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Enrichment, Coherence, and Quantifier Properties*

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Abstract

In Pagin 2014 I provided a new account of pragmatic enrichment. Building on the theory of coherence relations defended by Andrew Kehler, I proposed a four-step scale of coherence strength. According to the account, free enrichment takes place, subject to constraints, when it raises the degree of coherence. It turned out that there is an intriguing interaction between coherence raising and determiner semantics: certain determiners license coherence raising while others tend to block them. In this paper I investigate the phenomenon. I try to identify the determiner properties that license coherence raising, and provide an explanation of why they do.

Keywords: Enrichment; coherence; coherence raising; determiners; persistence; prominence.

1. Background: Pragmatic enrichment and coherence

There is a range of pragmatic phenomena that are located between *saturation* on the one hand—i.e. the assigning of values to indexical expressions—and standard *conversational implicatures* on the other—i.e. what is indirectly conveyed as based on what is directly said and features of the context (cf. Grice 1975). They are in between in the sense that, like saturations but unlike ordinary conversational implicatures, they contribute to *what is said* by an utterance, and, like implicatures but unlike saturations, they do not provide

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interpretation to context sensitive expressions.¹

The generic term for these intermediate operations differs between authors in the pragmatics literature: they have been called *explicatures* in *Relevance Theory* (Sperber and Wilson 1986, p. 182), *implicitures* by Kent Bach (1994, p. 126), and *modulations* by Francois Recanati (2004, p. 74). Recanati has referred to saturations and modulations jointly as *primary pragmatic processes* (2004, p. 17).²

One sub-type of these intermediate operations is that of *enrichment*, which is the process of *adding conceptual material* to what is given by the semantic interpretation. Enrichment comes in two varieties: *free* enrichment and *mandated* enrichment. These are also called *expansion* and *completion*, respectively, by Bach (1994, pp. 125-6). Enrichment is *free* if interpretation *before* the enrichment is already a full, truth evaluable proposition, and it is *mandated* when an enrichment is needed for the interpretation to arrive at a full proposition. Classical examples of each type are the following

- (1) a. He handed her the key and she opened the door.
b. He handed her the key and she opened the door [*with the key that he had handed her*].
- (2) a. Steel isn't strong enough.
b. Steel isn't strong enough [*for X*].

(Carston 2002, p. 71 and Bach 1994, p. 127, respectively.) In these examples, the b. sentence includes the intuitive pragmatic enrichment within square brackets.

That some addition is needed in (2a) is clear, but there is no contextual information to suggest what. (1a) is different. The intuitive reading, without further contextual information, is exactly the one produced in (1b) (allowing for some variations in formulation). The question is what explains it.

Much of the literature on modulations in general and enrichments in particular has been concerned with convincing readers that these phenomena exist, and with some sub-categorizing of different kinds of modulation. Little has been done in the way of explanation. Relevance Theory has indeed offered a number of principles that would help explain why this or that enrichment occurs, but the principles offered are not sufficient for predicting any particular enrichment on their own.³ Some predictive principles have

¹According to Levinson (2000, p. 186), generalized conversational implicatures do contribute to what is said: "[...] what is said seems both to determine and to be determined by implicature. Let us call this Grice's circle." For discussion, see Pagin 2014, pp. 61-4.

²There are indeed important differences between these authors. I discuss the matter at some length in Pagin 2014.

³This is not the place for criticism of Relevance Theory with respect to predictive capacity. For discussion, see Pagin 2014, pp. 88-92.

been offered by Levinson 2000, especially with his theory of *I*-implicatures. The basic idea there is that the speaker says as little as possible, and the hearer infers as much as possible, and Levinson (2000, pp. 117-8) offers some more concrete principles for achieving these ends. These principles are a mixed bunch, however, and I think enrichments often are not motivated by his general idea.⁴

In Pagin 2014, I proposed a theory that, I claimed, does this, given only background beliefs about the world. The general idea was that free enrichments occur because they *raise the coherence*: the proposition arrived at *after* enrichment has a higher degree of coherence than the prior proposition *before* the enrichment. As regards mandatory enrichments, the theory does not explain why an enrichment occurs, since some enrichment is needed irrespective of coherence, but rather (where there is enough background information) why some enrichment occurs rather than an alternative one.

The theory was spelled out by means of an ordinal scale of *coherence strength*. In doing so I was building on the theory of coherence relations (rhetorical relations) of Andrew Kehler (2002), who in turn developed idea presented by Jerry Hobbs, for instance in Hobbs 1985. After a suggestion by Hobbs, Kehler used the categories of *connections between ideas* of David Hume (1748) as his basic categories of discourse relations: *Resemblance*, *Cause-Effect*, and *Contiguity*.

Kehler's cause-effect relations are *Result*, *Explanation*, *Violated Expectation*, and *Denial of Preventer*. An example of *Explanation* (Kehler 2002, 21) is

- (3) George is dishonest. He is a politician.

This satisfies the *Explanation* relation insofar as it is *presupposed* that being a politician *implies* being dishonest.

Kehler's resemblance relations are *Parallel*, *Contrast*, *Exemplification*, *Generalization*, *Exception*, and *Elaboration*. An example of *Parallel* is

- (4) Dick Gephardt organized rallies for Gore, and Tom Daschle distributed pamphlets for him.

(Kehler 2002, p. 16). This exemplifies *Parallel* since organizing rallies for Gore and distributing pamphlets for Gore are subsumed under a common more general property/activity, such as *doing something in favor of Gore*. In addition, Dick Gephardt and Tom Daschle both had the property of being high-ranking Democratic politicians. The contrast between cause-effect relations and *Parallel* will be relevant later, as they will often be in competition: are two facts mentioned together because one depends on the other, or

⁴For discussion, see Pagin 2014, pp. 92-5.

because they are similar?

There is only one contiguity relation: *Occasion*. It is exemplified in

- (5) George picked up the speech. He began to read.

This exemplifies *Occasion* since we read (5) is conveying that nothing happened *between* the picking up and the start of the reading. That is, we read the discourse to the effect that it describes a change of state from what is described in the first sentence to what is described in the second, with nothing happening in between.

Partly based on these coherence categories and coherence relations, in Pagin 2014 I offered the following scale of coherence strength:

Scale of coherence strength

- 0) Vacuity
- 1) Contiguity type relations
- 2) Resemblance type relations
- 3) Possibility type relations
- 4) Necessity type relations

The scale runs from weakest (0) to strongest. Degree 0, Vacuity, is the measure of discourse without coherence, like

- (6) My dad bought a car. Bananas are yellow.

Degree 1, contiguity, could be exemplified by

- (7) The table is covered with books. A cat is lying on the sofa.

On reading (7), one typically makes a so-called *bridging inference* to the conclusion that the sofa mentioned in the second sentence is in the same room as the table mentioned in the first, thus close to each other.⁵

Degree 2, Resemblance, belongs to discourses where there is a certain type of thematic unity, typically together with contiguity. The *Parallel* example above from Kehler is a good example.

Degrees 3 and 4 mark coherence between states of affairs in virtue of either, loosely speaking, making *possible* (degree 3), or making *necessary* (degree 4). Often, these relations are causal in nature. In that case, a degree 3 coherence pertains to a discourse where one fact mentioned is such as to *enable* another fact or event also mentioned.

⁵Cf. Clark 1975, Levinson 2000, pp. 37-38, Wilson and Matsui 1998. According to Levinson, bridging inferences are examples of I-implicatures.

This is exemplified in (1): when we read into (1a) that the female subject opened the door with the keys that had been handed to her, we take the fact stated in the first conjunct to enable the action reported in the second, i.e. the opening of the door.

Degree 4, Necessity, concerns states of affairs related by *consequence* either causal/-evidential or logical/conceptual. For instance, teleological explanations belong to this type:

- (8) a. The man took out a knife. He was going to cut the rope.
 b. The man took out a knife. [*He did this because*] he was going to cut the rope.

Taking out the knife is a causal consequence of intending to cut the rope, presented in a teleological manner as a consequence of the purpose itself.

The justification of this strength ordering ultimately derives from the predictive success they generate together with the principle of coherence *raising*. Still, there are intuitive ideas behind it. First, there are correspondences between degrees of coherence and connection types. To zero degree coherence corresponds simply the lack of connections between objects or properties referred to, or facts stated. To coherence of degree 1 correspond connections between *objects*, and these are typically spatio-temporal connections or social connections: if several objects are mentioned, they are by default taken to be close in some respect or other. To coherence of degree 2 corresponds connections between *properties*. For instance, different objects may have the same properties, or different objects of the same kind may have related or contrasting properties. This normally presupposes that objects whose properties are compared are close in some respect. Thus, beyond concerning objects in a particular domain, there is also a further thematic unity to the discourse.⁶

To coherence of degrees 3 and 4 correspond connections between propositions, or facts/events. There is then some kind of interaction between facts or events mentioned, something that is not required for coherence of lower degrees. In both cases, the connection is such that stating a fact of one type mentioned raises the (subjective) probability that a fact of the second type obtains as well. This raising of probability is typically higher in coherence of degree 4 than in coherence of degree 3, which is in the nature of the distinction between enabling and causing/necessitating.

Thus, we can see an intuitive increase of the tightness of connections mentioned or presupposed in a particular discourse, but again, the ultimate justification comes from the predictive power of the theory.

⁶I would justify the choice of Kehler's theory in the same way: ultimately, it provides tools for making the linguistic predictions, but it also provides intuitively natural coherence relations that are systematically connected.

The general idea of the theory, called *Enrichment Theory* (ET) in Pagin 2014, is that a free enrichment takes place if it maximally raises the coherence compared with the unenriched content, given constraints regarding the *plausibility* and *accessibility* of the enrichment. The plausibility constraint depends on general background beliefs, often called “world knowledge”. For instance, the enrichment in (8b) depends on the background belief that rope-cutting is commonly done with a knife (it is commonly known to be feasible, hence commonly intended). The accessibility constraint concerns the complexity of the added content; it should be quick and easy to think.

The theory can in fact explain many of the enrichment examples in the literature, and many more examples as well. For instance, the enrichment in (8) is explained by the fact that it raises the coherence of the discourse from 1 (assuming the taking-out occurs just after the onset of the intending) to 4, Necessity, in that the taking-out is represented as a consequence of the intending.⁷

The enrichment in (1) is explained by its raising the coherence from degree 1 to degree 3, as getting the key is thought to enable the opening of the door. Degree 4 is not reachable here, unless we think that handing her the key somehow *causes* her to open the door. This is indeed possible, but the background plausibility of this assumption is not very high. The theory predicts, however, that those who *do* find it high, would also read this stronger relation into the sentence. For a precise statement of ET, see Pagin 2014, p. 76. The paper also has many more examples.

Two further features of coherence phenomena must be mentioned as part of the background. The first is that enrichment can take place within a single predication, in that it can relate a property that is *predicated* to a subject to a property that is *attributed*:

- (9) a. The temperature has risen to a dangerous level.
- b. The temperature has risen [*from a non-dangerous*] to a dangerous[*ly high*] level.⁸
- (10) a. A tall man picked up the book.
- b. A kind man picked up the book.

⁷Compare

- (i) The man took out a handkerchief. He was going to cut the rope.

⁸A reviewer objected that this effect can be explained by the lexical nature of the movement verb “rise”: the use of a movement verb always provides a cause of being at goal. For instance, as in “He ran to the door”, where the running is the cause of the being at the door. However, as far as I can tell, the lexical semantics only requires that the new level is distinct from and higher than the old level, causing the temperature to be at the higher level. That the lower level was non-dangerous does not follow from there having to be such a difference.

(Pagin 2014, p. 83).⁹ In (9a), two properties are ascribed to the temperature (as a changing property of some entity); that it has risen and that it is (at the time or utterance) at a dangerous level. These two facts could be unrelated without affecting the truth of the sentence, since the temperature might have been at a dangerous level before the rising. It could also be the case that the level is dangerous because the temperature is *low*, or that it is within a particular interval. Intuitively, we read into the statement the temperature was at a non-dangerous level before the rising. This is explained by the theory, since coherence is thereby raised to degree 4: the rising causes the danger. In addition, we take it that the danger depends on the temperature being high. This is not necessary for the rising to cause the danger, but it is natural to take the rising first to cause the temperature's being high, and the latter again to cause the danger.

In (10b), the property of being kind is attributed to a man and the property of picking up the book is predicated of him. Intuitively, these are taken to be connected, in that it is seen as an *act of kindness* to pick up the book. It is not completely easy to situate the example on the scale, since it would involve difficult considerations about reasons and causes, but I find it natural to say that the act of picking up the book, insofar as it is done out of kindness, is *motivated* by kindness as a trait, i.e. a disposition to perform acts that are beneficial to others. By contrast, no corresponding relation can be seen in (10a), since there is no plausible connection between being tall and picking up a book. This again can be contrasted with

(11) A tall man took down the book.

where being tall is easily seen as *enabling* the man to take down the book (from a high shelf, for instance).¹⁰

The second phenomenon to be noted is that of possible *competition* between a resemblance reading and a possibility/necessity reading. The following two examples were both suggested by an anonymous referee to Pagin 2014:

(12) Johnny has been getting too much homework in elementary school this year, and

⁹A reviewer objected that not much of a difference can be detected. As a possible improvement, try

- (i) a. The child dropped the book. A tall man picked it up.
- b. The child dropped the book. A kind man picked it up.

¹⁰A reviewer reported a stronger phenomenon: that already in (10a) the reader perceives that addition of the attribute 'tall' as indicating that *there is* an essential relation between being tall and picking up the book. This clearly related to the discussion of the effects of determiners, from section 2 and onwards, since the addition of 'tall' isn't truth-conditionally needed together with the indefinite. But it also goes further than the current theory, which only postulates pragmatic effects that are *licensed* by the general beliefs of the reader. A further investigation of the idea goes beyond the current paper.

[as a result] his parents are taking the school to court.

- (13) a. Mary embarrassed John, and Betty made fun of him.
b. Mary embarrassed John, and Betty made fun of him [*because of that*].

(Pagin 2014, pp. 74, 81). In the b. sentences, enrichments are added that raise the coherence degree to 4, in reading a causal connection into the conjunction. A *Parallel* reading is, however, available in both cases. In (12), two activities relating to the school of a child are ascribed to members of the family, which satisfies the conditions for a *Parallel* reading. In (13a) two actions that are unpleasant to John are reported, where in both cases the agents are women, and this again satisfies the conditions for *Parallel*.

The *Parallel* and the *Cause-effect* readings compete, since the *Parallel* reading can *block* the *Cause-effect* reading. One might ask *why* in such cases we don't automatically move to the higher degree. My guess is that the *Parallel* reading is more *accessible*, since no enrichment at all is needed. The thematic similarity between the conjuncts is seen from the mere understanding of the sentences, without the need of any pragmatic operation. The fact that there is a thematic unity, in instantiating *Parallel*, is enough to *justify* the conjoining of the subsentences: conjoining them into one sentence make sense even without the assumption of a causal connection. On the other hand, there is also a drive towards raising the coherence the Necessity degree. These two tendencies work in opposite directions, and the result is *ambiguity*: both readings are available, but neither is, I think, invariably preferred. We could say that for the *satisficing* interpreter the *Parallel* reading is preferred, while for the *maximizing* interpreter, the *Cause-effect* reading is better.

As we will see in the next section, features of *discourse semantics* become relevant in such cases, and can tilt the readings in different directions.

Next, we shall consider an interaction that does take place between coherence raising and semantic properties of determiners.

2. Effects on coherence by singular determiners

In footnote 29 of Pagin 2014, p. 97, the following example is given:

- (14) a. Adam saw a bird and Bill wanted to buy it.
b. Adam saw the bird and Bill wanted to buy it.

This is a minimal pair, as the only difference between (14a) and (14b) is at the position of the first determiner. (14a) has the indefinite determiner 'a' where (14b) has the definite determiner 'the'. This difference has a surprising intuitive effect on coherence aspects of

interpretation. In (14a), we easily find a *causal relation* between what is reported in the first conjunct and what is reported in the second. We tend to read into the sentence that somehow Bill wanted to buy the bird as a result of Adam's seeing it, plausibly because Adam's seeing the bird was part of a process that eventually led to Bill's becoming aware of the bird.

By contrast, in (14b), we don't find this effect. What we naturally see is only the *Parallel* relation, at coherence degree 2: (14b) reports the respective psychological states of two males in relation to some particular bird, but without intuitively suggesting any causal connection between these states. It is not immediately obvious that the determiners are responsible for this, but since the two sentences differ only with respect to the determiner, it apparently must be involved in creating the effect.

The effect is not peculiar to this example. For instance, we see a similar effect of the shift between 'a' and 'the' in the following pairs:

- (15) a. A kind man picked up the book.
b. The kind man picked up the book.
- (16) a. The police arrested a biker.
b. The police arrested the biker.
- (17) a. Mary caught sight of a sumo wrestler. She started laughing.
b. Mary caught sight of the sumo wrestler. She started laughing.

In (15b), we don't get the act-of-kindness effect. The man who picked up the book is reported as being, in fact, kind, whatever his reason for picking up the book.

In (16a), we read into the report that part of the reason of the police for arresting the biker is that he is – precisely – a biker (maybe there is a contextual background of an eye-witness report). We don't get the effect in (16b). The person arrested is identified by his being a biker, but it is not implicitly suggested that this property has much to do with why he is arrested.

We have the corresponding effect in (17). In (17a), we read into the second sentence that it is the sumo-wrestler-type appearance that makes Mary start laughing, and hence have a cause-effect type reading. This is lost in (17b), where no particular reason for laughing is provided. The person caught sight of is identified as a sumo wrestler, but there is no suggestion that his being, or looking like, a sumo wrestler, is why Mary starts laughing.

We see a pattern: in cases where an entity is introduced by means of an *indefinite* singular noun phrase, 'a'+CNP (common noun phrase), there is a tendency to read a coherence strengthening relation into a report, while this tendency is weakened or blocked

in the corresponding *definite* singular noun phrases, ‘the’+CNP. We are interested in understanding *why*.

We must first note that this tendency is far from universal. It requires that the strengthening relation, as always in coherence raising, is plausible. When it is not, no enrichment is induced whether the determiner is definite or indefinite. For instance, in

- (18) a. A farmer was hit by a car.
b. The farmer was hit by a car.

we don’t find any enrichment, neither in the definite nor in the indefinite version. It is simply not immediately plausible that the property of being a farmer would be causally relevant to being hit by a car. Indeed, the sentence (18a) itself is *prima facie* pragmatically odd, in the sense that it is hard to see why one would mention this profession in reporting, say, a traffic accident.

On the other hand, in some cases the connection between two properties is so plausible, or even frequently instantiated, that we tend to read a connection between the properties into the report both in the definite and in the indefinite case:

- (19) a. A biker was hit by a car.
b. The biker was hit by a car.¹¹

You can be a biker in virtue of having the habit of biking, but you can also be a biker at a particular time in virtue of biking at that time, regardless of your habits. Being a biker in the latter sense, and being on a road (typical of bikers in that sense) typically exposes you to the risk of being hit by a car. Hence being a biker *enables* the hit, and coherence thereby rises to degree 3. Hence, we read into the sentence that the biker was indeed biking at the time of being hit, and this goes, I think, for the definite version, (19b), as well.

The general claim must therefore be stated with a bit more caution:

Claim 1 There is a range of minimal pairs (S_1, S_2), where S_2 results from replacing the indefinite ‘a’ S_1 by the definite ‘the’, such that we see a coherence raising enrichment in S_1 but not in S_2 (and no range with the converse effect).

In short, indefiniteness in these cases tends to invite enrichment, while definites tend not to. What is the explanation?

¹¹With some adaptation, the last two examples are borrowed from Cohen and Kehler (2015).

3. Familiarity

The intuitive explanation, I think, of the effect of replacing the indefinite ‘a’ by the definite ‘the’ is the following: In the *definite* case, the property or properties mentioned are used to *identify* the referent, while in the *indefinite* case, the property or properties mentioned are not needed for this. They are chosen to give information about some individual (a witness to the indefinite NP), and the speaker is free to select properties that are relevant (in a non-technical sense). This freedom of selecting properties with respect to relevance corresponds to our tendency to read relevance into the use, and in particular relevance for coherence.

For instance, in (15a), out of context, the addition of the attribute ‘kind’ seems to serve to give information about the nature of the *action* by way of giving information about the *agent*: the mention of the character trait is taken to be relevant (again in the non-technical sense), not used for identifying a referent, and therefore available for use in a coherence raising enrichment; the agent acted *out of* his kindness.

Exactly this operation is weakened in (15b), since in this case the attribute ‘kind’, out of context, is used for *identifying* a referent. The man who performed the action was the unique kind man in the context, but this fact need not be causally relevant to the action, and is not *presumed* to be. Of course, if a person has the character trait of being kind, this induces (or consists in) a higher-than-average probability (in the population) of performing acts for altruistic reasons, but there is no additional presumption triggered by the text that this particular action was one of these acts.

I do take this to be the intuitively correct explanation. The next question is how it ties in with syntactic and/or semantic facts. What are the semantic facts that induce the pragmatic features of coherence raising. In the initial stages of *discourse semantics*, Irene Heim drew attention to the difference in pragmatic features between definite and indefinite (singular) noun phrases, summarized in the *Novelty-Familiarity-Condition*:

(NFC) **The Novelty-Familiarity-Condition**

Suppose something is uttered under the reading represented by ϕ , and the file prior to the utterance is F . Then for every NP_i in ϕ , it must be the case that: $i \in \text{Dom}(F)$ if NP_i is definite, and $i \notin \text{Dom}(F)$ if NP_i is indefinite. Otherwise, the utterance is not felicitous under this reading (Heim 1982, p. 202).

A *file* F , in the terminology of Heim, is a non-linguistic representation of information at a particular cognitive stage, where the representation is built up out of so-called *file cards*. A file card represents an individual, and stores information about that individual. Formally, a file F is characterized by two properties: a *satisfaction set* and a *domain*. The

satisfaction set of F , $SAT(F)$ is the set of *sequences of objects* a that satisfy F , i.e. such that when the first element in a , a_1 is assigned as referent to file card 1, and so on, F is true of each element in a (Heim 1982, pp. 180-1). The *domain* of F , $DOM(F)$, is the set of numbers of file cards in F .¹²

Then, (NFC) says that when interpreting a text, by way of building up a file F , the interpretation of a *definite* NP should be executed by way associating the NP with a card that is already in F (familiarity), while the interpretation of an *indefinite* NP should be executed by way of associating the NP with a *new* card (novelty). In short, we should assume by default that a definite NP refers to an individual already mentioned in the text or known in the context of interpretation, and that an indefinite NP introduces a new individual, so far not mentioned or known (in that particular way).¹³

Heim's (NFC) principle fits well in with the intuitive explanation of difference between definite and indefinite NPs with respect to coherence raising. A definite NP should by default be read as referring to a familiar individual, and hence the descriptive material (in a definite description) is co-opted for identifying or re-identifying the individual in question, and is therefore not easily available for coherence raising purposes. The opposite is true of the indefinite. In introducing a *new* individual, the speaker or author is free to select attributes that are relevant in providing new information, about the new individual or facts or events that individual is involved in.

Although Heim's account matches up well with the intuitive explanation, it cannot be the whole story. One reason is that definite descriptions can contain parts that are clearly superfluous for the purpose of identification. Consider

- (20) a. The angry father immediately sent a letter to his daughter.
b. The proud father immediately sent a letter to his daughter.

It is indeed possible that the sentences in (20) be used together to describe a situation involving two fathers, one angry and one proud, and that the attributes therefore serve an identifying purpose. The more typical reading of (20a), however, takes the referent of 'the angry father' to be the father of the referent of 'his daughter', and correspondingly for (20b). In these readings, the attributes are identificatorily superfluous, for the mundane reason that humans do not have more than one father. And indeed, we tend to read into these sentences that the father sent an *angry* letter, and a *proud* letter, respectively, i.e.

¹²Although the focus on the novelty/familiarity condition is associated with Heim's account, we find a parallel treatment in DRT. See, for instance, Kamp, von Stechow, and Reyle 2011, pp. 139-40

¹³The same individual might of course have been known as the referent of some other NP. The basic idea of familiarity that Heim formally implement had been suggested before. Heim mentions Christophersen 1939 and Karttunen 1968.

we infer something about the character of the letter.¹⁴

So, (20) provides an exception to the tendency of definites not to induce coherence raising, but this is not because of any deficiency in familiarity. On the contrary, to the extent that we can speak of *degrees* of familiarity, it is because the father is *more* familiar that descriptive material is made available for the pragmatic operation. A related example brings this out more clearly:

- (21) a. The angry accountant immediately sent a letter to the girl.
 b. The tall accountant took down the book from the upper shelf.

In a context where it is known to be exactly one accountant, we do see coherence raising enrichments in both (21a) and (21b). In the first case, something is inferred about the letter, and in the second about the height of the accountant enabling him/her to reach the shelf. If, on the other hand, we have a case where it is known to be more than one accountant (and none is salient), or at least not known not to be, the reading where the attribute is used for identification is much more accessible. So, in a sense, a *greater* familiarity makes coherence raising available. It is hard to see how familiarity itself helps explaining why it does not occur when it doesn't. Familiarity is correlated with the use of definites, but not, it seems, for reasons closely related to coherence.

4. Other determiners and the definiteness effect

There is another, perhaps more important, reason why Heim's (NFC) principle is not apt to explain the coherence raising effect. The reason is that the effect occurs in connection with other, plural, determiners, where the question of identifying or not a particular individual does not arise. Consider the following examples:

- (22) a. Some brave men volunteered.
 b. Several brave men volunteered.
 c. Three brave men volunteered.
 d. More than ten brave men volunteered.
 e. Many brave men volunteered.

¹⁴We see a similar phenomenon in the use of non-restrictive relative clauses, as in

- (i) The Italian, whose father was a mechanic, immediately started to look for the jack.

Here, we tend to read the relative clause as providing a partial explanation of why the Italian was looking for the jack; he was competent enough to know it would be needed. However, it is rather unlikely that the relative clause should be treated as part of the first argument of the determiner, i.e. as part of a definite description. So (i) is not really a counterexample to the tendency of material in definites not to induce coherence raising.

- (23) a. All brave men volunteered.
 b. Most brave men volunteered.
 c. The brave men volunteered.
 d. Exactly three brave men volunteered.
 e. At most three brave men volunteered.

As a matter of intuition, in the (22) examples we do see a coherence raising enrichment: that the volunteering was an act of bravery. We don't see that effect in (23). Rather, the intuition in this case is that there is some antecedently given set of brave men, and that some members of this set volunteered for something, where that something need not itself involve bravery.¹⁵

We can note at first that the contrast between (22) and (23) does not have much to do with familiarity or novelty in the narrow sense of the (NFC) principle. On the other hand, the intuition about the (23) sentences that they concern an antecedently given set is similar to the familiarity condition in a wider sense: in both cases we seem to be concerned with some individual or set of individuals already given to which a later cross-reference is made.

This impression is strengthened by the fact that the (22)/(23) contrast partly lines up with the so-called *definiteness effect* (DE), or the *definiteness restriction* (DR). These phenomena concerns the acceptability of NPs in *existential there* (ET-) sentences. Consider

- (24) a. There are some brave men in the garden.
 b. There are several brave men in the garden.
 c. There are three brave men in the garden.
 d. There are more than ten brave men in the garden.
 e. There are many brave men in the garden.
- (25) a. #There are all brave men in the garden.
 b. #There are most brave men in the garden.
 c. #There are the brave men in the garden.

All the sentences in (24) are acceptable, while all the sentences in (25) are pretty, or very, unacceptable. This phenomenon seems to have been investigated first by Milsark (1974). The phenomenon was connected with the definiteness property, and that ET-sentences provided a context where only *indefinite* NPs are acceptable. The literature since has developed along two paths, one for giving a general account of (in)definiteness, and one for explaining the restriction in ET-sentences. For overviews, see Reuland and ter Meulen

¹⁵In (23c) we do get the effect if there already is a contextually salient group of men. In (23e), of course, there need not have been any members at all who volunteered.

1987a, Abbott 2004, and Peters and Westerståhl 2006, pp. 125-35.

There has not been a general agreement on what exactly to call a *definite* determiner. Peters and Westerståhl (2006, p. 150) essentially follow the approach of Barwise and Cooper (1981). I shall not here set out the formal definition but rather the semi-formal gloss that Peters and Westerståhl provide. Below, subscript ' M ' denotes the domain of a model (in the model theoretic sense), and Q_M the result of applying the global quantifier Q to the domain M :

Definite NPs can be taken to refer to the generator set X_M of the principal filter (or, equivalently, to the intersection of all sets belonging to Q_M). In this sense, 'John' refers to John (technically, to $\{j\}$), 'John and Mary' refers to the set of John and Mary, 'John's books' refers to the set of books that John owns (say), 'the ten boys' refers to the set of boys in the discourse universe, provided there are exactly ten of them, etc (Peters and Westerståhl 2006, p. 151).¹⁶

Thus, for instance, the denotation of 'the ten boys' on a domain M is the set of sets $B \subseteq M$ that contain all the boys in M , provided there are exactly ten of them, and the empty set otherwise. We can note that on this conception, 'most' is *not* definite, although often considered so, for there is not in general any set $X \subseteq M$ such that 'most F' denotes all the sets $B \subseteq M$ that have X as subset. Also, 'every'/'each'/'all' is classified as definite only if they are taken to have existential import.¹⁷

Peters and Westerståhl (2006, chpt. 6) discuss ET-sentences in depth, largely by comparing the accounts in Barwise and Cooper 1981 and Keenan 1987. There is no need here to consider these accounts in detail. As pointed out by Keenan (1987, p. 317) and by Peters and Westerståhl (2006, p. 229), it is a consequence of Keenan's analysis that simple conservative¹⁸ $\langle 1, 1 \rangle$ quantifiers are acceptable in ET-sentences if, and only if, they are *symmetric*. A quantifier Q is symmetric iff it holds on all domains M that

$$Q_M(A, B) \text{ iff } Q_M(B, A).$$

This correctly rules in the (24) sentences and correctly rules out the (25) sentences. For instance, 'most' is not symmetric, since, for instance, it may be that most of the brave men are in the garden while it is not the case that most of those in the garden are brave men.

¹⁶I have here used ordinary quotation marks where Peters and Westerståhl use typewriter font to mark quotation.

¹⁷That is, 'Every AB ' is true only if ' A ' denotes a non-empty set.

¹⁸A quantifier Q is *conservative* iff it holds on every domain M that $Q_M(A, B) \text{ iff } Q_M(A, A \cap B)$. Virtually all determiner denotations are conservative.

However, of crucial importance in the present context, Keenan's analysis also correctly rules *in*

- (26) a. There are exactly three brave men in the garden.
- b. There are at most three men in the garden.

This in fact breaks the parallel between susceptibility to coherence raising and acceptability in ET-sentences. Thus, although there is a strong tendency that determiners that are indefinite by the definiteness effect are also liable to give rise to coherence raising, it is not exactly this property either that accounts for the coherence effects. We need something else.¹⁹

5. Monotonicity

In section 3 I suggested the intuitive idea that an attribute is free for a coherence raising enrichment if it is *not* required for identifying an individual or set of individuals. This idea can be made somewhat more precise by saying that the sentence that results from removing the attribute is true if the original sentence was. That is, formally:

- (27) $Q_M(A \cap B, C)$ entails $Q_M(A, C)$.

As an example, if

- (22a) Some brave men volunteered.

is true, then so is

- (28) Some men volunteered.

Adding the attribute 'brave' is not required, since (28) is already true. Hence, the attribute can be used for other purposes. This, I think, is exactly what is happening in the coherence raising cases.

In order to characterize the type of determiners that have this property, we need the concept of *monotonicity* from Generalized Quantifier theory.

- (MON) a. Q is said to be *left (monotone) increasing*, or *persistent*, iff for all M , $Q_M(A, B)$ and $A \subseteq A'$ entails $Q(A', B)$.

¹⁹Intuitively, the symmetry idea could help explain why interpretation of sentences with symmetric quantifiers is not concerned with selecting a particular subset from an antecedently given set specified in the first argument, because of the symmetry, the first argument can equally well be changed into the second argument.

- b. Q is said to be *left (monotone) decreasing*, or *anti-persistent*, iff for all M , $Q_M(A, B)$ and $A' \subseteq A$ entails $Q(A', B)$.
- c. Q is said to be *right (monotone) increasing* iff for all M , $Q_M(A, B)$ and $B \subseteq B'$ entails $Q(A, B')$.
- d. Q is said to be *right (monotone) decreasing* iff for all M , $Q_M(A, B)$ and $B' \subseteq B$ entails $Q(A, B')$.

Now the property that is exemplified exactly in (22a) and (28) is that of *left upward monotonicity*, or *persistence*. The new hypothesis would be, then, that a determiner tends to give rise to coherence raising enrichments just in case it is persistent.

We can indeed verify that all the determiners in (22) *are* persistent.²⁰ We can also verify that all the determiners in (23) are *not* persistent. ‘Most’ is not, since the fact that most brave men volunteered does not entail that most men volunteered. In addition, ‘exactly three’ isn’t persistent, for it may well be that exactly three brave men, and on top some brave women and cowardly men volunteered, making all of them together count to more than three. Thus, we get the right prediction in this case.

In light of this observation, we can generalize the original claim:

Claim 2 There is a range of minimal pairs (S_1, S_2) , where S_2 results from replacing a persistent determiner in S_1 by a non-persistent determiner, such that we see a coherence raising enrichment in S_1 but not in S_2 (and no range with the converse effect).

Thus, we do have a working hypothesis as to why certain determiners tend to give rise to coherence raising while others don’t, a hypothesis that is formally fairly precise and intuitively plausible. It does explain the original difference between the singular definite ‘the’ and indefinite ‘a’ (i.e. Claim 1), which started the investigation. It remains to be seen whether the hypothesis stands up to scrutiny in light of further and more complex examples.²¹

²⁰It is important here that ‘many’ in (22b) is not taken in its *proportional* sense but in a sense that is only relative to the size of the domain, and also that in (22c) ‘three’ is understood as *at least three*.

²¹One complication derives from quantifiers of the form *at least m of the k or more* (Peters and Westerståhl 2006, p. 173). According to the truth-conditions given to plural ‘the’ by Peters and Westerståhl, such quantifiers *are* persistent. Thus, on this semantics, (ii) follows from (i):

- (i) At least three of the ten or more brave men volunteered.
- (ii) At least three of the ten or more men volunteered.

But we do not intuitively see the coherence raising effect in (i). Intuitively, ‘brave’ seems to be used for selecting/identifying a particular set of individuals, and is therefore not available for pragmatically conveyed information. So, quantifiers of this form might be a counterexample to Claim 2. Note that on the semantics

6. Prominence

Recent work from Rutgers University, exemplified by Lepore and Stone 2015, Stojnić 2017, and Stojnić, Stone, and Lepore 2017, apply coherence theory to semantics and the philosophy of language. Their approach and the present approach are independent but partly parallel. One difference is that the Rutgers group proposes a version of logical form that includes the encoding of coherence relations.²²

Stojnić, Stone, and Lepore 2017 contains an application of coherence theory to pronoun resolution. The main idea is that a coherence relation raises a given potential antecedent to prominence, thereby selecting it for anaphoric resolution. An example of theirs is

(29) Phil tickled Stanley, and Liz poked him.

(Stojnić, Stone, and Lepore 2017, p. 535, taken from Smyth 1994). Under the coherence relation of *Parallel*, the natural reading is that ‘him’ is anaphoric on ‘Stanley’, while if the relation is *Result*, it is read as anaphoric on ‘Phil’. The authors sum it up:

Put simply, coherence relations establish interpretive connections, and moreover, (as we shall argue) as a matter of linguistic contribution, promote certain entities to prominence (Stojnić, Stone, and Lepore 2017, pp. 535-6).

I completely agree with the view. Coherence relations have the power of raising elements to prominence and the application to anaphora resolution is a case in point.

This application fits, as far as I understand, the definition of prominence provided by the CRC *Prominence in Language*:

proposed by Peters and Westerståhl,

- (iii) At least three brave men volunteered.
- (iv) At least three of the three or more brave men volunteered.

are equivalent. But we have the pragmatic effect in (iii) and not in (iv). So, on that semantics, the effect does not depend on left monotonicity alone.

However, an alternative is to take the plural ‘the’ to carry a *familiarity presupposition*, in the spirit of Heim’s account, where the first argument *does* serve to identify an antecedently introduced set. On a semantics of this kind, quantifiers of the form *at least m of the k or more* would not be persistent. For instance, an antecedently introduced set of three or more *brave men* need not be identical with an antecedently introduced set of three or more *men or women*, and perhaps not even with an antecedently introduced set of three or more *men*. On such a more dynamic understanding of the definite quantifier, (iii) and (iv) would no longer be equivalent, and (Claim 2) would still stand. However, I am not at all sure about this, and consider it an open problem.

²²On their account, the choice of coherence relation in interpretation is therefore a matter of disambiguation, and in their view, there is a radical difference between disambiguation and pragmatic operations (Stojnić, Stone, and Lepore 2017, pp. 529, 540); disambiguation is said to be pre-semantic. On my view, exactly the same considerations go into the choice of interpretation, and so I see the approaches, to *that* extent, as notational variants.

Def1: Prominence is a relational property that singles out one element from a set of elements of equal type and structure; Def2: Prominent elements are structural attractors, i.e. they serve as anchors for the larger structures they are constituents of, and they may license more operations than their competitors; Def3: Prominence status shifts in time (as discourse unfolds) (<http://sfb1252.uni-koeln.de/27258.html>).

How does this apply to the account proposed here? This depends on the degree of coherence. Spatio-temporal parameters given by the context are raised to prominence by the need to reach a coherence degree of at least 1 (as witnessed by (7)). Similarities between properties are raised to prominence in reaching coherence of degree 2 (as witnessed by (4)).

When it comes to degrees 3 and 4, the domain of *enrichments*, the relation of coherence of the relevant degree holds only *after* the enrichment, and it is not itself linguistic. However, the *potential* for coherence raising obtains before, and the relevant expressions are the syntactic constructions that correspond to states of affairs that potentially stand in the relevant relation. Typically, the potential for coherence raising is the same as or part of what raises to prominence expressions in the discourse that are central to describing the facts related. In the case of

- (1b) He handed her the key and she opened the door [*with the key that he had handed her*].

the two conjuncts ‘he handed her the key’ and ‘she opened the door’ describe states of affairs such that the first potentially enables the second, which is sufficient for their joint prominence. In the case of

- (22a) Some brave men volunteered.

‘brave’ and ‘volunteered’ are raised to prominence, because of the potential causal relation between courage and the act of volunteering. In this case, it is best described with respect to an underlying syntactic level: we have the joint prominence of ‘x is brave’ and ‘x volunteered’.

Presumably, if prominence is connected to the potential for coherence raising, then there should be cases where the potential obtains but the raising does not take place, because counter-acted by other factors, especially in the case of ambiguity as in (29). A further investigation of these phenomena must be deferred to another occasion.

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