LINGUISTICS

an interdisciplinary journal of the language sciences

Editor in Chief
WOLFGANG KLEIN

Offprint

Mouton de Gruyter
Berlin · New York

French universal quantifiers in conceptual semantics*

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Abstract

This paper is an attempt to import what is known as algebraic semantics (Link 1983, 1986) into conceptual semantics (Jackendoff 1983, 1987, 1990) in order to provide a unified account of the universal quantifiers tout, tous *and* chaque, chacun *in French. We show that the general principles for the determination of part structures provided for by algebraic semantics are exactly the ones we need in order to provide a unified account of French universal quantifiers in the conceptual semantics framework. The compatibility of these quantifiers varies with collective predicates, singular and collective nouns, and mass nouns, or when they are used as adverbials. We show that all of these differences can be predicted by postulating that the quantifiers select different types of parts for interpretation and that the types of parts selected for quantification are of the same kind whether the quantifier operates upon the nominal domain or the verbal domain. These types of parts are the ones provided to us by the lattice structure of algebraic semantic theories. We propose a unified syntactic representation for all universal quantifiers in French where the quantifier is a functional category that always selects a lexical category denoting the relevant part for quantification. Such a representation is motivated by a clear correspondence between syntactic categories and lattice-structure-endowed conceptual entities. We show that this analysis also explains some dialectal variation among quantifiers.*

This paper is an attempt to import what is known as algebraic semantics (Link 1983, 1986) into conceptual semantics (Jackendoff 1983, 1987, 1990) in order to provide a unified account of the universal quantifiers *tout*, *tous* and *chaque*, *chacun* in French.

Conceptual semantics considers meaning to be an information structure, mentally encoded by human beings. Its focus is on the internal

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0024–3949/94/0032–0213

representations or internalized concepts (Jackendoff 1990), that is, the kind of structures human beings impose on the world to create meaning. This conception of semantics is very similar to what Chomsky (1986) defines as the study of the internalized language, a study of the formal properties of the human mind/brain that allow linguistic competence.

In order for conceptual semantics to deal with quantification, we need to postulate some general principles for the determination of part structures. The goal of this paper is to show that the kind of structures provided for by algebraic semantics or mereology are exactly the ones we need in order to account for French universal quantifiers in the conceptual semantics framework.

Universal quantifiers in French, *tout*, *tous*, *chaque*, and *chacun*, do not exhibit the same distribution when combined with collective predicates ([1]), collective or singular nouns ([2]), mass nouns ([3]), or when used as adverbials ([4]).

(1) Collective predicates:
  a. *Chacun des étudiants *s'est rassemblé* dans le hall.
     'Every student/Each of the students gathered in the hall.'
  b. Tous les étudiants *se sont rassemblés* dans le hall.
     'All the students gathered in the hall.'

(2) Collective and singular nouns:
  a. *Chacune de la *famille* a participé à la fête.
     'Each of the family took part in the feast.'
  b. Toute la *famille* a participé à la fête.
     'The whole family took part in the feast.'

(3) Mass nouns:
  a. *Chaque *eau* est salée.
     'Each water is salted.'
  b. Toute l'*eau* est salée.
     'All water is salted.'
  c. Toute *eau* est salée.
     'Any water is salted.'

(4) Adverbial:
  a. *Le chien est *chaque* mouillé.
     'The dog is each wet.'
  b. Le chien est *tout* mouillé.
     'The dog is all wet.'

I will propose that all of these differences can be explained by postulating that the quantifiers select different types of parts for interpretation. These types of parts are of the same kind whether the quantifier operates upon the nominal domain ([1]–[3]) or the verbal domain ([4]), and they are the ones provided to us by mereological or algebraic semantic theories.

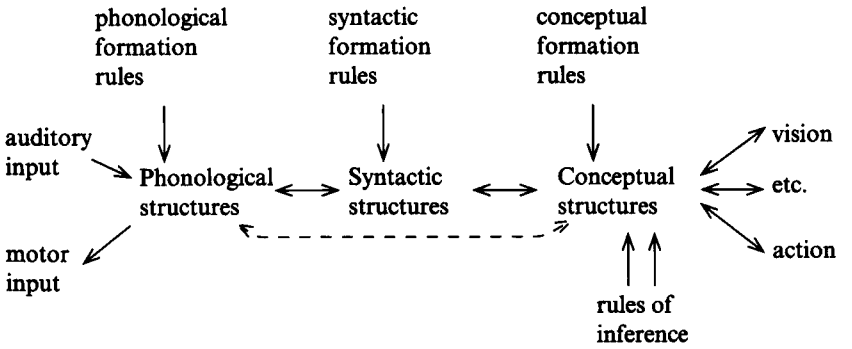
The paper is organized as follows: in the first section we look at the parts structures of algebraic semantics and see how they can provide a unified representation of parts at conceptual structure. We then characterize French universal quantifiers by assigning them a unified syntactic representation but a different parts-types selection. In the second section we apply this analysis to the problem at hand, the difference in distribution between French universal quantifiers. In the third section we consider more data, so-called generic *tout* and Quebec French *toute*, which is also accounted for by our analysis. In the fourth section we summarize the correspondence rules between syntactic and conceptual levels of representation for French quantifiers.

1. Parts structures

1.1. *The role of the lexicon in conceptual semantics*

In the conceptual semantics framework, as developed by Jackendoff (1990), the general organization of grammar, given in (5), is such that there are three autonomous levels of structures: phonological, syntactic, and conceptual.

(5) Organization of the grammar (from Jackendoff 1990: 16):



Formation rules for each level determine the well-formedness of the structures. A set of correspondence rules links each level with another. The correspondence between syntactic and conceptual structures is such

that each major constituent of the syntactic structure projects into a major ontological category: thing, path, event, place, etc. There are also correspondence rules between linguistic and nonlinguistic domains: phonological structures with the auditory system and the motor commands on one end, and conceptual structures with other forms of mental representation such as vision and action on the other end.

The lexicon, in this model, is part of correspondence rules. We will adopt Jackendoff's (1990) definition of a lexical item:

(6) A lexical item establishes a correspondence between well-formed fragments of phonological, syntactic, and conceptual structure (from Jackendoff 1990: 18).

This definition allows us to develop a perspective in which the same conceptual primitives, here parts structure, can be used to define the meaning of universal quantifiers. With a unified representation of parts structure at conceptual structure, the only difference between lexical items, across languages, resides in a different combination of phonological and syntactic fragments with conceptual fragments. Our hypothesis is that variation, as in (7), between the French universal quantifier *tout* and its various English counterparts results from different correspondence rules between each level of representation and not from differences in the structures of the levels themselves.

(7) a. *Tous* les étudiants se sont rassemblés dans le hall.
'*All* the students gathered in the hall.'
b. *Toute* la grange a brûlé.
'The *whole* barn burned down.'
c. *Tout* le monde est venu.
'*Every*body came.'

The parts structure we propose for a unified representation at conceptual structure is borrowed from algebraic semantics, as developed by Link (1983, 1986).

1.2. *Plurality, substances, and processes*

1.2.1. *Link's semantics for the nominal domain.* The main idea in Link's (1983, 1986) semantics is to give the domain of individuals more structure than in usual set theory. The domain of entities contains some subdomains that have the algebraic structure of semilattices.[1] These semilattices can be atomic or nonatomic. This kind of structure allows us to distinguish between ordinary individuals, as in (8), who are atomic individuals, and plural individuals, as in (9), who are nonatomic. Plurals are constituted by atoms, but are not atomic themselves. Finally there are also quantities of matter, as in (10), that correspond to both kinds of individuals: the gold in Sylvie's ring or the matter (for example *Jeanne*) making up the plural individual *Jeanne and Pierre.*

Composition of the nominal domain:
(8) atomic individuals: Jeanne, Pierre, Sylvie's ring.
(9) nonatomic individuals: Jeanne and Pierre, the children.
(10) quantity of matter: the gold in Sylvie's ring, the matter making up the plural individual Jeanne and Pierre.

The idea of taking plurals to be individuals is not as counterintuitive as it seems. Children produce sentences such as (11), which suggest that they treat a couple (Marie and Paul) like an individual.

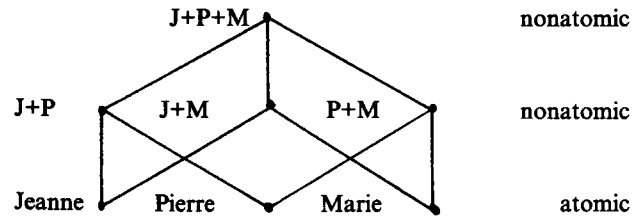
(11) Tiens, voilà Ri-Paul! (Anabelle, three years old)
'Here comes Ri-Paul!'

Certain relations structure the organization of the nominal domain. To illustrate this, let us suppose there are three individuals in our domain: Jeanne, Pierre, and Marie. Given what we have seen so far, there is also a fourth individual, the plural individual *Jeanne, Pierre, and Marie.* There is also another plural individual consisting of just *Jeanne and Pierre.* Jeanne is said to be an atomic individual part (atomic i-part) of the individual *Jeanne, Pierre, and Marie.* Pierre is also an atomic i-part of *Jeanne, Pierre, and Marie*, and so is Marie. The individual *Pierre and Jeanne* (the couple) is an i-part of the individual *Jeanne, Pierre, and Marie*, but not an atomic i-part, because it is an individual that itself contains atoms. (12) summarizes the individual parts relations.

(12) *Individual parts relations within the nominal domain:*
i-parts: Jeanne is an *atomic individual part* (atomic i-part) of the individual Jeanne, Pierre, and Marie. Jeanne and Pierre is an *individual part* (i-part), but nonatomic, of Jeanne, Pierre, and Marie.

There are therefore two kinds of individuals: atomic individuals who do

(13)



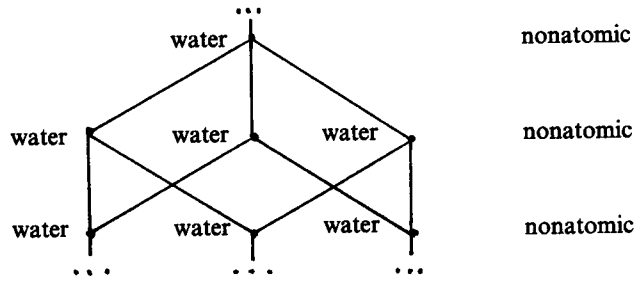
not have proper i-parts, and nonatomic individuals who do. For example, Jeanne alone doesn't have proper i-parts because she is an atom. The plural individual *Jeanne, Pierre, and Marie*, however, does have proper i-parts: atomic ones (Jeanne) and nonatomic ones (Jeanne and Pierre). (13) gives the semilattice for our nominal domain.

There is also a matter-part (m-part) relation between the individuals of the domain, linking the matter or texture of which the individuals are made. M-parts are different from i-parts. Two different (atomic) individuals can be made of the same matter, for example, old Egyptian gold for Sylvie's ring and her grandmother's necklace, as summarized in (14).

(14) m-part: the matter constituting Sylvie's ring is an *m-part* (m-part) of the matter constituting (what used to be) her grandmother's necklace (gold).

Some individuals can be nonatomic and not made of atomic parts. This is the case of the denotation of mass nouns, which have the semantic property of the cumulative reference (Quine 1960), which makes them similar to plurals: water plus water is always water and children plus children are children. The lattice structure allows for a similar representation for mass nouns and plural, the only difference being that mass nouns do not have smallest individual (atomic) parts. (15) gives the semilattice for mass nouns.

(15)



I propose that these three parts relations, i-part, atomic i-part, and m-part, represent the three fundamental ways in which the human mind establishes part–whole relations and characterizes discrete entities with regard to nondiscrete entities. I adopt them, as a hypothesis, as primitives for conceptual structure.[2] If these relations are primitives, they should not be limited to the structuring of only one ontological category, namely "things." We now turn to another ontological category: events.

1.2.2. *Bach's semantics for the verbal domain.* Bach (1986) extends Link's theory to the domain of eventualities, which, according to his definition, includes events, states, and processes, as classified by Vendler (1957). In the rest of this discussion, I will use "event" as a generic term for Bach's "eventuality," including states and processes.

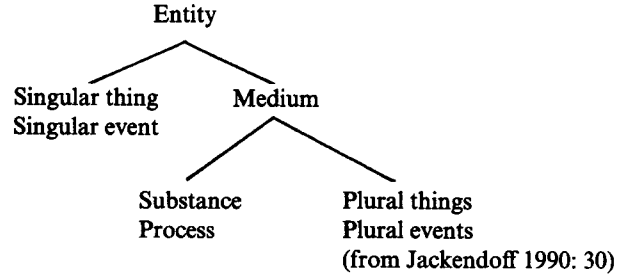
Bach takes events to be analogous to individuals and bits of processes to be analogous to matter parts used to make up individuals. These bits of processes are called process parts (p-parts), and they can make up events. We therefore have three kinds of individuals: atomic events, nonatomic events, and processes, which are the web of all events. (16) gives examples of parts relations within events.

(16) *Parts relations in the verbal domain:*
i-parts: *Marie jumps* is an i-part of the plural event *Marie jumps and twists her knee.*
Pierre discovers the treasure is an i-part of the plural event *Pierre, Jacques and Sylvie discover the treasure.*
p-parts: the process of *Marie is hammering a nail* can be a p-part of the process *Marie builds a cabin.*

1.2.3. *Algebraic lattices in conceptual structure.* Why this kind of structure is desirable for conceptual structure can be shown by comparing Bach's proposal with Jackendoff's (1990) feature system for distinguishing across the nominal and verbal domains.

Note that I am not adopting Jackendoff's (1991) proposal for parts structure, with features such as [+/−bounded] and [+/−internal structure], which allow a four-way distinction between any kind of object or event. I stay with the more standard proposals of a three-way distinction between mass/count and singular/plural, which is also the one given in Jackendoff (1990), shown in (17) below.

(17) Distinction between the nominal and the verbal domains:

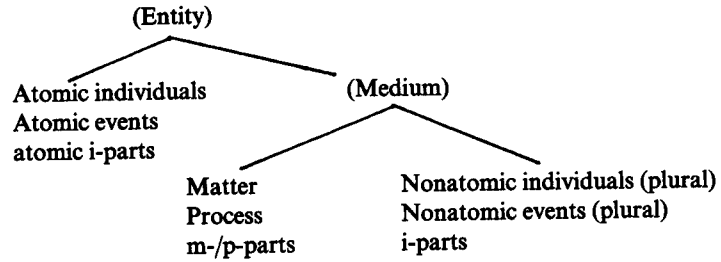


(from Jackendoff 1990: 30)

Thus, it seems that Bach's (1986) system produces exactly the kind of distinctions Jackendoff (1990) wants to establish. There are, indeed, within the algebraic structure of lattices as discussed above three types

of parts relations structuring three types of individuals: atomic individuals and events, corresponding in Jackendoff's system to singular things and events, matters and processes corresponding to substances and processes, and finally nonatomic individuals and events corresponding to plural things and individuals. The schema in (18) shows how well Bach's and Link's categories match Jackendoff's system.

(18)



The advantage of the Link/Bach model is that it offers a precise formalization of the distinctions of Jackendoff's feature system by defining the types of parts structuring verbal and nominal entities: atomic i-parts with atomic individuals and events, m-parts or p-parts with matter and processes, and i-parts with nonatomic individuals and events.

1.3. *Analysis*

1.3.1. *Parts types for the quantifiers.* In the conceptual semantics model, each major syntactic (lexical) category has a conceptual correspondent at conceptual structure that is an ontological entity: thing, place, event, path, etc. With the lattice structure we have now given to ontological entities, this means that a syntactic constituent can denote any part in the semilattice: m-part, p-part, i-part (atomic or nonatomic).

I propose to define the lexical meaning of the universal quantifiers by assigning them a type of part that they need to access. Such a characterization should predict their differences in distribution. For *chaque* and *chacun*, I propose that the parts accessed by the quantifier need to be atomic, while for *tous* these parts are not required to be atomic. Furthermore, *tous*, but not *chaque/chacun*, can access matter parts or process parts. This is summarized in (19):

(19) *Chaque/chacun* must access atomic individual parts.
Tous can access either i-parts or m-/p-parts.

Let us see that the parts *tous* accesses need not be atomic. A sentence

with *tous* is interpretable even if the parts are not necessarily made of single individuals (atoms) but made of couples or subgroups. In (20a), for example, it is possible to match balls with pairs of children, for example. So the distribution of the NP *un ballon* is not over the finest partition of the i-sum of children (resulting in one ball for every child), but over a coarser partition (one ball for every pair).[3] This is not possible with *chaque/chacun*, as shown by the oddity of the enumeration following the quantified sentence in (20b).

(20) nonatomic i-parts:
a. Tous les enfants reçurent un ballon: Sylvie et Véronique en reçurent un, Philippe et Christine: un et Stéphanie et Pascal: un.
'All the children received one/a ball: S and V received one, P and C received one, and P one.'
b. *Chacun des enfants/chaque enfant reçut un ballon: Sylvie et Véronique en reçurent un, Philippe et Christine, un et Stéphanie et Pascal, un.
'Each of the children/every child received one ball: S and V received one, P and C received one, and P one.'

When the enumeration consists of atomic i-parts, as in (21), both quantifiers are acceptable. The requirement on *tous* to access i-parts contains the possibility for these parts to be atomic, though they need not be.

(20) atomic i-parts:
c. Tous les enfants reçurent un ballon: Sylvie en reçut un, Véronique, un, Philippe, un, Christine, un et Pascal, un.
'All the children received one ball: S received one, V, one, P, one, C, one, and P, one.'
d. Chaque enfant/chacun des enfants reçut un ballon: Sylvie en reçut un, Véronique, un, Philippe, un, Christine, un et Pascal, un.
'Each of the children/every child received one ball: S received one, V, one, P, one, C, one, and P, one.'

The atomicity requirement on *chacun/chaque* appears also in examples in (22), with a restrictive clause added to the first sentence. Since with *tous*, nonatomic i-parts can be accessed, the restriction is more acceptable.

(21) a. Tous les enfants reçurent des ballons, sauf un.
'All the children received balls, except one.'
b. ??Chacun des enfants/chaque enfant reçut des ballons, sauf un.
'Each of the children/every child received balls, except one.'

Before we turn to more examples, we need to discuss the syntactic representation of our quantifiers.

1.3.2. *Syntactic representation.* I propose a unified syntactic representation for the quantifiers *tout/tous, chaque/chacun*. The quantifier is the head of a quantifier phrase (QP, possibly a functional category) that selects a lexical category (NP or VP or AP). QP is "transparent" to categorial features [±N; ±V], so that it inherits the categorial features of its lexical complement, and it is its lexical complement that is selected by other (lexical) categories. When the lexical category selected is an empty NP (e), this NP can have a DP complement. The basic structure for universal quantifiers in French is given in (21).

(22) [QP[[XP]]
(XP = NP, VP, AP)
When XP = NP = e, [QP[[XP]] = [QP[[NP]((de)[DP])]]
'of'

This analysis gives all quantifiers a determinerlike treatment. It also allows a parallel syntactic representation for pure determiner quantifiers like *tout* and *chaque* as in (23a ii)–(23a iii) and pronominal quantifiers like *tous* and *chacun* as in (23a iv)–(23a v) and (23b).

(23) a. [QP[[XP]]
(i) $[_{QP}$ tout $[_{VP/AP}$ mouillé]]
'all wet'
(ii) $[_{QP}$ tout $[_{NP}$ enfant]]
'any child'
(iii) $[_{QP}$ chaque $[_{NP}$ enfant]]
'every child'
(iv) $[_{QP}$ chac-un$_i$ $[_{NP}$ t_i]]
'each-one'
(v) $[_{QP}$ tous$_i$ $[_{NP}$ t_i]]
'all'

b. [QP[[NP]((de)[DP])]]
(i) $[_{QP}$ toute$_i$ $[_{NP}$ t_i]$[_{DP}$ la $[_{NP}$ famille]]]
'the whole family'
(ii) $[_{QP}$ tous$_i$ $[_{NP}$ t_i]$[_{DP}$ les $[_{NP}$ enfants]]]
'all the children'
(iii) $[_{QP}$ chac-un$_i$ $[_{NP}$ t_i] de $[_{DP}$ les $[_{NP}$ enfants]]]
'each-one of the children'

Such a parallel treatment is in line with traditional grammarians' observations that *chaque* is regressively derived from *chacun* (Grevisse 1980) and the fact that some dialects of French use *chaque* instead of *chacun* (Junker and Vinet 1993). In the representations (23), t_i indicates the trace of an incorporated morpheme: *-un* is incorporated, in the sense of Baker (1988), into the quantifier's head *chac-*. For *tous* the incorporated morpheme is not visible.[4] The DP complement in (23b) has the particular property of agreement with the quantifier's head, an agreement in gender and number for *tous* and in gender only for *chacun*. This is illustrated below, with feminine nouns (FEM) as complements.

(24) a. $[_{QP}$ toute$_i$ $[_{NP}$ t_i]$[_{DP}$ la $[_{NP}$ famille]]]
all-FEM the-FEM family(FEM)
'the whole family'
b. $[_{QP}$ toutes$_i$ $[_{NP}$ t_i]$[_{DP}$ les $[_{NP}$ femmes]]]
all-FEM-PL the-FEM-PL women(FEM)-PL
'all the women'
c. $[_{QP}$ chac-une$_i$ $[_{NP}$ t_i] de $[_{DP}$ les $[_{NP}$ femmes]]]
each-one-FEM of the-FEM-PL women(FEM)-PL
'each-one of the women'

This agreement distinguishes the DP complement from another regular noun complement as in (25), with which the quantifier would not agree.

(25) a. chaque enfant du village
'each child of the village'
b. chacun des enfants du village
'each of the children of the village'

Why not extend the representation in (23b) to all examples in (23a), by postulating an empty DP complement to (23a ii)–(23a iii)? It would predict the existence of examples such as (26), which are not possible:

(26) a. *chaque enfant des enfants
*$[_{QP}$ chaque [NP enfant (de) $[_{DP}$ les enfants]]]
'each child of the children'
b. *tout enfant des enfants
*$[_{QP}$ tout [NP enfant (de) $[_{DP}$ les enfants]]]
'all child (of) the children'

Looking now at the correspondence between our syntactic representation and our conceptual representation, the syntactic constituent (XP) selected by the Q head always denotes the part (x) for quantification. The DP complement of this XP (= NP) denotes the domain of quantification (X) — the entity out of which parts are to be found. This gives us a correspondence between syntactic and conceptual structures such as (27).

(27) [QP[[XP]], where XP denotes the part x for quantification.
[QP[[NP][DP]]], where XP denotes the part x for quantification and where DP denotes the entity X out of which parts are constructed.

Note that not all syntactic structures give both x and X. We will return to these in section 4. Now tying in our part-selection rule with our syntactic representation, we can reformulate (19) as (28), for nominal quantifiers:

(28) In the structure [QP[[NP]([DP])]] where
NP denotes a part x,
DP denotes a partable individual X,
- if QP = *chac-/chaque*, then NP must denote atomic individual parts;
- if QP = *tous/tout*, then NP can denote either individual parts or matter parts.

We are now sufficiently equipped to study the different semantic selections of our quantifiers. We have adopted a unified syntactic representation for all forms of the universal quantifiers *tout*, *tous*, *chaque*, and *chacun*. We proposed that syntactic categories selected by quantifiers correspond to lattice-endowed ontological entities at conceptual structure. In our syntactic representation, all quantifiers' heads select a category denoting a particular part type in the lattice. In the next section, we examine the consequences of this proposal.

2. Application

We will first address the contrasts between *chaque*, *chacun des* ... and *tout le*, *tous les* ..., which are the most common forms of universal quantification in Modern French. We will postpone to section 3 the discussion of "generic" *tout*.

2.1. *Collective predicates*

Quantification with collective predicates is subject to special constraints. A collective predicate is never true of the individual members of a group, but just of the group itself, as shown by (29) below:

(29) a is true but b is not:
a. Jeanne, Sylvie et Mireille se sont rassemblées.
'Jeanne, Sylvie, and Mireille gathered.'

b. *Jeanne s'est rassemblée, Sylvie s'est rassemblée et Mireille s'est rassemblée.
'Jeanne gathered, Sylvie gathered, and Mireille gathered.'

The individual members of the group must take part in the action denoted by the predicate but cannot complete the task alone. As noted by Dowty (1986) for English, *chacun* 'each' never appears with collective predicates, while the compatibility of *tous* with collective predicates varies. Compare (30) and (31):

(30) a. *Chacun des étudiants s'est rassemblé dans le hall.
'Each of the students gathered in the hall.'
b. *Sylvie et Jeanne sont chacunes pareilles.
'Sylvie and Jeanne are all alike.'
c. *Chacun des électeurs a élu Mulroney.
'Each of the voters elected Mulroney.'
d. *Chacun des étudiants est nombreux.
'Each of the students is numerous.'

(31) a. Tous les étudiants se sont rassemblés dans le hall.
'All (of the) students gathered in the hall.'
b. Sylvie et Jeanne sont toutes pareilles.
'Sylvie and Jeanne are all alike.'
c. *Tous les électeurs ont élu Mulroney.
'All of the voters elected Mulroney.'
d. *Tous les étudiants sont nombreux.
'All of the students are numerous.'

According to Dowty, predicates such as *elire* 'elect', *être nombreux* 'be numerous' are devoid of what he calls "distributive entailments" (i.e. entailments that cannot be described by applying the predicate itself to the individual members), while predicates such as *se rassembler* 'gather', *être pareil* 'be alike' have them.

I propose that what Dowty calls "distributive entailments" can be reduced to entailments about parts. We would distinguish the two types of collective predicates in the following manner: predicates that entail (nonatomic) parts, like *se rassembler* 'gather', *être pareil* 'be alike', and predicates that do not, such as *elire* 'elect', *être nombreux* 'be numerous'.

(32) Characterization of collective predicates:
- with (nonatomic) parts entailments: *se rassembler* 'gather', *être pareil* 'be alike'
- without parts entailment: *elire* 'elect', *être nombreux* 'be numerous'

Since distributive quantifiers need to access parts, collective predicates

without parts entailment are never compatible with them. *Elire* 'elect', *être nombreux* 'be numerous' are therefore never found either with *chaque/chacun* or with *tous*. When a collective predicate entails parts, like *se rassembler* 'gather', *être pareil* 'be alike', it is compatible with *tous*. Note that the parts entailment here is about nonatomic parts. If the parts entailed were atomic, the predicates should be compatible with *chaque/chacun*, according to our definition in (19).[5] The contrast between *chacun* and *tous*, when combined with collective predicates, has been shown here to be linked directly to the parts-selection properties of the respective quantifiers.

2.2. *Collective and singular nominals*

Another difference between *tout* and *chacun* is that *tout* can take a singular DP complement, while *chacun* can't:

(33) a. toute la tête
all the head
'the whole head'
b. *chacune (de) la tête
each (of) the head

Why is (33) excluded with *chacun*? According to the syntactic representation proposed, the DP complement denotes the domain of quantification X. Below are given the syntactic structure and the corresponding denotations:

(34) $[_{QP}$ toute$_i$ $[_{NP}$ $[t_i][_{DP}$ la tête]]]
x X
(part of)

The quantified part (x) is denoted here by an empty category, the trace t_i of the NP complement head, incorporated in the quantifier. The domain of quantification (X) is denoted by the DP complement (*la tête*). The DP complement, being singular, is itself an atom that cannot be further decomposed into atomic parts. But this is exactly what *chacun* requires. The sentence is therefore excluded with *chacun*.

On the other hand, our atom (*la tête*) can be decomposed into m-parts, as shown by the enumeration below, where the parts can overlap, and vaguely include each other, which is typical of mass parts:

(35) Toute la tête me fait mal: le dessus du crâne, l'arrière de l'occiput, les tempes, les lobes frontaux, sous les oreilles, partout ...
'My whole head hurts: the top of the skull, the back, the temples, the frontal lobes, behind the ears, everywhere ....'

By definition, *tout*, contrary to *chacun*, allows m-parts. Differences such as the ones seen here with a singular DP complement are predicted by our definition.

A similar phenomenon can be observed in the data with collective nouns. *Tout* combines well with collective nouns as its quantification domain, as illustrated in (36). A collective noun can be a group, or an aggregation of people or objects.

(36) Toute la famille, tout le comité, tout le troupeau, toute la foule, tout le feuillage ...
all the family, all the committee, all the flock, all the crowd, all the foliage ...
'the whole family, the whole committee, the whole flock, the whole crowd, the whole foliage ...'

Although the collective noun is an atom, it can be used as quantification domain (X) for *tout* in this construction. As I did for singular nouns, I will take these parts quantified by *tout* to be m-parts in Link's system, that is, parts that constitute the matter making up the collective entity. One could object that the quantified parts are rather individual parts, as (37) seems to show.

(37) Toute la *famille* a participé à la fête: la grand-mère, le père, la mère, la cousine, les jumelles ....
'The whole family took part in the feast: the grandmother, the father, the mother, the cousin, the twins ....'

But there is a special constraint on these parts that supports their account as m-parts. There is an obligatory internal cohesion among the parts of a collective noun, which a plural noun does not entail. The collective noun entails internal cohesion of its possible parts. If, to continue (37), one lists other family individuals as in (38), a collection of different families is not acceptable. The sentence is only interpretable if the enumerated families are relatives of each other, forming one big family gathering.

(38) Toute la famille a participé à la fête: les Laframboise, les Milot, les Lussier ... (→ ils sont en parenté).
'The whole family took part in the feast: the Laframboises, the Milots, the Lussiers ...' (→ they are relatives).

Tout, therefore has the ability here again to access m-parts, the matter making up the group, an atomic element, forming its domain of quantification.

With a plural complement, the domain of quantification is nonatomic, without any entailment of internal cohesion, where, for example, the

possible relationship between the different families is not relevant and certainly not suggested.

(39) Toutes les/chacune des familles ont participé à la fête: les Laframboise, les Milot, les Lussier ....
'All of the families/each of the families took part in the feast: the Laframboises, the Milots, the Lussiers ....'

It is, therefore, the ability of *tout* to access m-parts that explains the sentences where it selects a singular DP complement, whether a regular singular or a collective noun. Similarly, it is *chacun*'s inability to select such m-parts that excludes it from these sentences. This leads us to mass nouns.

2.3. *Mass nouns*

Mass nouns only have matter parts (m-parts). In (40), *tout* accesses m-parts, as stated in our definition (19). *Chaque*, on the other hand, cannot access such parts and the sentence is out.

(4) a. *Chaque *eau* est salée.
'Each water is salted.'
b. Toute l'*eau* est salée.
'All water is salted.'
c. Toute *eau* est salée.
'Any water is salted.'

Some mass nouns, like *l'or* 'gold', are strictly mass nouns. They are never compatible with *chaque*, as shown in (41).

(41) a. Tout l'or a été extrait de la mine.
'All the gold has been extracted from the mine.'
b. *Chaque or a été extrait de la mine.
'Every gold has been extracted from the mine.'

Other mass nouns, such as *le pain* 'bread', can easily become count nouns. In this case, the example with *tout* has a mass-noun interpretation and the example with *chaque* has a count-noun interpretation. The interpretive contrast in (42) is predicted by our definition (19): there is an atomicity requirement on the parts *chaque* selects that forces the count-noun interpretation of the mass noun, if available. Otherwise, the sentence is not possible, as in (41b).

(42) a. Tout le pain a été mangé.
'The whole (loaf of) bread has been eaten.'

b. Chaque pain a été mangé.
'Every (piece of) bread has been eaten.'

2.4. *Adverbials*

The adverbial usage of *tout* can be accounted for with the same requirement on parts selection. French has an adverbial quantifier *tout*, similar in form to the determiner quantifier. *Chaque* has no such use.

(43) a. *Le chien est chaque mouillé.
'The dog is each/every wet.'
b. Le chien est tout mouillé.
'The dog is all wet.'

I suggest that the morphological similarity between *tout* adverb and *tout* determiner is not accidental. If the principles that determine representations at conceptual structure are sufficiently general to apply across syntactic categories, then the type of conceptual representation associated to *tout* in the nominal domain should be available for its adverbial use in the verbal domain.

Indeed, in the model we have adopted, the algebraic structure of process parts is exactly the same as the one of matter parts. Thus, the parts selection for the quantifier *tout* is of the same kind across both domains, as shown in (44).

(44)

Nominal domain:	Verbal domain:
tout accesses m-parts	*tout* accesses p-parts

It is, however, rare, at least in French, to have the same morphological form for both the nominal and the verbal domain. *Chaque/chacun* does not seem to quantify directly on the verbal domain. However, in languages in which *each* is a reduplicated element, such as Georgian (Gil 1987a, 1987b), this reduplicated element can apply to the nominal and verbal domain alike (Junker 1990; Junker and Blacksmith i.p.). Another argument sustaining the cross-categorial status of the quantifier *tout* in French comes from Quebec French, which we will see in section 3.2 below.

3. More data

3.1. *Generic* tout

A potential problem for the analysis developed above is the generic use of the quantifier *tout*. In such use, the quantifier *tout* is directly followed

by a singular noun, with no definite article preceeding, and the sentence necessarily has a generic interpretation. For convenience, I will call it "generic *tout*."[6]

(45) Toute vérité n'est pas toujours bonne à entendre.
all (any) truth is not always good to hear
'The truth is sometimes best left unsaid.'

In some examples, generic *tout* appears as ungrammatical as *chaque*.

(46) a. *Chaque or a été extrait de la mine.
'Every gold has been extracted from the mine.'
b. *Tout or a été extrait de la mine.
'Any gold has been extracted from the mine.'

However, as first observed by Kleiber and Martin (1977), if the enumeration of the quantified parts is about kinds of entities or sorts of entities, namely TYPE parts, as in (47a), instead of TOKEN parts as in (47b), generic *tout* is acceptable.

(47) a. Toute soumission est humiliante: la soumission résignée, la soumission craintive, la soumission désabusée ... (from Kleiber and Martin 1977: 27).
'Any submission is humiliating: resigned submission, timid submission, undeceived submission ....'
b. *Toute soumission est humiliante: la soumission de Philippe, la soumission de Pierre, la soumission de Sylvie ...
'Any submission is humiliating: Philippe's submission, Pierre's submission, Sylvie's submission ....'

Applied to our example (46) above, the same contrast between TYPE parts and TOKEN parts is true. While generic *tout* does not accept TOKEN parts, it does accept TYPE parts, as shown below in (48).

(48) Tout or est réutilisable: l'or à 14 carats, l'or à 16 carats, l'or à 18 carats ....
'Any gold is reusable: 14 carat gold, 16 carat gold, 18 carat gold ....'

We noticed in section 2.3 that some mass nouns, such as *l'or* 'gold', resist becoming count nouns with *chaque*. However, when interpreted as type, they are compatible with generic *tout*. If such a type example was used with *chaque*, it would still sound odd. Contrast (48) with (49).

(49) ???Chaque or est réutilisable: l'or à 14 carats, l'or à 16 carats, l'or à 18 carats ....
'Every gold is reusable: 14-carat gold, 16-carat gold, 18-carat gold ....'

With a mass noun such as *pain* 'bread', which can switch from mass to count, only type parts ([50a]), and not token parts ([50b]), are licit to complete the enumeration after generic *tout*.

(50) a. Tout pain sera vendu: le pain blanc, le pain de seigle, le pain paysan, la baguette ....
'Any bread will be sold: the white, the rye, the dark, the baguette ....'
b. *Tout pain sera vendu: les trois pains blancs, les dix pains de seigle, les deux pains paysan, la baguette qui reste ....
'Any bread will be sold: the three white ones, the ten rye breads, the two dark breads, the leftover baguette ....'

Two solutions are available: either introduce the type–token distinction into Link's model, or derive it from the types of parts already existing in the model. Because of the following fact, we will opt for the second option.

As already discussed in section 1.2, a well-known semantic property of mass nouns is that they can refer in a cumulative manner (Quine 1960). Type nouns also have this property: if we add different types of families, we still have families, different kinds of bread, we still have bread. I will therefore assume that type parts are reducible to matter parts in Link's model and propose the following informal generalization:

(51) type parts = matter parts

We have seen that the generic use of *tout* is limited to type nouns. In our definition of lexical meaning, we stated that *tout* has this particular property of being able to access matter parts. Assuming (51), we see that generic *tout* follows from our definition (19).

3.2. *Québecois* toute

In Quebec French, the quantifier *toute* has larger uses than its standard French counterpart (see Lemieux et al. 1985). Two of these uses, where the quantifier is floated, are particularly interesting.

First, while in Standard French only the plural quantifier *tous* can be floated, as shown in (52a)–(52b), in Quebec French a quantifier *toute* can be floated either in relation with a plural subject NP, as in (52c), or in relation with a singular subject NP, as in (53b). (52a) and (53a) give the corresponding nonfloated sentences.[7]

(52) *Standard French (and Quebec French): plural subject*
  a. Tous les enfants sont venus.
     'All the children came.'
  b. Les enfants sont tous venus.
     'The children all came.'
  Quebec French only:
  c. Les enfants sont toute venus.
     'The children all came.'

(53) *Standard French (and Quebec French): singular subject*
  a. Toute la ville brûle.
     all the city burns.
     'The whole city is burning.'
  Quebec French only
  b. La ville brûle toute (from Léard and Beauchemin 1991: 6).
     the city burns all
     'The whole city is burning.'

Second, the quantifier *toute* can also be floated from a singular or plural object position, if the verb is in a complex tense,[8] as shown in (54) and (55). Note that in all these examples (52)–(55), floated *toute* does not show agreement with the NP.

(54) a. J'ai mangé toute la tarte.
     I have eaten all the pie
     'I ate the whole pie.'
  b. J'ai toute mangé la tarte.
     I have all eaten the pie
     'I ate the whole pie.'

(55) a. J'ai mangé tous les gâteaux.
     I have eaten all the cakes
     'I ate all the cakes.'
  b. J'ai toute mangé les gâteaux.
     I have all eaten the cakes
     'I ate all the cakes.'

The lack of agreement between the quantifier *toute* and the NP it seems to quantify points toward an adverbial treatment of this quantifier (Léard and Beauchemin 1991). But does the quantifier *toute* quantify over the verb or over the NP arguments of the verb? Actually, in a sentence like (56), the interpretation is ambiguous between a purely adverbial interpretation, synonymous with *completely* – (a) — and a subject-oriented interpretation — (b):

(56) Ça a toute fondu.
  a. 'It melted completely.'
  b. 'Everything melted' (Léard et Beauchemin 1991: 13).

These facts follow from the general analysis we proposed for French universal quantifiers. Quebec French *toute* can function two ways. In the interpretation (56a) it acts like the Standard French adverbial *tout* we studied above, in section 2.4. It accesses process parts and quantifies over the event. In the interpretation (56b) it acts like a floated quantifier, an NP quantifier with the structure [QP [NP]]. It accesses the m-parts or i-parts of the individual denoted by the subject NP. It can also be oriented toward the object, as in (54) and (55), and similarly access the parts (m-parts or i-parts, according to definition [19]) of the entity denoted by the object NP.

That Quebec French *toute* has such borderline behavior between adverbial quantifier and NP-oriented quantifier is not surprising according our analysis: at conceptual structure, the types of parts *toute* accesses are the same in the verbal and the nominal domain. The interpretative ambiguity results from the possibility of constructing the appropriate parts with the denotation of the verbal arguments. In fact, when the denotation of the NP is hardly divisible in parts, the adverbial interpretation is the only one available. My informant has the following contrasts (compare gloss). In (57a), the NP subject is a collective noun, divisible into m-parts or i-parts; the subject-oriented interpretation of the quantifier is natural. In (57b), the subject is an atomic singular *je* 'I' hardly divisible into parts. Therefore the purely adverbial interpretation (*badly*) is preferred, with the quantifier accessing the p-parts of the event denoted by the verb.

(57) a. La ville a toute brûlé.
     the city has all burned
     'The whole city burned down.'
     gloss: Toute la ville a brûlé, tous les bâtiments, tous les gens, partout.
     'The whole city burned down: all the buildings, all the people, everywhere.'
  b. Je me suis toute brûlé.
     I myself have all burned
     'I deeply burned myself.'
     gloss: Je me suis brûlé, pas partout, mais profondément.
     'I burned myself, not all over, but badly.'

When, on the other hand, the verb denotes an event hardly divisible into process parts, like the verbs *run* and *eat* in (58) and (59) below, the

purely adverbial interpretation is forbidden and the only available interpretation is to imagine a null object, linked with the quantifier (compare the [a] and [b] glosses).

(58) a. *Elle a toute couru.
she has all run
Elle a beaucoup couru.
'She ran a lot.'

b. Elle a toute couru (la distance).
she has all run (the distance)
Elle a couru toute la distance.
'She ran the whole distance.'

(59) a. *Elle a toute mangé.
she has all eaten
Elle a beaucoup/énormément mangé.
'She ate a lot.'

b. Elle a toute mangé (le gâteau).
she has all eaten (the cake)
Elle a mangé toute le gâteau.
'She ate the whole cake.'

The ambiguous status of Quebec French *toute* has been shown to result from the general property of the French quantifier *tous/tout* to quantify over both the nominal and the verbal domain. The latticelike structure we assign to conceptual entities in the present analysis has allowed us to account for this general property in a unified way: all we need is a lexical definition of the quantifier stating what kind of part structure it has to access for quantification.

4. Correspondence rules for the French quantifiers

To summarize, I would like to give an overall view of how the correspondence rules between the syntactic and the conceptual levels of representations might operate.

We proposed, in (27) repeated below, that the syntactic constituent (XP) selected by the Q head always denotes the part for quantification. The DP complement of this XP (= NP) denotes the entity out of which parts are to be found.

(27) [QP[[XP]], where XP denotes the part x for quantification.
[QP[[NP][DP]]], where DP denotes the entity X out of which parts are constructed.

In most cases only one of the two, either the part x or the entity X, is given by a full lexical item in the syntactic structure. For example, recall that generic *tout* is constructed without a definite article, as opposed to *tout* used with mass nouns. We stated that in both cases matter parts are selected. Now, according to our syntactic representations, the word *pain* 'bread' occupies different positions in the two constructions. With generic *tout* in (60), *pain* is the NP directly selected by the Q head and denotes the part in the lattice of a conceptual entity, for instance a type of bread among all types of bread. With the other *tout*, as in (61), the word *pain* 'bread' is included in a DP *le pain* 'the bread', which is the complement of the QP/NP. The syntactic constituent denoting the part is empty (t_i), but the DP complement *le pain* provides the entity whose parts will be quantified.

(60) tout pain $[_{QP}$ tout $[_{NP}$ pain]]
m-part of ?

(61) tout le pain $[_{QP}$ tout$_i$ $[_{NP}$ $t_i]$ $[_{DP}$ le $[_{NP}$ pain]]]
m-part of? DP'

According to this analysis, *chacun*, for example, has the peculiarity of having both the part and the entity realized as lexical items in the syntactic structure, if one agrees to consider pronominal *un* a full lexical item, as shown in (62).

(62) $[_{QP}$ chac-un$_i$ $[_{NP}$ $t_i]$ de $[_{DP}$ les $[_{NP}$ enfants]]]
i-part of DP

But often, *chacun* is found alone, and in this case, I consider that it has simply the structure [QP [NP]]. A floated quantifier, like *tous*, which we saw in section 3.2, similarly has the structure [QP [NP]].[9] When Québecois *toute* is used as an adverbial, I assign it the structure [QP [VP]] and, when it is a floated (nominal) quantifier, the structure [QP [NP]]. In both cases, the part x for quantification is given by a syntactic constituent: VP for the p-part, NP for the i-/m-part.

Table 1 summarizes the correspondence between the syntactic representation and the conceptual parts or entities for the constructions discussed in this paper. The type of part is given by (19), repeated below, and belongs to the lexical meaning of the particular quantifiers. This part is denoted by the first constituent XP/NP selected by the Q head (italicized in Table 1).

(19) *Chaque/chacun* must access atomic individual parts.
Tous can access either i-parts or m-/p-parts.

Table 1. *Partial correspondence between conceptual and syntactic representations for* chaque/chacun *and* tout/tous

Syntactic representation	Type of part selected in the conceptual representation
$[_{QP}$ tout $[_{VP/AP}$ mouillé$]]$	p-part
$[_{QP}$ tout $[_{NP}$ enfant$]]$ $[_{QP}$ toute $[_{NP}$ e$][_{DP}$ l' $[_{NP}$ eau$]]]$ $[_{QP}$ toute $[_{NP}$ e$][_{DP}$ la $[_{NP}$ famille$]]]$	m-part
$[_{QP}$ tous $[_{NP}$ e$][_{DP}$ les $[_{NP}$ enfants$]]]$ $[_{QP}$ tous $[_{NP}$ e$]]$	i-part (not necessarily atomic)
$[_{QP}$ chaque $[_{NP}$ enfant$]]$ $[_{QP}$ chac-$[_{NP}$ un$]$ de $[_{DP}$ les $[_{NP}$ enfants$]]]$ $[_{QP}$ chac-$[_{NP}$ un$]]$	atomic i-part

Conclusion

We have shown that various distributional behaviors of universal quantifiers in French can be accounted for by an analysis in the conceptual semantic framework, providing we import the parts structures defined by algebraic semantics. We have taken the lexicon to be itself a set of correspondence rules between the three levels of phonological, syntactic, and conceptual representations in the grammar. This has allowed us to formulate a precise conceptual representation for the parts accessed by quantifiers: ontological entities endowed with a semilattice structure. If this analysis is on the right track, we would expect, in future research, to be able to provide for other languages' quantifiers as well the same kind of account as for the French data, with differences residing not in the levels of representation themselves, but in the combination between levels, provided by the correspondence rules.

Received 5 April 1993
Revised version received
17 March 1994

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Notes

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1. For a good published introduction see Landman (1991). As presented by Partee (1992), a join semilattice is a structure $\langle E, \pi_i, \leq_i \rangle$, where E is a set, $\leq_i$ is a partial order on that set, and the join operation π_i is defined by the condition (i); the supremum operation *sup*, which appears in (i), is defined in turn in (ii).
   (i) $a\ \pi_i\ b = sup\ (a, b)$.
   (ii) *sup* (a, b) = c iff c is the smallest element (with respect to the ordering $\leq_i$) in E that is greater than both a and b.
   An atom in a semilattice is a smallest non-nul element, such that there is no element of the semilattice smaller than it (except for the $\emptyset$ element if there is one) with respect to the ordering relation $\leq_i$.
2. Recently, Jackendoff (1991) proposed a feature system using the notions of boundedness [+/−boundedness] and internal structure [+/−internal structure] to distinguish among conceptual entities across the nominal and verbal domains. Contrary to more traditional accounts, including the one developed here, which only distinguish between mass/count and singular/plural, his feature system, given in (i) below, provides a way to encode the distinction between individuals and groups or groups and plurals (aggregates). A group entity is bounded, as opposed to a plural, which, similarly to mass nouns, is unbounded. An individual, on the other hand, lacks the necessary entailment about internal structure that the group has.
   (i) +b, −i: individuals (a pig)
   +b, +i: groups (a committee)
   −b, −i: substances (water)
   −b, +i: aggregates (buses, cattle)
   So far this system does not appear to make better predictions for the contrasts between *tout/tous* et *chaque/chacun* than the ternary distinction atoms/substances/nonatoms used here.
3. The partition need not be even: we could have {S + V + P; C + S; P} in a situation where a ball per sibling set would be given.
4. Another possible representation for *tous* is to have an empty (pronominal) category e instead of the trace t_i of an invisible morpheme.
5. Actually, it would be in line with the approach developed here to assign to all predicates some kind of parts entailment, the type of which would predict their compatibility with quantifiers, according to the parts the quantifiers need to access. I will leave this suggestion for further research.
6. *Tout* has usually been analyzed in contrast with the determiner *chaque*. Rohrer (1971), following Reichenbach's characterization of *any*, *every*, and *all*, describes their difference in terms of an existential neutrality for *tout*, as opposed to *chaque*, which presupposes the existence of the quantified entities. This explains the affinity between *tout* and future, conditional, and subjunctive, as well as negative, contexts. Kleiber and Martin (1977) expand their analysis along the same line, postulating that *tout*'s reference classes can be empty. Whether the existential neutrality of *tout* can be worked out to be a result of its selecting parts that are nonatomic, or m-parts, I leave open for further research.
7. Facts about French floating quantifiers are discussed at length in Junker (i.p.). Note that although *chaque* does not float in Standard French, it does in some dialects, such as Prince Edward Island French (Junker and Vinet 1993), where it replaces floating or shifted *chacun*. But it then has to be an NP-oriented quantifier, to which I assign the structure $[_{QP}$ Q$[_{NP}$ e$]]$. Even in these dialects *chaque* can never be an adverbial, as predicted by the semantic analysis proposed here.
8. Similar cases with complex tenses are found in Standard and Quebec French with *trop/beaucoup/peu* (see Obenauer 1984 for a discussion).

(i) a. J'ai mangé trop/beaucoup/peu de gâteau.
b. J'ai trop/beaucoup/peu mangé de gâteau.

When the object NP is a clitic, unlike Standard French, which only has (iic), Québec French has (iia)–(iib). This is consistent with the paradigms (46)–(47).

(ii) a. Je l'ai toute mangé.
I it have all eaten
b. Je les ai toute mangées.
I them have all eaten
c. Je les ai toutes mangées.
I them have all-FEM-PLUR eaten.

9. Although we did not discuss it here, *chacun* can also float in all dialects of French. The sentential structure I propose for floated quantifiers is adjunction to VP. The domain of quantification X has to be provided from within the sentence, usually by a c-commanding DP in subject position. See Junker (i.p.) for a complete discussion.

References

Bach, Emmon (1986). The algebra of events. *Linguistics and Philosophy* 9, 5–16.

Baker, Mark, C. (1988). *Incorporation, A Theory of Grammatical Function Changing.* Chicago: University of Chicago Press.

Chomsky, Noam (1986). *Knowledge of Language.* New York: Praeger.

Dowty, D. (1986). A note on collective predicates, distributive predicates, and *all.* Unpublished manuscript.

Grevisse, Maurice (1980) *Le bon usage.* Paris-Gembloux: Duculot.

Gil, David (1987a). Georgian reduplication and the domain of distributivity. Unpublished manuscript, Tel Aviv University.

—(1987b). Definiteness, noun phrase configurationality, and the count–mass distinction. In *The Representation of (In) definiteness*, E. Reuland and A. Ter Meulen (eds.). Cambridge, MA: MIT Press.

Jackendoff, Ray (1983). *Semantics and Cognition.* Cambridge, MA: MIT Press.

—(1987). The status of thematic relations in linguistic theory. *Linguistic Inquiry* 18, 369–411.

—(1990). *Semantic Structures.* Cambridge, MA: MIT Press.

—(1991). Parts and boundaries. *Cognition* 41, 9–45.

Junker, Marie-Odile (1990). Floating quantifiers and Georgian distributivity. In *Papers from the Twenty-Sixth Regional Meeting of the Chicago Linguistic Society*, K. Deaton, M. Noske, and M. Ziolkowksi (eds.). Chicago: University of Chicago.

— (i.p.) *Syntaxe et sémantique des quantifieurs flottants* tous *et* chacun: *distributivité en sémantique conceptuelle.* Geneva: Droz.

—; and Blacksmith, Louise (i.p). Reduplication in East Cree. In *Proceedings of the 25th Algonquian Conference*, W. Cowan (ed.). Ottawa: Carleton University.

—; and Vinet, Marie-Thérèse (1993). Chaque, quantifieur binominal: représentation d'un phénomène de variation interdialectale. *Travaux de Linguistique* 26, 5–20.

Kleiber, Georges; and Martin, Robert (1977). La quantification universelle en français. *Semantikos* 2 (7), 19–36.

Landman, Fred (1991). *Structures for Semantics.* Dordrecht: Reidel.

Léard, Jean-Marcel; and Beauchemin, Normand (1991). Quelques propriétés morpho-syntaxiques du français du Québec: l'interprétation de /tUt/. In *Actes du 3e colloque international "Français de France–Français du Canada*, Hans J. Niederehe and Lothar Wolf (eds.), 173–192. Tübingen: Niemeyer.

Lemieux, Monique; Saint-Amour, Marielle; and Sankoff, David, (1985). /TUT/ en français de Montréal: un cas de neutralisation morphologique. In *Les tendances dynamiques du français parlé à Montréal 2*, Monique Lemieux and A. J. Cedergren (eds.), 7–89. Québec: Government of Québec.

Link, Godehard (1983). The logical analysis of plurals and mass terms: a lattice-theoretical approach. In *Meaning, Use, and Interpretation of Language*, R. Bauerle et al. (eds.), 302–323. Berlin: de Gruyter.

—(1986). Generalized quantifiers and plurals. In *Generalized Quantifiers*, Peter Gardenförs (ed.), 151–180. Dordrecht: Reidel.

Obenauer, Hans-Georg (1984). On the identification of empty categories. *Linguistic Review* 4, 153–202.

Partee, Barbara (1992). Naturalizing formal semantics. Paper presented at the XVth International Congress of Linguistics, Laval University, Quebec, Canada.

Quine, Williard Van Orman (1960). *Word and Object.* Cambridge, MA: MIT Press.

Rohrer, Christian (1971). Zur Bedeutung von *tout* and *chaque* in Französischen. *Interlinguistica, Festschrift Mario Wandruzka*, 509–517.

Vendler, Z. (1957). Verbs and times. *Philosophical Review* 56, 143–160.