On the "Scope of Negation" and Polarity Sensitivity

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1. Negation as a focus-sensitive operator.

Negation patterns with a number of other focus-sensitive operators in many ways, although it has been a matter of some controversy whether the effect of combining negation and focus has any direct bearing on truth-conditions or is better considered a pragmatic phenomenon. The intuition that in a sentence like (1) it is in some sense only "Mary" that is negated runs counter to the idea that as a logical operator negation must apply to a whole sentence, and that since (1) is true iff (2) is false, the scope of the negation in (1) must be the whole sentence, not just the focused item.

(1) I didn't get that book from MARY.

(2) I got that book from MARY.

Some of the most systematic work on this topic has come from the contemporary Prague school, particularly the work of Eva Hajicova, whose distinction between presupposition and allegation has helped

to clarify the sources of the sometimes unclear or conflicting intuitions about presupposition under negation that may be obtained when topic-focus articulation is not carefully controlled for (Hajičová 1973, 1984). On Hajičová's analysis of topic, focus, and negation at the tectogrammatical level, the mapping of which to (Tichy's) intensional logic has been formalized by Vlk, negation normally occurs at the boundary of topic and focus (topic-internal negation also being possible), taking the whole of the focus in its scope, and leaving the topic outside its scope; allegations which end up in the topic become presuppositions, allegations which are in the focus do not. This account can very neatly handle such contrasts as the presence and absence respectively of an entailment that we won in (3a) and (3b), and the range of possible readings of the famous *because* sentences in (4) (see Vlk (1988a,b) for details on the latter.)

(3) (a) This time John's COUSIN didn't cause our victory.
(b) This time John's cousin didn't cause our VICTORY.
(Hajičová 1973, 1984)

(4) Charles didn't come because Mary was ill.
(Vlk 1988a,b)

But if one says that the scope of negation is just the focus, rather than the whole sentence, what does one predict about the distribution of negative polarity items (NPI's) such as English *any*?

1. The distribution of negative polarity items.

Ladusaw (1979) gave convincing arguments for the hypothesis that negative polarity items are licensed by a semantic property of the contexts in which they occur; I first state Ladusaw's generalization in (5) and then briefly review the meaning of its key terms.

(5) NPIs occur in the scope of a monotone decreasing functor.

The definition of "monotone increasing/decreasing" is given in (6).

(6) **Definition:**
f is monotone increasing iff
$x \leq y$ entails $f(x) \leq f(y)$.
f is monotone decreasing iff
$x \leq y$ entails $f(y) \leq f(x)$.

The definition requires that there be a suitable notion of "less than" available; given the common sorts of type theories of Montague, Tichy, and others, "$\leq$" amounts to entailment for propositions, subset for properties, and can be generalized appropriately to other types. (See Ladusaw 1979, 1983.)

What does "in the scope of" in (5) mean? The standard answer is that it means occuring within the argument of the functor. Then at first sight, it would seem that the obvious prediction on the Prague school account of negation as exemplified by Hajičová (1984) is that NPIs in negative sentences should occur only in the focus. After all, what

is not in the scope of negation is the topic, the part of the sentence presumed to hold positively, so to speak, and the part where allegations become (positive) presuppositions. But then a sentence like (7) presents a clear counterexample.

(7) Mary didn't give any employee a raise because she was SOFT-HEARTED

Sentence (7) is ambiguous; the reading of concern here is one on which Mary may have given some employees raises - in fact she may have given all employees raises - but in no case was it because she was soft-hearted.

Unlike (8), which has a most natural reading where the focus does indeed include the NPI "any employee", the truth of (7) is compatible with (and in fact strongly

(8) Mary didn't give any employee a raise because her company was having financial difficulties.

favors) Mary giving some employees a raise, a positive implication or implicature that can only be expressed in English using *some*, rather than *any*.

So what is it that is licensing the negative polarity item *any* in (7)? That is the central question that this paper is concerned with.

The answer seems to lie in recognizing the potential quantificational force of negation noted by Heim (1982). If we

adopt Heim's tripartite quantificational structures with Operator - Restrictor - Nuclear Scope, and if we further accept the correlation "Restrictor = topic", "focus = nuclear scope" foreshadowed in Haiman (1978), articulated in Ahn (1989), and further argued in Partee (1991), and if we accept Ladusaw's explication of the licensing of NPIs by monotone decreasing operators in general, all of which are independently motivated, everything seems to fall into place. In the remaining sections we briefly review tripartite structures and the proposed correlation, and then put the pieces of the proposed solution together.

3. Tripartite Quantificational Structures

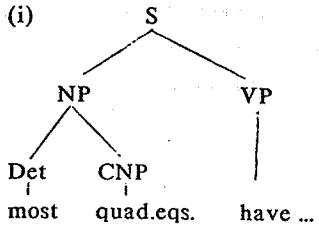
3.1 A-Quantifiers vs. D-quantifiers: Lewis, Heim, Kamp; Partee, Bach and Kratzer (1987).

Partee, Bach and Kratzer (1987) introduce the terminology "D-quantifier" for determiner quantifiers and "A-quantifier" for adverbial quantifiers (and some other "verb-oriented" quantificational devices not of direct concern here). D-quantification, well-studied since Montague (1973) and subsequent work on generalized quantifiers, is illustrated in (10); A-quantification, brought to prominence by Lewis (1975) and richly exploited in subsequent work by Kamp (1981) and Heim (1982), is illustrated in two different constructions in (10) and (11). In each case, a rough syntactic structure is given in (i) and a rough semantic function-argument structure in (ii). Sentences (9) and (10) have virtually identical truth conditions although syntactically structured in rather different ways; sentence (11) is a classic donkey-sentence

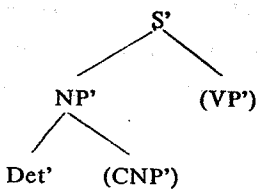
whose analysis in a Kamp-Heim framework exploits the "unselective binding" properties of adverbs of quantification, first noted by Lewis.

(9) Most quadratic equations have two different solutions.

(i)



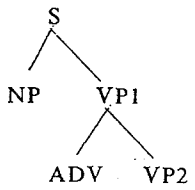
(ii)



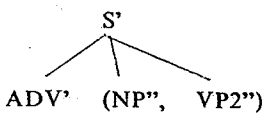
(10) (a) A quadratic equation usually has two different solutions.

(b) Usually, x is a quadratic equation, x has two different solutions.

(i)



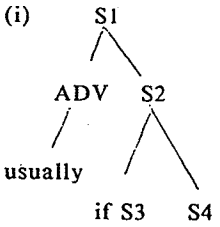
(ii)



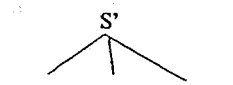
(11) (a) Usually, if a man owns a donkey, he beats it.

(b) Usually, x1 is a man and x2 is a donkey and x1 owns x2, x1 beats x2

(i)



(ii)

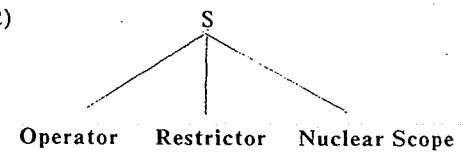


It is of particular relevance to the case at hand that Heim (1982, 1987) analyses negation as functioning like an adverb of quantification, unselectively binding free variables that occur in both restrictor and nuclear scope. We return to Heim's analysis in section 5.

3.2 Tripartite Structures as a unifying generalization

The terminology of tripartite structures shown in (12), used by Heim to represent what the D-quantification and A-quantification structures have in common, is useful at least at a metalevel in discussing the properties of various kinds of quantificational structures.

(12)



It is possible that these tripartite structures do not actually represent the linguistic structure of any of the examples; it could be the case, for instance, that there is always some binary-branching

nested structure in each instance. And it is very possible that in focus-sensitive constructions of the kind we are concerned with here, the operator is in an important sense more directly associated with the nuclear scope, its restrictor in a certain sense "outside". So I use the tripartite structure for the purposes of discussing certain generalizations without making a specific commitment to its application within the grammar of any particular construction in English or any other language.

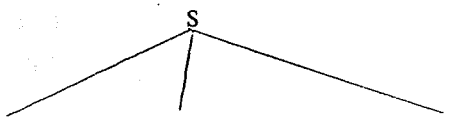
Among the questions of interest concerning tripartite structures a central one is the question of what aspects of linguistic structure determine or constrain the assignment of parts of the linguistic structure to parts of this logical structure. Among the relevant aspects of structure to consider, there are at least constituent structure (and/or dependency structure), function-argument structure, and focus structure. It is the role of the latter that concerns us here.

4. Focus structure and its correlation with quantificational tripartite structure.

The generalized picture of tripartite structures in (13) below mentions a number of hypothesized syntactic, semantic, and pragmatic structures that can be argued to be correlated with each other and with the basic tripartite scheme; some are discussed in Partee (1991), and others will be discussed in work that is still in preparation. The main claim in Partee (1991) is that the syntax (if we don't count focus structure as part of the syntax) sometimes leaves unspecified or underspecified what goes into the restrictor clause of

a tripartite structure, and focus structure frequently plays an important role in determining how the parts of the meaning of a sentence are divided up in tripartite structures, information that can be essential to assigning truth-conditions to a sentence. The basic correlation is stated in (14).

(13)



Operator	**Restrictor**	**Nuclear Scope**
∀	"cases"	main clause
must	if-clause	assertion
not	subordinate clauses	focus
almost every	common noun phrase	consequent
always	topic	main predication
mostly	presuppositions	comment
Generic	focus-frame	
	domain restrictions	
	reset default values	
	antecedent	
	context	

(14) The basic correlation: Unless overriden by the syntax of a particular construction, the following correlation holds:

Restrictor = Topic (or "focus-frame" or "background")
Nuclear Scope = Focus

I take the statement of this correlation to be compatible with,

and part of an instantiation of, the following claim of Hajičová and Sgall:

> Instead of such means as parentheses, variables, and prenex quantifiers, natural languages exhibit, at TL [the tecto-grammatical level -BHP], the topic-focus articulation, the scale of CD ('deep word order'), and other features from which the scopes of operators can be derived."
>
> -Hajičová and Sgall (1987)
> "The Ordering Principle".

I was skeptical about this claim when Professors Hajicova and Sgall and I began discussing it in the fall of 1989; but over the course of our discussions my attitude changed first to grudging agnosticism and then to a position (where I am now) of believing that some form of such a principle is likely to be true, and the challenge I have put to myself is to see if I can find a way of understanding and articulating the Prague school work (perhaps with some modifications) and of understanding and articulating the various kinds of quantificational and other relevant semantic structures so that one can test the scope and the explanatory bite of some version of the principle. I take the correlation enunciated in (14) as an instantiation of one aspect of this principle.

The correlation of topic-focus structure with quantificational tripartite structure also makes sense from the perspective of the various versions of "alternative semantics" for focus, as articulated, for example, by Rooth (1989): "The focus structure of a sentence expresses contrast with or alternatives to the proposition denoted by

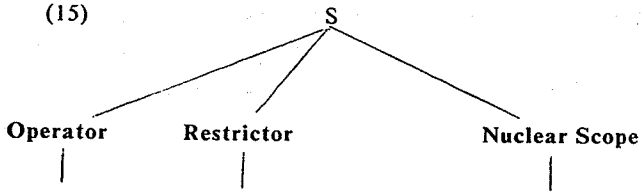
he sentence". In quantificational constructions, the topic or ocus-frame contributes a set of alternatives which establish or estrict the domain to be quantified over.

. Putting together the pieces of the explanation.

We repeat the puzzling example (7) below and indicate its pproximate tripartite quantificational structure in (15), exploiting oth Heim's analysis of negation as an implicitly quantificational perator (a negative universal) and the correlation of focus structure /ith tripartite structure stated in (14).

(7) Mary didn't give any employee a raise because she was SOFT-HEARTED

(15)



When the structure (15) is interpreted with NEG as an nselective universal negative quantifier, with its domain stablished by the restrictor clause, it says that no case in which lary gave any employee a raise for any reason is a case in which she ave that employee a raise because she was soft-hearted. There are :veral alternative ways of making (15) more precise. I have set it up

with an open sentence in both restrictor and nuclear scope, but that is not the only way to do it; there are alternatives spelled out in Rooth (1985) and Krifka (1991a).

With this structure, we can see that the term "scope" may be somewhat equivocal in the analysis of negation and other focus-sensitive operators: in one sense, both the restrictor and the nuclear scope are within the scope of negation, while in another sense, it is indeed the "nuclear scope" which is the scope proper of negation. Thus one can see a reasonable basis both for the traditional view that sentential negation has the full sentence within its scope and for the claim that only the focussed part of the sentence is within the scope of negation; the term "nuclear scope" can be helpful in distinguishing these two senses: we might say that negation has the full sentence within its scope but only the focussed part as its nuclear scope.

Now let us continue putting together our account of the possibility of the negative polarity item in (7). We know that restrictive clauses in essentially quantificational (i.e. essentially tripartite) structures are often paraphrasable by *if*-clauses and it is well-known that *if*-clauses license NPIs. It used to be common to try to explain the licensing of NPIs in *if*-clauses by appealing to the interdefinability of "if A then B" and "not-A or B", but instead it seems better now to make use of the generalization (Kratzer) that the basic function of *if*-clauses is to restrict operators. We will have completed a satisfactory account of our inital problem if we can establish the further generalization either that

(16) (i) *if*-clauses act as restrictors only on strong operators, operators that are monotone decreasing in their first (restrictor) argument; OR

(ii) when *if*-clauses are used as restrictors on operators that are not monotone decreasing on their first argument, those *if*-clauses do not license NPIs; otherwise they do.

It appears that (16i) is false but (16ii) is correct.

(17) a. Sometimes, if a man feeds a dog some bones, it bites him.

b. *Sometimes, if a man feeds a dog any bones, it bites him. [may be OK on some irrelevant readings]

Note here that only the 'essentially quantificational operators' can have different polarity properties in their two arguments, and the different properties of the two arguments are one reason that the two arguments do have to be essentially distinguished. (Positive) universal and quasi-universal operators are downward entailing on their first argument, upward entailing on their second. Negation as an operator is monotone decreasing on both arguments; it patterns in some ways with weak operators and in some ways with strong ones.

We thus have evidence in support of Hajičová's claim about the scope of negation, taken as a claim about the nuclear scope of a quantificational NEG operator; *any* in (7) is licensed because it is in the restrictive clause of a strong operator, not because it is "in the scope of NEG" (with caution, as noted above, about the term "scope", of course).

Further support comes from the observation that other strong operators pattern likewise; note the universals, which are monotone decreasing on the restrictor argument, monotone increasing in their nuclear scope.

(18) a. He always gives some extra soup to anyone who looks hungry.
b. He always gives any extra soup to someone who looks hungry.

Each of these sentences is well-formed, but with different interpretations corresponding, as predicted, to the requirement that the restriction on the domain of quantification is provided by the modifier containing the NPI, with the other modifier forming part of the nuclear scope. The interpretations below in (18') reflect Heim's principle that variables which occur free only in the nuclear scope are interpreted as existentially bound within the nuclear scope.

(18') a. Always$_x$ (x looks hungry, y is extra soup and he gives y to x)
i.e. Always (if x looks hungry, he gives some extra soup to x)
b. Always$_y$ (y is extra soup, x looks hungry and he gives y to x)
i.e. Always (if y is extra soup, he gives y to someone who looks hungry)

If the generalization (16 ii) holds up, the occurrence of NPIs can provide another important diagnostic for identifying tripartite

structures and testing the correlation of topic-focus articulation with division into restrictor and nuclear scope; and cases like (18) where the surface syntactic structure is identical but the tripartite structures are not gives further support to approaches which give topic-focus articulation a systematic place in underlying linguistic representation (or LF), a position that Sgall and Hajičová have been advocating consistently.

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REFERENCES

Ahn, Sung-Ho, ms. 1989. Restrictive Terms. Ling. Inst., Tucson, and U.Conn.

Haiman, J., 1978. Conditionals are Topics. *Language* 54: 564-589.

Hajičová, E., 1973. Negation and Topic vs. Comment. *Philologia Pragensia* 16: 81-93.

Hajičová, E., 1984. Presupposition and Allegation Revisited. *Journal of Pragmatics* 8: 155-167.

Hajičová, E. and P. Sgall (1987) The Ordering Principle. *Journal of Pragmatics* 11: 435-454.

Heim, I.R., 1982. *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. dissertation, University of Massachusetts, Amherst.

Heim, I.R., 1987. A note on polarity sensitivity and downward entailingness, *NELS* 14, GLSA, UMass, Amherst, 98-107.

Kadmon, N. and F. Landman, 1990. Polarity Sensitive Any and Free Choice Any. In: M. Stokhof and L. Torenvliet, eds. *Proceedings of the 7th Amsterdam Colloquium*, I, ITLI, University of Amsterdam.

Kamp, H., 1981. A Theory of Truth and Semantic Representation. Reprinted in J. Groenendijk, T.M.V. Janssen and M. Stokhof, eds. (1984), *Truth, Interpretation and Information, GRASS* 2, Foris: Dordrecht.

Koktova, E., 1987. On the Scoping Properties of Negation, Focusing Particles and Sentence Adverbials. *Theoretical Linguistics* 14, 173-226.

Kratzer, A., 1986. Conditionals. In: A.M.Farley et al, eds., *Papers from the Parasession on Pragmatics and Grammatical Theory, CLS* 22.

Krifka, M., 1990. Polarity Phenomena and Alternative Semantics. In: M. Stokhof and L. Torenvliet (eds.) *Proceedings of the 7th Amsterdam Colloquium*, I, ITLI, University of Amsterdam.

Krifka, M., 1991a. A compositional semantics for multiple focus constructions. In: S. Moore and A. Wyner, eds., *Proceedings of SALT* I, Cornell, 127-158.

Krifka, M., 1991b, Some Remarks on Polarity Items. In: D. Zaefferer, ed., *Semantic Universals and Universal Semantics*. Berlin: Foris-de Gruyter, 150-189.

Ladusaw, W., 1979. *Polarity Sensitivity as Inherent Scope Relations*. Ph.D. dissertation, University of Texas, Austin.

Ladusaw, W., 1983. Logical form and conditions on grammaticality. *Linguistics and Philosophy* 6, 373-392.

Lewis, D., 1975. Adverbs of Quantification. In: E. L. Keenan, ed., *Formal Semantics of Natural Language*, Cambridge University Press.

Materna, P., Hajičová, E. and Sgall, P., 1987. Redundant Answers and Topic/Focus Articulation. *Linguistics and Philosophy* 10, 101-113.

Montague, R., 1973. The Proper Treatment of Quantification in Ordinary English. In: Montague (1974), *Formal Philosophy*. Yale University Press.

Partee, B., 1991. Topic, focus, and quantification. In: S. Moore and A. Wyner, eds., *Proceedings from Semantics and Linguistic Theory (SALT)* I, Cornell Working Papers in Linguistics 10, Cornell University, Ithaca, 159-187

Partee, B., E. Bach, and A. Kratzer, 1987. Quantification: A Cross-Linguistic Perspective, NSF proposal, UMass, Amherst.

Rooth, M., 1985. *Association with Focus*. Ph.D. dissertation, University of Massachusetts, Amherst.

Rooth, M., ms. 1989. Indefinites, Adverbs of Quantification, and Focus Semantics.

Sgall, P.(ed.) 1984. *Contributions to Functional Syntax, Semantics, and Language Comprehension*, Praha: Academia.

Vlk, T., 1988a. Topic/Focus Articulation and Intensional Logic. In: D. Vargha, ed., *COLING'88*, ACL, Budapest. 720-725.

Vlk, T., 1988b. Towards a Transduction of Underlying Structures Into Intensional Logic. *The Prague Bulletin of Mathematical Linguistics* 50: 35-70.