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Predicate Interpretations as Intensions restricted along Dimensions

Master degree thesis

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<u>פרשנות פרדיקט כאינטנציה המוגבלת באמצעות מקבצי תכונות</u>

פרדיקטים (מילים המורות על תכונה. לדוג' 'ינשוף') הם יחידות בסיסיות מאד בשפה ומשום כך, ייצוג המשמעות של כמעט כל ביטוי בשפה (תארים, כמתים וכו') תלויה בייצוג משמעות פרדיקטים. באופן סטנדרטי בסמנטיקה מודל תאורטית, שהיא הפרדיגמה המרכזית שברקע תזה זו, פרדיקט, למשל 'ינשוף', מיוצג כאינטנציה, כלומר, בהינתן עולם אפשרי, קבוצת האובייקטים (האקסטנציה) בעלי התכונה עליה מורה המילה ינשוף באותו עולם ע"פ המידע, החלקי לעיתים, בהקשר. גישה אחרת, שמקורותיה בפילוסופים כוויטגנשטיין, רווחת בקרב פסיכולוגים העוסקים בחקר המושגים והחשיבה. אלה מיצגים את המושג ינשוף כמקבץ תכונות, הכרחיות או טיפוסיות לינשופים. מקבצי תכונות הקשורים במושג נמצאו רלבנטיים לתופעות קטגוריזציה, רכישה ולמידה של מושגים, זיכרון, ועוד. <u>הטענה המרכזית</u> שלי היא שמקבצי תכונות מסייעים בקביעת קבוצת האובייקטים הרלבנטיים בכל הקשר בו משתמשים בפרדיקט, וכן אופרציות הקשורות בכמתים ורכיבים אחרים פועלות עליהם. על כן, אני טוענת שבנוסף לאינטנציה, יש לייצג גם את מקבצי התכונות ההכרחיות והטיפוסיות הקובעות את פירוש הפרדיקט בהקשר, ישירות בתוך הפרשנות הבסיסית של פרדיקט במודל הסמנטי. אני מכנה תכונה במקבץ התכונות של פרדיקט <u>ממד</u> (dimension). ממד של פרדיקט אף הוא פרדיקט, המצביע על תכונה הכרחית או טיפוסית לפרדיקט.

<u>בפרק 1</u> אני מראה שמכיוון שמקבצי תכונות משפיעים על משמעות פרדיקט בהקשר, הם חוזרים ומופיעים גם בתיאוריות סמנטיות מודל תאורטיות, אך בד"כ ללא הגדרה שיטתית שלהם במסגרת המודל הסמנטי. מטרתי היא להציג מודל המספק הגדרה שיטתית כזו.

<u>בפרק 2</u> אני מתמקדת במקרה אחד (משמעות הביטוי any ותפוצתו), רלבנטי במיוחד לנושא התזה. אני תומכת בגישה המעניקה ניתוח אחיד למופעיו השונים של *any* (קדמון ולנדמן 89 ,1993), <u>באמצעות ממדים של פרדיקטים</u>. אני מנתחת את any בדוגמאות בעייתיות (למשל עם תחום כימות קבוע מראש) כמעלים תכונת טיפוסיות ובכך מעלים חלק מסדר הטיפוסיות בתחום הכימות.

<u>בפרק 3 ו 4</u> אני מגדירה מהי תכונה הכרחית (a membership dimension) ומהי תכונת טיפוסיות (an ordering dimension) של פרדיקט, ואני מציגה מודל מידע חלקי שבו משמעות פרדיקט מיוצגת באמצעות מקבצי תכונות כאלה, בנוסף לאינטנציות. אני משנה מספר תיאוריות, על מנת לשלב מקבצי תכונות (בעיקר: קדמון ולנדמן 1993, ון פראזן 1969, קמפ 1975, לנדמן 1991, בארטצ' 86 ,1984). אני מראה שמצב מידע חלקי יכול להיות בעל תוכן גם כשכל האקסטנציות ריקות. אני מגדירה ערפול לאורך ממד, ודרכים להסירו לשם קבלת פרשנות רחבה יותר או פחות לפרדיקט, וכן דרכים להרחבת אקסטנציות חלקיות באופן עקיף על סמך המידע במקבצי התכונות.

<u>בפרק 5</u> אני מנתחת את הביטויים a, every, any כאופרטורים המצמצמים (a), מרחיבים (every) או שניהם (any), באופן שיטתי, את מקבץ התכונות הקובעות את פרוש הפרדיקט (הארגומנט הראשון שלהם) בהקשר. קבוצת האובייקטים עליהם מצביע הפרדיקט (כלומר תחום הכימות) מצטמצמת או מתרחבת בהתאם, וכן הופכת הומוגנית יותר או פחות מבחינת טיפוסיות ביחס לפרדיקט. ע"כ תנאי האמת של הטענות סובלים יותר או פחות יוצאי דופן.

<u>בפרק 6</u> אני מתייחסת בקצרה להשלכות אפשריות נוספות של המודל, ביניהן הקשר בין סקלריות וגנריות למקבצי תכונות, הקשר בין אלמנטים של המערכת המושגית (כגון שיפוטי טיפוסיות ופרוטוטיפים) לאונטולוגיה באמצעותה מתפרשים ביטויי השפה בסמנטיקה מודל תאורטית, ולבסוף הפונקציה התקשורתית והרכישה של מקבצי התכונות.

What is in this thesis?

Predicates are very basic units of language and as such, the semantics for almost every item in the language (adjectives, quantifiers, and so on) depends on the specific representation of predicate meanings. Within model theoretic semantics, which forms the background framework for this thesis, predicates are grasped as the direct means of pointing at things, i.e. their core meaning is represented as intension. Another notion, widespread in cognitive psychology, represents predicate meanings as clusters of necessary conditions or typicality properties jointly characterizing their core meaning. The main argument of this thesis is that such clusters help determine the relevant contextual set of individuals in each predicate's use. Also quantifiers and other items access them and operate over them. Thus, I suggest that in addition to the intension, clusters of two kinds of properties, which I call membership and ordering dimensions of a predicate, are part of the basic interpretation of predicates. Predicate dimensions are other predicates denoting necessary or stereotypical properties of predicates.

In chapter 1 I show that since dimensions play an important role in the interpretation of predicates and in the compositional interpretation of sentences, many semantic theories appeal to dimensions, but usualy without trying to develop a systemstic account of the role of dimensions. My main goal is to construct a model, which does present such an account.

The second chapter focuses on a particular case (*any*'s meaning and licensing) most relevant to this thesis. I support the idea of a unified analysis to PS and FC *any* (Kadmon and Landman 1993), using predicate dimensions. I analyze *any,* in certain problematic uses (for instance, with predetermined domains), as an eliminator of ordering along dimensions.

In chapter three and four I define the notions of membership and ordering dimensions as part of the basic interpretation of predicates, and their role within a vagueness model. I modify several theories to accommodate dimensions (mostly: Kadmon & Landman 1989,93; Van-Fraassen 1969; Kamp 1975, Landman 1991; Bartsch 1984,86). I show that a partial information state may be contentful even if all the denotations are empty; I present the notion of vagueness along a dimension, ways of removing it in order to achieve more and less precise or tolerant interpretations, and how denotations given directly (by pointing) can be indirectly extended also on the basis of the necessary and stereotypical conditions.

In chapter five I analyse the semantics of *every*, *a*, and *any* as operators that treat the dimensions of the predicate (their first argument) in different systematic ways in order to achieve more or less wide domains of quantification. As a result the truth conditions of the statements are more or less tolerant of exceptions.

In Chapter 6 I briefly discuss subjects for future investigation (how scalarity and genericity relate to predicate dimensions; how items of the conceptual system (like typicality intuitions and prototypes) relate to the ontology with which semantic items are interpreted; the communicational functions depending on the two kinds of dimensions, and their acquisition).

Content

<u>הצעה לתזה</u>

נושא התזה: פרשנות פרדיקטים כאינטנציות המוגבלות באמצעות מקבצי תכונות

Subject: Interpretation of Predicates as Intensions restricted along Dimensions

מגישה: גלית ששון, מנחה: פרופ. פרד לנדמן.

הנושא המרכזי של התזה הוא ייצוג <u>משמעות פרדיקטים</u> (מילים המורות על תכונה. לדוג' 'ינשוף'). באופן סטנדרטי בסמנטיקה מודל תאורטית, פרדיקט, למשל 'ינשוף', מיוצג כ<u>אינטנציה</u>, כלומר, בהינתן עולם אפשרי, קבוצת האובייקטים (האקסטנציה) בעלי התכונה עליה מורה המילה ינשוף באותו עולם ע"פ המידע, החלקי לעיתים, בהקשר. גישה אחרת, שמקורותיה בפילוסופים כוויטגנשטיין, רווחת בקרב פסיכולוגים העוסקים בחקר המושגים והחשיבה. אלה מיצגים את המושג ינשוף כ<u>מקבץ תכונות</u>, אם <u>הכרחיות</u> לינשופים, ואם <u>טיפוסיות</u> לינשופים. מקבצי תכונות הקשורים במושג נמצאו רלבנטיים לתופעות קטגוריזציה, רכישה ולמידה של מושגים, זיכרון, ועוד.
<u>הטענה המרכזית</u> שלי היא שבנוסף לאינטנציה, יש לייצג גם את מקבצי התכונות ההכרחיות והטיפוסיות הקובעות את פירוש הפרדיקט בהקשר, ישירות בתוך הפרשנות הבסיסית של פרדיקט במודל הסמנטי.
אני מראה שמכיוון שמקבצי תכונות משפיעים על משמעות פרדיקט בהקשר, הם חוזרים ומופיעים גם בתיאוריות סמנטיות מודל תאורטיות, אך בד"כ ללא הגדרה שיטתית שלהם במסגרת המודל הסמנטי. לרוב מקבצי תכונות המגבילים משמעות פרדיקט בהקשר, מיוצגים באמצעות קבוצת טענות המגבילות את תווך האקסטנציות האפשריות באותו הקשר, כך שקבוצת התכונות אינה נגישה בעת הפרשנות הקומפוזיציונלית של ביטויים מורכבים המכילים פרדיקטים ואופרציות הפועלות עליהם (לדוג' כמתים). לכן, קבוצת תכונות (או טענות) נוספת מופיעה בנפרד בעת העיסוק בביטויים הרגישים למקבצי התכונות באמצעותן מפורש הפרדיקט בהקשר.
בפרק 1 אני סוקרת את בקורת הגישה האינטנציונלית כלפי גישת מקבצי התכונות מחד, ואת ביטויים של מקבצי תכונות בתיאוריות אינטנציונליות מאידך. לאור זאת אני מציעה מודל של אינטגרציה בין הגישות, המגדיר את תפקידם של מקבצי התכונות ההכרחיות והטיפוסיות במודל אינטנציונלי.
בפרק 2 אני מתמקדת במקרה אחד (הביטוי any). אני סוקרת את התאורה של קדמון ולנדמן 1993 המעידה על רלבנטיות הביטוי לנושא התזה, ומראה כיצד ייצוג מקבצי תכונות הכרחיות וטיפוסיות בתוך הפרשנות הבסיסית של פרדיקט מסייעת בהשגת תיאוריה אחידה למופעיו השונים של any. אני מנתחת את any בדוגמאות בעייתיות (למשל עם תחום כימות קבוע מראש) כאופרטור המעלים תכונת טיפוסיות ובכך מעלים חלק מסדר הטיפוסיות בתחום הכימות.
בפרק 3 ו 4 אני מגדירה מהי תכונה הכרחית ומהי תכונת טיפוסיות של פרדיקט, ואני מציגה מודל שבו משמעות פרדיקט מיוצגת באמצעות מקבצי תכונות כאלה, בנוסף לאינטנציות.
בפרק 5 אני מנתחת את הביטויים any ,every ,a כאופרטורים המצמצמים (a), מרחיבים (every) או שניהם (any), באופן שיטתי, את מקבץ התכונות הקובעות את פרוש הפרדיקט (הארגומנט הראשון שלהם) בהקשר. קבוצת האובייקטים עליהם מצביע הפרדיקט (כלומר תחום הכימות) מצטמצמת או מתרחבת בהתאם, וכן הופכת הומוגנית יותר או פחות מבחינת טיפוסיות ביחס לפרדיקט. ע"כ תנאי האמת של הטענות סובלים יותר או פחות יוצאי דופן.
בפרק 6 אני מתייחסת בקצרה להשלכות אפשריות נוספות של המודל, בניהן הקשר בין סקלריות וגנריות למקבצי תכונות, הממשק בין מרכיבים במערכת המושגית וביטויים בשפה, ולבסוף הפונקציה התקשורתית והרכישה של מקבצי התכונות.

Predicates are very basic units of language, and as such, the semantics for almost every item in the language (adjectives, quantifiers, and so on) depends on the specific representation of predicate meanings. Within <u>model theoretic semantics</u>, which forms the background framework for this thesis, predicates are grasped as the direct means of pointing at things, i.e. their core meaning is represented as <u>intension</u> (i.e. given a world, the set of individuals known to fall under that predicate in that world). Another notion, widespread in <u>cognitive psychology</u>, represents predicate meaning as a <u>cluster</u> of necessary conditions or typicality properties jointly characterizing the core meaning of the predicate.

I discuss several arguments of the intensional approach against cluster theories, on the one hand, and several points in which semantic theories appeal to dimensions, on the other hand. I show that clusters help determine the relevant contextual set of individuals in each predicate's use, and also quantifiers and other items access them and operate over them. Thus, <u>my main argument</u> is that, in addition to the <u>intension</u>, clusters of two kinds of properties, which I call <u>membership and ordering dimensions of a predicate</u>, are part of the basic interpretation of predicates. Predicate dimensions are <u>other predicates denoting necessary or stereotypical properties</u> of predicates. I present a model with such dimension sets (I modify several theories to accommodate dimensions, mostly: Kadmon & Landman 1989,93; Van-Fraassen 1969; Kamp 1975, Landman 1991; Bartsch 1984,86).

I explicate how dimensions help represent partial information; the notion of vagueness along a dimension; ways of removing it in order to achieve more and less precise or tolerant interpretations, and ways to indirectly extend the contextual set of individuals that fall under a predicate on the basis of the necessary and stereotypicality conditions.

Then, I focus on how such a model accounts for a particular case (*any*'s meaning and licensing). I support the idea of a unified analysis to PS and FC *any* (Kadmon and Landman 1993), <u>using predicate dimensions</u>. I analyze *any,* in certain problematic uses (for instance, with predetermined domains), as an eliminator of ordering <u>along dimensions</u>.

I develop an analysis of the semantics of <u>*every*</u>, <u>*a*</u>, and <u>*any*</u> as operators that treat the dimensions of a predicate (their first argument) in different systematic ways in order to achieve more or less wide domains of quantification. As a result the truth conditions of the statements are more or less tolarant of exceptions.

Finnaly, I briefly discuss subjects for future investigation (how scalarity and genericity relate to predicate dimensions; how typicality intuitions and prototypes relate to the ontology with which semantic items are interpreted; the communicational functions depending on the two kinds of dimensions, and their acquisition.

Chapter 1 – Introduction: predicate meanings in current theories

1.1. Intensions

In the model theoretic approach to semantics, which forms the background framework for this thesis, predicates are associated with denotations and the denotation of a predicate (in a situation or context) is, what is sometimes called an extensional property: the set of individuals that fall under that predicate (in that situation or context). The meaning of a predicate (or at least a core part of it) is identified with the pattern of variation of the denotation of the predicate across situations or contexts. This pattern of variation is a function from situations or contexts to denotations, the function which maps every situation or context onto the denotation of the predicate in that situation or context, hence into the set of individuals that fall under the predicate in that context. This function is called the intension of the predicate.

Within this general framework various refinements of the notion of intension have been proposed to deal with a variety of linguistic facts. I briefly discuss one particular refinement related to problems of vagueness and partial information.

The standard intensional semantics is a model of total information. Such a model determines for each individual and each property in a situation, context or world, whether it has that property or not. There is no third possibility, i.e. there is no gap containing individuals that are inherently borderline for a certain property or that one doesn't know if they have that property or not due to a lack of some crucial information. In such a case also all the relations between all the predicates, or between the properties they denote in a certain world, are completely specified. To put it differently, the linguistic "definitions" of predicates are complete. Every predicate P has in any world w a denotation $[P]_w$, and it is determined for each other predicate whether its denotation is a superset of $[P]_w$, intersects with $[P]_w$, etc. There is no space for vagueness. This contradicts sharply with the more common situation, in which the speaker is not completely familiar with the total definitions and denotations, even if we assume that they exist. It is also the case that as discourse extends, speakers may extend the information they have, for example by accepting more statements asserted during the discourse as true. Models of total information can not represent these dynamic stages of information expansion.

E.g. in many contexts or discourses about birds, one may not know about each individual if it is a bird or not (one may hesitate about bats, penguins, flying dinosaurs, bird toys etc.), exactly which animals are adult, or healthy or etc. One may know that a bird hunts mice, and not know whether only adult or healthy birds do so or all of them do (whether, when talking about birds' eating habits, the discourse actually refers only to some typical subset of all birds), etc.

In order to deal with this basic fact, dynamic discourse exchange models and vagueness models have been developed. The representation of partial information was found fruitful in the analysis of many semantic problems (see for example in Landman 1986,90,91, Stalnaker 1975, Veltman 1984, Groenendijk & Stokhof 1984).

While the work Robert Stalnaker (e.g. Stalnaker 1975) shows that many aspects of such partiality can be modeled in a classical theory by representing partial information states as sets of possible worlds (the worlds compatible with the information), it has been argued in the context of epistemic modality (Veltman 1984) and in the context of vagueness (van Fraassen 1969, Kamp 1975, Fine 1975) that partiality enters into the truth conditions, and hence into the basic semantics. In such approaches, possible worlds are replaced by what can be called information states, which are assumed to be partial. The partiality enters into the truth conditions in that the basic logic of predicates is assumed to be three valued. This means that we do not associate with a predicate in a context (or information state) just a denotation, the set of individuals to which the predicate applies, but a triple consisting of a positive denotation, $[P]^{+}_{c}$, the set of individuals that in c are positively known to fall under P, a negative denotation, $[P]^{-}_{c}$, the set of the individuals that in c are positively known not to fall under P, and a gap, $[P]^{?}_{c}$, the remaining individuals. In such a theory, intensions are more fine grained: the intension is the function that maps every context c and predicate P into the denotation triple of P in c.

Traditionally, intensional theories of meaning are contrasted with a maybe more traditional notion of meaning, namely, that of a meaning as <u>a cluster of properties</u> (see for example Kripke 1972's discussion of Searle's cluster of properties theory).

1.2. Clusters of properties

This conception of meaning goes back to Wittgenstein (in "Philosophical investigations" 1953), has played a major role in the philosophical tradition (for instance, Searle1958), plays a major role in psychological theories of concepts (see in Rosch 1978, Smith 1988, Reed 1988, Keil 1979), and in conceptualist theories of meaning (for instance, Fodor 1963,80, Katz and Postal 1964, Jackendoff 1972). In formal semantics it can be systematically found in the work of Renate Bartsch (Bartsch 1984,86,98).

In much of this philosophical and psychological literature (which concerns theories about concepts or categories), a concept representation is a cluster of concepts that, loosely, characterize it. I.e. a concept is associated with properties that do not actually restrict the set of entities that fall under this concept, but only raise the typicality of objects relative to that concept. This sometimes takes the form of a prototype. A prototype is a set of properties that characterize what a maximally typical object satisfying that concept would be like (whether there actualy is such an object or not). Instances of a concept may resemble the prototype in some properties or others, but not necessarily in all its properties. Thus, similarity among them is described as family resemblance (rather than a transitive relationship based on identical features in all the instances). The closer an individual is to satisfying all of the properties of the cluster, the more typical it is regarded with respect to that concept. Such typicality properties have been extensively investigated, see Rosch 1978, Smith 1988 and Reed 1988 for empirical evidence from a variety of psychological experiments, and see Keil 1979, Keil and Butterman 1984 and others in Smith 1988, and in Reed 1988, for evidence for the role of Prototypes in language acquisition.

Since the intensional theory of predicate meanings came into being partially as a reaction against cluster theories of meaning, let me briefly discuss some of the issues there.

1.3. Some arguments in favor of intensions, and Problems with the conceptualist notion of a predicate meaning as a cluster

The arguments for intensions as the core of meanings focus on compositionality and aboutness. Native speakers have (among others) a complex web of intuitions about entailment relations between the sentences they use. These intuitions are part of the data in linguistic theory (part of the facts to be explained). For this linguistic theory needs a notion of sentence meaning. But sentence meanings don't arise out of thin air; the grammar builds such sentence meanings out of meanings of the parts in a sentence, in a recursive way (compositionality). Aboutness concerns the relation between linguistic representations (like sentences and their constituents) and non - linguistic entities (the world, as non-linguistic conceptual structure). The observation is that it is a core part of the native speaker's capacity to classify objects or situations with linguistic items. All (or most) human beings are capable of distinguishing situations where it rains from situations where it doesn't rain. Only relatively competent speakers of French are able to distinguish these situations with the linguistic item "il ne pleut pas". It is part of the semantic competence of French speakers that they can use that sentence to distinguish these situations. This classificatory semantic competence is exactly what the notion of intension models. Intensional semantics, then, combines these factors: the semantics must be (1) a compositional theory of meaning (2) which supports the facts about intuitions concerning entailments and (3) which supports the classificatory competence. Associating intensions with expressions and providing a compositional grammar this association provides the first and the last requirements. Thirty years of research in semantics has been very succesful in explaining a multitude of complex facts concerning semantic intuitions like entailment relations.

Semanticists in the framework of intensional semantics have argued since Lewis 1970's influential paper, that a cluster theory which does not include a theory of aboutness (intensions) is inadequate as a theory of meaning.
In his discussion of the nature of meanings, Lewis 1970 criticizes linguists (like Katz and Postal 1964 for instance) who conceive of meanings as translations to 'semantic markers' or symbols in a language of thought, and of course this is what clusters of concepts are too. Lewis calls such a language 'Markerese'. Lewis argues that representing natural language in Markerese doesn't provide a semantics for natural language, but rather pushes the need for semantic interpretation one level up to the level of the interpretation of Markerese.
Lewis regards this stage of translating into a language of thought unnecessary, or at least unmotivated.

The need for a theory of aboutness shows up strongly in the semantics of predicates that stand for natural kinds, like ‘whale’ (see Kripke 1972, Putnam 1975 and many others since. See also a review in Chiercia & McConnel Ginet 2000). At some point in time, whales were thought to be fishes. Presumablly, at that time the cluster of concepts associated with ‘whale’ included the concept ‘fish’. But the discovery that whales are mammals was not a linguistic discovery about the meaning of the word ‘whale’, but an empirical discovery about whales. Thus, it is incorrect to assume that before the discovery “whales are fish” was a definitional tautology, and after the discovery a meaning change has turned it into definitional contradiction (even though, as Kripke and Putnam argue, it may be neccesarily false).
On the intensional theory, the meaning of ‘whale’ didn’t change at all, or very little (in so far as we achieved new and better ways of telling in problematic contexts whether something is a whale or not. That is, if we include among the contexts across which denotation vary “dubious contexts”, it could be that, with the new knowledge, the denotation of ‘whale’ in such dubious contexts actually changes. This would reflect the replacement of older criteria for whalehood by new ones). Kripke and Putnam argue that these distinctions can not be captured without a theory of aboutness.

Within intensional semantics, the effects of clusters of properties (e.g. contextually restricted meanings, typicality scales etc.) are usually dealt with (if at all) by either stipulating restrictions on intensions, or by meaning postulates, i.e. sets of constraints on predicate meanings that restrict the set of possible models for the language. These postulates determine the obligatory fixed relations between predicates (e.g that the property denoted by ‘boy’ is a subset of the property denoted by ‘masculine’, or in other words that ‘boy’ entails ‘masculine’ etc.)

1.4. Clusters of properties in model theoretic semantics

But clusters of predicates or properties pop up in intensional semantics at various points in the analysis of various semantic phenomena. Most typically, in the analysis of phenomena that are sensitive to contextual restrictions.

1.4.1. Kamp & Partee 1995 argue for a direct relevance of the typicality intuitions and prototypes in the semantics of predicates. The meaning of predicates like ‘table’, ‘chair’ are of course notoriously context dependent. Adjectival restrictions and similar grammatical operations show that also predicates - that, out of the blue we think of as less context dependent - are far more context dependent than usually assumed. ‘Tiger’ is an example. A relatively freestanding natural kind. But a semantic theory must adress the notorious question of the meaning of complex predicates like “toy tiger” (a compound), or “tiger which is stuffed with wool” (where the noun is modified by a relative clause). The latter case is particularly pertinent, because it is a gramatically complex expression (so we can not simply encode a shift of meaning by postulating just another lexical item. I.e. there is really a compositionality issue here). Kamp and Partee raise the issue of compositionality of prototype theory. They present a compositional theory based on supervaluations (Van Fraassen 1969), that induces prototypes in the operations that form the meaning of the complex expressions.

1.4.2. Renate Bartsch uses clusters of properties to account for a variety of linguistic phenomena.

Bartsch 1986 argues that some expressions are what she calls <u>thematically weakly determined expressions</u>. These are expressions that demand contextual specification of the dimension along which they are contextually interpreted. These are expressions like ‘good’, ‘satisfactory’, ‘does well’. Such dimensions belong to the cluster concept. She argues that other expressions directly <u>refer to those dimensions</u>. These are expressions like ‘financially’, ‘healthwise’, “with respect to health”, “as a teacher”. So ‘healthwise’ in (1c) restricts ‘does well’, and “as a teacher” in (1e) restricts ‘good’. This means that the semantics must specify a relation that will connect the meaning of “as a teacher” with the meaning of ‘good’ to build a complex meaning as in (1e).

(1) a. John is healthy.
  b. <u>John’s health</u> is well.
  c. John does well <u>healthwise</u>.
  d. <u>John as a teacher</u>, is good.
  e. John is <u>good as a teacher</u>.

Bartsch argues that dimensions, cluster concepts, mediate this operation. The fact that these criteria must enter into the grammar is shown in (2). Bartsch observes that dimensions can be quantified over:

(2) a. John does well in every respect.

b. John does well in some respect. Etc.

She also points out the fact that a dimension can have dimensions. E.g. 'strong' can be interpreted along the dimension "with respect to personality" which can be interpreted along the dimension "with respect to risk taking" which can be interpreted along the dimension "with respect to behaving with dogs".

In her 1984 paper, Bartsch proposes that every predicate is thematically weakly determined and involves dimensions (i.e. clusters of properties) in order to be contextually interpreted. As Bartsch illustrates, even a simple item like 'run' may apply to persons, dogs, machines, engines, bus, bus services, factories, supermarkets etc. In order to account for that Bartsch represent every predicate as a polysemic complex, that is, a pair consisting of a set of cluster sets (a set of contextual sets of properties), $\{J(P,c) \mid c \in C\}$, and a set of relations between contexts R (e.g. a metonymical relation: "apply P on a subpart of its argument in c, and interpret P along the set of properties $J(P,c_j)$"). So there is some typical context in which 'run' is interpreted along some set of dimensions (say, 'move', "on two feets" etc.), those that apply on persons. Whenever 'run' occurs in a context in which these dimensions can not apply to its argument (say, when predicating over dogs) then one searches another context in the polysemic complex of 'run' that has some relation with the current context and can be applied. (See very detailed examples in Bartsch's paper).
In her 1998's book, Bartsch adresses more complex issues with regard to concept formation and understanding.

1.4.3. Following Bartsch, Landman 1989 uses dimensions in the analysis of groups. E.g. if, say, some judge is on strike (or is well paid), and the same individual (say, John) happens to be the hangman too, it is still possible that the hangman isn't on strike or isn't paid well. Terms like 'the judge' denote only the aspect of John as a judge, that is represented in Landman 89 as, roughly, a partial set of John's properties. Landman 1989 uses this analysis to deal with group notions like 'committee'. For him a committee is a set of individuals with a property binding them together as an entity that is not the sum of its parts. He applies this analysis to several semantic puzzles . Again, dimensions are used by the semantics.

1.4.4. Lewis 1970,1979 analyses vague gradeable predicates like ‘tall’, ‘cold’ or ‘flat’, and comparative adjectives like ‘cooler’ or ‘taller’, or in general *more P than*. (Note that every predicate can fit in this construction; non scalar predicates need to be modified as in the expressions: *typical P* or *more of a typical P than)*. Lewis argues that the truth conditions of such items are highly context dependent. Whether it is true that individual d is bald (or tall, cool, flat, hexagonal, etc.) depends on where you draw the line. Relative to some very reasonable ways of drawing precise boundaries between ‘bald’ and ‘not- bald’ the statement is true. Relative to other reasonable delineations it is false. A sentence is simply true (or false) only if it is true (or false) relative to all delineations. Otherwise it is vague. Thus, Lewis argues that truth is relative to a context (i.e. time, place, and a possible world where a sentence is said). However contexts have countless features. So truth is also relative to an index which is an n tuple of features, which can shift one feature at a time. The truth of a sentence varies when certain features of context are shifted, one feature at a time.
E.g. “France is hexagonal” is true only under law standard of precision. It is true relative to a context and an index in which the truth of “Italy is a boot shape” is accepted, but false relative to a context and an index similar in all respects except that exact geometrical shapes are observed more carefully. A comparative like “d1 is cooler than d2” is true iff “d1 is cool” is true in more delineations than “d2 is cool”. Lewis 1979 points out also other phenomena, like the set of worlds that constitute a modal base, which is sensible to shifts of contextual features.
Lewis 1970 notes that everything can be a contextual feature, and only the ones shifted should be listed in an index.
Bartsch &Venneman 1972, and Kamp 1975, mention interpretation along dimensions (or contextual criteria) with regard to comparatives as well. Kamp 1975 argues that the shifts typicaly take place along contextual criteria (or dimensions), and in fact, usually dimensions that would naturally be regarded as part of the cluster of concepts in the other paradigm.

1.4.5. Lasersohn 1998 develops a model that represent pragmatic looseness, which is the possibility to interpret any predicate P in context c scalarly, such that even if P doesn't strictly apply to a certain argument x in c, 'P(x)' can be regarded true enough in c if it comes "close enough to the truth for all contextual practical purposes". Lasersohn associates with a predicate denotation a contextual "halo" that contains sets that differ from the actual denotation only in "pragmatically ignorable ways". Again, when you think about the relation between the denotation and the halo, you will find that this is mediated again by dimensions, properties in the cluster.

For instance, consider contexts of requests of socks to lend or discussions of preferences with regard to socks. If a wet sock is regarded as appropriate to lend, then a dry one certainly is, but not vice versa. Also other properties like 'new', "fit the weather", "has no holes" may be contextually associated with the ordering of socks to lend. Thus the stretching of a predicate like "socks to lend", from socks that the predicate truly applies to, to cases that are good enough, is mediated by scales that are constrained by dimensions, cluster properties.

The model I will develop here, will suggest to link contextual scales to ordering properties, and it explains how clusters of properties relate systematically to the ontology presupposed by semantic interpretations.

I.e. an item that is regarded as *more P* (or *more of a typical P*) than another item, satisfies more of P's stereotypical properties, i.e. these properties help determining the pairs of individuals in the denotation of *more P* (or *more of a typical P*).

Since the intension of the comparative *more P* is related to the intension of P in a systematic way, as argued by Lewis 1970,79, Kamp 1975, Landman 1991, and accepted here, a specification of "non- necessary" (or stereotypical) properties of a predicate has many implications regarding this predicate's instances. Those properties help identify new members and contextually typical or relevant members. As a result they also help make preferences between denotation members in choice contexts, help judge the degree of truth or approximation of the truth of statements involving this predicate etc. (See in chapter 4 and 5).

1.4.6. Items that take predicates as their arguments, like quantifiers, can access these sets of properties. Restrictions on quantifier domains and modals are mediated by context. While traditionally such context restriction is dealt with extensionally (by a context variable), some theories argue that this process must be mediated by a set of restricting properties. Kadmon and Landman 1989,93 assume this explicitely in the semantics of generics, and the modal base for conditionals, and they propose a theory of the meaning of *any* that crucially depends on this. The assumption that the grammar accesses an intension and a set of restricting properties has been made in the semantic literature in a variety of places. K&L 1989,93 argue that *any,* as discussed thoroughly in chapter 2, makes use of these sets of properties in its semantics, also in a unique way, i.e. in order to widen rather than to restrict.

1.4.7. The relevance of ordering and possibly also of properties that restrict the ordering comes up also in theories about adverbs like *very*, *absolutely*, *more or less*, *roughly* (Lasersohn 1998); *almost* and *barley* (Aldo Sevi 1998). K & L 1993 propose an account of the contrast between the felicitous expression *almost any owl* and the infelicitous expression *almost an owl,* by assuming that *almost* operates on a dimension. (See more on this in chapters 3 and 4).

1.4.8. To sum up, I argue that *any,* and all the other items that use the contextual sets of properties involved in the interpretation of predicates in order to determine the restriction of quantifiers or other operators, establish the need of a systematic representation of dimensions and hence of sets of properties. Rather than postulating separately a set of properties as the restriction on *any* (K & L 1989,93), a set to be used in cases of an explicite reference to dimensions along which weakly determined expressions are contextually interpreted (Bartsch 1984), a set of features (properties or propositions) to determine delineations of gradable predicates and comparatives (Lewis 1970,79), a set of postulates to determine which 'distorted' versions of the denotation are contextualy good enough to use (Lasersohn 1998), a representation of a prototype for predicates like 'table' and 'tiger' (Partee & Kamp 1995), a set of restrictions on conditionals, quantifiers, generics and other modals, adverbs etc, I will postulate that, in addition to intensions, also contextual clusters of restricting properties (which I call dimensions) are part of the basic interpretation of predicates, and that grammatical operations access in different constructions this very same set.

I will concentrate in this thesis mostly on how three items *a*, *any* and *every* use the dimensions in predicte contextual interpretations, and on comparatives and dimensions.

1.5. An integration of the notions of intension and contextual clusters of properties

I therefore suggest the following:

(1) Associate with every predicate P not just an intension, but also a cluster of predicates.

(2) Make this cluster of predicates part of the basic semantic interpretation of P.

This means that I propose to adapt in a way both intensions and clusters as the meaning of predicates. Grammar allows operations on both. This theory integrates the notion of a cluster of properties into the notion of intensions. This is what this thesis is about. I will argue that there are two kinds of relevant dimensions of predicates P:

(1) The necessary conditions to be regarded as P. I.e. the predicates whose denotations restrict $[P]^+$. I call these dimensions the membership dimensions of P. I discuss these in chapter 3.

(2) The stereotypical characteristics of P (the criteria for the ordering of $[P]^+$).
I call these dimensions the ordering dimensions of P. I discuss these in chapter 4.

1.6. More arguments for an integration of intensions and clusters of dimensions

The representation of partial information requires intensions and dimensions. The dimensions in a predicate interpretation ought to directly represent the fact that each and every contextual use of a predicate is restricted and influenced by the relations that are known to hold between predicates in that context. E.g. there is no absolute set of whales that is always a-priori referred to by a contextual use of that predicate. Contextual information determines whether the relevant objects are all the whales that ever existed, the set of whales that are alive now (the year 2001), or were alive last decade, the set of whales in a certain sea, nature reserve, or zoo, etc.

A sentence like "(the) whales are gray", "we feed the whales in the mornings", "every whale chooses a territory", "a whale suckles her offspring" is interpreted relative to contextual information, i.e to a contextually restricted set of relevant whales, and what is known about them. Hence, a property like "living in the north sea" or 'mammal' is not only a part of our world knowledge, but helps determining the relevant set of whales referred to by the predicate. A representation of those contextual restrictions is required in order to represent the actual denotation of 'whales' and the actual quantification domains in 'every whale' and 'a whale'.

If the properties, "living in the north- sea" or 'mammal', are regarded as contextual membership dimensions of 'whale', they are taken to be presupposed by 'whale' in the context. The last bit is important because I am not assuming that 'whale' presupposes its membership dimensions in every context. Hence, It doesn't follow that "whales are mammals" is a tautology.

Stipulating both the level of individuals (that are instances of a predicate) and the level of dimensions (the predicates that are obligatory or stereotypical characteristics of a predicate's instances) in predicate meanings is redundant only when one thinks of total information states. However, it is not redundant in the content of partial information states.

On the one hand, information regarding the dimension sets is not supplied by the information regarding the denotation. Thus, the individuals in $[\text{owl}]_c$ have lots of properties, but one can not deduce from this whether they are obligatory or not to all the denotation members. If all the known owls are healthy, it is not clear whether the dimension 'healthy' is obligatory or not for every potential member of 'owl'. In such a case, healthy creatures are unproblematic, but sick ones are borderline cases. One's confidence in judging an element as a member of the denotation of 'owl' reduces as its health reduces (it can be in a binary or a scalar manner).

On the other hand, information regarding the dimension sets doesn't supply information regarding the denotation. Thus, in some context one may know that the relevant owls ought to be, say, 'nocturnal', 'adult', 'male' owls, but the question whether an arbitrary nocturnal adult male owl is relevant in that context, may still be open if for instance it is not healthy.

Therefore, in a state of partial information one may have two kinds of information about each predicate, and they do not reduce to each other. On one hand one may know some property to be obligatory for (or stereotypical of) owls without knowing a single owl. On the other hand one may know that some individual is in the denotation of the predicate without knowing all the predicate's obligatory or non-obligatory propeties. Thus postulating the clusters of predicates denoting properties that are obligatory for or stereotypical of P instances, as a part of the basic interpretation of P (in addition to the intension), allows for a better representation of the actual content of the partial information a discourse participant may have regarding some predicate.

In the next chapter I make the case for *any* as an operator on predicate dimensions.

Chapter 2: *Any*'s meaning and licensing:

Any as an operator on the dimensions set in the interpretation of a predicate

2.1 Background

Ladusaw 1979 relates the distribution of NPIs (Negative Polarity Items) like *any* to DE (Downward Entailing) contexts. I.e. he claims that NPIs like *any* are licensed only if they are in the scope of a DE operator. For example, in (3)-(13), taken from Ladusaw 1979, *any* is licensed in examples like (a) and is not licensed in examples like (b):

(3)
a. I don't read any books.
b.* I am reading any books.
(4)
a. Every/no student who had ever read anything on phrenology attended the lectures.
b.* Some student who had ever read anything on phrenology attended the lectures.
(5)
a. No student who attended the lecture had ever read anything on phrenology.
b.* Every student who attended the lecture had ever read anything on phrenology.
(6)
a. At most three girls saw anything.
b.* At least three girls saw anything.
(7)
a. It's hard / not easy to find any squid at Safeway anymore.
b.* It's easy to find any squid at Safeway anymore.
(8)
a. He was against / not in favor of doing anything like that.
b.* He was in favor of doing anything like that.
(9)
a. He was ashamed / stupid / reluctant / surprised to see any more patients.
b.* He was glad / smart / anxious / sure to see any more patients.
(10)
a. He refused / forgot / is afraid to take any meat out of the freezer for dinner.
b.* He agreed / remembered / is eager to take any meat out of the freezer for dinner.

(11)

a. There <u>aren't</u> any unicorns in the garden.

b. * There are any unicorns in the garden.

(12)

a. The IRS <u>rarely</u> audits anyone.

b. * The IRS frequently audits anyone.

(13)

a. <u>Only</u> John ate any snails.

b.* John ate any snails.

Ladusaw defines DE operators as follows:

Operator O is DE iff: if y entails x then O(x) entails O(y).

Note that the notion of DE of an n-place operator is defined per argument, so that the general notion is of "operator O is DE on argument k".
E.g. 'run' entails 'move'. "At most three girls move" entails "at most three girls run" but "at least three girls move" doesn't entail "at least three girls run".
Hence "at most(X,Y)" is DE on its second argument whereas "at least(X,Y)" is not. Thus *any* is licensed in the second argument of "at most", but not in the second argument of "at least".
The same argument applies in the nominal argument of those determiners, the first argument. E.g. "three girls" entails "three persons". "At most three persons run" entails "at most three girls run" but "at least three persons run" doesn't entail "at least three girls run". Hence "at most(X,Y)" is DE on its first argument whereas "at least(X,Y)" is not. Thus *any* is licensed in the first argument of "at most", but not in the first argument of "at least".

Ladusaw's theory covers the facts pretty well, though there are some empirical problems (see Linebarger 1987 and Kadmon and Landman 1993 (K & L from now on) for discussion). More importantly for our purposes here is a theoretical problem discussed by K & L 1993. In Ladusaw's account there is no connection between the polarity sensitive *any* (PS *any*), i.e. *any* as it occurs in the examples above, and the free choice *any* (FC *any*) as in examples (14)-(18) below (from Ladusaw 1979):

(14) Any owl hunts mice.

(15) Just anyone won't do for this job.

(16) We saw any linguist who was at the party.

(17) John talks to anybody.

(18) Any student that we interviewed knew the answer.

According to Ladusaw, the interpretation of PS *any* is as an existential quantifier, whereas FC *any* is interpreted as a universal quantifier. K & L 1993 give good arguments in favor of a unified theory. One of them is the fact, already pointed out by Horn 1972 and Kamp 1973, that a similar duality is observed in the interpretation of other items in English. For instance *or* in FC contexts, as in (19a)-(19b), can be interpreted as a conjunction (choose whichever you like) just like *any's* universal interpretation in those FC contexts, as in (20a)-(20b) (K & L 1993).

(19).

a. Mary or Sue could tell you that.

b. I would dance with Mary or Sue.

(20)

a. Any lawyer could tell you that

b. I would dance with anybody.

Secondly, items with more or less parallel dual forms and distributions as *any* exist in various languages (for instance in Hindi).

These arguments make the fact that the two forms of *any* are realized in one lexical entry, seem more than a historical coincidence.

A second theoretical problem discussed by K&L is the following. Ladusaw's account predicts quite well *any'*s distribution, but does not explain it. Ladusaw's theory doesn't provide a rational for why *any* occurs in the contexts that it does. One has to show what there is in the meaning of *any* that fits into DE and FC contexts.

K & L 1993 modify Ladusaw's theory by an account which is formulated in terms of the semantics of *any* itself. They claim that *any*'s essential function is <u>widening</u> the interpretation of its complement NP along a contextual dimension. That is, *any* extensionally extends the NPs denotation. E.g. in (21) below *any* widens the set of the denotation of potatoes.

(21) I don't have *any* potatoes.

A contextual extension of 'potatoes' before widening may be restricted to, say, cooking potatoes. After widening it may contain also other kinds of potatoes. Consequently, K&L 1993, assume that the semantics of *any* involves two statements as in (22):

(22)
a. Before widening: I don't have (cooking) potatoes.
b. After widening: I don't have (cooking or non-cooking) potatoes.

Secondly, K&L claim that *any* is a semantic <u>intensifier</u>. This is where Ladusaw's observation about its distribution (i.e. in DE contexts) comes in. As an intensifier, *any* requires that the widening that it induces create a stronger statement. Strengthening is often interpreted as entailment (though not always, see K&L 1993). That is, *any* is licensed only if the statement on the wide interpretation entails the statement on the narrow interpretation. E.g. *any* is licensed in (21) because (22b), the result of widening the extension of 'potatoes', entails (22a) the meaning before widening.
(23) is a non downward entailing context. In such a context the widening doesn't induce strengthening. (24b) doesn't entail (24a). Therefore, *any* is not licensed.

(23) * I have any potatoes.
(24)
a. Before widening: I have (cooking) potatoes.
b. After widening: I have (cooking or non-cooking) potatoes.

K&L 1993, in the bulk of their paper, apply this theory to several cases, and show that it covers Ladusaw cases (because of the relation between DE and strengthening), as well as several problematic cases for Ladusaw (see in K&L for discussion).

In the second part of their paper, K&L extend their analysis of PS *any* to FC *any* (though they restrict themselves to the cases of generic FC *any* only).
K & L argue that PS *any* and FC *any* are essentially the same *any*, the NP is an indefinite NP, differing only in that, in the case of FC *any*, *any* occurs in the restriction of a generic operator. They discuss how the analysis of widening and strengthening makes the right predictions for generic *any*. This means that the analysis for licensing FC *any* is pretty much along the same lines as PS *any* in antecedents of conditionals and restrictions of universals. For example, consider (25):

(25) If John subscribes to any newspaper he gets well informed.

A DE account is problematic because it must rely on the problematic assumption that antecedents of conditionals are DE, which seem too strong. Such a principle is equivalent to the assumption that conditionals satisfy the principle of strengthening the antecedent, to which famous counter examples exist. However, K&L argue that whether or not antecedents of conditionals are generally DE, it seems that the more restricted inference pattern of strengthening (from an interpretation of the antecedent with a narrow interpretation of the noun modified by *any*, to an interpretation of the antecedent with a wide interpretation of the noun) doesn't have the intuitive invalidity that the general principle of DE has. So they provide a semantics in which the more restricted principle of strengthening is valid. Hence, whether or not antecedents of conditionals are generally DE, *any* is licensed.
E.g. *any* in (25) widens the interpretation of 'newspaper' and also weakens the restriction minimally so that it will not undo the effect of widening. The result is exemplified in (26).

(26)
a. Before widening:
If John subscribe to an (important) newspaper, he gets well informed. (Restriction: This is only about subscriptions to an (important) newspaper that, say, John can read).
b. After widening:
If John subscribe to a newspaper (whether important or not) he gets well informed. (Restriction: This is only about subscriptions to a newspaper (important or not) that John can read).

K&L propose the same analysis for FC *any* in the restriction of a generic quantifier. E.g. the analysis for example (14) repeated here is as given in (27):

(14) Any owl hunts mice.

(27) $\forall x \sim X_{owl}[Owl(x) \Rightarrow Hunts\ mice(x)]$.

X_{owl} is a contextually given set of properties which determine, roughly, what sort of owls example (14) is about (i.e. what counts as an owl in that specific context). The representation of K&L 93 says roughly: For every possible object, which has all the properties in X_{owl}, if it is an owl, it hunts mice.

Any, on this account, eliminates a predicate, 'healthy' for instance, out of X_{owl} and by that induces widening of the domain of the generic determiner. In order for the widening to occur, it has to be the case, of course, that the denotation of the predicate 'owl' itself is not restricted only to healthy owls. In contexts where we seem to restrict the denotation of 'owl' to healthy owls, we have to eliminate this restriction too, in order for widening to occur. K&L provide a mechanism to do this.

It is good to point out here that in practice there are interesting differences between the K&L analysis of PS *any* and of FC *any*, which they don't really discuss. The analysis of PS *any* is formulated in terms of an extensional notion of widening. I.e. the operation of widening refers in its formulation to the noun extension (i.e. the set of individuals that fall under it) or intension (i.e. the function that maps every world to the set of individuals falling under it).

But in the analysis of FC *any* the operation of widening is defined not just in terms of the noun extension or intension, but also a set of properties contextually associated with it. This set functions as a restriction on the generic quantifier, but is thought of as deriving from the noun's contextual interpretation. K & L do this in order to formulate a notion of dimension. Widening is along a relevant contextual dimension (e.g. 'health' in (14)), which in the case of FC *any* is formulated in terms of this set of properties (the contextual restriction of the generic quantifier).

As we shall see, I regard this as a good thing. But in K&L analysis this set of properties comes in an ad-hoc way. The main point of this thesis is going to be that these sets of properties are an integral part of noun meanings (hence, you shouldn't be surprised that K&L's widening operation refers to them), and that the semantic theory needs to make reference to them from the start, and not just as an ad-hoc side effect.
In this chapter I will give form to this general idea by arguing that:

a. The notion of widening needs to be formulated in terms of sets of properties from the start both in FC and PS *any*. I.e. the extensional account of it is inadequate.

b. Widening is not itself the fundamental notion in the semantics of *any*.

I argue for a more general operation. I assume that the semantics of *any* is to eliminate dimensional distinctions (following K&L proposal in the second part of the paper). I argue that eliminating dimensional distinctions (EDD) must crucially be formulated in terms of sets of properties (hence my earlier point). But eliminating doesn't always lead to widening. I discuss several cases in this chapter where EDD has different effects. I focus on two effects: homogenizing and clarifying. I will discuss several cases which are problematic for the K&L widening account, but can be successfully analyzed with EDD stated in terms of sets of properties, both for PS and FC *any* occurrences.
In the remainder of this chapter I make the case for the analysis of EDD for *any* (within a theory in which predicates are interpreted along sets of dimensions) and I show that it approves upon K&L's theory.

2.2. Problems for the K&L approach

2.2.1. Problems with the "widening" analysis

Problem 1: FC any in partitives

Partitives are a problem for K & L's analysis. FC *any* allows the noun phrase that *any* modifies to be partitive. But the partitive head presupposes a fixed quantificational domain. That means that *any* can not widen it as required by K & L. Yet *any* is licensed, as in (28) and (29):

(28) Just hand me any (one) of those ten bottles.

(29) Just hand me one of those ten bottles.

My claim is that since the number predicate ‘ten’ represents the amount of elements in the denotation of “(one) of those ten bottles”, no widening should occur. The natural interpretation of this request makes it quite clear that there is no specific bottle that is being requested. Nor one of five bottles, say. The denotation of the argument of the request is understood to include all ten bottles, with and without *any*. We see then that *any* is licensed though no widening occurs.

Any may be inserted here in order to assert that bottles that might have been considered <u>less</u> relevant are as relevant as the others in fact (for example very small or expensive ones). Yet claiming that some widening of the bottles denotation occurred, is not as natural as in the previous examples discussed, since it entails that one has literally uttered the exact number of bottles one referred to (‘ten’), where one was actually trying to refer to less than that number (say - five).

(Changing *any* to *anyone* in sentence (28) changes the meaning slightly. There is one clear intuition that with *anyone* only one bottle is requested whereas without *one* any number of bottles may be handed to the speaker. I should also note that some speakers don’t accept (or prefer less) these examples without *one*).

Example (28) is an imperative. Similar presuposition cases occur in statements though. Example (30) shows that inserting a number that represent the size of the denotation of *any’s* argument is impossible with FC *any*, since the generalization becomes non generic.

(30) A: I have ten hens in my farm. Each lay one egg every day.

B: Is it just the healthy ones?

A: *No, any of them.

A: No, all of them.

In this example, since the set’s size is known to be ten, a generalization with no exceptions is made. We would, thus, tend to use *all*, since it is a universal quantifier, rather than *any*, which, as a generic, gives space to exceptions.

On the other hand, examples like (31), (32) are perfectly fine:

(31) Any of the 50 videos in my store will please you.

(32) Any of those 10 discs was bought in NY /is sensible to temperature.

Problem 2: PS any in partitives.

Any in partitive in PS contexts seems to pattern with (31)-(32). *Any* is fine in all examples (33)-(36).

(33) I don't have/ don't like/ don't hear / rarely listen to any (one) of those ten c.d.'s.

(34) A: Some of my c.d.'s are dustier than others. But it is not because I listen to the clean ones more than the dusty ones. For instance, I don't listen to (any of) those ten c.d.'s at all though they are all quite clean.

(35) A: I see you have 50 c.d.'s. Some of them must be very good.

B: Yes, for example I have Abba. Did you listen to the Abba c.d.'s?

A: No. I studied. I didn't listen to (any (one) of) your c.d.'s.

(36) I didn't see any of the five children we met last week at the party.

There are cases of *any* in partitives in PS contexts, like example (38), that seems infelicitous out of the blue:

(37) I don't have any potatoes

(38) * I don't have any of those ten potatoes.

But (38) becomes felicituos in a suitable context, say, where the speaker and the addressee are involved in a rare hobby of collecting unique potato types. In more natural contexts this sentence is likely to be judged infelicitous, and that seems to be because of the lack of some specific properties for identifying each potato.
That rules out sentence (38) in contrast with (33)-(36) where each disc even in a very small predetermined set of discs, certainly has some specific identification of his own. This difference in felicity is therefore not semantic, but rather it is related to the specific predicates occurring in the statement. This suggests, then, that we need a theory in which the licensing and functioning of *any* is dependent on those predicates. The theory should also make reasonable the fact that *any* is rare and less likely to appear in non-generic statements of this sort than in the equivalent imperative form.

Let's see in more detail what K&L would have to say about those examples. Assume that widening did occur in contexts (31)-(38).

In (35) it is clear that there is no specific c.d. the discourse is about. It may be about the subset of good c.d.'s, or of Abba c.d.'s or all the 50 c.d.'s. But it is clear that the most natural interpretation for the denotation of "your c.d.'s" and thus probably also of "(one of) your c.d.'s" includes 50 elements.
In (34) one can assume that the clean compact discs are in the denotation of "those ten c.d.'s" only when *any* is used. But it makes the mentioning of the denotation size useless. It also means that the denotation was empty in the first place, because only dusty stuff can be part of it, and none of the compact discs is dusty. Thus it is hardly plausible that widening goes on. So K & L have a problem arguing that *any* is licensed in these contexts.

<u>Problem 3: Homogenizing the extension</u>: <u>an interpretation of *any* that can not be induced by widening.</u>
I believe that also in statements, though it is more rare, *any* can contribute to the meaning of the sentence even if no widening occurs. Even if the statement is already about the whole-predetermined denotation, independently of *any*'s functioning, by eliminating some contextual dimension (e.g. clean versus dusty, good versus bad, Abba versus not Abba) *any* contributes to the meaning. It adds the assertion that the dust, quality, or kind of music, is in no sense a cause or a measure for the frequency of listening. I rarely hear (or like) each of the discs regardless of whether it is, say – dusty, or not. This last bit is an essential part of the statement with *any*, and not of the statement *w*ithout *any*. This is a second possible and available interpretation for statements with *any*.

We see that even though widening doesn't occur, something is happening. What seems to happen is that, extensionally, the very same extension is made more homogenous in the following sense. <u>*Any* eliminates a dimension, which is not a necessary and sufficient condition for denotation membership, and hence its elimination doesn't induce widening. Yet this dimension orders the denotation in a scale as to the extent to which the elements are expected to fit the generalization or the request made in the sentence</u>. After the elimination, no element is expected to fit the generalization or the request less well just because it is less typical along that dimension. E.g. dusty or bad c.d.'s are expected to fit better the generalization "I don't listen to those c.d.'s" than clean or good ones, and good c.d.'s are expected to fit

better the request “hand me one of those c.d.’s”. After the use of *any* as an eliminator of these ordering dimensions, no c.d. is allowed to be an exception to this generalization or request just because it is dusty, bad or good.
I call this interpretation **homogenizing**, in contrast with **widening**. Thus, in some sense widening is going on, but not widening in K & L’s extensional sense. My proposal is that both widening and homogenizing can be seen as two possible effects of the more general phenomenon of elimination of dimensional distinctions (EDD), and I propose EDD replace widening in K&L theory. But that means that I need a theory in which homogenizing can be expressed.

I will now discuss some more evidence for the non- widening effect of *any,* described above as homogenizing.

Problem 4: *Any* sometimes conflicts with *especially*

K & L discuss the contrast between (39) and (40). They argue that this contrast shows that *any* as a ‘widener’ doesn’t allow exceptions along the eliminated dimension. The dimension to eliminate seems to be the first possible dimension supplied by the context. If this is the so then one can not explicitly introduce exceptions along this dimension with an exception phrase (“at least not…”) if *any* is there. E.g. the predicate Z in the phrase "at least not the Z" in the following cases:

(39) I didn’t listen to your c.d.’s; at least not the Abba ones.
(40) I didn’t listen to any of your c.d.’s; # at least not the Abba ones.

I would like to suggest another test that will demonstrate the other interpretation that I claim *any* can have. If *any* is interpreted as canceling any correlation between the eliminated dimension and the generalization or request asserted in the sentence in which it appears, also adding an *especially* phrase may sound odd with *any*. (If Z is claimed not to correlate with the generalization then claiming that "especially the Z" instances satisfy the generalization should be infelicitous). However, these intuitions are subtler, since there is always the possibility of interpreting the contribution of *any* as widening (even if in these contexts it may require some ‘correction’ as to the denotation size). My suggestion predicts the following.

When *any* is interpreted as a <u>homogenizer</u>, adding an *especially* phrase sounds odd, because the *any* statement is already too strong. It is used to assert the generalization to be especially true for elements of all kinds, regardless of that dimension, and not especially true just of some of them. (E.g. after the use of *any,* Abba and non Abba c.d.'s are regarded as equally relevant. The *any* statement doesn't fit the context if the generalization especially applies to just one of these subsets of the c.d.'s. None of them can be ignored, or treated less seriously if the generalization doesn't apply to it.)

However, when *any* is interpreted as a <u>widener</u>, it is predicted that adding an *especially* phrase would sound perfectly fine, because *any* is interpreted only as adding the assertion that the generalization is true for all elements without exceptions. Under this interpretation it claims nothing that conflicts with *especially*. (E.g. after the use of *any,* Abba and non- Abba c.d.'s are regarded as relevant, but Abba c.d.'s are still more relevant. The *any* statement perfectly fits the context if the generalization especially applies to just one of these subsets of the c.d.'s. The non- Abba c.d.'s can be regarded less seriously, if the generalization doesn't typically apply on them).

In fact, some informants noted the *especially* phrases to be systematically odd. They, thus, tend to interpret *any* as a homogenizer in addition to a widener. Their intuitions are represented in (41), (43), versus (42), (44), respectively:

(41) I rarely watch movies. Especially (not) long ones.
(42) I rarely watch any movies. # Especially (not) long ones.
(43) I rarely/ infrequently listen to my c.d.'s; Especially (not) the Abba ones.
(44) I rarely/ infrequently listen to <u>any</u> of my c.d.'s; # Especially (not) the Abba ones.

This sense, that the dust, quality, or kind of music, is in no sense a cause or a measure for the frequency of listening, and is in no correlation with it, can not be explained by simple widening. There is more that *any* does. It is as if *any* claims for the statement to be <u>definitely</u> true or highly accurate along some dimension. In no way "almost false".

Some of my informants find the *especially* phrase perfectly fine after *any* (e.g. in 42). Yet also these informants find the *especially* phrase odd in the following examples, where it was judged worse after sentences including *any* (e.g. (46)) than after those without *any* (e.g. (45)):

(45) Could you hand me one of those bottles? Try to make it a small one.
(46) Could you hand me any (one) of those bottles? # Try to make it a small one.

Those informants tend to interpret *any* as a widener rather than a homogenizer, at least in declaratives. But when *any* appears in imperatives, the homogenizing interpretation is available even for those speakers. One would not bother to use *any* if one prefers small bottles to big ones. This is, thus, a difference between the imperative and the declarative that needs an explanation. What is it in requests or choice contexts (take any of those bottles, pick any of those ten cards, buy any of those five jackets) that enables *any* to be effective enough even without widening, while in declaratives widening is much more natural?

We find related facts in (31)-(32):

(31) Any of the videos in my store will please you.
(32) Any of those (10) c.d.'s was bought in N.Y.

A natural interpretation for example (32) is like an imperative. Roughly: pick up any c.d. in this shop, if you want it to be bought in N.Y, your request will be satisfied. The domain in these examples is predetermined. In those cases the use of *any* calls for a homogenizing effect. This effect, in turn, may trigger an imperative-like interpretation.

To conclude the point of this section, note that, if the semantics of *any* amounts only to widening the extension of its complement, as argued by K&L 1993, then the fact that its occurrence in statements conflicts with the occurrence of an *especially* phrase can not be explained. As a widener, all that *any* contributes to the meaning is that the generalization in the statement it appears in is claimed to truly hold of a larger set of individuals, with no claim about extent or intensity (I.e. whether it "especially holds" or not). Since these interpretations exist, the semantics of *any* has to enable also some sort of homogenizing of the extension, besides widening.

(I would like to add that the speakers who normally have the widening interpretation more dominantly, at least in declaratives, sometimes claim that the use of *any* may even improve the acceptability of the *especially* phrase (i.e. they like (42) better than (41)). This is quite natural because using *any* to claim that the assertion holds with no exceptions helps to achieve a contrast: even though some elements are expected to fit the generalization while others are not, the generalization holds for all of them. Especially for those that it was expected to hold for in the first place. Without the presence of *any* this contrast is harder to achieve. Juxtaposing the statement and the *especially* phrase, where there is no contrast between them, is a bit superfluous and therefore slightly odd pragmatically).

<u>Problem 5: Sometimes widening is not captured.</u>

K & L note that when *any* is unstressed in (37) speakers don't feel much of a widening effect. They argue that the effect is nevertheless there, because it shows up also with unstressed *any* in the exception phrase test:

(37) I don't have any potatoes.

(47) I don't have any potatoes; # at least not cooking potatoes.

I think that speakers don't feel much of a widening effect when the context doesn't explicitly suggests a dimension to eliminate. Yet the *any* statement is still felt to be stronger than the statement without *any*. That may derive from the fact that in the presence of *any,* it is required that the whole denotation will satisfy the generalization as well as is normally expected mostly from typical (or relatively relevant) members of the denotation. (Without *any,* non- typical (or less relevant) members are more easily excused for being less good in satisfying the generalization).

If *any* cancels some scale of contextual relevance (or stereotypicality) forced on the denotation by some dimension, then no element fails to be regarded as typical just because it is atypical relative to that dimension. In that circumstance all elements have to satisfy the generalization better than in the circumstance where this dimension had reduced their typicality.

So also when the dimension is still unspecified, this general further requirement for the statement to be more highly accurate is still present. Thus some effect of *any* can still be captured, though not necessarily that of widening.

I do not give an explicit account for the case of homogenizing along a dimension Z, which is not yet specified in the context. However, my analysis doesn't put widening as the unique or necessary effect for the occurrence of *any*. Thus extending the analysis to this case is in principle possible.

Problem 6: *Any* in partitives with *exactly* and *only*

The problem with the widening analysis, stated above as the problem of *any* in partitives (cases in which the denotation size is predetermined by the context or by a number phrase) comes up also when *any's* argument is modified not only by a number phrase but also by the adverb *exactly*.

(48) I can easily recite any (one) of exactly 15 poems.

(49) A: I can/could cook any vegetable you like.

B: I can cook any of exactly three vegetables.

(50) A (regarding B's divorce): Well, he offered you all that he had, regardless of whether they were cheap or expensive.

B: He wasn't that generous. He offered me any (one) of exactly three of the things he had.

(51) you can use any (one) of exactly four types of vegetables for this soup.

In all cases (48) – (51) the size of the denotation is clearly predetermined. I believe that the contribution of *any* in these cases isn't necessarily widening the denotation. These examples illustrate again that the role of *any* can be limited to the elimination of some preferences of certain members of *any*'s argument's denotation over others.

In (48) the contribution of *any* to both A and B's statements lies in implicating that the speaker can recite easily all the relevant poems, regardless of whether they are long or short, famous or unknown or etc.

In (49) the speaker can cook one type of vegetables just as well as he can cook the other.

In (50) the non-generous person is described as still generous enough to offer the speaker each of the three things he got, without limiting her or manipulating her towards the choice of one of them and not the other.

In (51) the soup can be made of either one of the four types of ingredients, no matter which.

The point in these examples is that the elimination of the possible preferences of certain members of the denotation of *any'*s argument, is claimed to hold over a predetermined denotation, with a known size, that thus can not be further widened. The dimension *any* eliminates doesn't widen the denotation, but only cancels some order between the already determined denotation set members.

In the presence of *exactly* the *especially* phrases sound very odd with and without *any:*

(52) I can cook (any of) exactly three vegetables, # especially cabbage).

If I choose a scalar predicate, the sentence with *any,* interpreted as a homogenizer, is judged worse with *any* (more odd) than without *any*. The sentence with *any,* interpreted as a widener, is judged as better (less odd) than without *any*.

(53) I can cook well (any of) exactly three vegetables, (?#) especially cabbage.
(54) He wanted to offer me (any one of) exactly 3 things he had. (?#) Mainly his TV.

Only seems to be felicitous with *any* in these contexts too:

(55) A: I can cook any vegetable you like.
B: I can cook any one of <u>only three</u> vegetables.

I believe that the contribution of *any* in these cases too isn't necessarily widening the denotation, but making clear that for each of the elements, it holds that I can cook it just as well as the others, regardless of some contextual dimension that might have ordered the elements as to how suited they are for me cooking them.

Problem 7: *Any* without widening also in more typical examples

Also in other more typical examples of the use of *any*, the dimension to be eliminated by *any* isn't necessarily one that rules elements out of the argument denotation. It may be, as shown, a dimension that only orders the elements within the denotation into more or less preferred, relevant, normal or typical.

(56) A: Do you have some socks to lend me?
B: Yes. Do you prefer socks like those you usually wear?
A: No, any socks (you have) will do.

Unlike the previous examples, (56) is an example where the denotation size is not predetermined. It can be naturally interpreted as an example where *any* induced widening. Yet, even here both speakers do not assume that A's usual style of socks is a necessary condition for an element to be a sock in the context. *Any* eliminates the dimension of A's style of socks, but it might be that by so doing it doesn't (or not only) allow new socks to enter the denotation of "socks to lend" in the context. It might be that, for some elements already in the denotation of 'socks' in the context, it raises their status in the denotation as to how much they fit A's request.

Problem 8: Vagueness along the dimension to be eliminated: clarifying vs. widening

Sometimes the context doesn't encourage an interpretation that is restricted along the dimension later to be eliminated by *any* (as in the *exactly* cases). Sometimes in the context the meaning of the argument of *any* is just vague along that dimension (it is unknown whether it should or shouldn't restrict the denotation). The only effect induced by the use of *any* in that case might be eliminating the vagueness along that dimension. The denotation, which was not precise along a dimension, is made precise in the most tolerant way. For instance, in (28) the addressee may not know whether the speaker prefers big or small bottles, as illustrated in discourse (57):

(28) Just hand me any (one) of those ten bottles.
(57) A: Hand me a bottle.
B: A large one or a small one?
A: Just hand me any (one) of those ten bottles.

The denotation of ‘bottle’ is, possibly, but not necessarily, restricted to bottles of a certain size. There is vagueness along the dimensions ‘large’ and ‘small’ in the contextual interpretation of ‘bottle’. None of these predicates are specified as necessary for an item to be regarded a relevant bottle in the context, and none are specified as non-necessary. After the use of *any* the vagueness along the dimensions ‘large’ and ‘small’ in the contextual interpretation of ‘bottle’ is eliminated. *Any* cancels any possible restriction along these possible dimensions, i.e. they are specified as non- necessary conditions for an item to be regarded as a relevant bottle in the context.

The definition of strengthening should be one that captures the difference between the vague, possibly restricted and possibly tolerant, pre elimination statement and the precise tolerant post elimination one. I will call this effect of *any* **Clarifying**.

A theory of vagueness is required in order to formulate this effect.

2.2.2. Problems with the strengthening principle

Having discussed problems with the notion of widening let me turn to some problems for the K & L’s notion of strengthening.

K & L 1993 suggest that the licensing of *any* requires strengthening. Strengthening occurs when the post-dimensions-elimination interpretation entails the pre-elimination interpretation but not necessarily vice versa. K & L showed that this condition is necessary to explain the distribution of *any*.

Strengthening, which is related to DE (see K&L for discussion), is illustrated in examples (58)-(61):

(58) A: Do you read poetry books?

B: I don’t read any books.

(59)a. Pre elimination meaning: I don’t read poetry books.

b. Post elimination meaning: I don’t read books, novels, poetry or others.

Any is licensed in (58B) because (59b) entails (59a) and hence strengthens it.

(60) A: I love poetry. I am reading wonderful books.

B: * I am reading any books.

(61)a. Pre elimination meaning: I am reading poetry books.

b. Post elimination meaning: I am reading some kind of books, novels, poetry or others.

Any is not licensed in (60B) because (61b) doesn't entail (61a) and hence doesn't strengthen it.

K&L do not claim that strengthening is always captured by strict entailment. In some cases, as in (62), some statement strengthens another if their meaning together with other well established principles present in the context, guarantees strengthening.

(62)a. I am glad we got any tickets.

b. I am glad we got tickets.

K&L 1993 also do not claim that the same strengthening pattern that is valid for statements is valid in cases of other speech acts. In fact in the case of questions K&L 1989 propose not to define strengthening in terms of entailment, but in terms of a different informational relation. This notion is about requesting (rather than providing) more information. I.e. question A 'entails' question B iff when question B is already answered, question A is not necessarily answered. (For the precise details and justification see K&L 1989). This provides the valid strengthening pattern of (63b) by (63a):

(63)a. Does Sue have any potatoes?

b. Does Sue have potatoes?

<u>Problem 1: A strengthening constraint for imperatives</u>

K&L don't suggest an analysis for imperatives. One is tempted to generalize the notion suggested for questions such that it will hold for imperatives too. I.e. imperative A 'entails' imperative B iff when imperative B is already satisfied, imperative A is not necessarily satisfied. This may provide the valid strengthening pattern in (64b) relative to (64a), but it would not work for strengthening in (65b) relative to (65a):

(64)a. Don't hand me a bottle.

b. Don't hand me any bottle.

(65)a. Hand me a bottle.

b. Hand me any bottle.

So there is a general problem of defining the appropriate notion of strengthening for different speech acts. One would hope to come up with some <u>unified</u> theory (i.e. we don't want *any* to be sensitive to strengthening relations in different speech acts that have little in common. I will not adress this problem here (see a disscusion of polarity items in questions and imperatives in Krifka 1990, 1995).

<u>Problem 2: Strengthening without widening in imperatives</u>.
The strengthening definition should also cover the strengthening in (57):

(57) Person A cooks, and person B stands nearby. There are ten bottles on the shelf. Some are large, and some are small.

A: Could you hand me a bottle?

B: A large one, or a small one?

A: Just hand me any (one) of those ten bottles (or: any bottle from over there).

(66)
a. Pre elimination meaning: (size predicates are included in the set of predicates that limit the interpretation of *bottles.* These predicates are not treated as a necessary condition for being considered a bottle in that context, but as a characterization of the more typical or preferred bottle, in that context.) The speaker is understood to be <u>asking for a bottle that preferably has that size.</u>
b. Post elimination meaning: (The size predicates are eliminated, and thus it is claimed that they don't characterize the more typical or preferred bottle, in that context.)
The speaker is understood to be <u>asking for a bottle of either size, indifferently.</u>

In (65), put in the right context, we have the intuition that more bottles can satisfy the any-request in (65b) (e.g. for bottles of either size) than the request in (65a) (e.g. for big bottles). But in (57) the denotation size is predetermined. As in (65), an implicit dimension ('large' vs. 'small') can be at work, such that the pre-elimination request

concerns preferably big bottles. But since the denotation size is predetermined this request can not be interpreted as a request for big bottles only.
I.e. the crucial point is that the difference between the pre elimination request and the post elimination request doesn't ever make the set of events in which the first is satisfied different from the set of events in which the second is satisfied.
To put the problem in terms of the statements expressed in the imperative forms in (57): There is no truth conditional difference between the pre elimination statement and the post elimination statement, in the sense that if the first is true in the context of utterance, then the second is true too, and vice versa.
(I use the predicate 'true' for imperatives in the following sense. In a context where my actual request is for an apple the expression "hand me an orange" is false).

If the strengthening condition of K & L, extended to imperatives, is interpreted as "entailment of the pre elimination imperative by the post elimination imperative and not vice versa" it predicts that *any* isn't licensed in this case. That is, the entailment relation here is symetric, but the assumption that strengthening is asymetric is crucial for K & L's account. Otherwise they would predict that *any* is licensed anywhere (by zero widening).

Nevertheless, I believe that the post elimination request is intuitively understood as strengthening of the pre elimination request. It is the less expected request. One is ready to compromise on one's preferences in fewer states. I.e. one is committed to the idea that even atypical bottles fulfil his request just as well as typical bottles, in fewer states. In other words, the strengthening effect has to do with the intuition that we seem to have, that there are more cases that can satisfy the request for any bottle well than cases that can satisfy the request for preferably large bottles well. Thus, it is the ordering within the denotation (of "those ten bottles") that is affected, rather than the denotation itself.

If the ordering set (the set of dimensions that order all bottles in a scale) contains size predicates, some members of the denotation that don't have that size are regarded as less contextually typical (or less relevant). As such they are regarded as less preferred. They satisfy less well the request for bottles. Eliminating the size predicates from the

ordering set, by the use of *any*, makes these members contextually more typical bottles, and as such they satisfy better than before the request for bottles.
If in the context the predicate ‘bottle’ is vague with respect to size, the hearer is in an information state where he or she doesn’t know whether big or small bottles are better bottles, and thus preferred to the choice. After the use of *any* it is clearly the case that size doesn’t matter. *Any* implies that the size predicates are not in the ordering set. The predicate is no longer vague along the size dimension, and thus, about more bottles we can more definitely say that they satisfy the request for bottles well.

So <u>there is a difference between the post and pre elimination statements, despite the fact that in the context of utterance they are truth conditionally eqivalent</u> (as descriptions of the actual intended request). K & L’s theory can not capture such cases.

<u>Problem 3: Strengthening without widening in statements.</u>
The patterns discussed for imperatives above hold for statements as well.

(67) A: Do you have some socks to lend me?
B: No.
C: I don’t have <u>any</u> socks to lend.

B claims that he has got no socks to lend. C claims one of the following:

1. That he hasn't got socks at all (whether socks that are typically to lend, or not).
2. That he has socks, but none are such that he is willing to lend them (regardless whether he has socks one is typically willing to lend or not).

If typical socks to lend (say, dry ones) are found in B’s or C’s closet in context (67), one would be more likely to regard them as liars, unfriendly, less accommodating, more picky than if atypical socks were found (say, wet). That’s because the dimension ‘dry’ is a naturally available ordering dimension of the predicate “socks to lend”. This makes dry socks more typical members of that predicate denotation than wet ones. As such they are considered more seriously when evaluating B’s and C's answers.

If the exception is clearly an atypical member of ‘socks’ or of “socks to lend”, the assertion of not having a sock to lend is "almost right", and the speakers may even be considered willing to help. We feel that it is possible to raise only slightly the necessary demands for being a “sock to lend”, by adding the dimension of ‘dry’ to the contextual set of dimensions determining membership in the denotation. That would have the effect of excluding wet socks from the denotation of "socks to lend" or ‘socks’, and as such having them will represent no exception at all to B's statement.

However, if wet socks are found in B’s and C’s closet in context (67) C might be judged more of a liar, or less accommodating, than B. The reason, as before, is that the dimension ‘dry’ is associated with the predicate "socks to lend" (it helps ordering the socks on a scale of “fit to lend”). ‘Dry’ is eliminated by *any*. C’s claim, then, is that not even wet socks are found in his closet, or that no socks of his, dry or wet, are to lend. B did not claim that. He may claim to be “almost right” and very willing to help i.e. to be using “sock to lend” as meaning “typical sock to lend”. Having atypical sock to lend in his closet then is almost no evidence against him or against his willingness to help. In this case, wet socks that are in your closet, though being real atypical socks to lend, are still socks, and even socks you are capable of lending. Raising only slightly the demands for being a “sock to lend” would have the effect of excluding wet socks from the denotation of "socks to lend" and then B would be speaking the truth (and be considered quite friendly). This means that in this cass B is "almost right". He is just speaking sloppily, as we all normally do, and we don’t consider ourselves real liars by so doing, even when the statements we utter don't pass a strict logical truth test (for more elaboration on this point see Lasersohn 1998).
On the other hand, C is either not willing to accommodate at all (i.e. he is not willing to lend dry or wet socks even if he had ones), or if he is willing to help, he deliberately deviates from the truth, rather than be "almost right" as B. C deliberately claims not to have socks to lend, even if you regard wet and dry socks as equally typical socks to lend. If wet socks are regarded as typical denotation members they shouldn't be excluded from the denotation even after raising slightly the demands for being a “sock to lend”. Thus C’s statement is clearly false in case a wet sock is in his closet.

The elimination of the dimension ('dry') from the set of ordering dimensions of 'socks' or "socks to lend", homogenizes the domain of socks. More elements are typical examples of it. By that it strengthens the statement. The statement is stronger since the generalization it expresses is clearly claimed to apply also on the elements that have increased their typicality (the wet socks). That's why these elements, if found to be counterexamples, are considered more seriously than pre elimination.
So also here there is a difference between the post and pre elimination statements, despite the fact that the difference is not truth conditional (in the sense that if the first is true in the context of utterance, than the second is true in the context of utterance too, and vice versa).

I call these cases "scalar cases". They show that the notion of ordering dimensions is necessary not only for the explanation of examples like "any of those ten bottles" but also for a better analysis of the regular cases like "any socks".
The definition of strengthening one needs for the *any* sentence requires reformulation of the meaning of *any*, in terms of elimination of ordering dimensions. In the theory of partial information states developed in the next chapter, the difference between one information state and another shouldn't lie only in the wideness of some predicate denotation in the context of utterance. It could also lie in the amount of ordering on this predicate denotation in the context of utterance. So even in truth conditionally equivalent cases we can define an asymetric notion of strengthening by making it sensitive to other dimensions, in particular ordering dimensions.

2.3. Conclusions of chapter 2

I have discussed K & L 's theory of widening and strengthening. I argue that there is much to this theory and that in outline I am adapting it. But I am adapting it in spirit more than in detail. I have argued that there are serious problems both with their notion of widening and their notion of strengthening. I argue for an analysis of *any* as a dimensions-eliminator. I follow K & L's claim that *any* eliminates predicates (dimensions) that would otherwise limit the interpretation of the argument of *any*.
In order to accomodate the problems, I propose that (at least) two kinds of dimensions- sets are involved in the interpretation of predicates: a membership set (dimensions that determine membership in the denotation) and a stereotypical set (dimensions that order the denotation in a scale). The elimination of a dimension from

the set of dimensions that restrict the denotation in the context (the membership set) results in widening of the denotation along that dimension (as in K & L). However, as we have seen, widening does not always occur. Sometimes, from the beginning, the denotation is predetermined and the eliminated dimension doesn't restrict it. For example in "any of those ten bottles" the denotation is the ten bottles, and it may contain small and large bottles, even if *any* is used to eliminate 'small'. K & L's claim that *any*'s main effect is widening wouldn't explain intuitively *any*'s role in such examples. If we claim on the other hand, that *any* is predominantly a predicate eliminator, then widening is but one of several effects it may cause. Even if in most cases *any* has the effect of <u>widening of the denotation</u>, a slightly different effect of <u>homogenizing the denotation</u>, does take place in contexts like this. This effect is of canceling the relevance of a certain predicate to the choice. The predicates 'large' and 'small' don't <u>restrict</u> the denotation in the bottles example, but still might influence the choice. The speaker may reject the relevance of these properties to the choice. The use of *any* implies that size doesn't effect the chances of the bottle to fit the purposes of the speaker at all.

I therefore propose that *any* eliminate a predicate out of a set of predicates, which sometimes is a set of predicates that do not restrict the denotation but do some other relevant job. I call the set of the latter kind of dimensions, <u>the stereotypical (or ordering) set</u>. These dimensions do the job of ordering the elements already within the denotation on a scale of how well they fit the requirements for being a typical or expected instance of the predicate *any* modifies in that context.

<u>Chapter 3: Dimensions sets in Predicates interpretation</u>

In this chapter I define the notion "membership set", the set of dimensions determining the denotation of a predicate in a context.

I have to answer <u>the following questions</u>:
1. <u>What is "a dimension</u>"?
2. How is <u>a set of dimensions that determine membership in the denotation</u> (a membership set) of a predicate in a context defined?
- What is the relation that makes D (say "dry", "no holes", "made of cloth") be a membership dimension of a predicate P (say "socks to lend") in a context?
- What is the relation that prevents D (say "dry") from being a membership dimension of a predicate P (say "socks") in a context?
I.e. what does it mean for a predicate to be precise along a dimension?
What information should be encoded in the membership set, such that its lack induces vagueness?
3. How are sets of dimensions integrated in a model of partial information and vagueness? How should <u>the order of vagueness and strictness along dimensions</u> be represented?
In this chapter I propose answers to these questions.

In the second part of the chapter I review the advantages of an analysis that uses membership sets. I discuss the meaning of *any* as an eliminator of these dimensions. I also discuss the relevance of these dimension sets for other linguistic phenomena, such as facts about *almost* and about other universal quantifiers - *every* and generic *a* in comparison to *any* (from K&L 1993). I compare the suggested analysis to the analysis of K&L 1993.

<u>3.1 What is "a dimension"?</u>

I suggest that predicate meanings aren't represented directly as denotations (or functions from worlds to denotations), but normally there is a conceptual stage that guides the construction of the denotations. Moreover, I suggest that these guidelines have to be transparent and accessible. I.e. the dimensions, relative to which predicates are interpreted in a context, have to be explicitly represented in the interpretation of predicates in semantic models. If we associate with a predicate a set of predicates or properties then we can account for the fact that the grammar makes use of this set in a variety of constructions. For example, determiners, words like *any*, modifiers like *false* (as in "a false diamond") or *similar to*, seem to access such sets of dimensions and use them.

I therefore suggest that a predicate interpretation directly refers to the intension and to the set of predicates that are in some relevant relation with it (the predicate's dimensions), in a way that makes this dimension- set accessible to the semantic recursive interpretation of utterances containing the predicate.

On this chapter I will focus on what I call the membership dimensions of a predicate. I.e. the predicates that are potentially relevant for determining whether something is a member of the denotation of a predicate or not. From now on I will write P, Q, etc. for predicates, $[P]_c$, $[Q]_c$ etc. for denotations and $MS_{(P,c)}$, $MS_{(Q,c)}$ etc. for membership sets.

3.1.1. Partiality and monotonicity

We start with vagueness of membership. We assume that denotations of predicates in a normal context are partial denotations. That is, we associate with a predicate P in context c a positive denotation $[P]^+_c$, a negative denotation $[P]^-_c$, and a gap $[P]^?_c$.

If $[P]^+_c$ is the set of P instances, the rest of the individuals in the domain D are not necessarily non-P instances. Some may be borderline cases (elements of which there is not enough evidence to support neither "P" nor "not P"). Therefore also $[P]^-$ (the set of non-P instances) has to be represented. The gap consists of the elements in D that are neither in $[P]^+$ nor in $[P]^-$.

Partial denotations in vagueness models extend monotonically. I.e. if $[P]^+$ is the set of elements known in c to be P instances, then in any context that coherently extends c, they are known to be P instances as well. In the same way, the elements known in c to be "non P" instances are also known so in any context that coherently extends c.

I will assure that every partial state has some total information state that coherently extends it.

An **information structure** is a tuple $\mathbb{C}$ =<C, ≤ ,c_0 ,T ,D> where:

1. C is a set of information states (contexts)
2. ≤ is a partial order on C (in fact, a meet semi lattice)

3. c_0 is the minimum of C under $\leq$.

4. T is the set of maximal elements of C under $\leq$

5. Every context c in C has some maximal extension: $\forall c \in C, \exists t \in T: c \leq t$.

6. D is a domain of individuals.

A **partial information model** for a set of predicates PRED is a structure $<C, \leq, c_0, D, [\ ]_{PRED}^{+}, [\ ]_{PRED}^{-}>$ such that, $<C, \leq, c_0, T, D>$ is an information structure and $\forall P^n \in PRED$:

1. $[P^n]^{+}_{c0} = [P^n]^{-}_{c0} = \varnothing$ (minimal information state).
2. $\forall c \in C$: $([P]^{+} \cup [P]^{-}_{c} \subseteq D)$ & $([P]^{+}_{c} \cap [P]^{-}_{c} = \varnothing)$ (coherence).
3. $\forall c_1, c_2 \in C$ s.t. $(c_1 \leq c_2)$: $([P]^{+}_{c1} \subseteq [P]^{+}_{c2})$ & $([P]^{-}_{c1} \subseteq [P]^{-}_{c2})$ (monotonicity).
4. $\forall t \in T$: $[P^n]^{+}_{t} \cup [P^n]^{-}_{t} = D^n$ (totality).

Thus, I assume at the basis of the theory pretty much standard vagueness models (e.g. Kamp 1975, Fine 1975).

3.1.1.1. $MS^{+}_{(P,c)}$, the set of membership dimensions of P

Now we come to membership dimensions. In the same way (just as any predicate denotation in a partial information structure is actually a pair: $<[P^n]^{+}_{c}, [P^n]^{-}_{c}>$), also $MS_{(P,c)}$, the membership set for a predicate P in c, has to actually be a pair $< MS^{+}_{(P,c)}, MS^{-}_{(P,c)}>$. I will now characterize the two sets in this pair.

$MS^{+}_{(P,c)}$, the set of membership dimensions of P, contains the predicates that in c can be used to determine whether something falls under P. It is the set of predicates that in c are regarded as necessary conditions for ascribing P to an individual.

Definition: $MS^{+}_{(P,c)} = \{Q |\ \forall c_2 \geq c: [P]^{+}_{c2} \subseteq [Q]^{+}_{c2}\}$.

That is, in context c, if you have P in c, then you must also have Q in c.

$MS^{+}_{(P,c)}$ is the set of predicates whose denotations are known to always be supersets of $[P]^{+}$. The use of "always" is crucial here. That's where the notion of monotonicity comes in. $MS^{+}_{(P,c)}$ doesn't contain predicates whose denotations accidentally happened to be supersets of the denotation of P in c, but are not necessarily supersets of $[P]^+$ in other contexts that coherently extend c.

E.g. in a context discussing eating habits of owls, the predicates 'bird' and 'nocturnal' may be regarded as necessary conditions for ascribing 'owl' to an individual. If the discussion disregards young and sick birds' eating habits, also the predicates 'healthy' and 'adult' may be regarded as necessary in that context and all its extensions, even if they are not entailed by 'owl'. Young birds, then, can not be considered exceptions to any of the generalizations on owls made in c. The predicates 'bird', 'nocturnal', 'healthy' and 'adult' are then membership dimensions of P in c.

On the other hand, if all the owls in some partial context c are known to have an ink stain on their forehead, but there is a possible extension for c in which another element without an ink stain is discovered to be an owl, then "have an ink stain" is not an obligatory condition on membership in $[owl]^+_c$ but an accidental generalization that can be violated or refuted as information extends. Therefore "have an ink stain" is not a membership dimension of P in c.

In other words, the set $\{Q| [P]^+_c \subseteq [Q]^+_c\}$ is the set of predicates for which there is (possibly empirical or inductive) evidence in c that their contextual partial denotations are supersets of $[P]^+_c$. Only the subset $\{Q| \forall c_2 \geq c: [P]^+_{c2} \subseteq [Q]^+_{c2}\}$ stands for the predicates whose denotations are obligatorily (<u>always</u>) supersets of $[P]^+$. I.e. those predicates must be supersets of $[P]^+$, <u>by definition</u>. Those predicates, I propose, are the membership dimensions of P. By that, monotonicity of the dimensions set is achieved: $\forall c_1,c_2$: if $(c_1 \leq c_2)$ then $(MS^+_{(P,c1)} \subseteq MS^+_{(P,c2)})$.

<u>3.1.1.2. $MS^-_{(P,c)}$, the set of non- membership dimensions of P</u>

$MS^-_{(P,c)}$, the set of non- membership dimensions of P, contains the predicates that in c can not be used to determine whether something falls under P. It is the set of predicates Q that in c are regarded as <u>not providing necessary conditions</u> for ascribing P to an individual ($\{Q| \forall c_2 \geq c: [P]^+_{c2} \cap [Q]^-_{c2} \neq \emptyset\}$).

However, I propose that there is a further constraint on the predicates in $MS^-_{(P,c)}$: non triviality. I.e. the non- membership dimensions of P are those predicates that denote properties that are (using K&L's terminology) <u>non-trivial</u> on the denotation of P:

some member of $[P]^+$ has them and some member of $[P]^+$ doesn't have them. (This further constraint is justified later).

Definition: $MS^-_{(P,c1)} = \{Q | \forall c_2 \geq c_1: ([P]^+_{c2} \cap [Q]^-_{c2} \neq \emptyset) \& ([P]^+_{c2} \cap [Q]^+_{c2} \neq \emptyset)\}$.

That is, in context c, if you have P in c, it doesn't necessarily mean that you have Q in c. And also, if you have P in c, it doesn't necessarily mean that you have "not Q" in c. The information in c can not be extended coherently without Q (and "not Q") fail be obligatory condition on P instances. $MS^-_{(P,c)}$ is the set of predicates whose positive denotations and negative denotations are already known not to be supersets of $[P]^+$. Therefore also $MS^-_{(P,c)}$ extends monotonically.
It follows from the definitions so far that:
$\forall c$: $MS^+_{(P,c)} \cap MS^-_{(P,c)} = \emptyset$, and:
$\forall c_1,c_2$ s.t. $(c_1 \leq c_2)$: $(MS^+_{(P,c1)} \subseteq MS^+_{(P,c2)})$ and $(MS^-_{(P,c1)} \subseteq MS^-_{(P,c2)})$.

E.g. the predicate 'male' in some context c may be regarded as not providing a necessary condition for ascribing 'owl' to an individual. This is the case if some instance of $[owl]^+$ is known not to be a male. In c also "not male" may be regarded as not providing a necessary condition for ascribing 'owl' to an individual. This is the case if some instance of $[owl]^+$ is known to be a male. Then, 'male' (and "not male") denotes a non-trivial property on $[owl]^+$, and 'male' is therefore a non-membership dimension of 'owl'.

In the second part of the chapter, which is dedicated to the justification of the definition of $MS_{(P,c)}$, I present various empirical arguments in favor of adding this further constraint on the predicates in $MS^-_{(P,c)}$. I show data from K&L that demonstrates that it is this set of non trivial properties that is accessed and used by the operations denoted by various linguistic items, like *almost*, *any*, *every* and generic *a*.

In sum then: $MS_{(P,c)} = <MS^+_{(P,c)}, MS^-_{(P,c)}>$ where:
1. $MS^+_{(P,c)} = \{Q | \forall c_2 \geq c: [P]^+_{c2} \subseteq [Q]^+_{c2}\}$ (the set of <u>membership dimensions</u> of P).
2. $MS^-_{(P,c)} = \{Q | \forall c_2 \geq c: [P]^+_{c2} \cap [Q]^-_{c2} \neq \emptyset \& [P]^+_{c2} \cap [Q]^+_{c2} \neq \emptyset\}$ (the set of <u>non-membership</u> or <u>non-trivial</u> <u>dimensions</u> of P).

3.1.2. Dimensions are predicates in the object language

I assume that the items in the sets of the membership pair of any predicate P ($MS_{(P,c)}$), are themselves predicates of the object language, i.e. predicates applying to the same kind of entities as P. A predicate is called a dimension of P if it is a member in one of these sets. Any predicate, then, may be used either directly (and then it is contextually interpreted by a set of dimensions) or indirectly, as a contextual dimension in the interpretation of another predicate.

(Note, by the way, that the notion of a membership dimension is defined not only for one- place predicates but also for n- places predicates in general. If P has n places then every denotation member is an n tuple of individuals and therefore every dimension of P has n places too. A membership dimension of P^n is any predicate Q^n that always truly holds of any n-tuple argument on which P^n truly holds. I.e. Q^n is an obligatory condition on the members of the denotation $[P^n]^+$).

3.1.3. Dimensions are not more basic than the predicates they are dimensions of

In the past, people suggested theories in which there are two kinds of concepts or properties. Some are basic or primitive properties and some are not. All the non - primitive concepts or properties are constructed from the basic ones.

A theory of predicates interpretations along dimensions could treat dimensions as such basic properties (or predicates denoting them). However, there are very good arguments to reject the assumption that dimensions are more basic predicates than the predicates that they interpret. The major argument (see more in Fodor & Al 1980) is that “primitive predicates” in the interpretation of “non-primitive predicates” are sometimes very complicated and involve items we wouldn’t necessarily want to call ‘primitives’.

E.g. take the meaning of “sing a song”. It may have agentive entailments like “be a sentient being capable of controlling its vocal chords so as to intentionally produce notes on a recognized scale”, and, as is well known, it is pretty difficult to be the latter. This complex predicate is a perfectly reasonable characterizing dimension of “sing a song”, though there is no ground to the assumption that it is less complex than “sing a song” itself.

I therefore assume that a dimension can be just any predicate in the object language.

3.1.4. Dimensions are contextually accessible predicates

Actually, the required constraints for membership and non-membership dimensions have to be stricter than required above. I.e.:

$MS^{+}_{(P,c)} \subseteq \{Q | \forall c_2 \geq c: [P]^{+}_{c2} \subseteq [Q]^{+}_{c2}\}$.

$MS^{-}_{(P,c)} \subseteq \{Q | \forall c_2 \geq c: [P]^{+}_{c2} \cap [Q]^{-}_{c2} \neq \emptyset \ \& \ [P]^{+}_{c2} \cap [Q]^{+}_{c2} \neq \emptyset\}$.

That is, the set of membership dimensions is a subset of the set of possible membership dimensions. It is the subset that contains only those predicates that are active in speakers' minds in a context, and only those predicates that are relevant to the contextual semantic definition of the predicate in that context.

There are infinitely many possible predicates in the object language. Language enables one to construct infinitely many predicates (Like "being the man in Ben Yehuda Street who jumped three times", "being the man in Ben Yehuda Street who jumped four times" etc. or "not P", "not not not P" etc.). However, one is not always aware of every possible distinction, concept, or property denoted by some of the possible predicates in the language.

The accessible predicates are those that one does hold in mind in a context, the predicates that are active (i.e. that play some role) in a context. I call this set 'A'.

The closure of A, A*, is the set of all predicates that can be generated from the set A by the linguistic operations (*not*, *and*, *or*, *if - then* and so on).

E.g. if 'white' and 'cold' are active in c (are members in A) then "not white", "white and cold", "if cold then white or cold" etc. can be activated too (are members in A*).

The predicates in A are those that receive a 'primitive' interpretation, i.e. those predicates to which the interpretation function associates a denotations pair (a positive and a negative one) and a dimensions sets pair:

$\forall P \in A, \forall c \in C: I_{(P,c)} = \langle [P]^{+}_{c}, [P]^{-}_{c}, MS^{+}_{(P,c)}, MS^{-}_{(P,c)} \rangle$.

Dimensions of predicates are predicates in A*: $\forall P \in A: MS^{+}_{(P,c)}, MS^{-}_{(P,c)} \subseteq A^*$.

'A' is not necessarily the most minimal set generating A*. 'A' may contain synonyms, negations of its members and so on.

A context can only be claimed to be <u>completely specified</u> (or an information state totally precise) <u>relative to a defined finite set of predicates (A) and of individuals (D)</u>. It is always possible to add more fine- grained distinctions, by treating more subparts (or more sets) of the contextual entities as entities in their own right, or by characterizing entities using more out of the infinite set of possible predicates.
It is also always possible to characterize predicate meanings using more out of the infinite set of possible predicates as dimensions. Preciseness is therefore a relative notion: <u>precise relative to</u> the domain of contextually accessible individuals D and the domain of contextually accessible predicates A.

Therefore I redefine $MS_{(P,c)}$ as the pair $<MS^+_{(P,c)}, MS^-_{(P,c)}>$ where:
1. $MS^+_{(P,c)} = \{Q | Q \in \underline{A^*} \ \& \ \forall c_2 \geq c: [P]^+_{c2} \subseteq [Q]^+_{c2} \}$.
2. $MS^-_{(P,c)} = \{Q | Q \in \underline{A^*} \ \& \ \forall c_2 \geq c: ([P]^+_{c2} \cap [Q]^-_{c2} \neq \emptyset) \ \& \ ([P]^+_{c2} \cap [Q]^+_{c2} \neq \emptyset) \}$
3. A dimension sets pair of a predicate is contextually partial as long as for some predicate in A*, the closure of A, <u>neither</u> itself <u>nor</u> its negation is specified in any of the two sets in the pair.

$\forall P \in A$: $MS_{(P,c)}$ is <u>totally precise relative to A</u> iff:
$\forall Q \in A^*: Q \in MS^+_{(P,c)}$, or $\neg Q \in MS^+_{(P,c)}$, or $\neg Q, Q \in MS^-_{(P,c)}$.
(Where $\forall P,Z \in A^*: Z = \neg P$ iff $\forall s: [Z]^+_s = [P]^-_s \ \& \ [P]^+_s = [Z]^-_s$).

Therefore, we can distinguish between two notions: <u>completion</u> and <u>refinement</u>.
A context c is <u>totally complete relative to A</u> (or is <u>a total extension in M</u>) iff:
$\forall P \in A$: $MS_{(P,c)}$ is totally precise relative to A, and P has no gap: $[P]_c \cup [\text{not } P]_c = D$ (every individual in D is an instance of P or of not-P).

<u>The relation of information completion relative to A</u>, $\leq_A \subseteq C \times C$, is the relation between every two contexts $c_1, c_2 \in C$, such that the information in c_2 is <u>at least as complete</u> as the information c_1, relative to the set A of accessible predicates (and the set D of individuals).
I.e. $\forall c_1, c_2$: $(c_1 \leq_A c_2)$ iff: $([P]^+_{c1} \subseteq [P]^+_{c2}) \ \& \ ([P]^-_{c1} \subseteq [P]^-_{c2}) \ \&$
$$(MS^+_{(P,c1)} \subseteq MS^+_{(P,c2)}) \ \& \ (MS^-_{(P,c1)} \subseteq MS^-_{(P,c2)}).$$

For every superset A_2 of A ($A \subseteq A_2$) there is a relation $\geq_{A2}$ that is <u>a refinement</u> of $\geq_A$. Two contexts c_1, c_2 can be equally complete relative to A ($c_1 =_A c_2$), and even totally complete relative to A, but still be partial relative to A_2 and be in the relation of “more complete relative to A_2” ($c_1 >_{A2} c_2$).
This is the case, for instance, if two contexts c_1 and c_2 are equal in all respects except to the specification of some predicate $Q \in (A_2 - A)$ in some membership pair.
(I.e. $Q \in (MS^+_{(P,c2)} \cup MS^-_{(P,c2)})$ and $Q \notin (MS^+_{(P,c1)} \cup MS^-_{(P,c1)})$.

E.g. in some context c, a discussion about bachelors can take place and c can be considered to be a context of totally complete information, without the predicate “is the pope” ever raise and play a role in it. Context c is complete relative to some set of accessible predicates A that doesn’t contain the predicate “is the pope”. Context c is not complete relative to A∪{“is the pope”}.
Some extension c_2 of c may differ from c solely by “is not the pope” being a membership dimension in $MS^+_{(bachelor,c2)}$ without it being specified in $MS_{(bachelor,c)}$.
Some extension c_3 of c may differ from c solely by “is not the pope” being a non-membership dimension in $MS^-_{(bachelor,c3)}$ without it being specified in $MS_{(bachelor,c)}$.
If the pope violates some generalization regarding bachelors (which is probably the case), he constitutes an exception that refutes that generalization in c_3, but not in c_2.
The information in c (if in c it is also the case that the pope is in the gap of the denotation) is not enough to determine the status of the generalization.
The pope may also be simply irrelevant to the discussion in c. He may not be an item in D, or there may not be an accessible property that distinguishes a pope from every other bachelor (say, the property “is the pope”). Thus a context c may be considered complete enough, and the status of generalizations over bachelors may be clearly determined relative to c, without the property of being the pope be in A^* or the properties of the pope be determined.

<u>3.1.5. Which are the predicates in A?</u>

Those dimensions that guide one in constructing the denotation of a predicate, may denote properties of any kind of sensual or conceptual input that is accessible to one’s cognitive system (for example the color, smell, contour, scientific definition, etc. of this predicate’s instances). Which of those characteristics eventually end up in the dimensions-set of a predicate P is a question of contextual relevance. Those characteristics that actually guide us in a given context are in the membership set of P in that context. That is, they can be accessible for the process of semantic interpretations of utterances containing P.

For example, a predicate like 'Bottle' has a different denotation in different contexts. How is the denotation determined in a context? One way is by pointing at the relevant set of individuals. Another way is by supplying means of identifying that set of individuals when needed, i.e. a set of predicates that identify those individuals. The set of predicates associated with the predicate 'bottle' ($MS^{+}_{(bottle,c)}$) is based on our knowledge of the term and of the world and on contextual information.
So in some context c, $MS^{+}_{(bottle,c)}$ may contain predicates like: "is a container", "is open at the top", "is made of glass", "has the coca-cola logo on it" etc. This means that for each of these predicates Z, $[bottle]^{+}_{c} \subseteq [Z]^{+}_{c}$ (and also in every extension c_2 of c $[bottle]^{+}_{c2} \subseteq [Z]^{+}_{c2}$). I.e. in this context c every bottle is a coca cola bottle. MS doesn't distinguish general bottle properties from contextual restriction assumptions.

That is, the membership set of dimensions may denote two kinds of properties:
1. General characteristic properties of the kind one would expect to find in a dictionary definition (those that normally are <u>expressed in meaning postulates</u>.)
For example "has a bottle neck" and "made of a firm material" as a dimension for the predicate 'bottle', or 'child' and 'masculine' as dimensions for the predicate 'boy'. (Also this kind of properties may serve as dimensions, be eliminated by *any*, or be ignored in certain uses of the words 'bottle' or 'boy'. The advantage of representing them as a part of the meaning of the predicate rather than in meaning postulates is their accessibility in the interpretation of utterances containing those predicates. Semantic operations as those denoted by *any* or *almost* can trace them and use them, as is demonstrated later).
2. Properties that represent contextual episodic restrictions. Those may vary between contexts. They are normally represented <u>only in an ad hoc manner</u>, if at all, (only when required for the analysis of some linguistic item).
For example the dimension "of coke" for the predicate 'bottle' in context (68):

(68) (In this context, except for bottles of coke there are also bottles of some cleaning material on the kitchen table):
A: put the cheese and the bottles in the refrigerator.

Bottles or drinks served in a kindergarten party are not equal to bottles that are typically served in a cocktail party or in a party of AA or in advertisements of cleaning materials. The sets of dimensions, then, vary from one context to another.

Naturally, some predicates may be more prominent than other members of their equivalence class in a given context. For instance if "of coke" is a membership dimension of 'bottle' in c, an equivalent predicate as "not not of coke" is going to denote a superset of $[\text{bottle}]^{+}_{c}$ in c and every coherent extension of c. A whole class of synonyms of "of coke" can be generated and in every total information context t coherently extending c all of them are going to be in $MS^{+}_{(\text{bottle},t)}$ and not in $MS^{-}_{(\text{bottle},t)}$. But it is possible that only one of them is in $MS^{+}_{(\text{bottle},c)}$. The one that was most prominent in c, and was thus made part of the partial definition of P.
The same for $MS^{-}_{(\text{bottle},c)}$.

Different speakers may hold in mind different sets (sometimes not even equivalent sets, if they are not equally informed).
One may also hold in mind different alternative versions of a dimension set, differing for instance in the precision standard (more and less restricting sets). In those cases the predicate is of course ambiguous (see Bartsch 1984 for detailed examples of the polysemic nature of predicates, and their analysis with dimensions of predicates).

<u>3.1.6. Dimensions sets are arbitrarily given subsets of the set of relevant predicates</u>
The definitions should be even more refined, in the following sense. It is possible that all the bottles in some context are a bit dirty, or stained (and it is possible that some are stained and some are not), but this property is not intended to be a part of the relevant semantic definition of 'bottle' in that context. 'Dirty' will therefore be in $MS^{+}_{(\text{bottle},t)}$ (or $MS^{-}_{(\text{bottle},t)}$ respectively) in every total extension t of c, but not in c itself. $MS^{+}_{(\text{bottle},c)}$ represents only the arbitrary subset of predicates that are in fact given as membership dimensions (i.e. as obligatory conditions for bottles) in that context c (and the same for $MS^{-}_{(\text{bottle},c)}$).

This distinction (between predicates that are already bottle dimensions in c and predicates that are bottle dimensions only in every total extension of c), is worth mentioning because it clarifies the fact that in a given partial information context, $MS^{+}_{(P,c)}$ may consist of any arbitrary set of predicates (that satisfy certain constraints) just as much as $[P]^{+}_{c}$ may consist of any arbitrary given set of individuals (that satisfy certain constraints). Once such a set is given, further information can be indirectly deduced from it.

Given a set of predicates A and an information structure $C_A = <C, \leq_A, c_0, T, D>$, <u>an interpretation function</u> $I_{A(P,c)}$ for A in C is a function which maps every predicate P in A and every context c in C onto a tuple $<[P]^{+}_{c}, [P]^{-}_{c}, MS^{+}_{(P,c)}, MS^{-}_{(P,c)}>$ such that $MS^{+}_{(P,c)}, MS^{-}_{(P,c)} \subseteq A^*$ and $[P]^{+}_{c}, [P]^{-}_{c} \subseteq D$.

The constraints put by the predicates in $MS_{(P,c)}$ on the individuals in $[P]_c$ (and vice versa) are specified separately, in <u>the interpretation constraint</u>, IC, that every context c in C must satisfy.

A context c in C satisfies <u>the interpretation constraint</u>, IC(c), iff $\forall P \in A$:

1. $\forall Q \in MS^{+}_{(P,c)}$: $\forall c_2 \geq c$: $([P]^{+}_{c2} \subseteq [Q]^{+}_{c2})$.
2. $\forall Q \in MS^{-}_{(P,c)}$: $\forall c_2 \geq c$: $([P]^{+}_{c2} \cap [Q]^{-}_{c2} \neq \emptyset)$ & $([P]^{+}_{c2} \cap [Q]^{+}_{c2} \neq \emptyset)$.

That is, a context c is coherent only if the interpretation constraint is not violated, i.e. iff it contains no contradicting requirements. That is, iff MS associates with any predicate P only membership dimensions for which their denotations stand in the right relation with the denotation of P (i.e. superset-subset). And also those predicates that are specified as non-membership dimensions stand in the right relation with P, i.e. are non- trivial on $[P]^{+}$.

Thus the dimensions sets and the denotations are arbitrarily given in c.

$MS^{+}_{(P,c)} \subseteq \{Q | Q \in A^* \text{ \& } \forall c_2 \geq c: [P]^{+}_{c2} \subseteq [Q]^{+}_{c2}\}$.

$MS^{-}_{(P,c)} \subseteq \{Q | Q \in A^* \text{ \& } \forall c_2 \geq c: ([P]^{+}_{c2} \cap [Q]^{-}_{c2} \neq \emptyset) \text{ \& } ([P]^{+}_{c2} \cap [Q]^{+}_{c2} \neq \emptyset\}$.

The interpretation constraint guarantees that no predicate P could have some predicate Q specified as a membership dimension in a context, if "not Q" (rather than Q) applies to some denotation member d, or if an equivalent predicate "not not Q" is specified as a non-membership dimension of P, etc. It is also this constraint that guaranties that all predicates interpretations in a context are compatible.

In this way, we can distinguish between directly given characteristics of a predicate (properties for which it is presupposed by the use of the predicate that they are its dimensions in the context of utterance) and indirectly derived characteristics of a predicate (properties for which other facts make it necessary that they end up as dimensions of that predicate in the context of utterance).
E.g., in the context given in (68), a predicate like 'of cold drink' or 'of coke' is presupposed to be necessary for a bottle to be relevant. It is formally represented by the specification of one of these predicates in $MS_{(c,bottle)}$. A bottle of some cleaning material is therefore understood to be irrelevant for the request "to put the bottles in the fridge". In other words, the predicate 'bottle' requires <u>by its definition</u> in c that individuals be excluded from the denotation solely because they are not bottles of cold drink. This represents a definitional requirement from which follow certain facts in the world.
In another context, there may be no such definitional requirements, but some facts may make necessary that these predicates end up as necessary for bottles. E.g. in a context of uttering a request to "move the bottles to another room", neither "of cold drink" nor "of coke" are necessarily presupposed to be necessary for bottles. However, it might be that, by coincidence, its true that all the things that may turn out to be relevant bottles satisfy these properties. No bottle is of cleaning materials. Thus, "of cold drink" or "of coke" are not in $MS_{(c,bottle)}$ but they end up in $MS_{(t,bottle)}$ in every total extension t of c. We can now distinguish two contexts c_1 and c_2 that are the same in all respects except that for c_2 'of cold drink' is not in $MS^+_{(bottle,c2)}$, while for c_1 it is.

It may also be coincidentally the case that the bottles in c_2 are sometimes of coke and sometimes not, from some reason or another, irrelevant for the partial meaning of 'bottle' in c. From the specification of these individuals in $[bottle]^+_{c2}$, it indirectly follows that the predicates 'of coke' and 'not of coke' are in $MS^-_{(bottle,t2)}$ in every total extension t_2 of c_2. This represents a fact in the world and not a definitional requirement. We can now represent this, by not specifying the predicate 'of coke' in $MS^-_{(bottle,c2)}$.

3.1.7. Semantics with vagueness

Like vagueness models (e.g. Kripke 1965 (see in Landman 1991), Van Fraassen 1969, Fine 1975, Veltman 1984, Landman 1986,90,91) the dimensions model incorporates the distinction between direct information and indirect information.

Direct information about the denotation of a predicate P is the data given by pointing which is represented by the interpretation of P, given by $I_{(P,c)}$.

Indirect information about the denotation of P is the data that can be inferred on the basis of that direct information: the intersection of all possible precise denotations in states extending c. Thus, for every predicate P, context c, and expression α:

1. $[P]_c = \cap\{[P]^+_t | t \in T \;\&\; t \geq c\}$

   $[P(\alpha)]_c = 1$ iff $[\alpha]_c \in [P]_c$

An element d is (possibly indirectly) known as a clear case of P in c iff: d is a member in $[P]_c$, the intersection of all the total positive denotations of P (i.e. of all the sets that relative to the information in c can still be discovered as the total denotations of P). $[P]_c$ may be regarded as the indirectly extended positive denotation of P in c.

2. $[\neg P]_c = \cap\{[P]^-_t | t \in T \;\&\; t \geq c\} = D - \cup\{[P]^+_t | t \in T \;\&\; t \geq c\}$.

   $[P(\alpha)]_c = 0$ iff $[\alpha]_c \in [\neg P]_c$

An element d is (possibly indirectly) known as a clear case of "not P" i.e. a member in the indirectly extended negative denotation of P in c, iff: it is a member of the positive denotation of P relative to no precisifications.

3. $[P]^?_c = \{d | \exists t_1, t_2 \in T \;\&\; t_1 \geq c \;\&\; t_2 \geq c: d \in [P]^+_{t1} \;\&\; d \notin [P]^+_{t2}\}$.

   $[P(\alpha)]_c =$ undetermined iff $[\alpha]_c \in [P]^?_c$

An element is a borderline case of a predicate P, i.e. a member in the indirectly reduced gap of P in c, $[P]^?_c$, iff: if only in a proper subset of the precisifications of c it is in the positive denotation of P.

For example consider an element d which is known to have some property denoted by a predicate Q for which it is still open whether Q, or its negation "not Q", is a membership dimensions of P in c or not ($Q, \neg Q \notin MS^{+}_{(P,c)} \cup MS^{-}_{(P,c)}$), and d is not given by pointing as a P instance (d is not in $[P]^{+}_{c}$). This element d is only in the denotations corresponding to a proper subset of the precisifications of c, where it is not the case that "not Q" is a membership dimension ($\neg Q \notin MS^{+}_{(P,c)}$).

Note that there is a difference now between <u>a gap member</u> and an instance that is <u>not directly known to be a P instance</u>. An element can be in $[P]^{+}_{c}$ (the denotation given by pointing in c) if it is directly known as a P instance, or be only in the indirectly extended positive denotation $[P]_{c}$, if it is only indirectly known as a P instance.
An element is in the (indirectly reduced) gap of P, $[P]^{?}_{c}$, only if it is <u>impossible</u> to determine, whether directly or not, that it is a P instance. I.e. only if there is at least one coherent extension of the information in c in which it is a P instance and at least one coherent extension of the information in c in which it is not a P instance.
An element can not be in the (indirectly reduced) gap of P in c and also be in the denotation of P in every total extension of c (be indirectly known as a P instance).

A denotation is <u>precise</u> or <u>complete</u> iff there are no gap members:
$[P]_{c}$ <u>is precise</u> (has no vagueness) iff $\forall t \geq c$: $[P]^{+}_{t} = [P]_{c}$.
(I.e. iff $\{[P]^{+}_{t} | t \in T \ \& \ t \geq c\} = \{[P]_{c}\}$).
$[P]_{c}$ is <u>vague</u> otherwise.

In conclusion, one accesses a positive denotation member either by direct pointing or by some calculation using the information in MS, and in the directly given denotations (i.e. all the information the interpretation of P makes access to).
Some individuals are not known directly to be P instances (i.e. are not in $[P]^{+}$), but they have all the obligatory dimensions on P and there is no way to add obligatory dimensions that they would violate. This is the case if for instance on each unspecified dimension they are similar enough to some individual that is already a P instance by pointing (i.e. is in $[P]^{+}$). Thus they can't have a property that as information extends will be figured out to rule out members of the denotation.

These individuals are in the indirectly extended positive denotation, though they are not P instances by pointing ($[P]^+_c \subseteq [P]_c$).
Since sometimes information extends by enlarging the sets of dimensions characterizing a predicate, rather than by pointing at specific members, the denotation then can only be calculated using the dimensions sets as shown. Even in contexts in which the positive denotations of all predicates are empty, the information in the dimensions-sets can play an important role. It restricts the possible extensions of the denotations. E.g. if in every state "not red" is in $MS^+_{(pink,c)}$ then the denotation of "red and pink" is always empty. Only in total states one knows all the members of the denotation by pointing and the information in the sets of dimensions characterizing them is redundant. But contexts are rarely total (or directly total).

Now that indirectly extended denotations have been presented, I have to impose the membership constraints on them as well, rather than only on the directly given denotations. I.e. the interpretation constraint, should make sure that every P instance, directly and indirectly given, satisfies the necessary conditions of P (the demands in the membership dimensions sets).
$\forall c$: c satisfies the interpretation constraint (IC(c)) iff:
$\forall P \in A$: 1. $\forall Q \in MS^+_{(P,c)}$: $\forall c_2 \geq c$: $[P]_{c2} \subseteq [Q]_{c2}$ }.
2. $\forall Q \in MS^-_{(P,c)}$: $\forall c_2 \geq c$: $([P]_{c2} \cap [Q]_{c2} \neq \emptyset)$ & $([P]_{c2} \cap [\neg Q]_{c2} \neq \emptyset)$}

3.1.8. The membership dimension sets model:

We have now built up the whole membership dimensions model. I have suggested the following formulations.

Let A be a set of predicates, a set of accessible predicates in the object language.
An **information structure** for A is an information structure $\mathbb{C}_{\mathbb{A}} = \langle C, \leq_A, c_0, T, D \rangle$ s.t.:

4. C is a set of information states (contexts)
5. $\leq_A$ is a partial order on C (a meet semi lattice)
6. c_0 is the minimal element of C under $\leq_A$.

4. T is the set of maximal elements of C under $\leq_A$
5. Every context c in C has some maximal extension: $\forall c \in C, \exists t \in T: c \leq_A t$.
6. D is a domain of individuals.

A **membership dimension model** for A is a tuple $M = <\mathbb{C}_{\mathbb{A}}, I_A>$ where:

1. $\mathbb{C}_{\mathbb{A}}$ is an information structure for A.

2. I_A is an interpretation function for $\mathbb{C}_{\mathbb{A}}$, a function which maps every $P \in A$ and $c \in C$ onto a tuple $<[P]^+_c, [P]^-_c, MS^+_{(P,c)}, MS^-_{(P,c)}>$ satisfying the conditions below:

1. $\forall P \in A, \forall c \in C$: $([P]^+_c \cap [P]^-_c = \emptyset)$ and

$$([P]^+_c, [P]^-_c \subseteq D) \text{ and } (MS^+_{(P,c)}, MS^-_{(P,c)} \subseteq A^*).$$

(Where A* is the closure of A, i.e. the set of predicates that can be generated from the predicates in A by the linguistic operations).

2. $\forall c_1, c_2 \in C$: If $(c_1 \leq_A c_2)$ then: $\forall P \in A$:

$$([P]^+_{c1} \subseteq [P]^+_{c2}) \text{ and } ([P]^-_{c1} \subseteq [P]^-_{c2}) \text{ and}$$

$$(MS^+_{(P,c1)} \subseteq MS^+_{(P,c2)}) \text{ and } (MS^-_{(P,c1)} \subseteq MS^-_{(P,c2)}) \quad \text{(monotonicity)}$$

3. $\forall P \in A$: $[P]^+_{c0} = [P]^-_{c0} = MS^+_{(P,c0)} = MS^-_{(P,c0)} = \emptyset$

Definition: a context t is total in M (i.e. is totally complete relative to A) iff:

$$\forall P \in A: ([P]^+_t \cup [P]^-_t = D) \text{ and } (MS^+_{(P,t)} \cup \{\neg Q | Q \in MS^+_{(P,t)}\} \cup MS^-_{(P,t)} = A^*)$$

(Where $\forall P,Z \in A^*$: $Z = \neg P$ iff $\forall c$: $[Z]^+_c = [P]^-_c$ & $[P]^+_c = [Z]^-_c$).

3. Every $t \in T$ is total.

Definitions: $\forall P \in A, \forall c \in A$:

1. $[P]_c = \cap\{[P]^+_t | t \in T \text{ \& } t \geq c\}$
   (an indirectly extended positive denotation).
2. $[\neg P]_c = \cap\{[P]^-_t | t \in T \text{ \& } t \geq c\} = D - \cup\{[P]^+_t | t \in T \text{ \& } t \geq c\}$
   (an indirectly extended negative denotation).
3. $[P]^?_c = \{d | (\exists t_1 \in T \text{ \& } t_1 \geq c: d \in [P]^+_{t1}) \text{ \& } (\exists t_2 \in T \text{ \& } t_2 \geq c: d \notin [P]^+_{t2})\}$.
   (an indirectly reduced gap).

Definition: a context c satisfies the interpretation constraint iff:

$\forall P \in A$: 1. $\forall Q \in MS^+_{(P,c)}$: $\forall c_2 \geq c$: $[P]_{c2} \subseteq [Q]_{c2}$ }.

2. $\forall Q \in MS^-_{(P,c)}$: $\forall c_2 \geq c$: $([P]_{c2} \cap [Q]_{c2} \neq \emptyset)$ & $([P]_{c2} \cap [\neg Q]_{c2} \neq \emptyset)$}

4. Every $c \in C$ satisfies the interpretation constraint.

Having clarified the general idea behind a 'dimension' and semantics with dimensions in predicate interpretations, I can now go into more details. In the next section I justify the assumptions I stated here, i.e. that a predicate is interpreted by a tuple that consists, except for a positive and a negative denotation, also of a membership dimensions set and a non -trivial dimensions set. I justify empirically the condition of non- triviality on the dimensions in MS^-.

3.2. Advantages of a model with Membership dimensions in predicate meanings

A membership dimension of P in c is a member in $MS^+_{(P,c)}$.
E.g. in a context c in which it holds that in c and all its coherent extensions c_2:
$[\text{has a bottleneck}]_{c2} \supseteq [\text{bottle}]_{c2}$ we may say that "have a bottle neck" is a dimension along which the denotation of 'bottle' is determined. I.e. "have a bottle neck" is a membership dimension of 'bottle' in c.

A non-membership (or non-trivial) dimension of P in c is a member in $MS^-_{(P,c)}$.
E.g. in some context c a speaker may refer with 'bottle' to bottles of cold drink, which except for bottles of coke may include also bottles of sprite. Therefore it holds that for c and all its coherent extensions c_2:
$([\text{of coke}]_{c2} \cap [\text{bottle}]_{c2} \neq \emptyset)$ & $([\text{Not of coke}]_{c2} \cap [\text{bottle}]_{c2} \neq \emptyset)$.

An unspecified dimension of P in c: is a predicate that is active in the context (is in A*) but it or its negation are not specified in any of the two mentioned dimensions sets. I.e. the dimensions gap is the set: $\{Q|\ Q \in A^*\ \&\ Q, \neg Q \notin MS^+_{(P,c)} \cup MS^-_{(P,c)}\}$.

Within the latter set are the contextually accessible predicates Q, for which it may still be open whether they are obligatory conditions for P or not.
Some of these unspecified predicates coincidentally end up in just one of these sets, because they are in: $\cap\{MS^+_{(P,t)}|\ t \in T,\ t \geq c\}$or they are in: $\cap\{MS^-_{(P,t)}|\ t \in T,\ t \geq c\}$. These predicates must end up as membership or non-membership dimensions respectively, but not as a result of an apriori requirement on any denotation associated with P. Therefore these predicates are not specified in $MS_{(P,c)}$, but it follows indirectly that in every total extension they end up in just one of its set.

For every other unspecified dimension Q, we may say that P is <u>vague</u> along Q.

E.g. in some context c a speaker might not be sure whether ‘cooking’ is an obligatory requirement to count as a ‘potato’ in c (i.e. a membership dimension of ‘potato’ in c) or a non-obligatory requirement because a counter example already exists (i.e. a non-membership, or a non- trivial, dimension of ‘potato’ in c). An element non-suitable for ‘cooking’ is then <u>a borderline case</u>. Its membership in the denotation of ‘potato’ is determinable only relative to some context with more information. In this context c the positive denotation of ‘potato’ is vague. It is a set of at least two “possible denotation-sets”, with and without elements “non-suitable for cooking”. These two sets correspond to two precisifications of the set of membership dimensions of ‘potato’, with the dimension “suitable for cooking” in the non-trivial set in one and in the membership set in the other, respectively.

<u>3.2.1. The advantages in representing the non-trivial set in a predicate interpretation</u>

I assume that MS^- contains not just non-necessary predicates, but in fact non-trivial ones. We will discuss this constraint now.

<u>3.2.1.2. K&L’s proposal: dimensions in the restriction of the generic quantifier</u>

K&L give an account for FC *any* in generic contexts, as in (6), using a dimensions set.

(6) Any owl hunt mice.

K&L argue that FC *any* in those contexts is in the scope of a generic universal quantifier and therefore it is licensed. By widening the domain of quantification it strengthens the statement, as required for its licensing.
The question raised by K & L is why *almost*, as a mean of weakening a universal statement, can not modify generic indefinites, but can modify *every*, and *any*:

(71) *Almost an owl hunts mice.
(72) Almost every owl hunts mice.
(73) Almost any owl hunts mice.

The set of non-trivial dimensions plays a crucial role in their explanation. K&L describe the case in examples (71)-(73) as follows:

1. In (72) there is a strict universal quantifier, *every*.
It doesn't allow exceptions along any non- trivial dimension of 'owl'.
That is, consider a context c in which some properties, for example 'young', 'weak', or "of some rare sub-type of owls", are treated as non- trivial dimensions of 'owl' in c. Some owls in c are young and some are not young. All of them, as they are all regarded as owls regardless of age, must satisfy the asserted generalization on owls, i.e. "hunt mice". No owl is an exception just because it is young, weak, of some rare sub- type of owls, etc. The statement applies to young, weak and rare owls just as much as it applies to strong adult owls of a common type.
Almost weakens the statement by allowing a few exceptions along some of these dimensions. That is, some extreme cases (the very very young instances) are allowed to be exceptions for the asserted generalization on owls.

2. In (71) there is a generic universal quantifier, marked by indefinite *a.*
It does not require that there will be no exceptions along the non-trivial dimensions. More precisely, K & L argue that every such non- trivial dimension can be treated as a restriction at least in some contexts. The determiner *a* doesn't require that it would be treated as non- trivial.
Returning to the example given above, the properties 'young', 'weak', or "of some rare sub-type of owls" are treated as non- trivial dimensions in c. However, one can easily imagine, for each one of these properties, another context c1, in which its negation is treated as a contextual restriction on the set of owls. In such contexts, a young owl, a weak owl, an owl of some rare sub-type, or etc. can make an exception to the generalization "hunts mice", since the restrictions make it irrelevant. It is not regarded as negative evidence against the statement.
Almost can not weaken the statement by allowing a few exceptions along some of these dimensions, since in some contexts exceptions are already allowed. *Almost* is licensed only in statements with restrictions that in every context has a pair of non-trivial properties on the domain of quantification.

3. In (73) there is a generic universal quantifier with *any* in its scope.
Therefore, it possibly allows exceptions along all the dimensions, just as *a*, except for those dimensions that *any* eliminates in that context.
That is, the semantics of *any* requires that some dimension that is currently restricting the domain of quantification will be eliminated, meaning that also entities that violate this restriction will be added to the domain of quantification (providing that they don't violate other required conditions).
E.g. in some context c, in which (73) is uttered, the domain is assumed to be restricted to healthy owls ('healthy' is a membership dimension). After the elimination of this restriction (by the use of *any*) the statement applies to healthy and sick entities ('healthy' becomes non- trivial on the domain).
Almost weakens the statement by allowing a few exceptions along the eliminated dimension. Therefore a very sick owl that doesn't hunt mice is not negative evidence against the statement.

K&L analysis is therefore the following:
1. The set of dimensions contextually associated with the generic universal quantifier, X_{owl}, is a pair <S, V > such that:
1.1. S – is the set of contextual obligatory restrictions of the domain (i.e. properties that are obligatorily supersets of the domain).
1.2. V – the vagueness set - is a set of precisifications v (i.e. ways in which the vagueness in S can be eliminated).
Each precisification v is a completely precise superset of S.
I.e. in every v, each dimension along which 'owl' is vague (each dimension that is unspecified in S, and its negation isn't as well) is now specified, or its negation is specified. Otherwise, if both of them are not specified in v, it means that they are non-trivial on the denotation of 'owl'.

2. The elimination of a property from those sets (S and its supersets) makes it non-trivial on the denotation: It means that in the relevant context some objects in the denotation have the eliminated property, and some haven't.

3. *Almost*, as a mean of weakening universal statements, is licensed only in statements with restrictions that in every context have a pair of non-trivial properties on the domain of quantification.

4. Generic indefinites may have a non-empty set of non-trivial properties but they still violate the requirement for the licensing of *almost*, since no property is non-trivial in every context. In other words, a generic indefinite has every property (or its negation) obligatory in some context. E.g. consider example (74)-(76):

(74) A bachelor is unmarried.

K&L show that 'definitional' generic statements like (74) can have precise restrictions, meaning that $X_{bachelor}$ can be totally specified. For example $X_{bachelor}$ can be the pair $<\emptyset,\{\emptyset\}>$. I.e. all the accessible predicates in the context and their negations aren't supersets of $[bachelor]_c$, and not because 'bachelor' is vague (unspecified) along them in c, but because it is contextually claimed that they are not restrictions on the denotation. Thus, they are all non-trivial on the domain. (Except of course for any property made obligatory by a meaning postulate, as "not (or never) married" in this case). *Almost* is not licensed here, not because there are no accessible non -trivial dimensions, there are many. *Almost* is not licensed only because for each non -trivial property there is another context in which it is in fact trivial (a superset) of 'bachelor'.

For instance, if a married person expresses his longing for freedom by saying (75), we are quite uncertain whether he was referring to the precise set of bachelors in (74).

(75) Bachelors are happy.

Are chronically depressed bachelors included? Are people that aren't married due to some reason or other, but who are totally committed to someone (gays for instance) included? The pope? On the other hand what about divorcees? They have been married but they are single and free (in Hebrew they can sometimes be considered bachelors (ravakim, רווקים) in such contexts like (75)). In context (76) one may refer to a very limited set of people. Old enough but still connected to their mother more than to any other woman; nearly virgins.

(76) He is an eternal bachelor.

In Hebrew, on the other hand, ‘bachelor’ in context (76) has also another meaning. To date a lot, chase women, or to be unsteady in relationships is the main requirement for a bachelor to be called eternal.
Other properties, except for “not married”, can, therefore, be restrictions on ‘bachelor’ (be in S) in certain contexts. Every property can be a restriction of ‘bachelor’ in the right context. However, since there is no property that is <u>always</u> a non-trivial one, *almost* is not licensed.

<u>3.2.1.2. Problems</u>

<u>Problem 1: Economy</u>
The dimension- set is introduced by the quantifier rather than by the predicate. Thus, a set of dimensions has to be associated with every quantifier occurrence separately, and also an additional set should possibly be associated with the predicate itself (in order to determine the restrictions on the contextual denotation). This assumption is less economic than assuming one set associated to the predicate. It is true that the vague generic quantifier *a* differs from the non-vague quantifier *every*, but it is also true that these differences results from their semantics and not from the context itself. In fact, they can appear in the very same context, be it partial or precise. Consider for instance context (7) taken from a textbook about the cognitive sciences (Pinker 1999):

(7) Apparently, if you believe that any aspect of an organism has a function, you absolutely must believe that every aspect of an organism has a function.

Are two separate independent contextual sets of properties accessed in context (7), one for *any* and another for *every*? It is more economic to assume that these quantifiers access <u>the very same contextual list of predicates</u>, i.e. the dimensions in the contextual interpretation of the predicate in their first argument. And to assume that it is their semantics that treats this list differently.

Problem 2: The constraint on *almost* is stronger than logically required.

K&L show that the distribution of *almost* depends on the presence of some property that is non-trivial on the domain of quantification. (A property along which the quantification is "domain universal", in their terms). K&L claim that generic indefinites may have a non-empty set of non-trivial properties. But *almost* is still not licensed with them. E.g. consider examples of definitional generic statements like (74) repeated here:

(74) A bachelor is unmarried.

What we saw in the last subsection is that *almost* is not licensed with generic indefinites even in the contexts that I sketched where many non-trivial properties are claimed to exist (all the properties that themselves or their negations aren't in S). For such cases, K&L are forced to say that *almost* might be infelicitous even when there are many non-trivial properties to operate on. This is why they formulate a strong constraint:

Almost, as a mean of weakening universal statements, is licensed only in statements with restrictions that in every context have a pair of non-trivial properties on the domain of quantification.

But this requirement seems unintuitive, because it is too strong. Landman p.c. suggests a weakening of the constraint in terms of grammaticization:

Almost, as a mean of weakening universal statements, is combined only with quantifiers that in their meaning activate a pair of non-trivial properties on the domain of quantification.

This may work, but it is a stipulation that must be imposed on *every* and *any*, but not on generic *a*. This is rather ad hoc.

I suggest that what goes on is more than a grammatical stipulation. I think it actually follows from the proposal of K&L that for generic indefinites the set of non- trivial properties is empty. That is, I would impose the following constraint:

Almost, as a mean of weakening universal statements, is combined with a quantifier only if a pair of non-trivial dimensions is contextually associated with the predicate in the first argument of the quantifier (regardless of other contexts).

Every, *no* and *any* are markers of universal quantification over a domain determined by a predicate that has a non -empty non-trivial dimensions set ($MS^-_{(P,c)} \neq \varnothing$).
The indefinite article, on the other hand, though it might not seem intuitive at first sight, is a marker of a universal quantification over a domain determined by a predicate that has an -empty non-trivial dimensions set ($MS^-_{(P,c)} = \varnothing$). In other words, its use implies vagueness along every dimension that was not specified contextually as a membership dimension. It is this assumption that creates the main semantic difference between generic *a* and *every* or *any*.
This assumption means that even in definitional generics like (74), 'bachelor' or $X_{bachelor}$ is vague. This claim is not implausible. By defining 'bachelor' solely as "never married" (or 'unmarried'), it is implicated that nothing unmentioned matters (if not, we violate the maxim of Quantity). I.e. all other accessible dimensions that were not mentioned - are non-trivial. Thus the definition seems precise. But, of course, this is only an implicature. It is always possible to move to a context in which any such predicate does matter, and should be a superset dimension of 'bachelor' (as was previously demonstrated):

(74) A bachelor is unmarried.
(75) Bachelors are happy.
(76) He is an eternal bachelor.

In the case of (75), some property such as 'free', "has (vivid) social life, dates etc." or at least "didn't have any special trauma or misfortune lately" may restrict the domain (i.e. be a membership dimension). Also the property of not being the pope should be specified as a membership dimension, if accessible. In (76), a property like "being nearly virgin" or sometimes the opposite of it for Hebrew (say -"being unsteady in relationships") may restrict 'bachelor'. Many other properties can be regarded as contextual restrictions in (75)-(76). For instance, the speaker may refer to people who live in the United States or in similar circumstances, in a certain age, period, environment, etc.

If the context of utterance of (74) can be extended to the contexts of utterance of (75) or (76) with no correction (only by canceling the implicature), then ‘bachelor’ was actually not precise in the first place (in (74)). The set of non- trivial properties didn’t contain all the mentioned predicates (or any other predicates) even if they were accessible. It was actually empty. When it isn’t empty, the indefinite article isn’t used. Assuming vagueness along "nearly virgin", "unsteady in relationships" and “is not the pope” means that we have included them in some of the precisifications of ‘bachelor’ (i.e. they can still turn out to be restrictions).

This makes the constraint on *almost* a logical necessity. *Almost* requires the existence of some (only contextually) non-trivial pair of properties over the restriction of the universal quantification. When we use indefinite *a*, the predicate is simply never assumed to be non-trivial along a dimension (there is always a possibility to extend to a context in which it is trivial along it). When we use *any*, *every* the predicate is always assumed to be non-trivial along some dimension. There is some dimension, for which there is no way to extend to a context in which it will be trivial on the denotation. Therefore *almost (*as a mean of weakening a universal statement) is licensed only with *any* and *every*.

Problem 3: Representing systematic differences in the restrictions of *every*, *a*, *any*.

Given the standard assumption that a set of restrictions on the domain is associated with every quantifier occurrence separately, and possibly an additional set is associated with the predicate itself (the restrictions on the contextual denotation), it is also harder to predict the systematic relations between all these possible restrictions, given a certain context. I.e. given a fixed context, the interpretations of statements containing *any, every,* and *a* are systematically related. It is not necessarily the case that *any* and *every* occur in contexts with more complete information about the interpretation of the predicate. They can even occur in the very same context (as shown for instance in example (7)). It is a crucial part of the meaning of each of these items that makes each one treat the same contextual information in a certain characteristic way. This can be represented straightforwardly if it is assumed that all of them access the same contextual information, i.e. the same set of contextual restrictions. The membership dimension sets pair in the analysis I suggest is a good candidate to be that set, since it is accessible to all these operators. The systematic differences between these items are explained by the unique way in which each of these items systematically treat the same pair of dimension sets of a predicate.

3.2.2. The advantages in representing the set of accessible predicates

Problem 4: Non-trivial versus inaccessible in context

K&L do not distinguish between accessible predicates and non-accessible predicates. That means that, in essence, on their analysis every predicate is accessible. On my analysis, if a predicate is not in $MS^{+}_{(P,c)} \cup MS^{-}_{(P,c)}$ this can be for either of two reasons:

1. It is accessible in c (i.e. it plays a role in the context; Formally, it is in A*), but there is neither enough evidence to determine that it is providing a necessary condition for having P (i.e. it is not in $MS^{+}_{(c,P)}$), nor that it is not providing a necessary condition for having P (i.e. it is not in $MS^{-}_{(c,P)}$).
2. It is inaccessible. It is not a member in A or in A*. It is not active in the speaker's mind in that context.

This distinction was shown to be important, for example, in order to represent the distinction between a context in which "the pope" and "not the pope" are inaccessible, and a context in which they are accessible. If they are accessible, and the denotation of 'bachelor' is not given by pointing but is determined by dimensions- sets, the pope or any individual that might be the pope in D is in the gap. The pope can not be included in the denotation of 'bachelor' unless those predicates are specified as non-trivial. If "not the pope" is a membership dimension the pope is excluded.
In a context in which those predicates are inaccessible, if the pope or any individual that might be the pope in D doesn't fail to fulfil any other requirement for being regarded a relevant 'bachelor', this is sufficient to determine that he is a bachelor. The interpretation of 'bachelor' can be regarded as being complete without any information about the status of those predicates. This distinction is crucial, and can not be blurred.
Given K & L's analysis, it might be that in c both predicates ("is the pope" and "is not the pope") appear in no precisification of S (the restrictions on $X_{bachelor}$). That means that they are regarded as non- trivial. The pope, or any individual that might be the pope, can not be regarded as an exception to generalizations over bachelors.

But it is possible that in c these predicates are simply not activated (made accessible, added to A). If they would be, one of them may be added to S (say "is not the pope"). It is not explicitly specified in c that they are not supposed to restrict the domain of quantification (i.e. the set of bachelors).

On K & L's theory such <u>inaccessible</u> predicates, the predicates that don't play any role in the context since they are not active in the speaker's mind, <u>would be specified</u> in some precisifications v of S. K & L must assume that, because otherwise 'bachelor' is not regarded as vague along them. This is not intuitive.
Only if the set A, of <u>accessible</u> predicates, <u>is specified</u>, 'bachelor' is regarded as vague along those predicates if they are not specified in the sets of restrictions.

E.g. consider (77):

(77) A: Every bachelor hopes to get married some day.
B: The pope too?

It doesn't seem intuitive to assume that speaker A necessarily held the predicate "is not the pope" in mind and has regarded it as a constraint on 'bachelor'. It is certainly not considered by speaker A a non-trivial property, or something along which 'bachelor' is unspecified. Speaker A simply doesn't have this predicate (and this individual) in mind. Only after speaker B makes it accessible it is naturally considered a constraint in S. It is possible to represent how this discourse extends only if the distinction between non-trivial and inaccessible predicates is made.

It is also not economic to assume that the set of dimensions along which the predicate is vague, rather than the set of non- trivial dimensions, is specified within predicate contextual sets of restrictions. Since there are infinitely many different predicates in the language ("jumped one time", "jumped two times" etc.) it is hard to assume that they are all- accessible in every context and are simply regarded non-trivial. For example, it is unlikely that in (75) the speaker said that any bachelor, whether "jumped a million times" or not, is happy. It is also unlikely that the speaker regarded every <u>possible</u> property without which there is no happiness as a constraint in MS^+.

Most of these possible properties are simply so irrelevant that they are being ignored. They are inaccessible. The context can extend into some refinement where they are accessed, and then information about them has to be supplied or derived. But a context may be regarded as totally precise, i.e. complete <u>relative</u> to the <u>relevant</u> distinctions in question, without us having to decide if bachelors who jumped a million times are exceptions or not, etc.

In sum, without set A, if some dimension Q is not specified in MS^+ or in any of its precise supersets, it is impossible to specify whether this dimension Q is non-trivial in c or is simply inaccessible in c, and therefore unspecified even in the precisifications.

<u>3.3. The proposed analysis for *any*, *every* and *a*</u>

<u>3.3.1. Definitions</u>

<u>3.3.1.1.</u> <u>*Every*</u> can be regarded as an operation that shifts a context $c \in C$ to a context $every_{(c,P,Q)} \in C$, which is a context <u>maximally similar to c</u>, except that all <u>unspecified</u> dimensions are now in $MS^-_{(P,c)}$ ($MS^?_{(P,c)} = \varnothing$). <u>Every predicate in A* that is not specified as a necessary condition for P is treated as known to be non-necessary</u>.

1. $[\text{Every owl hunts mice}]_c = 1$ iff:
$\forall d \in [\text{owl}]_{every(c,owl,hunts\ mice)}: d \in [\text{hunts mice}]_{every(c,owl,hunts\ mice)}$.

2. $Every_{(c,owl,hunts\ mice)}$ is a more complete context coherently extending c ($c \leq_A every_{(c,owl,hm)}$). It is equal in all to c except that:

$$MS^-_{(owl,\ every(c,owl,hm))} = MS^-_{(owl,c)} \cup \{Z|\ (Z \in A)\ \&\ (Z \notin \cap\{MS^+_{(owl,t)}|t \geq c,\ t \in T\})\ \& \\ (\text{if } Z \notin MS^+_{(owl,c)} \text{ then } \neg\forall t \in T\text{: if } Z \in MS^-_{(owl,t)} \\ \text{then "hunts mice"} \in MS^-_{(owl,t)})\ \}.$$

("Hunts mice" is ignored such that statements with *every* would not be trivially false. I.e. every property that its non-triviality on 'owl' entails makes the non-triviality of "hunts mice" on 'owl' necessary is left unspecified by the operation *every* denotes).

E.g. if ‘healthy’ is not specified as a necessary condition for ‘owl’ in c, you assume it is not.

Thus, *every* is context dependent but not vague (more precisely – with respect to the dimensions sets of P it is complete relative to A). All the previously unspecified dimensions are specified as non -trivial. Therefore, *almost* can occur, and there are no legal exceptions to the universal generalizations. For no object it is the case that it has some property for which we do not know whether it restricts the domain of quantification or not (if such an unspecified property would have existed, it could have disqualified some object from being negative evidence to the statement).
In the extreme case, in which $MS^{-}_{(P,c)}$ is empty because all accessible predicates or their negations are in $MS^{+}_{(owl,c)}$, the denotation consists of only one individual or a set of indistinguishable individuals. The use of *every* and *almost* in those cases will therefore make no sense. It is either odd or funny.

This analysis of *every* makes sense from a processing point of view. Being precise takes a lot of effort. Actually, a speaker fully precise on a certain predicate’s meaning should know for each accessible applicable property whether the predicate denoting it is in the membership set or in the non-trivial set. There aren’t many contexts that are worth the effort of setting up all these details one by one. Even in the contexts of use of *every*, speakers only mark their intentions to be precise, or the existence of some precisification, but they don’t really go over the whole set of possible restrictions. In the presence of *every*, speakers simply treat the predicates unspecified in the membership pair (unspecified by context as obligatory conditions (in $MS^{+}_{(P,c)}$) or not (in $MS^{-}_{(P,c)}$)) as irrelevant (non- obligatory (in $MS^{-}_{(P,c)}$).

<u>3.3.1.2.</u> <u>*A*</u> (the indefinite article) can be regarded as an operation that shifts a context $c \in C$ to a context $a_{(c,P)} \in C$, which is a context <u>maximally similar to c</u>, except that all <u>non-trivial</u> dimensions are now unspecified ($MS^{-}_{(P,c)} = \emptyset$). <u>Every predicate in A* that is not specified as a necessary condition for P in c is treated as not known to be non-necessary</u>.

1. $[\text{An owl hunts mice}]_c = 1$ iff $\forall d \in [\text{owl}]_{a(c,owl)}: d \in [\text{hunts mice}]_{a(c,owl)}$.

2. $A_{(c,owl)}$ is at most as complete as context c ($a_{(c,owl)} \leq_A c$). It is equal in all to c except for a minimal change such that it holds that: $MS^-_{(owl,\ a(c,owl))} = \varnothing$.

Though in c you may already have settled that some properties are non-essential for being an owl, you open these up again, i.e. you turn these into properties you don't know about.
E.g. if 'healthy' and "not healthy" are not specified as necessary conditions for 'owl' in c, you assume it is still open whether they may be necessary or not.

Thus, generic *a* is context dependent and almost maximally vague. There are no dimensions along which exceptions to the universal generalizations are not allowed, and *almost* can not occur. For almost every object it is possible to find some property that we do not know whether it or its negation are membership dimensions. If the negation is a membership dimension, it therefore disqualifies the object from being negative evidence to the statement.

<u>3.3.1.3.</u> <u>*Any*</u> can be regarded as an operation that shifts a context $c \in C$ to a context $a_{(c,P)} \in C$, and shifts the <u>latter</u> to a context $any_{(c,P,D)} \in C$, which is a context <u>maximally similar to $a_{(c,P)}$</u>, except that the dimensions in D are now treated as known to be non-necessary ($D \subseteq MS^-_{(P,c)}$).

1. $[\text{Any owl hunts mice}]_c = 1$ iff $\forall d \in [owl]_{any(c,owl,D)}$: $d \in [\text{hunts mice}]_{any(c,owl,D)}$.

2. $Any_{(c,owl,D)}$ is at least as complete as context $a_{(c,owl)}$ ($a_{(c,owl)} \leq_A any_{(c,owl,D)}$).
It is equal in all to $a_{(c,owl)}$ except that it is changed as minimally as required such that: $D \subseteq MS^-_{(owl,\ any(c,owl,D))}$.

To be more precise, let E.D. be a superset of D that contains also any other dimension that if it is in $MS^+_{(owl,c)}$ then D must end up in it as well. Then:
($MS^+_{(owl,\ any(c,owl,D))} = MS^+_{(owl,c)} - E.D$) and ($MS^-_{(owl,\ any(c,owl,D))} = E.D$).

I.e. you assume that everything that is not specified as a necessary condition for ‘owl’ in c, is not known to be unnecessary, except D. The dimensions in D (the eliminated dimensions) are known to be unnecessary.

E.g. if ‘healthy’, “not healthy” are the dimensions to eliminate (one of them is specified as a necessary conditions for ‘owl’ in c, or they are unspecified for ‘owl’ in c), you assume that they are unnecessary for ‘owl’ in $\text{any}_{(c,owl,healthy)}$. The denotation of ‘owl’ is widened such that both sick and healthy entities are included.

With regard to unspecified dimensions other than the eliminated ones (those that are not in D, e.g. ‘adult’), it is still open whether they may be regarded necessary or not (as is the case with generic *a*).

Thus the set of non- trivial dimensions ($MS^{-}_{(P,any(c,P,D))}$) is not empty and *almost* can occur. Yet, every accessible predicate Z such that it or its negation are not members in $MS^{+}_{(P,c)}$ or D is regarded as unspecified, and exceptions to Z thus don’t refute generalizations on P. Therefore, *any* is context dependent and vague, but with respect to the interpretation of its first argument, it is complete with respect to D.

3.3.2. A detailed example of the analysis

Let me work out an example in order to clarify the different operation of *any, every,* and generic *a,* under the current analysis. Consider a partial context c in which a discourse concerning owls eating and reproduction habits takes place.

Suppose that in c:

1. A = {bird, nocturnal, owl, healthy, adult, female}.

1. D = $\{d_1,\ldots,d_{10}\}$
2. $MS^{+}_{(owl,c)}$ = {owl, bird, nocturnal, healthy}.
3. $MS^{-}_{(owl,c)}$ = {female, not female}.
4. The facts given directly are given in table 1.

Table 1: The directly given denotations

Denotations → Predicates ↓	$[P]^{-}_{c}$	$[P]^{?}_{c}$	$[P]^{+}_{c}$
Bird	{9}	{10}	{1,…,8}
Noctur.	{9}	{10}	{1,…,8}
Healthy	{3,5,7,8}	{9,10}	{1,2,4,6}
Female	{2,5,6,8}	{9,10}	{1,3,4,7}
Adult	{4,6,7,8}	{9,10}	{1,2,3,5}
Owl	∅	{2,…,10}	{1}

By the proposed analysis it follows that:

3.3.2.1. The facts in c:

1. $MS^{+}_{(owl,c)} \subseteq A^{*}$ such that $\forall Q \in MS^{+}_{(owl,c)}$: $\forall c' \geq c$: $[owl]_{c'} \subseteq [Q]_{c'}$.

Thus: $\forall c_2 \geq c$: $([owl]_{c2} \subseteq [owl]_{c2})$ & $([owl]_{c2} \subseteq [bird]_{c2})$ &

$([owl]_{c2} \subseteq [nocturnal]_{c2})$ & $([owl]_{c2} \subseteq [healthy]_{c2})$.

2. $MS^{-}_{(owl,c)} \subseteq A^{*}$ such that $\forall Q \in MS^{-}_{(owl,c)}$: $\forall c' \geq c$: $[owl]_{c'} \cap [Q]_{c} \neq \varnothing$ and $[owl]_{c'} \cap [\neg Q]_{c'} \neq \varnothing$.

Thus: $\forall c_2 \geq c$: $[owl]_{c2} \cap [not\ female]_{c2} \neq \varnothing$ and $[owl]_{c2} \cap [female]_{c2} \neq \varnothing$.

3. 'Adult' is an unspecified dimension, and it may still be discovered to be obligatory:

$\exists t_1 \geq c$: $([owl]_{t1} \cap [not\ adult]_{t1} \neq \varnothing)$ & $([owl]_{t1} \cap [adult]_{t1} \neq \varnothing)$ and

$\exists t_2 \geq c$: $[owl]_{t2} \subseteq [adult]_{t2}$.

However, "non adult" can not be discovered to be obligatory, since there is already an owl instance, d_1, that is adult, rather than non- adult.

4. Hence, these are the possible kinds of total states:

1. $[owl]^{+}_{t1} = \{d_1, d_2, d_4, d_6\}$, $[owl]^{-}_{t1} = \{d_3, d_5, d_7, d_8, d_9, d_{10}\}$,

(The new facts in t_1 are: $adult \in MS^{-}_{(owl,t1)}$ and the properties of d_{10} are violating some $MS^{+}_{(owl,t1)}$ requirement. Every healthy nocturnal bird, either adult female or not is considered an owl).

2. $[owl]^{+}_{t2} = \{d_1, d_2, d_4, d_6, d_{10}\}$, $[owl]^{-}_{t2} = \{d_3, d_5, d_7, d_8, d_9,\}$,

(the new facts in t_2 are: adult$\in MS^-_{(owl,t2)}$ and the properties of d_{10} are not violating any $MS^+_{(owl,t2)}$ requirement).

3. $[owl]^+_{t3} = \{d_1, d_2\}$, $[owl]^-_{t3} = \{d_3, d_4, d_5, d_6, d_7, d_8, d_9, d_{10}\}$,

(The new facts in t_3 are: adult$\in MS^+_{(owl,t3)}$ and the properties of d_{10} are violating some $MS^+_{(owl,t3)}$ requirement. Every adult, healthy nocturnal bird, either female or not is considered an owl).

4. $[owl]^+_{t4} = \{d_1, d_2, d_{10}\}$, $[owl]^-_{t4} = \{d_3, d_4, d_5, d_6, d_7, d_8, d_9,\}$,

(The new facts in t4 are: adult$\in MS^+_{(owl,t4)}$ and the properties of d_{10}, are not violating any $MS^+_{(owl,t4)}$ requirement).

5. $[owl]_c = \cap\{[owl]^+_t \mid t\geq c, t\in T\} = \cap\{[owl]^+_{t1},\ldots, [owl]^+_{t4}\} = \{d_1, d_2\}$.

$[owl]^?_c = \{d \mid \exists t_1,t_2\geq c, t_1,t_2\in T: d\in[owl]^-_{t1}$ and $d\in[owl]^+_{t2}\} = \{d_4,d_6,d_{10}\}$.

$[not\ owl]_c = \cap\{[owl]^-_t \mid t\geq c, t\in T\} = \cap\{[owl]^-_{t1},\ldots, [owl]^-_{t4}\} = \{d_3,d_5,d_7,d_8,d_9\}$.

3.3.2.2. The facts in every$_{(c,owl,hunts\ mice)}$:

Every$_{(c,owl,hm)}$ is equal to c in all respects except to the interpretation of 'owl':

1. $MS^+_{(owl,every(c,owl,\ hm))} = MS^+_{(owl,c)}$,

Thus: $MS^+_{(owl,every(c,owl,\ hm))} = \{$owl, bird, nocturnal, healthy$\}$.

2. $MS^-_{(owl,every(c,owl,\ hm))} = \{Z \mid Z\in A^*, Z,\neg Z\notin\cap\{MS^+_{(owl,t)}: t\geq c\},$

(if $Z\notin MS^+_{(owl,c)}$ then $\neg\forall t\in T$: if $Z\in MS^-_{(owl,t)}$ then "Hunts mice"$\in MS^-_{(owl,t)})\}$.

Thus: $MS^-_{(owl,every(c,owl,hm)} = \{$female, not female, adult, not adult$\}$.

3. As a result:

$[owl]_{every(c,owl,hm)} = \cap\{[owl]^+_t \mid t\geq every_{(c,owl,hm)}, t\in T\} = \cap\{[owl]^+_{t1}, [owl]^+_{t2}\}$

$= \{d_1, d_2, d_4, d_6\}$.

$[not\ owl]_{every(c,owl,hm)} = \cap\{[owl]^-_t \mid t\geq every_{(c,owl,hm)}, t\in T\} = \cap\{[owl]^-_{t1}, [owl]^-_{t2}\}$

$= \{d_3,d_5,d_7,d_8,d_9\}$.

$[owl]^?_{every(c,owl,hm)} = \{d \mid \exists t_1,t_2\geq every_{(c,owl,hm)}, t_1,t_2\in T, d\in[not\ owl]^-_{t1}\ \&\ d\in[owl]^+_{t2}\}$

$= \{d_{10}\}$.

(The gap contains only elements with some crucial unknown properties. No element is in the gap due to a vagueness of the definition of 'owl' itself. Once you discover if these elements satisfy the obligatory membership dimensions of ‘owl’, you can determine if they are in the positive or in the negative denotation of ‘owl’. In general, except for these elements, all the gap of ‘owl’ in c is added to the positive denotation of ‘owl’).

3.3.2.3. The facts in $a_{(c,owl)}$:

$a_{(c,owl)}$ is equal to c in all except for a minimal change such that the interpretation of ‘owl’ is: $MS^{+}_{(owl,a(c,owl))} = MS^{+}_{(owl,c)}$, $MS^{-}_{(owl,a(c,owl))} = \emptyset$. Thus:

1. $MS^{+}_{(owl,a(c,owl))}$ = {owl, bird, nocturnal, healthy}.

2. $MS^{-}_{(owl,a(c,owl))} = \emptyset$.

3. Hence, either d_2 (“not female”) or d_1 (‘female’) are removed from the denotation. Let’s assume that d_2 has been added to the denotation last in this context, and that removing it is a more minimal change than removing d_1. (In another model in which d_1 and d_2 are added to the ‘owl’ denotation in the same context, both would be removed). Thus, there are more kinds of total states above $a_{(c,owl)}$ than above c
(i.e. states 1-4 specified in section 3.3.2.1.):

5. $[owl]^{+}_{t5} = \{d_1, d_4\}$, $[owl]^{-}_{t5} = \{d_2, d_3, d_5, d_6, d_7, d_8, d_9, d_{10}\}$,
(The new facts in t_5 are: adult$\in MS^{-}_{(owl,t5)}$, female$\in MS^{+}_{(owl,t5)}$ and the properties of d_{10} are violating some $MS^{+}_{(owl,t5)}$ requirement. Every healthy nocturnal female bird, either adult or not is considered an owl).
6. $[owl]^{+}_{t6} = \{d_1, d_4, d_{10}\}$, $[owl]^{-}_{t6} = \{d_2, d_6, d_3, d_5, d_7, d_8, d_9,\}$,
(The new facts in t_6 are: adult$\in MS^{-}_{(owl,t6)}$, female$\in MS^{+}_{(owl,t6)}$ and the properties of d_{10} are not violating any $MS^{+}_{(owl,t6)}$ requirement).
7. $[owl]^{+}_{t7} = \{d_1\}$, $[owl]^{-}_{t7} = \{d_2, d_3, d_4, d_5, d_6, d_7, d_8, d_9, d_{10}\}$,
(The new facts in t_7 are: adult$\in MS^{+}_{(owl,t7)}$, female$\in MS^{+}_{(owl,t7)}$ and the properties of d_{10} are violating some $MS^{+}_{(owl,t7)}$ requirement. Only an adult, healthy nocturnal female bird is considered an owl).
8. $[owl]^{+}_{t8} = \{d_1, d_{10}\}$, $[owl]^{-}_{t8} = \{d_2, d_3, d_4, d_5, d_6, d_7, d_8, d_9,\}$,

(The new facts in t_8 are: adult$\in MS^+_{(owl,t8)}$, female$\in MS^+_{(owl,t8)}$ and the properties of d_{10}, are not violating any $MS^+_{(owl,t8)}$ requirement).
(Note that "not female" can not be a membership dimension since d_1 is a female owl).

4. Hence: $[owl]_{a(c,owl)} = \cap\{[owl]^+_t \mid t \geq a_{(c,owl)}, t\in T\} = \cap\{[owl]^+_{t1} \ldots [owl]^+_{t8}\}$
$= \{d_1\}$.
$[not\ owl]_{a(c,owl)} = \cap\{[owl]^-_t \mid t \geq a_{(c,owl)}, t\in T\} = \cap\{[owl]^+_{t1} \ldots [owl]^+_{t8}\}$
$= \{d_3, d_5, d_7, d_8, d_9\}$.
$[owl]^?_{a(c,owl)} = \{d \mid \exists t_1, t_2 \geq a_{(c,owl)}, t_1, t_2 \in T: d\in[not\ owl]^-_{t1}$ and $d\in[owl]^+_{t2}\}$
$= \{d_2, d_4, d_6, d_{10}\}$.

3.3.2.4. The facts in $any_{(c,owl,healthy)}$:
$Any_{(c,owl,healthy)}$ is equal to c in all except for the interpretation of 'owl' such that:

1. $MS^+_{(owl,any(c,owl,healthy))} = MS^+_{(owl,c)}$ - E.D. = $MS^+_{(owl,c)}$ - {healthy, not healthy}
Thus: $MS^+_{(owl,any(c,owl,healthy))}$ = {owl, bird, nocturnal}.

2. $MS^-_{(owl,any(c,owl,healthy))}$ = E.D. = {healthy, not healthy}.

3. Hence, these are the possible kinds of total states above $any_{(c, owl, healthy)}$:
1. $[owl]^+_{t1} = \{d_1, d_2, d_4, d_3, d_5, d_6, d_7, d_8, \}$, $[owl]^-_{t1} = \{d_9, d_{10}\}$,
(the new facts in t_1 are: female,adult$\in MS^-_{(owl,t1)}$ and the properties of d_{10} are violating some $MS^+_{(owl,t1)}$ requirement. Every nocturnal bird, either healthy adult female or not is considered an owl).
2. $[owl]^+_{t2} = \{d_1, d_2, d_4, d_6, d_3, d_5, d_7, d_8, d_{10}\}$, $[owl]^-_{t2} = \{d_9\}$,
(The new facts in t_2 are: adult,female$\in MS^-_{(owl,t2)}$ and the properties of d_{10} are not violating any $MS^+_{(owl,t2)}$ requirement).
3. $[owl]^+_{t3} = \{d_1, d_2, d_3, d_5\}$, $[owl]^-_{t3} = \{ d_4, d_6, d_7, d_8, d_9, d_{10}\}$,
(The new facts in t_3 are: adult$\in MS^+_{(owl,t3)}$, female$\in MS^-_{(owl,t3)}$ and the properties of d_{10} are violating some $MS^+_{(owl,t3)}$ requirement. Every adult, nocturnal bird, either healthy female or not is considered an owl).
4. $[owl]^+_{t4} = \{d_1, d_2\ d_3, d_5, d_{10}\}$, $[owl]^-_{t4} = \{d_4, d_6, d_7, d_8, d_9,\}$,

(The new facts in t4 are: adult$\in MS^{+}_{(owl,t4)}$, female$\in MS^{-}_{(owl,t4)}$ and the properties of d_{10}, are not violating any $MS^{+}_{(owl,t4)}$ requirement).

5. $[owl]^{+}_{t5} = \{d_{1,} d_3,d_4, d_7\}$, $[owl]^{-}_{t5} = \{d_2, d_5, d_6, d_8, d_9,d_{10}\}$,

(The new facts in t_5 are: adult$\in MS^{-}_{(owl,t5)}$, female$\in MS^{+}_{(owl,t5)}$ and the properties of d_{10} are violating some $MS^{+}_{(owl,t5)}$ requirement. Every nocturnal female bird, either healthy adult or not is considered an owl).

6. $[owl]^{+}_{t6} = \{d_{1,} d_3,d_4, d_7, d_{10}\}$, $[owl]^{-}_{t6} = \{d_2, d_6, d_5, d_8, d_9\}$,

(The new facts in t_6 are: adult$\in MS^{-}_{(owl,t6)}$, female$\in MS^{+}_{(owl,t6)}$ and the properties of d_{10} are not violating any $MS^{+}_{(owl,t6)}$ requirement).

7. $[owl]^{+}_{t7} = \{d_1, d_3\}$, $[owl]^{-}_{t7} = \{d_2, d_4, d_5, d_6, d_7, d_8, d_9,d_{10}\}$,

(the new facts in t_7 are: adult,female$\in MS^{+}_{(owl,t7)}$ and the properties of d_{10} are violating some $MS^{+}_{(owl,t7)}$ requirement. Every adult, nocturnal female bird, whether healthy or not, is considered an owl).

8. $[owl]^{+}_{t8} = \{d_{1,} d_3, d_{10}\}$, $[owl]^{-}_{t8} = \{d_2, d_4, d_5, d_6, d_7, d_8, d_9,\}$,

(the new facts in t_8 are: adult, female$\in MS^{+}_{(owl,t8)}$ and the properties of d_{10}, are not violating any $MS^{+}_{(owl,t8)}$ requirement).

4. Hence: $[owl]_{any(c,owl,healthy)} = \cap\{[owl]^{+}_{t} \mid t \geq any_{(c,owl,healthy)}, t\in T\} = \{d_1,d_3\}$

$[not\ owl]_{any(c,owl,healthy)} = \cap\{[owl]^{-}_{t} \mid t \geq any_{(c,owl,healthy)}, t\in T\} = \{d_9\}$.

$[owl]^{?}_{any(c,owl,healthy)} = \{d \mid \exists t_1,t_2 \geq any_{(c,owl,healthy)}, t_1,t_2 \in T: d\in[not\ owl]^{-}_{t1}\ \&\ d\in[owl]^{+}_{t2}\}$

$= \{d_2,d_4,d_{5,} d_6,d_7, d_8, d_{10}\}$.

Since *almost* accesses the properties in MS^{-}, it is licensed with *every* and *any* but not with generic *a*.

<u>3.3.2.5. FC *any* versus PS *any*</u>

Since I assume that the dimensions sets pair is introduced by the predicate (and not by the generic quantifier, as K&L), the analysis of FC *any* extends to PS *any* as well without any further stipulations. The proposed model enables a representation for the interpretation of the widening examples of PS as well as FC *any*, in a unified way.

FC *any*

Let's consider the semantics of example (6):

(6) Any owl hunts mice.

$[\text{Any owl hunts mice}]_c = 1$ iff:

$[\text{owl}]_{any(c,owl,\ healthy)} \subseteq [\text{hunt mice}]_{any(c,owl,\ healthy)}$

The statement "any owl hunts mice" is true in the state c, in which there is some contextual dimension, say 'healthy' for 'owl', such that: healthy$\in MS^{+}_{(owl,c)}$, iff every element in the denotation of 'owl' is also in the denotation of 'hunts mice' in $any_{(c,owl,healthy)}$. Thus, if we take the model presented in details in this section and add "hunts mice" to A, (6) would be true iff $\{d_1,d_3\} \subseteq [\text{hunts mice}]_{any(c,owl,healthy)}$.

PS *any*

Let's consider the semantics of example (58):

(58) I don't read any book.

$[\text{I don't read any}_{\text{-PS}}\text{ book}]_c = 1$ iff (vagueness semantics):

$[\text{I read any}_{\text{-PS}}\text{ book}]_c = 0$ iff:

$[\text{any}_{\text{-PS}}(\text{ book}, \lambda x.\text{I read x })]_c = 0$ iff:

$[\exists(\text{ book}, \lambda x.\text{I read x })]_{any(c,\ book,of\ poetry)} = 0$.

Thus far, I assume with K & L that PS *any* is an indefinite and gets an existential interpretation. The effects of PS *any* is the same as for FC *any*, it shifts from c to $any_{(c,P,D)}$. The last step in the interpretation is the semantics of the existential quantifier, which has the standard vagueness semantics:

$[\exists(P,Q)]_c = 1$ iff $[P]_c \cap [Q]_c \neq \emptyset$.

$[\exists(P,Q)]_c = 0$ iff $[P]_c \subseteq [\neg Q]_c$.

So we get: $[\text{I don't read any book}]_c = 1$ iff:

$[\text{book}]_{any(c,\ book,of\ poetry)} \subseteq [\lambda x.\neg \text{ I read x}]_{any(c,\ book,of\ poetry)}$.

Every book is in the extension of things that are known as things I don't read.

3.3.2.6. The meaning relations and the differences

Case 1: $[owl]_{a(c,owl)} \subset [owl]_c$. I.e.: $\{d_1\} \subset [owl]_c = \{d_1, d_2\}$.

More generally it follows that:

- If $MS^-_{(P,c)} = \emptyset$: $[P]_{a(c,P)} = [P]_c$ (no changes are induced by the use of *a*).
- If $MS^-_{(P,c)} \neq \emptyset$ then: $[P]_{a(c,P)} \subset [P]_c$. (Some d is not in $[P]_{a(c,P)}$ but is in $[P]_c$ because there is some property Q, that is non trivial on P in c and is unspecified as such in $a_{(c,P)}$. Thus there is some d that doesn't have Q in $[P]_c$. However, in some extensions of $a_{(c,P)}$, Q is an obligatory requirement for having P and d is therefore a non P instance, and in some extensions of $a_{(c,P)}$, Q is non trivial on P and d is a P instance. Thus d is in the gap of P in $a_{(c,P)}$).

Case 2: $[owl]_{a(c,owl)} \subset [owl]_{any(c,owl,healthy)}$. I.e. $\{d_1\} \subset \{d_1,d_3\}$.

More generally, it follows that:

- If the dimension eliminated by a*ny* is specified in $MS^-_{(owl,c)}$ (say 'female') then the use of *any* induces no further changes with respect to the use of *a* (e.g. if *any* is used to eliminate the non trivial dimension 'female': $[owl]_{a(c,owl)}= [owl]_{any(c,owl,female)} =\{d_1\}$), and thus *any* has no widening effect (It may still induce a homogenizing effect as demonstrated in the next chapter).

Otherwise, widening or clarifying occur:

- Widening: if the dimension eliminated by a*ny* is a member of $MS^+_{(owl,c)}$ (say 'healthy') then every element of $[not\ owl]_c$ that violates only the eliminated requirement (and there must be at least one such element, by the definition of MS^-) is in $[owl]_{any(c,owl,D)}$.

E.g.: $[owl]_{a(c,owl)} \subset [owl]_{any(c,owl,healthy)}$ i.e. $\{d_1\} \subset \{d_1,d_3\}$.

Since 'healthy' is in $MS^+_{(owl,a(c,owl))}$ no sick element is a clear case of 'owl' in $a_{(c,owl)}$ ($d_3 \notin [owl]_{a(c,owl)}$. Only d_1, which is healthy, is in $[owl]_{a(c,owl)}$).

However, since 'healthy' is in $MS^-_{(owl,any(c,owl,healthy))}$, no sick element is disqualified from being a member of $[owl]_{any(c,owl,healthy)}$ only because it is sick. Moreover, from the definition of MS^- (following the definition of non- triviality in K&L 93) it follows that there are at least two members in the denotation of ‘owl’, a healthy one and a sick one ($d_1,d_3 \in [owl]_{any(c,owl,healthy)}$). Thus the denotation of ‘owl’ in $any_{(c,owl, healthy)}$ includes at least one more member than in $a_{(c,owl)}$.

Since $any_{(c,owl,healthy)}$ is similar to $a_{(c,owl)}$ in all respects except for the status of ‘healthy’ in the interpretation of ‘owl’, the denotation of ‘owl’ in it is equal in all other respects to the one in $a_{(c,owl)}$.

I.e. the interpretation of the first argument of *any* (‘owl’) in the state $any_{(c,owl,healthy)}$, is at least as precise as in $a_{(c,owl)}$, but in the least restricted way along ‘healthy’.

- <u>Clarifying</u>: if the dimension that a*ny* eliminates is unspecified, and it is still a potential requirement for owls in c (say ‘adult’), after its elimination, any element of $[owl]^?_{a(c,owl)}$, that doesn’t satisfy it (but satisfies any other potential requirement), is in $[owl]_{any(c,owl,D)}$.

E.g. if a*ny* eliminates ‘adult’: $[owl]_{a(c,owl)} \subset [owl]_{any(c,owl,adult)}$, i.e. $\{d_1\} \subset \{d_1,d_4\}$.

The interpretation of the first argument of *any* (‘owl’) in the state $any_{(c,owl,adult)}$, is more precise than in $a_{(c,owl)}$. It is the least restricted interpretation along ‘adult’).

<u>Case 3</u>: $[owl]_c \subset [owl]_{every(c,owl)}$. I.e. $\{d_1, d_2\} \subset \{d_1, d_2,d_4,d_6\}$.

More generally, it follows that:

- If $MS^-_{(P,c)} = \{Z| Z \in A^*, Z, \neg Z \notin \cap\{MS^+_{(owl,t):}\ t \geq c\}\}$ then: $[P]_c = [P]_{every(c,P,Q)}$ (the use of *every* induces no changes, since already in c the dimension set pair of P is complete).

- Otherwise: $[P]_c \subset [P]_{every(c,P,Q)}$ (Some d is not in $[P]_c$ but is in $[P]_{every(c,P,Q)}$ because d doesn’t have some property Z, that is non trivial on P in $every_{(c,P)}$ and is not necessarily non trivial in c).

<u>Case 4</u>: $[owl]_{a(c,owl)} \subset [owl]_{every(c,owl,hunts\ mice)}$. I.e. $\{d_1\} \subset \{d_1, d_2,d_4,d_6\}$.

More generally, it follows that:

- It is always the case that: $[P]_{a(c,P)} \subset [P]_{every(c,P,Q)}$, except for one extreme case:

- If every predicate or its negation is an obligatory requirement for having P (if $MS^+_{(P,c)} \cup \{\neg Z: Z \in MS^+_{(P,c)}\} = A^*$) then $MS^-_{(P,c)}$ is empty, and so is $MS^-_{(P,a(c,P))}$ and $MS^-_{(P,every(c,P,Q))}$. This is the case in contexts in which one knows that there is but one P instance (or a set of indistinguishable P instances). The use of ‘every’ in such cases is naturally rare. It is either odd or funny.

Case 5:

- If E.D. $\subseteq MS^{+}_{(P,c)}$ then: $[P]_{any(c,P,D)} \not\subset [P]_{every(c,P,Q)}$.

(Since the dimensions that *any* eliminates from $MS^{+}_{(P,c)}$, are non-trivial on $[P]_{any(c,P,D)}$ but are obligatory restrictions of $[P]_{every(c,P,Q)}$).

- If E.D.$\subseteq MS^{-}_{(P,c)}$ then: $[P]_{any(c,P,D)} \subseteq [P]_{every(c,P)}$

(If the eliminated dimension is non trivial in the first place, *any* has no widening effect, but *every* may still be effective in widening).

E.g. $[P]_{any(c,P,D)} \subset [P]_{every(any(c,P,D),P,Q)}$.

(The dimensions that *any* eliminates from $MS^{+}_{(P,c)}$, are non trivial on $[P]_{any(c,P,D)}$ and on $[P]_{every(any(c,P,D),P,Q)}$. Other dimensions are non-trivial only in the latter case).

- If E.D.$\cup MS^{+}_{(P,c)} \cup \{\neg Z: Z \in MS^{+}_{(P,c)}\} = A^*$ then: $[P]_{any(c,P,D)} = [P]_{every(c,P,Q)}$

(if the eliminated dimensions are the only potential non trivial dimensions *every* would have no additional effect except to the effect induced by *any*.

If it is also the case that E.D. $\subseteq MS^{+}_{(P,c)}$ then even: $[P]_{any(c,P,D)} \supseteq [P]_{every(c,P,Q)}$).

3.3.2.7. The distribution of *any*

This analysis enables me to account for the strengthening that *any* induces as a result of widening or clarifying. I use an asymmetric strengthening constraint:

S1 strengthens S2 iff S1 entails S2, but not vice versa.

Since we are dealing with partial information (three valued semantics) I use the following definition for entailment:

S1 entails S2 iff $\forall$c: If $[S1]_c = 1$ then $[S2]_c = 1$

If $[S2]_c = 0$ then $[S1]_c = 0$.

FC *any*: any owl hunts mice:

1. In every c it hold that: $[owl]_{a(c,owl)} \subseteq [owl]_{any(c,owl,D)}$ and:

$$[not\ owl]_{a(c,owl)} \supseteq [not\ owl]_{any(c,owl,D)}$$

$$[hunts\ mice]_{a(c,owl)} = [hunts\ mice]_{any(c,owl,D)}$$

$$[not\ hunts\ mice]_{a(c,owl)} = [not\ hunts\ mice]_{any(c,owl,D)}$$

2. In some context c it holds that: $[\text{owl}]_{a(c,owl)} \subset [\text{owl}]_{any(c,owl,D)}$ (see in 3.3.2.5).

3. It follows that: "any owl hunts mice" => "an owl hunts mice", but not vice versa.

Thus, I have proved strengthening.

Widening occurs and thus the statement, as it should hold of more elements, is stronger. In case that some sick member, say d3, is the only exception to the generalization (it is the only owl that doesn't hunt mice) the statement post elimination (with *any*) is false and the statement pre elimination (with *a*) is true. In all other cases they are true together or false together.

PS *any*: I don't read any book:

1. In every c it holds that: $[\text{book}]_{a(c,owl)} \subseteq [\text{book}]_{any(c,owl,D)}$

$$[\text{not book}]_{a(c,owl)} \supseteq [\text{not book}]_{any(c,owl,D)}$$

$$[\lambda x.\neg read(I,x)]_{a(c,owl)} = [\lambda x.\neg read(I,x)]_{any(c,owl,D)}$$

$$[\lambda x.\ read(I,x)]_{a(c,owl)} = [\lambda x.\ read(I,x)]_{any(c,owl,D)}$$

2. In some context c it holds that: $[\text{book}]_{a(c,owl)} \subset [\text{book}]_{any(c,owl,D)}$

3. It follows that: "I don't read any book" => "I don't read a book" but not vice versa.

Thus, I have proved strengthening for PS *any* as well.

Widening occurs, and thus the statement, as it should hold of more elements, is stronger. In case that some non-poetry member (say, a novel or a technical book) is the only exception to the generalization (it is the only book that I read) the statement post elimination (with *any*) is false and the statement pre elimination (with *a*) is true. In all other cases they are true together or false together.

As demonstrated the domain of quantification is the denotation of the predicate, but it is the denotation in some state less strict along the eliminated dimensions (differently than expected pre elimination). Thus no further mechanisms are required to represent PS *any* and the strengthening it induces.

3.3.2.8. The same relation holds between statements with *every* and with *a*:

1. $[\text{An owl hunts mice}]_c = 1$ iff $[\text{owl}]_{a(c,owl)} \subseteq [\text{hunts mice}]_{a(c,owl)}$

   $[\text{Every owl hunts mice}]_c = 1$ iff $[\text{owl}]_{every(c,owl)} \subseteq [\text{hunts mice}]_{every(c,owl)}$

2. [hunts mice]$_{a(c,owl)}$ = [hunts mice]$_c$ = [hunts mice]$_{every(c,owl)}$ and:

3. [owl]$_{a(c,owl)}$ $\subseteq$ [owl]$_c$ $\subseteq$ [owl]$_{every(c,owl)}$

[Not: owl]$_{a(c,owl)}$ = [Not: owl]$_c$ = [Not: owl]$_{every(c,owl)}$

4. It follows that: "every owl hunts mice" => "an owl hunts mice", but not vice versa.

<u>3.3.2.9. Monotonicity:</u>

The semantics of "every(P,Q)" is usually (i.e. if we disregard the possibility of elements with unknown properties as d_{10}) monotonic. If "every(P,Q)" is true in c it is known in c that the positive denotation and the gap of P are subsets of [Q]$_c$. Thus, any possible extension of the positive denotation (with gap members adjoin to it, e.g. $d_{4,}$ d_6) and any possible reduction of the gap (e.g. without $d_{4,}$ d_6, that enter the positive or the negative denotation) would still be subsets of [Q]$_c$ or its extensions.

Only d_{10} may still be discovered to be an exception. I.e. to be an owl not hunting mice. This exception is impossible if there is some obligatory conditions for 'owl' that entails hunting mice.

The semantics of "a(P,Q)" is monotonic only to the extent that one doesn't suggest to take into account some counter-examples as P instances, on a basis that is independent from the dimensions sets. If "a(P,Q)" is true in c, still some things that are indirectly known as P instances in c on the basis of some MS^- properties, may violate Q, but since they are regarded as gap members of P in $a_{(P,c)}$ they don't constitute negative evidence against "a(P,Q)". In further extensions of c they may be known as P instances on some other basis (as direct pointing, like in "lets regard d3-d10 as owls"). Then, they would be in the positive denotation of P in $a_{(P,c)}$ as well, and may constitute a negative evidence against "a(P,Q)".

I.e. the semantics of "a(P,Q)" is monotonic as long as the directly given denotation $[P]^+_c$ (rather than the indirectly extended denotation [P]$_c$) is not extended in a 'surprising' way.

The same holds for the semantics of *any*. If Q applies to the widened subset of [P]$_c$ it would apply to it also in further extensions (like in the case of 'every'). But if [P]$_c$ is widened in further extensions from independent reasons, also along other dimensions, Q may not apply on [P] in those extensions (like in the case of 'a').

3.4. In conclusion,

In this section I have demonstrated the advantages of a model with dimensions sets in the meaning of predicates. The dimension sets represent the contextual variance in the meaning of predicates. They illuminate the facts that hold when there is vagueness along some dimension.

Since the non- trivial dimension set is directly represented in the membership pair of a predicate, it is easy to account for the distribution of *almost*, and for the differences in the semantics of *any*, *a*, and *every*. It is clearly the non- trivial dimension set that is crucial for the explanation of these facts. K&L already show this, but since this set is not directly represented in the dimensions set in their analysis, they need to force a constraint for the licensing of *almost* that is too strong, or a grammatical stipulation, which is ad hoc. The present analysis is also more economic. *Any*, and quantifiers in general, don't have to be further accompanied with a separate contextual set of properties, which is usually stipulated in order to account for contextual restrictions on the domains of quantification. In this analysis, these items make use of the membership dimension sets of the predicate in their restriction. The analysis suggested here helps illuminate the meaning relations, the similarities and the differences between the meanings of these items in the same context.

I have shown, at this point, that a completely unified accounts for PS and FC *any* can be given, in which widening is not defined directly on predicate extensions but on dimension sets.

In chapter two I discussed cases of homogenizing, where the extension seems to stay the same, but some ordering between the elements in the extension is operated upon. I have not yet introduced in the theory the means to deal with these distinctions. This is the task of chapter four.

Chapter 4: Ordered denotations and Ordering dimensions in predicate interpretation

In this chapter I define the notion "ordering dimension set", the set of dimensions ordering the denotation of a predicate on a scale in a context.

I have to answer the following questions:

1. How exactly can we account for denotations being ordered in scales?
2. How does a set of ordering dimensions play a role in this process?
3. What is the relation that makes a dimension D (say 'beautiful', 'designed', "fit the suit", "fit the weather") an ordering dimension of a predicate P (say "socks to lend") in a context?
4. What is the relation that prevents a dimension D (say "fit the suit") from being an ordering dimension of a predicate P (say "socks to lend") in a context?

In this chapter I propose answers to these questions.

4.1 What is a dimension in the Ordering set?

4.1.1. Ordering conditions versus necessary conditions (membership dimensions)

The model presented in chapter three relies on the assumption that when we 'know' some predicate P, we normally hold in mind some knowledge about the characteristic predicates that identify the individuals in P's denotation (i.e. a membership set $MS^{+}_{(P,c)}$), and we are usually also familiar with some individuals that have P (i.e. that were pointed to us as being in P's denotation, $[P]^{+}_{c}$).
In the model as it is, all such characteristic predicates are treated as being of equal weight. The model as it is can not deal with fine-grained distinctions between the predicates in the membership set. There is ample reason to assume that we <u>must</u> make more fine-grained distinctions.
For instance, <u>some individuals</u> are intuitively <u>not regarded as instances of P</u>, or are regarded as atypical P instances, even though they may <u>have all the predicates that are used to identify P members</u> (all the necessary conditions for membership in $[P]^{+}_{c}$).
E.g. bats or dolphins are regarded as atypical mammals not because they lack mammal features, but because they have some typical bird or fish features that reduce their typicality. (Mammals, characteristically, should differ from birds and fishes).

Secondly, some <u>other individuals</u> that we would intuitively regard as <u>instances of P</u> may <u>not have some known characteristics of P</u>. For example, the characteristics required of a "cooking oil" in a context where one is making one's shopping list, may include predicates like "not very expensive", 'yellow', "packed in a plastic bottle", "contains about a liter and a half oil" etc. Now, one may have ten oil bottles in one's kitchen, some of which are very small, green, expensive, glass bottles. One might still want to keep one's characteristic or identifying dimensions set for "oil bottles", and yet insist on including these bottles in the denotation of "oil bottles". They may be regarded as contextually atypical, or fitting the contextual definition (interpretation) of "oil bottle" less.

The notion of 'typicality' used here, corresponds in part to that used in the psychological literature, but differ in some important respect. In the psychological literature, it usually refers to fixed typicality properties (e.g. 'hairy' for mammals, "white hair" for grandmothers, etc.) The salience of these fixed typicality properties has been assessed by many psychological experiments (see Smith 1988, Rosch 1978). I use the notion 'typicality' for contextually dependent properties, that in certain contexts happen to be used as ordering criteria of some predicate's instances. But these need not be used thus in all other contexts. Thus, the notion of 'typicality' used here, is a far more context dependent notion. For the ease of speech, I call the elements with the higher status on a contextual predicate scale the "(contextually) typical" elements. Similarly, I also sometimes will call the ordering criteria "(contextual) typicality properties". However, as explained, they need not be ordering criteria in every context, and thus, the order they are a criterion of need not reflect the notion of typicality as used in the psychological literature. It simply reflects some relevant contextual ordering of a predicate's instances.

<u>4.1.2. The nature of the ordering dimensions in the interpretation of predicates</u>

To deal with the kind of exceptions described above (i.e. the individuals that are not regarded as good examples of P though they satisfy all the possible membership constraints, and the individuals that are regarded as P though they don't satisfy some stereotypical property of P instances), one will need to keep these ordering characteristics separate from the set of obligatory conditions (the membership dimensions).

The ordering dimensions in question are the properties that a contextually typical element has. They are non- necessary, but stereotypical properties of P instances.
In certain relatively tolerant contexts, they can be ignored, in such a way that instances that fail to have them are regarded as members of the denotation, though less typical ones (in this case these ordering properties are specified in MS^-). In stricter contexts, they may be specified in MS^+ as well and be obligatory restrictions for all members. In yet a third kind of context, they are not specified in MS at all, and then an instance that fails to satisfy these stereotypical characteristics might not be confidently be regarded as a member in the denotation.
For example, an ordering dimensions set is associated with the predicate 'bottle'. That set represents the properties of contextually typical bottles. Namely, when we look for members of the denotation of 'bottle' in the context, we look for individuals as typical as possible relative to as many of the predicates in the ordering dimensions set of 'bottle'. So the contextual typicality of an objects (which is their status on the contextual scale of bottles) reduces as their necks are less like typical bottleneck (for instance, by being too wide).
The predicate interpretation, without context, is vague. Some of its precisifications are stricter than others depending on the degree of typicality of "has a bottle neck" required by their membership dimensions. The contextual denotation of 'bottle' may allow atypical bottles (with a wide neck) or not.
In contexts in which we are not informed about the exact borderlines of the denotation, our judgements concerning whether something counts as a bottle are less determined as their typicality reduces.
In contexts in which we have to choose one of few bottles, bottles are less preferred as their typicality reduces (e.g. if they fail to have the ideal bottleneck, size, prize etc. in the context).
If in a context a generalization over bottles is made, we are more willing to tolerate less typical exceptions to a generalization than more typical ones. Bottles that fail to have the contextual ideal bottleneck, size, prize etc., unlike contextually typical bottles, might be regarded as less relevant. We may regard only the latter as the elements we actually intend to talk about.

To put it in other words, the values of the function $[\ ]_c$ (the function that associates each predicate with a denotation) are constrained by the predicates in $MS^+_{(P,c)}$, but there are still more constraints on it. Some element d can be regarded as a member of $[P]_c$ even in a state in which d has some property unspecified in $MS^+_{(P,c)}$, but specified as an ordering, a stereotypical property of P instances. For example, in the context of a discourse about owls' eating habits, 'healthy' may be known to be neither an obligatory dimension, nor a non- trivial dimension of P in c, but yet only healthy creatures (that fit the constraints on P) may be clearly regarded as the subjects of the conversation or as the relevant individuals referred to by 'owl' in c (members in $[owl]_c$), while the question of whether sick creatures are relevant may still be open. The speakers in c more easily take into account creatures that have higher levels of health and fit the constraints on P in c, as P instances.

Think of two ways of extending the denotation of 'owl'. On the first way, we add healthy individuals before we add sick ones. On the second way we add healthy and sick individuals indiscriminately. In the first case and not in the second case, 'healthy' is regarded as a stereotypical characteristic of owls, and thus eases the decisions regarding the membership of healthy creatures in $[owl]_c$.

It is this kind of constraint that is to be encoded in the ordering dimensions set OS. OS contains properties, that usually identify denotation members, but that don't necessarily rule out objects that don't satisfy them. The object's contextual typicality reduces when more such properties have to be ignored in order include this object in the denotation.

4.2. Contexts in which ordering constraints are most relevant

In certain contexts it is not just the distinction between P instances and others that is interesting and crucial, but also some possible distinctions within the set of P instances are relevant. In that case, it is useful to order individuals in scales, determined by ordering dimensions.

4.2.1. Choice contexts

One type of contexts of this sort is that of choice contexts, or preference contexts. For example if one expresses a wish to have a P instance, or a request for a P instance, just one member of the denotation has to be chosen. But not all the members may have the same status. Some members may be less likely, preferred or expected to be chosen. That is, there is a contextual scale of individuals. [P] is ordered by contextual

typicality relative to P (or fitness to the contextual characterization of P, or expectedness to be regarded a P instance or etc.)
E.g. a rotten fruit is less likely to fit a request for some apple to eat than a good apple. An alcoholic drink, coffee or a non refrigerated coke, is less typical for a drink in a kindergarten birthday party than some sweet cold drink. If a drink is requested in such a context, the sweet cold drink is more expected to be served than the other things.

4.2.2. Loose speech

A second type of context, in which it is useful to introduce scales of individuals ordered by some ordering dimensions, is that of loose speech. In many contexts, speakers refer to elements that are hardly regarded as P instances as if they are not -P instances, even though they are in fact P instances. Generalizations on P that are violated only by these atypical instances can be regarded as “true enough” (Lasherson 1998). Generalizations violated by contextually typical P instances, however, can not be so regarded, even loosely speaking. The expectation that a generalization over P would apply to some individual increases as the individual’s status on the P scale increases. In other words, exceptions to generalizations over P instances are ignored or are regarded less seriously when the exceptional individuals are atypical P's.

E.g. a very bad looking apple may be ignored when the proposition “I don’t have any apples” or “I like apples” is uttered. Generic generalizations over mammals are more highly expected to hold of cows, lions or dogs than of bats, or whales, or of healthy adult instances rather than of sick or babies. Even healthy adult creatures that happen to be of a rare vegetarian kind may be ignored when the proposition “an owl hunts mice” is uttered. It may be regarded as true enough for some contextual purposes. Exceptions to generalizations on apples, mammals or owls are ignored when the exceptional apples are bad looking apples, the mammals – similar to a bird or a fish, or the owl – young, sick or of a rare type.

4.3. A scale of individuals in a predicate interpretation

Thus, we will associate a scale of individuals with every predicate P. The contextual scale can be formally represented as a relation, $\leq^{+}_{(P,c)}$, (“at most as P as”). This relation associates P in c with a set of pairs of individuals $<d_1,d_2>$, such that d_1 is at most as P as d_1 (or d_2 is at least as P as d_1). That means that d_2 is on an equal or higher position on the relevant contextual P scale than d_1.

I propose that this order is part of the basic interpretation of every predicate, not just scalar ones. The partial nature of information regarding meanings (or denotations) makes scales that reflect the gradual expansion of information, always available.

Take socks. We don't think of 'sock' as a scalar predicate, but in context, an ordering scale is readily available. For instance, the more dry a pair of socks is, the easier it may be to determine its membership in the denotation of "socks to lend". In some contexts - those with stricter standards for membership - the relatively wet instances may not be good enough to be members in the denotation of "socks to lend". Thus the predicate "socks to lend", which is not semantically a scalar predicate, nevertheless can have a contextual scale associated with it.

4.3.1. A model with scales of individuals

Up to now, information structures were based on a set of accessible predicates A*. We are adding to this a new set of scalar predicates $\{\leq_{(P)}: P \in A^*\}$. We will be concerned with extending the theory so as to give an interpretation to those new predicates and fit them in with the rest. The new predicates will denote relations between individuals. E.g. if P is "sock to lend" then $[P]^+_c$ is the set of socks to lend in c, and $[\leq_{(\text{sock to lend})}]^+_c$ is the set of pairs of individuals such that the second fits the characterization of "socks to lend" in c at least as well as the first one does.

4.3.2 What does the comparative relation $\leq_{(P)}$ of a non- scalar predicate P contain?

If a predicate P is not inherently scalar, there may be two kinds of relevant contexts. In some contexts, the whole denotation of P may be in the symmetric relation "as P as" (in contexts in which there are no relevant differences in status between P members). The relation $\leq_{(P)}$ may even be empty. In that case there is not enough evidence (or even no evidence at all) to make ordering judgements.

But in request contexts, among other kinds of contexts, also a non- scalar predicate P is likely to be associated with a contextual ordering dimension set, and to be ordered on a scale, as demonstrated above. Then, $\leq_{(P)}$ becomes more complete.

Based on this I suggest that non- scalar predicates, in contrast with inherently scalar ones, are vague as to their ordering criteria. Whereas you always know the ordering criteria for ‘tall’ (it is fixed in the semantics of ‘tall’), you don’t always know the ordering criteria for ‘socks’, or ‘kibbutznic’. However, though such an ordering is not fixed by the semantics of non- scalar predicates, in many contexts there may be some contextual ordering criteria for, say, ‘socks’ or ‘kibbutznic’. Once these criteria are contextually fixed, individuals can be ordered in a scale relative to them, in a manner expressed by the derived comparative relation ($\leq^{+}_{(\text{kibutznic,c})}$).

Some non-scalar predicates P have some relatively known and accepted scalar meaning to which they can refer only if they are modified by the modifier *typical*. The predicate *typical P* is scalar, and it determines a comparative relation that expresses its contextual scale (*more typical P than*). The exact similarities and divergences between the scale associated with P and the scale associated with *typical P* are not very clear. E.g. consider example (78).

(78) a. John is <u>more of a kibbutznic</u> than Mary.
b. John is <u>more of a typical kibbutznic</u> than Mary.

Both (78a) and (78b) are likely to be stated if the speaker has some information about John and Mary, relative to which John has more of the properties that contextually characterize kibbutznics rather than non kibbutznics in (a), or typical kibbutznics rather than non typical ones in (b). But the lack of these properties may be ignored when membership in the denotation of ‘kibbutznic’ is determined.
When (b) is uttered, both a scalar meaning and a non-necessarily scalar meaning for ‘kibbutznic’ are accessible. In the scalar case (associated with “typical kibbutznic”), kibbutznics are ordered by typicality (say, stronger than a city man, closer to nature, dressed less elegantly etc.). In the other case (‘kibbutznic’) either all kibbutznics are regarded as “equally kibbutznics”, or they are ordered relative to some other more contextual criteria (the number of years they lived on a kibbutz, the extent they tend to share in food or other stuff, the kind of job they have and so on). In order to refer to the first scalar interpretation one needs to modify the word with *typical*.
Thus, kibbutznic may not be scalar while “typical kibbutznic” is always scalar. In contexts in which “more of a kibbutznic” is still an empty relation this expression is therefore not very useful. In other contexts, possibly, all the denotation members are

regarded as kibbutznics to the same degree. Again, the comparative "more of a kibbutznic" is not likely to be uttered and it may even sound odd. Even in these contexts "more of a typical kibbutznic" <u>can</u> be properly used. It is possible, that all what *typical* does, is to associate with the predicate it modifies some contextual ordering criteria.

However, given enough context, a member of the denotation of a predicate P can be regarded as P to a variety of degrees - more or less P than some other P instances. Also an individual that is not known as P can at least be regarded as more or less P than other individuals.

<u>4.3.3. What does the P scale of individuals (or the relation $\leq_{(P,c)}$) stand for?</u>

I will follow almost completely the idea behind the analysis of comparatives like *more P than* by Kamp 1975 and Landman 1991 (Kamp's account applies to P gap members only. Landman 1991 extends it to apply also to P denotation members). The analysis expresses the connection between any adjective P (say 'tall') and a comparative like *more P than* ("taller than").

On Landman's 1991 version of the theory, the claim is that a statement of the form *d_1 is at most as P as d_2* is true in c iff after minimally reducing the information in c such that both d_2 and d_1 are borderline cases of P, in all the extensions of this reduced context, it is never the case that d_1 is clearly a P instance and d_2 is not.

The crucial insight is that the ordering of individuals as to the extent that they are instances of a predicate encodes the ease they become members of the predicate's denotation as information grows. An individual d_1 is more P than another is if it easier to determine that P applies on d_1. E.g. the taller an instance is, the easier it is to determine its membership in the denotation of 'tall'. In some contexts (those with stricter standards for membership in the denotation of 'tall'), the less tall instances may not be tall enough to be members in the 'tall' denotation.

Since information is normally partial, the denotation of <u>any</u> predicate P can be extended scalarly. Therefore, a comparative relation can always be defined.

I assume that an individual d_1 is more P than another individual d_2 in a state c ($d_1 >_{(P,c)} d_2$) iff it is always the case that either d_1 becomes a member of P's positive denotation earlier than d_2, or d_2 becomes a member of P's negative denotation earlier than d_1.

Formally:
Let B_c, be the set of branches through c in C (i.e. the set of maximal linearly ordered subsets b of C, with the state c as a member in every b).
$\forall d_1,d_2 \in D$, $\forall P \in A^*$, $\forall c \in C$: $\mathbf{d1 \leq^{+}_{(P,c)} d2}$ iff:
$\forall b \in B_c$, $\forall c_1 \in b$: (If $d_1 \in [P]_{c1}$ then $d_2 \in [P]_{c1}$) and (If $d_2 \in [\neg P]_{c1}$ then $d_1 \in [\neg P]_{c1}$).

Intuitively, d_1 is less of a P than d_2 in c iff in every way of extending the information from zero to totality through c, d_1 is regarded as P only if d_2 is already regarded as P, and d_2 is disqualified from being regarded as P only if d_1 is already disqualified.
E.g. d_2 is taller than d_1 in c iff if every way of making d_1 tall makes d_2 tall before that, and every way of making d_2 not tall makes d_1 not tall before that.

Naturally, $d1 =^{+}_{(P,c)} d2$ (d_1 is as P as d_2) iff $d1 \leq^{+}_{(P,c)} d2$ and $d2 \leq^{+}_{(P,c)} d1$.
$d1 <^{+}_{(P,c)} d2$ (d_1 is less P than d_2) iff $d1 \leq^{+}_{(P,c)} d2$ but not $d2 \leq^{+}_{(P,c)} d1$.

A information model for a set of predicates $A \cup \{\leq_{(P)}: P \in A\}$ is a structure $<C, \leq_A, c_0, D, A, I_{A \cup \{\leq(P):\, P \in A\}}>$ where $<C, \leq_A, c_0, D, A, I_A>$ is an information model for A and the following condition holds:

<u>The Ordering Condition.</u> $\forall c \in C$, $\forall P \in A^*$, $\forall d_1,d_2 \in D$: $[\leq_{(P)}]^{+}_{c} = \{<d_1,d_2>|\ d_1 \leq^{+}_{(P,c)} d_2\}$

$$[\leq_{(P)}]^{-}_{c} = \{<d_1,d_2>|\ d_1 >^{+}_{(P,c)} d_2\}.$$

The predicates $\leq_{(P)}$ are subject to the same constraints as the predicates of A. Hence:
- From the requirement for <u>monotonicity</u> it follows that:
  $\forall c_1 \leq c_2$: $([\leq_{(P)}]^{+}_{c1} \subseteq [\leq_{(P)}]^{+}_{c2})$ and $([\leq_{(P)}]^{-}_{c1} \subseteq [\leq_{(P)}]^{-}_{c2})$.
- From the requirement for <u>totality</u> it follows that:
  $\forall t \in T$, $\forall P \in A^*$: $([\leq_{(P]}]^{+} \cup [\leq_{(P,c)}]^{-} = D \times D)$.
  (I.e. $\forall d_1,d_2 \in D$: $(d1 <^{+}_{(P,t)} d2)$ or $(d1 >^{+}_{(P,t)} d2)$ or $(d1 =^{+}_{(P,t)} d2)$).

- The membership of some pairs in the denotation of a comparative relation may be given directly (providing that they satisfy the requirements in the ordering constraint). For other pairs it may not be given. For these pairs, the order may either be unknown or indirectly derived. Let me illustrate these two cases.

Consider the predicate ‘bottle’. In some context c there is no specific order in which gap members that differ in size are added to the denotation of ‘bottle’ in the contexts under and above c (i.e. in the branches through c). In certain branches through c, bigger bottles are added before smaller ones. In others, bigger bottles are added after smaller ones, and still in other branches members are added regardless of size. Thus, not all the pairs of bottles that differ in size satisfy the requirements in the ordering constraint. More information is required in order to determine the precise contextual order of ‘bottle’ along the dimensions of size.

Alternatively, in some contexts c, some pairs of individuals may satisfy the requirements in the ordering constraint. I.e. it happens to be the case that in every state in the branches through c (in every state under and above c), if the first individual in the pair is regarded as a bottle the other one is already so regarded, and if the latter is regarded as ‘not bottle’ the first one is already so regarded. There is no way to expand the information in c such that this pair doesn’t satisfy the requirements in the ordering constraint. The information specified in c is enough to make every state in C, in which only the first individual in the pair is regarded as a bottle, or only the second one is regarded as non-bottle, incompatible with c (it is not an extension of c and c is not one of its extensions). Hence, the pair must end up in $[\leq_{bottle}]_t$ in all total extension of c. It is determined to be in this relation, not by pointing, but indirectly.

The indirectly extended positive order, $\leq_{(P,c)}$, is the intersection of the given positive orders $[\leq_{(P)}]^+_c$ in all total extensions of c:

$[\leq_{(P)}]_c = \{<d_1,d_2>| \forall t\in T, t\geq c: <d_1,d_2>\in[\leq_{(P)}]^+_t \}$.

The negative order, $\leq^-_{(P,c)}$ is actually $>_{(P,c)}$.

$[not: \leq_{(P)}]_c = [>_{(P)}]_c = \{<d_1,d_2>| \forall t\in T, t\geq c: <d_1,d_2>\in[\leq_{(P)}]^-_t \} =$

$= \{<d_1,d_2>| \forall t\in T, t\geq c: <d_2,d_1>\in[>_{(P)}]^+_t\}$

The gap $\leq^{?}_{(P,c)}$ includes those pairs that can not be positively ordered by the information in c (by pointing or indirectly).

$[\leq_{(P)}]^{?} = \{<d_1,d_2>|\exists t_1,t_2\in T, t_1,t_2\geq c: <d_1,d_2>\in [\leq_{(P)}]^{-}_{t1} \ \& <d_1,d_2>\in[\leq_{(P)}]^{+}_{t2}\}$.

4.3.4. Opposite order relations ($\leq_{(P)}$ versus $\leq_{(not\ P)}$)

Naturally, an individual d_1 is 'less tall' than another individual d_2 iff d_2 is 'taller' than d_1. Or, d_1 is "more of a typical kibbutznic" iff d_2 is "more of a typical city man".

The suggested analysis predicts this, since, by definition, $\leq_{(P)}$ has exactly the opposite requirements from those of $\leq_{(not\ P)}$. That is:

1. $(d1\leq_{(P,c)}d2)$ iff: $\forall b\in B_c, \forall c_1\in b$: 1. If $d_1\in[P]_{c1}$ then $d_2\in[P]_{c1}$ &

2. If $d_2\in[\neg P]_{c1}$ then $d_1\in[\neg P]_{c1}$.

2. $(d1\leq_{(\neg P,c)}d2)$ iff: $\forall b\in B_c, \forall c_1\in b$: 1. If $d_1\in[\neg P]_{c1}$ then $d_2\in[\neg P]_{c1}$ &

2. If $d_2\in[\neg\neg P]_{c1}$ then $d_1\in[\neg\neg P]_{c1}$.)

3. $[P]_c = [\neg\neg P]_c$ (since $\forall P,Z\in A^*$: $Z=\neg P$ iff $\forall c$: $[Z]^{+}_{c} = [P]^{-}_{c}$ & $[Z]^{+}_{c} = [P]^{-}_{c}$).

Hence, it follows that $(d_1\leq_{(P,c)}d_2)$ iff $(d_2\leq_{(\neg P,c)}d_1)$.

4.4. The ordering dimensions sets pair

4.4.1. Ordering dimensions are not membership dimensions of comparatives

We are adding to the theory for each predicate P an ordering relation $\leq_{(P,c)}$. We interpret this relation along the following lines: $(d_2 \leq_{(P,c)} d_1)$ means: d_1 is more of a P than d_2, d_1 is a better example of P than d_2. The intuition is that this relation represents stereotypicality: d_1 is more of a P than d_2, if d_1 satisfies more of the stereotypical properties associated with P than d_2.

Now we start by making an argument in analogy. We have argued in the first three chapters of this thesis for a semantic theory in which we associate with a predicate in a context its positive and negative denotations, plus a structure of accessible predicates, the predicates that are known in the context to determine P-hood and the predicates that are known in the context not to determine P-hood. We add now to P an ordering relation $\leq_{(P)}$ and we have associated with the latter in the context its positive and negative denotations.

But, arguably, the ordering relation $\leq_{(P)}$ itself comes with a structure of predicates in the same way that P does. That is, just as the positive and the negative extensions of P are constrained by the contextual set of properties that are known to determine P-hood and the contextual set of properties that are known not to determine P-hood, the positive and the negative extensions of the ordering relation $\leq_{(P)}$ are constrained by such sets. The set of properties known in c to determine ordering, and the set of properties known in c not to determine ordering.

The argument so far runs as follows: given the way the theory works for membership dimensions of P, we expect it to work the same for $\leq_{(P)}$, i.e. we expect that $\leq_{(P)}$, comes with membership dimensions.

Now the simplest and most attractive assumption would be to reduce stereotypicality with respect to P to the membership dimensions of $\leq_{(P)}$: identify the set of properties that stereotypical P's have with $MS^{+}_{(\leq(P),c)}$: the set of properties that are known to be relevant for ordering P by the order "d_1 is more of a P than d_2".

Unfortunately, it is rather simple to show that such a theory is too strong. Take a predicate like "sock to lend". Intuitively, 'dry' is a good candidate for a stereotypical property for this predicate. Typical socks to lend are, presumably, dry. But we can not assume that, because of that, 'dry' is a membership dimensions of $\leq_{(\text{sock to lend})}$, because that would entail that:

$(d_2 \leq_{(\text{sock to lend},c)} d_1)$ implies $(d_2 \leq_{(\text{dry},c)} d_1)$.

If d_1 is a better example of a sock to lend than d_2, then, by necessity, d_1 is dryer than d_2. While in some contexts this may be a reasonable assumption, obviously, in many it is not. A wet sock without holes may just be more stereotypical than a dry sock with lots of holes. Thus, if we want to say that 'dry' is a property relevant for determining the ordering of "socks to lend", - and we do - then it can not be in virtue of the fact that 'dry' is a membership dimension of $\leq_{(\text{sock to lend})}$, because it is not.

I will say that 'dry' is a property relevant for determining the ordering of "sock to lend", in virtue of the fact that 'dry' is an ordering dimension of "sock to lend".

Thus, I will associate with a predicate P a structure of predicates called "ordering dimensions". This, as usual, will be a structure $<OS^{+}_{(P,c)}, OS^{-}_{(P,c)}>$, where $OS^{+}_{(P,c)}$ and $OS^{-}_{(P,c)}$ are sets of accessible predicates. The task of this chapter is to determine the nature of the sets $OS^{+}_{(P,c)}$ and $OS^{-}_{(P,c)}$ and the constraints on them. What I will argue in the next chapter is that this additional structure of ordering dimensions is accessed by the grammar and operated upon by the context change operations associated with *every, any* and *a.* I will show that in the resulting theory we can successfully deal with the phenomena of homogenizing and clarifying discussed in chapter two.

4.4.2. The ordering dimensions set OS^+

4.4.2.1. Definitions

So, if ordering dimensions for P are not membership dimensions for $\leq_{(P)}$, then what are they?

Take again "sock to lend" and stereotypical property for this predicate 'dry'. As we have seen we can not assume that if you are a more typical sock to lend, you will be a dryer sock. That correlation is too strong. But there is some correlation, and the task of defining the notion of ordering dimension, is precisely determining what correlation there is.

The correlation that there is, is a ceteris paribus correlation: No, it is not the case that being a more typical sock to lend means that you are dryer, and it is not the case that being dryer means that you are a more typical sock to lend. But it is the case that your being dryer than a sock which has exactly the same accessible properties as you, except for dryness, does entail that you are a more typical sock to lend than that sock. This is going to be the idea about ordering dimensions. Ordering dimensions for P are those predicates whose scales correlate in this way with the scale of P.

Thus, 'dry' is a stereotypical characteristic of a "sock to lend" in a context c only if in that context one must regard any pair of socks d_1 and d_2, where d_1 is less dry than d_2, and is equal or worse than d_2 in everything else (say, the amount of holes), as a pair in the relation $<_{(\text{sock to lend},c)}$. This leaves the fitness of any pair such that d_1 is less dry than d_2, but has fewer holes than d_2, as an open question.

In other words, being more dry raises the status (as a sock to lend) of any item only with respect to items equally good or even better in all other respects.

Moreover, 'dry' is a stereotypical characteristic of a "sock to lend" in a context c only if in that context one must regard any pair of socks d_1 and d_2, where d_1 is as dry as d_2, and is equal to d_2 in everything else (such as the amount of holes), as a pair in the relation $=_{(\text{sock to lend},c)}$. Being equally dry, and equally good in all other respects, must entail having the same status as a sock to lend.

There is one regular exception to the requirement for the pairs to be "equally good in all other respects". If some property, say 'yellow', is contextually known as irrelevant for the ordering of socks to lend ('yellow' $\in OS^{-}_{(\text{socks to lend},c)}$) then also pairs that are not equally yellow should be taken into account.
E.g. suppose that a friend knocks on one's door in a stormy night and says that he fears he will catch a cold, as he is completely wet. It is likely that for any two pairs of socks one may offer him, if they have the same amount of holes, the drier the socks are the more they satisfy the request for socks, and how yellow they are is irrelevant. They may even be less yellow than any other relevant pair.

This means that Q is an ordering dimension of P (a member in $OS^{+}_{(P,c)}$), only if:
1. Any pair in the relation $>_{(Q,c)}$ (more Q than) is also in the relation $>_{(P,c)}$ (more P than), at least whenever this pair is in the opposite relation $<_{(Z,c)}$ (less Z than) only relative to any predicate Z that is already known not to be involved in the ordering of $[P]_c$ (to be in $OS^{-}_{(P,c)}$).
(If a pair is in the relation $<_{(Z,c)}$ relative to another (potential) ordering dimension, it can not be taken as an evidence for the relevance of Q in the ordering of $[P]^{+}_{c}$, since Z as a possible stereotypical characteristics of P, may influence the P ordering relation).
2. Any pair in the relation $=_{(Q,c)}$ (equally Q) is also in the relation $=_{(P,c)}$ (equally P) at least whenever this pair is in the relation $\neq_{(Z,c)}$ (more Z than or less Z than) only relative to any predicate Z that is already known not to be involved in the ordering of $[P]_c$ (to be in $OS^{-}_{(P,c)}$).
(A pair may differ in typicality relative to any predicates in $OS^{-}_{(P,c)}$. This difference may be ignored when the relevance of Q in the ordering of $[P]^{+}$ is examined, since these predicates are specified as not being stereotypical characteristics of P, i.e. as not influencing the P order).

I have used the name "the interpretation constraint", IC, for the set of constraints which any context in any model should satisfy. Until now it has only included constraints on the predicates in MS. Now we add OS. Therefore the interpretation constraint is extended by the following constraint.

<u>The interpretation constraint – part 2</u>

$\forall c\in C$, $\forall P\in A$, $\forall c_2 \geq c$: $\forall d_1,d_2\in D$:

1. If ($\exists Q\in OS^+_{(P,c2)}$, $d_1 <_{(Q,c2)} d_2$) & ($\forall Z\notin OS^-_{(P,c2)}$, such that $Z\neq P$, $d_1 \leq_{(Z,c2)} d_2$),
   Then ($d_1 <_{(P,c2)} d_2$).
2. If ($\forall Z\notin OS^-_{(P,c2)}$, such that $Z\neq P$, $d_1 =_{(Z,c2)} d_2$),
   Then ($d_1 =_{(P,c2)} d_2$).

Note that (1) and (2) are requirements on every extension c_2 of c.

- Constraint (1) applies to every pair in the relation <u>less Q than</u> ($d_1 <_{(Q,c2)} d_2$) relative to some ordering dimension Q, and in the relation <u>equal or less Z</u> ($d_1 \leq_{(Z,c2)} d_2$) relative to every other (potential) ordering dimension Z (except for P).

Such pairs must also be in the relation <u>less P than</u> ($d_1 <_{(P,c2)} d_2$).

- Constraint (2) applies to every pair in the relation <u>equally Z</u> ($d_1 =_{(Z,c2)} d_2$) relative to every (potential) ordering dimension Z (except for P).

Such pairs must also be in the relation <u>equally P</u> ($d_1 =_{(P,c2)} d_2$).

(Note that it must be required that $Z\neq P$. The conditions that constrain the set of pairs in the relation $<_{(P,c2)}$ (or $=_{(P,c2)}$), can not be restricted to the set of pairs in that relation).

Intuitively, Q is a stereotypical characteristic (or an ordering dimension) of P ($Q\in OS^+_{(P,c)}$) only if the Q level (or fitness to the contextual semantic definition of Q) of an instance helps determining its P level.

That is, only if:

1. Any pair in $<_{(Q,c2)}$, <u>which is in the opposite relation (>) only relative to non-ordering dimensions</u>, is in $<_{(P,c2)}$ in every extension c_2 of c, and
2. Any pair in $=_{(Q,c2)}$, <u>which is in the opposite relation (≠) only relative to non-ordering dimensions</u>, is in $=_{(P,c2)}$ in every extension c_2 of c.

E.g. let ‘dry’, ‘yellow’ and ‘large’ be stereotypical characteristics of “socks to lend” (dry, yellow, large $\in OS^+_{(\text{sock to lend},c)}$).

The interpretation constraint requires that:

1. Every pair of socks <d_1,d_2> in which one sock d_1 is dryer than the other d_2, and not less large, less yellow or <u>less good relative to any other potential stereotypical characteristics of "socks to lend"</u>, is also in the relation $d_1 >_{(\text{socks to lend},c)} d_2$.
2. Every pair of socks <d_1,d_2> that are equally dry, large, yellow <u>and also equally good relative to any other potential stereotypical characteristics of "socks to lend" in c</u> is also in the relation $=_{(\text{socks to lend},c)}$.
These, I believe, are natural constraints. Some property Q is stereotypical for P, if it provides a reason for each two individuals to differ in the ease with which they can be regarded as P. Even if there is no other reason for that difference, it can be accounted for by the fact that they differ in the ease with which they can be regarded as Q.

<u>4.4.2.2. Degree modifiers and OS^+</u>

This definition of OS^+ accounts also for the following intuitions regarding modifiers that express status relative to P:
Intuitively, a <u>*perfectly* P</u> or a *maximally* P instance, d_1, is perfect or maximal relative to all the stereotypical characteristics (the dimensions in OS^+).
It follows from the definition that this must be the case. Otherwise, there may exist an individual d_2 equal in all respects except for being more typical relative to some stereotypical characteristic. But then d_2 would not be regarded less (but more) P than d_1 (by the definition of OS^+) and d_1 would therefore not be perfectly or maximally typical.
E.g. the pair of socks that is best to lend is the one that is best relative to the ordering dimensions, say 'dry', "has no holes", "fits the weather" etc. A pair is more easily recognized as fit to lend, only if it is more easily recognized as a member in the denotation of 'dry', "has no holes", "fits the weather", etc.

A <u>*very typical* P</u> instance is, roughly, very typical relative to all those ordering dimensions (*very* may roughly mean perfectly or almost perfectly).

With OS^+, we can introduce <u>*prototypes*</u>. The Prototype Theory (Rosch 1978, Smith 1988) assumes that concepts are not defined by a set of necessary and sufficient conditions, but by the most typical examples of the concept, the prototypes.

A prototype may be conceived in two ways. Either as an actual object, or as a set of typicality properties, such that maybe no object exists that satisfies all of them, but the more of them an object satisfies the more typical an example of that concept it is.

In the model suggested in this chapter, the objects of the highest status on a predicate's scale (those that are most easily regarded as this predicate's instances) can be regarded as the set of prototypes of the first kind described. The set of stereotypical characteristics (OS^+ dimensions) when not empty, can be regarded as the second kind of prototype.

The set of stereotypical characteristics (OS^+ dimensions) is totally restricted by the properties of these prototypical objects. Any one of their properties may be either ignorable or an OS^+ dimension, and no other property Q can be an OS^+ dimension, because some other individual equal in all except for being more of a typical Q, if exists, would result more typical than the prototype, as demonstrated above.

The cut off between <u>*typical*</u> and *not typical* or <u>*atypical*</u> (or between: *very* P and *not very* P) is contextually dependent. Not typical is an instance that doesn't satisfy well enough the stereotypical characteristics. The notion 'well enough' is contextually dependent. It may be determined if a membership set for *typical* P (or *very* P) is specified.

<u>*Least typical*</u>, (or *minimally* P) is an instance of minimal status on all the stereotypical characteristics scales. (Otherwise, by the definition of OS^+, some individual equal in all except for a lower status relative to some stereotypical characteristic, if such exists, would result less typical).

<u>A P instance</u> is therefore P to some degree, and if it is the minimal degree, it is not due to a lack of an obligatory constraint, but due to the ordering constraints.

<u>A non-P instance</u> doesn't satisfy some obligatory condition (some dimension in MS^+).

<u>A borderline case</u> is an instance d that has some dimensions Q specified in neither MS nor OS. Or if specified only in OS^+, d's status on the Q scale is lower than that of all the P members, and therefore further information is required to determine if d is P.

4.4.2.3. Relative importance of different stereotypical properties

The possible partiality of the ordering set ($OS^+_{(P,c)}$) accounts also for intuitions regarding the relative importance of different stereotypical properties. I.e. some ordering dimensions may be more crucial than other ones. This is accounted for by the fact that they may order the denotation in more states than other dimensions do. Having a low degree along them would then be more crucial. The relative importance is therefore expressed again by the ease with which these predicates are regarded as ordering dimensions.

4.4.3. The non- ordering dimensions, $OS^-_{(P,c)}$.

4.4.3.1. definitions

The members of $OS^-_{(P,c)}$, the non-ordering dimensions, denote properties along which the individuals are not ordered. Those are the predicates whose scale systematically doesn't correlate with the scale of P. E.g. if 'dry' is in OS^+ then 'wet' is not in OS^+. But 'wet' is not in OS^- either, because its scale negatively correlates with P's scale.

A predicate is known as <u>a non-ordering dimension</u> only if <u>there is evidence that rules it out as an ordering dimension</u>. E.g. 'yellow' is a non- ordering dimension of socks to lend (yellow$\in OS^-_{(\text{socks to lend},c)}$) only if there is a pair d1, d2 of non equally yellow socks, say: "d1 is more yellow than d2", and d1, d2 are equally good relative to any other potential ordering criteria, but nevertheless neither d1 is regarded as a better sock to lend (i.e. 'dry' violates the constraint on the OS^+ dimensions), nor d2 is so regarded (i.e. 'wet' violates the constraint on the OS^+ dimensions). They are regarded as equally good socks to lend in c, and that entails that wetness plays no role in the construction of the scale of socks to lend in c.

Note that pairs may differ relative to predicates that are already known as ignorable (as members in OS^-). The described pair may not be "equally yellow" for example, if 'yellow' is regarded in $OS^-_{(\text{socks to lend},c)}$. However, a pair that differs relative to some predicate that may still be regarded as an ordering dimension (say a pair in the relation "have more holes" or "fit less the weather") can not be regarded as an evidence for 'yellow' being an ordering dimension or a non- ordering dimension. These other relations may influence the ordering relation of P.

Thus, Q is a non -ordering dimension of P (is a member in $OS^-_{(P,c)}$), only if there is a pair in the relation "more Q than" and in the relation "as Z as" relative to any other possible ordering dimension Z, but yet it is in the relation "as P as". Hence, it violates the requirement on ordering dimensions (it isn't in the relation "more P than").

Note that this condition on OS^-, just as the condition on MS^-, is stronger than might be expected. It requires the existence of evidence against regarding its members as OS^+ dimensions. A predicate is not in OS^- before such evidence exists. It eliminates the undesired possibility that a predicate would be in the negative and in the positive ordering dimension sets simultaneously. Moreover, the removal of predicates from the positive to the negative dimension set must cause, when the negative set is defined in this strong way, a real truth conditional effect, which is a desired possibility, as I will show in the next chapter.

This constraint has to be added to the interpretation constraint:

<u>The interpretation constraint – part 3:</u>

$\forall c \in C$, $\forall P \in A$, $\forall c_2 \geq c$:

$\forall Q \in OS^-_{(P,c2)}$: $\exists d_1,d_2$: $(d_1 <_{(Q,c2)} d_2)$ & $(\forall Z \notin OS^-_{(P,c2)}$, such that $Z \neq P$, $d_1 =_{(Z,c2)} d_2)$ &
$(d_1 =_{(P,c2)} d_2)$.

Intuitively, Q is clearly not a stereotypical characteristic of P ($Q \in OS^-_{(P,c)}$) only if the Q level of an instance doesn't help determining its level or fitness to the contextual semantic definition of P. I.e. in whatever ordering relation a pair is relative to Q, the individuals in the pair are equally P. Not satisfying Q is not a reason to be regarded less easily as a P instance.

E.g. 'new' is known not to be a stereotypical characteristic of "socks to lend" ($new \in OS^-_{(\text{socks to lend},c)}$) only if there is a pair of individuals (that differ in status only relative to other ignorable predicates i.e. dimensions in $OS^-_{(\text{socks to lend},c)}$), that are equally good socks to lend, even though one is newer than the other.

4.4.4. In sum, according to what I argued above, the interpretation of a comparative order $\leq_{(P,s)}$ is constrained by two kinds of information that correlate:

1. The order between the states in which the individuals become members of the denotation of P itself (as observed by Kamp 1975 and Landman 1991).
2. The order between the states in which the individuals in the denotation of P become members of the denotations of the predicates in the ordering set $OS^+_{(P,c)}$.

4.5. The relevance of OS in case of dimensions that are unspecified in MS

The ordering constraints limit the set of possible precise denotations and membership pairs. For example, lets assume that Q is an ordering dimension of P ($Q \in OS^+_{(P,c)}$).

Individuals that are at least as Q as some P instance d_1 (and are fine in every other respect) can be regarded as P. These individuals are P in every extension, since Q can not order P if elements of Q's highest levels are not-P (i.e. if 'not-Q' or "at most Q as d_1" are in $MS^+_{(P,c)}$). I.e. the ordering set definition requires that, if the highest Q levels are non-P, and Q is an ordering dimension, then lower Q levels must be non-P as well (and the Q levels (i.e. all D) are in not-P. [P] is empty because P's requirements are contradictory).

However, individuals that are less-Q than every P instance can not be automatically regarded as P. Some minimal Q level can still be required. Predicates like "at least as Q as d_1" may still be added to $MS^+_{(P,c)}$, and lower Q levels regarded as non-P. In the strictest case only perfectly Q instances are regarded as P.

E.g. consider a context c in which 'dry' is in $OS^+_{(\text{socks to lend},c)}$, and a partially wet object d_1 is regarded as a sock to lend. A dryer object can be regarded a sock to lend as well. A similar object that is less dry, however, can not be indirectly regarded a "sock to lend", until the maximal level of wetness allowed is specified in MS.

If perfectly-Q becomes a non-membership dimension then also instances that are only almost perfectly-Q can be regarded as P. In every precision standard (i.e. for every potential membership dimension of the form "at least as Q as") they are certainly P. If "Q to at least n level"$\in MS^-_{P,c)}$ then instances of almost n Q level are P. And so on for every m<n. This way [P] can grow gradually. If we extend tolerantly, lower and

lower Q levels are regarded as P as well.
If "Q to at most level n"$\in MS^{-}_{(P,s)}$ then Q levels n and up are regarded as P.

E.g. lets assume that 'healthy' orders the set of owls. Dimensions that are added to the non-membership set can make the denotation expand gradually.
If "at least very healthy" is add to $MS^{-}_{(owl,c)}$ then almost very healthy instances and healthier instances are regarded as owls. Afterwards "at least quite healthy" can be added to $MS^{-}_{(owl,c)}$ and then also almost quite healthy instances are regarded as owls.
If "at most very healthy"$\in MS^{-}_{(owl,c)}$ then at most very healthy instances and healthier ones are regarded as owls. If "at most almost very healthy"$\in MS^{-}_{(owl,c)}$ then also almost very healthy instances are regarded as owls as well, etc. If, finally, 'healthy' and "not healthy" or "healthy to a degree n" are added to $MS^{-}_{(owl,c)}$ the health dimension is eliminated from MS^{+}.
In sum, the information in $OS_{(P,c)}$ constrains the extensions of $MS_{(P,c)}$ and $[P]_c$.

<u>4.6. The ordering dimension sets, OS^{+}, OS^{-}, are partial and contextually given</u>
Ordering of denotations in scales is in many cases very strongly contextually dependent and very easily constructed given a context. E.g. if a person who cooks a very big meal asks to hand him a bottle of sauce, the contextual denotation of bottles may be ordered in a scale by size, such that the bigger the better. If a person who packs a bag with quite small spaces in it, asks to hand him a bottle, the contextual denotation of bottles may be ordered in a scale by size, such that the smaller the better. The very same chair may have a different status as a chair depending on the context (a kindergarten, a school, a pub, an auditorium etc.) If for instance different clients in a furniture shop ask for a chair, the chair expected to be handed to them may vary depending on their job, status or need. And so on.
Not every predicate is always accessible (active in the speakers mind and play some role in the context). The predicates that are in $OS^{+}_{(P,c)}$ are accessible in c (formally: in A^{*}) and are directly known in c to play a role in determining the scale of P in c.
In other words, the function $OS_{(P,c)}$ associates any predicate P in c with a pair of sets of predicates $\{Q_{1,\ldots,}Q_n\}$, $\{Z_{1,\ldots,}Z_n\}\subseteq A^{*}$. The extended interpretation constraint sees to it that every Q_i and Z_i stand in the right relation with P (the relations required from an ordering dimension of P and a non- ordering dimension of P, respectively).

4.7. The membership and ordering dimension sets model

Let A be a set of accessible predicates, A* the closure of A (the set of predicates generated from the predicates in A by the linguistic operations), and $\{\leq_{(P)}: P\in A^*\}$ a set of corresponding ordering relations.

A **membership and ordering dimension model** for a set of predicates $A^*\cup\{\leq_{(P)}: P\in A^*\}$ is a structure: $M = <\mathbb{C}_{A\cup\{\leq(P):\, P\in A^*\}}, I_{A\cup\{\leq(P):\, P\in A^*\}}>$ where

1. $\mathbb{C}_{A\cup\{\leq(P):\, P\in A^*\}}$ is an information structure for $A^*\cup\{\leq_{(P)}: P\in A^*\}$ (see in chapter 3).

2. $I_{A\cup\{\leq(P):\, P\in A^*\}}$ is an interpretation function for $\mathbb{C}_{A\cup\{\leq(P):\, P\in A^*\}}$, a function which maps every $P\in A$ and context $c\in C$ onto a tuple $<<[P]^+_c , [P]^-_c>, <MS^+_{(P,c)}, MS^-_{(P,c)}>, <OS^+_{(P,c)}, OS^-_{(P,c)}>>$ satisfying the conditions below.

Definition For every function $I_{A\cup\{\leq(P):\, P\in A^*\}}$ let $I^M_{A\cup\{\leq(P):\, P\in A^*\}}$ be given by:
$I^M_{(P,c)} = <<[P]^+_c , [P]^-_c>, <MS^+_{(P,c)}, MS^-_{(P,c)}> >$ iff:
$I_{(P,c)} = <<[P]^+_c , [P]^-_c>, <MS^+_{(P,c)}, MS^-_{(P,c)}>, <OS^+_{(P,c)}, OS^-_{(P,c)}>>$.

1. $<\mathbb{C}_{A\cup\{\leq(P):\, P\in A^*\}}, I^M_{A\cup\{\leq(P):\, P\in A^*\}}>$ is a **membership dimension model** (as defined in chapter 3).

2. $\forall P\in A$: $(OS^+_{(P,c)}, OS^-_{(P,c)} \subseteq A^*)$ &
$(OS^+_{(P,c0)} = OS^-_{(P,c0)} = \varnothing)$ (zero information) &
(If $(c_1 \leq_A c_2)$ then $((OS^+_{(P,c1)} \subseteq OS^+_{(P,c2)})$ &
$(OS^-_{(P,c1)} \subseteq OS^-_{(P,c2)}))$ (monotonicity) &
$(\forall t\in T, \forall Q\in A^*: (Q\in OS^+_{(P,t)}$, or $\neg Q\in OS^+_{(P,t)}$, or $\neg Q,Q\in OS^-_{(P,t)}))$ (totality).

Definition: The interpretation constraint - part 2: $\forall P \in A$,

$\forall Q \in OS^{+}_{(P,c)}$, $\forall c_2 \geq c$: $\forall d_1, d_2 \in D$:

1. If $(d_1 <_{(Q,c2)} d_2)$ & $(\forall Z \notin OS^{-}_{(P,c2)}$, such that $Z \neq P$: $d_1 \leq_{(Z,c2)} d_2)$

   Then: $(d_1 <_{(P,c2)} d_2)$.
2. If $(\forall Z \notin OS^{-}_{(P,c2)}$, such that $Z \neq P$: $d_1 =_{(Z,c2)} d_2)$

   Then: $(d_1 =_{(P,c2)} d_2)$.

$\forall Q \in OS^{-}_{(P,c2)}$: $\forall c_2 \geq c$: $\exists d_1, d_2$,

1. $(d_1 <_{(Q,c2)} d_2)$ & $(\forall Z \notin OS^{-}_{(P,c2)}$: $d_1 =_{(Z,c2)} d_2)$ & $(d_1 =_{(P,c2)} d_2)$.

3. Every $c \in C$ satisfies the interpretation constraint - part 2.

Definition: The ordering condition:

Let B_c, be the set of branches through c in C (i.e. the set of maximal linearly ordered subsets b of C, with the state c as a member in every b).

$\forall c \in C$: OC(c) iff: $\forall d_1, d_2 \in D$, $\forall P \in A^{*}$:

1. $\langle \mathbf{d1,d2} \rangle \in [\boldsymbol{\leq}_{\mathbf{(P)}}]_c$ iff: $\forall c_2 \geq c$: $\forall b \in B_{c2}$, $\forall c_1 \in b$:

   (If $d_1 \in [P]_{c1}$ then $d_2 \in [P]_{c1}$) &

   (If $d_2 \in [\neg P]_{c1}$ then $d_1 \in [\neg P]_{c1}$).
2. $\langle \mathbf{d1,d2} \rangle \in [\neg \boldsymbol{\leq}_{\mathbf{(P)}}]_c = [\boldsymbol{>}_{\mathbf{(P)}}]_c$ iff $(\langle d2,d1 \rangle \in [\leq_{(P)}]^{+}_{c})$ &

   $(\forall c_2 \geq c$: $\exists b \in B_{c2}$, $\exists c_1 \in b$:

   Either: $(d_1 \in [P]_{c1}$ & $d_2 \notin [P]_{c1})$

   Or: $(d_2 \in [\neg P]_{c1}$ & $d_1 \notin [\neg P]_{c1}))$.

4. Every $c \in C$ satisfies the ordering constraint.

The semantics is three-valued (see Van Fraassen 1969, Landman 1991).

4.8. A detailed example of the analysis

4.8.1. The accessible predicates and individuals

1. A = {bird, owl, healthy, adult, female, strong, gray}

   A, the set of accessible predicates, is the set of the contextually relevant basic predicates, i.e. the set of predicates that the participant in that discourse actually holds in mind and use, either directly or in the interpretation of other predicates.

2. D = $\{d_1,\ldots,d_{10}\}$; D is the set of accessible individuals.

4.8.2. The interpretation of the predicates

The interpretation of 'owl' in c, $I_{(owl,c)}$:

$I_{(owl,c)} = \langle\langle[owl]^+_c, [owl]^-_c\rangle,\langle MS^+_{(owl,c)}, MS^-_{(owl,c)}\rangle, \langle OS^+_{(owl,c)}, OS^-_{(owl,c)}\rangle$.

4.8.2.1. Table 2: The directly given denotations of each predicate

Denotations → / Predicates ↓	$[P]^-_c$	$[P]^?_c$	$[P]^+_c$
Bird	∅	∅	{1,…,10}
Healthy	{3,5,7}	{8,9}	{1,2,4,6,10}
Female	{2,5,6,8,9}	∅	{1,3,4,7,10}
Strong	{9}	∅	{1,…,8,10}
Gray	{10}	∅	{1,…,9}
Adult	{4,6,7,8,9}	∅	{1,2,3,5,10}
Owl	∅	{2,…,10}	{1}

4.8.2.2. The membership dimensions set pairs, $MS_{(P,c)}$:

For simplicity I assume that the membership dimension set pair of all the predicates are empty, except for 'owl'. $MS_{(owl,c)}$ is as follows:

1. $MS^+_{(owl,c)}$ = {owl, bird, healthy}.

   $MS^+_{(owl,c)}$, the membership dimensions set, is the set of known necessary conditions for being regarded as an owl in that context.

In other words, it is the set of properties that we know in c that follow from owlhood.

I.e. the interpretation constraint demands the following:

$\forall Q \in MS^{+}_{(P,c)}$: $\forall c_2 \geq c$: $[P]_{c2} \subseteq [Q]_{c2}$.

Hence: $\forall c_2 \geq c$: $([owl]_{c2} \subseteq [owl]_{c2})$ & $([owl]_{c2} \subseteq [bird]_{c2})$ & $([owl]_{c2} \subseteq [healthy]_{c2})$.

This information has some indirect consequences. The individuals 3,5 and 7 are not directly given as non- owls. However, since they are not healthy, and healthy is a necessary condition (a membership constraint) for owls, by the information given in c, they can not possibly be owls. They are regarded as non-owls in every total extension of c. Hence, they are in the indirectly extended negative denotation of ‘owl’ $[\text{not owl}]_c$. (See in section 4 below).

2. $MS^{-}_{(owl,c)}$ = {adult, not adult, female, not female}

$MS^{-}_{(owl,c)}$, <u>the non-membership dimensions</u> set, is the set of predicates that are known in c as non necessary for being regarded an owl in c.

In other words, it is the set of properties that we know in c that don’t follow from owlhood. Some owls have them and some don’t. They are non- trivial on the owl denotation.

(I.e. the interpretation constraint demands the following:

$\forall Q \in MS^{-}_{(P,c)}$: $\forall c_2 \geq c$: $([P]_{c2} \cap [Q]_{c2} \neq \emptyset)$ & $([P]_{c2} \cap [\neg Q]_{c2} \neq \emptyset)$

Hence: $\forall c_2 \geq c$: $([owl]_{c2} \cap [adult]_{c2} \neq \emptyset)$ & $([owl]_{c2} \cap [\text{not adult}]_{c2} \neq \emptyset)$ &

$([owl]_{c2} \cap [female]_{c2} \neq \emptyset)$ & $([owl]_{c2} \cap [\text{not female}]_{c2} \neq \emptyset)$.

This information has some indirect consequences. Individuals 4 and 2 are not directly given as owls. However, ‘female’ (the property 2 fails to satisfy) and ‘adult’ (the property 4 fails to satisfy) are given as non -trivial on ‘owl’. Also none of their other properties can disqualify them from being considered owls since they satisfy all the other properties just as much as owl 1.

Thus, they are regarded as owls in every total extension of c. By the information given in c, they must be owls. Hence, they are in the indirectly extended denotation of ‘owl’ $[owl]_c$ (See in section 4 below).

3. 'Strong' and 'gray' are yet unspecified in $MS_{(owl,c)}$. They are not given as necessary or not for owls.

Table 3: The membership dimensions of each predicate:

Dimension sets → Predicates ↓	$MS^{-}_{(P,c)}$	$MS^{?}_{(P,c)}$	$MS^{+}_{(P,c)}$
Bird	-	{bird, owl, healthy, adult, female, strong, gray}	-
Healthy	-	{bird, owl, healthy, adult, female, strong, gray}	-
Female	-	{bird, owl, healthy, adult, female, strong, gray}	-
Strong	-	{bird, owl, healthy, adult, female, strong, gray}	-
Gray	-	{bird, owl, healthy, adult, female, strong, gray}	-
Adult	-	{bird, owl, healthy, adult, female, strong, gray}	-
Owl	{adult, female}	{strong, gray}	{bird, owl, healthy}

Note that the predicate 'bird', for instance, eventually ends up as a membership dimension (in MS^{+}) of all the predicates in all the total extensions. However, this may not be a relevant part of the predicate meanings, so 'bird' is not specified as such in c. The model may be refined (more individuals and predicates may be added to D and A respectively. I.e. more individuals and predicates may be taken under consideration in the interpretation of the predicates). If non- birds are added, 'bird' may end up as non -trivial on the denotation of 'healthy', 'adult' and the rest of the predicates in M (except for the predicate 'owl').

4. The indirectly extended denotations:

The denotations can be indirectly extended relying on the information given in the membership dimension sets as described. These sets impose constraints on every total extension of c. Since only the membership set of 'owl' is specified, only the denotation of 'owl' can extend in this way.

The indirect denotations are the intersections of the direct denotations in every total extension of c.

1. $[P]_c = \cap\{[P]^+_t |\ t\in T,\ t\geq c\}$.

2. $[\neg P]_c = \cap\{[P]^-_t |\ t\in T,\ t\geq c\ \}$.

3. $[P]^?_c = \{d|\ \exists t_1,t_2\in T,\ t_1,t_2 \geq c\text{: } d\in[P]^+_{t1}\ \ \&\ d\notin[P]^+_{t2}\ \}$.

Table 4: the indirectly extended denotation of 'owl' (temporary*)

Denotations → Predicates ↓	$[P]_c$	$[P]^?_c$	$[\text{Not: } P]_c$
Owl	{3,5,7}	{6,8,9,10}	{1,2,4}

* Note that I haven't yet presented the ordering dimensions sets. The denotations can be indirectly extended relying on the information given in them too, so this table will be altered when we take OS into account.

4.8.2.3. Comparative relations $\leq_{(P,c)}$:

Let me add first directly given comparative relations

For simplicity I assume for every two individuals di,dj in D and every predicate P in A that: (If di,dj $\in[P]^+_c$ or di,dj $\in[P]^-_c$ then d_i is as P as d_j) and

(If di,dj $\in[P]^?_c$ then it is unknown).

Naturally, by the ordering condition, it is always the case that:

(If $d_i\in[P]_c$ and $d_j\notin[P]_c$ then d_i is more P than d_j) and

(If $d_i\in[\text{not } P]_c$ and $d_j\notin[\text{not } P]_c$ then d_i is less P than d_j).

Additionally, I assume that d_8 and d_9 are equally healthy: $d_8 =_{(\text{healthy},c)} d_9$.

The comparative relations of each predicate ($\leq_{(P,c)}$)

The following picture (table 5) represents the ordering of elements per dimension. The picture should be read as follows: individuals 1 – 10 are equally good examples of 'bird'. When we look at 'healthy' we see that 1,2,4,6 and 10 are equally healthy, 8 is less healthy than 1,2,4,6 and 10, and so is 9. For 8 and 9 it is undetermined which is healthier than the other. 3,5 and 7 are again equally healthy, but all of them are less healthy than 8 and less healthy than 9. Etc.

You can see that a variety of relations are expressed in this picture. For instance, 1 and 10 are always simultaneously in or out of the positive and of the negative denotations of every accessible predicate except ‘gray’ and ‘owl’.

<u>Table 5: The ordering relations</u>

Bird	[1,…,10]			
Healthy	[1,2,4,6,10]			
	[8] [9]			
	[3,5,7]			
Female	[1,3,4,7,10]			
	[2,5,6,8,9]			
Strong	[1,…,8,10]			
	[9]			
Gray	[1,…,9]			
	[10]			
Adult	[1,2,3,5,10]			
	[4,6,7,8,9]			
Owl	[1]	[2]	[4]	
	[10]	[6]	[8]	[9]
	[3]	[5]	[7]	

It is required by the ordering condition:

$\forall c \in C$, $\forall d_i, d_j \in D$, $\forall P \in A^*$: $\boldsymbol{<d_i,d_j> \in [\leq_{(P)}]_c}$ iff:

$\forall c_2 \geq c$: $\forall b \in B_{c2}$, $\forall c_1 \in b$: (If $d_i \in [P]_{c1}$ then $d_j \in [P]_{c1}$) &

(If $d_j \in [\neg P]_{c1}$ then $d_i \in [\neg P]_{c1}$).

(Where: $<d1,d10> \in [=_{(P)}]_c$ iff $<d1,d10> \in [\leq_{(P)}]_c$ and $<d10,d1> \in [\leq_{(P)}]_c$).

In the table 6 I present the information in a different way. I give here a detailed list of the pairs in the (indirectly extended) denotations of the comparatives derived from each of the accessible predicates (one may skip this table, unless one feels one needs this clarification).

Table 6: The pairs in the ordering relations of ‘owl’

Denotations → Predicates ↓	$[\text{not} \leq P]_c$	$[\leq P]^?_c$	$[\leq P]_c$
	(more P than)	unknown relation	(at most as P as, i.e. equally or less P than)
Owl	<1,3>,<1,5>,<1,6>,<1,7>,<1,8><1,9> <1,10>	<1,2>,<1,4>	<1,1>
	<2,3>,<2,5>,<2,6><2,7>,<2,8>,<2,9> <2,10>	<2,4>	<2,1>,<2,2>,
		<3,5>,<3,7>	<3,1>,<3,2>,<3,3>,<3,4>, <3,6>,<3,8>,<3,9>,<3,10>
	<4,3>,<4,5><4,6>,<4,7>,<4,8>,<4,9> ,<4,10>	<4,2>	<4,1>,<4,4>
		<5,3>,<5,7>	<5,1>,<5,2>,<5,4>,<5,5>, <5,6>,<5,8>,<5,9>,<5,10>
	<6,3>,<6,5>,<6,7>	<6,8>,<6,9><6,10>	<6,1>,<6,2>,<6,4>,<6,6>
		<7,3>,<7,5>	<7,1>,<7,2>,<7,4><7,6>, <7,7>,<7,8>,<7,9>,<7,10>
	<8,3>,<8,5>,<8,7>,	<8,6>,<8,9>,<8,10>	<8,1>,<8,2>,<8,4>,<8,8>
	<9,3>,<9,5>,<9,7>	<9,6>,<9,8>,<9,10>	<9,1>,<9,2>,<9,4>,<9,9>
	<10,3>,<10,5>,<10,7>,	<10,2><10,6> <10,4> <10,8><10,9>	<10,1>,<10,10>

4.8.2.4. The ordering dimensions sets pair of ‘owl’

1. $OS^+_{(owl,c)}$ = {female, adult, healthy, owl, bird}.

OS^+ is the largest set of predicates Q such that relative to the information in c their scale correlates with the scale of P in c and all its extensions. That is roughly: for every predicate Q, and every two individuals d_i, d_j, such that if they are equal in every other respect except that d_i is at least as Q as d_j, then d_i is also at least as P as d_j.

I.e. the interpretation constraint demands the following:

$\forall Q \in OS^+_{(P,c)}$: $\forall c_2 \geq c$: $\forall d_i, d_j \in D$:

1. If $(d_i <_{(Q,c2)} d_j)$ & $(\forall Z \notin OS^-_{(P,c2)}, Z \neq P$: $d_i \leq_{(Z,c2)} d_j)$ Then: $(d_i <_{(P,c2)} d_j)$.
2. If $(\forall Z \notin OS^-_{(P,c2)}, Z \neq P$: $d_i =_{(Z,c2)} d_j)$ Then: $(d_i =_{(P,c2)} d_j)$.

Let take for example the ordering dimension ‘adult’:

The interpretation constraint demands that the following holds in c:

$\forall di,dj \in D$: 1. If $(di <_{(adult,c)} dj)$ & $(\forall Z \notin \{gray,owl\}$: $di \leq_{(Z,c)} dj)$ Then: $(di <_{(owl,c)} dj)$

2. If $(\forall Z \notin \{gray,owl\}$: $d_i =_{(Z,c)} d_j)$ Then: $(d_i =_{(owl,c)} d_j)$.

(For the sake of monotonicity, the same is also required from every extension c2 of c).

Individuals 1,2,3,5 and 10 are adults in c and 4,6,7,8 and 9 are not adult.
So, for instance, it holds that ($d4 <_{(adult,c)} d1$). It also holds that 4 and 1 are equal in every other respect, so it holds that: ($\forall Z \notin \{gray,owl\}$: $d_4 \leq_{(Z,c)} d_1$).
Hence, constraint (1) above tells us that the status of 4 as an owl is less good than the status of 1 as an owl ($d_4 <_{(owl,c2)} d_1$).

It also holds that: ($d10 =_{(adult,c)} d1$) and that 10 and 1 are equal in every other respect, except for how gray they are (as we will see soon 'gray' is a non-ordering dimension and thus ignorable) so it holds that: ($\forall Z \notin \{owl,gray\}$: $d_1 =_{(Z,c)} d_{10}$).
Hence, constraint (2) above tells us that 1 and 10 have equal status as owls:
($d_1 =_{(owl,c)} d_{10}$). Etc.

The same constraints apply to the other ordering dimensions: female, healthy, owl, and bird, as well. As seen, this information has some consequences, since it puts constraints on the set of contexts that may be included in the branches through c (i.e. the contexts with more or less information than in c, the completions of c and the reductions of c).

For example, it entails that individuals 2 and 4, which differ from 1 only in one respect, have a lower status than 1 on the scale of 'owl'. (They are equal in all properties except that 2 fails to satisfy the owls contextual stereotypical property 'female', and 4 fails to satisfy the owls contextual stereotypical property 'adult'). Hence, in every state in the branches through c, if 2 or 4 are regarded as owls, then also 1 is an owl, and if 1 is regarded as a non- owl then also 2,4 are non- owls. But not vice versa: there is a state in the branches through c in which 1 is regarded as an owl and 2 and 4 are not, or 2 and 4 are regarded as non- owls but 1 is not regarded as such. This would not necessarily be the case, if 'adult' and 'female' were not known as relevant to the contextual typicality ordering of the owls (i.e. if they were not in $OS^{+}_{(owl,c)}$).

It also entails that individuals 5 and 7, which differ from 3 only in one respect, have a lower status than 3 on the scale of 'owl'. (They are equal in all properties except that

5 fails to satisfy the owl's contextual stereotypical property 'female', and 7 fails to satisfy the owl's contextual stereotypical property 'adult').

Hence, in every state in the branches through c, if 5 or 7 are regarded as owls, then also 3 is an owl, and if 3 is regarded as a non- owl, then also 5,7 are not owls. But not vice versa: there is a state in the branches through c in which 3 is regarded as an owl and 5 and 7 are not, and also one where 5 and 7 are regarded as non- owls but 3 is not regarded as such.

Similarly, 6 is higher on the owl's scale than 8 (they are equal in all respects except that 6 is healthier).

2. <u>$OS^{-}_{(owl,c)}$ = {gray}.</u>

OS^{-} is the largest set of predicates such that relative to the information in c their scales do not correlate with the scale of P in c and all its extensions.

That is roughly: for every non-ordering dimension Q there are two individuals d_1, d_2 that are equal in every respect except Q, but d_1 is as P as d_2.

I.e. the interpretation constraint demands the following:

$\forall Q \in OS^{-}_{(P,c)}$: $\forall c_2 \geq c$: $\exists d_i, d_j$: $(d_i <_{(Q,c2)} d_j)$ & $(\forall Z \notin OS^{-}_{(P,c2)}$: $d_i =_{(Z,c2)} d_j)$ & $(d_i =_{(P,c2)} d_j)$.

In c there already exist two individuals d1 and d10 such that: $(d_{10} <_{(gray,c)} d_1)$ & $(\forall Z \notin \{gray,owl\}$: $d_1 =_{(Z,c)} d_{10})$. Thus, the specification of 'gray' as non-ordering 'owl' tells us that in c and in its extensions these individuals are equally good owls: $(d_1 =_{(owl,c)} d_{10})$.

This information has some consequences, as it put constraints on the set of contexts that are included in the branches through c. Specifically, it entails that individuals 1 and 10 are always in or out of the denotations of 'owl' simultaneously. Hence there is no state under c in which 1 is regarded as an owl but 10 is not or vice versa.

This would not necessarily be the case, if 'gray' were not known as irrelevant for the contextual typicality ordering of the owls (i.e. was not in $OS^{-}_{(owl,c)}$).

Hence the extended denotation of 'owl' is further extended as to include 10, and the extended denotation of 'equally owl' is further extended as to include <10,1>, <1,10> as demonstrated in the corrected table below.

Moreover, 'gray' is not specified in $MS_{(owl,c)}$ but it would necessarily end up in MS^{-}

$_{(owl,t)}$ in every complete state t above c, since the gray individual 1 and the non-gray individual 10 are both regarded as owls in c.

3. <u>‘Strong’ is unspecified in $OS_{(owl)}$.</u>

’Strong’ may still turn out to be an ordering dimension or not. Individuals d_8 and d_9 are equal in all respects except for how strong they are. Thus, they are the pair that will determine whether ‘strong’ is an ordering or a non- ordering dimension.

‘Strong’ is an ordering dimension iff they are not equally owls:

$\exists t_1 \geq c$: $\forall t' \geq t_1$: $(d_8 >_{(strong,t')} d_9)$ & $(\forall Z \in OS^{+}_{(owl,t')}$: $d_8 =_{(Z,t')} d_9)$ & $(d_8 =_{(owl,t')} d_9)$.

$\exists t_2 \geq c$: $\forall t' \geq t_2$: $(d_8 >_{(strong,t')} d_9)$ & $(\forall Z \in OS^{+}_{(owl,t')}$: $d_8 =_{(Z,t')} d_9)$ & $(d_8 \neq_{(owl,t')} d_9)$.

This information has some consequences.

Specifically, it allows for the pair of individuals 8 and 9 to be in the gap of $\leq_{(owl,c)}$.

In the extensions of c in which ‘strong’ is regarded as irrelevant to the owls ordering, they are in or out of the denotations of ‘owl’ simultaneously in all the states in the branches through those extensions.

In the extensions of c in which ‘strong’ (or ‘not strong’) is regarded as relevant to the owls ordering, 8 is regarded as an owl before 9 (or after 9, respectively) in all the states in the branches through those extensions.

<u>Table 7: The ordering dimensions of each predicate</u>

Dimension sets → Predicates ↓	$OS^{-}_{(P,c)}$	$OS^{?}_{(P,c)}$	$OS^{+}_{(P,c)}$
Bird	-	{bird, owl, healthy, adult, female, strong, gray}	-
Healthy	-	{bird, owl, healthy, adult, female, strong, gray}	-
Female	-	{bird, owl, healthy, adult, female, strong, gray}	-
Strong	-	{bird, owl, healthy, adult, female, strong, gray}	-
Gray	-	{bird, owl, healthy, adult, female, strong, gray}	-
Adult	-	{bird, owl, healthy, adult, female, strong, gray}	-
Owl	{gray}	{strong}	{bird, owl, healthy, adult, female}

($OS^{?}$ includes of course also all the rest of the predicates in A^{*}, i.e. the complex predicates generated from the basic ones, as “female or adult”, “gray or strong” etc.)

4. The indirect information in c

1. Table 8: The indirectly extended denotations of each predicate (final)

Denotations → Predicates ↓	$[P]^-_c$	$[P]^?_c$	$[P]^+_c$
Bird	∅	∅	{1,…,10}
Healthy	{3,5,7}	{8,9}	{1,2,4,6,10}
Female	{2,5,6,8,9}	∅	{1,3,4,7,10}
Strong	{9}	∅	{1,…,8,10}
Gray	{10}	∅	{1,…,9}
Adult	{4,6,7,8,9}	∅	{1,2,3,5,10}
Owl	{3,5,7}	{6,8,9}	{1,2,4,10}

2. The indirectly known Comparative relations

The denotations of the comparatives derived from each predicate can be indirectly extended, relying on the information given in the ordering dimension sets, as described in the previous section. These sets impose constraints on every total extension of c. The indirect denotations are the intersections of the direct denotations in every total extension of c.

1. $[\leq P]_c = \cap\{[\leq P]^+_t | \; t \in T, t \geq c \}$.
2. $[\text{not} \leq P]_c = \cap\{[\leq P]^-_t | \; t \in T, t \geq c \}$.
3. $[\leq P]^?_c = \{<di,dj>| \; \exists t_1,t_2 \in T, t_1,t_2 \geq c\text{: } <di,dj> \in [\leq P]^+_{t1} \;\&\; <di,dj> \notin [\leq P]^+_{t2} \}$.

Since only the ordering dimensions of 'owl' are specified in M, pairs are added only to the denotation of the comparative derived from 'owl', as specified in table 9:

Table 9: The indirectly known ordering relation of 'owl'

<table>
<tr><td rowspan="6">Owl</td><td colspan="2">[1,10]</td></tr>
<tr><td colspan="2">[2] [4]</td></tr>
<tr><td colspan="2">[6]</td></tr>
<tr><td>[8]</td><td>[9]</td></tr>
<tr><td colspan="2">[3]</td></tr>
<tr><td colspan="2">[5] [7]</td></tr>
</table>

Table 10: The pairs in the indirectly known ordering relations of ‘owl’

Denotations → Predicates ↓	$[\text{not} \leq P]_c$	$[\leq P]^?_c$	$[\leq P]_c$
	(more P than)	unknown	(at most as P, i.e. equally or less P than)
Owl	<1,2>,<1,4><1,3>,<1,5>,		<1,1>,<1,10>
	<1,6>,<1,7>,<1,8><1,9>		
	<2,3>,<2,5>,<2,6>,<2,7>,<2,8>,<2,9>		<2,1>,<2,2>,<2,10><2,4>
	<3,5>,<3,7>		<3,1>,<3,2>,<3,3>,<3,4>,
			<3,6>,<3,8>,<3,9>,<3,10>
	<4,3>,<4,5>,<4,6>,<4,7>,<4,8>,<4,9>		<4,1><4,2>,<4,4>,<4,10>
			<5,3>,<5,7><5,1>,<5,2>,<5,4>,
			<5,5>,<5,6>,<5,8>,<5,9>,<5,10>
	<6,8>,<6,9>,<6,3>,<6,5>,<6,7>		<6,1>,<6,2>,<6,4>,<6,6>,<6,10>
			<7,3>,<7,5><7,1>,<7,2>,<7,4>
			<7,6>,<7,7>,<7,8>,<7,9>,<7,10>
	<8,3>,<8,5>,<8,7>,	<8,9>	<8,6>,<8,1>,<8,2>,<8,4>,<8,8>,<8,10>
	<9,3>,<9,5>,<9,7>	<9,8>	<9,6>,<9,1>,<9,2>,<9,4>,<9,9>,<9,10>
	<10,2>,<10,3>,<10,5>,<10,6>,		<10,1>,<10,6>,<10,10>
	<10,4>,<10,7>,<10,8>,<10,9>		

4.8.3 The expansion of information: branches through c

4.8.3.1. A detailed example of one possible branch through c, b1.1

In table 11 I demonstrate one possible branch through c. That is, one particular way in which the information can extend along a path through c.

In the left column are the information expansion steps, i.e. the information states.

One column to the right, there are explanations of the contextual moves or actions, i.e. which properties are accepted in that discourse-step or contextual state as relevant to the determination of membership or status of entities in a predicate denotation.

The third column gives the formal implementation, I.e. which dimensions are specified, as to represent that move.

In the rightmost column I demonstrate the consequences of that action, i.e. the widening of the denotations.

Note that it can also go the other way around. The action can be that of pointing at more individuals. As a result more dimensions fall under one of the categories (necessary or not, stereotypical or not). As a result the denotations may be even more widened.

Context c itself is represented in boldface.

Table 11: Branch b1.1 through c

States in b1.1	Action	Formal implementation: $MS_{(owl,c)}$, $OS_{(owl,c)}$	Effects on [owl],[not owl]
C_0	Null information, except for that fixed in the word's semantics (i.e. entailed properties are specified in MS^+).	$MS^+_{(owl,c)}$ = {bird} $MS^-_{(owl,c)}$ = {} $OS^+_{(owl,c)}$ = {} $OS^-_{(owl,c)}$ = {}	$[owl]_{c0}$ = $[not\ owl]_{c0}$ = {}
C_1	The property 'gray' is regarded as irrelevant for the ordering of owls in c. As a result some individuals are regarded as equally good owls.	$MS^+_{(owl,c1)}$ = {owl,bird} $MS^-_{(owl,c1)}$ = {} $OS^+_{(owl,c1)}$ = {} $OS^-_{(owl,c1)}$ = {gray}	$[owl]_{c1}$ = {} $[not\ owl]_{c1}$ = {} $d1 =_{(owl,c1)} d_{10}$
C_2	Some individual (d1) is regarded as an owl. As a result all the individuals that are equally owls are also so regarded. Since these are the first individuals regarded as owls, they are regarded as perfectly stereotypical (prototypes). Their properties determine the set of possible necessary and stereotypical conditions on owls (i.e. 'healthy', 'female', 'strong', and 'adult', and not their negations or the predicate 'gray').	$MS^+_{(owl,c2)}$ = {owl,bird} $MS^-_{(owl,c2)}$ = {} $OS^+_{(owl,c2)}$ = {} $OS^-_{(owl,c2)}$ = {gray}	$[owl]_{c2}$ = {d_1,d_{10}} $[not\ owl]_{c2}$ = {} - $d1 =_{(owl,c2)} d_{10}$
C_3	The properties "healthy or female" and "healthy or adult" are regarded as necessary for owls, and 'healthy' is regarded as a stereotypical condition. As a result, the most atypical individuals are regarded as non-–owls. I.e. those with the lowest status on the most important (potential) ordering properties, (the sick and either not female or not adult) are maximally far from being regarded as owls. ('important ordering properties' because	$MS^+_{(owl,c3)}$ ={owl,bird,healthy or female, healthy or adult} $MS^-_{(owl,c3)}$ = {} $OS^+_{(owl,c3)}$ ={owl,bird,healthy} $OS^-_{(owl,c3)}$ = { gray }	$[owl]_{c3}$ = {d_1,d_{10}} $[not\ owl]_{c3}$ = {d_5, d_7} $d1 =_{(owl,c3)} d_{10}$ $[healthy]_{c3}$ = {d_1,d_{10}, d_2,d_4,d_6}

	the first ordering criteria specified, order owls in the largest numbers of contexts)		
C_4	'Healthy ' is regarded as a necessary condition on owls. As a result, the individuals that are just sick, but satisfy every other potential ordering property are regarded as non- owls.	$MS^{+}_{(owl,c4)}$ ={owl,bird,healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c4)}$ = {} $OS^{+}_{(owl,c4)}$ ={owl,bird,healthy} $OS^{-}_{(owl,c4)}$ = {gray}	$[owl]_{c4}$ = $\{d_1,d_{10}\}$ $[not\ owl]_{c4}$ = $\{d_3,d_5, d_7\}$ $d1 =_{(owl,c4)} d_{10}$
C_5	'Adult' and 'female' are regarded as stereotypical. All potential owls are ordered by their status as adult females. As a result more individuals are regarded as better examples of owls than others in c are.	$MS^{+}_{(owl,c5)}$ ={owl,bird, healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = {owl,bird,healthy, adult,female} $OS^{-}_{(owl,c5)}$ = { gray }	$[owl]_{c5}$ = $\{d_1,d_{10}\}$ $[not\ owl]_{c5}$ = $\{d_3,d_5, d_7\}$ $d1 =_{(owl,c5)} d_{10}$, $d6 <_{(owl,c5)} d_2$ $d6 <_{(owl,c5)} d_4$
C_6	**'Adult' and 'female' are regarded as non- necessary. As a result, more individuals are known to satisfy every possible necessary condition, and are regarded as owls. They are just "almost perfect" owls. (They fail to satisfy one potential stereotypical property (female or adult).**	**$MS^{+}_{(owl,c6)}$ ={owl,bird, healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c6)}$ ={adult,female} $OS^{+}_{(owl,c6)}$ ={owl,bird,healthy, adult,female } $OS^{-}_{(owl,c6)}$ = {gray}**	**$[owl]_{c6}$= $\{d_1,d_{10},d_2,d_4\}$ $[not\ owl]_{c6}$ = $\{d_3,d_5, d_7\}$ $d1 =_{(owl,c6)} d_{10}$ $d6 <_{(owl,c6)} d_2$ $d6 <_{(owl,c6)} d_4$**
C_7	'Strong' is regarded as non-stereotypical for owls. As a result, all owls are ordered regardless of strength. More individuals are regarded as equally good examples of owls in c.	$MS^{+}_{(owl,c7)}$ ={owl,bird, healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c7)}$ = {adult,female} $OS^{+}_{(owl,c7)}$ ={owl,bird,healthy, adult,female} $OS^{-}_{(owl,c7)}$ = {strong}	$[owl]_{c7}$ = $\{d_1,d_{10},d_2,d_4\}$ $[not\ owl]_{c7}$ = $\{d_3,d_5, d_7\}$ $d1 =_{(owl,c7)} d_{10,}$ $d6 <_{(owl,c7)} d_2$ $d6 <_{(owl,c7)} d_4$ $d8=_{(owl,c7)}d9$
C_8	'Adult or female' is regarded as non- necessary for owls. As a result, more individuals are known to satisfy every possible necessary condition, and are regarded as owls.	$MS^{+}_{(owl,c8)}$ ={owl,bird, healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c8)}$ = {adult,female, Adult or female} $OS^{+}_{(owl,c8)}$ = { owl,bird,	$[owl]_{c8}$ = $\{d_1,d_{10},d_2,d_{4,}d_6\}$ $[not\ owl]_{c8}$ = $\{d_3,d_5, d_7\}$ $d1 =_{(owl,c7)} d_{10,}$ $d6 <_{(owl,c7)} d_2$

	(Those that fail to satisfy two potential stereotypical properties (female and adult)).	healthy, adult,female } $OS^{-}_{(owl,c8)}$ = { strong }	d6 $<_{(owl,c7)}$ d_4 d8$=_{(owl,c7)}$d9
C_9	More individuals are regarded as healthy, also those that are not perfectly healthy. As a result more individuals are regarded as owls. (Those that fail to satisfy three potential stereotypical properties: female, adult and not perfectly healthy).	$MS^{+}_{(owl,c9)}$ ={owl,bird,healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c9)}$ = {adult,female, Adult or female} $OS^{+}_{(owl,c9)}$ = { owl,bird, healthy, adult,female } $OS^{-}_{(owl,c9)}$ = { strong }	$[owl]_{c9}$ = $\{d_1,d_{10}, d_2,d_{4,}d_6,d_8,d_9\}$ $[not\ owl]_{c9}$ = $\{d_3,d_5,d_7\}$ d1 $=_{(owl,c7)}$ $d_{10,}$ d6 $<_{(owl,c7)}$ d_2 d6 $<_{(owl,c7)}$ d_4 d8$=_{(owl,c7)}$d9 $[healthy]_{c9}$ = $\{d_1,d_{10}, d_2,d_{4,}d_6,d_8,d_9\}$

Note that health seems to be more crucial than being female or adult, hence the healthier d_8 and d_9 have a better status than the less healthy individuals, even if they lack many more stereotypical properties than d_3.
E.g. d_3 is less healthy, but has a better status as an adult and as a female. Since d_8 and d_3 differ in two properties the ordering condition allows for any possible order between them. The order is determined by the relative importance of each property. Relative importance of stereotypical properties is therefore encoded.

If d_8 and d_9 were not in the gap of 'owl' in c (if they were discovered earlier than d_3,d_5 and d_7 as sick i.e. they were sicker) the branch through c would be one in which they are the worst cases of owls. This would be the branch in such a case:
- $[not\ owl]_{c3}$ = {d9} (the worst cases are the unhealthy, non-adults, non-strong, males).
- $[not\ owl]_{c4}$ = {d9,d8} (also strong individuals are regarded as non-owls).
- $[not\ owl]_{c5}$ = {d_5 d9,d8,d7} (also female or adults are so regarded).
- $[not\ owl]_{c6}$ = {d_3 d_5 d9,d8,d7} (also those that violate only one condition, the non-healthy female adults, are regarded as non-owls).

Note also that, even without changing any detail in c, there may have been some different possible stages under c (states of information reduction) than those actually given in the table above.

In one possible state, say c5.1, for instance, when the property ‘female’ is already discovered as non- necessary for owls, the property ‘adult’ is not yet so discovered. In such a case being male is less problematic than being young in the determination of a creature as an owl, i.e. as a relevant owl for the contextual purposes.
Thus, $[owl]_{c5.1} = \{d_1,d_{10},d_2\}$ (the perfect individuals and those that are not perfect in but one (potential) stereotypical property: not female, are clearly regarded as owls). It follows that ($d_2 >_{(owl,c5.1)} d_4$) which is not the case in b1.1.

Another possibility is that the expansion of information goes in somewhat different order. Say, ‘healthy’ could have been discovered as necessary for owls (and hence 3,5,7 would have been discovered as non- owls) before ‘gray’ is discovered as non- -ordering owls (and 10 and 1 as owls, and as equally owls).

There are no constraints in c as to the order between these steps.
Hence there is also a set of different possible information reduction states.
However, for simplicity I take the rather intuitive position that these states are always given (known) to any discourse participant. I assume that when they aren’t known, one constructs a possible hypothetical branch with a set of information reduction states of a certain sort possible relative to the information in c, say b1.1.
If required, one accommodates this branch, and corrects one’s assumptions, by moving to any other possibility that falls under the constraints in c.

4.8.3.2. Other possible extensions of c, a detailed review of B_c

Let’s examine the gradual expansion of information (and in particular the interpretation of ‘owl’ in several other branches through c). I.e. the branches with total states, in which the given denotations and dimensions sets are superset of those given in c. In table 12 I present 7 principal kinds of branches in B_c, the set of branches through c. It represent the space of possibilities above c, i.e. the kinds of total states still possible.

It can be seen by the kinds of total states in those branches that:

$[\text{owl}]_c = \cap\{[\text{owl}]^+_t \mid t \geq c, \text{ t is total}\} = \{d_1, d_2, d_4, d_{10}\}$.

$[\text{not owl}]_c = \cap\{[\text{owl}]^-_t \mid t \geq c, \text{ t is total}\} = \{d_3, d_5, d_7\}$.

$[\text{owl}]^?_c = \{d \mid \exists t_1, t_2 \geq c \ d \in [\text{owl}]^-_{t1} \text{ and } d \in [\text{owl}]^+_{t2}\} = \{d_8, d_9, d_6\}$.

Table 12: the kinds of branches in B_c

$[\text{owl}]_{c6} = \{d_1, d_{10}, d_2, d_4\}$ & $[\text{not owl}]_{c6} = \{d_3, d_5, d_7\}$						
b1.1	b1.2	b2	b3.1	b3.2	b4.1	b4.2
$d8 =_{(owl,c7)} d9$	$D8 >_{(owl,c7)} d9$	$d8 >_{(owl,c7)} d9$	$d8 =_{(owl,c7)} d9$	$d8 >_{(owl,c7)} d9$	$d8 =_{(owl,c7)} d9$	$d8 >_{(owl,c7)} d9$
d_6 is added to [owl]	D_6 is added to [owl]	d_9 is added to [not owl]	d_6 is added to [owl]	d_6 is added to [owl]	d8 d9 added to [not owl]	d_9 is added to [not owl]
d8, d9 added to [owl]	D8 is added to [owl]	d_6 is added to [owl]	d8 d9 added to [not owl]	d_9 is added to [not owl]	d_6 is added to [not owl]	d_8 is added to [not owl]
	D9 is added to [owl]	d8 is added to [owl]		d_8 is added to [not owl]		d_6 is added to [not owl]
$[\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4, d_6, d_8, d_9\}$ $[\text{not owl}]_{c9} = \{d_3, d_5, d_7\}$ $d8 =_{(owl,c7)} d9$	**$[\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4, d_6, d_8, d_9\}$ $[\text{not owl}]_{c9} = \{d_3, d_5, d_7\}$ $d8 >_{(owl,c7)} d9$**	**$[\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4, d_6, d_8\}$ $[\text{not-owl}]_c = \{d_3, d_5, d_7, d_9\}$ $d8 >_{(owl,c7)} d9$**	**$\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4, d_6\}$ $[\text{not owl}]_{c9} = \{d_3, d_5, d7, d8, d_9\}$ $d8 =_{(owl,c7)} d9$**	**$[\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4, d_6\}$ $[\text{not owl}]_{c9} = \{d_3, d_5, d_7, d_8, d_9\}$ $d8 >_{(owl,c7)} d9$**	**$\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4\}$ $[\text{not owl}]_{c9} = \{d_3, d_5, d7, d_6, d8, ,d_9\}$ $d8 =_{(owl,c7)} d9$**	**$[\text{owl}]_{c9} = \{d_1, d_{10}, d_2, d_4\}$ $[\text{not owl}]_{c9} = \{d_3, d_5, d_7, d_6, d_8, d_9\}$ $d8 >_{(owl,c7)} d9$**

However, the table above doesn't specify all the information given in each state. Most importantly, this table doesn't specify the dimension sets. It is an important fact that there may exist several different branches of each of the specified kinds.

For example in one branch of the kind indexed above as b3, d9 may be regarded as healthy (though not perfectly healthy, as it is less healthy than 1,2,4,6 and 10. It is regarded as healthy only after them, i.e. above c), but yet non-owl since 'strong' or "perfectly healthy" may be regarded there as necessary for owls. On another branch of kind b3, d9 may be regarded as non-owl simply since it may be regarded there as sick. That is, there exist more lines that are unspecified in the table. In those lines the denotations don't change but the dimension sets get widened. Let me describe these seven kinds of branches in more details, i.e. with the dimension sets. I will not specify tables with all the details as I did for branch b1.1, since I assume that I have already made clear the general idea regarding the interactions between the expansion of the dimension sets and the denotations. The conclusion to be drawn from the whole section is the following: the structure is constrained by the information in the initial state, by the constraints on the expansion of information (which elements can not be added, which elements must be added simultaneously and which are added orderly), and by the space of total possibilities.

The branches of the kind b1.2 are similar to b1.1 except that ‘strong’ is regarded as an ordering dimension. In branch b2 ‘strong’ is regarded also as a membership dimension.

Other two branches b3.1, b3.2 extend slightly more strictly, as to regard “female or adult or very healthy” in $MS^{+}_{(owl,t4.1)}$ (i.e. instances that are not females, not adults and also fail to have perfect health are not regarded as owls). As a result all the non- adult males that are not perfectly healthy (8,9) are regarded as non- owls.

An indirect effect of this in the current example is that ‘strong’ must be regarded also as a membership dimension (since only 9 is weak and 9 is not regarded as an owl).

In addition, in b3.2 being weak reduces one’s status as an owl (9 is regarded as non-owl before 8). In b3.1 strength is ignorable.

Other two branches b4.1 and b4.2 extend even more strictly as to regard “female or adult” as a membership dimension (i.e. instances that are neither females nor adults are not regarded as owls). As a result all the non- adult males (6,8,9) are regarded as non- owls. Again, an indirect effect of this is that ‘strong’ must be regarded also as a membership dimension (since only 9 is weak and 9 is not regarded as an owl).

In b4.2 being weak reduces one’s status as an owl (9 is regarded as non- owl before 8). In b4.1 strength is ignorable.

Other branches of the same type extend more strictly such that d_8 and d9 are discovered sick, though less sick than d_5,d_7,d_3 (i.e. they are discovered sick later).

If they are equally good as owls, strong is in $OS^{-}_{(owl,t4.1).}$ If not, strong is in $OS^{+}_{(owl,t4.2)}$.

The branches reviewed in this section present the space of possibilities in c. They show the general kinds of ways information can expand (branches) and the general possible completions of the information in c (states of complete information given the set of predicates A and the set of individuals D). I have shown how these possibilities are constrained not only by the information encoded in the denotations but also by the information encoded in the dimension sets.

4.9. Conclusions to chapter 4

In this chapter I have presented a theory of "ordering dimensions" and demonstrated in detail how a model of membership and ordering dimensions works. I will apply this theory to the semantics of *any, every,* and *a* next chapter.

Chapter 5: *Any, every* and *a*

In this chapter I will reformulate the analysis of *any, every* and *a* presented in chapter three, in a form which allows us to assume that these items operate also on the ordering dimension sets, as introduced in chapter four. I will argue that the truth of statements containing *any, every* or *a* imply different constraints on the information state in which they are interpreted, and that these constraints impose different restrictions on the interpretation of the predicate (their first argument). These differences concern the level of strictness of the interpretation of that predicate.

I assume that *any, every* and *a* specify for all the dimensions that are not necessarily membership or ordering dimensions, whether they may still turn out to be restrictions on the denotation (as in the more vague interpretation with *a* and *any*) or whether they must be regarded as non-restrictions (specified in MS^-, OS^-, as in the less vague, and possibly wider interpretation with *every*, and as with respect to the dimension that *any* is used to eliminate). This will make *any*, *every* and generic *a* means of interpreting the restriction of a universal quantifier more or less strictly, as stated in chapter 3, except that they may operate over both kinds of dimensions sets, MS and OS.

5.1. *every*

5.1.1. *Every* – is tolerant along its first argument's dimensions

Statements with determiners like *every* and *all* are not vague. They don't allow exceptions. So the truth conditions of statements like "every owl hunts mice" require that the statement is true if every relevant owl in that context c hunts mice, and the statement is false otherwise. No relevant owl can be an exception to "hunts mice".

The crucial question is- what are the relevant owls? In the model presented here the interpretation of 'owl', $I_{(owl,c)}$, already encodes the notion of relevance.

The interpretation function associates with the predicate ‘owl’ in every context c a positive and a negative denotation, $<[owl]^{+}_{c}, [owl]^{-}_{c}>$, a positive and a negative set of necessary conditions for being an owl, $<MS^{+}_{(owl,c)}, MS^{-}_{(owl,c)}>$, and a positive and a negative set of stereotypicality conditions for owls, $<OS^{+}_{(owl,c)}, OS^{-}_{(owl,c)}>$.

$I_{(owl,c)} = < <[owl]^{+}_{c}, [owl]^{-}_{c}>, <MS^{+}_{(owl,c)}, MS^{-}_{(owl,c)}>, <OS^{+}_{(owl,c)}, OS^{-}_{(owl,c)}> >.$

The positive denotation, $[owl]^+$, is not 'the absolute set of objects that are owls', but the set of objects which are referred to by the predicate 'owl' in a particular use of it, i.e. the set of relevant owls in c. It follows that if $d \in [owl]^+_c$, d is contextually relevant and if $d \in [owl]^-_c$, d is contextually irrelevant, as an owl.
Moreover, some individuals may be regarded as relevant owls even without explicitly pointing to them as such. Their being relevant can be implicitly determined on the basis of the information that is given in c. This is the case if, for instance, some individual doesn't fail to satisfy any possible necessary condition for being a relevant owl in c. This is already encoded in the model too.

$[owl]_c = \{d | \forall t \in T, t \geq c: d \in [owl]^+_t\}$, hence if $d \in [owl]_c$ then d is also contextually relevant.
$[not\ owl]_c = \{d | \forall t \in T, t \geq c: d \in [owl]^-_t\}$, hence if $d \in [not\ owl]_c$ then d is also contextually irrelevant.

I don't need any further mechanism of contextual restriction to get to the contextual interpretation of 'owl'.

The yet unsolved question is: what about the other objects, for which c doesn't determine whether they ought to be regarded as relevant or not? These are the objects in $[owl]^?$. The information in c can still be extended either such that they are regarded relevant, or such that they are regarded irrelevant.
$[owl]^? = \{d | \exists t2, t1 \in T, t1 \geq c, t2 \geq c: d \in [owl]^+_{t1} \text{ and } d \in [owl]^-_{t2}\}$.

E.g. consider a context in which there are two members in $[owl]^?$, one brown and one gray. Both of them don't fail to satisfy any potential necessary requirement for being regarded as a relevant owl, except for the properties 'gray' and 'brown'. It is still open whether they are necessary or not.
Note that even if only one relevant owl is 'gray', then 'brown' (or 'not-gray') can not be regarded as necessary for owls. The statement "every owl hunts mice" can not be regarded as true, if a gray creature doesn't hunt mice, on the basis that the exception is gray. (Formally, in every total state t, either 'gray' is necessary (in $MS^+_{(owl,t)}$) or

neither ‘gray’ nor ‘not gray’ are necessary (both are in $MS^-_{(owl,t)}$). ‘Not-gray’ is never in $MS^+_{(owl,t)}$.) The gray creature in that case is not in the gap, $[owl]^?_c$, but is necessarily a relevant owl (in $[owl]_c$). There is no possible requirement for owls that it fails to satisfy.

However, if no relevant owl is brown (or more generally if no relevant owl is non-gray), it is still open whether ‘not-brown’ (or ‘gray’) has to be regarded as necessary for owls. Then, the brown creature is indeed in the gap. Can the statement “every owl hunts mice” be regarded true, even if the brown creature doesn’t hunt mice, on the basis that the exception is not-gray?

There are two possibilities here.

<u>Theory 1</u>: The statement “every owl hunts mice” can be regarded as true, even if the brown creature doesn’t hunt mice, on the basis that the exception is not-gray.

In the context of *every*, non- gray creatures that do not violate any other necessary condition are regarded as non- owls.

<u>Theory 2</u>: The statement “every owl hunts mice” can not be regarded as true, if the brown creature doesn’t hunt mice, on the basis that the exception is not-gray.

In the context of *every,* non- gray creatures that do not violate any other necessary condition must be regarded as owls.

If we adopt theory 1, it follows that we are actually committed to the idea that ‘gray’ is necessary for owls. Otherwise, it can not be an excuse for an exception to a true generalization. (Formally, we interpret the generalization in some precisification c1 of c, in which ‘gray’$\in MS^+_{(owl,\ c1)}$).

If we adopt theory 2, it follows that we are actually committed to the idea that ‘gray’ is non-necessary for owls. Therefore, it can not be an excuse for an exception to a true generalization. (Formally, we interpret the generalization in some precisification c2 of c, in which ‘gray’$\in MS^-_{(owl,\ c2)}$).

If we don’t give up the idea that *every* is not vague, there is no third possibility. Indeed I believe we ought to keep this assumption, and to adopt theory 2. I will call the precisification c2 ‘$every_{(c,owl,hunts\ mice)}$’. I believe that this is the case on the basis of the following intuitions.

1. The *every* generalization can not be regarded as true if some creature, that is possibly an owl, violates it.
   I.e. the *every* generalization can only be regarded as true if all the creatures, that are potentially owls, satisfy it.
   This is just a paraphrase of the commonly held opinion that *every* allows no exceptions.
2. We can and we do accept an *every* generalization as true even in very partial information contexts. Actually we rarely specify whether each possible predicate is necessary or not for being regarded as a relevant instance of the predicate in the restriction of *every* (say 'owl'). We simply hold in mind a set of properties that are explicitly or implicitly specified in the context of utterance as necessary, and we ignore all other restrictions as irrelevant. This is an automatic shortcut towards precisification. If we want another property to restrict the quantification domain we should specify it as such. Otherwise, it isn't so regarded. Thus, against theory 1, I assume that <u>gray</u> is <u>not</u> treated as necessary for owls, because we should have specified it as such if it were. If we don't want to commit ourselves to such a strong statement, we simply shouldn't use *every*, but use vague quantifiers that allow exceptions, like the generic universal *a*.
   This is the reason why when "every owl hunts mice" is regarded as true, a generalization as "some owls don't hunt mice" can not be regarded as even possibly true. Its truth- value is not undetermined, but false.

   This is also the reason why we can "jump to conclusions" without a total specification of what we actually argue. E.g. if we are informed that 'poofs' are numbers that can be divided by 3 without a remainder, we can quite naturally jump to the conclusion that the generalization "every poof is even" is false. We do not assume that a further unadded restriction as 'can be divided by 10 without a remainder' is relevant. The use of *every* <u>presupposes</u> its irrelevance.
   If we are informed that 'poofs' are books for children, and we are even given an example of a poof which is a childrens' book with colored pictures, we wouldn't ignore childrens' books without colored pictures, when we judge the truth of the generalization "every poof is interesting/ funny/ starts with the *words "Once upon a time"*" etc. We take into account, out of the blue, childrens' books without colored pictures in determining the truth or falsity of the universal generalizations, and we do

that by ignoring the restrictions that exclude them. We do not assume that a further unadded restriction, as ‘with colored pictures’, is relevant. The use of *every* presupposes its irrelevance.
We may regard one of the universal generalizations as true enough in certain contexts, in spite of the presence of exceptions, but only loosely speaking, while relative to the strict truth conditions it is actually false.
If we have a reason to think that the set of relevant poofs is actually more restricted than specified, we simply wouldn’t use *every* but *a,* when uttering generalizations over poofs.

Consider one more example. When a cleaner in a book store with books in English and Spanish reports the situation in the store by saying that every childrens’ book is clean, then the cleaner claims that every childrens’ book in English and Spanish is clean, unless the cleaner is explicitly told to clean only the books in English, or she is known to be responsible only for this set of books.

Therefore, if a predicate P is the first argument of *every* and a predicate Q is the second argument, P and Q are interpreted relative to a state ‘$\text{every}_{(c,P,Q)}$’, at least as precise as c, but in the least restricted way along all the dimensions unspecified in $MS^{+}_{(P,c)}$. I.e. the dimension set pairs of P in $\text{every}_{(c,P,Q)}$ are totally completed, in such a way that the denotation of P is the largest possible, relative to the information in c. In c, every unspecified dimension Z (that is in $MS^{?}_{(P,c)}$) may actually turn out to be an $MS^{+}_{(P,c')}$ dimension in some state c’ above c. In the context of *every*, every such unspecified Z is treated as an $MS^{-}_{(P,\text{every}(c,P,Q))}$.

Note that, if we accept theory 2, it follows for any property that is not given apriori as necessary for owls in c, that it is irrelevant for being regarded an owl. Its irrelevance is, once again, presupposed by the use of *every*.
Theory 1 has the opposite presupposition. From theory 1 it follows that the use of *every* presupposes that any property that is not given apriori as necessary for owls in c, is actually necessary. This assumption allows for many exceptions to the *every* generalization. The gap members are actually regarded as non- owls and may make exceptions. As argued above this seems to be unintuitive.

Note also that even if we accept theory 2, the irrelevance of the property ‘hunts mice’ is not presupposed. It is not presupposed that also some creatures that don’t hunt mice are regarded as owls, but rather it is asserted that all owls do hunt mice.
There is a set of properties for which their specification as irrelevant entails the irrelevance of the property ‘hunts mice’. Those properties are ignored. They are not presupposed to be irrelevant, unless it is so specified independently.
For example, the irrelevance of the properties “hunts certain types of mammals” or “hunts snakes or mice” in c (i.e. their specification in $MS^{-}_{(owl,c)}$) entails that not all the relevant owls in c hunt certain types of mammals, or hunt snakes or mice; some do not. This entails that the property “hunts mice” doesn’t apply on the set of relevant owls in c. If *every* would have eliminated all these properties, the generalization “every owl hunts mice” would be always false. But this is not the case. *Every* ignores the properties for which specification as irrelevant for owlhood entails the specification of “hunts mice” as irrelevant for owlhood.

Moreover, after the addition of the set OS (the set of relevant ordering properties) to the context, we may assume that *every* operates also on OS.
Every unspecified dimension Z (that is in $OS^{?}_{(P,c)}$) may actually turn out to be an $OS^{+}_{(P,c2)}$ dimension in some state c_2 above c, so that pairs of instances that are not equally Z in c may be regarded as not equally good owls in c_2. If *every* operates over OS, every such unspecified Z is treated as being in $OS^{-}_{(P,every(c,P,Q))}$.

E.g. if ‘strong’ is an $OS^{?}_{(owl,c)}$ dimension, strength may still turn out to influence the stereotypicality of an instance as an owl in c. If we accept that *every* operates also on OS, it follows that strength is regarded as not influencing the stereotypicality of an instance as an owl in $every_{(c,owl,hunt\ mice)}$. Intuitively, that means that if there is an exception to the *every* generalization, whether strong or weak, the *every* generalization is equally false. In c every pair not equally strong may differ also in their status on the scale of ‘owl’ (Formally, such a pair is not necessarily in $[=_{(owl)}]_c$), but not in $every_{(c,owl,hm)}$, where such a pair is in $[=_{(owl)}]_{every(c,owl,hunt\ mice)}$).

Assume that there is an exception to the generalization “hunts mice” (when applied on the set of owls). A speaker wants to express a statement, which is not too strong, but maximally, strong enough.

In the first case, i.e. in c (before the move to ‘every$_{(c,P,Q)}$), if the only exception is weak enough, the generalization, though strictly false, may still fit the context (i.e. not be regarded as too strong), on the basis that the exception is a contextually atypical owl (a weak one). The generalization can not be so regarded, if the exception is strong (i.e. contextually typical). In that case the generalization is definitely too strong and doesn’t fit the context.

However, in the second case, i.e. in ‘every$_{(c,owl,hunt\ mice)}$’, the generalization doesn’t fit the context (is definitely regarded as too strong), regardless of whether the only exception is strong or not. Being weak doesn’t reduce the contextual typicality of an owl in that context. Weak and strong owls are equally relevant.

This means that if a property Z is unspecified in $OS^{+}_{(owl,c)}$ (‘gray’ or ‘strong’ in our example), the expectation is that *every* generalization applies to owls with a low status on the scale of Z (non- gray or weak owls, in our example).

5.1.2. <u>Defining the state ‘every(c,P,Q)</u>

<u>5.1.2.1.</u> The context ‘every$_{(c,P,Q)}$’ is therefore equal in all respects to c except for the interpretation of P:

$$I_{(P,every(c,P,Q))} = < <[P]^{+}_{every(c,P,Q)}\ ,\ [P]^{-}_{every(c,P,Q)}>,\ <MS^{+}_{(P,every(c,P,Q))},\ MS^{-}_{(P,every(c,P,Q))}>,$$
$$<OS^{+}_{(P,every(c,P,Q))},\ OS^{-}_{(P,every(c,P,Q))}>\ >.$$

The items in this tuple are as follows.

1. The directly given denotations remain the same as in c:
$<[P]^{+}_{every(c,P,Q)}\ ,\ [P]^{-}_{every(c,P,Q)}> \ = \ <[P]^{+}_{c},\ [P]^{-}_{c}>$.

2. The positive dimensions sets also remain as in c:
$(MS^{+}_{(P,every(c,P,Q))} = MS^{+}_{(P,c)})$ and $(OS^{+}_{(P,every(c,P,Q))} = OS^{+}_{(P,c)})$.

3. The negative dimensions sets $(MS^{-}_{(P,every(c,P,Q))},\ OS^{-}_{(P,every(c,P,Q))})$ widen, so as to include every accessible predicate (i.e. every predicate in A^{*}) which is unspecified in $MS^{+}_{(P,c),}$ or $OS^{+}_{(P,c)}$, unless the information in c already entails that it must end up as an MS^{+} or OS^{+} dimension of P (i.e. it is so specified in every total state above c).

The second argument of *every* (Q) and the unspecified predicates such that their specification as non- trivial entail the specification of Q as non- trivial, are ignored, as explained above. Thus:

1. $MS^{-}_{(P,every(c,P,Q))} = \{Z \mid Z,\neg Z \in (A^{*} - \cap\{MS^{+}_{(P,t)}: t \geq c\})$ &

$$\text{If } Z \in MS^{?}_{(P,c)} \text{ then } (\neg\forall t \in T: \text{ if } Z \in MS^{-}_{(P,t)} \text{ then } Q \in MS^{-}_{(P,t)})\}.$$

(The set of predicates that are not already determined in c to end up as necessary for P (not in $MS^{+}_{(P,c)}$). The predicates that their specification as non-trivial on P entails the non-triviality of Q on P, are excluded from this set.).

2. $OS^{-}_{(P,every(c,P,Q))} = \{Z \mid (Z,\neg Z \in (A^{*} - \cap\{OS^{+}_{(P,t)}: t \geq c\})$ &

$$(\text{If } Z \in OS^{?}_{(P,c)} \text{ then } (\neg\forall t \in T: \text{ if } Z \in OS^{-}_{(P,t)} \text{ then } Q \in OS^{-}_{(P,t)})\}:$$

(The set of predicates that are not already determined in c to end up as ordering P (not in $OS^{+}_{(P,c)}$). The predicates that their specification as non-ordering P entails that Q doesn't order P, are excluded from this set).

4. '$Every_{(c,P,Q)}$' is equal to c in every other respect. I.e. the interpretation of every predicate Z other than P remains just as in c:
$\forall Z \in A$, such that $P \neq Z$: $I_{(Z,every(c,P,Q))} = I_{(Z,c)}$.

Thus, the truth conditions of a statement of the form "every(P,Q)" are as follows:
$[Every(P,Q)]_c = 1$ iff $[P]_{every(c,P,Q)} \subseteq [Q]_{every(c,P,Q)}$.

5.1.2.2. The effects induced by *every*

As a result of the widening of the negative dimension sets, the indirectly extended denotations of P and of $\leq_{(P)}$ in $every_{(c,P,Q)}$ may widen along the added dimensions.

For instance, in the example above, not all the gray and non- gray creatures that satisfy any property apriori given as necessary for owls, may be members in $[owl]_c$ (since 'gray' or "not gray" may still turn out to be necessary for owls).

However they are all specified in $[owl]_{every(c,owl,hunt\ mice)}$ (since 'gray' and "not gray" can not turn out to be necessary for owls in this context. They are already specified in $MS^{-}_{(owl,(every(c,owl,hunt\ mice))})$.

Thus: $[owl]_c \subseteq [owl]_{every(c,owl,hunt\ mice)}$ &

$[not\ owl]_c = [not\ owl]_{every(c,owl,hunt\ mice)}$ &

$[hunt\ mice]_c = [hunt\ mice]_{every(c,owl,hunt\ mice)}$ &

$[doesn't\ hunt\ mice]_c = [doesn't\ hunt\ mice]_{every(c,owl,hunt\ mice)}$

Let us define 'every*' as a universal quantifier that doesn't involve the jump to $every_{(c,owl,hunt\ mice)}$:

$[every^*(P,Q)]_c = 1$ iff $[P]_c \subseteq [Q]_c$.

Then $[every(P,Q)]_c$ is stronger then $[every^*(P,Q)]_c$, because the domain of quantification is widened (i.e. $[P]_c \subseteq [P]_{every(c,P,Q)}$). So if "every(P,Q)" is true in c then "every*(P,Q)" is true in c.

Moreover, if the predicate 'strong' is in $OS^{?}_{(owl,c)}$ all the pairs of weak and strong owls that are equal in any other property potentially ordering owls, are members in $[\leq owl]^{?}_{c}$ (Their relative status on the scale of 'owl' is still undetermined). However they are all specified in $[=owl]_{every(c,owl,hunt\ mice)}$ (equally good as owls, since 'strong' and "not strong" can not turn out to be ordering owls in this context).

Since the domain of quantification is more homogenized, $[every(P,Q)]_c$ is less tolerant to exceptions.

Every* treats more objects as having low status as owls than *every*. If these objects don't satisfy Q, then even though both statements are strictly false, $[every(P,Q)]_c$ doesn't fit the context, while $[every^*(P,Q)]_c$ can be interpreted as not too strong on the basis that the exceptions have a low status as owls.

Thus $[every(P,Q)]_c$ is stronger then $[every^*(P,Q)]_c$.

This means, of course, that the constraints on '$every_{(c,P,Q)}$' make a statement with *every* less tolerant with respect to truth value. Its domain of quantification is larger and less ordered, hence the statement is easier to falsify.

5.1.2.3. Summary of definitions:

$\forall c \in C$, $\forall P \in A$, $\forall Q \in A^*$**:**

1. $[\text{every } P,Q]_c = 1$ iff $[P]_{every(c,P,Q)} \subseteq [Q]_{every(c,P,Q)}$.

2. 'every(c,P,Q)' is the smallest context above c in C ($every_{(c,P,Q)} \geq c$) such that:

  1. $I_{(P,every(c,P,Q))} = < <[P]^+_c,[P]^-_c>,$

$$<MS^+_{(P,c)}, \{Z \mid Z,\neg Z \in (A^* - \cap\{MS^+_{(P,t)}: t \geq c\})\ \&$$
$$(\text{If } Z \in MS^?_{(P,c)} \text{ then } (\neg\forall t \in T: \text{ if } Z \in MS^-_{(P,t)}$$
$$\text{then } Q \in MS^-_{(P,t)})\}.$$
$$<OS^+_{(P,c)}, \{Z \mid Z,\neg Z \in (A^* - \cap\{OS^+_{(P,t)}: t \geq c\})\ \&$$
$$(\text{If } Z \in OS^?_{(P,c)} \text{ then } (\neg\forall t \in T: \text{ if } Z \in OS^-_{(P,t)}$$
$$\text{then } Q \in OS^-_{(P,t)})\}> \quad >.$$

  2. $\forall Z \in A$, $P \neq Z$: $I_{(Z,every(c,P,Q))} = I_{(Z,c)}$.

5.1.3. A detailed example

So let's work out the interpretation of the example given above relative to the model detailed in the previous chapter:

1. $[\text{every owl hunts mice}]_c = 1$ iff:
   $[\text{owl}]_{every(c,owl,hunt\ mice)} \subseteq [\text{hunts mice}]_{every(c,owl,hunt\ mice)}$.

2. '$Every_{(c,owl,hunt\ mice)}$' is of the kind of state c9 above c in branch b1.1 (see a detailed review of this branch, with respect to other branches through c, in section 4.8.3). It is the only branch in which 'strong', 'gray' (and any other generated predicate that mustn't end up in the positive dimensions sets) is added to $OS^-_{(owl,c9)}$,$MS^-_{(owl,c9)}$:

$$MS^-_{(owl,every(c,owl,hunts\ mice))} = \{Z \mid Z,\neg Z \in (A^* - \cap\{MS^+_{(owl,t)}: t \geq c\})\ \&$$
$$(\text{If } Z \in MS^?_{(P,c)} \text{ then } (\neg\forall t, t \text{ is total: if } Z \in MS^-_{(P,t)}$$
$$\text{then } Q \in MS^-_{(P,t)})\}.$$
$$= \{\text{female, adult, strong, grey, not female, not} \ldots\}.$$

$OS^-_{(owl,every(c,owl,hunts\ mice))} = \{Z|\ Z,\neg Z\in(A^* - \cap\{OS^+_{(owl,t)}: t\geq c\})\ \&$

$(\text{If } Z\in OS^?_{(P,c)} \text{ then } (\neg\forall t, t \text{ is total: if } Z\in OS^-_{(P,t)}$

$\text{then } Q\in OS^-_{(P,t)})\ \}.$

$= \{\text{gray, strong, not gray,not strong..}\}.$

I.e. you assume that everything (excluding “hunts mice”) that is not specified as a necessary or an ordering condition for ‘owl’ in c or in every total state above c, is known not to be necessary or ordering.

3. Hence, it follows that the indirectly extended positive denotation is the maximal possible one, and the indirectly extended negative denotation is the minimal possible one:

$[owl]_{every(c,owl,hunt\ mice)} = \cap\{[owl]^+_t|\ t\geq every_{(c,owl,hunt\ mice)}, t \text{ is total}\} =$

$= [owl]_{c9\ in\ b1.1} = \{d_1,d_2,d_4,d_6,d_{10},d_8,d_9\}.$

$[not\ owl]_{every(c,owl,hunt\ mice)} = \cap\{[owl]^-_t\ |\ t\geq every_{(c,owl,hunt\ mice)}, t \text{ is total}\}=$

$= [not\ owl]_{c9\ in\ b1.1} = \{d_3,d_5,d_7\}.$

$[owl]^?_{every(c,owl,hunt\ mice)} = \{d|\ \exists t_1,t_2\geq every_{(c,owl,hunt\ mice)}, d\in[not\ owl]^-_{t1} \text{ and } d\in[owl]^+_{t2}\}$

$= [owl]^?_{c9\ in\ b1.1} = \emptyset.$

In any other branch through c, in which some gap member d_6,d_8, or d_9 is added to “non owl”, some restriction is added to $MS^+_{(owl,c9)}$ – ‘strong’, “healthy or adult”, “healthy or adult or strong” etc. None of these potential restrictions is added to $MS^+_{(owl,every(c,owl,hunt\ mice))}$. Thus, $every_{(c,owl,hunt\ mice)}$ is equal to c in all except to the interpretation of ‘owl’ that is maximally tolerant.

The meaning of *every* remains in essence the same as specified in chapter 3, before OS was added to the model. The gap of ‘owl’ in c is added to the positive denotation of ‘owl’ in $every_{(c,owl)}$.

So in c “every owl hunts mice” is true iff $\{d_1,d_2,d_4,d_6,d_{10},d_8,d_9\} \subseteq [hunts\ mice]_c$.

In other words we can only ignore those instances that are known not to be owls. All the rest are required to hunt mice.

Note that if 'gray' has been specified as necessary for owls in the first place (i.e. 'gray' had been specified in $MS^{+}_{(c,owl)}$), then the non-gray (say - brown) individual 10 would have been regarded as irrelevant, and therefore the requirement 'hunt mice' wouldn't have to apply to it.

There is only one additional implication that results from the fact that *every* operates also on OS. It is the implicature that if there is an exception to the generalization, whether weak or strong, gray or not gray, the generalization is equally false.
I.e. if a property Z was unspecified in $OS^{+}_{(owl,c)}$ ('strong' in our example), the expectation for the *every* generalization to truly apply isn't lower for owls with a low status on the scale of Z (weak owls like 9 versus similar strong owls like 8, in our example, as seen in the table 13).

Table 13: The scale of 'owl' in $\text{every}_{(c,owl,hunts\ mice)}$

[1,10]
[2] [4]
[6]
[8, 9] (<9,8>,<8,9> are added to $[=\text{owl}]_{every(c,owl,hunts\ mice)}$)
[3]
[5,7]

This further implicature doesn't always exist, but it may occur as a result of the use of *every*. In terms of the model, I would say that the primary use of *every* is as an operation over MS. The primary meaning of *every* is as a universal quantifier over the largest possible quantification domain. However, *every* may be used also as an operation over OS. In this meaning of *every,* it is a universal quantifier over the largest and least ordered possible quantification domain.

5.2. The indefinite determiner

5.2.1. The indefinite determiner – is vague along its first argument's dimensions

Statements with the indefinite determiner *a* (or with bare plurals) are vague. They allow exceptions. So the truth conditions of statements like "an owl hunts mice" (or: "owls hunt mice") allow that the statement is true even when some owls don't hunt mice. There may exist some property that these creatures fail to satisfy and that can be a basis to justify their exclusion from the domain of quantification.

E.g. if we are informed that ‘poofs’ are books for children, and we are even given an example of a poof which is some childrens’ book with colored pictures, we may ignore childrens’ books without colored pictures when we judge the truth of a generalization as “a poof is visually interesting“. We may assume that further unadded restrictions, as ‘with colored pictures’, are relevant. The use of *a* presupposes this potential relevance of the restrictions.
A worker in a book- store with books in English and Spanish may report the situation in the store by saying that a childrens’ book has illustrations (or that childrens’ books have illustrations). That person argues that childrens’ books generally have illustrations. This generalization may be accepted even if only books in one of the languages, or only books that sell well, have illustrations. The relevant set of books may be contextually restricted such that many exceptions are allowed.
So the quantification domain in a statement ‘a(P,Q)’ can be even more restricted than the denotation of the first argument P.

Consider now the owl- example. If the property ‘gray’ isn’t given as necessary for owls in a context c, a non- gray creature that satisfies any property potentially necessary for owls in c except for ‘gray’, is either in the denotation $[\text{owl}]_c$ or in the gap ($[\text{owl}]^?_c$). Intuitively, even if this creature doesn’t hunt mice in c, it is still possible that the statement “an owl hunts mice” is true, on the basis that the exception is not gray. ‘gray’ may still turn out to be necessary for owls. Just as we introduced a state ‘$\text{every}_{(c,P,Q)}$’, we will introduce a state ‘$a_{(c,P)}$’. I.e. in the context of *a* (in $a_{(c,\text{owl})}$) this creature is removed from $[\text{owl}]_c$ into $[\text{owl}]^?_{a(c,\text{owl})}$. In $a_{(c,\text{owl})}$, non- gray creatures that do not violate any other necessary condition for owls mustn’t be regarded as owls.

Thus, an *a* statement is a statement that allows exceptions along every dimension Z unspecified in $MS^+_{(P,c)}$. It is the negation, ‘not Z’, that may actually turn out to be an $MS^+_{(P,c')}$ dimension in some extension c’ of c, so that Z instances that fail to satisfy “hunts mice” are ignorable.
Therefore, the predicate P that is the first argument of *a*, denotes almost the smallest possible denotation, i.e. the set of relevant owls is selected relative to almost the least complete dimension sets. The denotation is likely to be only the set of elements that are given directly as owls (i.e. the members in the directly given denotation in c,

$[P]^+_c$). And maybe also elements that are similar enough to the $[P]^+_c$ members, so that they are maximally P, and therefore must be in the denotation in every total state.

These intuitions can be represented in the model developed here in the following way. The predicate in the restriction (say P) is interpreted relative to a state $a_{(c,P)}$ under c, at most as precise as c, but least complete along all dimensions unspecified in $MS^+_{(P,c)}$.
So whereas *every* moves us to a state above c, *a* moves us to a state under c.
Whereas in the state $every_{(c,P,Q)}$ the dimensions unspecified in $MS^+_{(P,c)}$ are all treated as unnecessary (the unspecified dimensions are also regarded as MS^- dimensions), in the state $a_{(c,P)}$ the dimensions unspecified in $MS^+_{(P,c)}$ are all treated as unspecified (the $MS^-_{(P,c)}$ dimensions are also regarded as unspecified, i.e. $MS^?$ dimensions).
The use of *a* presupposes the potential relevance of the dimensions unspecified as necessary (i.e. unspecified in $MS^+_{(P,c)}$, but maybe even specified in $MS^-_{(P,c)}$).
As a result, the indirectly extended denotation of P is less complete than in c.

Moreover, after the addition of OS, the set of stereotypicality properties, to the context, it is possible that *a* operates also on OS.
E.g. assume that 'gray' doesn't influence the stereotypicality of an instance as an owl in c. If there is an exception to the generalization, whether gray or not gray, the generalization is equally false. (I.e. 'gray' is an $OS^-_{(owl,c)}$ dimension).
However, if *a* operates also on OS, then an $OS^-_{(P,c)}$ dimension Z (just as any $OS^?_{(P,c)}$ dimension) is regarded as an $OS^?_{(P,a(c,P))}$ dimension. That means that it may still turn out to influence the stereotypicality of an instance as an owl (i.e. to be an $OS^+_{(P,c2)}$ dimension) in some state c_2 above $a_{(c,P)}$. Thus, pairs of instances, which are not yet in the relation equally Z in $a_{(c,P)}$, may be regarded not equally good owls in c_2.

In the detailed example 'gray' is in $OS^-_{(c,owl)}$ but it may still turn out to be an ordering dimension of 'owl' in some state c_2 above $a_{(c,owl)}$ (i.e. in $OS^+_{(owl,c2)}$).
Every pair of individuals which are not equally gray (<1,10> in our detailed example) may differ also in their status as owls. (In state c_2 above $a_{(c,owl)}$ this pair (<1,10>) is in $[<_{(owl)}]_{c2}$ rather than in $[=_{(owl)}]_{c2}$).

Assume that there is an exception to the generalization "hunts mice" when applied on the set of owls. The speaker wants to express a statement, which is not too strong, but, maximally strong enough.
In c, regardless of whether the exception is gray or not, the generalization is false.
In $a_{(c,owl)}$ it may also be strictly false (if this counterexample is in $[owl]_{a(c,owl)}$), but it can still be regarded as not too strong, if the exception has a low status as an owl. A low status can be determined on the basis that the exception is not gray. Exceptions with low status can be regarded less seriously.
So the use of *a* weakens the statement such that it is almost true. The statement "an owl hunts mice" may be treated as true enough for the contextual pragmatic purposes (using the terms of Lasersohn 98). In that sense it fits the context.

Thus, if a property Z is unspecified in $OS^{+}_{(owl,c)}$ ('gray' or 'strong' in our example), it is still possible that the expectation for the *a* generalization to truly apply should be lower for owls with a low status on the scale of Z (non gray or weak owls, in our example).
This further implicature doesn't always exist, but it may arise as a result of the use of *a*. In terms of the model suggested here, I would say that the more primary use of *a* is as an operation over MS. The primary meaning of *a* is as a generic universal quantifier over at least the smallest possible quantification domain. However, *a* may be used also as an operation over OS. In this meaning of *a* it is a generic universal quantifier over at least the smallest and potentially most ordered possible quantification domain. I will elaborate more on this potential implicature and demonstrations of it in the section about *any*.

Note that in the case of 'every(P,Q)' properties are added to the negative dimension sets ($MS^{-}_{(P,c)}$, $OS^{-}_{(P,c)}$), whereas in the case of 'a(P,Q)' properties are removed from them. Thus, in the case of *every* it is entailed that the denotation is widened whereas in the case of *a* it narrows (and this is why exceptions are allowed in the latter case). This is the reason for the inclusion of Q in the definition of the state '$every_{(c,P,Q)}$', and the exclusion of Q from the definition of the state '$a_{(c,P)}$'. We must see that no property that entails the falsity of Q is added to the negative dimension sets in '$every_{(c,P,Q)}$. However, no property that entails the falsity of Q is ever added to the negative dimension sets in '$a_{(c,P)}$'.

5.2.2. Defining the state '$a_{(c,P)}$'

5.2.2.1. The context '$a_{(c,P)}$' is therefore equal in all respects to c except for the interpretation of P:

$I_{(P,a(c,P))} = <<[P]^{+}_{a(c,P)}, [P]^{-}_{a(c,P)}>, <MS^{+}_{(P,a(c,P))}, MS^{-}_{(P,a(c,P))}>, <OS^{+}_{(P,a(c,P))}, OS^{-}_{(P,a(c,P))}>>$.

The items in this tuple are as follows.

1. The positive dimensions sets remain the same as in c:
   ($MS^{+}_{(P,a(c,P))} = MS^{+}_{(P,c)}$) and ($OS^{+}_{(P,a(c,P))} = OS^{+}_{(P,c)}$).

2. The negative dimensions sets become empty:
   ($MS^{-}_{(P,a(c,P))} = \varnothing$ and $OS^{-}_{(P,a(c,P))} = \varnothing$).

This means that we don't accept the properties in these sets as being irrelevant for determining owlhood any longer. They are potentially relevant.

3. The directly given denotations, $<[P]^{+}_{a(c,P)}, [P]^{-}_{a(c,P)}>$, remain roughly the same as in c ($<[P]^{+}_{c}, [P]^{-}_{c}>$).

(More precisely, $[P]^{+}_{a(c,P)}$ is only a subset of $[P]^{+}_{c.}$ The maximal subset such that the purpose of applying the operation denoted by *a* is obtained, i.e. the maximal subset such that the dimensions eliminated from the negative dimensions sets must not end up in the positive dimensions sets but it is still open whether they end up there or not. '$A_{(c,P)}$' should be less complete than c along the dimensions of P. Potentially, but not necessarily, more restricted. Thus: $[P]^{+}_{a(c,P)}$ is the maximal subset of $[P]^{+}_{c}$ s.t. $(\cap\{OS^{+}_{(P,t)} | t\in T, t\geq a_{(c,P)}\}) \cap OS^{-}_{(P,c)} = \varnothing$).

I demonstrate the need for this further restriction in the detailed example given later.

4. The context '$a_{(c,P)}$' is equal in all other respects to c. I.e. the interpretation of every predicate Z other than P remains just as in c:

$\forall Z\in A$, such that $P\neq Z$, $I_{(Z,a(c,P))} = I_{(Z,c)}$.

Thus, the truth conditions of a statement of the form "a(P,Q)" are as follows:

$[A(P,Q)]_{c} = 1$ iff $[P]_{a(c,P)} \subseteq [Q]_{a(c,P)}$.

5.2.2.2. The effects induced by *a*

As a result of the empty negative dimension sets, the indirectly extended denotations of P and of $\leq_{(P)}$ in $a_{(c,P)}$ may narrow along the dimensions that become unspecified. For instance, in the example above, if 'gray' is in $MS^{-}_{(owl,c)}$ all the gray and non- gray creatures that satisfy any potentially necessary requirement for owls, are members in $[owl]_c$ (since 'gray' or "not gray" can not turn out to be necessary for owls). However they are not all specified in $[owl]_{a(c,owl)}$ (since 'gray' or "not gray" may still turn out to be necessary for owls in this context).

Thus: $[owl]_c \supseteq [owl]_{a(c,owl)}$ & $[not\ owl]_c = [not\ owl]_{a(c,owl)}$ & $[owl]^?_c \subseteq [owl]^?_{a(c,owl)}$
$[hunt\ mice]_c = [hunt\ mice]_{a(c,owl)}$ & $[doesn't\ hunt\ mice]_c = [doesn't\ hunt\ mice]_{a(c,owl)}$

Let us define 'a*' as a universal quantifier that doesn't involve the jump to $a_{(c,P)}$:
$[a^*(P,Q)]_c = 1$ iff $[P]_c \subseteq [Q]_c$. (this is, of course the same as "every*(P,Q)").
The statement $[a(P,Q)]_c$ is weaker than the statement $[a^*(P,Q)]_c$, since the domain of quantification narrows ($[P]_{a(c,P)} \subseteq [P]_c$). I.e. if $[a^*(P,Q)]_c$ is true in c than $[a(P,Q)]_c$ is true in c.

Moreover, if 'gray' is in $OS^{-}_{(owl,c)}$ all the gray and non- gray pairs that are equal in any property potentially ordering owls, are members in $[=owl]_c$. However they are not all specified in $[=owl]_{a(c,owl)}$ (since 'gray' and "not gray" may still turn out to be ordering owls in this context).
The statement $[a(P,Q)]_c$ is weaker than the statement $[a^*(P,Q)]_c$, since the domain of quantification in the first case becomes (potentially) less homogenized than in the latter. More objects (in $a_{(P,c)}$) may still turn out to have low status as owls (all those that have low status on the scale of the dimensions in $OS^{-}_{(owl,c)}$). If they are the only exceptions to the generalization Q, then both statements may be regarded false, but there is still a pragmatic difference.
Assume that in c, 'gray' is irrelevant for owlhood (there are gray and non-gray owls and they are equally relevant owls) and some non- gray owls don't hunt mice (in c they are exceptions to the generalization "hunts mice"). A speaker wants to express a statement, which is not too strong, but, maximally, strong- enough. "Every owl hunts mice" is too strong, because there are exceptions. "An* owl hunts mice" is too strong

for the same reason. But “an owl hunts mice” is strong enough. It is the only statement that fits the context. In c, exceptions that have low status on the scale of the dimensions in $OS^{-}_{(owl,c)}$ clearly <u>can not</u> be tolerated on that basis.

However, in $a_{(c,owl)}$, exceptions that have low status on the scale of the dimensions in $OS^{-}_{(owl,c)}$ <u>can</u> be tolerated on that basis. These dimensions are regarded as potentially ordering owls. Hence they form a potential basis for regarding the exceptions as having low status as owls. As such they are not very relevant. Loosely speaking, in the terms of Lasershon 1998, i.e. ignoring these atypical exceptions, the statement can be regarded as a “good enough approximation of the truth”.

In sum, the indefinite determiner is incomplete (vague), and thus potentially stricter, along its first argument’s dimensions. Therefore, a statement $[a(P,Q)]_c$ is more tolerant with respect to truth values.

5.2.2.3. Summary of the definitions

$\forall c \in C, \forall P \in A, \forall Q \in A^*$**:**

1. $[\text{Gen a } P,Q]_c = 1$ iff $[P]_{a(P,c)} \subseteq [Q]_{a(P,c)}$.

2. ‘$a_{(c,P)}$’ is the largest state in C <u>under</u> c ($c \geq a_{(c,P)}$) such that:

   1. $\forall Z \in A, P \neq Z, I_{(Z,a(c,P))} = I_{(Z,c)}$.
   2. $I_{(P,a(c,P)} = < <[P]^{+}_{a(c,P)},[P]^{-}_{c}>, <MS^{+}_{(P,c)}, \varnothing>, <OS^{+}_{(P,c)}, \varnothing> >$.
   3. $[P]^{+}_{a(c,P)}$ is the maximal subset of $[P]^{+}_{c}$ such that $(\cap\{OS^{+}_{(P,t)} | t \in T, t \geq a_{(c,P)}\}) \cap OS^{-}_{(P,c)} = \varnothing$.

5.2.3. A detailed example

So let’s work out the interpretation of the example “an owl hunts mice” relative to the model detailed in the previous chapter:

1. $[\text{Gen an owl hunts mice}]_c = 1$ iff: $[\text{owl}]_{a(c,owl)} \subseteq [\text{hunts mice}]_{a(c,owl)}$.

2. ‘$A_{(c,owl,hunt\ mice)}$’ is of the kind of state under c which is maximally similar to c except that the negative dimensions sets get empty:

$MS^{+}_{(owl,a(c,owl))}$ = {owl, bird, healthy}. $MS^{-}_{(owl,a(c,owl))} = \varnothing$.

$OS^{+}_{(owl,a(c,owl))}$ = {female, adult, healthy, owl, bird}. $OS^{-}_{(owl,a(c,owl))} = \varnothing$.

I.e. you assume that for everything that is not specified as a necessary condition or an ordering condition for 'owl' in c, the question whether it should be regarded as necessary or ordering owls is still open.

3. Let me carefully clarify now which objects are removed from the positive denotation and comparative relation and why.

First, it follows that 'female' and 'adult' are removed from $MS^{-}_{(owl,c)}$ (see section 2 above). As a result, d_2 (which is male) is removed from the indirectly extended denotation. ('female' is an ordering dimension in c, hence d_2 has been added to the denotation in some state <u>after</u> d1 has been added. Thus, removing d_2 is a more minimal change than removing d_1). Similarly, d_4 (which is not adult) is removed from the indirectly extended denotation, and the more contextually typical owl, d2, stays in.

Finally, 'gray' is removed from <u>$OS^{-}_{(owl,c)}$</u> (see section 2 above). As a result, all the pairs that differ only as to how gray they are ($\langle d_1,d_{10}\rangle,\langle d_{10},d_1\rangle$) must be removed from $=_{(owl,c)}$ (since 'gray' is not in $OS^{-}_{(owl,a(c,owl))}$), and be added into $\leq^{?}_{(owl,a(c,owl))}$. I.e. they mustn't be regarded as neither equally good owls nor non equally good owls in $a_{(c,owl)}$ (so that either 'gray' or 'not gray' may be potentially ordering (i.e. for each there will be a state c_2 above $a_{(c,owl)}$ in which they are in $OS^{+}_{(owl,c2)}$).

For this to be the case: $(\langle d_1,d_{10}\rangle,\langle d_{10},d_1\rangle \in \leq^{?}_{(owl,a(c,owl))})$, in some states above $a_{(c,owl)}$ it should hold that 1 and 10 are always regarded as owls or not simultaneously, and in some states above $a_{(c,owl)}$ it should hold that one of them is always regarded as an owl if the other is, but not vice versa. Therefore, it has to be the case that in $a_{(c,owl)}$, neither is regarded as an owl yet.

Only if it is directly given (independently of the specification of 'gray' in OS) that 1 (which is gray) is a better example of an owl than 10 (which isn't gray), then 'gray' must necessarily be regarded as relevant for the ordering of owls in $a_{(c,owl)}$.

Also, if there is independent background information, relative to which d_{10} (the non-gray individual) is also directly given as an owl, equally good owl as 1, these items are clearly not removed from the extended denotation, since their membership isn't entailed simply by the fact that 'gray' is a non -ordering dimension in c. Thus, 'gray' is regarded as irrelevant for the ordering of owls in $a_{(c,owl)}$.
Since in c there is no such background information, if 10 is regarded as a gap member (in $[owl]^{?}_{a(c,owl)}$) then also 1 should be so regarded, so that the question whether 'gray' is in $OS^{+}_{(owl)}$ or not may still be open.

Thus $[P]^{+}_{a(c,P)}$ is the maximal subsets of $[P]^{+}_{c}$ such that $a_{(c,P)}$ still obtains the purpose of its use: removing dimensions to the gap $OS^{?}$ rather than to OS^{+}. In our case: $[owl]_{a(c,owl)} = \{\}$ and $[not\ owl]_{a(c,owl)} = \{d_3,d_5,d_7\}$.

In sum, what is known in $a_{(c,owl)}$ (i.e. what is presupposed by the use of *a*)?
One presupposes that owls must be healthy birds, and that their status as owls (their relevance in any discourse about owls) rises as their status as healthy adult female birds rises.
No individual can be regarded as clear evidence against any generalization about owls. Any individual may make a legitimate exception on some ground (being gray or being not gray, being strong or weak etc.)
Finally, one presupposes that individuals 3,5,7 are regarded as irrelevant owls.

Hence, $a_{(c,owl)}$ is the most complete state under c, in which 'female', 'adult', 'strong' and 'gray' can still restrict the denotation and 'gray' and 'strong' can still restrict the derived comparative relation (i.e. contribute to the stereotypicality of an instance). The denotations are: $[owl]_{c'} = \{\}$ and $[not\ owl]_{c'} = \{d_3,d_5, d_7\}$.
This is state c_3 in branch b0 (the result of accommodating the assumptions regarding the states under c in b1.1 as to include $a_{(c,owl)}$), given in table 14.

Table 14: Branch b0 in $B_{a(c,owl)}$

States in b0	Action	Formal implementation: $MS_{(owl,c)}$, $OS_{(owl,c)}$	Effects on [owl],[not owl]
C_0	Null information, except for that fixed in the word's semantics (i.e. entailed properties are specified in MS^+).	$MS^+_{(owl,c)}$ = {bird} $MS^-_{(owl,c)}$ = {} $OS^+_{(owl,c)}$ = {} $OS^-_{(owl,c)}$ = {}	$[owl]_{c0} = [not\ owl]_{c0} = \{\}$
C_1	The properties "healthy or female" and "healthy or adult" are regarded as necessary conditions on owls. As a result, the sick individuals that are also not female or not adult are regarded as non-owls. As such they are maximally far from being regarded as owls.	$MS^+_{(owl,c1)}$ ={owl,bird,healthy or female, healthy or adult} $MS^-_{(owl,c1)}$ = {} $OS^+_{(owl,c1)}$ ={owl,bird} $OS^-_{(owl,c1)}$ = { }	$[owl]_{c1} = \{\}$ $[not\ owl]_{c1} = \{d_5,d_7\}$ $[healthy]_{c1} = \{d_1,d_{10},\ \ d_2,d_4,d_6\}$ $[not\ healthy]_{c1} = \{d_5,d_7,d_3\}$
C_2	'Healthy' is regarded as a necessary and streotypical condition on owls. As a result, the individuals that are just sick are regarded as non- owls.	$MS^+_{(owl,c2)}$ ={owl,bird,healthy or adult, healthy or female, healthy} $MS^-_{(owl,c2)}$ = {} $OS^+_{(owl,c2)}$ ={owl,bird,healthy} $OS^-_{(owl,c2)}$ = {}	$[owl]_{c2} = \{\}$ $[not\ owl]_{c2} = \{d_3,d_5, d_7\}$ $[healthy]_{c2} = \{d_1,d_{10},\ \ d_2,d_4,d_6\}$ $[not\ healthy]_{c2} = \{d_5,d_7,d_3\}$
C_3 = $a_{(c,owl)}$	**'Adult' and 'female' are regarded as stereotypical for owls.** **All potential owls are ordered by their status as adult females.**	**$MS^+_{(owl,c3)}$ ={owl,bird, healthy or adult, healthy or female, healthy}** **$MS^-_{(owl,c3)}$ = {}** **$OS^+_{(owl,c3)}$ = {owl,bird,healthy, adult,female}** **$OS^-_{(owl,c3)}$ = { }**	**$[owl]_{c3} = \{\}$** **$[not\ owl]_{c3} = \{d_3,d_5, d_7\}$** **$d6 <_{(owl,c3)} d_2$** **$d6 <_{(owl,c3)} d_4$** **$[healthy]_{c3} = \{d_1,d_{10},\ \ d_2,d_4,d_6\}$** **$[not\ healthy]_{c3} = \{d_5,d_7,d_3\}$**
C_4	The property 'gray' is regarded as irrelevant for the ordering of owls in c. As a result some individuals are regarded as equally good examples of owls.	$MS^+_{(owl,c4)}$ = {owl,bird, healthy or adult, healthy or female, healthy} $MS^-_{(owl,c4)}$ = {} $OS^+_{(owl,c4)}$ = { owl,bird,healthy adult,female } $OS^-_{(owl,c4)}$ = {gray}	$[owl]_{c4} = \{\}$ $[not\ owl]_{c4} = \{d_3,d_5, d_7\}$ $d6 <_{(owl,c4)} d_2$ $d6 <_{(owl,c4)} d_4$ $d1 =_{(owl,c4)} d_{10}$ $[healthy]_{c4}=$

			$\{d_1,d_{10}, \quad d_2,d_{4,}d_6\}$ [not healthy]$_{c4}$= $\{d_5,d_7,d_3\}$
C_5	Some individual (d1) is regarded as an owl. As a result all the individuals that are equally owls are also so regarded. Their properties determine the set of possible necessary conditions (i.e. 'adult' and 'female' and not their negations or "gray") and streotypical conditions (i.e. 'strong' and not 'weak').	$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = { owl,bird,healthy adult,female } $OS^{-}_{(owl,c5)}$ = {gray}	[owl]$_{c5}$ = $\{d_1,d_{10}\}$ [not owl]$_{c5}$ = $\{d_3,d_5, d_7\}$ d6 $<_{(owl,c5)}$ d_2 d6 $<_{(owl,c5)}$ d_4 d1 $=_{(owl,c5)}$ d_{10} [healthy]$_{c5}$= $\{d_1,d_{10}, \quad d_2,d_{4,}d_6\}$ [not healthy]$_{c5}$= $\{d_5,d_7,d_3\}$
C_6 = c	**'Adult' and 'female' are regarded as non- necessary for owls. As a result, more individuals are known to satisfy every possible necessary condition, and are regarded as owls.**	**$MS^{+}_{(owl,c6)}$ ={owl,bird, healthy or adult, healthy or female, healthy} $MS^{-}_{(owl,c6)}$ ={adult,female} $OS^{+}_{(owl,c6)}$ ={owl,bird,healthy, adult,female } $OS^{-}_{(owl,c6)}$ = {gray}**	**[owl]$_{c6}$= $\{d_1,d_{10},d_2,d_4\}$ [not owl]$_{c6}$ = $\{d_3,d_5, d_7\}$ d1 $=_{(owl,c6)}$ d_{10} d6 $<_{(owl,c6)}$ d_2 d6 $<_{(owl,c6)}$ d_4**

Thus, there are more kinds of total states above $a_{(c,owl)}$, besides those specified above for c, states in which 'female' or 'adult' or both are membership dimensions, and 'gray' is an ordering dimension.

Let's examine the gradual extension of the denotation of owl in branches in $B_{a(c,owl)}$ – <u>the set of branches through a(c,owl)</u>.

$B_{a(c,owl)}$ contains the branches in B_c (the set of branches through c) that were specified in details in chapter 4, but $B_{a(c,owl)}$ contains also other branches. Though I am not specifying them in details, let me describe them briefly.

$B_{a(c,owl)}$ contain branches similar in all respects to the branches in B_c with 'gray' as an ordering property. In those branches d1 is always added to the positive denotation of 'owl' <u>before</u> d10.

$B_{a(c,owl)}$ contain similar branches with ‘gray’ as a necessary and ordering property. In those branches it is also the case that d10 is always added to the negative denotation of ‘owl’.

However $B_{a(c,owl)}$ contain also similar branches with “non-gray” as an ordering property. In those branches d1 (and all the other individuals, that are all gray) are always added to the positive denotation of ‘owl’ after d10.
$B_{a(c,owl)}$ contain similar branches with “non-gray” as a necessary and ordering property. In those branches it is also the case that d1- d9 are always added to the negative denotation of ‘owl’. Only d10 is regarded as a relevant owl.

$B_{a(c,owl)}$ contain similar branches with ‘adult’ as a necessary property. In those branches the non- adult d4, d6 and d8, d9 are regarded as non- owls.

$B_{a(c,owl)}$ contain similar branches with ‘female’ as a necessary property. In those branches the non- female d2, d6 and d8, d9 are regarded as non- owls.

$B_{a(c,owl)}$ contain similar branches with both ‘female’ and ‘adult’ as necessary. In those branches the non- female or non- adult d2, d4, d6, d8 and d9 are regarded as non-owls.

In all the cases in which ‘female’ or ‘adult’ or both are membership dimensions, d9, which is male and non- adult, is not an owl, and as it is the only weak individual, ‘strong’ gets in $MS^{+}_{(owl).}$

Similarly, there may exist a branch, in which ‘weak’ is necessary, and then d_9 is the only owl. There may exist a branch in which ‘weak’ is ordering and then d_9 is the first owl, and the others are regarded as owls later in the same orders specified above.

Finally, there may exist a branch in which ‘weak’ and “perfectly healthy” are necessary and than the denotation of ‘owl’ is empty (no individual is weak and perfectly healthy).

'Adult' and 'female' are ordering dimensions, thus "non adult" and "non female" can not be necessary for owls. (It can not be the case that a non- adult individual would be regarded as an owl, a similar but adult individual would be regarded as a non- owl, and the first would still be regarded as a worse example of an owl).

The set of branches through $a_{(c,owl)}$ includes all these kinds of branches.

<u>The most tolerant total state</u> is then:

- $[owl]^{+}_{t1} = \{d_{1,}d_2,d_4,d_6,d_8, d_9, d_{10}\}$ & $[owl]^{-}_{t1} = \{ d_3\ d_5, d_7\}$

<u>Four relatively strict total states</u> are then:

- $[owl]^{+}_{t1} = \{d_1\}$ & $[owl]^{-}_{t1} = \{d_2, d_3, d_4,d_5, d_6, d_7, d_8, d_9, d_{10}\}$
- $[owl]^{+}_{t2} = \{d_{10}\}$ & $[owl]^{-}_{t2} = \{d_2, d_3, d_4,d_5, d_6, d_7, d_8, d_9, d_1\}$
- $[owl]^{+}_{t3} = \{d_9\}$ & $[owl]^{-}_{t3} = \{d_2, d_3, d_4,d_5, d_6, d_7, d_8, d_{10}, d_1\}$
- $[owl]^{+}_{t4}= \{\}$ & $[owl]^{-}_{t4} = \{d_2, d_3, d_4,d_5, d_6, d_7, d_8, d_9, d_{1,}\ d_{10}\}$

<u>Hence</u>: $[owl]_{a(c,owl)} = \cap\{[owl]^{+}_{t} \mid t \geq a_{(c,owl)}, t\in T\} = [owl]_{c3} = \{\}$.

$[not\ owl]_{a(c,owl)} = \cap\{[owl]^{-}_{t} \mid t \geq a_{(c,owl)}, t\in T\} = [not\ owl]_{c3} = \{d_{3,}d_5,d_7\}$.

$[owl]^{?}_{a(c,owl)} = \{d_2,d_4,d_6, d_8,d_{9,}d_1,d_{10}\}$.

The meaning of '$a_{(c,P)}$' remains in essence the same as is presented in chapter 3 before OS was added to the context. Some of the positive denotation of P in c is removed to the gap. In addition, now, some of the ordered pairs are removed to the gap as well.

<u>Table 15: The scale of 'Owl' in $a_{(c,owl)}$</u>

<table>
<tr><td rowspan="4">[10] [9]
(Either gray and strong or not gray and not strong may still turn out to be necessary. Thus 9,10 may be either the most typical or very atypical)</td><td colspan="2">[1] (healthy, adult, female, and thus more contextually typical than 2-8)</td></tr>
<tr><td>[2]
(Either female or adult may turn out to be necessary making either 2 or 4 less typical)</td><td>[4]</td></tr>
<tr><td colspan="2">[6]</td></tr>
<tr><td colspan="2">[8] (less healthy)</td></tr>
<tr><td rowspan="2"></td><td colspan="2">[3] (unhealthy)</td></tr>
<tr><td colspan="2">[5] [7] (unhealthy)</td></tr>
</table>

<u>Table 9:</u>
<u>The scale of 'owl' in c</u>

<table>
<tr><td colspan="2">[1,10]</td></tr>
<tr><td colspan="2">[2] [4]</td></tr>
<tr><td colspan="2">[6]</td></tr>
<tr><td>[8]</td><td>[9]</td></tr>
<tr><td colspan="2">[3]</td></tr>
<tr><td colspan="2">[5] [7]</td></tr>
</table>

Table 16: The pairs in the ordering relations of ‘owl’ in c and in $a_{(c,owl)}$

$[\text{not} \leq P]_c$	$[\leq P]^{?}_c$	$[\leq P]_c$
(more P than)	unknown	(at most as P, i.e. equally or less P than)
The scale of Owl in c		
<1,2>,<1,4><1,3>,<1,5>,		<1,1>,<1,10>
<1,6>,<1,7>,<1,8><1,9>		
<2,3>,<2,5>,<2,6>,<2,7>,<2,8><2,9>		<2,1>,<2,2>,<2,4><2,10>
<3,5>,<3,7>		<3,1>,<3,2><3,3><3,4><3,6><3,8><3,9><3,10>
<4,3>,<4,5>,<4,6>,<4,7>,<4,8><4,9>		<4,1><4,2>,<4,4>,<4,10>
		<5,3>,<5,7><5,1>,<5,2>,<5,4>,
		<5,5>,<5,6>,<5,8>,<5,9>,<5,10>
<6,8>,<6,9>,<6,3>,<6,5>,<6,7>		<6,1>,<6,2>,<6,4>,<6,6>,<6,10>
		<7,3>,<7,5><7,1>,<7,2>,<7,4>
		<7,6>,<7,7>,<7,8>,<7,9>,<7,10>
<8,3>,<8,5>,<8,7>,	<8,9>	<8,6>,<8,1>,<8,2>,<8,4>,<8,8>,<8,10>
<9,3>,<9,5>,<9,7>	<9,8>	<9,6>,<9,1>,<9,2>,<9,4>,<9,9>,<9,10>
<10,2>,<10,3>,<10,5>,<10,6>,		<10,1>,<10,6>,<10,10>
<10,4>,<10,7>,<10,8>,<10,9>		
The scale of Owl in $a_{(c,owl)}$		
<1,2>,<1,4><1,3>,<1,5>,<1,6>,<1,7>	**<1,9><1,10>**	<1,1>
<1,8>		
<2,3>,<2,5>,<2,6>,<2,7>,<2,8>,	**<2,4>,<2,9><2,10>**	<2,1>,<2,2>,
<3,5>,<3,7>	**<3,9><3,10>**	<3,1>,<3,2>,<3,3>,<3,4>,<3,6>,<3,8>,
<4,3>,<4,5>,<4,6>,<4,7>,<4,8>,	**<4,2><4,9><4,10>**	<4,1>,<4,4>,
	<5,9><5,10>	<5,3>,<5,7><5,1>,<5,2>,<5,4><5,5><5,6><5,8>
<6,8>,<6,3>,<6,5>,<6,7>	**<6,9><6,10>**	<6,1>,<6,2>,<6,4>,<6,6>,
	<7,9><7,10>	<7,3>,<7,5><7,1>,<7,2><7,4><7,6><7,7>,<7,8>
<8,3>,<8,5>,<8,7>,	<8,9>**<8,10>**	<8,6>,<8,1>,<8,2>,<8,4>,<8,8>,
	<9,10><9,8>**<9,3><9,5><9,7**	<9,9>
	> <9,6>,<9,1>,<9,2>,<9,4>	
	<10,1><10,2><10,3><10,5>	
	<10,6>,<10,4><10,7>,	
	<10,8><10,6>,<10,9>	<10,10>

As can be observed, there is less information regarding the relative degrees of the elements as owls, thus less possibility to make judgments about preferences of elements over others when an owl is requested, or when some property is expected to apply on an instance if it is an owl.

This situation calls for the possibility (the implicature) that some elements are less relevant owls than others, and hence requests or generalizations about owls are less likely to apply on them.

5.2.4. More kinds of examples

5.2.4.1. The 'duck' conjunction

A certain discourse may be about a central topic and it may deal with various subtopics of it one after the other, or even somewhat simultaneously. That is, the relevant points slightly change in each stage. In the current model that means that the discourse participants are committed to the partial information encoded in some context c, but they can temporarily add and remove again more temporarily relevant restrictions. That is, in the course of one discourse, one may move forwards and backwards in the information states structure.
I.e. consider the duck example from K&L 93:

(79) A duck has colorful feathers and lays whitish eggs.

While accepting the truth of the first generalization ("has colorful feathers") the speaker of (79) regards only male ducks as relevant.
While accepting the truth of the second generalization ("lays whitish eggs") the speaker of (79) regards only female ducks as relevant.
If instances of both genders or instances of but one and the same gender must be regarded as relevant in both the first and the second parts of the sentence, the assertion is necessarily false. However intuitively it isn't a contradiction.

In the current model, the case would be described as follows.
In the context of utterance, the speaker is committed to a certain set of restrictions on what is a relevant duck, as specified in some partial information state, say c, (i.e. the speaker is committed to the restrictions in $MS^{+}_{(c,\ duck)}$).
When the speaker utters (79) the domain of quantification is interpreted as the set of relevant owls in the state $a_{(c,duck)}$. In this state, both gender predicates ('male' and 'female') are still regarded as potentially necessary for being regarded a duck. That means that the denotation $[duck]_{a(c,duck)}$ is actually empty. (Once an object is regarded as a member in it, if it is a male then the predicate 'female' can not be regarded as potentially necessary for duckhood any longer. If it is a female, then the predicate

‘male’ can not be so regarded. Hence, even if $[duck]_c \neq \emptyset$ it still must be the case that $[duck]_{a(c,duck)} = \emptyset$).

That simply means that every duck can still make a legitimate exception to the generalization either on the basis that it is male, or on the basis that it is female.

If the domain is empty, every universal generalization can be trivially asserted on it. However, intuitively, we are not willing to accept every generalization. For instance, we usually regard (80) as false.

(80) A cow has colorful feathers and lays whitish eggs.

What is the difference between (79) and (80)? This difference has to do with the operation denoted by *a*. We are willing to accept the truth of a statement $[a(P,Q)]_c$ when the dimensions sets of P in ‘$a_{(c,P)}$’ can still be settled in a way that makes the truth of Q possible.

This is never the case in (80). Even if in $a_{(c,cow)}$ the set of cows is empty, the dimensions set of ‘cow’ can not be settled in a way that the generalization “lays eggs” or “has feathers” would truly apply over a set of more than zero cows. Since creatures that are regarded as cows must be mammals, there is no way to restrict this set of relevant cows such that these predicates would truly apply on it.

However, the dimensions set of ‘duck’ can easily be settled in a way that the generalization ‘lays eggs’ or ‘have feathers’ would truly apply over a set of more than zero ducks.

The relevant point that I want to make is that we are willing to interpret an example of a conjunction like the ducks- example (79), as non- contradictory, since we predict that (79), unlike (80), is trivially true. This trivial truth is obtained by the properties of *a* which involves the jump to ‘$a_{(c,duck)}$’, in which the denotation of ‘duck’ is empty.

In the analysis suggested, the use of *every* and *any* is different from the use of *a*. The use of the first items, rather than the latter item, involves a jump to a state in which the negative dimension set of ‘duck’ is not empty and thus the denotation of ‘duck’ is not empty.

In ‘$\text{every}_{(c,duck,Q)}$’, every dimension that is not specified as relevant for duckhood in c is added to $MS^{-}_{(duck,\ every(c,duck,Q))}$. So only if all the dimensions are specified as relevant for owlhood in c (in $MS^{+}_{(duck,c)}$) the denotation is empty. This is not common. In fact though universal statements are trivially true when the domain is empty, speakers rarely use ‘every(P,Q)’ when [P] is empty. The analysis suggested here predicts that, because normally the use of *every* as a filler of $MS^{-}_{(P,c)}$ simply results in non- empty denotations.

In ‘$\text{any}_{(c,duck,Q)}$’, as I propose in the next section, after K & L 1993, at least one contextual dimension that is not specified as irrelevant for owlhood in c is added to $MS^{-}_{(duck,\ every(c,duck,Q))}$. Hence, the denotation of ‘duck’ is not empty.

Therefore, the analysis suggested here predicts that the following statements with *any* and *every* are not trivially true, even in a context in which ‘male’ and ‘female’ are both still potentially relevant for duckhood.

(81) Every duck has colorful feathers and lays whitish eggs.
(82) Any duck has colorful feathers and lays whitish eggs.

For this reason we are not willing to accept the truth of these conjunctions while we are willing to accept the truth of a similar statement with *a*.

Note that I am not explaining here how the natural interpretation of (79) comes about. In fact, the literature suggests many possible interpretation mechanisms, like a type shift to a predicate $\lambda T.(\ T(\text{has colorful feathers}) \wedge T(\text{lays whitish eggs})\ )$. What I <u>am</u> explaining is why the language would appeal to such an interpretation mechanism in the case of (79) but not in the cases of (81) and (82).

<u>5.2.4.2. *A* in existential contexts</u>

The analysis of generic *a* suggested here extends also for uses of *a* in existential contexts, in quite a natural way. Consider the following example:

(83) A girl and a boy enter the room.
The boy asks the girl…

The analysis suggested here claims the following:

1. The truth conditions of a statement with *a* in the scope of an existential quantifier are as follows:

$[\text{Existential a P,Q}]_c = 1$ iff $[P]_{a(P,c)} \cap [Q]_{a(P,c)} \neq \varnothing$.

Thus:

$[\text{a girl enters the room}]_c = 1$ iff $[\text{girl}]_{a(\text{girl},c)} \cap [\text{enters the room}]_{a(\text{girl},c)} \neq \varnothing$.

2. '$A_{(c,\text{girl})}$' is of the kind of state under c which is maximally similar to c except that the non-membership dimension set of 'girl' become empty, and sometimes also the non-ordering dimension set of 'girl' become empty:

- $MS^{+}_{(\text{girl},a(c,\text{girl}))} = MS^{+}_{(\text{girl},c))}$ & $MS^{-}_{(\text{girl},a(c,\text{girl}))} = \varnothing$.
- $OS^{+}_{(\text{girl},a(c,\text{girl}))} = OS^{+}_{(\text{girl},c)}$ & $OS^{-}_{(\text{girl},a(c,\text{girl}))} = \varnothing$.

That is, the predicate 'girl' in the context of use of an indefinite, conveys information only regarding the necessary properties of girls, i.e. the properties that the entity, whose existence is asserted, has.

The properties that are non-trivial on the denotation of 'girl', i.e. those that some girls have and some girls don't have, are ignored.

Now, it is generally accepted that indefinites are used to introduce new entities in the discourse, like in (83) (See Prince 1979). The speaker assumes that the addressee knows little, at best, about the entity (even the entity's private name is treated as if it is unknown). The speaker chooses to introduce the entity through some distinguishing aspect, i.e. 'girl'.

In such a case the non- trivial properties of the predicate 'girl' in c (i.e. the dimensions in $MS^{-}_{(\text{girl},c)}$) are irrelevant, since these are the properties that this entity (and any other girl) may or may not satisfy. Thus, in such a context, they are <u>completely uninformative</u>.

Moreover, it is still possible that the entity represented is the only relevant girl in c.

In fact, the discourse in (83) continues presupposing exactly that (by using *the*).

Therefore the optimal choice for the first stage of such a discourse is one that allows for the possibility that no property would end up as non-trivial (i.e. in $MS^{-}_{(girl,c)}$).
So, an operation like the one suggested here for *a*, i.e. an eraser of the dimensions in MS^{-}, is very natural in the context of introducing the existence of a (possibly) unique contextually relevant instance of a predicate.

The discourse in (83) continues in the second clause (call this stage c_2) presupposing that this girl is the only relevant girl. I.e. the predicates that can end up as necessary conditions for being regarded a relevant girl in this context ($MS^{+}_{(girl,c2)}$) can only be exactly all the properties that this girl has (and the negations of all the properties that this girl doesn't have). No property can turn out to be in $MS^{-}_{(girl,c2)}$. The existence of an $MS^{-}_{(girl,c2)}$ dimension, Z, requires, by the definition of MS^{-}, the existence of at least two girls (one that satisfies Z and one that doesn't satisfy Z in c).

In any event, the analysis of the indefinite in generic contexts extends to uses of the indefinite in existential contexts. Nothing has to be changed.

Concerning OS, if OS plays a role in the context, it must be the case that OS^{+} is complete, in such a way that the entity, whose existence is asserted, is the most relevant girl. Only then will it be the case that this entity must end up as a girl and as the unique instance that is a relevant girl in c. (Otherwise this entity may be removed from the denotation in order for the purpose of the use of *a* be optimally obtained). This is, in fact, quite intuitive. When the distinguishing property, with which an entity is introduced, is 'girl', it must be the most relevant entity relative to that predicate in the context. Otherwise, the addressee would mistakenly think that the speaker refers to another entity.

5.3. FC *any*

5.3.1. *Any* – a dimensions eliminator

As demonstrated already by Kadmon and Landman 1993 *any* is similar to the indefinite determiner in some respects and to *every* in other respects.

On the one hand, statements with *any*, like statements with the indefinite determiner *a* (or with bare plurals), are vague. They allow exceptions. So the truth conditions of statements like “any owl hunts mice” allow that the statement is true even when some owls don’t hunt mice. There may exist some property that these creatures fail to satisfy, and that can be a basis to justify their exclusion from the domain of quantification.

On the other hand, *any* differs from the generic indefinite determiner *a* by being partially precise: it is precise along some contextually specified dimensions of its first argument. In similarity to the case with *every*, exceptions along some contextually specified dimensions are not allowed. They constitute negative evidence against the generalization.
So the truth conditions of statements like *any owl hunts mice* require that the statement is true if every relevant owl that satisfy any property potentially necessary for owls, except, maybe, for the contextually specified dimensions, hunts mice, and the statement is false otherwise. I.e. these contextually specified dimensions can not be a basis to justify the exclusion of individuals from the domain of quantification. If there is no other reason for the exclusion of an individual, that individual must satisfy the generalization in order for the statement to be true.

For example, consider a pet shop administrator who guides a client in his shop, and presents to his client two owls that are equal in all respects except that one is gray and the other is white. If, at that point, the management is asked to deliver ‘an owl’ to that client, it is still open whether the delivered owl has to be (preferably) gray or white. On the other hand, if the management is asked to deliver ‘(just) any owl’ to that client, the delivered owl may be either gray or white. This is an already closed issue. I.e. exceptions are not allowed along the dimensions ‘gray’ and ‘white’.
In terms of the model presented here, the use of $any_{(c,owl,gray)}$ presupposes that ‘gray’ is now irrelevant to owlhood (i.e. is specified in $MS^{-}_{(owl,c),}OS^{-}_{(owll,c)}$). Both creatures are relevant owls and both of them are regarded as equally relevant owls. They fit the request just the same.

Thus, as argued and justified in detail in Kadmon & Landman 1993, a statement *any(P,Q)* allows exceptions along all dimensions except for the contextually specified dimensions, the dimensions *any* is used to eliminate (i.e. to mark as irrelevant for being regarded as P).

The difference, at this point, is only that in Kadmon & Landman 1993 the dimensions are presented in the context in an ad -hoc manner. There is no consistent mechanism of contextual restriction to get the contextual interpretation of P. In case of FC-*any* it is the generic universal quantifier that brings them about. In case of PS-*any* some other trigger would have to do that (the existential quantifier, probably).

In the model presented here, there is a mechanism of contextual restriction to get the contextual interpretation of P. One doesn't need to accompany the contextual occurrence of every quantifier or conditional with an ad- hoc set of contextual restrictions. A partial set of relevant contextual dimensions is brought about by the predicate P itself. A contextual use of a quantifier only adds instructions as to how to regard the unspecified dimensions (as potentially relevant or as irrelevant).

So in terms of the model suggested here, a statement *any(P,Q)* allows exceptions along all the dimensions that are unspecified in $MS^{+}_{(P,c)}$. Just as in *a* contexts, they are regarded as possibly necessary. However, a statement *any(P,Q)* doesn't allow exceptions along some contextually specified dimensions, the dimensions *any* is used to eliminate (i.e. to mark as irrelevant for being regarded as P).

The central modification in the theory is that now, after the addition of the set OS, the set of stereotypicality properties of P, to the context, I assume that *any* may operate also on OS.

On the one hand, just as in *a* contexts, the dimensions unspecified in $OS^{+}_{(P,c)}$ are regarded as possibly ordering owls. Exceptions with a low status on the scale of those dimensions (except for the dimensions *any* marks as irrelevant), may be regarded as less relevant after the use of *a* or *any* (that presuppose that it is still open whether these dimensions are relevant for the ordering of P).

Even though the presence of these exceptions may make a statement *any(P,Q)* be strictly false, this statement can still be regarded as not too strong in the context. If the exceptions are very atypical P instances, they may be regarded less seriously. The statement would then be regarded as almost true (and that may be good enough for all the contextual purposes).

On the other hand, a statement *any(P,Q)* is too strong (or not almost true), if the exceptions have a low status relative to the dimensions *any* is used to eliminate (i.e. to mark as irrelevant for the ordering of P).

Just as in *every*- contexts, the eliminated dimensions are regarded as clearly non-ordering P (in $OS^{-}_{(P)}$). There may exist exceptions that have a high status on the scale of all the potential ordering properties of P, but a low status on the scale of the dimensions eliminated by *any* (those marked as irrelevant for the ordering of P). These individuals are therefore regarded as having a high status on the scale of P. Thus, they present serious negative evidence against the truth of the generalization.

E.g. consider example (84) in which 'female' is the eliminated dimension of 'owl'. Assume that in this context both female and male owls are relevant. However, the females of this kind of owls are known to be much more active than the males, such that in most of the discussions about the behavior of these owls, females are actually more relevant than males.

(84) A: An owl hunts mice.
B: Females you mean?
A: No, any owl hunts mice.

The use of *any* <u>presupposes</u> that an object can not make a legitimate exception just on the basis that it is a male.
Moreover, the use of *any* <u>presupposes</u> that, if there exists an exception with a low status as a female (i.e. a male), and a high status on the scale of all other potential owl's ordering properties, the statement can not be used even in a manner of loose speech. It simply doesn't fit the context, since the use of *any* implies that males and females are equally relevant. Being male is not a basis on which to regard an exception less seriously. This way, even if the set of owls doesn't widen by the use of *any*, the statement still strengthens. The set gets more homogenized such that more members of it (the males) are regarded as highly relevant and not ignorable. If these instances are exceptions, the statement is not even almost true. It is simply too strong.

This additional meaning doesn't always exist, but it may exist in certain contexts. Another possible kind of context within which this implicature is likely to occur, is a choice context.
Assume that a pet shop administrator who guides a client in his shop refers to two creatures, male and female, as relevant and interesting items for any collector of owls,

but that the administrator also stresses that female owls are much more interesting for such a collector. If, at that point, the management is asked to deliver an owl to that client, it is still open whether the delivered owl has to be female, but it is natural to assume that a female is more expected or preferred. On the other hand, if the management is asked to deliver (just) any owl to that client, the delivered owl/s may be of either gender. This is already a closed issue. The use of $any_{(c,owl,female)}$ presupposes that 'female' is now an MS^-,OS^- dimension of 'owl'.

In conclusion, in terms of the proposed model, I can describe *any* as a dimension eliminator. The use of *any* presupposes that a set D of some relevant contextual dimensions $D_{1,\ldots,}D_n$ is eliminated from $MS^+_{(P,c)}$ or $OS^+_{(P,c)}$ and all their precisifications, i.e. $D_{1,\ldots,}D_n$ are specified in $MS^-_{(P,c)}$ and $OS^-_{(P,c)}$.
That means that the use of *any* moves us to a state $any_{(c,P,D)}$ in which the following is the case. Any dimension D_i in D is not an obligatory restriction on $[P]_{any(c,P,D)}$ and the scale of D_i doesn't correlate with that of P (D_i doesn't help order $[P]_{any(c,P,D)}$). Therefore, the denotation of P rules out no instances from the denotation or from every stage on its scale, just because they have low D levels. $[P]_{any(c,P,D)}$ is the largest possible denotation along D, maximally unordered along D.

5.3.2. Defining the state '$any_{(c,P,Q)}$'

5.3.2.1. Let P be the first argument of *any*, and D be the set of dimensions contextually specified as the dimensions to eliminate.
'$Any_{(c,P,D)}$' is equal in all to $a_{(c,P)}$, except that it is precise and tolerant along some contextual set of dimensions D. I.e. '$any_{(c,P,D)}$' is changed as minimally as required so that any eliminated dimension D_i in D, and its negation $\neg D_i$, are added to $MS^-_{(P,any(c,P,D))}$ and $OS^-_{(P,\ any(c,P,D))}$.

Thus '$any_{(c,P,D)}$' is the state in C that is equal in all respects to c except for the interpretation of P:

$$I_{(P,any(c,P,D))} = \langle\langle [P]^+_{any(c,P,D)}\ ,\ [P]^-_{any(c,P,D)}\rangle,\ \langle MS^+_{(P,any(c,P,D))},\ MS^-_{(P,any(c,P,D))}\rangle,\ \langle OS^+_{(P,any(c,P,D))},\ OS^-_{(P,any(c,P,D))}\rangle\rangle.$$

The items in this tuple are as follows.

1. $MS^+_{(P,\ any(c,P,D))}$ contains all the dimensions in $MS^+_{(P,c)}$, except for the dimensions in D, and except for any other dimension that if it is not excluded, then the dimensions in D (or their negations) can not be excluded from $MS^+_{(P,\ any(c,P,D))}$ as well.

$MS^+_{(P,any(c,P,D))} = MS^+_{(P,c)}$ - E.D.$_{(MS)}$
E.D.$_{(MS)}$ = $\{Z|\ \exists D_i \in D: \forall c$: if $Z \in MS^+_{(P,c)}$ then: D_i or $\neg D_i \in \cap\{MS^+_{(P,t)}|\ t \in T, t \geq c\}\ \}$.

For example, in order for the elimination of D_i be effective, any membership dimension of the forms: D_i,$\neg D_i$, $\Box D_i$, $\Box\neg D_i$, $Z\wedge D_i$, $Z\rightarrow D_i$ (where Z is a membership dimension itself) etc., is necessarily eliminated as well.

Why is this necessary? Say that $Z\wedge D_i$, for instance, is left in $MS^+_{(any(c,P,D))}$ (i.e. is regarded as necessary for being regarded as P).
Thus $[Z\wedge D_i]_t$ is a superset of $[P]_t$ in every extension t above $any_{(c,P,D)}$.
But then both $[Z]_t$ and $[D_i]_t$ are necessarily supersets of $[P]_t$.
Hence, both Z and D_i are in $MS^+_{(P,t)}$ in every extension t above $any_{(c,P,D)}$.
Therefore, D_i can not be regarded as non- membership dimension. It necessarily turns out to be a membership dimension (in $MS^+_{(P,t)}$) in every precisification t.

That *any* can eliminate more then one predicate in one use is demonstrated in (85):

(85) A: Could you hand me a bottle?
B: A large one, or a small one, a pink or a blue, a cheap or an expensive bottle?
A: Just hand me any of the bottles.

Any, here, eliminates a set of different dimensions. The set of relevant bottles includes all the mentioned sets of bottles (large, small, pink, blue, cheap and expensive bottles). I.e. all the mentioned dimensions are removed. What else may be removed?

(86) A: A red balloon?
B: no, any balloon.
A: # A blue balloon?

‘Blue’ is excluded from the membership set already in stage one, when ‘red’ and “not red”, and anything that entails ‘red’ or “not red” is eliminated, i.e. all the relevant color predicates.

2. All the eliminated dimensions make the set $MS^{-}_{(P,any(c,P,D))}$). Thus:
$MS^{-}_{(P,any(c,P,D))} = E.D._{(MS)}$

The same procedure is done for OS:
3. $OS^{+}_{(P,\ any(c,P,D))}$ contains all the dimensions in $OS^{+}_{(P,c)}$, except for the dimensions in D and any other dimension such that if it is not excluded, then the dimensions in D (or their negations) can not be excluded from $OS^{+}_{(P,\ any(c,P,D))}$ as well.

$OS^{+}_{(P,any(c,P,D))} = OS^{+}_{(P,c)} - E.D._{(OS).}$
$E.D._{(OS)} = \{Z|\ \exists D_i \in D\text{: } \forall c\text{: if } Z \in OS^{+}_{(P,c)} \text{ then: } D_i \text{ or } \neg D_i \in \cap\{OS^{+}_{(P,t)}|\ t \in T, t \geq c\ \}\ \}.$

4. All the eliminated dimensions make the set $OS^{-}_{(P,any(c,P,D))}$).
$OS^{-}_{(P,any(c,P,D))} = E.D._{(OS)}$

5. The directly given denotations remain roughly the same as in c. More precisely, $[P]^{+}_{any(c,P,D)}$ is only a subset of $[P]^{+}_{c}$ and $[P]^{-}_{any(c,P,D)}$ is only a subset of $[P]^{-}_{c}$.
The maximal subsets such that the purpose of applying the operation denoted by *any* is obtained, i.e. such that the following considerations are regarded.

1. The same constraint as in the case of *a* should apply here too*:*
The dimensions that are removed from the negative dimension sets must not end up in the positive dimension set, but it should still be open whether they end up there or not. I.e. ‘$any_{(c,P,D)}$, like ‘$a_{(c,P)}$’, should be vague along the dimensions unspecified in $OS^{+}_{(P,c)}$ (and in D). Potentially, but not necessarily, more restricted along them.

$[P]^{+}_{any(c,P,D)}$ is the maximal subset of $[P]^{+}_{c}$ such that:
$(\cap\{OS^{+}_{(P,t)}|\ t \in T, t \geq any_{(c,P,D)}\}) \cap OS^{-}_{(P,c)} = \varnothing.$

(Elements are removed from $[P]^{+}_{c}$ until it is ensured that no dimension removed from $OS^{-}_{(P,c)}$ necessarily ends up in $OS^{+}_{(P,any(c,P,D))}$. For further clarifications see note 1).

2. Since the dimensions in D are added to the negative dimensions set, the interpretation constraint requires that the directly given <u>negative</u> denotations <u>narrow</u> along these dimensions. $Any_{(c,P,D)}$, like $every_{(c,P)}$, is more tolerant than c along the eliminated dimensions D of P.
The instances that fail to satisfy a property D_i in D must be members of the positive rather than the negative denotation. Otherwise, it would not be possible to specify D_i in $MS^{-}_{(P,c)}$ and in $OS^{-}_{(P,c)}$.
The pairs of instances that are directly known in c to be in a different status along a property D_i in D, must be members of the gap $[\leq P]^{?}_{any(c,P,D)}$ rather than of the directly given P relation. Otherwise, it would not be possible to specify D_i in $OS^{-}_{(P,c)}$.

Without the removal of the relevant individuals from $[P]^{-}$ $any_{(c,P,D)}$ would simply not follow the interpretation constraint (i.e. will include contradictory information).

6. The interpretation of every predicate Z other than P is identical to the one in c:
$\forall Z \in A$, such that $Z \neq P$: $I_{(Z,any(c,P,D))} = I_{(Z,c)}$.

Thus, the truth conditions of a statement of the form "any(P,Q)" are as follows (where D is the set of (the contextually given) dimensions to eliminate):
$[Any(P,Q)]_c = 1$ iff $[P]_{any(c,P,D)} \subseteq [Q]_{any(c,P,D)}$.

<u>5.3.2.2. The effects induced by *any*</u>

As a result of the changes in the dimension sets and in the directly given denotations of P the following holds in $any_{(c,P,D)}$.

The indirectly extended denotation of P in $any_{(c,P,D)}$, is like in $a_{(c,P)}$, except that it may <u>widen</u> along the eliminated dimensions (the dimensions in D).
The <u>negative</u> denotation of P in $any_{(c,P,Q)}$, is like in $a_{(c,P)}$, except that it may <u>reduce</u> along the eliminated dimensions.

The scale of P ($\leq_{(P)}$), is like in $a_{(c,P)}$, except that it may be <u>less ordered</u> along the eliminated dimension. I.e. pairs that differ only along these eliminated dimensions are regarded as equally good Ps. Thus, a subset of the positive denotation $[=_{(P)}]$ may <u>widen</u>, and the negative denotation $[\leq_{(P)}]^-$ may <u>reduce</u> along the eliminated dimension.

E.g. if 'gray' is in D it is <u>presupposed</u> to be in $MS^-_{(owl,any(c,owl,D))}$.
Thus, both gray and non- gray creatures are regarded as relevant owls. All the gray and non gray objects that satisfy all the other potential membership constraints are in the positive denotation of 'owl' ($[owl]_{any(c,owl,D)}$), rather than in the gap ($[owl]^?_{any(c,owl,D)}$) or the negative denotation.

If 'gray' is in D, it may also be <u>presupposed</u> that it is in $OS^-_{(owl,any(c,owl,D))}$.
Then, both gray and non- gray creatures are also regarded as equally good owls.
All the pairs of gray and non- gray creatures that have equal status on the scale of all the other potential ordering properties, are regarded as equally good owls (i.e. in $[=_{(owl)}]_{any(c,owl,D)}$), rather than in the gap of the comparative ($[\leq_{(owl)}]^?_{any(c,owl,D)}$), or the negative relation ($[\leq_{(owl)}]^-_{any(c,owl,D)}$, i.e. $[>_{(owl)}]^+_{any(c,owl,D)}$).

As demonstrated in chapter 2 and here, this implicature is more likely to occur in certain contexts than in others. Among these contexts are choice or preference contexts, contexts of loose speech and contexts in which 'gray', the dimension to eliminate, is necessarily in MS^-, even without the use of *any*, as is the case when the denotation is directly predetermined, such that it has gray and non gray members. Then, the contribution of *any* to the meaning is only by its operation on OS, as demonstrated above.

Thus: $[owl]_{any(c,owl,D)} \supseteq [owl]_{a(c,owl)}$ &
$[not\ owl]_{any(c,owl,D)} \subseteq [not\ owl]_{a(c,owl)}$ &
$[hunt\ mice]_{any(c,owl,D)} = [hunt\ mice]_{a(c,owl)}$ &
$[doesn't\ hunt\ mice]_{any(c,owl,D)} = [doesn't\ hunt\ mice]_{a(c,owl)}$

Let us define the expression '*any' as a universal quantifier that doesn't involve the jump to $any_{(c,P,D)}$. In order to compare the contribution of *every* and *a* to the meaning of statements I have defined star determiners that do not involve any change in context. I.e. every* = a* = any*. However, *any* involves two jumps. First, like *a*, it eliminates all the dimensions from $MS^{-}_{(P,c)}$ and/ or $OS^{-}_{(P,c)}$. I.e. the use of *any* involves a jump to '$a_{(c,P)}$'. Secondly, it eliminates some set of contextually specified dimensions D from $MS^{+}_{(P,c)}$ and/ or $OS^{+}_{(P,c)}$. I.e. the use of *any* involves one more jump to '$any_{(c,P,D)}$'.

Let us define the expression 'any**' as a universal quantifier that doesn't involve the elimination of the dimensions in D. I.e. it doesn't involve the jump to $any_{(c,P,D)}$, but only to $a_{(c,P)}$.I.e. $any^{**}_{(c,P,D)} = a_{(c,P)}$.
Every statement $[{**}any(P,Q)]_c$ is weaker than a statement $[any(P,Q)]_c$, since the quantification domain in the latter case is potentially wider along the dimension in D.

Moreover, every statement $[{**}any(P,Q)]_c$ is weaker than a statement $[any(P,Q)]_c$, since the quantification domain in the latter case is potentially less ordered along the dimension in D. It is equally or less ordered along the eliminated dimensions.

I.e. consider a context in which all the exceptions have low status on the scale of some dimensions in D. A speaker doesn't want to make a statement which is too strong, but maximally strong enough.
The statement $[{**}any(P,Q)]_c$ may be regarded as not too strong. It regards the exceptions as having low status on the scale of P, and thus they may be taken less seriously.
However, a statement $[any(P,Q)]_c$ can not be interpreted that way. Exceptions that have low status on the scale of the eliminated dimensions clearly can not be tolerated on that basis. The use of *any* presupposes that their status on the scale of P doesn't reduce on that basis and hence they must be taken seriously. If they do not satisfy the generalization, the use of *any* simply doesn't fit the context. It induces a statement which is too strong.

I have already demonstrated in details in chapter 3 two possible effects of *any:*

a. <u>Widening: the eliminated dimension is an $MS^{+}_{(c,owl)}$ dimension</u>
This is the case that Kadmon and Landman describe extensively.

This is the case in which the dimensions in D are such that $[P]_{any^{**}(c,P,D)} \subset [P]_{any(c,P,D)}$.
That is, eliminating these dimensions leads to widening in the sense of K& L.
This is typically the case when the eliminated dimension is an $MS^{+}_{(c,owl)}$ dimension (say 'healthy').
In general, for any way of making two membership sets (with 'healthy' in MS^{+} or with 'healthy' in MS^{-}) equally complete along all dimensions except "healthy", the latter (less strict) always corresponds to wider denotations than the first that is less tolerant of non healthy individuals.
Objects that are regarded as irrelevant (<u>non- owls</u>) in c just because they are not healthy, are regarded as (potentially) <u>owls</u> after the use of *any:*
$([P]_{any^{**}(c,P,D)} \subset [P]_{any(c,P,D)})$ and $([Not\ P]_{any(c,P,D)} \subset [Not\ P]_{any^{**}(c,P,D)})$.
Thus, *any* by elimination of membership dimensions, induces <u>widening</u>.

However, there is also an effect that is slightly different than that described by K & L.

b. <u>Clarifying: the eliminated dimension is an $MS^{?}_{(c,owl)}$ dimension</u>
This is also a case in which the dimensions in D are such that:
$[P]_{any^{**}(c,P,D)} \subset [P]_{any(c,P,D)}$. However, this is typically the case when the eliminated dimension is an $MS^{?}_{(c,owl)}$ dimension (say 'healthy').
In this case objects are <u>not</u> regarded as irrelevant (<u>non- owls</u>) in c, just because they are not healthy. It is still open whether health is crucial for owlhood in c. Thus, unhealthy individuals are not regarded as non – owls in c, but rather as borderline cases. They are in the gap of 'owl' in c.
They are clearly regarded as owls only after the use of *any*.
Thus, whereas in the case described in (a) above, it is also the case that:
$[Not\ P]_{any(c,P,D)} \subset [Not\ P]_{any^{**}(c,P,D)}$, in case (b): $[Not\ P]_{any^{**}(c,P,D)} = [Not\ P]_{any(c,P,D)}$.
The widening of the positive denotation is coming from the gap rather than the negative denotation.
In general, in any way of making two membership sets (with 'healthy' unspecified in MS or with 'healthy' in MS^{-}) equally complete along all dimensions except "healthy", the latter always corresponds to a wider denotation than the first that may still extend such that 'healthy' restricts the set of owls.
Thus *any*, by elimination of unspecified dimensions, induces another type of widening

that I named clarifying. Those elements that are borderline cases of ‘owl’ only because they aren’t particularly healthy are clearly in the denotation now. Before, it wasn’t clear whether they could have been exceptions for generalizations on owls or not, but now it is clear that they can not.

The case that I want to demonstrate in detail in this chapter is of yet another kind, the most interesting one, in which the dimension to eliminate is a member of MS^- in the first place. The difference lies in the range of OS.

c. Homogenizing: the eliminated dimension is an $OS^+_{(c,owl)}$ dimension
This is the effect that is hard to describe in the terms of K & L’s analysis. This is not a case in which the dimensions in D are such that $[P]_{any^{**}(c,P,D)} \subset [P]_{any(c,P,D)}$. Rather, in this case $[P]_{any^{**}(c,P,D)} = [P]_{any(c,P,D)}$, as is the case when the denotation is predetermined.

K &L defined *any*’s meaning directly as a means to induce widening of denotations. As a result, the occurrence of *any* in contexts where widening is not possible is problematic for their analysis. What is also hard to derive, under their analysis, is the implicature that may accompany the occurrence of *any* in many of the examples, that individuals that don’t satisfy the eliminated dimensions and individuals that do satisfy them are just equally relevant for the generalization.

In the analysis suggested here, *any* is defined as a dimension eliminator. Thus, widening is only one of the possible effects that this elimination may induce. If the denotation is predetermined (and sometimes even when it isn’t, as demonstrated in chapter 2) and the eliminated dimension is only an ordering dimension, no widening occurs. The effect is of homogenizing of the denotation.
In any way of making both ordering sets (with, say - ‘healthy’, specified or potentially specified in OS^+ or with ‘healthy’ specified in OS^-) equally complete along all dimensions except ‘healthy’, the latter always corresponds to at least as wide and less ordered denotations than the first. The first may still extend such that ‘healthy’ orders the set of owls. In this case, the status of an individual relative to ‘owl’ depends also on the individual’s health level. In contexts of loose speech, for instance, healthy exceptions to generalizations on owls would be less tolerated than unhealthy

exceptions, since unhealthy individuals fit less well to the stereotype of 'owl' in those contexts.
In case 'healthy' is in OS^-, it doesn't even force its ordering on the set of owls.
More individuals have a better status on the scale of 'owl'. As such, they are regarded more seriously when they don't satisfy generalizations on owls; they are regarded as more preferred in choice contexts and they satisfy requests for owls better.
Thus *any*, by elimination of ordering dimensions, induces another type of effect that I named homogenizing.

In what follows I will work out a detailed example, and I will demonstrate how a *strengthening* constraint on the licensing of *any* (asymmetric entailment), predicts the felicity of *any* in cases without widening.

5.3.2.3. Summary of the definitions

$\forall c \in C, \forall P \in A, \forall Q \in A^*$:

1. $[\text{any P Q}]_c = 1$ iff $[P]_{any(c,P,D)} \subseteq [Q]_{any(c,P,D)}$.

2. '$Any_{(c,P,D)}$' is equal in all respects to c except for the interpretation of P:

1. $\forall Z \in A, Z \neq P$: $I_{(Z,any(c,P,D))} = I_{(Z,c)}$

2. $I_{(P,any(c,P,D))} = \langle\langle [P]^+_{any(c,P,D)}, [P]^-_{any(c,P,D)} \rangle,$
$\langle MS^+_{(P,c)} - E.D._{(MS)}, E.D._{(MS)} \rangle, \langle OS^+_{(P,c)} - E.D._{(OS)}, E.D._{(OS)} \rangle\rangle$.

3. $E.D._{(X)} = \{Z \mid \exists D_i \in D: \forall c$: if $Z \in X^+_{(P,c)}$ then: D_i or $\neg D_i \in \cap\{X^+_{(P,t)} \mid t \in T, t \geq c\}$.

4. $\langle [P]^+_{any(c,P,D)}, [P]^-_{any(c,P,D)} \rangle$ are the maximal subsets of $\langle [P]^+_c, [P]^-_c \rangle$ possible relative to the dimension sets in (2) and such that:
$OS^-_{(P,c)} \cap \{Z \mid \forall t \geq any_{(c,P,D)}: Z \in OS^+_{(P,t)}\} = \varnothing$.

5.3.3. A detailed example

5.3.3.1. Let's work out the interpretation of the example "any owl hunts mice" relative to the model detailed in the previous section.

1. $[\text{any owl hunts mice}]_c = 1$ iff $[\text{owl}]_{any(c,owl,female)} \subseteq [\text{hunts mice}]_{any(c,owl,female)}$.

2. In the detailed example, $any_{(c,owl,female)}$ is at least as complete as context $a_{(c,owl)}$, such that it is more tolerant along the dimension ‘female’ in the interpretation of ‘owl’:

$\underline{MS^+_{(owl,any(c,owl,female))}}$ = $MS^+_{(owl,c)}$ – E.D. ={owl,bird,healthy}-{ female, not female}=
={owl, bird, healthy}.

$\underline{OS^+_{(owl,any(c,owl,female))}}$ = $OS^+_{(owl,c)}$ – E.D. = {adult, healthy, owl, bird, female}-
{ female, not female} =
= {adult, healthy, owl, bird}

$\underline{MS^-_{(owl,any(c,owl, female))}}$ = E.D.= {female, not female}.

$\underline{OS^-_{(owl,any(c,owl, female))}}$ = E.D.= {female, not female}.

3. Thus:

1. From the definition of MS^- it follows that there are at least two owls in $any_{(c,owl,female)}$, a female and a male. As a result, except for the contextually most typical owl in c, d1, which is a female, also the male individual d2 (which is similar to d1 in all respects besides gender) is in the denotation. The denotation of ‘owl’ is such that in every total state both female and male entities are included.
Note that the denotation in $any_{(c,owl, female)}$ is widened with respect to $a_{(c,owl)}$ in which ‘female’ is not specified in $MS_{(owl,a(c,owl))}$, but not with respect to c in which ‘female’ is also non- trivial on ‘owl’ as well.
The negative denotation in $any_{(c,owl, female)}$ doesn’t get reduced, since ‘female’ isn’t regarded as necessary in the first place and thus no element is regarded as non- owl just because it is not a female.

2. In c and $a_{(c,owl)}$ ‘female’ is an ordering dimension, whereas in $any_{(c,owl,female)}$ ‘female’ is a non-ordering dimension. I.e. every two owls, equal in all respects except for whether they are ‘female’ or not, are also regarded as equally good owls, regardless of any gender differences. No element loses a position on the scale of ‘owl’ just because it is not female. ‘Owl’ denotes the least ordered possible denotation along the dimensions female.

Formally, this is derived from the definitions of OS^+ versus OS^-:

‘Female’ is in $OS^{+}_{(owl,a(c,owl))}$. From the definitions of OS^{+} it follows that:

$\underline{\forall d_1,d_2,\ \forall c_2 \geq \mathbf{a}_{(c,owl)}}$:

- If $(d_1 <_{(female,c2)} d_2)$ & $(\forall Z \notin \{owl\}: d_1 \leq_{(Z,c2)} d_2)$ Then: $(d_1 <_{(owl,c2)} d_2)$ &
- If $(\forall Z \in A\text{-}\{owl\}: d_1 =_{(Z,c2)} d_2)$ Then: $(d_1 =_{(owl,c2)} d_2)$.

However ‘Female’ is in $OS^{-}_{(owl,any(c,owl,female))}$. From the definition of OS^{-} follows that:

$\underline{\exists d_1,d_2,\ \forall c_2 \geq \mathbf{any}_{(c,owl,female)}}$:

$(d2 <_{(female,c2)} d_1)$ & $(\forall Z \notin \{female,owl\}: d_1 =_{(Z,c2)} d_2)$ & $(d_1 =_{(owl,c2)} d_2)$.

As a result, besides the contextually most typical owl in c, d1, which is a female, also the non- female individual d2 is in the denotation in every extension above and under *any*$_{(c,owl,\ female)}$ in which d1 is in the denotation.

Since d1 is in the denotation, there are only two possibilities regarding d10, and I argue that the second is the right one.

1. If the identical but non- gray individual d10 is not in the denotation in any$_{(c,owl,\ female)}$ or in some state under it in which d1 is already in it, ‘gray’ must end up as an $OS^{+}_{(owl)}$ dimension.
2. If d10 is in the denotation in any$_{(c,owl,\ female)}$ and in every extension under any$_{(c,owl,\ female)}$ in which d1 is in the denotation, ‘gray’ must end up as an $OS^{-}_{(owl)}$ dimension.

Since any$_{(c,owl,\ female)}$ has to be the state most similar to c possible, and in c ‘gray’ is in $OS^{-}_{(owl,c)}$, d10 has to be in the denotation in every extension under any$_{(c,owl,\ female)}$ in which d1 is in the denotation, and ‘gray’ is necessarily going to end up in $OS^{-}_{(owl)}$.

Everything else that is not specified as a necessary or an ordering condition for ‘owl’ in c, may still turn out to be necessary or ordering in any$_{(c,owl,female)}$, just as in a$_{(owl,c)}$. I.e. ‘adult’ and ‘strong’ are still potential restrictions of the set of owls, and ‘strong’ is a potential ordering dimension.

Hence: $[owl]_{any(c,owl,female)} = \{d_1,d_{10}, d_2\}$ and $[not\ owl]_{any(c,owl,female)} = \{d_3, d5, d7\}$. (the non- strong and non- adults are still in the gap).

Note that in all the stages under $any_{(c,owl,female)}$ in which the positive denotation is less complete, it must be empty. Only this way 'female' doesn't order the denotation. The female d1 is not determined to be an owl before the non- female d_2 is so determined (and the same for 'gray' and the pair d1,d10).

4. The states under $any_{(c,owl,female)}$ are similar in all respects to the states under c except that 'female' is not necessary and non- ordering for 'owl', and d_1 and d2 are equally owls now. The rest is the same. So the set of branches through $any_{(c,owl,female)}$, $B_{any(c,owl,female)}$, includes branches of kinds similar to those through c (0-4) except that <u>there is no state in them such that d_1 (female) is regarded as an owl and d2 (male) is not</u>.

<u>Table 17: Branch b_{any} in B_{any}</u>

<u>States in B_{any}</u>	<u>Action</u>	<u>Formal implementation</u>: $MS_{(owl,c)}$, $OS_{(owl,c)}$	<u>Effects on</u> [owl],[not owl]
$C_{0'}$	Null information, except for that fixed in a word's semantics (i.e. entailed properties are specified in MS^+).	$MS^+_{(owl,c)}$ = {bird} $MS^-_{(owl,c)}$ = {} $OS^+_{(owl,c)}$ = {} $OS^-_{(owl,c)}$ = {}	$[owl]_{c0}$ = $[not\ owl]_{c0}$ = {}
C_1	The sick individuals that are also not adult are regarded as non-owls. The property "healthy or adult" is regarded as a necessary condition on owls. The non- healthy non- adult individuals are maximally far from being regarded as owls.	$MS^+_{(owl,c1)}$ ={owl,bird, healthy or adult} $MS^-_{(owl,c1)}$ = {} $OS^+_{(owl,c1)}$ ={owl,bird} $OS^-_{(owl,c1)}$ = { }	$[owl]_{c1}$ = {} $[not\ owl]_{c1}$ = {d_7} $[healthy]_{c1}$={d_1,d_{10},d_2,d_{4}, d_6} $[not\ healthy]_{c1}$= {d_5,d_7,d_3}
C_2	'Healthy' is regarded as a necessary and streotypical condition on owls. The individuals that are just sick are regarded as non- owls.	$MS^+_{(owl,c2)}$ ={owl,bird, healthy or adult, healthy} $MS^-_{(owl,c2)}$ = {} $OS^+_{(owl,c2)}$ ={owl,bird,healthy} $OS^-_{(owl,c2)}$ = {}	$[owl]_{c2}$= {} $[not\ owl]_{c2}$ = {d_3,d_5, d_7} $[healthy]_{c2}$={d_1,d_{10},d_2,d_4, d_6} $[not\ healthy]_{c2}$= {d_5,d_7,d_3}
C_3	'Adult' is regarded as stereotypical for owls.	$MS^+_{(owl,c3)}$ ={owl,bird, healthy or adult, healthy}	$[owl]_{c3}$ = {} $[not\ owl]_{c3}$ = {d_3,d_5,

	All potential owls are ordered by their status as adults.	$MS^{-}_{(owl,c3)}$ = {} $OS^{+}_{(owl,c3)}$ = {owl, bird, healthy, adult} $OS^{-}_{(owl,c3)}$ = { }	d_7} d4 $<_{(owl,c3)}$ d_2, d7 $<_{(owl,c3)}$ d5 d7 $<_{(owl,c3)}$ d3 $[healthy]_{c3}$={d_1,d_{10},d_2,d_4,d_6} $[not\ healthy]_{c3}$= {d_5,d_7,d_3}
C_4	The property 'gray' is regarded as irrelevant for the ordering of owls in c. As a result some individuals are regarded as equally good examples of owls.	$MS^{+}_{(owl,c4)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c4)}$ = {} $OS^{+}_{(owl,c4)}$ = {owl, bird, healthy, adult} $OS^{-}_{(owl,c4)}$ = {gray}	$[owl]_{c4}$ = {} $[not\ owl]_{c4}$ = {d_3,d_5, d_7} d4 $<_{(owl,c4)}$ d_2 , d7 $<_{(owl,c4)}$ d5 d7 $<_{(owl,c4)}$ d3, d1 $=_{(owl,c4)}$ d_{10} $[healthy]_{c4}$={d_1,d_{10},d_2,d_4,d_6} $[not\ healthy]_{c4}$= {d_5,d_7,d_3}
	The property 'female' is regarded as irrelevant for the ordering of owls in c. As a result some individuals are regarded as equally good examples of owls.	$MS^{+}_{(owl,c4)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c4)}$ = {} $OS^{+}_{(owl,c4)}$ = {owl, bird, healthy adult} $OS^{-}_{(owl,c4)}$ = {gray,female}	$[owl]_{c4}$ = {} $[not\ owl]_{c4}$ = {d_3,d_5, d_7} d4 $<_{(owl,c4)}$ d_2, d7 $<_{(owl,c5)}$ d5 d7 $<_{(owl,c5)}$ d3, d1 $=_{(owl,c4)}$ d_{10} d5 $=_{(owl,c4)}$ d3, d1 $=_{(owl,c4)}$ d2 d6 $=_{(owl,c4)}$ d4 - $[healthy]_{c4}$={d_1,d_{10},d_2,d_4, d_6} $[not\ healthy]_{c4}$= {d_5,d_7,d_3}

C_5 = Any$_{(c\ owl,female)}$	**Some individual (d1) is regarded as an owl. As a result all the individuals that are equally owls are also so regarded.**	**$MS^+_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy}** **$MS^-_{(owl,c5)}$ = {}** **$OS^+_{(owl,c5)}$ = {owl,bird, healthy,adult }** **$OS^-_{(owl,c5)}$ = {gray,female }**	**$[owl]_{c5} = \{d_1,d_2,d_{10}\}$** **$[not\ owl]_{c5} = \{d_3,d_5, d_7\}$** **$d4 <_{(owl,c5)} d_2$, $d7 <_{(owl,c5)} d5$** **$d7 <_{(owl,c5)} d3$, $d1 =_{(owl,c5)} d_{10}$** **$d1 =_{(owl,c5)} d2$, $d6 =_{(owl,c4)} d4$** **$[healthy]_{c5}=\{d_1,d_{10},d_2,d_4,d_6\}$** **- $[not\ healthy]_{c5}= \{d_5,d_7,d_3\}$**

5. The states above any$_{(cowl,female)}$:

Any$_{(c,owl,female)}$ can extend non-tolerantly such that:

'Adult','strong' are in $MS^+_{(owl,t1)}$, 'strong' is in $OS^+_{(owlt1)}$.

'Adult', 'strong' are in $MS^+_{(owl,t2)}$, 'strong' is in $OS^-_{(owlt2)}$).

In these total contexts: $[owl]^+_{t1/2} = \{d_1, d_2, d_{10}\}$,

$[owl]^-_{t1/2} = \{d_3, d_4,d_5, d_6, d_7, d_8, d_9\}$.

Any$_{(c,owl,female)}$ can extend tolerantly such that:

'Adult','strong' are in $MS^-_{(owl,t5),}$ 'strong' is in $OS^+_{(owlt5)}$.

'Adult','strong' are in $MS^-_{(owl,t6),}$ 'strong' is in $OS^-_{(owlt6)}$).

In these most tolerant total contexts: $[owl]^+_{t5/6} = \{d_1, d_2, d_4, d_6, d_8, d_9, d_{10}\}$,

$[owl]^-_{t5/6} = \{d_3,d_5, d_7\}$.

Thus: $[owl]_{any(c,owl,\ female)} = \{ d_1,d_{10},d_2\}$

$[not\ owl]_{any(c,owl,\ female)} = \{d_3,d_5, d_7\}$ (the non healthy ones).

$[owl]^?_{any(c,owl,\ female)} = \{d_4, d_6, d_8, d_9, d_{10}\}$.

The set of owls is widened with respect to $a_{(c,owl)}$ ($\{\}\subseteq\{ d_1,d_{10},d_2\}$,).

The set of non owls is identical (at most as wide) ($\{d_3,d_5, d_7\}$).

Hence, "any owl hunts mice" is true iff $\{d_1,d_{10},d_2\}\subseteq [hunts\ mice]_c$.

Moreover, as seen in table 18, more individuals (2,6,5) are contextually more typical in $any_{(c,owl,female)}$ than in c. As a result, generalizations they are exceptions of don't fit the context, even if they could have been regarded almost true, or true enough if the evaluation was relative to the information in c.

Table 18: The ordering relation of 'owl' in c and in $any_{(c,owl,female)}$

The scale of 'Owl' in c		**The scale of 'Owl' in $any_{(c,owl,female)}$**	
[1,10]		[1, 2,10] (2, which is non female is now regarded as contextually maximally typical. 2 has improved its typicality since gender doesn't matter)	
[2] [4]		[4,6] (4 and 6 differ only as to being female or not, hence, they are contextually equally typical. 6 has improved its typicality since gender doesn't matter)	
[6]			
[8]	[9]	[8]	[9]
[3]		[3,5] (3 and 5 differ only as to being female or not, hence, they are contextually equally atypical. 5 has improved its typicality since gender doesn't matter)	
[5] [7]		[7]	

Table 15: The ordering relation of 'owl' in $a_{(c,owl)}$

The scale of 'Owl' in $a_{(c,owl)}$		
[10] [9]	[1]	
	[2]	[4]
	[6]	
	[8]	
	[3]	
	[5] [7]	

In table 19 we see that since the denotation is homogenized the set of pairs that are equally good owls ($[=_{owl}]_{any(c,owl,female)}$) is widened with respect to $a_{(c,owl)}$ and c.

Table 19: The ordering relations of 'owl' in c, $a_{(owl,c)}$ and $any_{(owl,c,female)}$

$[not \leq P]_c$ (more P than)	**$[\leq P]^?_c$ (unknown)**	**$[=P]_c$ (equally P)**
The scale of Owl in c		
<1,2><1,4><1,3><1,5><1,6><1,7><1,8><1,9>		<1,1>,<1,10>
<2,3>,<2,5>,<2,6>,<2,7>,<2,8>,<2,9>		<2,2>,<2,4><2,10>
<3,5>,<3,7>		<3,3>
<4,3>,<4,5>,<4,6>,<4,7>,<4,8>,<4,9>		<4,2>,<4,4>
		<5,7><5,5>
<6,8>,<6,9>,<6,3>,<6,5>,<6,7>		<6,6>
		<7,5>,<7,7>
<8,3>,<8,5>,<8,7>,	<8,9>	<8,8>
<9,3>,<9,5>,<9,7>	<9,8>	<9,9>

<10,2><10,3><10,5><10,6><10,4><10,7><10,8><10,9>		<10,1>,<10,10>
The scale of Owl in a$_{(c,owl)}$		
<1,2>,<1,4><1,3>,<1,5><1,6>,<1,7>,<1,8>	**<1,9><1,10>**	<1,1>
<2,3>,<2,5>,<2,6>,<2,7>,<2,8>,	**<2,4>,<2,9><2,10>**	<2,2>,
<3,5>,<3,7>	**<3,9><3,10>**	<3,3>
<4,3>,<4,5>,<4,6>,<4,7>,<4,8>,	**<4,2><4,9><4,10>**	<4,4>,
	<5,9><5,10>	<5,7>,<5,5>
<6,8>,<6,3>,<6,5>,<6,7>	**<6,9><6,10>**	<6,6>,
	<7,9><7,10>	<7,5>,<7,7>
<8,3>,<8,5>,<8,7>,	<8,9>**<8,10>**	<8,8>,
	<9,10><9,8>**<9,3>,<9,5>,<9,7>**	<9,9>,
	<9,6>,<9,1>,<9,2>,<9,4>	
	<10,1><10,2><10,3><10,5><10,6>	<10,10>
	<10,4><10,7><10,8<10,6>,<10,9>	
The scale of Owl in any$_{(c,owl,female)}$		
,<1,4><1,3>,<1,5>,<1,6>,<1,7>,<1,8><1,9>		**<1,2>**<1,1>,<1,10>
<2,3>,<2,5>,<2,6>,<2,7>,<2,8>,<2,9>**<2,4>**		**<2,1>**,<2,2>,<2,10>
<3,7>		**<3,5>**<3,3>,
<4,3>,<4,5>,<4,7>,<4,8>,<4,9>		**<4,6>**<4,2>,<4,4>,
<5,7>		<5,3>,<5,5>,
<6,8>,<6,9>,<6,3>,<6,5>,<6,7>		**<6,4>**,<6,6>
		<7,7>
<8,3>,<8,5>,<8,7>,	<8,9>	<8,8>,
<9,3>,<9,5>,<9,7>	<9,8>	<9,9>
<10,3><10,5><10,6><10,4><10,7><10,8><10,9>		**<10,2>**<10,1>,<10,10>

In sum, the effect demonstrated is of clarifying and homogenizing.

Clarifying, because the set of owls in any$_{(c,owl,D)}$ is wider than in any**$_{(c,owl,D)}$, and the widening comes from the gap rather than the negative denotation. I.e. in any**$_{(c,owl,D)}$ it is still open whether males are relevant, thus males are not regarded as non-owls but as borderline cases, potential exceptions. The negative 'owl' denotations in any$_{(c,owl,D)}$ and in any**$_{(c,owl,D)}$ are equal.

Homogenizing, because this wider domain is also less ordered, as seen in the tables.

When is the effect of *any* purely homogenizing?

When the denotation is predetermined. In the following section I illustrate this case.

5.3.3.2. A predetermined denotation

Sometimes more independent background information exists, as may be the case when the denotation is predetermined.

When the denotation is totally predetermined, it is determined on a basis coherent with, but independent from, the information in the dimension pairs, and it is known to be the maximal possible set of relevant owls in the context.

This is the case in the following examples of *any* in Imperatives:

(28) Just hand me any (one) of those ten bottles.
(87) Deliver me / Choose any (one) of the owls in this zoo.

In the cases of generic *any* the extension is open. Part of what makes the statement generic is that the domain is not fixed (see K & L 1993). But as is well known, so called free choice *any* can also appear in cases where the domain is fixed or is presupposed to be given, as in partitives.

(88) I don't listen to any (one) of those fifty c.d.'s. - (PS *any* with partitives)
(89) Any one of these owls could make a nice pet. - (FC *any* with partitives)
(90) Any Cornell professor reads the Ithaca- Times. - (FC any with a fixed domain)

K & L's account of widening and strengthening can not extend to such cases, because there is nothing to widen if the extension of 'c.d.', 'owl', 'Cornel Professor' and so on is presupposed to be fixed. Hence, their account doesn't predict that *any* is allowed in those cases. I assume with them that extensional widening doesn't take place, but my theory allows also the elimination of ordering dimensions rather than membership dimensions. The effect in such a case is only homogenizing of the domain, which is enough to induce strengthening. Hence, my theory predicts that *any* is allowed in those cases (given the strengthening constraint defined below).

The statements before the contribution of *any*, imply that all the owls in the zoo, all the ten bottles, all the fifty c.d.'s, and all the professors in a certain department (and only them) are relevant. However, since information extends gradually, there is no reason to assume that all the owls in the zoo, all the bottles, c.d.'s etc. are equally typical. It is not necessarily the case that once the contextual information implies that one of the items is to be regarded as relevant, it is also implied that all of the items are

relevant. It is quite reasonable to assume that the subset regarded as relevant has possibly widened gradually.
Hence, the number of relevant items in earlier stages of the information expansion is not necessarily 50, 10, the number of owls in the zoo, and so on. The number has to be interpreted as true in c, and not necessarily in any other state under it.

In such a case, there is no need to suppose that the <u>new</u> information, asserted by the use of these examples, is that all the 50 items, 10 items or owls in the zoo, are relevant. Even if this is presupposed, rather than new information, there is another piece of <u>new</u> and unexpected information, namely that all of them are to be regarded as equally relevant.
That is, even though the set of owls in the any- state is equal to the set in the c state, the set in the *any*-states is more homogenized along the dimension ‘male’. All males are regarded as at least as good owls as their corresponding females.
Formally, this means that in some states c_2 under c the set of owls in the any-c_2-state is wider than the set in c_2 (unlike in c_2, it contains some male owls).
Thus the statement strengthens by applying the operation *any*.

The statement with *any* is strengthened because a larger subset of the owls (the males included) is expected to turn out as mice hunters more easily (i.e. in earlier extensions), as easily as the females that we expected to be mice hunters from the start.
Without the assumption that *any* may operate on OS, this implication would not be captured.

Let’s consider now the detailed example, and assume that $\{d_{1,}d_2, d_4, d_6, d_{10}\}$ are all directly given as owls ($[P]^+_c = \{d_{1,}d_2, d_4, d_6, d_{10}\}$). The branches through this context can be represented by the table of states in $B_{any(c,owl,D)}$, providing that it is altered as follows: 1. In state c5, individuals d1,d2,d10 are all directly given as owls.
2. In state c6, which is $any_{(c,owl,female)}$ individuals d4 and d6 are directly given.

<u>Table 20: Branch b^+_{any} in B^+_{any}</u>

States in B^{+}_{any}	Action	Formal implementation: $MS_{(owl,c)}$, $OS_{(owl,c)}$	Effects on [owl],[not owl]
C_5	Some adult female and male individuals (d1,d2, d10) are directly regarded as owls. They are the prototypes (the maximally typical instances)	$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = {owl,bird, healthy,adult } $OS^{-}_{(owl,c5)}$ = {gray,female }	$[owl]_{c5} = \{d_1,d2,d10\}$ $[not\ owl]_{c5} = \{d_3,d_5, d_7\}$ $d4 <_{(owl,c5)} d_2$, $d7 <_{(owl,c5)} d5$ $d7 <_{(owl,c5)} d3$, $d1 =_{(owl,c5)} d_{10}$ $d1 =_{(owl,c5)} d2$, - $d6 =_{(owl,c4)} d4$
C6 = $Any_{(c\ owl,female)}$	**Some individuals (d4,d6) are (directly) regarded as owls (also not adult)**	**$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy}** **$MS^{-}_{(owl,c5)}$ = {}** **$OS^{+}_{(owl,c5)}$ = {owl,bird, healthy, adult }** **$OS^{-}_{(owl,c5)}$ = {gray,female }**	**$[owl]_{c5} = \{d_1,d2,d10,d4,d6\}$** **$[not\ owl]_{c5} = \{d_3,d_5, d_7\}$** **$d4 <_{(owl,c5)} d_2$, $d7 <_{(owl,c5)} d5$** **$d7 <_{(owl,c5)} d3$, $d1 =_{(owl,c5)} d_{10}$** **- $d1 =_{(owl,c5)} d2$, $d6 =_{(owl,c4)} d4$**

The denotation is predetermined, thus it can not widen. It is predetermined such that female and male individuals are given directly as members in it.

Hence, 'female' (as well as 'gray' and 'adult') necessarily end up in $MS^{-}_{(owl,t)}$ in every total extension t above c and $any^{**}_{(c,owl)}$, in the first place.

I.e. these contexts <u>don't</u> differ from $any_{(c,owl,female)}$ by the range of MS^{+} ('female' is in MS^{-} anyway, since individuals of both genders are directly given to be owls).

Thus, <u>no widening</u> occurs after the use of *any* (the set of owls remains as in c, and $any^{**}_{(c,owl,female)}$).

Thus:

- $[owl]_c = [owl]_{any^{**}(owl,c)} = [owl]_{any(c,owl,\ female)} = \{ d_1,d_{10},d_2\ d_4, d_6\}$ (the directly given).
- $[not\ owl]_c = [not\ owl]_{any^{**}(owl,c)} = [not\ owl]_{any(c,owl,\ female)} = \{d_3,d_5, d_7\}$ (the sick).
- $[owl]^{?}_{c} = [owl]^{?}_{any^{**}(owl,c)} = [owl]^{?}_{any(c,owl,\ female)} = \{d_8, d_9\}$

('Strong' and 'perfectly healthy' may still turn out to be necessary dimensions. Hence, d8 and d9 (the weak or not very healthy individuals) are still in the gap of 'owl' in $any_{(c,\ female,owl)}$. It is still open whether this combination is fine for owls).

However, even if the denotation size is equal pre and post elimination, *any s*till has an effect. In every total state above $\text{any}_{(c,owl,female)}$ the scale of 'owl' is less ordered (less restricted) than it is in total states above $\text{any}^{**}_{(c,owl)}$ or c. Homogenizing is the effect that occurs in both cases, and it induces strengthening, because *any* eliminates the dimension 'female' from $OS^{+}_{(owl,c)}$.

$\underline{OS^{+}_{(owl,any(c,owl,female))}} = OS^{+}_{(owl,c)}$ – E.D. = {female, adult, healthy, owl, bird}-
{female, not female} =
= {adult, healthy, owl, bird}

$\underline{OS^{-}_{(owl,any(c,owl,\ female))}}$ = E.D.= {female, not female}.

Since 'female' is in $OS^{+}_{(owl,c)}$ (and hence in $OS^{+}_{(owl,any^{**}(owl,c))}$) in the first place, this elimination has an actual effect. In order to see this we have to consider the states under $\text{any}_{(c,owl,female)}$ and under $\text{any}^{**}_{(c,owl,female).}$

The states through $B_{any^{**}(owl,c)}$ can be represented by a table similar to the one of $B^{+}_{any(c,owl,female)}$, except that instate of c5 there are two stages: in state c5.1only the females d1, d10 are directly given as owls, while the male d2 is directly given as an owl only in the following state c5.2. Similarly the female c6 is directly given as an owl in state c6.1 and the male d6 only in state c6.2 (which is $\text{any}^{**}_{(c,owl,female)}$).
I.e. the denotation is directly predetermined, but in a gradual way such that the property 'female' helps in the determination of an instance as an owl. See in table 21.

So we can compare the use of *any* that involves a jump to $\text{any}_{(c,owl,\ female)}$ to the use of an operation like any** which doesn't involve such a jump, but is interpreted as in $a_{(c,P)}$. As demonstrated, the set of branches through $\text{any}_{(c,owl,female)}$, $B^{+}_{any(c,owl,female)}$, includes branches of kinds similar to those through $\text{any}^{**}_{(c,owl)}$, except that <u>there is no state in them such that d_1 (female) is regarded as an owl and d2 (male) is not</u>, or such that d_4 (female) is regarded as an owl and d_6 (male) is not, etc. In the *any* case, the domain of quantification extends such that it includes males besides females already in earlier extensions.

<u>Table 21: Branch $b^{+}_{any^{**}}$ in $B^{+}_{any^{**}}$</u>

States in $B^{+}_{any^{**}}$	Action	Formal implementation: $MS_{(owl,c)}$, $OS_{(owl,c)}$	Effects on [owl],[not owl]
$C_{5.1}$	Some female individuals (d1,d10) are (directly) regarded as owls. They are the prototypes (the maximally typical instances)	$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = {owl,bird, healthy,adult,**female**} $OS^{-}_{(owl,c5)}$ = {gray,female }	$[owl]_{c5}$ ={$\mathbf{d_1}$**,d10**} [not owl]$_{c5}$ = {d_3,d_5, d_7} d4 $<_{(owl,c5)}$ d_2, d7 $<_{(owl,c5)}$ d5 d7 $<_{(owl,c5)}$ d3, d1 $=_{(owl,c5)}$ d_{10} **- d2 $<_{(owl,c5)}$ d1, d6 $<_{(owl,c4)}$ d4**
$C_{5.2}$	Some similar but male individual (d2) is (directly) regarded as an owl.	$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = {owl,bird, healthy,adult,**female**} $OS^{-}_{(owl,c5)}$ = {gray,female }	$[owl]_{c5}$ ={$\mathbf{d_1}$**,d2,d10**} [not owl]$_{c5}$ = {d_3,d_5, d_7} d4 $<_{(owl,c5)}$ d_2, d7 $<_{(owl,c5)}$ d5 d7 $<_{(owl,c5)}$ d3, d1 $=_{(owl,c5)}$ d_{10} **- d2 $<_{(owl,c5)}$ d1, d6 $<_{(owl,c4)}$ d4**
C6.1 =	Some non adult female individual (d4) is (directly) regarded as an owl	$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = {owl,bird, healthy,adult,**female**} $OS^{-}_{(owl,c5)}$ = {gray,female }	$[owl]_{c5}$ ={$\mathbf{d_1}$**,d2,d10,d4**} [not owl]$_{c5}$ = {d_3,d_5, d_7} d4 $<_{(owl,c5)}$ d_2, d7 $<_{(owl,c5)}$ d5 d7 $<_{(owl,c5)}$ d3, d1 $=_{(owl,c5)}$ d_{10} **- d2 $<_{(owl,c5)}$ d1, d6 $<_{(owl,c4)}$ d4**
C6.2 = Any$^{**}_{(c, owl,female)}$	**Some non- adult male individual (d6) is (directly) regarded as an owl.**	**$MS^{+}_{(owl,c5)}$ = {owl,bird, healthy or adult, healthy} $MS^{-}_{(owl,c5)}$ = {} $OS^{+}_{(owl,c5)}$ = {owl,bird, healthy,adult,female} $OS^{-}_{(owl,c5)}$ = {gray,female }**	**$[owl]_{c5}$ ={d_1,d2,d10,d4,d6} [not owl]$_{c5}$ = {d_3,d_5, d_7} d4 $<_{(owl,c5)}$ d_2, d7 $<_{(owl,c5)}$ d5 d7 $<_{(owl,c5)}$ d3, d1 $=_{(owl,c5)}$ d_{10} - d2 $<_{(owl,c5)}$ d1, d6 $<_{(owl,c4)}$ d4**

Formally:

$\forall c\in C$: $\exists c_2 \leq c$: $[owl]_{any^{**}(c2,owl,female)} \subset [owl]_{any(c2,owl,female)}$ &

$\neg\exists c_2 \leq c$: $[owl]_{any(c2,owl,female)} \subset [owl]_{any^{**}(c2,owl,female)}$.

The fact that the domain of quantification extends so as to include males besides females in earlier extensions in the *any* case, allows for the possibility that the any-statement would be regarded false already in earlier extensions than the any**-statement. If the only exceptions to the generalization "hunts mice" are males, the statement $[any(owl, hunts\ mice)]_c$ is regarded false already in earlier extensions than the statement $[any^{**}(owl, hunts\ mice)]_c$.

In the *any* case, initially females are taken more seriously. But when the truth of the statement is evaluated males and females are equally relevant.

So even if both statements are false in c, the *any* statement is false in more partial states under c.

Moreover, <u>for every context of utterance c both statements are true together or false together</u>. However, <u>the *any* statement is always false in more partial states under c.</u>

In that sense <u>the relevant difference is not truth conditional</u>.

One can even describe the case by saying that sometimes both statements are false, but the any- statement is even more false than the any**- statement, in the sense that it is false in more partial states under c.

There are no other differences.

In the following section I define 'strengthening', the condition for the licensing of *any*, in a way that captures this kind of strengthening as well.

<u>5.3.4. Capturing the Pragmatic (non truth functional) Strengthening patterns</u>

I have described the operation *any* performs, and now I want to move a step further, and describe the condition for the licensing of *any*.

<u>5.3.4.1. What strengthening pattern is common to all the *any* effects?</u>

I have described the common pattern as follows: under or above c or $any^{**}_{(c,owl)}$ (i.e. <u>pre elimination</u> of 'female' from OS^+) there exist states in which females are already specified as owls but non- females are not specified as owls. Such states don't exist under or above $any_{(c,owl,female)}$, i.e. <u>post elimination</u> of 'female' (when 'female'$\in OS^-$

$_{(any(c,owl,female),owl)}$). This means that after the dimension elimination, the males are taken more seriously than before. Male and female instances are equally relevant when the truth of the statement is evaluated.
In order to capture the strengthening effect, the strengthening constraint must account for the case not only in c (in comparison with the case in $any_{(c,P,D)}$), but also in the extensions c_2 under and above c (versus the extensions under and above $any_{(c2,P,D)}$).

The pattern found here generalizes to all the extensions in C. Since *any* is a dimension eliminator that may operate on either MS or OS, for every state c it holds that the quantification domain after the elimination of D is <u>at least as wide</u> as before elimination:
$\forall c \in C$: $[owl]_{any^{**}(c,owl)} \subseteq [owl]_{any(c,owl,\ female)}$.

Moreover, for every state c in which 'female' is specified in either $MS^+_{(owl,c)}$ or $OS^+_{(owl,c)}$, it holds that there is some state c_2 equal to c or under c, $c_2 \leq c$, such that the quantification domain after the elimination of D is actually <u>wider</u>:
$\forall c \in C$, 'female'$\in(MS^+_{(owl,c)} \cup OS^+_{(owl,c)})$: $\exists c_2 \leq c$: $[owl]_{any^{**}(c2,owl)} \subset [owl]_{any(c2,owl,female)}$.

If the predicate in the statement explicitly refers to a predetermined denotation, the statement is never uttered in these more partial contexts c_2, in which the denotation is still more- narrow than determined by the statement. Only if the predicate in the statement doesn't explicitly refer to a predetermined denotation, and 'female' is eliminated from $MS^+_{(owl,c)}$, then the widening is captured in the context of utterance c itself. (Any** only removes dimensions from $MS^-_{(c,owl)}$. Since 'female is in $MS^+_{(c,owl)}$ it is also in $MS^+_{(any^{**}(c,owl),\ owl)}$. *Any* eliminates it from MS^+ into $MS^-_{(any(c,owl,female),\ owl)}$. Thus, males are added to the set of relevant owls, i.e. widening takes place.)

Otherwise, 'female' is eliminated from $OS^+_{(c)}$, and widening is captured only in some state c2 under c. (Since 'female is in $MS^-_{(c,owl)}$ in the first place it is also in $MS^-_{(any^{**}(c,owl),\ owl)}$. However, 'female is in $OS^+_{(c,owl)}$ and thus in $OS^+_{(any^{**}(c,owl),\ owl)}$. *Any* eliminates it from OS^+ into $OS^-_{(any(c,owl,female),\ owl)}$). Thus, in c, both males and females are relevant but males are less relevant. That is, in some state c_2 under c, males are not yet in the set of relevant owls, but females are already in that set. However, in

$any_{(c2,owl,female)}$, males are already added to this set, i.e. widening takes place there.

If some male violates a generalization over owls, it necessarily forms negative evidence against the post elimination statement ("any owl hunts mice"), but it is not always regarded as serious negative evidence against the pre elimination statement ("any** owl hunts mice"). It may be ignored on the basis that it is atypical. Both statements are strictly false, but only the latter can possibly be regarded as almost true or true enough for the contextual purposes.

So even in these cases, when both statements are always either true or false in the context of utterance c, (when: $[owl]_c = [owl]_{any^{**}(owl,c)} = [owl]_{any(c,owl,\ female)}$), the following general pattern still holds:
In every state c_2 in C: If $[any(owl,hunts\ mice)]_{c2}$ is true so is $[any^{**}(owl,hunts\ mice)]_{c2}$,
But not vice versa:
In some state c_2 in C: $[any^{**}(owl,hunts\ mice)]_{c2}$ is true but $[any(owl,hunts\ mice)]_2$ is not.
The *any* statement is true in fewer partial states. Hence, it is a stronger statement.

The strengthening constraint suggested by K & L 1993 is based on entailment.

K & L 1993: The post elimination statement must entail the pre elimination statement.

Formally: <u>S1 is stronger than</u> S2, iff:
1. $\forall M, \forall c$: If $[S1]_{c,M} = 1$, Then $[S2]_{c,M} = 1$ &
2. $\forall M, \forall c$: If $[S2]_{c,M} = 0$, Then $[S1]_{c,M} = 0$.

Unlike K & L 1993, I would adapt an asymmetric entailment constraint, since I believe that *any* must have an <u>actual</u> effect of strengthening. I.e. the *any* statement must be actually <u>stronger</u> than the *any*** statement (it can not be just equally strong). Such a constraint is not too strict. Its validity derives from the way *any* is defined, as is shown above.
An asymmetric constraint is more faithful to the intuition that *any* always induces some strengthening, also when the denotation is predetermined.

An asymmetric constraint doesn't have the empirical problem that a symmetric constraint has. The latter trivially applies to cases in which there is no widening. Thus it predicts that *any* would be licensed, without inducing effects on the domain at all, also in examples as the following.

(91) John kissed any girl.

An asymmetric strengthening constraint:
<u>S1 is stronger then S2</u> iff: statement S1 entails S2, <u>but not vice versa</u>.

Formally, <u>S1 is stronger then S2</u> iff:
- S1 entails S2:
1. $\forall$M,$\forall$c: If $[S1]_{c,M} = 1$, Then $[S2]_{c,M} = 1$ &
2. $\forall$M,$\forall$c: If $[S2]_{c,M} = 0$, Then $[S1]_{c,M} = 0$.
- But not vice versa:
3. $\exists$M,c: $[S2]_{c,M} = 1$ and $[S1]_{c,M} = 0$.

A statement with *any* asymmetrically entails the statement with *any***. That means that the statement with *any*** can be true when the statement with *any* is false or when its truth or falsity is still undetermined. However, the statement with *any*** can be false only to the extent that the statement with *any* is false (or "is more false"), not when the statement with *any* is true or when its truth or falsity is still undetermined.

The difference with K & L's strengthening notion is that in my analysis the truth conditions of $[any(P,Q)]_c$ themselves refer to other contexts, in particular to more partial contexts. When one checks whether entailment holds (i.e. whether $[any(P,Q)]_c$ entails $[any^{**}(P,Q)]_c$), in essence, by the truth conditions of *any*, one quantifies over more partial states than one would in K & L. It is this that allows us to say that there is <u>real</u> asymmetric strengthening as opposed to <u>trivial</u> strengthening.

I.e. whenever *any* eliminates an OS dimension, it homogenizes the domain.

The domain in c or *any*$^{**}_{(c,P,D)}$ is assumed to be ordered. That means that it must be the case that the set of instances that are regarded as P extends gradually in the partial information states under and above c or *any*$^{**}_{(c,P,D)}$.
The domain in $any_{(c,P,D)}$ is less ordered. That means that the set of instances that are regarded as P extends less gradually in the partial states under and above $any_{(c,P,D)}$.
Some partial states under $any_{(c,P,D)}$ are widened with respect to the parallel partial states under c (or *any*$^{**}_{(c,P,D)}$).
Thus even if with respect to c (or *any*$^{**}_{(c,P,D)}$) there is no widening effect (the denotation is predetermined), the assumption that more partial states (that determine the order between the P instances) must exist under c(or *any*$^{**}_{(c,P,D)}$) allows for widening in these states.

Thus, in the model suggested here, a constraint based on entailment captures the strengthening also in the cases which I called in chapter 2 “scalar cases”, i.e. the examples with homogenizing rather than widening, relative to c.
In the model adapted here, the differences between the statements are brought through in some partial states which are less complete than c. Widening is captured there also when it isn’t captured in states as complete as c.

I have already shown that in chapter three how the present analysis accounts for cases of PS *any*. The very same meaning of *any* as a dimension eliminator leads to strengthening in PS *any* contexts.

In sum, in order to examine strengthening, one examines whether for every state c, if “any owl hunts mice” is true in c then “any** owl hunts mice” is true in c.
One actually compares the truth value of the same statement when evaluated in any$^{**}_{(c,owl)}$ and when evaluated in any$_{(c,owl,female).}$ Any** simply doesn’t involve the jump to any$_{(c,owl,female)}$, i.e. the elimination of ‘female’.
The set of owls in the any-states is always <u>at least as wide</u> as it is in the any**-states, since in the any-states males are always owls too. The set of non-owls is always <u>at most as wide</u> in the any-states since the property male doesn’t ease the determination (or raise the status) of an individual as a non-owl. Thus *any* induces strengthening.

<u>5.3.4.2. Non-eliminable dimensions: elimination without a strengthening effect</u>

The immediate implication of the strengthening condition suggested here is that *any* is licensed only if in the context of its use there exist a dimension to eliminate. I.e. a dimension that is specified as either a membership or an ordering dimension of *any*'s first argument. If there is no dimension to eliminate, the interpretations with *any* and with *any*** are exactly the same, and there is no strengthening effect whatsoever to *any*.

Naturally, strengthening occurs only when *any* eliminates a dimension that actually restricts the interpretation of its argument. I.e. a dimension that when eliminated, causes widening, or homogenizing (removing an actual ordering relative to it).

In order to achieve maximum effect (widening and homogenizing) by the same means (i.e. by using *any,* that can eliminate dimensions from MS^+ and OS^+ or from the gaps $MS^?$ and $OS^?$, if there are any) the meaning of the argument of *any* should not be precisely and tolerantly determined (i.e. such that all the dimensions are in MS^- and OS^-). In the worst case, all the dimensions are in MS^-, and the denotation is completely tolerantly defined. Then the contribution of *any* is solely in homogenizing (removing predicates from OS^+ to OS^-).

Moreover, some dimensions are <u>non-eliminable</u>. D is eliminable from $MS^+_{(P,s)}$ iff "not D" is still compatible with the satisfaction of the generalization.

No strengthening effect is induced if the eliminated dimension D denotes a property that, the generalization asserted in the *any* sentence never applies for its negative instances (the "not D" instances).

For instance, in the following example the predicates 'males' and 'females' are not eliminable. Since our knowledge of the world does not permit (not yet, anyway) a male dog to give birth, the dimension 'female' in this context is definitely a necessary condition for anything speaker A refers to as a 'dog' (i.e. in context of "give live birth" it is necessarily the case that female$\in$ $MS^+_{(dog,c)}$):

(92) A: Any dog gives live births.
B: Females, you mean.
A: But, of course.

A*ny* can not eliminate that predicate from the membership set of ‘dog’ because once eliminated the generalization expressed in the sentence is clearly false. *Any* can eliminate only predicates that in the context limit obligatorily ‘dog’ but not “gives live birth”. ‘Healthy’ doesn’t obligatorily constraint “give live birth” in this context thus is eliminable. The *at least* test (K&L) supports this claim:

(93) a. My dog gave live birth to five sweet creatures when she was seriously sick with high fever. Any dog can give live birth. #Healthy ones, at least.
b. Any dog gives live birth. Females, at least.

Discourse (a) is odd since statements like “at least Q” are not compatible with statements in which *any* eliminates Q.
Discourse (b) is not odd since ‘female’ is non-eliminable.

5.3.4.4. The effect of having more contextually typical instances

Note that in the *any* case there are more potential prototypes (members in the highest stage in P’s scale) because fewer properties have to be satisfied by an instance in order to be regarded maximally typical:

$$\{d_1 \mid d_1 \in D \;\&\; \forall d_2 \in D\colon d_2 \leq_{(owl,any^{**}(c,owl))} d_1\} \subseteq$$
$$\{d_1 \mid d_1 \in D \;\&\; \forall d_2 \in D\colon d_2 \leq_{(owl,any(c,owl,D))} d_1\}$$

(If some dimension D_i is removed from OS^+ to OS^-, all non maximal D_i instances improve in their P status, i.e. pass into one of the higher stages on the scale of P. Only the maximal level just grow (no new instances pass from it, only to it). So, potentially, there are more “best" or “maximally typical” P instances).

The analysis suggested here captures some basic intuitions regarding the role of prototypical instances of a predicate. I.e. in the first place, prototypical instances are more highly expected to fulfil generalization over the predicate than non- typical instances of it. Secondly, if many instances are regarded as contextually very typical, more instances are highly expected to fulfil a generalization over that predicate.

In that sense, a statement expressing a generalization is pragmatically stronger in such a case than when fewer instances are regarded as highly typical.

On the analysis suggested, members of the highest stages in P's scale are added to the denotation earlier than the elements in lower stages. Thus, if exceptions to some generalization on P come from the higher stages in P's scale, the generalization must be false in more extensions, than if the exceptions are members of lower stages in P's scale. Therefore the highest stages are more likely to reduce the strength of a generalization.

For example, if the only exception to "hunt mice" is an atypical owl (or a creature with a low status on the 'owl' scale) that doesn't hunt mice, say d9, in most states it is not regarded as an exception, because it is not a member of the owl denotation.

If the only exception is a much more typical owl (or a creature with a good status on the 'owl' scale) in contrast, say d1, it is regarded as an owl in many more states, and thus it counts as an exception that disproves the generalization.

So the generalization is false in both cases, but it is false in more states in C in the latter case. In that sense one may say, that for all the pragmatic purposes the statement fits the context in the first case (it is almost true if only d9 is an exception), but not in the latter (in which it may be determined as false in very early extensions).

Even if a typical owl hunts mice, but has a low status on the scale of "hunts mice", the generalization is true in fewer extensions then if it was a non- typical owl. This is the case because, in the latter case, in fewer extensions, it was regarded as an owl but still a borderline case of hunt mice, than in the first case.

5.4. Conclusions to chapter 5: *Any, every* and *a* as Strictness regulators

To sum up, I suggest that the three items *any, every* and *a* are strictness regulators. As an interpretation $I_{(P,c)}$ extends to completeness more strictly, more dimensions or more strict dimensions are specified in MS^+ or OS^+ and therefore it is easier to violate the constraints on denotation membership and ordering (more possible individuals do). If MS^+ and OS^+ are either less precise or more restricted there may be fewer instances that are clear cases of P, more negative instances, and fewer maximally P instances.

Formally I can define a relation of strictness between states as follows:

$I_{(P,c1)}$ is at least as strict as $I_{(P,c2)}$, iff: $[P]_{c1} \subseteq [P]_{c2}$ and $[\neg P]_{c1} \supseteq [\neg P]_{c2}$.

(It follows that every individual is at most as relevant (or typical) in c2 as it is in c1. $\forall d$: if $[P(d)]_{c1} = 1$ then $[P(d)]_{c2} = 1$ & if $[P(d)]_{c2} = 0$ then $[P(d)]_{c1} = 0$).

The strictness order differs from the vagueness order (the order that reflects the monotonic expansion of information through states). A predicate interpretation is more vague (or less complete) iff fewer dimensions and individuals are specified in it, its gap is bigger, and its scale less ordered. So for instance it holds that:

$I_{(P,c1)}$ is at least as vague as $I_{(P,c2)}$, iff: $[P]_{c1} \subseteq [P]_{c2}$ but also that $[\neg P]_{c1} \subseteq [\neg P]_{c2}$.

$I_{(P,every(c,P,Q))}$ is always at least as complete and at most as strict as $I_{(P,c)}$.
The use of *every*, that triggers a jump to $every_{(c,P,Q)}$, means that generalization Q applies even if P is interpreted as tolerantly as possible.
By its semantics, the statement "every(P,Q)" becomes stronger (than without the jump to $every_{(c,P,Q)}$), because $I_{(P,Every(c,P,Q))}$ is less strict.

$I_{(P,a(c,,P))}$ is always at most as complete and at least as strict as $I_{(c,P)}$.
The use of *a*, that triggers a jump to $a_{(c,P)}$, means that generalization Q applies at least if P is interpreted as strict as possible. You restrict P to the set you are sure about.
By its semantics, the statement "a(P,Q)" becomes more tolerant i.e. weaker (than without the jump to $a_{(c,P)}$), because $I_{(P,a(c,P)}$ is stricter.

$I_{(P,any(c,,P,D))}$ is always more complete and less strict than $I_{(P,a(c,P))}$.
The use of *any*, that triggers a jump to $any_{(c,P,D)}$, means that generalization Q applies not only if P is interpreted as strict as possible, but also if P is interpreted more tolerantly along some contextually specified dimensions (the dimensions in D).
By its semantics, the statement "any(P,Q)" becomes stronger than "a(P,Q)", because $I_{(P,any(c,P,D)}$ is less strict along D.

There is no commitment for a case in which the interpretation of P is tolerant along any dimension other than those in D.

Elimination of dimensions is moving to the closest state in which the interpretation of P is the least strict along those dimensions (just as an adjectival modification may involve a shift to a stricter information state along some dimension).

This analysis of *any* as a predicates eliminator fits even more closely to the formalism suggested by K & L specifically for *FC-any*, than their own proposal for *any*'s meaning. For then, eliminating a predicate is all what *any* does, and widening comes only as a result (for more details see K & L 1993). I allow two possible results: widening or homogenizing.

Chapter 6: Conclusions

6.1. Summary

In this thesis, I have proposed to adapt a theory of predicate interpretation along dimensions. Each contextual use of a predicate P is constrained by other predicates that are regarded as necessary conditions for P-hood, and/ or stereotypical of P. I have suggested that these context dependent conceptual guidelines, that help us to construct the intension, have to be explicitly represented in the linguistic model. Hence, in this proposal, the interpretation of a predicate P in a context c doesn't amount to just one structure (the partial extensions: $<[P]^+_c, [P]^-_c>$) as is usually the case in vagueness models, but rather, it requires the stipulation of three structures (in addition to the partial extensions, also partial sets of necessary conditions and non trivial conditions: $< MS^+_{(P,c)}, MS^-_{(P,c)} >$, and partial sets of stereotypical properties and non stereotypical ones $<OS^+_{(P,c)}, OS^-_{(P,c)} >$), in order to represent the data that is given directly regarding the predicate P.

I have argued that despite the facts that a predicate is associated with dimension sets in addition to denotations, this model is more economic. Contextual restrictions (dimensions) play an important role in semantics, and hence they occur in most current theories. Since they are not formulated directly as a part of the interpretation of predicates, the interpretation seems more economic. Actually, lots of additional stipulations are required later in order to express the contextual restrictions. For instance, contextual restrictions are stipulated separately each and every time a quantifier, or a conditional, occurs. Contextual restrictions are often represented by a list of meaning postulates that restrict the intension of a predicate. The problem is that the list of restrictions, represented in the meaning postulates, is not accessible to operations like *any*, which forces one to stipulate contextual restrictions again when required by such an operation. Formulating the notion of dimension set explicitly and directly as part of the interpretation of predicates allows grammatical operations to access this set, and to operate upon it. This spares further stipulations of restrictions, and hence is more economical.

I have shown in detail how three expressions, *every, any* and *a*, use the dimensions sets by and large in a systematic and predictable way to construct a quantification domain. Given one context, the differences between the domains of these items are systematic. Hence, these differences are a result of their semantics, and not of the contextual information. Thus, the set of restrictions on the domains, in the proposed analysis, is not stipulated separately for each case. It is the dimension structure associated with a predicate, upon which these quantifiers operate. The semantics given to *every*, *any* and *a* treat these sets in different ways (or level of strictness) in each case. In addition to being economical, this analysis illuminates the relations between the contextual denotation and the contextual domain of quantification of each quantifier.

The idea is that a speaker doesn't want to express too strong statements, but, maximally, statements that are strong enough. When a speaker wishes to express a universal generalization Q over a domain P, that speaker has to choose one of several possible linguistic items. Those items differ in the level of vagueness and strictness that they assume in the dimension sets of P. If the dimension sets are either less precise or more restricted, there may be fewer instances that are clear cases of P, more negative instances, and fewer maximally P instances. I propose the following:

(1) Statements with expressions like *a* or bare plurals, that allow exceptions, allow settling the requirements for being regarded a relevant member in the domain of quantification, in quite a liberal way, but once settled – every relevant object must fulfil the generalization. Since all the dimensions of P that were not regarded as necessary or stereotypical for P-hood in the context, are treated as potential restrictions, it is likely that almost every exception can be tolerated on some basis.

(2) The interpretation of statements with expressions like *every*, that do not allow exceptions, is not liberal with respect to settling the requirements for being regarded a relevant member in the domain of quantification. If a property wasn't initially assumed to be a requirement for being regarded a member in the domain, then it can not be assumed to be such after the use of *every*. Thus, no exception is tolerated.

(3) I have suggested that the correct analysis of *any* is as a dimension- eliminator (as suggested by K & L specifically for *FC-any*). *Any* is similar to *a* in all respects, except that an eliminated dimension D is treated as non-necessary and/ or not stereotypical of P (the first argument of *any*). I allow by that three possible results: widening (by

eliminating a membership dimension), <u>homogenizing</u> (by eliminating an ordering dimension), or <u>clarifying</u> (by eliminating unspecified dimensions). That allows *any* to have an actual effect also without widening, for example when the domain is predetermined.

In sum, these items are associated with <u>context shifting operations</u>. For instance, the elimination of a dimension D implies a move to the closest information state in which the interpretation of P is the least strict along D.

The use of *every* <u>strengthens</u> a generalization (*every(P,Q)*), because the interpretation of P in the state $every_{(c,P,Q)}$, $I_{(P,every(c,P,Q))}$, contains wider negative dimension sets and thus wider positive denotation than the interpretation of P in c, $I_{(P,c)}$.

The use of *a* <u>weakens</u> a generalization (*a(P,Q)*), because $I_{(P,a(c,P))}$ contains less wide negative dimension sets and thus less wide positive denotation than $I_{(P,c)}$.

The use of *any* results in a <u>stronger</u> generalization than the use of *a* - *any(P,Q)* is stronger than *a(P,Q)* - because some dimension D is eliminated from the positive dimension sets of $I_{(P,any(c,P,D))}$, and is added to the negative dimension sets. Thus, $I_{(P,any(c,P,D))}$ contains a wider positive denotation and a narrower negative denotation along D.

Under this analysis, <u>*almost*</u>, as a means of weakening a universal statement along a dimension (K & L 1933), is not licensed with *a*, since the semantics of *a*, as described above, already allows exceptions along every dimension. This provides <u>a semantic explanation for the distribution of *almost*</u>, rather than through a grammatical stipulation.

<u>6.2. The characteristics of dimensions</u>

The main part of the thesis concentrates on a clear representation of the characteristics of dimensions and how they combine in a complete model, with detailed examples of the way it works. I have gathered several interesting conclusions along the way.

One conclusion is that <u>the simplest way to represent dimensions is simply as predicates</u>.

Another conclusion, adapted from K & L 1993, is that <u>non- triviality is a restriction on the non-membership dimensions</u>. I.e. the membership dimensions of P are those predicates whose denotations are supersets of P’s denotation, but the non-membership dimensions of P are <u>not</u> just those predicates whose denotations are not supersets of P.

The denotations of their negations must also be non- supersets of P. It is this set that helps account for *any*'s meaning or *almost*'s distribution.

A third conclusion is that the ordering dimensions of P are not the membership dimensions of $\leq_{(P)}$. The correlation between the stereotypicality ordering of P and stereotypicality ordering of P's stereotypical properties is ceteris paribus correlation. I.e. a specification of Q as an ordering dimension of P (i.e. as a predicate that helps order P instances on a scale of relevance or contextual stereotypicality in c) entails that for every two individuals $d_{1,}d_2$ equal in all other respects except Q, (1) if d_1 has a better status along Q than d_2, then d_1 also has a better status along P than d_2. (2) If they have equal status along Q, they also have equal P status.
A specification of Q as a non- ordering dimension of P (a predicate that relative to c doesn't order P on a scale) entails that every two individuals $d_{1,}$ d_2 equal in all other respects except Q, have equal P status.

Fourth, in order to represent stereotypicality, I have suggested that a relation $\leq_{(P,c)}$, i.e. an order of relevance or contextual typicality between individuals relative to P in c, is associated with every predicate. I have argued that the accessibility of scales derives from the partial nature of information regarding meanings. The ordering condition requires that the values of $\leq_{(P,c)}$ directly reflect the order in which the individuals become members in the denotation of P in the partial contexts in the branches through c. The interpretation condition requires that the values of $\leq_{(P,c)}$ encode the order in which the individuals become members of the denotations of the predicates in $OS^{+}_{(P,c)}$ in the branches through c.
This accounts for the high accessibility of scalar interpretations for sharp predicates once a suitable context is given. (Along the same lines, the association of membership dimensions with every predicate can account for the accessibility of sharp interpretations for scalar predicates, given a suitable context). My conclusion is that a semantic model must encode this basic nature of predicates' meanings (i.e. their partiality). If it does, the difference between scalar and non- scalar predicates becomes less extreme. Possibly, one doesn't need to introduce two totally different semantic mechanisms in order to represent the semantics of these different types of expressions.

6.3. Questions and speculations

6.3.1. Scalarity

The relevance of the ordering dimension set on the one hand, and the membership dimension set on the other hand (or, the scale versus the denotation), depends on the kind of context, rather than on the grammatical feature of the predicate (i.e. sharp or scalar).

Ordering a denotation is crucial in contexts of decision within denotation.

For example, when one is asked to take or to hand a P instance, it is possible that a whole set of elements will fit the clear-cut conditions for P-hood. Scales help determine the relevance of each item in a predicate contextual use. More relevant items are those one expects to satisfy well requests for P and generalizations over P. The order helps to choose an item to hand (in a request context), or to decide whether a false generalization is "true enough" for the contextual practical purposes or not (Lasersohn 1998). A generalization may be regarded "true enough" only if the exceptions are not very relevant, etc. Therefore a set of ordering criteria contextually associated with the predicate is an aid.

Membership in a denotation is crucial in contexts of decision between denotations.

I.e. if one must make a decision whether a certain state or object has some property or not, clear-cut conditions may help. In certain situations one must be able to decide, for instance, which people have to pay minimum tax, or receive some government aid. There can be no borderline cases where it is undeterminable if they may receive it or not. Theorems on triangles in math must have a precise set of things that are triangles upon which they ought to apply. One can not be stuck without a decision about such matters. And so on. Therefore a set of necessary conditions associated with the predicate (and automatic ways of making this set precise), are an aid.

In fact, homogenizing interpretations of examples with *any* are more dominant in contexts of decision within a denotation. The related facts are the following:

(1) In imperatives judgments regarding a conflict between *any* as an eliminator of an ordering dimension and clauses that presuppose ordering along that dimension are much clearer. Some of my informants get them only in imperatives. ("Could you hand me any (one) of those bottles? # Try to make it a small one"). I.e. only in the imperative examples which perform requests, they interpret *any* as a homogenizer. In

declaratives they usually interpret *any* as a widener.
(2) A natural interpretation for declarative examples like (32) ("any of those (10) c.d.'s was bought in N.Y") is like an imperative. Roughly: pick up any c.d. in this shop, if you want it to be bought in N.Y, your request will be satisfied. The domain in the example is predetermined. In those cases the use of *any* calls for a homogenizing effect. This effect, in turn, possibly triggers an imperative-like interpretation, in which questions of ordering are in fact informative.
(3) The homogenizing interpretation is natural also in some of the more typical examples (without a predetermined denotation) like (56), (67) ("any sock would help"; "I don't have any socks to lend"). Those are examples that deal with preferences within the denotation (since they are related to contexts of requests).

It is not surprising, that association of predicates with ordering criteria, and the elimination of ordering criteria by the use of *any*, show up in imperatives that perform requests, or in declaratives in contexts of preferences, or in contexts that any other interpretation is not available (i.e. when the domain is predetermined). In these contexts the ordering of the denotation by ordering criteria is very useful, enabling the addressee to guess what elements are the most highly expected from him to give (or not to give). In that case homogenizing (i.e. elimination of order along a dimension) is informative enough and indeed I believe this is the most natural interpretation in this case. This is in contrast with the usual case of universal statements, where necessary conditions for membership in the domain above all enables the addressee to evaluate the truth or falsity of the generalization. Speakers want to determine the truth-value of the statement, hence they want to determine the exact borders of the domain. Thus they prefer the 'heavier' effect induced by widening, and it is quite difficult to isolate examples of the more modest effect of homogenizing without widening.

In sum I suggest that homogenizing is in general more rare because usually we want to achieve stronger effects on the meaning, and we do that by assuming that the eliminated dimension was previously intended to be obligatory. However, when widening is impossible, an imperative like interpretation is forced upon the statement. In such a case, ordering helps even more than cutoffs, and thus homogenizing is the 'heavier' effect. Predicates are associated with both necessary conditions and stereotypical properties because each of these two kinds of sets is valuable for other purposes, and this fact is totally independent from the features of a specific predicate. Therefore the 'amount' of scalarity in the interpretation depends also to a great degree on the context, and it is important to interpret predicates in a way that will be able to account for all these contextual shifts in meanings in a natural way.

6.3.2. The existential use of *a*

I have suggested that the semantics of *a* in this analysis is compatible with its existential use, which introduces new entities to the discourse (Prince 1979). I.e. it is informative to introduce a new entity by a predicate associated with a set of characteristics which the entity must satisfy (membership dimensions), and not by a predicate associated with a set of characteristics which the entity may or may not satisfy (non-membership dimensions). It is therefore useful to introduce an entity with a predicate modified by the indefinite article. MS^- of such a predicate is empty.

6.3.3. Genericity and dimensions

Greenberg 1994 has convincingly claimed that the availability of a generic interpretation for statements depends on the relations between the subject and the predicate. For example, "being in London" can be a stable property essential to the identity of a place (so statement (93a) can be interpreted generically), but not of a person, which may change geographical location (so (93b) is naturally episodic).

(93)a. The palace is in London (*today).
b. John is in London (today).

Again, it is simple and natural to see the implicit generic quantifier as a simple universal quantifier, while the vagueness, the stability, and other characteristics of the predicate in the restriction of the universal statement, determine whether the generalization allows exceptions or not, is interpreted modally or not, etc. I.e. maybe the membership dimension set in a predicate interpretation can represent the properties that the argument must satisfy in every world, history or information state which *gen* binds. This set ought to guarantee that the predicate in the nuclear scope truly applies on the argument.

Another question is whether it is possible that in generic statements like "birds fly", the relation between the argument and the predicate is not of subset - superset (the relation between P and its membership dimensions), but rather the relation between P and its ordering dimensions. I.e. whether the statement "birds fly" doesn't mean that all the relevant birds fly, but rather, that for every two creatures that are equal in all respects except that one flies and the other doesn't fly, it holds that the first is regarded as a more relevant bird or more of a typical bird than the second.

([birds fly/ a bird flies]$_c$ = 1 iff 'fly'$\in \cap\{OS^{+}_{(bird,t)} | \forall t \geq a_{(c,bird)}, t \in T\}$

Iff $\forall d_1, d_2, \forall c_1 \geq a_{(c,bird)}$:

(1) If $(d_1 <_{(fly,c1)} d_2)$ & $(\forall Z \in A\text{-}\{bird\}: d_1 \leq_{(Z,c1)} d_2)$ Then: $(d_1 <_{(bird,c1)} d_2)$ &

(2) If $(\forall Z \in A\text{-}\{bird\}: d_1 =_{(Z,c1)} d_2)$ Then: $(d_1 =_{(bird,c1)} d_2)$).

In such a case the fact that a penguin doesn't fly is not a problem at all. Whether regarded as a relevant bird or not, it is a very atypical bird. The same holds also for sick or young birds, and so on. The move to $a_{(bird,c)}$ is still necessary since it enables the treatment of many properties as potentially ordering dimensions. As such, instances that do not satisfy them can be regarded as contextually atypical birds, and thus not be expected to fly.

Another related idea is, that the tolerance along dimensions is the relevant feature of *a* and *any* that fits mostly in generic statements, whereas the strictness along dimensions of *every* fits mostly in episodic statements.

I.e. the worlds in the domain of the implicit generic determiner are usually described as "not too far from the real world" or as 'normal'. That means that they do not differ in crucial things (say, the law of gravitation), but only in episodic matters (say, which individuals are sick in the context). Given that, it is clear why *every*- statements don't fit in the scope of *gen*. Consider a context c1 in which dimensions like 'healthy', 'adult' or 'gray' are not specified in $MS_{(owl,c)}$. Then, it is likely that there are many possible worlds w_1 in which some owls are sick, some owls are young, and so on. *Every* treats all the dimensions that are not specified in $MS^{+}_{(P,c)}$ as non- restrictions (i.e. 'healthy', 'adult', 'gray' etc. are in $MS^{-}_{(P,c)}$). Therefore, if these owls don't hunt mice in the worlds- w_1, the generalization *Gen(every(owl,hunts mice))* is not valid. Only the lack of specification of *a* and *any* expresses the genericity of a law. These operations do exactly the job of allowing the creatures that are young, sick, non-gray or etc. to be legitimate exceptions, by treating all the dimensions that are not specified in $MS^{+}_{(P,c)}$ as potential- restrictions (i.e. 'healthy', 'adult', 'gray' etc. are in $MS^{?}_{(P,c)}$). Therefore, even if these owls don't hunt mice in the worlds- w_1 the generalization *Gen(any(owl,hunts mice))* may still be valid. The set of instances on which the generalization applies may vary quite substantially between worlds. A generalization over possible worlds, histories, information states or etc., with such operators is much weaker a commitment than a similar generalization with *every*. Imaginable worlds are simply not that similar to each other so that an *every*- generalization would, usually, appropriately apply in all of them. Since *gen* is an implicit operator, it simply doesn't ever show up when the result is clearly a false statement. Only items like *a* or *any* can therefore be interpreted as in the scope of *gen*.

This may also be the reason why *a* and *any* don't fit into episodic universal generalizations ("* Yesterday at noon we admitted any passer by"). Such a statement means that we admitted every passer by, presupposing that the set of relevant passers by may be empty. Some may not be admitted since they are thirty years old, others because they are forty years old, wearing certain clothes etc. Such a statement, in an episodic context, is not strong enough. It is meaningless. The speaker can't have a clue regarding the question which passers by, if any, were admitted. Only *every* which doesn't allow exceptions (unless they are independently presupposed to be "non passers by"), fits in such a context. It induces a perfectly meaningful generalization. So it is a fact that *any* strengthens such examples (with respect to *a*), but not enough. A speaker that wishes to express strong enough generalizations chooses to use *every* in such a case. (PS *any* and existential *a* are not regarded as too weak in DE contexts that express generalizations (say, "I don't have any potatoes") since there is no stronger option, i.e. an existential item that behaves like *every*).

Finally, sometimes *any* is licensed in what seem to be episodic contexts, but an interpretation that is intensional in some sense is available. Now if it is reasonable that a generalization is satisfied in every world which satisfies the requirements in the contextual positive dimension set of the predicate in the restriction, then the implicit operator *gen* may show up, and the interpretation may be strong enough. For instance, "was bought in NY" is not an inherent property of c.d.'s in general, but it may be regarded as inherent for a c.d. in a specific shop that has a unique character, and this property expresses it. Thus, *gen* and FC *any* occur only in the latter cases. Similar distinctions, like essential versus non-essential properties (see in Dayal 1998) are

found in the literature. I propose that even if the set of P instances changes intensionally, the contextual dimension set remains steady, and it represents the inherent /essential part in the contextual meaning of P. Thus, it is clearer how one decides whether some predicate Q is an inherent property of P.
In sum, a future investigation of the adequacy of the ideas presented in this section (the relations between predicate dimensions and genericity) seems likely to be fruitful.

6.3.3. Kamp and Partee 1995 ask whether and how the prototype of, say, “striped apple”, “male nurse” or “stone lion” is composed from the prototypes of the parts. Their 1995 account uses a typicality function and a prototype, but they suggest, in conclusion, that a cluster approach to semantic concepts might help in these matters. The model developed here suggests a possible link between these psychological notions (*prototype*, *typicality*) and the semantic ontology, in terms of clusters of ordering dimensions that restrict stereotypicality scales. It would be interesting to see the predictions of the dimension model regarding the problems presented by Partee and Kamp. In the current model, the predicates ‘male’ and ‘nurse’, for instance, if accessible, are associated with an ordered denotation and ordering dimensions. The top of the scale of individuals contains the prototypes. The set of properties of the prototypes is the set of ordering dimensions. “Male nurse” may be associated with those ordering dimensions (of ‘male’ and ‘nurse’ or of neither one of them) that characterize just the items that are both males and nurses. The fact that the set of prototypes and the set of ordering properties change are not in contrast with, but comes as a result of, the composition of meanings.
Note also, that the building blocks of many psychological theories about concepts, categorization, metaphors etc, are clusters of predicates and not intensions. Thus, these theories are more easily related to a linguistic theory that adapts dimension sets (i.e. sets of restrictions on intensions). Some of them provide explanation for linguistic facts, as sortal selection, non-literal meaning, acquisition of predicate meanings, etc. (e.g. Keil’s 1979 analysis of ontological categorization and concept acquisition).
One may question the possibility to learn or acquire all the sets of dimensions, scales, and so on. The part that must exist a-priori to such a learning procedure is only the ability of a subject to ‘read’ inputs consisting of a predicate P and a predicate Q as: "Q is necessary for P-hood" or "stereotypical of P", and to read inputs consisting of an

individual d and P as: "d is P" or "is more P than…". The rest seems to be easily learnable by the same means in which other complex systems are learned. The data (i.e. pairs of P and other predicates or individuals) is collected and with age and experience generalizations (functions) for denotation membership judgments ([P]) and ordering ($\leq_{(P)}$) emerge. The generalizations that give the right results for new pairs of data are used later in novel cases. If certain mistakes are never made during this acquisition process, then more has to be regarded as a-priori given.

6.3. In sum, I believe that a model of partial information, with membership and ordering dimensions in a predicate interpretation, is necessary and fruitful in semantics. I hope a more serious semantic work will be done in the future to explore the advantages of such a kind of analysis, and I hope to be involved in these efforts.

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