Informational Object Nouns and the mass/count distinction

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1 Introduction. This paper provides a novel contribution to the small but growing literature on the countability of abstract nouns (Ns) ([2, 6, 11, 12], i.a.). Abstract Ns have so far been largely set aside in semantic theories of the mass/count distinction, which focus on, the more tractable, concrete Ns denoting material objects or stuff. Given the heterogeneity of abstract Ns [2, 12], here we focus on one lexical subclass, which we call *Informational Object Ns* (IONs). What needs to be explained is why some IONs are straightforwardly countable (e.g., *three statements/beliefs/facts*), they are count, but others are not (*#three information(s)/knowledge(s)*), they are mass. We draw on theories of the mass/count distinction developed for concrete Ns, especially on the semantics of Collective Artefact Ns (CANs), e.g., *furniture*, *equipment*, and *jewellery*, which we argue share certain grammatical properties with IONs. Moreover, we use the type-generalised mereological approach in [7, 8] which can accommodate, e.g., sums of propositions as well as the more familiar sums of entities. We also appeal to the semantic stative/episodic distinction which, perhaps surprisingly, turns out to be one factor in determining what interpretations are available for some IONs in counting constructions.

2 Diagnostics for Informational Object Ns (IONs). We provide corpus evidence that IONs pass **both** the following tests, while other Ns do not: If N is an ION, then **(i)** *N that is true/false* is felicitous (truth-evaluability); **(ii)** *N that p* is felicitous (propositional complementisers, e.g., *Alex's belief that it's raining*). In contrast, Ns like *feeling* are not IONs, because they pass the complementiser test (ii) (e.g., *the feeling that I have forgotten something*), but they fail test (i) (e.g., *that feeling was true* is odd, if *true* is intended in its truth-value sense, and not in the *genuine, real* sense). Neither are concrete Ns like *book, article* IONs: even if they are felicitous in collocations like *this article is true* (understood as meaning that its content is true at a given world/time), they fail test (ii).

3 Data. Abstract IONs share with concrete CANs considerable cross-linguistic variation in their mass/count lexicalisation patterns (Table 1). Moreover, when CANs and IONs are lexicalised as mass Ns, they resist mass-to-count coercion (1a, 2a), in contrast to other mass Ns (1b, 2b):

(1) a. #Two furnitures/jewelleries/footwears.
    b. Two more beers and a fried rice, please.

(2) a. #Two informations/evidences/knowledges.
    b. I have two loves/passions: wine and cheese.

4 Analysis. Putting subkind readings to one side, concrete count Ns denote sets of discrete individuals, each clearly demarcated from the other in a given context. For IONs, we argue, what is 'one' in their denotation is either a propositional unit (targeted by the diagnostic tests above), or an eventuality such that this eventuality may be in the extension of some speech act (e.g. a stating), or a psychological state (e.g. a belief state), depending on their lexical meaning and interaction with context. For example, *two statements* can refer to the same proposition across two speech acts or to two propositions, provided that there is at least one clearly individuated speech act that each proposition can be tied to. Having *two beliefs*, on the other hand, means that there are two distinct contents to those beliefs. If two people believe the same thing, even at different times, they share one belief. What is *one* in the denotation of *belief* cannot be individuated in terms of separate cognitive agents' belief states.

Given that we assume that all IONs have a sense that denotes propositions, what we need is a notion of a unified mereological sum ($\sqcup$) operation over different semantic types (minimally, for entities of type e and propositions of type $\langle w, t\rangle$). For this, we use Schmitt [7, 8] who assumes,

Table 1: Mass/count lexicalisation patterns for Collective Artifact Ns and Informational Object Ns

	Mass	Count (PL_{NOM})
furniture	*furniture*, *meubilair* (Dutch)	*meubel(s)* (Dutch), *huonekalu(t)* (Finnish)
jewellery	*jewellery*, *Schmuck* (German)	*taxšit(im)* (Hebrew), *koru(t)* (Finnish)
footwear	*footwear*, *Schuwerk* (German)	*jalkine(et)* (Finnish)
information	*information*	*Information(en)* (German), *tieto (tiedot)* (Finnish)
evidence	*evidence*	*Beweis(e)* (German), *todiste(et)* (Finnish)

for each Domain $\mathcal{D}_a$ a bijection function pl_a on the powerset of $\mathcal{D}_a$ to the set of singularities and pluralities for that domain, $\mathbf{PL}_a$:

(3) $$pl_a : (\mathcal{P}(\mathcal{D}_a) \setminus \varnothing) \rightarrow \mathbf{PL}_a$$

So we have a homomorphism between the set $\mathcal{P}(\mathcal{D}_a)$ and the set $\mathbf{PL}_a$ for any type a. Sums in $\mathbf{PL}_a$ are defined in terms of set union at the level of subsets of $\mathcal{P}(\mathcal{D}_a)$ mapped back 'up' to $\mathbf{PL}_a$. The mereological part relation ($\sqsubseteq$) is likewise specified in terms of the subset relation. For $\mathbf{a}, \mathbf{b} \in \mathbf{PL}_a$:

(4) $$\mathbf{a} \sqcup \mathbf{b} = pl_a(pl_a^{-1}(\mathbf{a}) \cup pl_a^{-1}(\mathbf{b}))$$

(5) $$\mathbf{a} \sqsubseteq \mathbf{b} \text{ iff } pl_a^{-1}(\mathbf{a}) \subseteq pl_a^{-1}(\mathbf{b})$$

In effect, what this means is that we have domains for what is assumed to exist in the model, the power sets of which are isomorphic with Boolean semilattices minus the bottom element (one for each semantic type). This is, therefore, a departure from classical extensional mereology that assumes sums at the level of the domain.

Recent analyses of CANs [1, 4, 5, 9, 10] treat mass CANs as predicates which overspecify what counts as 'one' in their denotation, such that, if not resolved, this overspecification yields a failure of grammatical countability. For count CANs, it has been proposed that overspecification is removed, because count Ns generally encode a requirement for a contextually salient schema of individuation that quantizes the predicate [1]/makes the predicate disjoint [4, 5, 9, 10] (*quantized* in the sense of [3]):

(6) $$QUA(P) \leftrightarrow \forall x, y[(P(x) \wedge P(y)) \rightarrow \neg x \sqsubset y]$$

Importantly, *across different* schemas of individuation, IONs like *belief* overspecify what counts as 'one', similarly as CANs do. For example, (7) and (8) can be viewed as truth-conditionally equivalent, even if what counts as one belief in (7) overlaps with what counts as two separate beliefs in (8):

(7) Alex's *belief* that Paris is in France and Madrid is in Spain *is* true.

(8) Alex's *beliefs* that Paris is in France and Madrid is in Spain *are* true.

Building on [1], we assume: (i) while *mass* CANs (*jewellery*) specify *non-quantized sets of objects* for counting, *mass* IONs (*information*) specify *non-quantized sets of propositions* for counting; (ii) while *count* CANs (*korut* 'items of jewellery', Finnish) specify *quantized sets of objects* for counting relative to each context, *count* IONs (*Informationen* 'pieces of information', German) specify *quantized sets of propositions* relative to each context.

Formally, for a context i, count ION lexical entries contain a function $\mathcal{Q}_i$ such that $\mathcal{Q}_i(X)$ is a maximally quantized subset of X.

(9) $$X \subseteq_{max.QUA} Y \text{ iff } X \subseteq Y, QUA(X), \forall Z \subseteq Y[Z \supseteq X \wedge QUA(Z) \rightarrow Z = X]$$

For *belief(s)*, for instance, the sets are sets of sets of possible worlds mapped via pl_w (i.e., $pl_w(\mathcal{P}(\mathcal{D}_w))$), so $\mathcal{Q}_i$ ensures the relevant set is quantized, and so suitable as the input for a grammatical counting operation (see (10-11) below).

When it comes to individuation presupposed by grammatical counting, for propositions, which we take is the denotation of all IONs, what seems to matter is whether we view them as contents of mental states or as what is (also) conveyed by speech acts. We give simplified lexical entries for *belief*, *statement*, and *knowledge* in (10)-(12). Consider first our (simplified) lexical entry for the singular count ION *belief* (10). The predicate of mental states $belief$ is stative (individual-level). Given that generally such stative predicates are odd with modifiers referring to specific locations in time and space, they cannot be individuated relative to space and/or time, and neither, as we argue, relative to particular belief-holders, i.e., Experiencer participants. The criterion of individuation which is needed for grammatical counting derives from the set of propositions themselves ($pl_w(\mathcal{P}(\mathcal{D}_w))$) which form a quantized set due to the function $\mathcal{Q}_i$. Contrast this with the entry for *statement* in (11) which is polysemous between two count concepts. In its speech act-related meaning (11a), it is episodic (stage-level), as it sanctions modifiers referring to specific locations in time and space, and it denotes a set of eventualities, each of which is the extension of a speech act performed by an agent. Consequently, we can count these eventualities via anchoring them (cf. [2]) to their corresponding, different, speech acts even if the contents of these speech acts is the same. Alternatively, given that *statement* can refer to contents, i.e., to propositions (11b), one can count distinct propositions conveyed by statements (speech acts), even if they are the product of some larger speech act-related event (e.g. *The President made several statements in one long, meandering tirade.*). In effect, our treatment of *belief* in (10) and *statement* in (11) amounts to the claim that some IONs have more than one sense or use, each associated with a different criterion of individuation in counting constructions, depending on whether the criterion of individuation comes from their episodic or stative sense.

The lexical difference between count IONs (*belief*, *statement* (10,11)) and mass IONs (*knowledge* (12)) is captured by the presence (count) or absence (mass) of the $\mathcal{Q}_i$ function in their lexical entries. The lexical entry for *knowledge* (12) resembles that of *belief* minus the $\mathcal{Q}_i$, but plus (minimally) a veridicality constraint that the proposition is true at every world in the common ground. (12) exemplifies a lexical entry for a mass ION, it lexically specifies no criterion of individuation. (For clarity of presentation, we suppress the applications of pl_w and pl_w^{-1} in the formulas below.)

(10) $$[\![\text{belief}]\!]^i = \lambda x.\lambda p.\exists s[belief(s) \wedge (exp(s))(x) \wedge \mathcal{Q}_i(contents(s))(p)]$$

(11) $$[\![\text{statement}]\!]^i = \begin{cases} \text{(a) } \lambda x.\lambda e.\exists p[\mathcal{Q}_i(statement)(e) \wedge (agent(e))(x) \wedge (contents(e))(p)] \\ \text{(b) } \lambda x.\lambda p.\exists e[statement(e) \wedge (agent(e))(x) \wedge \mathcal{Q}_i(contents(e))(p)] \end{cases}$$

(12) $$[\![\text{knowledge}]\!]^i = \lambda x.\lambda p.\exists s.\forall w \in CG \quad \begin{array}{l}[knowledge(s) \wedge (exp(s))(x) \wedge \\ (contents(s))(p) \rightarrow p_w = 1]\end{array}$$

Although the entry in (10) is satisfactory if experiencers are drawn only from the domain of single individuals, in our full paper, we also discuss complications arising from pluralities of experiencers. Beliefs are sharable, so just as one can say *Alex and Billie's mother* with the inference that the individual referred to is the mother of both Alex and Billie, one can also say *Alex and Billie's belief that p* with the inference that the belief referred to is the belief of both Alex and Billie. The same is not true for mass nouns, both concrete and abstract. Neither *Alex and Billie's flour* nor *Alex and Billie's knowledge* implies that there is one amount of flour/knowledge possessed by Alex and Billie (even though this possibility is not excluded). The entry in (10) does not yield this result, hence we need the entry in (13), mutatis mutandis for other count IONs.

(13) $$\begin{array}{l}[\![\text{belief}]\!]^i = \lambda x.\lambda p.\exists s[{}^*belief(s) \wedge ({}^*(exp(s)))(x) \wedge \forall s'\forall y[(belief(s') \wedge \\ \qquad (exp(s')))(y) \wedge s' \sqsubseteq s \wedge y \sqsubseteq x) \rightarrow \mathcal{Q}_i(contents(s'))(p)]\end{array}$$

The entry in (13) requires that, given a plurality of experiences and an ι closing of the p λ-bound variable, each of the belief states of each of the experiencers must have the same content, p.

In summary, a major methodological and theoretical consequence of our approach is that we can make inroads into the analysis of abstract Ns by extending models developed for concrete Ns (*pace* common pretheoretic claims that concrete and abstract Ns require entirely different semantic models), and do so parsimoniously via applying concepts anyway needed to characterise countability for concrete Ns and the distinctions between stative/episodic predicates of eventualities.

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