The Salience Theory of Definiteness

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Abstract The salience theory of definiteness combines the best features of the uniqueness theory and the familiarity theory to a novel concept of definiteness. A definite expression refers to the most salient element of a given set. Thus, this theory does not suffer from the notoriously problematic uniqueness condition nor from the often to globally interpreted familiarity condition. The paper provides the theoretical and empirical foundations for the salience theory of definiteness and illustrates its range by successfully analyzing different uses of definite noun phrases.

1 Introduction

The concept of definiteness in natural language is of special interest because it seems to be pragmatic in nature but it has semantic impact. The analysis of definite expressions exhibits some aspects of the fuzzy borderline between semantics and pragmatics and the interaction between the two areas. In this paper, I will examine four semantic theories about definiteness with particular view on English. I conclude that the pragmatic concept of "salience" is the underlying principle for definiteness. However, no theory has given a formal account of this pragmatic principle. I show that choice functions provide the adequate means to reconstruct salience in a formal theory. They are functions that assign to each non-empty set one of its elements. In this formal approach the pragmatic principle of salience gets its semantic reconstruction, which yields a unified account of the semantics of definite noun phrases and pronouns.

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25 The paper is organized in the following way: In the second section I introduce
26 five different groups of definite expressions, namely proper names, definite NPs,
27 demonstratives, personal pronouns, and possessive constructions. In the third
28 section, I focus on definite NPs as the most complex kind of definite expressions
29 and discuss the relevant contexts where they are used: the anaphoric linkage, the
30 relational dependency, the situational salience, and the unique case.

31 In the fourth section, I shortly sketch three semantic theories of definiteness.
32 Each of the theories focuses on one of the typical contexts of definite expressions:
33 Russell's Theory of Descriptions focuses on uniques, Kamp and Heim's famil-
34 iarity theory takes the anaphoric use as fundamental, and Löbner's relational
35 approach bases definiteness on relational dependencies. However, none of these
36 three theories gives a complete picture of all uses of definite NPs. Therefore, the
37 more general salience approach is presented in the fourth section. In this approach,
38 the context crucially contributes to the interpretation of the definite NP by forming
39 a salience hierarchy among the potential referents. It is assumed that each context
40 can be associated with an ordering among the elements of subsets of the domain of
41 discourse. This ordering reconstructs the intuitive idea of a salience hierarchy. The
42 three historical sources of this salience theory are outlined: Lewis' semantic
43 criticism of Russell, the linguistic conception of the Prague School and the
44 investigation of AI researchers. However, there has not by any attempt to for-
45 malize the principle of salience.

46 In the sixth section, I give a formal representation of the concept of salience by
47 means of context dependent choice functions, which pick out from a set one of its
48 elements or a "representative". Due to this formal account of the pragmatic
49 principle of salience it becomes possible to reconstruct definiteness in the logical
50 representation of natural expressions. It will be shown that the developed for-
51 malism can uniformly describe all four different uses of definite NPs.

52 ## 2 Definite Expressions

53 In a pretheoretical definition, a definite singular expression unambiguously denotes
54 or refers to one object, i.e. the object can be identified as the only one that is
55 denoted by the expression. The fixed reference of a definite expression depends on
56 different grounds: it can be determined by lexical material, by semantic rules or by
57 pragmatic strategies. Traditionally, proper names, definite NPs, demonstratives,
58 personal pronouns and possessive constructions are regarded as definite. In this
59 section I will give a short overview of these types on the example of English
60 expressions and discuss some of their properties. I confine the presentation to
61 expressions referring to singular countable objects.

2.1 Proper Names

A proper name is a prototypical definite expression. It refers to exactly one individual, namely the bearer of the name. The reference is purely conventional since no internal part of the expression points or gives any relation to its bearer. Despite their treatment as constants in formal semantics, proper names are highly context dependent as the list (1) shows. There are many Baraks and Angelas and there is even more than one Barak Obama and one Angela Merkel. However, these problems of proper names should not concern us here too much.

(1a) *Barak*
(1b) *Angela*
(1c) *Barak Obama*
(1d) *Angela Merkel*

2.2 Definite NPs

Definite NPs (here short for "definite descriptions") as in (2) refer to their objects not by convention but due to their descriptive content. Since there is only one person who has been the first man on the moon the definite NP *the first man on the moon* refers to exactly that man. This behavior of definite NPs caused their use in mathematics and epistemology for definitions. In the context of a definition, a definite NP (or definite description, as this term is more common in this literature) refers to the unique object that satisfies the descriptive material. Russell's Theory of Descriptions is based on such cases and, therefore, entails the uniqueness condition for definite descriptions. However, in normal natural language discourse we find definite NPs whose descriptive material can be satisfied by more than one individual, like *the sun, the university, the table* etc. Such NPs are sometimes called incomplete definite descriptions. They refer uniquely to one object due to their descriptive material and further information, like our shared background knowledge about the astronomical system of the earth, or contextual information about the place and time of utterance.

(2a) *the first man on the moon*
(2b) *the sun*
(2c) *the university*
(2d) *the table*

2.3 Demonstratives

Demonstrative expressions include demonstrative pronouns or demonstrative NPs. Demonstrative pronouns like *this* or *that* refer to an object only if the linguistic

utterance is accompanied by a non-linguistic demonstration or ostension. They
form a borderline case of the semantic-pragmatic interface since they do not
determine the referent of the expression by themselves but rather indicate that an
additional demonstration is to be undertaken. Like deictic expressions (*here, now*
etc.) demonstrative pronouns have a very impoverished lexical content. They
express the *here-there*-distinction in English and can indicate gender, case and
number in other languages. Demonstrative NPs like *this man, that book* etc. consist
of a demonstrative and a descriptive part. Thus, they identify their referent by
combining a demonstrative action with descriptive information about the referred
object.

(3a) *This* is my teacher.

(3b) I take *that*.

(3c) *This man* is very late.

(3d) I bought *that book*.

It is noteworthy, that in all Indo-European languages that have a definite article
the form of the article has developed out of the demonstrative pronoun. We come
back to this point later.

2.4 Personal Pronouns

The use of personal pronouns is traditionally analyzed either as deictic or as
anaphoric. In absence of any linguistic context, the pronoun *he* in (4a) most likely
refers to an object that must be in some way prominent in the context or "easy to
access". This deictic interpretation of the pronoun is licensed if the pronoun is
accompanied by a demonstration or if the non-linguist context contains some
prominent or salient object. Background knowledge may play an important role,
too. A pronoun is interpreted anaphorically, if it refers to an object that has been
already introduced into the discourse, as in (4b). The analysis of pronouns is
crucial for any theory of reference. Therefore, examples similar to (4c) and (4d)
have been discussed since classical times illustrating the interaction with other
expressions and constructions, like conditionals.

(4a) *He* will be late again.

(4b) A man walks. *He* whistles.

(4c) If a man is in Athens *he* is not in Rhodes.

(4d) If a man has a donkey *he* beats it.

2.5 Possessives

Possessive constructions like *John's car* consist of a common noun or head noun
(*car*) that is preceded by a definite expression or a modifier, like a pronoun, a

134 proper name or a definite description, but not by a demonstrative pronoun. Both
135 expressions are conjoined by the possessive "s" which indicates the definiteness of
136 the whole expression. Personal pronouns and the possessive "s" merge to pos-
137 sessive pronouns as in (5a). The possessive expression denotes exactly the object
138 that fulfills the property that is expressed by the common noun (cf. *car*) and that
139 further stands in a certain relation to the object that is denoted by the modifier
140 (cf. *John*). This relation can be determined by the lexical material of the head noun
141 if it is a functional concept, like *father*. Since for each person there exists exactly
142 one father, an expression of the kind *X's father* denotes always one person. If the
143 head noun does not denote a functional concept, but rather a sortal one as in (5b)
144 the relation is usually the possessor relation. *John's car* is that object that is a car
145 and has a certain relation to John, which is probably the car that John owns.
146 Possessive constructions of this kind should not be mixed with constructions of the
147 kind *the car of John*, because the definiteness in the latter case comes from the
148 definite article and not from the possessive relation.

149 (5a) *his claim*
150 (5b) *John's car*
151 (5c) *Lisa's father*
152 (5d) *the man's bag*

154 In the following I will concentrate on the use of definite NPs in natural language
155 since they form the most complex group of definite expressions. Definite NPs need
156 for their reference not only descriptive content but also contextual information of a
157 different kind. This combination of descriptive content and contextual information
158 makes their analysis not only difficult and controversial but also a very challenging
159 enterprise for semantic analysis. Definite NPs exhibit an interaction between the
160 different mechanisms and, hence, call for general principles explaining the way
161 they are linked with their referents.

162 ## 3 The Uses of Definite NPs

163 There are several different uses of definite NPs and even a more subtle categori-
164 zation of these uses. We will start with the overview that was presented by
165 Christophersen (1939). His work on articles is very prominent for two reasons.
166 Firstly, he not only summarizes the descriptive state of art, but also tries to give a
167 more abstract categorization of definiteness. And secondly, he was one of the first
168 who reacted to Russell's Theory of Descriptions. It is interesting to note that all
169 approaches except Russell's theory refer to Christophersen's work as precursor of
170 their ideas.

171 Christophersen (1939, 29) distinguishes between *the explicit contextual, the*
172 *implicit contextual* and *the situational basis* use for definite NPs. According to the
173 contemporary terminology in the literature we will call these three main groups

174 *anaphoric, relational* and *situational* use, respectively. I discuss a fourth group of
175 unique uses though Christophersen does not recognize it as a proper use, but rather
176 subsumes it under the three other uses (see Hawkins 1978 and Lyons 1999 for
177 further types of uses).

3.1 Anaphoric Linkage

179 In the anaphoric use (Christophersen's explicit contextual), the definite NP refers
180 to an object that is explicitly introduced by the linguistic context. Thus, definite-
181 ness is based on the principle of coreference.

182 (6) Once upon a time, there was a king, … and *the king* …
183

184   The object is introduced by the indefinite expression *a king* and then the ref-
185 erence is picked up by the definite NP *the king*. It could be picked up by the
186 pronoun *he* or by the demonstrative NP *that king,* as well. However, there are
187 differences in application of anaphoric pronouns, demonstratives or definite NPs.
188 One principle concerns the distance between the antecedent and the anaphoric
189 expressions: The further the distance between the first mention and the resumption,
190 the more likely it is to use the definite NP.

3.2 Relational Dependency

192 In the relational (associative, implicit contextual) use, the definite NP refers to an
193 object due to another already mentioned object in the discourse. However, it does
194 not refer to the same object like in the anaphoric linkage discussed in the last
195 subsection. The definite NP *the author* receives its referent not by coreference with
196 an antecedent expression, but rather by a significant association relation to the
197 antecedent *a book*.

198 (7a) I read a book. I cannot remember *the author*.
199 (7b) I bought a new car. I had to change *the motor*.
200 (7c) I bought a new car. ?I had to change *the wheel*.
201

202   The definite NP *the author* does not pick up the referent of another expression,
203 but it refers to an object that is unequivocally linked to a just mentioned object.
204 This is possible due to the relational (or functional) nature of the expression. An
205 author has to be an author of something, probably a book. The definite NP
206 expresses two things: its descriptive material delimits the class of potential ref-
207 erents and then establishes a relation to a mentioned object in discourse. In the
208 example (7a) this is done by the common noun *author*, which expresses the

209 relational concept between a person and a written text such that the person has
210 produced the text.
211   The link between a definite NP and an expression it is related to must be in
212 some way unique. Since nothing else than the relation is expressed, the relation
213 itself must unequivocally determine exactly one object. Otherwise one has to use
214 the indefinite article. The sentence *I bought a new car. I had to change the wheel* is
215 awkward without any further context. Therefore, functional expressions like *the*
216 *father* are preferred to relational expressions like *the wheel*. One can think of such
217 relational definite NPs as abbreviated possessive constructions. *The author* stands
218 for *the author of the book* or *its author* etc. It seems that the definite article stands
219 for the possessive construction discussed in Sect. 2.5 and could be easily replaced
220 by the appropriate possessive pronoun. However, the definite NP cannot be
221 substituted by a pronoun or by a demonstrative expression as illustrated in (7d).

222 (7d) I read a book. ?I cannot remember *this author/him*.
223

224   The relational concept of an definite NP must be lexically determined, whereas
225 possessive construction can be used in a wider range of contexts. The relational
226 property need not be lexically expressed, but can also be given by the context.

227 ## 3.3 Situational Salience

228 Definite NPs that are neither relational nor just mentioned can be used if the
229 situation or the non-linguistic context delivers additional information to single out
230 the referent.

231 (8a) *The island* is beautiful.
232 (8b) *The sun* shines.
233 (8c) *The talk* will start soon.
234 (8d) *The train* left two minutes ago.
235

236   The isolated sentences in (8) can only be uttered felicitously if the non-lin-
237 guistic context specifies which object is uniquely meant. This non-linguistic
238 context can consist in the shared background knowledge or in the actual cir-
239 cumstances. The latter should be the case when uttering (8a). If we stand at the
240 University of Konstanz and look around the lake uttering (8a) we mean the only
241 visible island, namely the Mainau. This use is sometimes called deictic or
242 demonstrative and has a special relation to demonstrative NPs (cf. 2.3), as the
243 definite article can be substituted by the demonstrative pronoun *this* or *that*. It is
244 interesting to note that in all Indo-European languages the definite article is
245 derived from the demonstrative pronoun. Therefore, Lyons (1977, II, 671ff.)
246 assumes that every definite NP contains a deictic element. This idea will be
247 formalized in Sect. 6. However, there are some cases in which we cannot replace
248 the definite article by the demonstrative: The definite NP *the sun* in (8b) refers

249 uniquely due to our background knowledge that there is only one sun (in the
250 relevant circumstances). In this case we cannot replace the definite article with the
251 demonstrative pronoun.

3.4 Uniques

253 Despite the fact that uniques do not form an independent class of definite NPs in
254 Christophersen's classification they should be discussed here. Uniques are nouns
255 whose lexical content is such that only one object can fit it. Thus, we find such
256 nouns in the latter two groups of definite NPs discussed above: A unique can
257 consist in a noun that expresses a functional concept, i.e. a concept that gives
258 exactly one value for each argument. It can also consist in a complex nominal
259 expression that due to its meaning refers only to one object (in the relevant
260 context) like *the first man on the moon*. *The sun* refers uniquely because there is
261 only one sun in our solar system. Or one can argue that *the sun* stands for the
262 relational concept of *sun of something* and given the case that all of us live on the
263 same planet, the sun of this planet refers to the only sun we have. Finally,
264 the definiteness could be reduced to the principle of salience as well: we refer to
265 the sun with "the sun", because it is the most salient sun. Uniques are used for
266 definitions and have got, therefore, a special place in logic and epistemology.
267 Certainly, in formal semantics their role is overestimated because they can be
268 captured by the other classes. In the remainder, we will disregard uniques as an
269 independent class and consider only the other three classes.
270   These uses of definite NPs are not independent of each other and sometimes it is
271 hard to classify a particular use. They often overlap and a definite NP refers
272 uniquely because there are linguistic and non-linguistic pieces of information
273 given in distinct ways. The question that arises is whether there is one basic use or
274 function of the definite NP and how we can describe it. In the next section we will
275 see that different approaches take different uses as primary and try to define the
276 other uses in terms of the chosen one.

4 Three Theories of Definiteness

278 We have mentioned above that definiteness is a pragmatic principle that has a
279 semantic impact. An analysis of definite expressions is a central task for every
280 semantic theory. In this section, I will characterize three alternative theories of
281 definiteness: Russell's classical Theory of Descriptions, Heim and Kamp's
282 Familiarity theory and Löbner's relational approach to definite expressions. In
283 Sect. 5, I introduce the salience approach which is based on the situational salience
284 of the referred object. Though the theories are confronted with the multiple uses of
285 definite NPs discussed in the last section, they assume that there is only one

286   underlying meaning of the definite NP that can be found in all of its uses. How-
287   ever, each of the theories chooses a different use of definite NPs as the primary one
288   and gives an adequate analysis of this use. The analysis is then extended to the
289   other uses. Further arguments for each of the discussed theories are gained if other
290   definite expressions, as discussed in Sect. 2, can be described in the same format or
291   according to the same principles. The first three theories mentioned are successful
292   in their primary area, but they cannot convincingly describe other uses of definite
293   NPs. Therefore, a more general approach will become necessary.

294   The Russellian Theory of Descriptions is the clearest and the best understood
295   approach. It gives a clear formal representation of definite and indefinite NPs as
296   quantifier phrases. In this way certain ontological and epistemological problems
297   with non-existent objects are solved. The definite article expresses the uniqueness
298   condition, either as an assertion (Russell 1905) or as a presupposition (Frege 1892;
299   Strawson (1950), and most contemporary theories, as presented in Abbott 2004;
300   Ludlow 2007 or Heim 2011). Definite NPs are represented as quantifier phrases,
301   and typical ambiguities can be explained in terms of quantifier interaction and
302   scope. The problematic uniqueness condition is amended by a rule of domain
303   restriction, which is also necessary for the interpretation of other quantifiers. Still,
304   this approach is conceptually and technically grounded on the unique use of
305   definite NPs, and not easily transferable to other uses of definite NPs. The
306   uniqueness condition poses a general problem, and several arguments show that
307   definite and indefinite NPs are not quantifier phrases but terms (e.g. Löbner 1985;
308   Egli 1991; von Heusinger 1997; but see for arguments in favor of the quantifier
309   view Abbott 2004; Ludlow 2007; Heim 2011).

310   All of the three following theories, namely Heim and Kamp's familiarity the-
311   ory, Löbner's functional approach and the salience approach, introduced in the
312   next section, can be understood as a reaction to the very strong Russellian
313   assumptions. It is noteworthy that all of them refer in one way or another to
314   Christophersen's original work and claim that they spelled out his original ideas.
315   Heim and Kamp's approach focuses on the anaphoric use of definites in a dis-
316   course. This view gave rise to the new generation of dynamic semantic theories,
317   which do not analyze isolated sentences, but an entire discourse. Heim and Kamp's
318   familiarity theory claims that there is a uniform representation of definite and
319   indefinite NPs as open sentences with free variables at the additional level of
320   discourse representation. The indefinite article indicates that a new variable has to
321   be introduced whereas the definite article expresses that the open sentence has to
322   be linked to an already introduced variable, i.e. to a familiar variable. Thus, Heim
323   and Kamp claim to have adapted Christophersen's familiarity on the level of
324   discourse representation. Anaphoric pronouns can be described by means of the
325   same formalism and for deictic expression the formalism can be extended in an
326   acceptable way. In this view, definite and indefinite NPs are not represented as
327   quantifier phrases but as singular terms, which nevertheless can be bound by
328   higher operators.

329   Löbner's relational approach occupies a position between the two former the-
330   ories. On the one hand he focuses on the relational use of definites like Russell (i.e.

331 narrow scope definites) and rejects Heim and Kamp's approach that concentrates
332 on the anaphoric use. On the other hand he refuses all three of Russell's claims,
333 namely (1) that definite NPs are quantifier phrases, (2) that there is a uniform
334 semantics of definite and indefinite NPs, and (3) that uniqueness is a property of
335 the descriptive material of a definite NP. He rather takes definite NPs as terms like
336 proper names, whereas indefinites are quantifier phrases. Instead of Russell's
337 uniqueness condition he uses Christophersen's view according to which definite
338 NPs refer unambiguously. This fits well into the formal representation of definites
339 as terms since a term refers uniquely *per definitionem.* In contrast to Heim and
340 Kamp's approach, definites do not express a global definiteness (wide scope) but
341 rather a local definite relation. A global relation can be constructed by chains.

4.1 Russell's Theory of Descriptions

343 Russell takes the uniques as the prototype of definite NPs or definite description.
344 His uniques are generally functional concepts, like *the center of the solar system* or
345 *the father of Bertrand Russell.* He does account for context dependencies, which
346 do not play any role in mathematics and logic. Furthermore, context has no place
347 of its own at the formal level of analysis in his conception of a language as formal
348 system. However, Russell's Theory of Descriptions is a very common view among
349 formal semanticists since it is a well developed theory, which fulfills logical,
350 ontological and epistemological standards. Russell (1905) represents the definite
351 article with the "iota operator" as in (9a), which is contextually defined as a
352 complex quantifier phrase consisting in the uniqueness condition, the existential
353 condition and the matrix predication, as spelled out in (9b). The iota operator can
354 represent complex possessive constructions, like in (10):

355 (9)   The father of Bertrand Russell was English.
356 (9a) English(ιx Father_of(b, x))
357 (9b) $\forall$x [Father_of(b, x)) & $\exists$y [(Father_of(b, y)) $\rightarrow$ x = y] & English(x)]
358 (10) Bill's father's dog's basket = the basket of the dog of the father of Bill
359 (10a) ιx [Bx(ιy (Dy ιz(Fzb))]
360

361   Neale (1990) gives an excellent defense of the Russellian approach and extends
362 it to more sophisticated problems. Especially, he successfully exploits the Rus-
363 sellian iota terms for describing functional dependencies as in (11). He further
364 integrates the treatment of so called "E-type pronoun", i.e. cross-sentential pro-
365 nouns, into this formalism by using complex iota terms like in (12b):

366 (11) Every man loves the woman that raised him.
367 (11a) $\forall$x Mx $\rightarrow$ Lx(ιy)(Wy & Ryx))
368 (11b) $\forall$x Mx $\rightarrow$ $\exists$y [(Wy & Ryx) & $\forall$z [(Wz & Rzx) $\rightarrow$ z = y] & Lxy]
369 (12) A man walks. He whistles.

(12a) A man walks. The man who walks whistles.

(12b) $\exists x [Mx \& Wx] \& Wh(\iota x [Mx \& Wx])$

However, there seem to be some problems with Russell's theory that concern the uniqueness condition: it is too strong for natural language descriptions. And even if we assume domain restrictions, as for other quantifiers, it is still an open question, whether we can restrict the relevant domains such that the definite NP always corresponds to exactly one referent that fits its descriptive content. An additional problem is that the difference between the definite and the indefinite article lies only in this problematic uniqueness condition. Finally, in this analysis definite NPs do not belong to the class of referring terms like proper names and pronouns, but to the class of denoting phrases like quantifiers.

4.2 Heim and Kamp's Familiarity Theory

With the beginnings of the eighties a new generation of semantic theories was developed (Kamp 1981; Heim 1982) that uses an additional level of representation. This representational level was motivated by linguistic investigation into anaphora (Karttunen 1976), by research of artificial intelligence into the representation of discourse (e.g. Webber 1983) and by philosophical investigations (cf. Stalnaker 1978). There are two main aims of these new theories. One is to extend the semantic representation from the sentence to discourse phenomena. The discourse representation level should model not only the meaning of a sentence, but also the information of a whole discourse. The second aim is to represent definite and indefinite NPs in a uniform way as discourse referents that 'live' on the discourse representation level, but not necessarily in the real world. Hence, ontological problems with non-existent objects can be solved by describing them as discourse referents with a short 'livespan'. The emphasis of these theories lies in the investigation of discourse anaphora that carry on certain information from one sentence to the following sentences. This is also the beginning of a dynamic view of meaning.

Thus, the most prominent discourse phenomenon that is treated in this approach is the anaphoric linkage between sentences. The core meaning of definite NPs is seen in the anaphoric use. An indefinite NP introduces a new discourse referent into the discourse representation, whereas a definite NP is anaphorically linked to an already introduced or 'familiar' discourse referent. This view on definiteness is traced back to Christophersen (1939) and his familiarity theory, which says that an indefinite NP introduces a new referent and a definite NP refers to an old or familiar referent. However, Heim and Kamp transfer this principle to the level of discourse representation to avoid ontological problems. The indefinite NP *a man* in (13) introduces a new discourse referent d_1 in (13a). The definite pronoun *he* in the second sentence of (13) introduces the discourse referent d_2 which is identified with the first one in (13b) expressing the anaphoric relation in (13). Discourse

referents can also be bound by other operators like conditionals in (14) and (15) which are interpreted as universal adverbial quantifiers (cf. Lewis 1975):

(13) A man walks. He whistles.

(13a) $\{d_1 \mid M(d_1) \,\&\, W(d_1)\}$

(13b) $\{d_1, d_2 \mid M(d_1) \,\&\, W(d_1) \,\&\, d_1 = d_2 \,\&\, Wh(d_2)\}$

(14) If a man is in Athens he is not in Rhodes.

(14a) $\forall\{d_1 \mid M(d_1) \,\&\, A(d_1)\} \, \{d_1 \mid \neg Rh(d_1)\}$

(15) If a man has a donkey he beats it.

(15a) $\forall\{d_1, d_2 \mid M(d_1) \,\&\, D(d_2) \,\&\, O(d_1, d_2)\} \, \{d_1, d_2 \mid B(d_1, d_2)\}$

In this analysis indefinite NPs are not scope-bearer by themselves, but get scope assigned by some other operator, such as the conditional in (14) or a text-level existential operator as in (13). Definite NPs get wide scope, i.e. at least the scope over the sentence they are constituents of. This mechanism explains the anaphoric use of definite NPs. It shows how the information that is needed for establishing anaphoric linkages is carried on in discourse.

However, such theories face problems with the other uses of definite NPs. The situational use is explained by the assumption that in such cases non-linguistic information may introduce discourse referents to which definite NPs can be linked. The sentences listed in (8) can only be uttered if the non-linguistic context delivers an object that introduces a discourse referent. This mechanism allows for an analysis of both deictic pronouns and definite NPs by creating one domain for linguistic and non-linguistic information. However, there may be a problem of delimiting the non-linguistic information that is needed for the semantic analysis.

Relational definite NPs cause a different problem. They can be bound by a higher operator in the same sentence (cf. Heim 1982, 245ff).

(16) Every man saw the dog that barked at him.

This problem is generally solved by introducing a new kind of rule, namely accommodation according to Lewis (1979). An accommodation is possible if the sentence cannot be interpreted felicitously. This may be the case if one processes a sentence and comes across a definite NP without an antecedent. Then the alternative consists in rejecting the whole sentence or in accommodating it. If one has good reasons to think that the given sentence is felicitous, one has to apply accommodation. The accommodation rule says that one can add a new property that stands for a functional concept whose argument must already be given. In the following sentence, the definite NP *the dog that barked at him* introduces a new complex $D(x) \,\&\, B(x, y)$ for the functional concept *dog that barked at y* and the argument *y* refers to the discourse referent d_1 that is introduced by the NP *a man*.

(17) A man saw the dog that barked at him.

(17b) $\{d_1, d_2 \, [D(x) \,\&\, B(x, y)] \mid M(d_1) \,\&\, d_2 = \iota x \, [D(x) \,\&\, Bark(x, d_1)] \,\&\, S(d_1, d_2)\}$

To sum up, we have seen that the representational approach with the familiarity principle explains the anaphoric use of definites in an elegant way. However, for

455 the situational and relational use, some modifications are necessary. The situa-
456 tional use is explained by stipulating that non-linguistic context can establish
457 discourse referents as well. In this way, the deictic use of definites in general (i.e.
458 deictic NPs and deictic pronouns) gets a uniform analysis together with the ana-
459 phoric use (of NPs and pronouns). The most obvious problem with this stipulation
460 is that it is difficult to delimit the non-linguistic information that is necessary. The
461 relational use of definites is explained by accommodation, i.e. a pragmatically
462 determined repair of semantic procedures. If the semantic analysis does not find an
463 antecedent for a definite expression, one may introduce the relational concept such
464 that one argument is filled by an antecedent expression. This move to save the
465 theory is not unproblematic since the restriction of this very powerful rule is not
466 obvious. And if one needs such powerful mechanism, the question arises whether
467 this mechanism is only a repair mechanism or whether it represents the real
468 character of the definite NP. This position is discussed in the next section.

469 ## 4.3 Löbner's Relational Approach

470 Löbner (1985) takes the complementary position to Heim and Kamp, namely that
471 the prototypical use of definite NPs is not the anaphoric but the relational or
472 functional use. However, he differs also dramatically form the Russellian
473 approach. According to Löbner the definite article has no lexical meaning, but just
474 indicates the way the reference is established, namely that the expression refers
475 non-ambiguously.[1] This function was already defined by Christophersen. "I agree
476 with Christophersen that the crucial feature of definiteness is non-ambiguity of
477 reference" (Löbner 1985, 291).[2] It means that a definite NP cannot be represented
478 by a quantifier phrase, but must be reconstructed by a term, like proper names and
479 pronouns. The Russellian case, where the definite NP refers due to its descriptive
480 material that uniquely denotes an object, comes out as a special case of unam-
481 biguous reference.

482 Löbner (1985, 299) distinguishes between semantic and pragmatic definites.
483 "Semantic definites refer unambiguously due to general constraints; Pragmatic
484 definites depend on the particular situation for unambiguous reference." Thus, he
485 merges the anaphoric use and the situational (or deictic) use into one class, which
486 he coins pragmatic definite. The relational use becomes the semantic definites and
487 the paradigm of definite NPs. "An NP is semantic definite if it represents a
488 functional concept, independently of the particular situation referred to" (Löbner
489 1985, 299). An expression is inherently functional if it needs a further argument to
490 refer to an object. This argument can be implicitly expressed by the situation like

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[1] Löbner (1985, n8) notes that the German word *eindeutig* expresses this very accurately.

[2] He further rejects the claim of Heim and Kamp to have reformulated Christophersen's familiarity theory, but argues that they have deviated from the original idea.

weather, prime minister, post office etc. and like proper names. This is what we
have called the larger situational use of the definite article. The argument can also
be explicitly expressed by an overt object argument like *father of_, capital of_,*
The argument slot need not be filled by another definite expression. It can also be
filled by an indefinite or quantificational expression:

(18) The mayor of a small town in Wales.

(19) Every man loves his wife.

   Examples like these suggest that the definiteness has not to be considered as a
property of (global) reference (cf. Lyons 1977) but as a local property of the link
between the head and its argument. (18) means that there is a definite relation from
the town (whatever it is) to its mayor. Löbner confirms this view of definiteness by
the following class of examples, which he calls configurational use.

(20) He was the son of a poor farmer.

(21) He put his hand on her knee.

   Again, the definiteness expresses a local determined relation between two
arguments. It expresses neither a global definite reference nor any uniqueness
condition of the definite term.

   Pragmatic definites consist in anaphoric and deictic uses of definites. Löbner
explains their use in terms of functional concepts. A pragmatic definite is a
function from an established situation to an (unique) object. He develops some
kind of discourse network to show that definite relations exist in local relation.
However, Löbner does not give any formal definition of what a discourse consists
of and which parts influence the definite NPs. Since he focuses on the local effect
of definiteness he cannot account for the discourse phenomena of definite NPs.
Therefore, he regards anaphora only as an epiphenomena and not as the central use
of definite NPs.

5 The Salience Theory of Definiteness

Neither Russell's Theory of Description, nor Heim and Kamp's discourse repre-
sentation or Löbner's relational view can analyze all uses of definite NPs.
Therefore, a more general approach is necessary, which takes the situational use as
the central one of definite NPs. The salience approach essentially incorporates
contextual information into the representation of definite expression. The contri-
bution of the context to the interpretation of the definite NP consists in a salience
hierarchy. It is assumed that each context can be associated with an ordering
among the elements of subsets of the domain of discourse. The definite NP *the F*
denotes the most salient F according to the situation *i*. This representation com-
pletes the ideas of discourse representation theories by producing a more com-
prehensive picture: a definite NP is not only linked to an already introduced

531 discourse referent, it is rather linked to the most salient discourse referent of the
532 same kind so far.

533   The salience theory of definiteness has three historical sources: first, Lewis
534 (1979) criticizes Russell's Theory of Descriptions and sketches an alternative
535 theory using a salience ranking instead of Russell's uniqueness condition. Second,
536 the investigation of the Prague School (cf. Sgall et al. 1973; Hajicová et al. 1995)
537 developed an information structure of a sentence the pragmatic background of
538 which is a hierarchy of "activated" referents. Third, research in artificial intelli-
539 gence showed that discourse models need a structure or hierarchy of referents that
540 is very similar to Lewis' concept of salience (cf. Grosz et al. 1995).

5.1 Lewis' Theory of Salience

542 Lewis (1970, 63) develops the concept of salience in the philosophical and lin-
543 guistic discussion of the Russellian Theory of Descriptions:

544   Second, consider the sentence 'The door is open'. This does not mean that the one and
545   only door that now exists is open; nor does it mean that the one and only door near the
546   place of utterance, or pointed at, or mentioned in previous discourse, is open. Rather it
547   means that the one and only door among the objects that are somehow prominent on the
548   occasion is open. An object may be prominent because it is nearby, or pointed at, or
549   mentioned; but none of these is a necessary condition of contextual prominence. So
550   perhaps we need a *prominent-objects coordinate*, a new contextual coordinate independent
551   of the other. It will be determined, on a given occasion of utterance of a sentence, by
552   mental factors such as the speaker's expectation regarding the things he is likely to bring
553   to the attention of his audience.

554   Lewis (1979, 178) rejects Russell's uniqueness condition for definites or any
555 modified version of it: "It is not true that a definite description 'the F' denotes x if
556 and only if x is the one and only F in existence. Neither is it true that 'the F'
557 denotes x if and only if x is the one and only F in some contextually determined
558 domain of discourse." He considers the following examples, in which two indi-
559 viduals are introduced by the same definite NP (in the non-generic reading):

560 (22) The pig is grunting, but the pig with floppy ears is not grunting.
561 (23) The dog got in a fight with another dog.

563   In both examples two individuals with the same property are introduced into the
564 discourse. However, the definite NP should unambiguously refer to one object.
565 Note that no functional concept plays a role, since *pig* and *dog* are sortal concepts
566 (except one would claim a functional concept from situations into objects of the
567 mentioned kind). An anaphoric link to another expression seems not to be relevant
568 here. Thus, the definite NP must refer uniquely according to another and more
569 general principle. Lewis (1979, 178) names this principle *salience*:

570 The proper treatment of description must be more like this: 'the F' denotes x if and only if
571 x is the most salient F in the domain of discourse, according to some contextually
572 determined salience ranking.

573 However, there has been no attempt to formalize this concept in order to
574 integrate it into formal semantics.[3]

5.2 The Praguian School

576 The Prague School has developed a dynamic view of the information expressed in
577 a sentence. In this approach, the "stock of shared knowledge" (Sgall et al. 1973,
578 70) constitutes the common background of the speaker and the hearer. It is the set
579 of potential referents for definite expressions. This set is further divided into
580 background and foreground information, which depends on encyclopedic knowl-
581 edge, context information and thematic structure of the sentence. Besides this
582 dichotomy, there is a further structure which are described in the following way
583 (Sgall et al. 1973, 70f.):

584 There is no clear-cut dichotomy in the stock of shared knowledge, and it would be,
585 probably, more adequate to work here with a kind of ordering than with two subclasses.
586 Let us remark that the mentioning of an element of the stock of shared knowledge brings
587 this element into the foreground of the stock, and, in some respects, it is possible to
588 conceive the last mentioned element to be more foregrounded that the elements mentioned
589 before, the foregrounding of which already shades away step by step, if it is not supported
590 by some specific moments due to the given situation.

591 In the extended system of Sgall et al. (1986, 54f.), different ways of shifts in a
592 discourse model ("hearer's image of the world") are assumed. One of this shift is
593 described in terms of a salience hierarchy:

594 not the repertoire [of objects, relations etc., K.v.H.] itself is changed, but a certain rela-
595 tionship between its elements, namely their salience, foregrounding, or relative **activation**
596 (in the sense of being immediately 'given', i.e. easily accessible in memory).

597 Hajicová et al. (1995, 14ff.) show how the position of an element in a sentence
598 may effect its force to shift the salience: "(…) the activation of an item in SSK
599 [=stock of shared knowledge, K.v.H.], if conceived as its attractiveness towards
600 pronominal anaphora, seems to depend on in which position the item has been
601 mentioned for the last time and on how many utterances have passed since that
602 time point." They show that the choice of different pronouns (weak or strong) in

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[3] Heim (1982, 21f.) additionally shows that the pragmatic concept of salience is too coarse-
grained (the argument is due to Barbara Partee). In examples (1) and (2), the salience of the lost
marble is raised by the preceding sentence. However, only in (1) the anaphoric linkage is
possible. It seems that the structure of the expression plays an important role:

(1) I dropped ten marbles and found all of them, except for one. It is probably under the sofa.
(2) I dropped ten marbles and found only nine of them. # It is probably under the sofa.

603 Czech depends on this hierarchy of salience in the stock of shared knowledge. This
604 view differs from Lewis' concept in that salience is regarded as a property of the
605 cognitive discourse model, rather than as a property of the discourse such. Fur-
606 thermore, it concentrates on the use of pronominals rather than on the analysis of
607 definite NPs.

608 ## 5.3 The AI Approach

609 Computational analyses of discourse assume additional structures for discourse
610 models in form of a hierarchy. Such analyses treat referential process on par with
611 the representation of the discourse in structured models. Sidner (1983) develops a
612 system in which a focus-algorithm administrates the activation and focusing of
613 potential referents such that anaphoric expressions can be linked to a focused
614 expression. According to Grosz and Sidner (1985, 3), a general discourse model
615 consists of three components: "a linguistic structure, an intentional structure, and
616 an attentional state." The third component encodes the dynamic hierarchy between
617 the different discourse objects. Grosz and Sidner (1985, 9) define them in the
618 following way:

619 The third component of discourse structure, the attentional state, is an abstraction of the
620 participants' focus of attention as their discourse unfolds. The attentional state is a
621 property of discourse, not of discourse participants. It is inherently dynamic, recording the
622 objects, properties, and relations that are salient at each point in the discourse.

623 In contrast to the Praguian approach, this structure does not depend on the
624 hearer or speaker, but it is a property of the context (like in Lewis' view). Webber
625 (1983, 335) distinguishes between the act of reference by the speaker, and the
626 referential behavior of expression in a certain discourse:

627 That is, "referring" is what people do with language. Evoking and accessing discourse
628 entities are what texts/discourses do. A discourse entity inhabits a speaker's discourse
629 model and represents something the speaker has referred to. A speaker *refers* to something
630 by utterances that either *evoke* (if first reference) or *access* (if subsequent reference) its
631 corresponding discourse entity.

632 Grosz et al. (1995, 205) use the term "centering" instead of "focusing" or
633 "evoking". They distinguish between "forward looking centering", which raises
634 certain entities to salience, and "backward looking centering", which links ana-
635 phoric expression to such salient entities. The elements of the set of forward
636 looking centers "are partially ordered to reflect the relative prominence" (209).
637 They discuss a number of factors that may affect the ordering on these elements.
638 However, they do not give a formal account of this that could be integrated into a
639 formal approach to sentence and discourse meaning.

5.4 Salience and Discourse

According to Lewis (1979), a definite NP refers to the most salient object in the discourse that fits the descriptive content. And he notes further that the salience ranking depends on the context, i.e. it is not global in the sense that each expression gets its referent for global constraints nor it is local in the sense of Löbner, since once established it can keep its ranking during the whole discourse if there is no other salience changing expression. This property of changing the salience may be exemplified by the following example given by Lewis (1979, 179):

> Imagine yourself with me as I write these words. In the room is a cat, Bruce, who has been making himself very salient by dashing madly about. He is the only cat in the room, or in sight, or in earshot. I start to speak to you:

(24) The cat is in the carton. The cat will never meet our other cat, because our other cat lives in New Zealand. Our New Zealand cat lives with the Cresswells. And there he'll stay, because Miriam would be sad if the cat went away.

In terms of discourse representation theory, where the salience shifting potential cannot be encoded, the representation would look as follows: The first sentence in (24) introduces a discourse referent, that must be linked to an already introduced one. The second sentence refers to this referent by the expression *the cat* and introduces a new discourse referent with the same property of being a cat and the further relation that belongs to the speaker (and the presupposition that the first cat belongs to the speaker, as well). The third sentence refers to the second introduced cat by the expression *our New Zealand cat*. And the fourth sentence is anaphoric linked to that cat by the expression *he* and *the cat*. However, in a discourse representation there would be no difference in the accessibility of the discourse referents. Therefore, the theory must rely on further information.

However, if we modify the theory and let the indefinite NP not introduce a discourse referent but let it give the highest salience ranking to an individual that fits the description, a definite NP would then refer to the object that fits the description and that has the highest salience rank.[4] The first sentence introduces a new cat, lets say Bruce, into the discourse and raises him to the most salient cat, such that the definite NP *the cat* in the next two sentence can refer to this salient cat Bruce. The third sentence refers to this cat and introduces a second cat Albert, that gets a lower rank. Therefore, in the following two sentences we have to refer to Albert by an unambiguous description (*our other cat* and *our New Zealand cat*). Since in sentences (iv) and (v) only we talk only about Albert, he gains it the first

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[4] "Thus although indefinite descriptions – that is, idioms of existential quantification – are not themselves referring expressions, they may raise the salience of particular individuals in such a way as to pace the way for referring expressions that follow" (Lewis 1979, 180).

679 rank of the salience hierarchy such that in the last sentences we can refer to Albert
680 by the pronoun *he* and by the definite NP *the cat*.

681 (25) Discourse Ranking
682 (i) In the room is a cat Bruce
683 (ii) The cat is in the carton. Bruce
684 (iii) The cat will never meet our other cat, Bruce > Albert
685 (iv) Because our other cat lives in New Zealand. Albert, Bruce
686 (v) Our New Zealand cat lives with the Cresswells. Albert, Bruce
687 (vi) And there he'll stay, because Miriam would Albert > Bruce
688 (vii) Be sad if the cat went away. Albert > Bruce

690   This salience ranking can be represented in the following schema, which goes
691 back to Hajicová (1993, 77). The mechanism used there is more fine-grained since
692 it also considers the topic-focus structure of the text. This is especially important
693 for the resolution of anaphoric pronouns. However, it seems that it is less
694 important for anaphoric definite NPs. Moreover, it is not clear how the Praguian
695 approach integrates the descriptive material of the NPs in questions. This becomes
696 relevant in cases where we have more than one individual of the same kind, like in
697 sentence (iii). The anaphoric reference in sentence (iv) is possible because the
698 definite NP contains the description "other cat", which identifies only one cat.

699 (25a) *Schematic representation of the salience ranking*
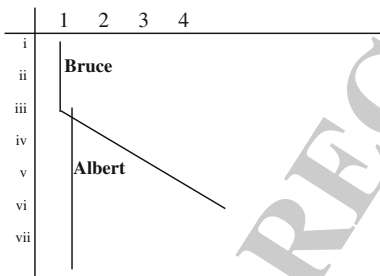
702   With the illustration of this small discourse the anaphoric use of definite
703 descriptions is explained in terms of salience. That means that the anaphoric use
704 can be seen as a specialized form of deictic use. In this way a uniform conception
705 of definite NPs and deictic and anaphoric pronouns is possible.

706 ## 6 Salience and Choice Functions

707 The concept of salience was never formally reconstructed although it was often
708 regarded as an essential part for fixing the referent of definite expressions. In this
709 section I develop a formal reconstruction of salience by means of context
710 dependent choice functions. A choice function f is defined as the operation of
711 assigning to a non-empty set one of its elements (It is not defined for empty sets).

712 Recently, choice functions are used to represent wide scope indefinites (Reinhart
713 1997; Winter 1997; Kratzer 1998). This type of choice functions are *local* choice
714 functions (see below), while I use *global* choice functions in the sense of Egli
715 (1991) and Egli and von Heusinger (1995). A global choice function depends on
716 the shared knowledge between speaker and hearer or the common ground. A
717 choice function selects the first element of an ordered set. Different choice func-
718 tions can select different elements from one and the same set, i.e. the ordering of
719 the elements in the set may differ. Peregrin and von Heusinger (2004) and von
720 Heusinger (2004) combine the choice function approach with a dynamic logic. I
721 try to keep the choice function mechanism as informal as possible.

722   Let us consider a situation where we have three cats *Albert, Bobby* and *Casimir*
723 and three owners of the cats, *Ann, Beatrice* and *Carola*, respectively. The definite
724 NP *the cat* is represented as the context dependent choice function applied to the
725 set of cats $f_i(cat)$, which refers to the most salient cat in the context i. The different
726 situations and accordingly the choice functions vary in the cat that is the most
727 salient cat of the set of the three cats. We can define three choice functions (I use
728 bold letters for indicating the objects of the model: **bobby** is the object we refer to
729 by the name "Bobby"):

730 (27a) f_{ann} assigns to the set {**albert**, **bobby**, **casimir**} the cat **albert**
731 (27b) $f_{beatrice}$ assigns to the set {**albert**, **bobby**, **casimir**} the cat **bobby**
732 (27c) f_{carola} assigns to the set {**albert**, **bobby**, **casimir**} the cat **casimir**

734   Given this model with the defined choice functions, we can represent sentence
735 (28) by the logical form (28a). The context index is informally integrated into the
736 logical form in (28b). The interpretation (28c) of this representation proceeds
737 according to compositional rules: The sentence is true if the extension of the
738 definite NP *the cat* lies inside the extension of the predicate *very intelligent*. In
739 order to fix the extension of the definite NP, the choice function $f_{beatrice}$ is applied
740 to the set of cats yielding the individual **bobby** as value:

741 (28) The cat is very intelligent uttered by Beatrice
742 (28a) Very_Intellegent(f_i(cat) uttered by Beatrice
743 (28b) Very_Intelligent($f_{beatrice}$(cat)

745   A sentence with two individuals of the same characterization can be analyzed
746 like (29). The two individuals are described by choice functions applied to sets of
747 dogs. Additionally, the second mentioned dog is represented by the choice func-
748 tion applied to the set of dogs that does not contain the most salient dog, i.e. the
749 functions picks out the second most salient dog: $f_i (\lambda y \mid y$ is a Dog $\& y \neq f_i(Dog)]$,
750 which indicates that the referred object is not identical with the first chosen dog.
751 i.e. it is the second most salient dog (cf. Egli and von Heusinger 1995, von
752 Heusinger 1997):

753 (29) The dog got in a fight with another dog.
754 (29a) Got_a_Fight(f_i(Dog), $f_i(\lambda y \mid y$ is a Dog $\& y \neq f_i(Dog)]$

755

6.1 *The Situational Use*

In the following subsections we will apply this formal reconstruction of salience, and hence definiteness, to the different uses of the definite NP, which were already discussed in Sect. 3. In the last example we saw how the situational context determines the choice of the object. Definite descriptions of the following kind crucially depend on context information. We will encode this information into the context index:

(30a) the sun $f_i(Sun)$
(30b) the university $f_i(University)$
(30c) the republic $f_i(Republic)$
(30d) the table $f_i(Table)$

We can now insert an argument in the situational index and fix the choice function. For example, if we are here in Cologne and speak of the republic we can fill the index slot with *cologne* and get the following expression:

(30e) $f_{cologne}(Republic)$

This term denotes that object that is a republic and that is first selected by a choice function, called *cologne*. Of course, we would define this choice function in such a way that it picks up first the German Federal Republic. This formalism implies that definite NPs contain an indexical element (see Wettstein 1981).

6.2 *The Anaphoric Use*

The representation of definite NPs as context dependent choice functions is a very general analysis and can be adapted to more specific uses. In the case of the anaphoric use the situation index has to be made exclusively dependent on the linguistic information of the discourse. We assume that the linguistic context in the discourse can raise the salience of an object by different means. One very obvious means is to refer to this object by a definite or an indefinite NP. The indefinite NP is used when the object has not yet been mentioned and the definite NP is used if the object was mentioned before. However, both make the object salient as the example (24) with the cats showed. In order to represent indefinite NPs we use *local* choice functions, i.e. choice functions that are different from the global choice function that is used for interpreting the definite NPs. A local choice function (see Reinhart 1997; Winter 1997; Kratzer 1998; von Heusinger 2002) is a newly introduced choice function, either bound by a local salient agent or existentially bound at some structural configuration, but not higher than the text level. We index such local choice functions by *x, y, z*.

793   The anaphoric linkage can be decomposed into the salience change potential of
794 an expression and the contextually dependent interpretation of another expression
795 as illustrated in example (31). In (31) the indefinite NP *a man* in the first sentence
796 introduces an arbitrary object d, which then becomes the most salient object of the
797 set of men. Thus, the indefinite not only updates the set of referents but also
798 updates the salience structure of the set of men (this feature distinguishes the
799 salience theory of definiteness from the familiarity theory). Therefore, the definite
800 NP, which refers to the most salient man, denotes the same object d as the
801 indefinite. In the representation, we assume that the indefinite NP changes the
802 given context i to the context j. The difference between the two context indices
803 reduces to the difference of choice function assignments. The assignment of the
804 updated global choice function f_j is equal to that of the initial global choice
805 function f_j except for the value of the set of men, which is d. This individual has
806 been introduced by the indefinite NP *a man* (for a more detailed formalism, see
807 Peregrin and von Heusinger 2004, von Heusinger 2004).

808   (31) A man comes. The man smokes.
809   (31a) Comes(f_x(Man)) & Smokes(f_j(Man)) with f_x(Man) = d
810   (31b) $f_j = f_i$ « $[[Man]]^{M,g}/d$ » with f_j(Man) = d

812   We generally indicate the update of a choice function by a set **s** and its new
813 assignment **a** inside double angle brackets: $f_j = f_i$ « ***s/a*** » : f_j is equal to f_i except
814 for the assignment to the set **s**, which is **a**.
815   We can account for anaphoric pronouns in the same way. They are represented
816 as very general choice function terms: f_i (λx [$x = x$]). The property [$x = x$]
817 denotes the individual domain D. Such a choice function term picks up the most
818 salient object in discourse, which is in sentence (32) identical with the most salient
819 man: $f_i(\lambda x [x = x]) = f_j(Man)$. In order to license the link between the indefinite
820 NP *a man* and the anaphoric pronoun, we must modify the salience change
821 potential of NPs. It does not only change the assignment for the set of men, but
822 also for certain supersets, e.g. the set of all (male) objects (in the following we
823 disregard gender differences):

824   (32) A man comes. He smokes.
825   (32a) Comes(f_x(Man)) & Smokes(f_j(λx [$x = x$]))
826   (32b) $f_j = f_i$ «$[[Man]]^{M,g}/d$, D/d»

828   We have now created the adequate means to describe even longer discourse
829 fragments like (25), which is repeated as (33). We assume that each sentence has
830 its own contextual index, i.e. is interpreted according to an optionally updated
831 global choice function. The relation between the different choice functions is
832 indicated by the equations. Generally, the choice functions are identical except for
833 the assignment of the sets that are denoted by the properties in the NPs and the
834 domain D of individuals, i.e. they are updates of the preceding choice functions in
835 respect to the used NPs. In (33i), the indefinite NP *a cat* refers to Bruce and
836 changes the choice function f_i to the choice function f_1. f_1 is equal to f_i except that

837 is assigns **bruce** to the set of cats and to *D*. Therefore, the definite NP *the cat* refers
838 to **bruce**, too. Since **bruce** is already the most salient cat, sentence (33ii) does not
839 change the actual salience hierarchy and its formal counterpart, the choice function
840 f_2. Sentence (33iii) changes the assignment to the set of *other cats* to **albert**, and
841 the next two sentences change the assignments to the set of cats and the universal
842 set to **albert**, too. The definite expressions *he* in (33vi) and *the cat* in (33vii) refer
843 to this very cat **albert**:

844 (33i) In the room is a cat
845

846   In_the_Room(f_1(Cat) $f_1 = f_i$ «[[Cat]]^{M,g}/**bruce,** D/**bruce**»

847 (ii) The cat is in the carton.
848

849   In_Carton(f_2(Cat)) $f_2 = f_1$

850 (iii) The cat will never meet our other cat,
851

852   Never_Meet(f_3(Cat(x)), $f_3(\lambda y [Cat(y) \& y \neq f_3(Cat))])$
853   «[[other cat[[M,g/**albert**» $f_3 = f_2$

854 (iv) because our other cat lives in New Zealand.
855

856   Lives_in_New_Zealand(f($\lambda y [Cat(y) \& y \neq f_4(Cat))])$ $f_4 = f_3$

857 (v) Our New Zealand cat lives with the Cresswells.
858

859   Lives_with_Cresswells(f_5(Cat & In_New_Zealand])
860                              $f_5 = f_4$ «[[New Zealand cat]]^{M,g}/**bruce,** D/**bruce**»

861 (vi) And there he'll stay,
862

863   Stay(f_6([x = x]) $f_6 = f_5$

864 (vii) because Miriam would be sad if the cat went away.
865

866   Miriam_Would_Sad_If_Went_Away(f_7(Cat) $f_7 = f_6$

6.3 The Relational Use of Definite NPs

868 A choice function term can express complex dependencies by embedding, i.e. if a
869 term is dependent on other terms this can be expressed by a parameter inside the
870 term. Definites without further modifications have wide scope since they are
871 dependent on the situation whose scope is certainly wider than the sentence in
872 which the definite NP stands. The definite NP in (34) has wider scope than the
873 quantifier expression *every man*. However, if we add the relative clause *that*
874 *barked at him* the definite NP is narrow scoped, since the universal quantifier binds

a variable inside the term. The denotation of the set depends on the choice of the variable of the universal quantifier.

(34) Every man saw the dog.

(34a) $\forall x \, (Man(x) \rightarrow Saw(x, f_i(\lambda y \, Dog(y)))$

(35) Every man saw the dog that barked at him.

(35a) $\forall x \, (Man(x) \rightarrow Saw(x, f_i(\lambda y \, [Dog(y) \,\&\, barked\_at(x, y)]))$

7 Summary

The different uses of definite NPs can be best reconstructed with context dependent choice function terms. This representation focuses on the situational use of definite NPs and extends its analysis to the anaphoric and relational uses as well. Choice functions allow capturing the uniqueness condition of classical theories in a very elegant way: They select exactly one element of a set, but the set itself need not be unique. They also capture one of the main insights of the familiarity theory: Indefinite and definite NPs are updates on the context, here on the salience structure of the discourse. The salience theory of definiteness also mirrors the diachronic development of definite articles from demonstratives and other indexical items. While demonstratives clearly need additional information such as an ostension, the definite article expresses a contextually given salience ordering. The salience theory of definiteness also allows for a unified account of definite and indefinite NPs in terms of global versus local choice functions (see Chierchia 2005). Thus, it raises many new and challenging questions to our semantic interpretation of noun phrases in general.

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