

Beck The Universal Semantic Cycle Contents and Chapter 1

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Abstract

This chapter motivates the diachronic semantic research undertaken in this book. Two crosslinguistically common etymological sources of universal quantifiers are plural related expressions on the one hand, and interrogative or free choice expressions on the other. From the point of view of compositional semantics, it is not clear how such semantic change comes about, because semantic analyses of free choice and of plurals use different semantic mechanisms than those that bring about standard universal quantification. The chapter introduces the Universal Semantic Cycle (USC) as a model for the diachronic development of universal quantifiers. The USC links standard quantification, plural semantics and the semantics of free choice. It defines a diachronic and crosslinguistic option space for expressions of universal quantification in language, which will be explored in the subsequent chapters.

1.1. Introduction: The Idea of the Universal Semantic Cycle¹

The goal of this book is to offer a novel perspective on universal quantification in natural language. Its key proposal is that diachronic pathways link the puzzlingly diverse ways of expressing universal quantifiers that human languages use.

Past decades of crosslinguistic research have revealed that languages may involve plural-related expressions, question-related or free choice expressions, or Generalized Quantifiers to express nominal universal quantifiers. Based on such observations, there is substantial motivation for three different strategies of quantification in language: plural quantification, alternative semantics (for questions or free choice) and standard quantification. It is surprising that the grammar of human language includes such complexity threefold.

¹I am grateful to Katrin Axel-Tober, Doris Penka and Viola Schmitt for their thoughtful comments on this chapter. Thank you also to Jana Allgaier, Thilo Götz, Kinga Kuti, Caroline Spetzger and Paul Zödl for their input.

At the same time, the descriptive literature in historical linguistics notes that both plurals and interrogative pronouns are common historical sources for nominal universal quantifiers. This suggests that the three strategies - plural quantification, alternative quantification and standard quantification - are linked.

To give an example, the etymological source of the German universal quantifier *jedweder* 'every' is an interrogative pronoun *hwedar* 'which of the two' (Behagel (1923), Braune & Reiffenstein (2004)). This pronoun combines with a prefix *gi-* or *eo/io+gi-* (relating to an adverbial quantifier 'ever'; Haspelmath (1995)) to yield the forms *gihwedar* and *eogihwedar*, from which the modern word is derived. To the semanticist, such a development raises analytical questions. A standard meaning for the interrogative pronoun is given in (1a) and a standard interpretation of the quantifier in (1b). (1a) illustrates a question-based or alternative semantic meaning and (1b) standard quantification in terms of a Generalized Quantifier (more on this below). There is no obvious connection between the two interpretations in (1a) *versus* (1b). Thus (1) sets up the basic puzzle that the book investigates: How come that there are such different semantic mechanisms in language, and how can diachronic language change derive one from the other?

- (1) a. $[[hwedar]] = \{x:x \in D\}$
 the set of alternative individuals
 (where the domain D is limited to two)
- b. $[[jedweder]] = \lambda P.\lambda Q.\forall x[P(x) \rightarrow Q(x)]$
 the relation between two properties that holds if everything that makes the first
 property true also makes the second property true

The book offers compositional semantic analyses of the crosslinguistic and diachronic observations I allude to here. It tracks the history of English *each* and *every* from Old English to Present Day English and shows that all three strategies of quantification are involved in their trajectory. (I also briefly return to example (1).) It offers the Universal Semantic Cycle (inspired by the famous Jespersen Cycle for negation) as an overarching theory of universal quantification.

Section 1.2. of this chapter provides a more detailed motivation for the enterprise undertaken in the book, both empirical and theoretical. Section 1.3. gives a preview of the theory that the book develops: the Universal Semantic Cycle (USC). The USC systematises the different grammatical strategies of quantification proposed in the analysis of natural language by linking them as stages of a diachronic cycle. A set of empirical predictions follows from the USC. Section 1.4. lays out the structure of the book as a way of following up on these predictions.

The idea of the USC, when spelled out in detail, has repercussions for the theory of quantification. It impacts the analysis of diachronic semantic change and the circumstances that allow it. It affects how we conduct empirical research on quantificational phenomena in the areas of crosslinguistic variation, diachronic development and language acquisition. It may even shed a new light on certain reasoning phenomena.

But first, let's take a closer look at the puzzling facts that motivate this enterprise.

1.2. Motivation: The Puzzle

This section reviews the groundbreaking work on the history of universal quantifiers by Haspelmath (1995). It links it to research on the compositional semantic analysis of universal quantifiers and to semantic variation in this domain. From the point of view of compositional semantic theory, this body of research raises the central theoretical question I address in this book: why does natural language have the complexity of not one, but several semantic strategies for the expression of (universal) quantification?

1.2.1. Haspelmath (1995): Typology of Universals

The empirical starting point of the project undertaken in this book is Haspelmath's (1995) observation that Free Choice Relative Clauses and Free Choice Items are a frequent diachronic source of universal quantifiers.

Let's first introduce the protagonists of Haspelmath's observation, and let's begin with universal quantifiers. An example of a nominal universal quantifier from English is the DP 'every book' in (2a). (2b) is an informal paraphrase of (2a)'s interpretation. My investigation is about the rise and fall of these quantifiers in English and potentially other languages.²

- (2) a. Robin will recommend [_{DP} every book]. (*universal DP quantifier*)
 b. For each x, x a book: Robin will recommend x.

Examples of Free Choice Relative Clauses (FCRs) and Free Choice Items (FCIs), the proposed sources of universal DP quantifiers, are given in (3a) and (4a), also from Present Day English (PDE). Further cases of FCRs and FCIs are given in (3b) and (4b).

- (3) a. [_{FCR} Whatever book Robin recommends] will be well written. (*FCR*)
 b. [_{FCR} Whatever book Robin recommends], the class will be fun. (*unconditional*)
- (4) a. Robin will recommend [_{FCI} any book]. (*FCI*)
 b. Robin will recommend [_{FCI} whatever book]. (*FC wh-ever*)

I summarize Haspelmath's observation as in (5) and refer to it as the Alternatives Generalization (my use of this term will become clear shortly).

- (5) **Alternatives Generalization:**
 FCRs and FCIs are a common diachronic source of nominal universal quantifiers.

Haspelmath provides a range of data from diverse languages supporting (5), showing that the historical source is visible in the way universal quantification is expressed today. I repeat some of his crosslinguistic examples in (6) (showing Korean examples) and (7) (examples from Hausa).³ (6) and (7) below contain so-called indeterminate pronouns (Kuroda (1965)), glossed as 'who' or 'which'. These pronouns can be interrogative *wh*-pronouns as seen for instance in (6a) and (7a). They are part of a universal quantifier in (6b) and (7b), together with some additional morphology (like the scalar particle *koo* 'even' in the Hausa example (7b)).

² I do not include adverbial quantification in my investigation. See e.g. Halm (2024) and Beck (2025) for connections.

³ My presentation of the examples in this book, where they are not my own, follows the source cited, except for minor typographical adjustments. Sometimes, for this reason, the examples from a given language will not be transliterated and glossed homogeneously throughout the book or the chapter.

Generally, indeterminate pronouns have a range of uses, including uses as the *wh*-expression in *wh*-questions like (6a), (7a), in FCRs as in (3), as FCIs as in (4b) and in quantificational contexts as for example in (6b) and (7b) (see e.g. Kuroda (1965), Shimoyama (2001), Szabolcsi (2015), Uegaki (2018)). Indeterminate pronouns are central to the connection between expressions of free choice and universal quantifiers that the Alternatives Generalization (5) establishes.

(6) Korean:

- a. Minsu-nûn nwukwu-lûl po-ass-ni?
Minsu-TOP who-ACC see-PAST-Q
'Who did Minsu see?'
- b. nwukwu-na: 'everyone'
- c. nwukwu: 'who'
-na: 'or'

(Haspelmath (1995), (10b) p370)

(7) Hausa:

- a. wane áikii zái yi?
which work FUT.3SG.M do
'What work will he do?'
- b. Koo-wane mutum yá naa yii.
even-which person 3SG.M PROG do
'Every person is doing it.'

(Haspelmath (1995), (9) p370)

In addition to the synchronic crosslinguistic evidence, Haspelmath shows that the etymology of present day universal quantifiers in some well documented languages reveals an indeterminate pronoun at their core. I present some of his evidence in (8), (9) and (10). The Old English universal quantifier *ælc* is the source of Present Day English (PDE) *each*. *Ælc* itself can be traced to a combination of expressions for *ever* and *which* according to Haspelmath; see (8). Similarly, there is evidence in German and Russian that an indeterminate pronoun is part of the etymological source of present day universal quantifiers, see (9) and (10).

(8) English *each*:

- a. Proto-Germanic: *ajw-hwalik
ever-which
- b. Old English: *ælc*
- c. PDE: *each*

(Haspelmath (1995), (11) p371)

(9) German *jeder, jedweder, jeglicher*:

- a. Proto-Germanic: *ajw-ga-hwalik
ever-ADDITIVE-which
- b. PD German: *jeglich* 'every'
- c. Proto-Germanic: *ajw-hwaeðer
ever-which (of the two)
- d. PD German: *jeder, jedweder* 'every' (Haspelmath (1995), (11) p371)

(10) Russian *kazdyi*:

- a. Old Church Slavonic: ku-zido: 'every'
ku: 'which' -zido: ?
- b. Russian: *kazdyi* 'every' (Haspelmath (1995), (10f) p370)

The diachronic pathway (5) that is witnessed by (8), (9) and (10) and supported by crosslinguistic evidence like (6) and (7) is one road to a universal quantifier. As Haspelmath points out, universals can arise in other ways as well. Another common source is expressions meaning 'whole' or 'all'. An example is given in (11). The Latin word *totus* meant 'whole'. It is the ancestor of words like *tous* (French) *tutti* (Italian) etc. in today's Romance languages, meaning 'all'. Portuguese in (11b) shows that from such a plural DP, a quantifier meaning 'every' can evolve.

- (11) a. Latin: totus: whole
 Romance languages: tous/tutti/... : all
 b. Portuguese: (i) Todas as casas são vermelhas. (*plural DP*)
 all the houses are red
 'All the houses are red.'
 (ii) Toda casa é vermelha. (*universal DP*)
 every house is red
 'Every house is red.'
 (after Haspelmath (1995), (27) p378)

This observation makes a connection between plural DPs and universal quantifiers. The reverse perspective on the connection documented by (11) is offered by PDE examples like (12). In (12a), an expression we think of as a quantifier, *everyone*, is used as group denoting. This is clear because of the combination with the predicate *gather*, a type of collective predicate. *Gather* requires a group denoting subject, compare the ungrammatical (12d) with a singular subject. It cannot combine with the quantifier meaning of *everyone*: the paraphrase in (12c) is as unacceptable as (12d). PDE increasingly uses universal quantifiers in such collective contexts, indicating that there is a change under way.

- (12) a. Everyone gathered in the hallway.
 b. 'The group consisting of all x (x a person) gathered in the hallway.'
 c. # 'For each x, x a person: x gathered in the hallway.'
 d. * Alex gathered in the hallway.

The data in (11) and (12) suggest that, in addition to the connection between indeterminate pronouns and universals established by (6)-(10), there is a connection between pluralities or groups and universal quantification. I phrase this second connection provisionally as in (13).

(13) **Plurals Generalization:**

There is a diachronic connection between plurals and universals.

Haspelmath's observations and generalizations are compelling, and they have since been supported by a body of further evidence, often of a crosslinguistic nature (see for example Haspelmath (1997), Lin (1998), Shimoyama (2001), Kratzer & Shimoyama (2002), Zimmermann (2008, 2009), Slade (2011), Szabolcsi (2015), Erlewine & Kotek (2016); see also Halm (2024) and Beck (2025) for overviews of research on the diachrony of quantifiers). They raise interesting questions for semantic theory.

1.2.2. The View from Compositional Semantics

The two generalizations (5) and (13) uncovered above, repeated here, invite a detailed semantic analysis.

- (5) **Alternatives Generalization:**
FCRs and FCIs are a common diachronic source of nominal universal quantifiers.

- (13) **Plurals Generalization:**
There is a diachronic connection between plurals and universals.

Since both generalizations are identified as crosslinguistically recurring phenomena, the connections they reveal must be rooted in the grammar of human language. A semantic connection is intuitive for both generalizations, because in different ways we ultimately end up with a universal statement, whether we consider nominal universal quantifiers like (2), FCRs (3), FCIs (4) or plural quantifiers like (11b). The intuitive interpretation in each case can be described roughly as in (14).

- (14) For each x , $P(x)$: $\varphi(x)$
For each x such that x has property P : φ is true of x .

This is illustrated by the informal paraphrases of the examples (2a), (3a) and (11b)(i) below.

- (15) a. Robin will recommend every book.
For each x , x a book: Robin will recommend x .
b. Whatever book Robin recommends will be well written.
For each x , x a book that Robin recommends: x will be well written.
c. All the houses are red.
For each x , x one of the houses: x is red.

At the same time, as we will see below, expressions of free choice and universal quantifiers, or plurals and universal quantifiers, do not receive identical semantic analyses. That is, the way in which compositional semantics yields, roughly, (14) is very different for the various data points introduced in the previous subsection. It will be argued that (15a) arises from standard quantification, (15b) from an alternative semantics and (15c) from a plural semantics - the three strategies or systems of quantification to be investigated. So the question is, what exactly is behind the semantic connections that (5) and (13) document? Putting it differently, how are these diachronic changes to be analysed by compositional semantics?

In order to address this question, let us first be clear about what has to be involved in an analysis of diachronic change from the point of view of formal or compositional semantics. Suppose we want to semantically analyse the diachronic trajectory of an expression in some given language which is observed to have undergone change. For a given stage of the language under investigation, we first require a compositional semantic analysis of that stage. For example, if we assume for the sake of the argument that a counterpart of (4b) is the point of **origin** of the change we are analysing, we would need a compositional semantic analysis of (the counterpart of) (4b) in the language we are investigating.

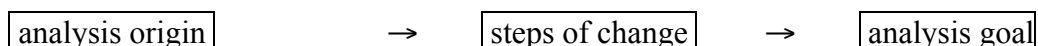
- (4b) Robin will recommend [_{FCI} whatever book]. (*FC wh-ever*)

Next, let us suppose that the **goal** structure of the change is some expression corresponding to PDE (2a). Then, secondly, we require a compositional semantic analysis of (the counterpart of) (2a).

- (2a) Robin will recommend [_{DP} every book]. (*universal DP*)

Finally, given both synchronic analyses, we can ask about the semantic **change** involved: What series of changes in the grammar lead from the analysis of (4b) to the analysis of (2a)? In (16), I sketch the components that go into such a diachronic compositional analysis in general terms.

(16) **Compositional semantic change:**



Q1 Origin and goal: What is the compositional semantics of the structure investigated before and after the semantic change?

Q2 Steps of change: How does the structure come to acquire the new compositional analysis?

I informally illustrate (16) for the example at hand, the Alternatives Generalization. I continue to use PDE *wh-ever* and (4b) to represent the origin of such a change, and PDE *every* and (2a) to represent the goal. Of course, PDE *every* did not evolve from PDE *wh-ever*; these expressions merely allow me to represent a first simple sketch of the origin and the goal semantics. I will go into a little more detail in the next section. After the required semantic background is given in Chapter 2, the subsequent chapters develop detailed analyses of actual instances of change.

The FCI example (4b) consists of an indeterminate pronoun *what* (here combined with a noun to form an indeterminate phrase) plus some extra morphology (here: *ever*). A plausible semantics of an indeterminate pronoun is a set of alternatives (Hamblin (1973) and much subsequent work). This is seen in (17a): the indeterminate phrase denotes the set of alternative books. The alternatives introduced by the indeterminate phrase contribute alternative propositions at the sentence level. (17b) is the set of propositions 'that Robin will recommend x', where x is a book. A first approximation to the meaning of (4b) is that all those propositions are true, (17c).

- (17)
- a. $[[\text{whatever book}]] = [[\text{what book}]] = \{x: x \in D \ \& \ x \text{ is a book}\}$
 - b. $[[\text{Robin will recommend whatever book}]]$
 $= \{\text{that Robin will recommend } x \mid x \in D \ \& \ x \text{ is a book}\}$
 - c. All propositions p such that
 $p \in \{\text{that Robin will recommend } x \mid x \in D \ \& \ x \text{ is a book}\}$ are true.

This simple sketch of a semantics for FCIs suffices for the moment (I provide a proper introduction to alternative semantics in Chapter 2). Next, let's look at the goal, represented by (2a), a standard Generalized Quantifier (GenQ) DP (Barwise & Cooper (1981) and much related work). Its analysis is sketched in (18).

- (18)
- a. $[[\text{every}]] = \lambda P. \lambda Q. \forall x [P(x) \rightarrow Q(x)]$
 - b. $[[\text{every book}]] = \lambda Q. \forall x [x \text{ is a book} \rightarrow Q(x)]$
 - c. $[[\text{Robin will recommend every book}]] = 1$ iff
 $\forall x [x \text{ is a book} \rightarrow \text{Robin will recommend } x]$

Again, the simple sketch is sufficient to highlight the issue I want to raise. Given the two synchronic analyses in (17) and (18), the question concerning semantic **change** is how the grammar can get from the compositional contribution of the DP as analysed in (17) to the compositional contribution in (18). (19), in which the two DP meanings are juxtaposed,

makes it clear that this is not a trivial question. There is no obvious lexical connection between (19a) and (19b). So how could (19b) arise from (19a)? Answering this question will lead to an analysis of the Alternatives Generalization (5).

(19) *From indeterminate phrase to Generalized Quantifier:*

- a. $[[\text{whatever book}_{\text{old}}]] = [[\text{what book}]] = \{x: x \in D \ \& \ x \text{ is a book}\}$ (*indet.*)
- b. $[[\text{whatever book}_{\text{new}}]] = [[\text{every book}]] = \lambda Q. \forall x [x \text{ is a book} \rightarrow Q(x)]$ (*GenQ*)

Similarly, the second connection postulated above between universal quantifiers and plurals, the Plurals Generalization (13), also raises non-trivial questions about semantic change. In this case, one analysis is represented by (18) and the other by (20) (with PDE (20a) standing in for (11b)(i) and further crosslinguistic instances of the same semantic change). I illustrate informally the plural semantics for (20a) in (20b,c) (following in particular Link (1983)). The plural DP refers to a sum or group of entities, here, the largest group of relevant books, (20b) (the operator *max* yields the largest group of entities that have the property it applies to, books in the example). The intuitive interpretation of (20a) that Robin recommended each member of that group is brought about by distributive predication. The sentence is true if all parts of the group of books have the property of being recommended by Robin, see (20c) (here as well I will be a bit more detailed in the next section; Chapter 2 provides an introduction to plural predication and a spelled out analysis).

- (20) a. Robin will recommend [_{DP} all the books]. (*plural DP*)
- b. $[[\text{all the books}]] = \max(\lambda x. x \text{ are books})$
the largest group of relevant books
- c. For all *z*, *z* a part of the largest group of relevant books:
z will be recommended by Robin.

The issue of the semantic connection between the source and the goal analysis is made clear by the juxtaposition of the two DP meanings in (21). Here, too, it is not obvious which steps of change will lead from (21a) to (21b) (or vice versa). But if we understand how this connection comes about, we can analyse the Plurals Generalization in (13). Given that both (5) and (13) describe crosslinguistically widely attested phenomena, linguistic theory should give a principled answer to how (19a) relates to (19b), and how (21a) relates to (21b).

(21) *From Generalized Quantifier to group denoting DP:*

- a. $[[\text{every book}_{\text{old}}]] = \lambda Q. \forall x [x \text{ is a book} \rightarrow Q(x)]$ (*GenQ*)
- b. $[[\text{every book}_{\text{new}}]] = [[\text{all the books}]] = \max(\lambda x. x \text{ are books})$ (*plural DP*)

The stages involved in the diachronic development of universal quantification and the semantic connections between them is what I investigate in this book.

The following consideration highlights the importance of this task: Standard quantification (some version of Generalized Quantifier theory) is arguably responsible for considerable complexity in the theory of composition. In most frameworks,⁴ it comes with a need for variable binding, and it necessitates Quantifier Raising (May (1985)). It leads to the assumption of covert syntactic ambiguity to account for scope ambiguities, as e.g. in Heim & Kratzer (1998). The data and analyses in (17)-(21) indicate that in addition to this system of

⁴ Other theories place the same complexity elsewhere; see e.g. Barker & Jacobson (2007) for a discussion of alternative theories, as well as work in the tradition of Categorical Grammar like Steedman (2000).

standard quantification, there are two other strategies or, as I will phrase it, systems of quantification that language uses: one based on alternatives, and the other on plural predication. Both systems come with their own complexity, as we will see in the next chapter. Why does the compositional component of the grammar of natural language involve three separate systems of quantification? One might have expected a more economical set-up with fewer, potentially just one grammar of quantification. Understanding the connections between the three systems may help us understand this lack of parsimony.

In sum, this section has raised a set of questions about universal quantification which can be summarised as follows:

- (i) How do we account for Haspelmath's empirical generalizations?
- (ii) Can we detect a systematics of diachronic change?
- (iii) Why does natural language use three separate grammars of quantification?

The next section lays out the general perspective I offer in order to approach these empirical, theoretical and conceptual questions.

1.3. The Proposal: Universal Semantic Cycle (USC)

I propose that there is a diachronic cycle in the emergence and loss of universal quantifiers, akin to Jespersen's (1917) cycle for negation. The two semantic changes that emerged from the preceding section - the Alternatives Generalization and the Plurals Generalization - are part of this cycle (e.g. Jespersen (1917)) or spiral (e.g. Gergel (2016)). The Universal Semantic Cycle (USC) is presented below in a compact form (see also Beck (2017), where it is called the Alternative Semantic Cycle, and Beck (2020)).

(22) **Universal Semantic Cycle** (following Beck (2017, 2020)):

- stage 1:** Universal quantification over alternative propositions in a question set
Example FCR (unconditional):
Whoever Ellen supervises, she needs a bigger office.
 For all propositions $p \in \{\text{that Ellen supervises } x | x \in D \ \& \ x \text{ is a person}\}$:
 if p , then Ellen needs a bigger office.
- stage 2:** Direct universal quantification over alternatives
Example FCI (wh-ever):
Ellen will supervise whoever.
 All propositions 'that Ellen will supervise x ' (where x is a person)
 are true.
- stage 3:** Lexical universal quantification over individuals by universal DP
Example Generalized Quantifier DP:
Ellen will supervise everyone.
 For all x such that x is a person: Ellen will supervise x .
- stage 4:** Group denoting DP with possible universal distributive readings
Example universal pronoun:
Everyone (gathered in the hallway and) shouted 'PIZZA'.
 The largest group of (relevant) persons consists of parts
 each of which shouted 'PIZZA'.

Below, I offer a first sketch of the semantic analyses of the four stages proposed in (22). My purpose, besides explaining what is meant in (22), is to prepare the reader for the type of semantics we will need, which will be properly introduced in Chapter 2 and used for detailed analyses in the subsequent chapters.

So let us look at each stage of the proposed USC in turn. Beginning with stage 1, the variant of an FCR in (23a) is an unconditional, like (3b) (Rawlins (2013)). I follow the analysis developed in Rawlins (2013) and Hirsch (2016) for such structures. Accordingly, the subordinate clause of (23a) has a question semantics. The meaning of a question is a set of propositions (Hamblin (1973)) - in the example, (23b). The indeterminate pronoun *whoever* introduces alternative individuals (23c), which project to the propositional level to create this set of alternative propositions. In the structure in (23a), the overall meaning is a universal quantification over the propositions contributed by the question. A paraphrase for the meaning of the whole biclausal structure is given in (23d). The universal quantifier here is covert, and it quantifies over propositions. This analysis yields an appropriate semantics for (23a). (Again, see Chapters 2 and 3 for detailed analyses.)

- (23) **stage 1:** Universal quantification over alternative propositions in a question set
- a. Whoever Ellen supervises, she needs a bigger office.
 - b. $[[\text{whoever Ellen supervises}]] = \{\text{that Ellen supervises } x \mid x \in D \ \& \ x \text{ is a person}\}$
 - c. $[[\text{whoever}]] = [[\text{who}]] = \{x: x \in D \ \& \ x \text{ is a person}\}$
 - d. $\forall p[p \in \{\text{that Ellen supervises } x \mid x \in D \ \& \ x \text{ is a person}\} \rightarrow \text{if } p, \text{ then Ellen needs a bigger office}]$

The kind of universal quantification used in unconditionals and FCRs is, I suggest, the starting point of the USC and of Haspelmath's Alternatives Generalization (5).

(5) **Alternatives Generalization:**

FCRs and FCIs are a common diachronic source of nominal universal quantifiers.

In the next stage, stage 2, there is still universal quantification over alternatives. But the subordinate clause interrogative and the biclausal structure is no longer there. In the preceding section, I used English *wh-ever* free choice DPs, see (24a). Plausibly, the indeterminate pronoun in *whoever* continues to contribute alternatives in this reduced structure, (24b) (as was anticipated in (17) for *whatever book*; I am not aware of an analysis dedicated to *wh-ever* free choice DPs in English and offer the example for ease of exposition). Those individual alternatives are quantified over in (24c).

An established role model for stage 2 that many readers are probably familiar with is quantification in Japanese with the particle *-mo* (Shimoyama (2001), (2006)). An example of the Japanese construction is given in (25); it will be a topic of Chapter 3. Shimoyama's semantics of (25), given in (26), is also in terms of alternative individuals. At stage 2, quantification is over alternatives, but in contrast to stage 1, it is no longer over propositions in a question set.

- (24) **stage 2:** Direct universal quantification over alternatives
- a. Ellen will supervise whoever.
 - b. $[[\text{whoever}]] = [[\text{who}]] = \{x: x \in D \ \& \ x \text{ is a person}\}$
 - c. $\forall z[z \in \{x: x \in D \ \& \ x \text{ is a person}\} \rightarrow \text{Ellen will supervise } z]$

- (25) Dono gakusei-mo kita. (Shimoyama (2001), (25) p25)
which student-MO came

'Every student came.'

- (26) a. $[[\text{dono gakusei}]] = [[\text{which student}]] = \{x: x \in D \ \& \ x \text{ is a student}\}$
 b. $\forall z[z \in \{x: x \in D \ \& \ x \text{ is a student}\} \rightarrow z \text{ came}]$

Stage 3 is the stage that readers will be most familiar with, the standard Generalized Quantifier analysis of nominal universal quantifiers in well-studied languages like English (Barwise & Cooper (1981), a.m.o.). We have already seen it in (18). (27) analyses the example from (22), (27a). *Everyone* is a Generalized Quantifier, (27b). It combines with the rest of the sentence by way of the Logical Form in (27c) (May (1985), Heim & Kratzer (1998)). At stage 3, quantification is no longer over alternatives, as in a Hamblin semantics. Instead, it happens at the level of ordinary meaning. The Alternatives Generalization (5) connects stages 1 and 2 to stage 3.

- (27) **stage 3:** Lexical universal quantification over individuals by universal DP
 a. Ellen will supervise everyone.
 b. $[[\text{everyone}]] = \lambda Q. \forall x[x \text{ is a person} \rightarrow Q(x)]$
 c. $[[[\text{everyone}]] [1[\text{Ellen will supervise } t_1]]]$
 d. $[[[[[\text{everyone}]] [1[\text{Ellen will supervise } t_1]]]]] = 1 \text{ iff}$
 $\forall x[x \text{ is a person} \rightarrow \text{Ellen will supervise } x]$

Finally, I propose that an expression may lose its universal quantificational force and become a plural element in stage 4. We have seen the mirror image of this in the case of Portuguese (11b). I have pointed out English examples like (28a), see (12), which are interesting because *everyone* cannot be a Generalized Quantifier when combined with a plural predicate like *gather*. I take this to be an indication of change in progress in PDE (to be discussed in detail and analysed in Chapter 4). The expression is acquiring the semantics in (28b): it can refer to the largest group of people in the context. This referential meaning will yield a universal statement only indirectly by way of plural predication. Plural predication is represented by the operator PL (for 'pluralization') in the predicate, in the Logical Form in (28c) (see Link (1983), Roberts (1987) and subsequent work). The structure's interpretation is (28d) (where ' $\leq$ ' is the part-of relation, here the members of the group of persons). (28a) is analysed as a distributive reading, like (20) above. The Plurals Generalization (13) connects stages 3 and 4.

- (28) **stage 4:**
 a. Everyone (gathered in the hallway and) shouted 'PIZZA'.
 b. $[[\text{everyone}]] = \max(\lambda x.x \text{ are persons})$
 c. $[[[\text{everyone}]] [\text{PL } [1[t_1 \text{ shouted 'PIZZA'}]]]]]$
 d. $\max(\lambda x.x \text{ are persons}) \in [\lambda z. \forall x[x \leq z \rightarrow x \text{ shouted 'PIZZA'}]]$
 'The largest group of (relevant) persons consists of parts
 each of which shouted 'PIZZA'.

(13) **Plurals Generalization:**

There is a diachronic connection between plurals and universals.

The USC as sketched in (22) is a global perspective on a possible diachronic trajectory of an expression of universal quantification. It represents the major stages the expression goes through. A shorter version without the particular examples is given in (29). In (29), $\emptyset$ is a question meaning like that of the FCR clause in (23). ALT_{indet} stands for a set of alternatives introduced by an indeterminate phrase, with no question meaning involved. Stage 3 is the

Generalized Quantifier stage, and stage 4 the plurals stage (where '*P' is a pluralised predicate P, for example 'persons' above stood for '*person'; see Chapter 2).

(29) **Universal Semantic Cycle USC:**

- stage 1:** Universal quantification over alternative propositions in a question set
 $\forall p[p \in \wp_{\langle\langle s, t \rangle, t \rangle} \rightarrow \varphi(p)]$
- stage 2:** Direct universal quantification over alternatives
 $\forall z[z \in ALT_{\text{indet}} \rightarrow Q(z)]$
- stage 3:** Lexical universal quantification over individuals by universal DP
 $\forall x[P(x) \rightarrow Q(x)]$
- stage 4:** Group denoting DP with possible universal distributive readings
 $\max(\lambda x. *P(x)) \in [\lambda z. \forall x[x \leq z \rightarrow Q(x)]]$

The USC represents the core proposal concerning the diachronic development of universals in this book. It relates lexical universal quantification as in Generalized Quantifier theory to other, compositionally complex instances of universal quantification. The complex instances involve alternatives, on the one hand, and plural predication on the other. Thus the USC also connects three different strategies for universal quantification that natural language employs. It conceptually makes sense of the tripling of strategies by understanding them to be systematically related.

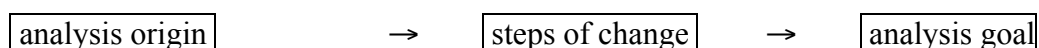
Given that the USC is a hypothesis about the diachronic development of universal quantifiers, we should be interested not just in its stages but also in the transitions between them. The three transitions and how they affect the semantics are given in general terms in (30).

(30) **Transitions:**

- a. stage 1 $\rightarrow$ stage 2: *From question to plain indeterminate phrase*
- b. stage 2 $\rightarrow$ stage 3: *From indeterminate phrase to Generalized Quantifier*
- c. stage 3 $\rightarrow$ stage 4: *From Generalized Quantifier to plural*

That is, the USC calls for three instances of the analysis of semantic change represented abstractly in (16), where the structure investigated is the constituent containing the indeterminate pronoun and its mutations to universal quantifier and group denoting DP.

(16) **Compositional semantic change:**



Q1 Origin and goal: What is the compositional semantics of the structure investigated before and after the semantic change?

Q2 Steps of change: How does the structure come to acquire the new compositional analysis?

The following chapters contribute case studies of the USC - its stages and its transitions - and the corresponding analyses. But first, a few more words on the cycle itself.

The notion of a linguistic cycle or spiral is an old one in historical linguistics and usually traced back to von der Gabelentz (1972 [1891]) and Meillet (1912). It has proven fruitful in modern diachronic linguistics, see e.g. van Gelderen (2011). Well-known examples of linguistic cycles include Jespersen's (1917) negation cycle (see for example also Jäger (2008) on the history of negation in German) and the complementizer cycle (compare e.g. Axel-

Tober (2017)). My general role model for the USC is Jespersen's (1917) famous cycle for negation.

A simple description of the negation cycle is given in (31). Similar to the USC, there is a logical operator at the heart of Jespersen's cycle. The operator is negation in (31) and universal quantification in (29). There is a stage in the cycle at which the logical operator is expressed by a lexical item. But at other stages, the expression of the logical concept is more complex. Several grammatical elements interact to produce the interpretive effect of the logical operator.

(31) **Jespersen's cycle for negation:**

- a negative marker expresses logical negation $\neg$
- negation weakens and is strengthened by a Negative Polarity Item (NPI)
- the former NPI becomes one of two negative particles (Negative Concord NC)
- the old negative marker becomes obsolete; one particle (the former NPI) suffices to express negation

The stages of Jespersen's cycle and the USC are linked by diachronic development. A well-known instance of Jespersen's cycle is negation in French. I provide a very rough sketch of this diachronic development in (32) with schematic structures (see Chapter 6 for some actual historical examples).

- (32)
- | | | | | |
|----|-----------------------|-------|------------|-----------------|
| a. | Je | ne | cours. | - stage a |
| | I | not | run | |
| | 'I don't run.' | | | |
| b. | Je | ne | cours pas. | - stage b (NPI) |
| | I | not | run step | |
| | 'I don't run at all.' | | | |
| c. | Je | ne | cours pas. | - stage c (NC) |
| | I | NEG | run NEG | |
| | 'I don't run.' | | | |
| d. | Je | (ne) | cours pas. | - stage d |
| | I | (NEG) | run NEG | |
| | 'I don't run.' | | | |

Stage a in (32) represents a historical stage at which the lexical item (here: *ne*) expresses the logical operator (negation). There is an analogy to stage 3 of the USC and Generalized Quantifiers.

Stage b represents a stage at which there is phonological and syntactic weakening of the exponent of negation. It gets strengthened by a negative polarity item (NPI), as a way of emphasizing the negative semantic context. This happened in Old French. In the example we see *pas* whose original meaning was 'step' and which turned into a minimizer NPI '(not) a single step' (see e.g. Eckardt (2021) for discussion). The NPI in turn loses its status as a polarity sensitive element and becomes tied syntactically to negation: it can only occur in negative contexts. This is stage c, Negative Concord (NC) (see e.g. Zeijlstra (2004), Penka (2011)). At this stage, there are two negative particles marking the logical concept of negation. At the last stage, stage d in (32), the former negative marker *ne* becomes optional and is eventually lost altogether. This is what is happening in present day spoken French, where *ne* is often omitted. The former NPI *pas* takes on the meaning of negation.

There are parallels to the USC in terms of the diachronic development of the central expression in the cycle (here *pas*): The expression first occurs in contexts in which the logical concept is expressed, and eventually it takes on the meaning of that concept. In the case of the USC, the expression is an indeterminate pronoun or an FCI, out of which the universal quantifier arises (from stages 1 and 2 to stage 3). Another parallel is found in the fact that the central item of the cycle may cease to express the logical concept (stages d and 4, respectively). This is what happened to French *ne* and is happening to PDE *everyone*, making room for the cycle - or more accurately spiral - to begin anew.

Let me also mention a potential difference between Jespersen's cycle and the USC. The negation cycle is seen as unidirectional. The Plurals Generalization, on the other hand, comes with an indication that change is possible in both directions. That is, we see both the development in Portuguese from a plural related expression *all* to a quantifier, and the development in English from a quantifier *everyone* to a plural related expression. This would mean that at least some of the changes in the USC are not unidirectional. This observation alerts us to the fact that the name - Universal Semantic Cycle - has yet to be substantiated by specific analyses of language change, and the question asked in how far the USC is like other, known cycles of language change. This discussion will be resumed in Chapters 5 and 6. For now, I ask the reader to go along with the general conceptual analogy of the USC to the negation cycle, without worrying too much about its name.

Jespersen's cycle for negation is very well-known. But similarly to the USC, it raises interesting questions which, to my knowledge, have not been investigated fully from the point of view of compositional semantics. To illustrate: it seems plausible that at stage d in (32), the lexical item under investigation (e.g. French *pas*) expresses negation:

(33) $[[pas]] = \lambda p.p=0$

But how does an expression come to acquire the semantics in (33) from denoting an NPI with the semantics of, say, 'any step'? See Eckardt (2021) for interesting discussion. I return to this issue in Chapter 6.

On the other hand, for Jespersen's cycle, the circumstances of changes like the ones illustrated in (32) are well studied. They are affected by syntax (movement of the verb) and information structure (focus) when negation weakens (see for example Zeijlstra (2004) for analyses). Jespersen's cycle teaches us that such grammatical factors influence how the logical concept of negation is expressed syntactically.

The fact that the logical concept in the present example is universal quantification in the place of negation means that there is a different conspiracy of interacting factors. The division of labour that is negotiated in the USC is between indeterminate pronouns, covert universal quantification, and lexical universal quantifiers. In Jespersen's cycle, it is instead the interaction of NPIs, negative concord and lexical negation.

In the case of Jespersen's cycle, the investigation into the diachrony of negation contributed greatly to our understanding of the relation between the grammar and logic. The semantics of logical negation is expressed in human languages in surprisingly diverse and complex ways. Jespersen's cycle has helped us to see how and why this is so.

The goal of this book is to begin to accomplish something similar for universal quantification. In this area, as well, the basic semantic or logical concept is expressed in the languages of the

world in surprisingly diverse ways (see e.g. Bach et al (1995), Matthewson (2008), Keenan & Paperno (2012), (2017) for numerous case studies). I believe that the perspective taken here, in terms of the USC, will help us to understand the system behind the diversity.

1.4. Preview of the Book

The sample analyses in this chapter have indicated the semantic background needed in order to flesh out a complete USC theory. In **Chapter 2**, I will provide the necessary semantic foundations for the topics involved: After the chapter introduction in section 2.1., the basics of Generalized Quantifier theory and a standard semantics of quantification are provided in section 2.2. Alternative semantics is presented in section 2.3. and plural predication in section 2.4. The chapter introduces the versions of these theories that I will use in subsequent chapters. It serves to make the book self-contained.

The USC makes predictions about crosslinguistic and diachronic variation in the area of universal quantification, and it predicts that certain pathways of change must be available. Following up on these predictions and filling the bare bones concept of the USC in (29) with detail by way of a series of concrete examples and their analyses makes up the main part of the book.

In **Chapter 3**, we look at crosslinguistic examples of universal quantification and their analyses. The theory represented by (29) predicts that we should see instantiations of several stages of the USC across languages. Since the standard analysis in terms of Generalized Quantifiers represents stage 3, and stage 4 is instantiated by regular plural predication, I concentrate on other stages of the USC in Chapter 3. Section 3.1. introduces the chapter. Stage 1 is examined in section 3.2. by way of FCR constructions (unconditionals and FCRs); it includes a discussion of a correlative FCR construction in Turkish. Stage 2 is supported in section 3.3. by analysing alternative-based quantification in Japanese. The next two sections discuss what we might think of as in-between stages: FCIs in section 3.4. mediate between stages 1 and 2; Korean FCIs provide an interesting case study. A stage between 3 and 4 (which we might call stage 3.5) is analysed in section 3.5. Mandarin universal quantification with *mei* plus DOU is the chosen representative of this intermediate stage. A chapter summary is given in section 3.6.

The theory guided plot of the chapter motivates the way I proceed: I do not exhaustively examine all quantifiers in a given language, or even all universal quantifiers, but specifically such crosslinguistic representatives as showcase the relevant USC properties. The analyses developed in Chapter 3 support the crosslinguistic predictions of the USC. As a result of the chapter, the stages of the proposed USC are well-motivated, spelled out in detail and applied to concrete examples of universal quantification. The chapter also prepares the investigation in Chapter 4: All required semantic tools are introduced. We have in place, for the diachronic investigation, the basic building blocks of meaning that construct universal statements.

Chapter 4 is dedicated to the claim that the stages of the USC are indeed stages in a diachronic development. It connects the four major stages by investigating the history of English nominal universal quantifiers. The chapter introduction in section 4.1. provides an overview. Then, I trace Present Day English *each* and *every* from their origins to their present day grammar. I begin with Old English (OE) in section 4.2., exemplifying stages 1 and 2. I move on to Middle English (ME) (in section 4.3.), showing how English changed towards stage 3. Modern and Present Day English (PDE) are examined in section 4.4., where we observe the emergence of a stage 4 semantics from stage 3. Section 4.5. summarizes: the stages of the USC trace the historical development of these universally quantified expressions

in English, and plausibly other such expressions in other languages. English turns out to be a good case study of the central stages of the USC.

In theoretical terms, the chapter expands on the decompositional analysis begun in Chapter 3: it identifies basic building blocks of meaning that go into composing the propositional interpretation of universal statements. The decomposition approach allows a theoretically guided analysis of the diachronic data.

The combined perspective of Chapter 3 and Chapter 4 suggests that crosslinguistic variation in quantification is about which expressive options a language uses at a given time. There is an inventory of basic meaning components that is in principle available. A language at a particular stage may, for example, choose not to use a particular one. The USC details what is available instead.

What is gained by a compositional semantic analysis of the diachronic development of an expression? **Chapter 5** argues that instances of lexical change, such as the ones seen in Chapter 4, are puzzling when viewed in isolation. When examined in their syntactic and compositional environment, the individual changes are revealed as part of a shift in which several grammatical components participate. The combined changes allow a speaker with the new grammar to function in a community in which the old grammar dominates because the overall interpretive impact of sentences remains stable, while the grammar that creates it changes. This general approach to such interpretive change relates the history of words like *each* and *every* to the systems of quantification within which they function. In Chapter 5, I focus on the transitions between the (now well-documented) stages of the USC: the USC leads us to expect that the three transitions in (30) are compositionally plausible. After a short chapter introduction in 5.1., section 5.2. sets the scene. Each subsequent section of Chapter 5 investigates one transition: Section 5.3. from stage 1 to stage 2, section 5.4. from stage 2 to stage 3, and section 5.5. from stage 3 to stage 4. The chapter summary in section 5.6. highlights that an all-important ingredient to understanding the transitions is the fact that the overall propositional meaning of the construction remains stable. This is formulated as Constant Entailments (Beck & Gergel (2015)).

I explore consequences of the analyses summarized as the USC plus the analyses of the transitions in **Chapter 6**. Those consequences relate to interpretive change in general. I speculate on the origin of Generalized Quantifiers and highlight consequences of the USC theory for empirical research on quantification. Finally, the chapter invites application of the new overarching perspective on universal quantification to other fields, such as the study of reasoning and some so-called fallacies involving universal quantifiers.

In sum, the significant outcomes of the book concern, most importantly, interpretive language change. In this, it follows in the footsteps of works such as Eckardt (2006), Gergel (2010), and Deo (2015a) by contributing to the emerging field of formal diachronic semantics (see Deo (2015b), Eckardt (2022)). The book also makes a contribution to crosslinguistic semantics, in that it structures an option space for variation in the domain of universal quantification. It thereby continues the endeavour in for instance von Stechow & Matthewson (2008) and Beck (2021) of identifying semantic universals and dimensions of semantic variation. Finally, it has an impact on the theory of quantification because it changes the expectations concerning what is or can be a quantifier.

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