Who and what do *who* and *what* range over cross-linguistically?

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Roadmap

- Dayal's (1996) account of the Uniqueness Presupposition.
- A problem for Dayal from cross-linguistic data.
- The weak theory of plurality.
- Analysis in terms of higher-order quantification.

Singular *which* questions

Singular *which* questions carry a *Uniqueness Presupposition* (UP).

(1) Which employee left early?

a. Moss left early.

b. # Roy and Moss left early.

Plural *which* questions

Plural *which* questions carry an *anti-singleton inference*.

(2) Which employees left early?

a. # Roy left early.

b. Roy and Moss left early.

Simplex *wh*-questions

Simplex *wh*-questions carry neither a UP nor an anti-singleton inference(!)

(3) Who left early?

a. Roy left early.

b. Roy and Moss left early.

Which vs. *who*

- singular *which* - UP
- plural *which* - anti-singleton
- *who* - neither(!)

What is especially puzzling is that *who* patterns with neither singular *which* nor plural *which*.

Maximal Informativity

Dayal's (1996) solution is to propose the *Maximal Informativity Principle* (MIP): a question Q presupposes the existence of a unique maximally-informative true answer to Q.

Dayal cashes this out as an operator that composes with a question at LF.

(4) $$\mathfrak{A}(w)(Q) = \iota p[p(w) \wedge Q(p) \wedge \forall p'[[p'(w) \wedge Q(p)] \rightarrow p \subseteq p']]$$

Maximal Informativity (cont.)

Dayal additionally assumes that singular *which* phrases range over atomic individuals only.

This immediately derives the UP for singular *which*-questions.

$$[\![(1)]\!] = \left\{ \begin{array}{l} ① \, \lambda w.\texttt{leftEarly}_w(\texttt{Roy}), \\ ② \, \lambda w.\texttt{leftEarly}_w(\texttt{Moss}), \\ \lambda w.\texttt{leftEarly}_w(\texttt{Jen}) \end{array} \right\}$$

If ① and ② are both true in $w_@$, then $\mathfrak{A}(w_@)([\![(1)]\!])$ is undefined, since ① does not entail ②, and ② does not entail ①.

Maximal Informativity (cont.)

Dayal assumes that semantically plural *which*-phrases may also range over pluralities.

$$[\![(2)]\!] = \left\{ \begin{array}{l} ① \lambda w.\texttt{leftEarly}_w(\texttt{Roy}), \\ ② \lambda w.\texttt{leftEarly}_w(\texttt{Moss}), \\ \lambda w.\texttt{leftEarly}_w(\texttt{Jen}), \\ ③ \lambda w.\texttt{leftEarly}_w(\texttt{RoyAndMoss}), \\ \lambda w.\texttt{leftEarly}_w(\texttt{RoyAndJen}), \\ \lambda w.\texttt{leftEarly}_w(\texttt{MossAndJen}), \\ \lambda w.\texttt{leftEarly}_w(\texttt{RoyMossAndJen}) \end{array} \right\}$$

If ①, ②, and ③ are all true in $w_@$, then $\mathfrak{A}(w_@)([\![(2)]\!])$ is defined, returning the proposition in ③.

Maximal Informativity (cont.)

In order to account for the absence of a UP with simplex *wh*-questions, Dayal claims that, although simplex *wh*-expressions such as “who” are morphosyntactically singular (in English), they are semantically plural.

(5) Who { is | *are } leaving early?

Dayal’s explanation, therefore, rests on an idiosyncratic property of English.

Cross-linguistic data

Dayal's account makes predictions about languages which make a distinction between *who.SG* and *who.PL*.

Our findings based on Spanish and Hungarian:

- *who.SG* questions do not carry a UP.
- *who.PL* questions carry an anti-singleton inference.

Spanish *which* questions

(6) *Qué chico se fue pronto?*
Which boy.SG refl left early?

a. John left early.

b. # John and Bill left early.

(7) *Qué chicos se fueron pronto?*
Which boy.PL refl left early?

a. # John left early.

b. John and Bill left early.

Spanish *who* questions

(8) *Quién* *se* *fue* *pronto?*
Who.SG refl left early?

a. John left early.

b. John and Bill left early.

(9) *Quiénes* *se* *fueron* *pronto?*
Who.PL refl left early?

a. # John left early.

b. John and Bill left early.

Hungarian *which* questions

(10) *Melyik fiú ment el?*
which boy.SG goes away?

a. John went away.

b. # John and Bill went away.

(11) *Melyik fiú-k men-t-ek el?*
which boy.PL went away?

a. John went away.

b. # John and Bill went away.

Hungarian *who* questions

(12) *Ki* *énekel?*
who.SG sings?
a. John sings.
b. John and Mary sing.

(13) *Ki-k* *énekel-nek?*
who.PL sing?
a. # John sings.
b. John and Mary sing.

Problems for Dayal 1996

A possible account consistent with Dayal's assumptions.

$\rightsquigarrow$ Both *who.SG* and *who.PL* are semantically plural.

Problems for this account:

$\rightsquigarrow$ Lack of congruity between semantics and morphosyntax (learnability issues)

$\rightsquigarrow$ Accounting for the anti-singleton inference associated with *who.PL*

Plurality

We assume that semantically plural DPs denote *i-(ndividual) sums* (Link 1983).

(14) a. $[\![\text{Roy and Moss}]\!] = \texttt{Roy} \oplus \texttt{Moss}$

b. $[\![\text{the employees}]\!] = \texttt{Roy} \oplus \texttt{Moss} \oplus \texttt{Jen}$

D_e is closed under $\oplus$.

(15) $$D_e = \left\{ \begin{array}{c} \texttt{Roy}, \texttt{Moss}, \texttt{Jen} \\ \texttt{Roy} \oplus \texttt{Moss}, \texttt{Roy} \oplus \texttt{Jen}, \texttt{Moss} \oplus \texttt{Jen} \\ \texttt{Roy} \oplus \texttt{Moss} \oplus \texttt{Jen} \end{array} \right\}$$

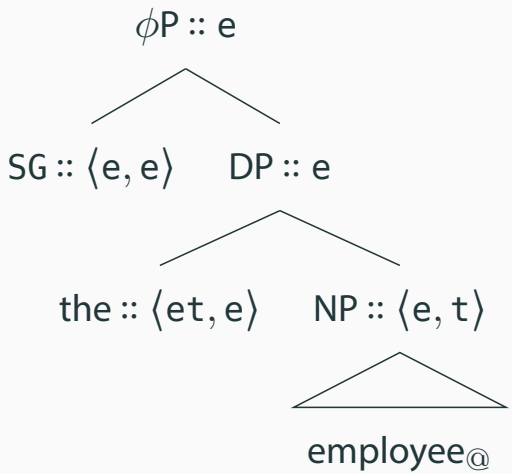
The weak theory of plurality

Conjecture: the plural is semantically vacuous; the singular is meaningful (Sauerland 2003, 2008 and Sauerland, Anderssen & Yatsushiro 2005).

(16) a. $[\![\mathsf{SG}]\!] = \lambda x : \overbrace{\mathtt{ATOM}_@(x)}^{\text{presupposition}} .x$

b. $[\![\mathsf{PL}]\!] = \lambda x.x$

N.b. following Sauerland 2003 we assume that number heads a ϕP projection, and applies to DP rather than NP.



Accounting for the anti-singleton inference

(17) $[\![\text{the}]\!] = \lambda P.\sigma(P)$ σ is defined for P iff there is a unique maximal element in P

(18) $[\![\text{the man left}]\!] = \lambda w : \texttt{ATOM}_@(\sigma(\texttt{man}_@)).\texttt{left}_w(\sigma(\texttt{man}_@))$

(19) $[\![\text{the men left}]\!] = \lambda w.\texttt{left}_w(\sigma(\texttt{man}_@))$

(20) **Maximize Presupposition! (MP!) (informal)** (Heim 1991)
Do not use S if there is a presuppositionally stronger $S' \in \texttt{ALT}(S)$.

If (18) $\in \texttt{ALT}((19))$, an utterance of (19) gives rise to an *implicated presupposition* (Sauerland 2008): (18) is not defined in c, and therefore $\texttt{ATOM}_@(\sigma(\texttt{man}_@))$ is not believed to be true.

Recap

Dayal's account of the UP has to assume that *who* in English is semantically plural (despite being morphosyntactically singular).

The puzzle: Dayal's account makes the wrong predictions for languages with *who.SG* and *who.PL*. Potential fixes are independently problematic.

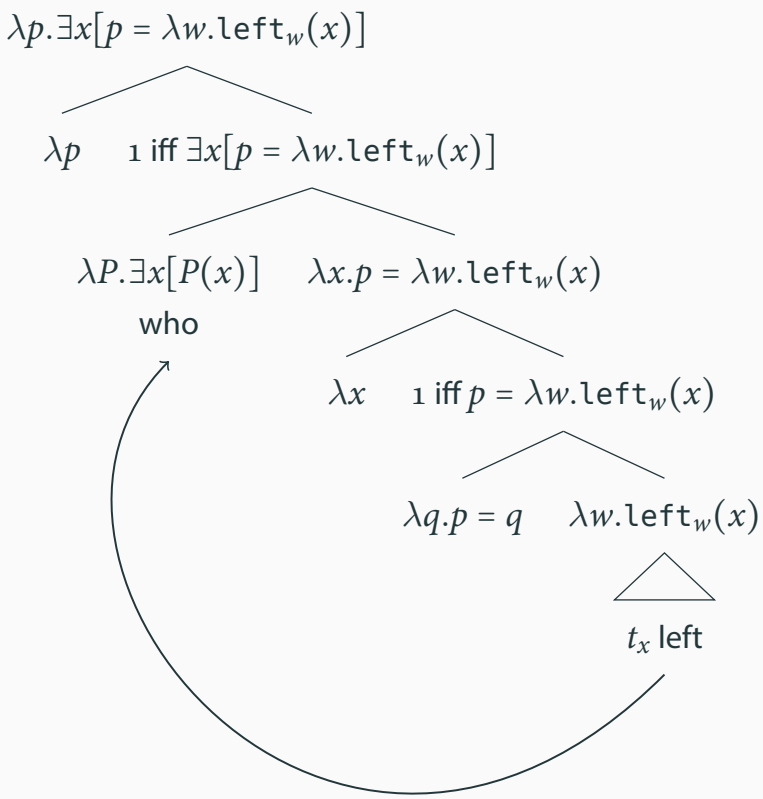
The goal:

- retain Dayal's account for the UP of singular *which*-questions and the anti-singleton inference of plural *which*-questions.
- Accommodate the absence of the UP with *who.SG*.

Analysis

Questions

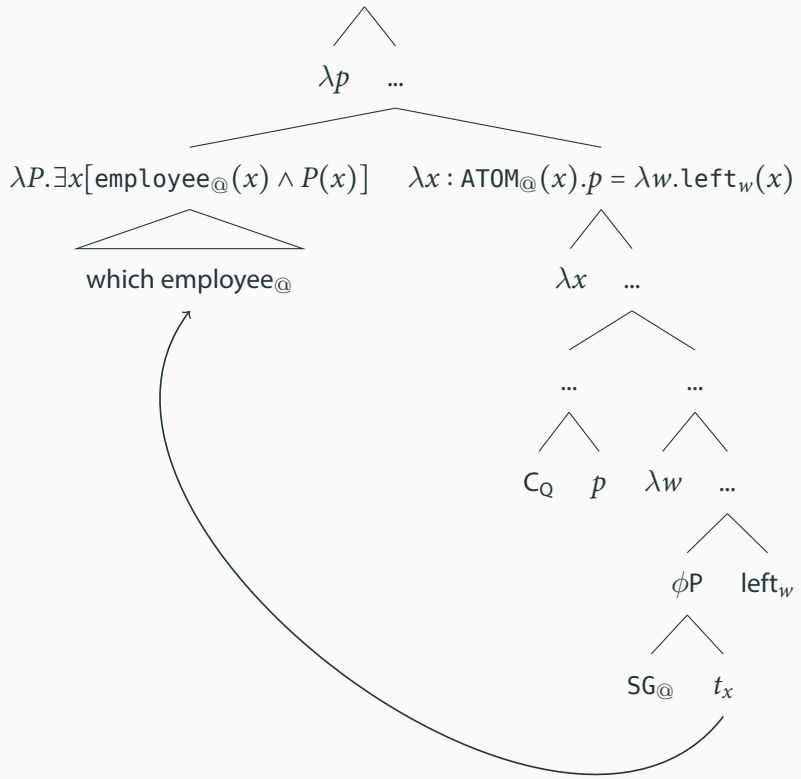
For concreteness, we assume that *wh*-phrases are existential quantifiers, adopting Fox's (2012) take on Karttunen 1977.



Questions and number

Adopting Sauerland's (2003) account of number, number features are defined for arguments of type e, and therefore apply to the trace of *wh*-movement.

$$\lambda p : \forall x'[(\texttt{employee}_@(x') \wedge \texttt{left}_@(x')) \rightarrow \texttt{ATOM}_@(x')].\exists x[\texttt{employee}_@(x) \wedge p = \lambda w.\texttt{left}_w(x)]$$



A type-flexible denotation for *who*

We claim that simplex *wh*-expressions can range over higher-order semantic objects, rather than just members of D_e.

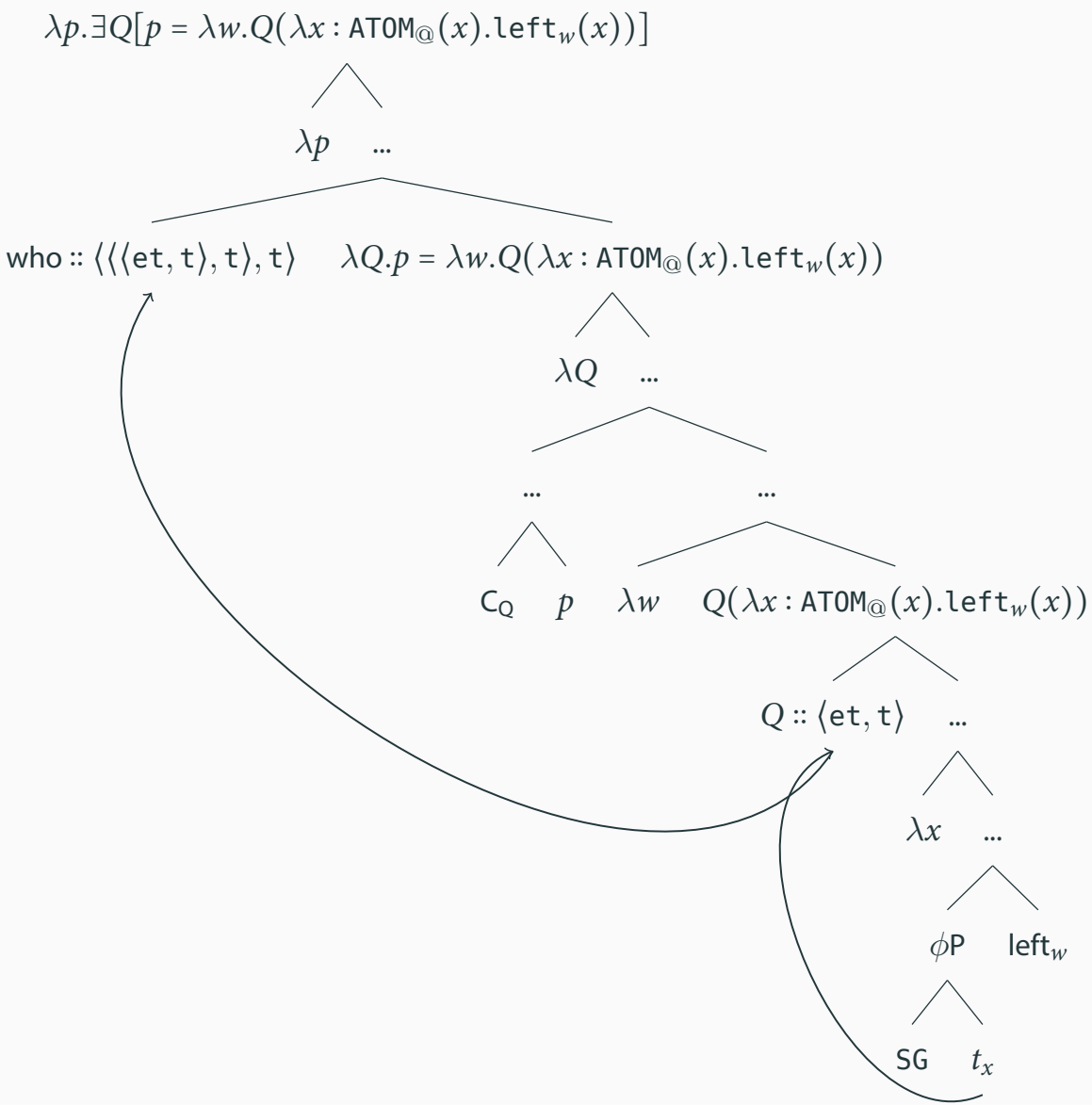
(21) $[\![\text{who}]\!] = \lambda P_\sigma . \exists x [P(x)]$
$\sigma \in \Sigma$

(22) $\sigma_1 \in \Sigma$ iff $\begin{cases} \sigma_1 = \langle \mathsf{e}, \mathsf{t} \rangle \\ \sigma_1 = \langle \sigma_2, \mathsf{t} \rangle \quad \text{where } \sigma_2 \in \Sigma \end{cases}$

(23) $\Sigma = \{\langle \mathsf{e}, \mathsf{t} \rangle, \langle \langle \mathsf{e}, \mathsf{t} \rangle, \mathsf{t} \rangle, \langle \langle \langle \langle \mathsf{e}, \mathsf{t} \rangle, \mathsf{t} \rangle, \mathsf{t} \rangle, \mathsf{t} \rangle, \mathsf{t} \rangle, \ldots \}$

See Spector (2007, 2008) for related ideas.

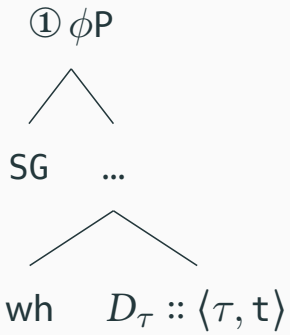
LF for *who.SG$_Q$ left?*

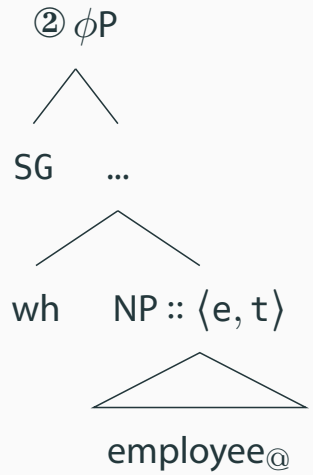


(24) $[\![\text{who}_Q \text{ left?}]\!] =$

$$\left\{\begin{array}{l}
\lambda w.\{\{\mathtt{R}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
\lambda w.\{\{\mathtt{M}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
\lambda w.\{\{\mathtt{J}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
①\lambda w.\{\{\mathtt{R},\mathtt{M}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
②\lambda w.\{\{\mathtt{R},\mathtt{M}\},\{\mathtt{R}\oplus\mathtt{M}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
\lambda w.\{\{\mathtt{R},\mathtt{J}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
\lambda w.\{\{\mathtt{M},\mathtt{J}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
\lambda w.\{\{\mathtt{R},\mathtt{M},\mathtt{J}\}\}(\lambda x : \mathtt{ATOM}_@(x).\mathtt{left}_w(x)), \\
\ldots
\end{array}\right\}$$

If in $w_@$ both Roy and Moss left, then ① and ② are both *true*, and $\mathfrak{A}(w_@)([\![(24)]\!])$ is defined, returning ①. This is because ① asymmetrically entails ②; it is more informative.





$\tau \in Q$ and $\tau_1 \in Q$ iff $\begin{cases} \tau_1 = \mathrm{e} \\ \tau_1 = \langle \tau_2, \mathrm{t} \rangle \quad \text{where } \tau_2 \in Q \end{cases}$

We claim that simplex *wh*-expressions are type-flexible because they spell out the structure in ①; polymorphism arises due to the polymorphic domain variable at the core of the *wh*-expression. NP restrictors are however strictly typed as $\langle \mathrm{e}, \mathrm{t} \rangle$.

(25) $\quad [\![\mathrm{wh}]\!] = \lambda P_{\sigma,t}.\lambda Q_{\sigma,t}.\exists x_\sigma [P(x) \wedge Q(x)]$

Anti-singleton inference

We retain Sauerland, Anderssen & Yatsushiro's (2005) account of the anti-singleton inference as a reflex of MP! (see also Sauerland 2008).

To account for the anti-singleton inference associated with *who.PL* in Spanish and other languages just so long as $who_{\langle et,t\rangle}$.*SG left?* is always in ALT($who_{\langle \sigma,t\rangle}$.*PL left?*).

Conclusion

The puzzle: Dayal's account makes the wrong predictions for languages with *who.SG* and *who.PL*. Potential fixes are independently problematic.

The goal: Retain Dayal's account for the UP of singular *which*-questions and the anti-singleton inference of plural *which*-questions, and accommodate the absence of the UP with *who.SG*.

The solution:

- *who.PL* and *which.PL* range over both atoms and groups, just as the weak theory of plurality tells us they should.
- The atomicity presupposition associated with SG in conjunction with $\mathfrak{A}$ gives rise to a UP with *which.SG*.
- In order to weaken the UP associated with *who.SG*, we claim that *who* can range over higher-order semantic objects as well as individuals (a claim made for independent reasons by Spector 2007, 2008).

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Questions?

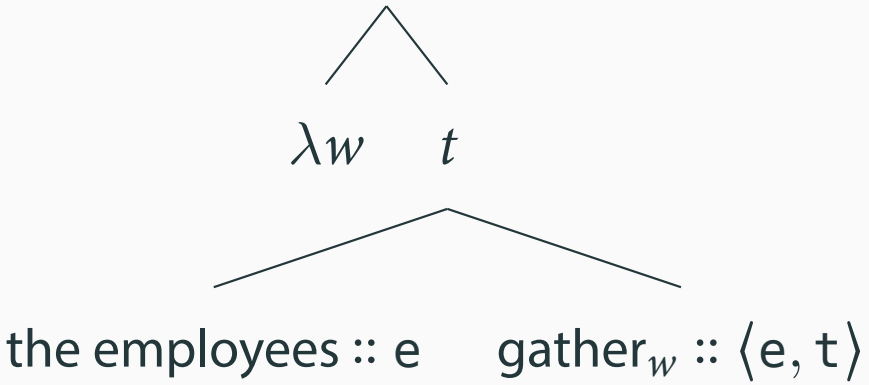
Appendix

Collective predicates

Group-denoting expressions compose directly with collective predicates.

(26) $[\![\text{gather}_w]\!] = \lambda x : \neg\texttt{ATOM}_@(x).\texttt{gather}_w(x)$

$$\lambda w : \neg\texttt{ATOM}_@(\texttt{theEmployees}).\texttt{gather}_w(\texttt{theEmployees}) :: \langle \texttt{s}, \texttt{t} \rangle$$



Collective predicates cont.

A major advantage of our account is that it allows us to treat simplex *wh*-expressions in English as semantically singular, consistent with their morphosyntactic singularity.

BUT simplex *wh*-expressions *can* compose with collective predicates for many speakers.

(27) a. Who gathered in the hallway?

b. #Which employee gathered in the hallway?

Collective predicates cont.

We do not provide a concrete analysis here, but simply observe that many speakers allow a morphosyntactically singular quantificational DP to compose with a collective predicate in the case of *every NP*.

(28) Every employee gathered in the hallway.