $P$  is cumulative iff the sum of two instances of  $P$  also is an instance of  $P$ .  
 $\forall P[CUM(P) \leftrightarrow \forall x,y [P(x) \wedge P(y) \rightarrow P(x \oplus y)]]$  (Krifka 1992:32)

To illustrate (1): a proper part of an entity referred to by *a blanket* won't also be *a blanket*. For (2), imagine adding more milk to some milk. The result is still *milk*. Thus, *a blanket* is a quantized predicate, *milk* is cumulative.

The grammatical category of number interacts with these properties and the count/mass distinction. For example, in English, singular count nouns are quantized and not cumulative; mass nouns and plural count nouns are cumulative and not quantized. And number, together with definiteness, is the basis for the morphosyntactic count/mass criteria of English, (3a–c). There are also some semantic criteria, such as (3d), which are based on semantic rather than grammatical well-formedness (# indicates semantic ill-formedness).

- |     |  |                               |                |
|-----|--|-------------------------------|----------------|
| (3) | <u>(sg) count nouns:</u>                                 | <u>mass nouns:</u>            | <i>English</i> |
| a.  | √ plural inflection                                      | * plural inflection           |                |
| b.  | √ indefinite article <i>a</i>                            | * indefinite article <i>a</i> |                |
| c.  | * bare in argument position<br>(= without PL or article) | √ bare in argument position   |                |
| d.  | √ numerals   | # numerals                    |                |

However, the semantic and grammatical count/mass properties familiar from languages like English do not carry over to Dëne Sųłné. I begin by showing that count/mass cannot be characterized in terms of quantization vs. cumulativity in this language, due to the absence of the grammatical category of number.

## 1.2 Problem: no quantized nouns in Dëne Sųłné

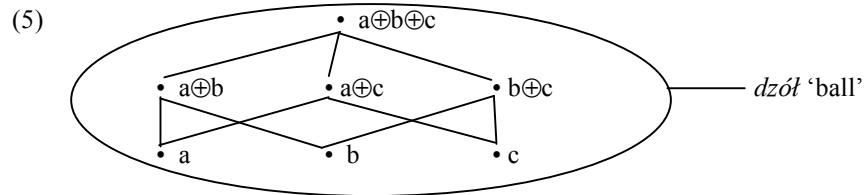
Dëne Sųłné, or Dëne [dɛnɛ] for short, is a Northern Athapaskan language spoken in a large area to the east and south of Great Slave Lake. Unless otherwise indicated, the data presented here are from the Cold Lake dialect of Dëne, spoken at Cold Lake First Nations, Alberta. Dëne is an SOV language with optional nominals; the verb is a complex structure consisting of a rightmost stem (usually the last syllable) and a sometimes large number of prefixes.

Nominal constituents are usually bare nouns, as shown in (4) for subjects, direct objects, and postpositional objects. There are no articles, and except for a handful of kinship terms (cf. Wilhelm 2006), Dëne nouns do not inflect for number: A noun has the same—bare—form in singular and plural contexts. For example, *ł* ‘dog’ is the subject of an inherently plural predicate in (4a) and the subject of the inherently singular predicate in (4b), without change in form. Due to the absence of number marking, bare nouns comprise singular and plural meaning, as apparent from the translations of (4c–d). The examples in

(4) furthermore show that Dëne bare nouns correspond to both English definite and indefinite noun phrases.<sup>1</sup>

- (4) a. Yuwé ḥ nádé.  
over there dog impf-several stay/live impf  
'There's dogs that live over there.'
- b. Łḭ sekui ch'azí tthihéłgé.  
dog child away one animal go perf  
'The dog ran away from the child.'
- c. Larry chu Mo ʔejëre náheghéńígh.  
Larry and Mo bovine 3dl-perf-buy O  
'Larry and Mo bought some cattle/ a cow/ some cows.'
- d. Dzól xéł senádé.  
ball with several play impf  
'They (several) are playing with a ball/with balls.'

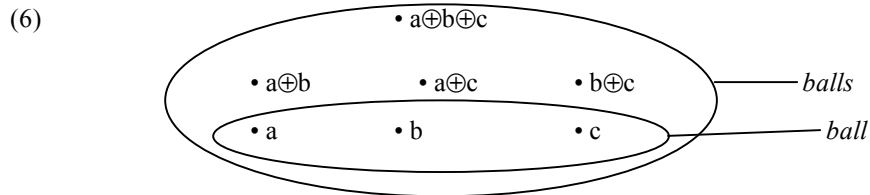
The absence of number inflection means that Dëne nouns are *number-neutral*: A bare noun refers to any number of instances of an object—singular, plural, dual, etc. To illustrate for *dzól* 'ball', imagine a world with three balls, a, b, and c. Then *dzól* can refer to a single ball (ball a or ball b or ball c), to two balls (balls a and b, balls b and c, or balls a and c), or to all three balls.



We can say that a Dëne noun denotes a set of singularities and all sums

<sup>1</sup> Data are presented in the practical orthography, with the following conventions: dh = [ð], th = [θ], gh = [ɣ], ł = [ɬ], zh = [ʒ], sh = [ʃ], j = [tʃ], ch = [tʃʰ]; voiced obstruent symbols represent plain voiceless obstruents, voiceless obstruent symbols represent aspirated obstruents; C' = glottalized consonant; y = [j], ɪ = [i], ə, ɛ, ɪ etc. = nasal vowels, á, é etc. = high-tone vowels, ě = schwa. Abbreviations used: 1 = first person, 2 = second person, 3 = third person, 4 = fourth ("the other third") person, ar = areal (argument that is an area or situation), assert = assertive, cl = "classifier" (a voice/valence marker), dim = diminutive, distr = distributive/plural, dl = dual, impf = imperfective, mir/emph = emphatic mirative, mom = momentaneous, N = nasal feature, O = object, opt = optative mood, PC = partial control, i.e., action is only partially-controlled by agent, perf = perfective, pl = plural, prsp = prospective, RO = round/compact object, S = subject, SO = sticklike object, sg = singular, U = unspecified subject. Third person subject marking is zero, i.e., it is indicated by the absence of first or second person subject marking.

formed from them. Put more formally, the denotation of *dzól* is a set closed under sum formation, or an atomic join-semilattice, as in Link (1983). English is different in that it has a special form that denotes only the singularities, e.g., the form *ball*, as opposed to *balls* (lines are omitted to improve legibility):



The fact that Dëne nouns are number-neutral (more precisely, the fact that they do not have a singular form), means that even intuitively countable nouns like *dzól* ‘ball’ fulfill the criterion of cumulativity:  $\forall x,y [\mathbf{dzól}(x) \wedge \mathbf{dzól}(y) \rightarrow \mathbf{dzól}(x \oplus y)]$  is true, as just illustrated in (5). Even worse, nouns like *dzól* fail the criterion of quantization:  $\forall x,y [\mathbf{dzól}(x) \wedge \mathbf{dzól}(y) \rightarrow \neg y \sqsubset x]$  is false. For example, in (5) above, if  $x$  is  $a \oplus b$  and  $y$  is  $a$ , then  $[\mathbf{dzól}(a \oplus b) \wedge \mathbf{dzól}(a) \ \& \ a \sqsubset a \oplus b]$ .

It appears, then, that by the well-established criteria of cumulativity and quantization, all nouns in Dëne are mass, by virtue of being number-neutral. More generally, the absence of grammatical number (and definiteness) appears to wreak havoc with the count/mass distinction: Count nouns cannot be recognized by a special singular form, and there are no morphosyntactic criteria for count versus mass. Does this mean that Dëne does not distinguish between count and mass nouns?

The literature would have us believe just this. It is a common assumption that bare, number-neutral nouns are in some sense mass (Hundius & Kölver 1983, Seiler 1986, Wiese 1997, to appear, Chierchia 1998a,b, 2005, Cheng & Sybesma 1999, Grinevald 2000, Krifka 2003, Borer 2005). Closely related is the view that languages without number (and other relevant morphosyntax) do not have a count/mass distinction.

Dëne challenges these assumptions. I will show that despite a lack of relevant morphosyntax, Dëne does have a count/mass distinction. In the absence of relevant grammatical categories, the distinction is purely semantic. But crucially, it cannot be characterized semantically in terms of quantization versus cumulativity, since all Dëne nouns have cumulative reference. Instead, I propose to characterize it in terms of atomicity.

### 1.3 Dëne does distinguish between count and mass nouns

Since Dëne lacks morphosyntactic criteria for count and mass, we must use semantic criteria. The basic semantic criterion for “countness” (denoting something that can be counted) is whether a noun can combine directly with a

numeral. This criterion reveals a clear distinction in Dëne: some nouns combine directly with a numeral such as *sɔ́lághe* ‘five’, (7), while others do not, (8). The latter require some sort of measure construction in order to be counted, (9).

- (7) *count nouns*  
*sɔ́lághe ts'éré* ‘five blankets’, *sɔ́lághe ʔerihťíšchënë* ‘five pencils’,  
*sɔ́lághe dzól* ‘five balls’, *sɔ́lághe kón* ‘five pieces of firewood (sticks,  
logs)’, *sɔ́lághe bek'eshích'ely* ‘five tables’, *sɔ́lámı dëne* ‘five people  
(individuals)’, *sɔ́lághe ts'uzı* ‘five flies’, *sɔ́lághe ʔejëre* ‘five cows’,  
*sɔ́lághe ı*, ‘five dogs’, etc.
- (8) *mass nouns*  
#*sɔ́lághe ʔejëretth'úé* (five milk), #*sɔ́lághe bér* (five meat), #*náke/*  
*hunénóna thay* (two/one hundred sand), #*sɔ́lághe dedhay* (five salt),  
#*sɔ́lághe suga* (five sugar), #*sɔ́lághe dzą* (five mud), #*náke tlës* (two  
grease/fuel), #*ʔı́lághe yú* (one cloth/clothing), #*sɔ́lághe/* *hunénóna*  
*yath* (five/one hundred snow), etc.
- (9) *mass nouns + measure construction*
- |    |                                  |   |
|----|----------------------------------|---|
| a. | <i>sɔ́lághe nedádhi bér</i>      | ‘five <u>pounds of</u> meat’                    |
|    | five pound meat                  |   |
| b. | <i>sɔ́lághe ʔejëretth'úé tıı</i> | ‘five milk <u>cartons</u> , five <u>cartons</u> |
|    | five milk container              | <u>of</u> milk’                                 |
| c. | <i>ʔı́lághe yú delch'ëı</i>      | ‘one <u>yard</u> of cloth’                      |
|    | one cloth yard                   |   |

I conclude that Dëne does have a count/mass distinction, although there are no grammatical categories that could reflect it. The distinction is semantic (more on this in section 3). I now turn to the question how to characterize this distinction.

#### 1.4 Semantics of count nouns: atomicity

In the absence of quantization, what makes the nouns in (7) count? The intuition is that these nouns refer to things which have clear minimal parts or atoms, while the nouns in (8) do not. I will hence follow Link (1983), who proposes an atomic domain (of individuals/entities) for count nouns and a nonatomic domain (of substances/quantities) for mass nouns. Atomicity itself is not defined, but we can use the definitions of Krifka (1992:32).

- (10) Atom of *P*:  
An instance of *P* is an *atom of P* iff none of its proper parts are an instance of *P*.  
 $\forall x, P[ATOM(x, P) \leftrightarrow P(x) \wedge \neg \exists y[y \sqsubset x \wedge P(y)]]$

- (11) Atomicity:  
 A predicate  $P$  is *atomic* iff all instances of  $P$  contain an atom of  $P$ .  
 $\forall P[ATOMIC(P) \leftrightarrow \forall x[P(x) \rightarrow \exists y[y \sqsubseteq x \wedge ATOM(y,P)]]]$

On this account, a count noun denotes a set of atoms and sums from those atoms. A mass noun also denotes sums, but there need not be any atoms, i.e., indivisible “bottom elements“.

A longstanding objection to characterizing count nouns as atomic is the “minimal parts problem“ (cf. Quine 1960): If one goes “far enough down“, even mass nouns have minimal parts or atoms. For example, sand molecules are proper parts of instances of *sand*, but they are not themselves instances of *sand*. It appears, then, that *sand* does have minimal parts, perhaps individual grains of sand, although it is a mass noun in English as well as Dëne.

However, I think that this is an extralinguistic problem that need not concern us. Although it is true in our world that substances can be divided down to microscopic levels, in most cases these levels are irrelevant to our experience and don’t play a role in the semantic representation of mass nouns. For example, that sand is made up of sand molecules is extralinguistic knowledge and hence should not enter the evaluation of semantic atomicity. Generally, it appears to be the case that a certain granularity threshold is part of the meaning of nouns (and other linguistic expressions). Pioneering lexical semantic work (Wierzbicka 1988) as well as recent psycholinguistic research (e.g., Middleton et al. 2004) suggest that for most nouns, this threshold involves two main factors, perceivability with the naked eye, and whether standard interaction involves a single item or a group. For most nouns these two factors converge, so that perceivability is the default threshold. But there are other nouns where the threshold is higher than perceivability (cf. section 3.2), and also nouns, probably mostly scientific terms such as *molecule*, *electron*, where the threshold is lower than perceivability.

How to formalize these ideas is a matter of further research. One possibility, pursued in Moltmann (1997) and Chierchia (2005), is to relativize definitions to situations that correspond to a certain granularity threshold. For example, if the evaluation of (10) and (11) is restricted to situations in which the objects involved are perceivable to the naked eye, then *sand* and other mass nouns will not be atomic, because one will always be able to find smaller (perceivable) parts that are still sand.

For the remainder of this paper, I will use atomicity (at a certain granularity threshold) as the criterion for count nouns. I will now turn to numerals and give them a semantics that explains their differential behaviour with count and mass nouns.

## 1.5 Semantics of numerals

I propose that only count nouns combine directly with numerals because using numerals—counting—requires access to atoms (cf. Chierchia 1998a). This means that numerals like Dëne *taghe* ‘three’ do not simply denote a

whole number, but also an atom-accessing function. I formalize this in (12), loosely following Krifka (1995), cf. also Kang (1994). Here *OU* is the atom-accessing function. It gives the number of “object units“, i.e., atoms, in a plurality. For example, imagine a world with four balls a, b, c, d. Then the denotation of *dzól* ‘ball’ contains each of the four single balls (the atoms a, b, c, d) and all and sums formed from them ( $a\oplus b$ ,  $b\oplus c$ , ...,  $a\oplus d$ ,  $a\oplus b\oplus c$ , etc.). The denotation of *taghe dzól* ‘three balls’ contains only those instances of *dzól* that consist of three “object units“ or atoms. In other words, the denotation contains only sums of three balls, (13):

(12) *taghe* ‘three’:  $\lambda P\lambda x[P(x) \ \& \ OU(x) = 3]$   
 “a function from a set *P* (of atoms and sums) onto that subset of *P* containing the sums of three object units/atoms “

(13) *taghe dzól*:  $\lambda x[dzól(x) \ \& \ OU(x) = 3]$

If a numeral is combined with a mass noun, i.e., a nonatomic noun, semantic ill-formedness results, because it is not clear what the atoms are, and so *OU* has nothing to apply to. In this way the atom-accessing function *OU* of numerals accounts for their differential behaviour with count/atomic and mass/nonatomic nouns.

Dëne numerals provide independent evidence for *OU*. Up to the number 10, there are two sets of numerals, one for nouns referring to humans and one for other nouns. Cook (2004) calls the “nonhuman“ numerals the basic ones, because from 11 on they are used for all nouns.

- (14) a. *basic numerals* (Cook 2004:110)  
 (ʔ)lághe ‘one’, náke ‘two’, taghe ‘three’, dǫghǫ ‘four’, sǫlághe ‘five’, (ʔe)k’étage ‘six’, laísdi/totǫ ‘seven’, (ʔe)k’édǫ ‘eight’, (ʔe)lótǫ ‘nine’, honéna ‘ten’, (ʔ)lághe ch’adhǫ ‘eleven’, etc.
- b. *human numerals* (Cook 2004:110)  
 ʔlágghǫ ‘one person’, nádëne ‘two people’ (cf. dëne ‘person, people’), taghǫ/tanǫ/tǫnǫ ‘three people’, dǫghǫ/dǫghǫni/dǫnǫ ‘four people’, sǫlágghǫ/sǫlǫni/sǫlǫnǫ ‘five people’, (ʔe)k’étanǫ/ (ʔe)k’étanǫ ‘six people’, laísdiǫghǫ/totǫ ‘seven people’, (ʔe)k’édǫghǫ/(ʔe)k’édǫnǫ ‘eight people’, (ʔe)lótǫ ‘nine people’, honéna ‘ten people’

The “human“ numerals often contain a suffix *-ni/-nǫ* or a nasal feature. This may be an old, now morphologically opaque, classifier, perhaps from *dëne* ‘person’. Synchronically, we can give the following analysis: The basic numerals contain a general classificatory element, namely the general *OU* function, as in (12). It does not specify what kind of “object unit“ it applies to. The denotation of “human“ numeral contains an additional classificatory element that specifies the “object unit“ as human:

(15) *tɔny* ‘three people’:  $\lambda P\lambda x[P(x) \ \& \ OU_{\text{HUMAN}}(x) = 3]$

In other words, Dëne numerals have what Krifka (1995) calls a “built-in classifier” (as opposed to a morphologically overt/separate one, as in classifier languages). Krifka (1995) suggests that numerals in all non-classifier languages contain such a semantic, built-in classifier. In section 2.3, I provide evidence that this is true.

But before turning to typological considerations, let me sum up this section. Dëne distinguishes between count and mass nouns; only the former combine directly with a numeral. However, this distinction cannot be captured in terms of quantization vs. cumulativity, because all Dëne nouns have cumulative reference. This is so because Dëne count nouns are number-neutral. Instead, I have proposed atomicity as the semantic basis for the count/mass distinction in Dëne. I have given a semantics of Dëne nouns and numerals that accounts for their behaviour. Dëne numerals contain an atom-accessing function *OU*, which means that they are only compatible with atomic, or count, nouns. *OU* can also be thought of as a general semantic classifier.

## 2 Implications for countability typologies

### 2.1 Three types of number/countability systems

We now turn to the bigger picture, namely how the Dëne facts fit into countability typologies. First, we have to acknowledge that there are three types of number/countability systems, with Dëne representing the third type:

(16)

I:	II:	III:
NUMBER INFLECTION	NUM. CLASSIFIERS	<b>BARE NOUNS</b>
<i>five dog-s</i> (English)	<i>sān zǎi xióng</i> ‘three bears’ (Mandarin)	<i>splághe t̥</i> ‘five dogs’ (Dëne)

This is important because the primary focus in the formal literature has been on types I and II only. As a consequence, number inflection and classifiers are often perceived to be in complementary distribution. This, in turn, has led to accounts that only predict types I and II, without type III as a theoretical possibility. But Dëne shows us that a typology/theory that does not predict bare number-neutral nouns is wrong.

Disregarding type III languages creates a further problem; it leads to an inaccurate view of type II nouns, and number-neutral nouns more generally. If one only contrasts type I and II nouns, it appears that bare nouns are not countable. And this perceived uncountability of bare nouns is commonly explained by claiming that bare nouns are in some way semantically deficient: in the absence of number inflection, they are “mass“, “collective“, “aggregates“, “not individuated“, or they refer to a “kind“, “type“, or “concept“ only (e.g., Greenberg 1990[1972], Hundius & Kölver 1983, Seiler 1986, Wiese 1997, to



appear, Chierchia 1998a,b, 2005, Cheng & Sybesma 1999, Grinevald 2000, Krifka 2003, Borer 2005). Because of this deficiency, they require a classifier to be counted. But the consideration of type III languages reveals that this widespread view of bare nouns, and of the reason for classifiers, is incorrect.

## 2.2 Bare, number-neutral nouns are not semantically deficient/“mass“

One important typological implication of the analysis of Dëne is that bare, number-neutral nouns are not semantically deficient. More specifically, they are neither mass, nor for some other reason inherently uncountable.

That bare nouns are in principle countable (as long as they have atomic reference), is shown by the fact that they combine directly with numerals in Dëne, as well as in Korean (Kang 1994), Hungarian (Ortmann 2000), Turkish (Bliss 2003), and Armenian (Borer 2005). There is also ample evidence that bare, number-neutral nouns are not the same as mass nouns, as claimed, for example, by Chierchia (1998a,b). We already saw the differential behaviour of bare count and bare mass nouns in the type III languages Dëne. Halkomelem is another type III language that distinguishes count and mass nouns (Wiltschko 2005). And even in type II languages, not all nouns are mass. A distinction between count and mass nouns has been shown for Thai (Hundius & Kölver 1983), Korean (Kang 1994), and Chinese (Cheng & Sybesma 1999).<sup>2</sup>

Now, if bare nouns are not inherently uncountable, why are classifiers obligatory in type II languages? This is the topic of the next subsection.

## 2.3 Crosslinguistic variation in the semantics of numerals

Another shortcoming of type I vs. II typologies is that there is no variation in numerals; all variation is in the nouns (e.g., Chierchia 1998a,b, Krifka 2003). A type I vs. II vs. III typology, however, is based on variation in nouns *and* in numerals:

(17)

	I:	II:	III:
	NUMBER INFLECTION	NUMERAL CLASSIFIERS	BARE NOUNS
Nouns:	sg vs. pl	number-neutral	number-neutral
<b>Numerals:</b>	<b><i>OU</i> function</b>	<b>no <i>OU</i> function</b>	<b><i>OU</i> function</b>

Nouns vary in whether they are number-neutral or not—but they are never semantically deficient. Number-neutrality, or the absence of number inflection, is the difference between type I and type II/III languages. Numerals

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<sup>2</sup> More detailed arguments that bare, number-neutral nouns are not the same as mass nouns, and specifically against the proposals of Chierchia (1998a,b) can be found in Wilhelm (2006).

vary in whether they contain an *OU* function or not.<sup>3</sup> This creates the difference between type II and type I/III languages. Crucially, type II languages require numeral classifiers not because the nouns are deficient, but because the numerals are deficient, in denoting whole numbers only and lacking a “built-in” classifier. Instead, these languages have overt grammatical elements that contribute the *OU* function—the classifiers. They are obligatory in counting contexts because they provide the access to atoms that is the foundation of counting.

Informally, we could say that in type I and III languages, *OU* is lexicalized in the numerals, while it is grammaticalized in type II languages. A language may over time lexicalize formerly grammatical classifiers; this likely has happened in Dëne.

By way of summary, in a typology where there is variation in both nouns and numerals, a third type of languages arises: Type III languages are like type II in having numer-neutral nouns, but unlike type II, and like type I, they have atom-selecting numerals. I now present two pieces of independent evidence for this typology, and specifically for the claim that type I and III numerals contain *OU* but type II numerals do not.

The first piece of evidence is based on a comparison of English (type I), Dëne (type III), and Mandarin (type II) numerals. English and Dëne numerals pattern together in that both can be used pronominally. In Mandarin, numerals by themselves cannot be used this way, only the combination of a numeral and a classifier can be used pronominally:<sup>4</sup>

(18) *English*

I bought two new blankets. One is black and one is red.

(19) *Dëne*

a. Tth'idzíné k'e ts'éré nádághíńígh.  
 yesterday blanket distr-perf-1sgS-buy O  
ʔlághe delzën ʔú ʔlághe delk'os.  
 one black and one red  
 ‘Yesterday I bought blankets. One is black and one is red.’

<sup>3</sup> I leave open the question whether there are languages where numerals have additional functions, such as creating partitions. If a numeral created partitions, it should be compatible with atomic/count and nonatomic/mass nouns. Halkomelem Salish may be such a language (Wiltschko 2005).

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<sup>4</sup> The numeral+CL restriction is loosened in two ways in Mandarin (A. You, A. Tremblay, p.c., 2006). First, in spoken Mandarin the numeral *yi* ‘one’ can be omitted from the numeral+CL+noun construction (higher numerals cannot be omitted). Second, in less formal (spoken) register the numeral alone can be used pronominally. In this case, *de* must also be omitted. I leave these facts of (informal) spoken Mandarin for future research. Perhaps the language has begun to change into a language without obligatory classifiers. In this case, I predict that numerals will acquire the “classifying function” as part of their meaning.

- b. [from a story about beaver hunting; context: ... After I did that, I talked to the people (*dëne*). “Here I have barred the beaver den. We will see. ...]

ʔilághɪ sa tsáʔaghe ghə wage,” desɪ.  
 one-human me-for beaver hole P opt-dig/poke 1sgS-say  
 ‘One person will dig through the beaver den,” I said.’

(adapted from Li & Scollon 1976:389)

(20) *Mandarin* (A. You, p.c., 2006)

- a. Wo mai-le liang-tiao xin tanzi.  
 I buy-ASP two-CL new blanket  
Yi-tiao hei-de, yi-tiao hong-de.  
 one-CL black-DE one-CL red-DE  
 ‘I bought two new blankets. One is black and one is red.’
- b. \*Wo mai-le liang-tiao xin tanzi. Yi hei-de, yi hong-de.  
 I buy-ASP two-CL new blanket one black-DE one red-DE  
 intended: ‘I bought two new blankets. One is black and one is red.’
- c. \*Wo mai-le liang-tiao xin tanzi. Tiao hei-de, tiao hong-de.  
 I buy-ASP two-CL new blanket CL black-DE CL red-DE  
 intended: ‘I bought two new blankets. One is black and one is red.’

Other classifier languages appear to pattern like Mandarin, cf. Greenberg (1990[1972]), Aikhenvald (2000), Grinevald (2000). If in type II languages the numeral indicates only a cardinality, without relating it to ‘object units’, its inability to be used pronominally is explained. English and Dëne numerals, on the other hand, resemble pronouns in containing some specification like ‘object unit’ or ‘entity-referring expression’.

A second, general piece of evidence that in type II languages numerals and not nouns are deficient, is the fact that in such languages, classifiers form a constituent with numerals, not with nouns, in terms of adjacency and fixed word order (Greenberg 1990[1975]). If the numeral is deficient, as in my typology, there is a natural explanation for the close association of numeral and classifier: the classifier “helps out” the numeral. Type I vs. II typologies, which view the noun as deficient, have no explanation for the syntactic facts.

In conclusion, the fact that Dëne has bare count in addition to bare mass nouns has led us to a new and expanded countability typology, one in which numerals as well as nouns are a source of variation. I now turn to a last implication of my typology, namely that the count/mass distinction can be semantic.

## 2.4 The count/mass distinction in Dëne is semantic

In both type I and type II languages, nouns are associated with grammatical elements in counting contexts: number inflection and classifiers, respectively. Moreover, these elements appear to be in complementary distribution (ignoring the absence of both of them in type III languages). Finally,

we saw earlier that number inflection is a major criterion for count nouns. Facts like these have led to a syntactic version of the type I vs. II typology. On it, all bare nouns, or noun roots, have identical semantic representations, and the count/mass distinction is purely morphosyntactic. i.e. a result of the syntax a noun occurs in. For example, Borer (2005) claims that lexical noun roots are unmarked for mass or count. The syntax provides “partitioning“ functional elements, specifically number inflection, certain determiners, and numeral classifiers. All nouns are countable if they are embedded in such partitioning syntax, otherwise they have a default mass interpretation.

But in Dëne, countability is *not* predictable from the syntactic environment. As we saw above, a certain class of nouns combines bare with numerals, e.g., *sɔ́lághe dzól* ‘five balls’, while another class of nouns does not, e.g., *#sɔ́lághe thay* (five sand). In either case, there is no partitioning syntax such as number inflection, determiners, or classifiers.<sup>5</sup> According to the syntactic I vs. II typology, in this environment all nouns should be mass by default. How, then, is it that some nouns are countable here while others are mass? The only possible explanation is that count or mass is part of the nouns’ inherent meaning, part of the semantic representation of noun roots. In section 1.4, I attempted to express this semantic count/mass distinction in terms of atomicity and a granularity threshold.

Additional evidence that the count/mass distinction in Dëne is semantic is discussed in detail in Wilhelm (2006, to appear). Here I can only mention the main points. First, the distribution of nouns in the two classes is far from arbitrary, as might be expected if the count/mass distinction is purely syntactic. Countable nouns are those that denote (at the default granularity threshold) discrete objects, cf. (7) above. Uncountable, or mass nouns are those which (at a default threshold) denote substances or matter, cf. (8) above. This distribution supports my proposal that count nouns inherently have atomic reference while mass nouns do not.

Second, a syntactic view of the count/mass distinction must heavily rely on regular semantic mechanisms, such as the “universal packager“ (Bach 1986:10), for deriving count from mass meanings. However, this type of mechanism is not very productive in Dëne; it is restricted to items frequently used in standard portions, such as coffee and beer.

- (21) a. #sɔ́lághe lígofĩ *Mass*  
           five       coffee  
           Corrected as follows:
- b. sɔ́lághe lígofĩ dáninēl *Count/Universal Packager*  
               five       coffee distr-1sgS-handle<sub>PC</sub> substance in container perf  
               ‘I poured five coffees’

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<sup>5</sup> If the numerals were the partitioning syntactic elements, a possibility suggested in Borer (2005), nouns like *thay* ‘sand’ should combine directly with numerals as well. Thus, I discard this possibility for Dëne.

Third, there are nouns which do have both a mass and a count meaning, but one cannot be predicted from the other by the regular semantic mechanisms that a syntactic view must rely on. Rather, these nouns are lexically ambiguous (or polysemous) between two separate semantic specifications, one of which happens to be atomic while the other one is not. A comparable English example are the two readings of *marble* ‘type of natural stone’ (mass) and ‘small glass ball’ (count).

- (22) a. tu yeghə nínłta *Mass*  
water 4O-for adv-perf-handle substance in container perf  
‘he brought her some water (e.g., in a pail)’
- b. náke tu ghes?ı *Count*  
two lake perf-1sgS-see perf  
‘I saw two different lakes’ (e.g., from hilltop)

I conclude that the count/mass distinction in Dëne is semantic. In section 3, I will argue that the semantic count/mass distinction is in fact universal, but can only be perceived clearly in type III languages, which lack a grammatical count/mass distinction.

### 3 A “pristine“ view of count & mass semantics

#### 3.1 Syntax vs. semantics in the typology

My view of the role of syntax and semantics in the countability typology is summarized in (23).

(23)

	SEMANTIC DOMAIN		SYNTACTIC DOMAIN
III. BARE NOUN languages (e.g., Dëne)	N <sub>object</sub> : atomic => countable N <sub>substance</sub> : nonatomic => uncountable		
I. NUMBER-INFLECTING languages (e.g., English)	N <sub>object</sub> : atomic => countable N <sub>substance</sub> : nonatomic => uncountable	≈	√ number infl. => count noun *number infl. (√ measure phrase) => mass noun
II. CLASSIFYING languages (e.g., Mandarin)	N <sub>object</sub> : atomic => countable N <sub>substance</sub> : nonatomic => uncountable	≈	√ classifier => count noun *classifier (√ measure phrase) => mass noun

In this typology, all three types of languages operate on a semantic, lexically encoded distinction between nouns that have atomic denotations and

hence are countable, and nouns that have nonatomic denotations and hence are uncountable. This is in fact the traditional functional-cognitive view (cf. Wierzbicka 1988, Goddard 2006).

Variation occurs through grammaticization, i.e., through what happens (or does not happen) in the syntactic domain. If a language grammaticizes countability (through number inflection or classifiers), the grammatical distinction will be based on the semantic one, but there will also be some mismatches between the two (cf. Wiltschko 2005), indicated in (23) by the ‘almost equal to’ symbol. Well-known examples of mismatches are singularia tantum and pluralia tantum in number-inflecting languages. For instance, *scissors* is plural-only although it refers to a single object (contrast German: *Schere*<sub>SG</sub> – *Scheren*<sub>PL</sub>); *brains* is plural-only although it refers to ‘grey matter’, and *crockery* is singular-only although it refers to plural objects. Thus, the syntactic categories do not divide up a language’s nouns in precisely the same way as the semantic categories they are based on.

Such mismatches, and their purported arbitrariness, are often cited as evidence that the count/mass distinction is purely morphosyntactic (e.g., Chierchia 1998a, Borer 2005). However, it appears that broadly speaking, the mismatches are not that arbitrary. They occur with the same types of nouns in language after language, for example, with nouns denoting things that are small (and numerous) enough to fall both above or below the granularity threshold (cf. Wierzbicka 1988). I therefore conclude that while mismatches do mask the semantic count/mass distinction, their existence does not invalidate its universality.

Finally, only in type III languages, where no countability-related grammatical categories exist, is the semantic count/mass distinction of nouns clearly perceivable, without being masked by semantics-syntax mismatches.

### 3.2 Prediction: a more gradient distinction in type III languages

I predict that in type III languages, the count/mass distinction is more gradient than in type I and II languages. This is based on the assumption that the syntactic domain has more clearcut categories than the (lexical) semantic domain. In our case, the evaluation of atomicity, the semantic hallmark of countability, is more flexible than, say, the grammaticality of plural inflection. Recall that I proposed above that the evaluation of atomicity is relative to a granularity threshold, which in turn depends on perceivability and type of interaction with an object. In certain pragmatic circumstances, this threshold can be moved, as I shall now demonstrate with Dëne examples.

Dëne contains a class of nouns that denote what I call an “atomic multitude“, e.g., *jie* ‘berries’, *tthígha* ‘(human) head hair’, *lést’olá* ‘wheat’, *tychot’oláé* ‘oats’. Here it is in principle clear what the atoms are, but the atoms are small, rarely occur singly, and usually are not handled individually. Thus, based on perceivability and, particularly, type of interaction, the granularity threshold is set above individual berries, hairs, etc., and the nouns behave like nonatomic, mass nouns. However, under certain conditions the granularity threshold is lowered to the level of individual berries, hairs, etc., and then the nouns are atomic/count. These nouns thus exhibit mixed behaviour as far as the count/mass distinction is concerned.

(24) shows the noun *jíe* ‘berries’. In (24a–b), we see that this noun usually behaves like a mass noun. (24a) is the familiar numeral test; (24b) combines the noun with an inherently plural verb, one of the many Dëne verbs derived from a classificatory verb root.<sup>6</sup> Unless the universal packager is applied (berries in jars), the plural-object verb fails, presumably because one does not bring, i.e., handle, berries one by one. However, if one focuses on a single berry, as in (24c), it is possible to use the inherently singular classificatory verb for round objects, i.e. *jíe* acts like a count noun. *Jíe* also acts count in contexts that plausibly involve each atom of a multitude individually, such as in eating raw berries, (24d), or as in distributing berries to different locations, (24e). In these cases, *jíe* is compatible with an inherently plural verb, and with the distributive prefix *dá-*.

- (24) a. náke jíe ghesʔɪ mass  
two berries perf-1sgS-see O perf  
 intended: ‘I saw two berries’  
 speaker comments: “*you could say that but it’s stupid*”; “*you talk about berries as a whole—leave the number off*”; “*jíe right away suggests a bunch*”
- b. ??jíe yeghə níŋɪla mass  
 berries 4O-P adv-handle pl O perf  
 intended: ‘s/he brought him/her berries’  
 speaker comment: perhaps possible if berries are canned in jars
- c. jíe beghámɪʔa count  
 berries 3O-to-1sgS-handle sg RO perf  
 ‘I gave him/her a berry’
- d. jíe hesdɛɭ count  
 berries 1sgS-plural eat impf  
 ‘I am eating (raw) berries’
- e. jíe dadánélah count  
 berries adv-distr-th-stem  
 ‘a bunch of berries are hanging (off the ground)’

The noun *tthígha* ‘(human) head hair’ shows even more clearly that a special context is required to lower the granularity threshold to individual hairs. This makes sense, since there are probably even less such situations for hair than for berries. (25a–b) show that the threshold is usually above individual hairs: The normal choice of classificatory verbs for *tthígha* are those used with mass nouns. The numeral test, shown in (25c), creates only laughter, unless a context is evoked in which individual hairs are salient, in this case a crime scene where investigators search for minute pieces of evidence. Similarly, *tthígha* is compatible with the classificatory verb for handling plural (count) objects only in such a special context, (25d).

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<sup>6</sup> On classificatory verbs in Dëne and Athapaskan, see Carter (1976), Cook (1986, 2004), Davidson et al. (1963), S. Rice (1998).

- (25) a. *tthígha thedzáy* *mass*  
 (head) hair impf-loose matter exists  
 ‘there is hair’ (e.g., after a haircut)
- b. *deníghá yeghā nínl̥ta* *mass*  
 moose hair 4O-P adv-handle substance in a container perf  
 ‘s/he brought him/her some moose hair (in a bag)’
- c. ??*náke tthígha* *mass*  
two (head) hair  
 intended: ‘two hairs’  
 can only be said in a context like forensics, cf.:
- √ *samáganís náke tthígha húl̥ʔa* *count*  
 cop two (head) hair find O perf  
 ‘the cop found two hairs’
- d. ??*náke tthígha yeghā nínl̥la* *mass*  
 two (head) hair 4O-P adv-handle pl O perf  
 intended: ‘s/he brought him/her two hairs’
- √ can be said in a context like forensics *count*

A semantic account of the behaviour of these nouns could approximately be as follows: For nouns such as *jíe*, the evaluation of atomicity is usually restricted to situations where *x* is a (largish) sum. In this case  $\forall x, \text{jíe}[ATOM(x, \text{jíe}) \leftrightarrow \text{jíe}(x) \wedge \neg \exists y[y \sqsubset x \wedge \text{jíe}(y)]]$  will not be true; there will always be proper parts of *x* that are also denoted by *jíe*—*jíe* is not atomic. However, one can force situations in which *x* can be a single berry (and not a nontrivial sum). In this case, the atomicity condition will be fulfilled for *jíe*.

Nouns like *jíe* and *tthígha* are clear evidence that the semantic count/mass distinction is more gradient, with cases that fall in-between the count-only nouns like *dzól* ‘ball’ and the mass-only nouns like *thay* ‘sand’. Interestingly, it is precisely these kinds of nouns that are prone to mismatches in type I and II languages. And crucially, their mixed behaviour does not depend on functional elements, as the syntactic view predicts, but on (the meaning of) other lexical items, such as the classificatory verbs/verb roots. I conclude this section by exploring the meaning of these verbs further. This will bring us full circle to the topic we started out with, quantization.

### 3.3 Classificatory verbs and quantization

The basic semantic test for count nouns in Dëne is (direct) compatibility with a numeral. A similar semantic test is compatibility with single-object classificatory verbs. These verbs almost exclusively require a count noun argument as well.<sup>7</sup>

<sup>7</sup> A notable exception are nouns like *bér* ‘meat’, *yú* ‘cloth, clothing’. They are compatible with appropriate single-object (as well as plural-object) classificatory verbs, but they cannot be combined directly with a numeral. I believe that they are superordinate nouns like English *clothing*, *furniture*, which are notoriously problematic as far as the count/mass distinction is concerned, and I leave them for further research.



- (26) a. solághe dechën nádáthe?a  
five stick up-distr-impf-stem  
‘there’s five sticks/poles/posts/trees standing up’
- b. dechën yeghā níntā  
stick 3O-to adv-handle sg SO perf  
‘s/he brought her/him a stick’
- (27) a. solághe tthe dáthela  
five rock distr-impf-pl O exist impf  
‘there’s five stones’
- b. dēneyuaze tthe téshél<sup>8</sup>  
boy rock incept-perf-handle<sub>PC</sub> sg RO perf  
‘the boy threw a rock’

I proposed above that numerals are only compatible with count nouns because they contain an *OU* function, which must access atoms. I shall now argue that the same is true of single-object classificatory verbs. They also contain an *OU* function, with the only difference that the function specifies what kind of object it applies to, i.e., it is truly classifying. We could indeed say that these verbs contain the semantics of a (classificatory) numeral ‘one’:<sup>9</sup>

- (28) a. ?lághe ‘one’:  
 $\lambda P\lambda y[P(y) \ \& \ OU(y) = 1]$
- b. *-tā* ‘handle single sticklike object’:  
 $\lambda e\lambda x\lambda y[\text{handle}(e) \ \& \ Ag(e,x) \ \& \ Pat(e,y) \ \& \ OU_{\text{STICKLIKE}}(y) = 1]$
- c. *-shél* ‘handle<sub>PC</sub> single round/compact object’:  
 $\lambda e\lambda x\lambda y[\text{handle}_{PC}(e) \ \& \ Ag(e,x) \ \& \ Pat(e,y) \ \& \ OU_{\text{ROUND/COMPACT}}(y) = 1]$

This is a somewhat unusual semantics for verb roots. Usually, if verbs contain number information, they specify event number rather than participant number (cf. Mithun 1988, Lasersohn 1995, Thompson, this volume). But there is good reason to believe that Dēne classificatory verbs truly specify participant number, as expressed in (28). Most importantly, singular and not plural classificatory verbs must be used if there are multiple events involving a single participant. For example, in (29) the verb roots *-shúł*(impf)/*-shél*(perf) for throwing a single round/compact object are used. If these verbs specified event number, a plural verb would be expected here. Instead, a plural verb, based on the roots *-dél*(impf)/*-del*(perf) for the partially-controlled handling of plural objects, is used when multiple rocks are involved, irrespective of whether there are several events, (30a), or one event, (30b).

- (29) a. dēneyuaze hōlā tthe téshél  
boy many times rock incept-perf-handle<sub>PC</sub> sg RO perf  
‘the boy threw the rock many times’ (the same rock)

<sup>8</sup> The inceptive morpheme may be *te-* or *he-*, so an alternate form of *téshél* is *hészél*.

<sup>9</sup> I abstract away from viewpoint aspect (imperfective or perfective) in (28c–d).

- b. d̥h bes teshúf xa  
 four times knife incept-handle<sub>PC</sub> sg RO impf prsp  
 ‘s/he’s gonna throw the knife four times’
- (30) a. d̥neyuaze h̥l̥ t̥t̥e t̥é̥d̥el  
 boy many times rock incept-handle<sub>PC</sub> pl O perf  
 ‘the boy many times threw rocks’ (different rocks)
- b. t̥t̥e tesd̥é̥l xa  
 rock incept-1sgS-handle<sub>PC</sub> pl O impf prsp  
 ‘I’m gonna throw rocks’

If my analysis as in (28) is correct and D̥ne singular verbs contain the semantics of a numeral ‘one’, these verbs have the semantic property that is absent in D̥ne nouns: quantization. The *OU* function requires the verb’s (internal) argument to denote an atom, and atoms are by definition not further divisible, cf. (10) above.<sup>10</sup> To illustrate, throwing only a proper part of a round/compact object is not an instance of *t̥esh̥é̥l*. In a reversal of the English situation, where an argument nominal’s quantization imparts a quantized (i.e., telic) interpretation on a verb, in D̥ne, verbal quantization imparts a quantized interpretation on nominal arguments. But unlike in other such cases (e.g., Krifka 1992), verbal quantization does not involve event-related properties such as aspect, but the more “nominal” property of participant number.

Summing up, I have proposed that D̥ne singular and plural classificatory verbs contain an *OU* function, just like numerals. And just like the numeral ‘one’, singular verbs impose a singular, hence quantized, interpretation on their (internal) argument. We can thus say that quantization, and the notion of ‘singular’/‘one single object’, is not grammaticalized in D̥ne, but instead is lexicalized in the numeral ‘one’ and in inherently singular verbs.

#### 4 Conclusion

In this paper, I have proposed a three-way typology of countability systems, as in (17), repeated below.

(17)

	I:	II:	III:
	NUMBER INFLECTION	NUMERAL CLASSIFIERS	BARE NOUNS
Nouns:	sg vs. pl	number-neutral	number-neutral
Numerals:	<i>OU</i> function	no <i>OU</i> function	<i>OU</i> function

This typology is based on three claims: First, the semantics of numerals varies across languages. Second, bare nouns are not semantically deficient. And third, there is a universal semantic count/mass distinction that can be expressed in terms of atomicity, relative to situations/granularity thresholds. The semantic distinction can be masked in a language by a grammatical count/mass distinction, when there are mismatches between the semantic and the syntactic categories. Such mismatches are prone to occur, as the underlying semantic count/mass distinction is more gradual than a grammatical one.

Since D̥ne does not have number inflection, quantization is not

<sup>10</sup> As far as I know, most transitive singular verbs require this of their internal argument.

grammaticalized in Dëne nouns. Instead, we find that quantization, and the notion of ‘singular’, is lexicalized in Dëne verbs (and the numeral ‘one’). Overall, Dëne expresses lexically/semantically many notions that we are accustomed to thinking of as grammatical: the count/mass distinction, quantization, singular.

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