

Certain Verbs Are Syntactically Explicit Quantifiers

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Quantification over individuals, times, and worlds may be
 made explicit in the syntax of the object language: $\lambda v[\dots v\dots]$, $\exists v[\dots v\dots]$, $\forall v[\dots v\dots]$, etc.
 or left implicit (semantic, metalinguistic): \wedge , \diamond , \square , etc.

Diagnostics for explicitly quantifiable arguments in natural language:

- (i) the existence of variable-like pronouns referring to the syntactically represented argument;
- (ii) the argument is not evaluated with respect to a single index;
- (iii) the argument need not be linked to the closest suitable operator.

Widely held view:

Quantification over individuals is explicit; quantification over times and worlds is implicit.

But see, a.o., Quine 1960 re: individuals; Groenendijk & Stokhof 1984, Percus 2000, Lechner 2007 re: worlds; Cresswell 1990, Iatridou 1994, Schlenker 1999, 2004, von Stechow 2004, Kusumoto 2005 re: times and worlds; Schlenker 2006 re: ontological symmetry in general.

Once everyone now happy was going to be miserable. (Cresswell 1990)

It might have been that everyone actually rich was poor. (Cresswell 1990)

Compare Karttunen 1977 with Groenendijk & Stokhof 1984 for Who walks?

complement of <u>know/wonder</u> , Karttunen:	$\lambda p \exists x [p = \wedge \text{walk}(x) \wedge \vee p]$
complement of <u>know</u> , G&S:	$\lambda i [\lambda x [\text{walk}(i)(x)] = \lambda x [\text{walk}(w^*)(x)]]$
complement of <u>wonder</u> , G&S:	$\lambda j \lambda i [\lambda x [\text{walk}(i)(x)] = \lambda x [\text{walk}(j)(x)]]$

Clarification question:

Is explicit quantification the same as having variables and variable binding in the logical syntax or LF?

“For my purpose is to shew that the facts of natural language are such that if we begin with a possible worlds semantics for it at all, then we must have one which has the power of quantification over worlds. Perhaps some will say that even if \mathcal{L}^* has the power of quantification over worlds yet it still does not quantify over worlds, because it actually does not have world variables. My reply to that is simple. If possession of variables is a *syntactic* matter then it is doubtful that natural language quantification has variables in *any* interesting sense even if pronouns have sometimes been thought to be such. If it is not a syntactic matter then I am unsure what other criterion can be given than expressive power.” (Cresswell 1990: 61)

To wit, a rewrite of G&S’s wonder-complement: Let “walk” be of type $\langle s, \langle e, t \rangle \rangle$; “=” of type $\langle \langle e, t \rangle, \langle \langle e, t \rangle, \langle e, t \rangle \rangle \rangle$; functional composition $Bfgi = f(gi)$; and argument permutation $Cfab = fba$. Then $\lambda j \lambda i [\lambda x [\text{walk}(i)(x)] = \lambda x [\text{walk}(j)(x)]]$ is $B(C(B(=)(\text{walk}))) (\text{walk})$.

Non-variable-binding operators by themselves have less expressive power than \forall , \exists , λ , but a system that combines them with operations that manipulate the arguments of functions has the same expressive power. Quine 1960 and Cresswell 1990 used a modal propositional logic to demonstrate this. The rewriting of who walks above is non-propositional and uses Curry's 1958 combinators; see also Hendriks 1993 for full-blown quantification.

Answer to the clarification question:

Having explicit quantification over times and worlds is understood as follows: natural language expressions have time and world arguments alongside entity arguments, and some uses of operators with quantificational force require that time and world arguments be manipulated in the same ways as entity arguments are manipulated. *With what method* they are manipulated is not essential.

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Among the linguistic operators with quantificational content, which ones are explicit quantifiers?

Propositional attitude verbs (know, believe, want, etc.) are typically regarded as implicit quantifiers over accessible worlds: Hintikka 1962, Heim 1992, ... But von Stechow 2004, 2008: Tenses, modals, and attitude expressions are generalized quantifiers that bind, respectively, a temporal argument of the verb, a world argument of the verb, and <world, time> argument pairs.

A new empirical diagnostic

Hitherto unnoticed scope interactions between so-called raising verbs and their subjects suggest that those raising verbs are syntactically explicit quantifiers over time (or, possibly, world) arguments.

A "raising verb" takes an infinitival clause as a complement and bears a semantic relation to the whole of the complement clause, not to its superficial subject. The superficial subject of the finite clause is promoted ("raised") from the infinitival clause.

PART I. VERBAL QUANTIFIERS OVER TIMES

In lead role: cross-linguistic counterparts of the **aspectual raising verb begin** (Perlmutter 1970)

- | | |
|--|---------------------------|
| (1) There began to be a commotion. | (expletive <u>there</u>) |
| (2) Heed began to be paid to the urban problems. | (idiom chunk) |
| (3) The paint began to dry. | (non-sentient subject) |
| (4) Mary began to get good roles. | (non-agentive subject) |

HI subject reading

Who is getting good roles?
 before May after May
 Mary: no Mary: yes
 Susan: no Susan: no
 Eva: yes Eva: yes

LO subject reading

Who is getting good roles?
 before May after May
 Mary: yes/no Mary: yes
 Susan: no Susan: no
 Eva: yes Eva: no

- (5) In May, only Mary began to get good roles.

HI reading of the subject: *only Mary > it began to be the case that*

'only Mary is such that previously she did not get good roles, but now she is getting good roles'

LO reading of the subject: *it began to be the case that > only Mary*

'previously people other than Mary were getting good roles (maybe Mary too), but now only Mary is getting good roles'

In some languages the verb-precedes-subject order carries the LO reading of the subject.

The subject-precedes-verb orders would unambiguously carry the HI reading.

- | | | | | | | | |
|-----|-------------------------------------|---------------------------|----------------------------|---|--------------------|------------------------|-----------------------|
| (6) | Elkezdett
<u>began</u> | csak Mari
only Mari | kapni
get.inf | jó szerepeket.
good roles.acc | | Hungarian
(only LO) | |
| (7) | Stal
<u>began</u> | prixodit'
go-inf | domoj
home | tol'ko Ivan ustalym.
only Ivan tired | | Russian
(only LO) | |
| (8) | In mei begon
in May <u>began</u> | alleen Marie
only Mary | goede rollen
good roles | te krijgen.
to get.inf | | Dutch
(HI/LO) | |
| (9) | À
focus | kà
<u>past</u> | jěfǎ
<u>begin</u> | ndùù Maria
only Maria | jìngět
inf.have | ndàà li?
good roles | Shupamem
(only LO) |

How do such data bear on whether we have explicit quantification over times?

Suppose the right syntactic analysis is that ONLY MARY is located in the main clause, and the verb BEGAN acquires scope above it by fronting. What could be the matching semantics?

- If BEGAN is a syntactically analyzed as an operator of type α , and its trace is of the same type,

(10) $(\text{BEGAN}_\alpha) \lambda V_\alpha [\text{ONLY MARY}(V_\alpha (\text{GET GOOD ROLES}))]$

then we have a classical case of “scope reconstruction” (Cresti 1995, a.o.). No LO reading is produced.

- But in (11) we have a classical case of quantifying-in. LO reading is produced.

(11) $\text{BEGAN}_\alpha (\lambda t[\dots \text{ONLY MARY} \dots t \dots \text{GET GOOD ROLES}])$ with t a 1st-order time argument

Analytical possibilities for LO subject readings to be considered below:

	Syntactic locus of ONLY MARY	Scope of ONLY MARY	How does the LO reading come about? (BEGIN_> ONLY MARY)	Here proposed for
(A)	Infinitival clause	Infinitival clause	Trivial	Hungarian (Russian?)
(B)	Main clause	Infinitival clause	ONLY MARY binds a higher-order variable trace in the infinitival clause = “scope reconstruction” of subject	—
(C)	Main clause	Main clause	Verb is fronted without leaving a semantically significant trace	—
(D)	Main clause	Main clause	Fronted verb binds a first-order argument within the scope of the subject = “quantifier raising” of verb	Shupamem, Dutch (Russian?)
(E)	Main clause	Main clause	Covert (logical form) counterpart of verb fronting with first-order time argument	English

(A) ‘Only NOM’ is the subject in the infinitival clause: Hungarian

Constituent order makes clear that csak Mari is inside the infinitival clause in (12). Csak ‘only’ phrases must be immediately preverbal, cf. (13). The only possible order of operators in (12) replicates the only possible order in the preverbal field in finite clauses.

(12) Elkezdett [mindenütt csak Mari beszélni].
 pfx.began.3sg everywhere only Mary speak.inf
 ca. ‘It began to be the case that everywhere only Mary speaks’

(13) * Beszélt mindenütt csak Mari. versus Mindenütt csak Mari beszélt.
 spoke.3sg everywhere only Mary everywhere only Mary spoke.3sg
 ‘Everywhere only Mary spoke’

Given this syntax, the LO reading is not surprising in Hungarian. A similar argument can be made for Italian and Spanish, for both raising and control complements (Szabolcsi 2009).

But in Shupamem, Dutch, and English there is no evidence that the infinitival clause can have an overt nominative subject, or there is evidence to the contrary.

The status of Russian is debatable. Tol’ko Ivan ‘only Ivan’ in (7) may be inside the complement clause, in which case the construction is like the Hungarian, etc. ones. Alternatively the mingling of tol’ko Ivan with complement material may be a result of rightward scrambling (Polinsky and Potsdam 2008), in which case Russian raises the same questions as Shupamem, etc.

(B) “Scope reconstruction” of subjects cannot be the source of LO readings in Shupamem

Suppose V-fronting is semantically inert. Shupamem (9a,b) are unambiguous. So the subject would only lower from the finite clause back into the infinitive when V is fronted, but then obligatorily. Very unusual. Perhaps V-fronting would be blocked by the scopally intervening ONLY-phrase?

[9] a. HI		Ndùù	Maria	kà	jèfǒ	jìngět	ndàà	lì?	
		only	Maria	past	begin	inf.have	good	roles	
b. LO	à	kà	jèfǒ	ndùù	Maria	kà jèfǒ	jìngět	ndàà	lì?
	focus	past	begin	<u>only</u>	<u>Maria</u>	past begin	inf.have	good	roles

Not likely. Dutch (8) is ambiguous. Obligatory lowering (reconstruction) would disambiguate it.

[8] HI/LO	In mei	begon	<u>alleen Marie</u>	begon	goede rollen te krijgen.
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(C) Finite verb is not fronted in the main clause without leaving a semantically significant trace

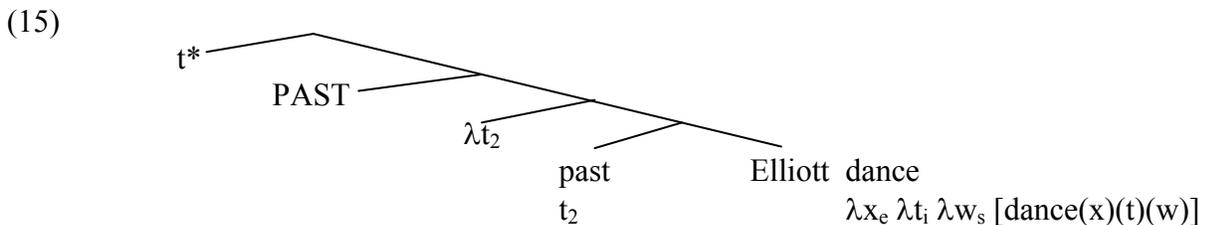
(14) a. HI		ONLY MARY	BEGAN	INF	} Shupamem, Dutch
b. LO	BEGAN	ONLY MARY		INF	

This amounts to treating the finite verb like an adjunct. Not likely, for syntactic reasons. Semantically, the finite raising verb may be an adjunct; syntactically it is not, cf. the configurational account of the nominative case of the subject.

(D) Verb fronting as quantifying-in (“quantifier raising”, QR)

The fronting of the raising verb across the main clause subject assigns the verb scope over the subject. This effect is possible only if BEGIN binds a first-order argument within the scope of the subject – a time argument.
Thus, the scope-changing effect of verb movement diagnoses the binding of a first-order time argument (or world argument, depending on the kind of verb: aspectual vs. intensional).

- Kusumoto 2005, following Kratzer:
past is the tense inflection on the verb (a free variable), PAST is a phonetically null tense quantifier, and *t** is the evaluation time. The type (sort) of times is \bar{i} .



$$[[\text{PAST}]] = \lambda P_{\langle i, \langle s, t \rangle \rangle} \lambda t_i \lambda w_s \exists t'' [t'' < t \wedge P(t)(w)]$$

(E) LO/HI ambiguities in English and Dutch: “scope reconstruction” of BEGIN

- [8] In mei begon alleen Marie goede rollen te krijgen. (LO/HI)
 in May began only Mary good roles to get.inf
- [5] In May only Mary began to get good roles. (LO/HI)

LO readings: overt V-fronting in Dutch; covert V-fronting in English.
 HI readings: “scope reconstruction” of begon in Dutch; no covert action in English.

Scope reconstruction is routinely used to derive lower-than-surface scopes for nominal quantifiers:

- (19) A unicorn seems to be approaching.
 ‘It seems that a unicorn is approaching’
- (20) How many people should I talk to?
 ‘For what n , it should be the case that there are n people that I talk to’

Implemented using a higher-order, as opposed to first order, variable as a trace. A (10)-style derivation would give the correct interpretation of V-fronting when it has no scope effect (8-HI):

$$\lambda V_{\alpha} [\dots \text{Subject} \dots V \dots] (\text{Verb}_{\alpha}) = [\dots \text{Subject} \dots \text{Verb}_{\alpha} \dots]$$

Shupamem V-fronting does not reconstruct, because it involves focus, not just V-2, as in Dutch.

Aspectual verbs as quantifiers undergo the same kind of scope-assignment processes (“quantifier raising”, possibly “reconstruction”) as nominal quantifiers.

(B) again: Why not simply assume reconstruction of the subject in English (5-LO)?

- Only indefinites reconstruct into the complement of intensional raising verbs (Lasnik 1999); but non-indefinites happily participate in LO readings with begin (Google hits):
 - (21) Every student is quite likely to pass the exam.
 # ‘It is quite likely that every student passes the exam’ (Lasnik 1999)
 - (22) Every step began to be a struggle.
 - (23) Beginning with Abraham Darby's bridge ... in 1779, most bridges began to be built of cast and wrought iron.
 - (24) when every game began to be televised on CBS ... it dulled the interest in the final game.
- Reconstructed indefinite subjects can be inversely scoped over in the complement, see (25); but **at least some** possible inverse readings disappear with LO-reading of subject, see (26)-(27):
 - (25) Some politician is likely to address every rally. OK likely > every rally > some politician
 - (26) Only Mary showed up every day. OK every day > only Mary
 - (27) In June only Mary began to show up every day. # began > every day > only Mary

PART II. VERBAL QUANTIFIERS OVER WORLDS?

Is scope interaction with the subject exhibited by modals and intensional raising verbs?

The picture is much less clear. Some but not all modals exhibit interaction; intensional raising verbs generally do not. (I am trying to discount cases where probably the subject reconstructs.) Maybe all of these are syntactically active quantifiers, but some of them resist taking inverse scope, somewhat like modified numeral QPs. Maybe the main demarcation line is between functional elements (aspectuals, modals) vs. fully lexical intensional raising verbs.

What are the prospects for a generalized quantifier-style treatment of propositional attitudes?

Modals

- Lechner 2007: split scope with can and need; covert head movement with semantic effect:

(28) Not every boy can make the team. neg > can > every

(29) No player needs a partner. neg > must > exist

[[need]] = $\lambda p \lambda w \forall w' [\text{Acc}(w)(w') \rightarrow p(w')]$ (plus short lowering of subject)

- Homer 2009: subject reconstruction, or covert movement of the modal past both the indefinite and negation:

(30) [Context: the rules of this bowling game state that exactly one pin must remain standing, no matter which one. . .]

Exactement une de ces quilles ne doit[deont] pas être renversée.

exactly one of those pins neg must-present neg be knocked.down

'Exactly one of those pins mustn't be knocked down.' (must[deont] > exactly one > not)

- LO readings with epistemic must (also could, but for some reason not may or might):

(31) [Seeing the lights on in all the windows of a big apartment building]

Everybody must be home.

(32) [Hearing loud music when we know that Mary's roommates hate loud music]

Only Mary must be home.

- The effects of fronting BEGIN are replicated by CAN in Shupamem:

(33) Ndùù Maria jètnǎ jìngět ndàà li? (unambiguous)

only Mary can inf.have good role

'Only Mary is such that she can get good roles'

(34) À jètnǎ nà ndùù Maria _ jìngět ndàà li? (unambiguous)

focus can accompl only Mary inf.have good role

'It is possible that only Mary gets good roles'

Intensional raising verbs?

- The verb seem is not useful:

(35) Only Mary seems to be tall *iff* It seems that only Mary is tall

- The verb threaten is possibly useful. Assertion: complement *p* is likely; presupposition: *p* is bad

[Context: A flood. We own a barn and a fortress. We hope that neither collapse, i.e. both survive.]

(36) Only the barn threatened to collapse.

HI (reasonable reading) `Only the barn is such that the threat is that it will collapse`

LO (weird reading) `The threat is that only the barn will collapse`

(37) Only the fortress threatened to survive.

HI (weird reading) `Only the fortress is such that the threat is that it will survive`

LO (reasonable reading) `The threat is that only the fortress will survive`

- The LO reading is possible in Dutch (same pattern as with begon)

(38) Alleen de schuur dreigde te bezwijken.

only the barn threatened to collapse

HI (reasonable reading) `Only the barn is such that the threat is that it will collapse`

LO (weird reading) `The threat is that only the barn will collapse`

(39) In mei dreigde alleen het fort overeind te blijven.

in May threatened only the fortress to survive

HI (weird reading) `Only the fortress is such that the threat is that it will survive`

LO (reasonable reading) `The threat is that only the fortress will survive`

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Selected references

Cresswell 1990. *Entities and Indices*. Kluwer. * Curry & Feys 1958 *Combinatory Logic I*. North-Holland. * Groenendijk & Stokhof 1984. *The Semantics of Questions and the Pragmatics of Answers*. PhD, Amsterdam. * Heim 1992. Presupposition projection and the semantics of attitude reports. *JoS* 9. * Hintikka 1962. *Knowledge and Belief*. Cornell UP. * Homer 2009. Epistemic modals: high ma non troppo. *NELS* 40. * Iatridou 1994. On the meaning of conditional *then*. *NLS*. Jacobson 1999. Towards a variable-free semantics. *L&P* 22. * Kusumoto 2005. On the quantification over times in natural language. *NLS* 13. * Lechner 2007. Interpretive effects of head movement. At *lingBuzz*. * Perlmutter 1970. The two verbs *begin*. In Jacobs & Rosenbaum. * Percus 2000. Constraints on some other variables in syntax. *NLS* 8. * Schlenker 2006. Ontological symmetry in language. *Mind and Language* 21. * von Stechow 2008. Tenses, modals, and attitudes as verbal quantifiers. *ESSLLI Hamburg*. * Szabolcsi 2009. Overt nominative subjects in infinitival complements cross-linguistically. <http://www.nyu.edu/gsas/dept/lingu/nyuwpl/>