

A pied-piping theory of exceptional *de re*: Scoping after all

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[virtual] GLOW 43

02 April 2020

1 What's this paper trying to do?

- A very well-known observation: overt displacement in a given string may alter the truth conditions of that string, as illustrated by the sentence pair in (1).

- (1) a. [QP₁ bi çocuk] [QP₂ her elma-yı] ye-di
a child every apple-ACC eat-PST.3SG
'A child ate every apple.'
false if every apple was eaten by a different child.
- b. [QP₂ her elma-yı] [QP₁ bi çocuk] t_{QP₂} ye-di
every apple-ACC a child eat-PST.3SG
true if every apple was eaten by a different child. Turkish

– Surely, there are many grammars consistent with this observation. Here is a popular one:

- A widely adopted view of grammar:

- Assumption #1
What gets interpreted is hierarchical structures (also called LFs), i.e. not directly strings.
- Assumption #2
a. Grammar is endowed with an operation of **movement** - defined over structures, **not** strings.
b. String-level displacement is **not** a necessary feature of movement, i.e. movement can also be covert (e.g. Quantifier Raising (Heim and Kratzer, 1998)).
- Assumption #3
Semantic effects that arise with movement (concerning, in particular, scope & opacity) **also arise in the absence of movement**. Therefore, we need additional (non-movement) mechanisms that can derive these semantic effects, e.g.
 - * pointwise composition (Shimoyama, 2006, a.o.), choice functions (Reinhart, 1997, a.o.)
 - * world/situation pronouns (Percus, 2000; Schwarz, 2012, a.o.)

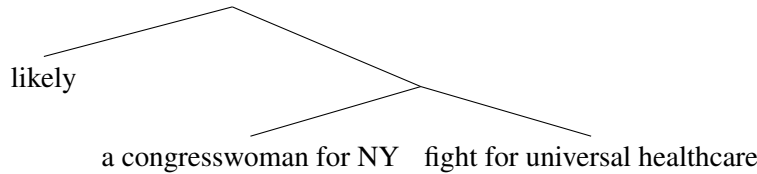
- This paper challenges Assumption 3 by revisiting the fairly established view that “semantic effects that arise with movement can also arise without movement”.

- In particular, I rework Charlow's (2019) proposal on exceptional (i.e. island-violating) scope into a **unified theory of scope and opacity effects** that does not resort to in-situ mechanisms.

2 SEM 101: Semantic effects of movement

- When XP moves above ω , XP is no longer in the syntactic scope of ω . This movement may affect the **semantic scope** and the **intensional status** of XP with respect to ω .
- Under the traditional **Scope Theory of Intensionality** (STI), the LF/interpretation-position of a DP determines its intensional status (opacity) (Russell, 1905; Montague, 1973; Heim and Kratzer, 1998; von Fintel and Heim, 2011, a.o.). Accordingly:
 - If a DP is in the syntactic scope of an intensional operator, that DP is **opaque** (= *de dicto*) with respect to that operator (i.e. evaluated in the intensional context created by that operator)
 - If a DP is outside the syntactic scope of an intensional operator, that DP is **transparent** (= *de re*) with respect to that operator (i.e. evaluated outside the intensional context created by it)
- To illustrate, if syntactic scope determines semantic scope, we derive distinct truth conditions from the LFs below under STI's assumptions
 - In (2a), the indefinite **a congresswoman for New York** is narrow scope & *de dicto* with respect to **likely**, which is an intensional operator.¹
 - In (3a), the indefinite **a congresswoman for New York** is now outside the syntactic scope of **likely**. Therefore, it is wide scope & *de re* with respect to **likely**.

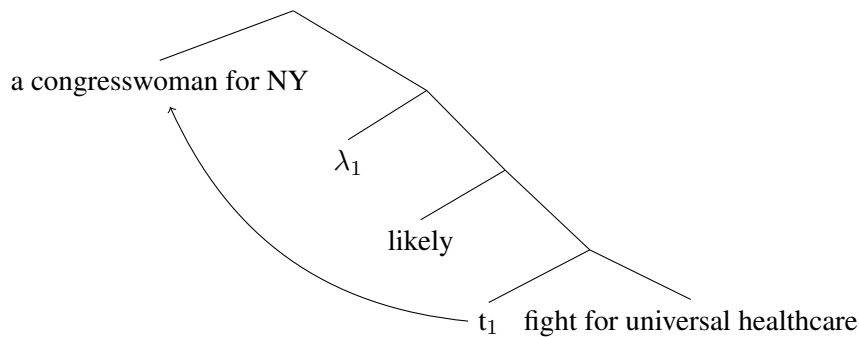
(2) a.



b. $\llbracket (2a) \rrbracket^w = 1$ iff $\llbracket \text{likely} \rrbracket^w(\lambda w'. \llbracket \text{a congresswoman for NY fight for UH} \rrbracket^{w'})$

c. Paraphrase: In likely worlds, some or other congresswoman for NY in those likely worlds fights for UH. (*can be true even if there has never been a congresswoman for NY*)

(3) a.



b. $\llbracket (3a) \rrbracket^w = 1$ iff $\exists x: \llbracket \text{congresswoman for NY} \rrbracket^w(x) \ \& \ \llbracket \text{likely} \rrbracket^w(\lambda w'. \llbracket \text{fight for UH} \rrbracket^{w'}(x))$

c. Paraphrase: There is a congresswoman for NY & in likely worlds, she fights for UH. (*cannot be true if there has never been a congresswoman for NY*)

¹If α is the sister of an intensional operator ω , ω will FA with the *intension* of α , i.e. $\lambda w'. \llbracket \alpha \rrbracket^{w'}$. Following von Fintel and Heim (2011), I assume this is achieved in one step via Intensional FA: e.g. $\llbracket \text{likely } \alpha \rrbracket^w = \llbracket \text{likely} \rrbracket^w(\lambda w'. \llbracket \alpha \rrbracket^{w'})$

3 It appears that movement is not the whole story

- Then, moving a DP is able to
 - make the DP *de re* with respect to an intensional operator it moves across
 - give the DP **wide scope** with respect to a scopal element it moves across
- The problem: both of these semantic effects have been argued to be available **without movement!**
 - ‘Third Reading’ - narrow scope + *de re* taken to be ‘*de re* without movement’
 - exceptional (island-violating) scope taken to be ‘*wide scope* without movement’
- Below, I briefly discuss both of these paradoxes and the enrichments proposed to deal with them

3.1 Third Reading: “Have I moved or stayed in-situ?”

PROBLEM

- A DP that semantically scopes **below** an intensional operator can be *de re*/transparent with respect to that operator (Fodor, 1970; Farkas, 1981; Cresswell, 1990; Ludlow and Neale, 1991; Abusch, 1994; Farkas, 1997; Percus, 2000, a.o). von Fintel and Heim (2011) call this **the third reading**.

(4) **the third reading:** *transparent [de re] but narrow scope*

- a. “*Mary looks at the ten contestants and says ‘I hope one of the three on the right wins — they are so shaggy — I like shaggy people.’. She doesn’t know that those are my friends.*”
- b. Mary hopes that **a friend of mine** will win the race. [von Fintel and Heim (2011): e190]
 - The third reading of *a friend of mine* requires it to take **narrow scope** with respect to *hope*, for in Mary’s hope-worlds possibly different people win the race.
 - However, that the winner has the property of being a friend of the speaker is clearly not part of Mary’s hope-worlds. Hence, *a friend of mine* has to be interpreted **transparent** with respect to the intensional context created by *hope*.
 - The third reading has been argued to lead to a paradox under STI’s assumptions:
 - * *a friend of mine* has to move above *hope* to be **transparent**
 - * *a friend of mine* has to remain below *hope* to be **narrow scope**

ENRICHMENT

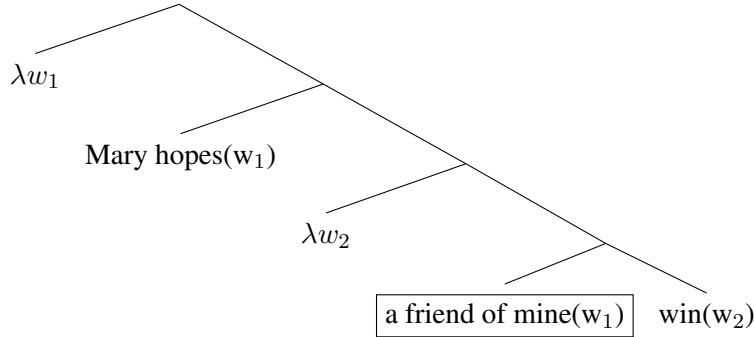
- This apparent paradox with the third reading has been used to argue that the representation of intensionality assumed under STI is not expressive enough.
 - Premise: A DP that is *narrow scope* with respect to an intensional operator is below it at LF.
 - Given that **the third reading** exists, STI **cannot** be our theory of intensionality because under STI’s assumptions, a DP can be transparent wrt an intensional operator iff it moves above it

- If the third reading cannot be derived via movement, then we do it via binding: We abandon STI and adopt the Binding Theory of Intensionality (BTI), a more expressive/permissive representation of intensionality (Percus, 2000; Schwarz, 2012, a.o.).

- Merge **world-denoting pronouns** in syntax.
- Bind them in-situ at a distance. (needs a binding theory that tells us what's allowed)

(5) Illustration of *de re* via binding in-situ under BTI

a.



b. $\llbracket (5a) \rrbracket(w) = 1$ iff $\llbracket \text{hopes} \rrbracket(w)(\lambda w'. \llbracket \text{a friend of mine} \rrbracket(w)(\llbracket \text{win} \rrbracket(w')))(\text{Mary})$

3.2 Exceptional Scope: “If I can’t move out of this island, how can you?”

PROBLEM

- **A long-known observation:** Indefinites & *wh*-phrases (existential quantifiers) can scope out of extraction islands, unlike universal quantifiers (Farkas, 1981; Huang, 1982; Fodor and Sag, 1982; Ruys, 1992; Abusch, 1994; Reinhart, 1997, a.o.).

(6) What can scope out of islands?

- a. [ISLAND If **every rich relative of mine** dies], I’ll inherit a house. [Charlow (2019): e2]
 $\times \forall x: x$ is rich relative of mine \rightarrow if x dies, I’ll inherit a house.
- b. [ISLAND If **a rich relative of mine** dies], I’ll inherit a house. [Charlow (2019): e1]
 $\checkmark \exists x: x$ is a rich relative of mine & if x dies, I’ll inherit a house.
- c. [ISLAND **Hangi akraban** ölürse], sana bir ev miras kalır?
 which relative.POS.2SG die.COND to.you a house pass.to.MODAL
 \checkmark which $x: x$ is a relative of yours, if x dies, you’ll inherit a house? Turkish

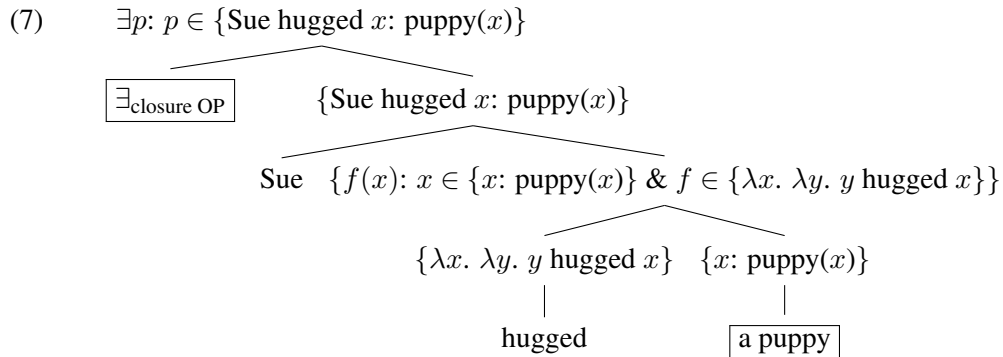
- Deriving exceptional scope via island-violating movement appears to require a paradoxical stance on extraction islands.

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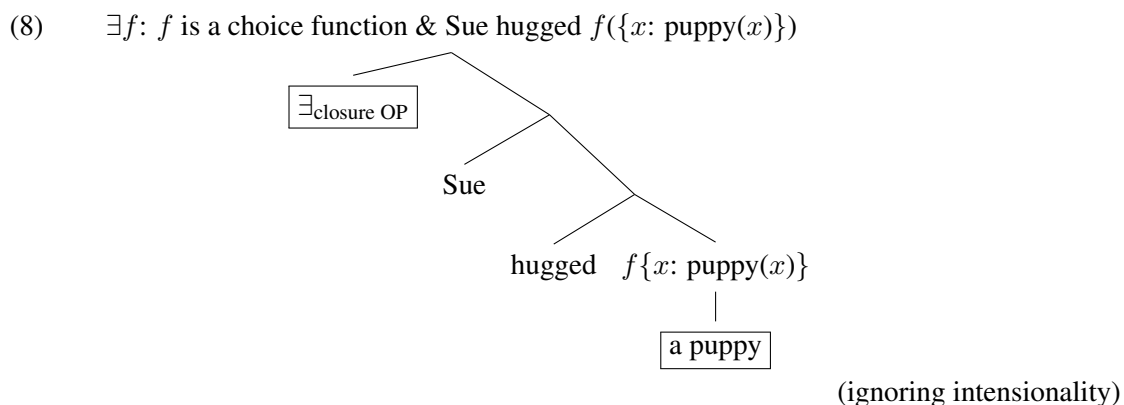
- Widely adopted solution to this paradox:

We drop the assumption that indefinites and *wh*-phrases are quantificational DPs that take scope via movement. We need an additional in-situ (hence, island-insensitive) ‘pseudo-scope’ mechanism. Two such influential proposals:

- *pointwise/set-friendly composition* (Hamblin, 1973; Rooth, 1985; Hagstrom, 1998; Kratzer and Shimoyama, 2002; Beck, 2006; Kotek, 2016, a.o.)



- *choice functions*² (Reinhart, 1997, 1998; Winter, 1997; Sternefeld, 2001a; Cable, 2010, a.o.)



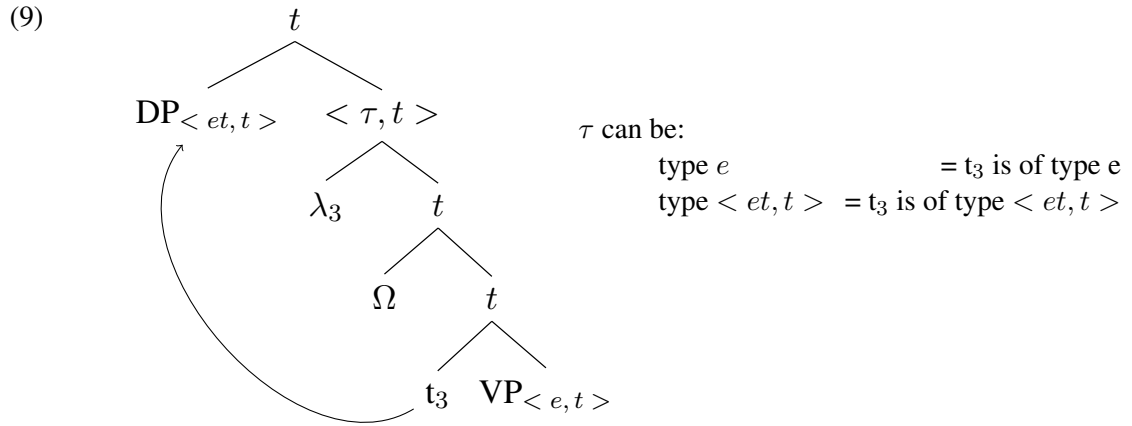
Interim Summary

- Both the third reading and exceptional scope are serious challenges against the traditional view.
 - They constitute the empirical basis for the view that semantic effects traditionally derived via movement can arise in the absence of movement.
- These empirical challenges have been used to justify independent enrichments in grammar that can do things “at a distance”
 - scoping out of islands \rightsquigarrow long distance closure operators ‘acting on’ sets or variables
 - *de re* without wide scope \rightsquigarrow long distance binding of world pronouns

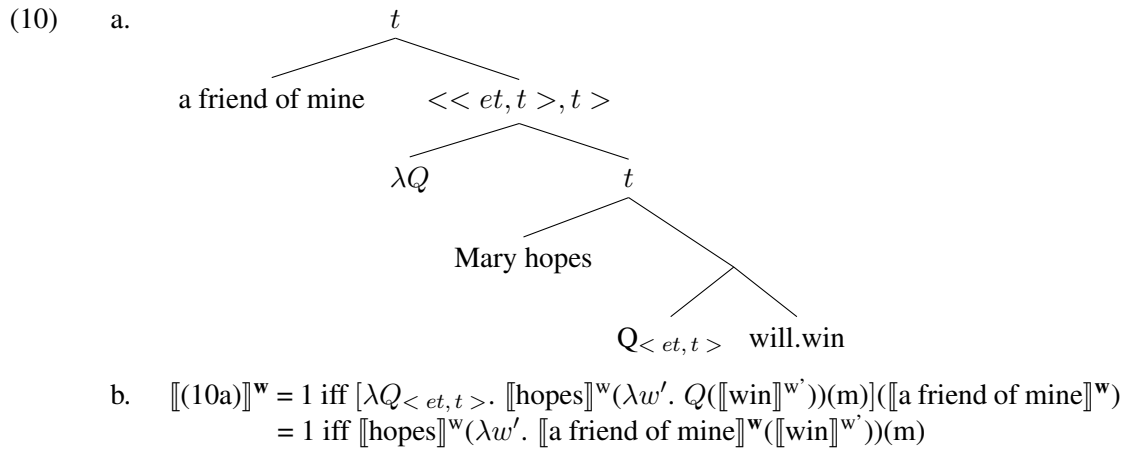
²A function f is a choice function only if for every non-empty predicate P , $f(P)$ is a member of P .

4 The core challenge: island-insensitive semantic effects

- Let us pretend that we have been informed that grammar doesn't have any of these fancy tools. What is the best we can do?
- In regards to the challenge posed by the 'third reading' problem, von Stechow and Heim (2011) have already entertained this possibility and proposed a neat solution.
 - Their proposal resorts to 'scope reconstruction': (Cresti, 1995; Sternefeld, 2001b)
i.e. the idea that **movement does not necessarily shift semantic scope**.
hence: syntactic scope does not always determine semantic scope
 - The λ -abstract that movement creates is in some sense a type-neutral function into truth values.³



- Suppose that DP and Ω in (9) are scopal expressions (e.g. 'every boy' and 'not'). Then:
 if τ is type e , DP has wide scope wrt Ω
 if τ is type $\langle et, t \rangle$, DP has narrow scope wrt Ω (i.e. 'semantic reconstruction' happens)
- Accordingly, narrow+*de re* (i.e. 'third reading') requires movement just like wide scope+*de re*. Narrow scope can be attained via scope reconstruction in semantics. Illustrated in (10) for (4):



- In short, **the semantic effects of movement can be disassociated.**

³Unless we explicitly stipulate that it is not.

- The proposal in von Fintel and Heim (2011) is a great start but doesn't yet address the core objection against deriving *de re* only by movement:

The problem of exceptional *de re* (i.e. *de re* out of scope islands)
 A DP **may be** transparent with respect to an intensional operator Ω even when it **cannot** semantically scope above Ω .

- I use the term exceptional *de re* to refer to that subset of 'third reading' cases, where *de re* obtains despite the **impossibility** of wide scope (as opposed to simple absence of wide scope).

- Exceptional *de re* is illustrated by (11a), which receives the truth conditions in (11b), simplifying the Lewis-Kratzer semantics for conditionals.

- (11) a. If **everyone in this room** were outside, it would be empty. [Keshet (2011): e6]
 b. $\llbracket (11a) \rrbracket^w = 1$ iff
 $\llbracket \text{would} \rrbracket^w(\lambda w'. \llbracket \text{everyone in this room} \rrbracket^w(\llbracket \text{outside} \rrbracket^{w'}))(\lambda w'. \llbracket \text{it be empty} \rrbracket^{w'})$

- Keshet reports that *everyone in this room* in (11a)

- * **cannot scope out of the if-clause** given that (11a) cannot mean 'every person x in this room is such that if x were outside, the room would be empty'
- * **can** (in fact, has to) **be transparent** relative to the relevant modal because no human can be in a room and outside that room in the same world.

- A naive attempt at deriving the right truth conditions raises two acute problems:

- We have to let the universal quantifier move out of the if-clause, an extraction island.
- We have to make sure that when a universal quantifier moves out of an extraction island, this movement is not scope-shifting, i.e. it cannot leave a trace of type e , but has to leave a trace of type $\langle et, t \rangle$.

- Summing up,

- we *do* have a way to deal with narrow scope+*de re* (thanks to von Fintel and Heim (2011))
- but we have some serious explaining to do regarding exceptional behavior concerning **islands**.
- In particular, we have to explain
 - * how grammar generates semantic effects "by-passing" islands
 - * why these effects are not fully symmetric for indefinites/*wh*-phrases vs. universal quantifiers

- **Common view:**

Exceptional *de re* and exceptional scope are distinct problems requiring distinct enrichments.

- **This paper:**

A unified account of exceptional scope and exceptional *de re* is possible! **Once we have a movement account of exceptional scope, exceptional *de re* simply follows from it.**

5 Then, how does grammar generate exceptional scope? : via pied-piping!

- As we have discussed, it is widely assumed that grammar generates exceptional (island-violating) scope via non-movement mechanisms.
- Recently, however, Charlow (2019) has proposed a semantics for exceptionally scoping indefinites that relies on cyclic scope-taking **via pied-piping**. Charlow’s proposal ingeniously combines:
 - earlier influential syntactic proposals to derive exceptional scope via pied-piping (Nishigauchi, 1990; Richards, 2000, a.o.)
 - the ingredients used in the compositional semantics of *wh*-questions offered in Heim (2000)
- Charlow’s key insight is that grammar can use these ‘question ingredients’ to create more complex scope-takers, which forms the basis for interpreting pied-piping structures.⁴
- The most straightforward empirical evidence for this view on exceptional scope comes from **overt island pied-piping** reported to be available in a few languages like Finnish (Huhmarniemi, 2012) (see also (Cable, 2010) for Tlingit and (Enrico, 2003) for Haida).
 - To illustrate, when-clauses in Finnish are regular extraction islands and do not permit *wh*-extraction, as shown in (12b).

(12) Finnish [Huhmarniemi (2012): e352]

- a. Pekka kompastui [_{island} laittaessaan ruokaa **Merjalle**]
 Pekka.NOM fell cook.ESSA.PRS.PX.3SG food.PAR Merja.ALL
 ‘Pekka fell when he was cooking for Merja.’
- b. ***Kenelle**₁ Pekka kompastui [_{island} laittaessaan ruokaa **t₁**]
 who.ALL Pekka.NOM fell cook.ESSA.PRS.PX.3SG food.PAR
 ‘Which person x is such that Pekka fell when he was cooking for x?’

- Yet, when *wh*-movement targets **the left edge of the island** and then the entire island is subsequently moved to the left periphery, we get an acceptable string, as shown in (13b).

(13) Finnish [Huhmarniemi (2012): e358]

- a. Pekka katkaisi puhelun [_{island} soittaessaan **Merjalle**]
 Pekka.NOM cut call.ACC call.ESSA.PRS.PX.3SG Merja.ALL
 ‘Pekka disconnected when he was calling Merja.’
- b. [_{island} **Kenelle**₂ soittaessaan **t₂**]₁ Pekka katkaisi puhelun **t₁**
 who.ALL call.ESSA.PRS.PX.3SG Pekka.NOM cut call.ACC
 ‘Which person x is s.t. Pekka disconnected when he was calling x?’

- That is, while *wh*-movement out of an extraction island is barred as expected, **a *wh*-phrase can scope out of an island by moving to its edge and subsequently pied-piping it.**

⁴As pointed out to me by Uli Sauerland, this idea goes back to (Dayal, 1994) who repurposed these ingredients to give a compositional semantics for scope-marking constructions.

- But how do we interpret pied-piping structures? Here's an outline of the upcoming discussion:
 - We learn the basic idea of building complex scope-takers from Charlow (2019)
 - We translate Charlow's proposal into a theory where scope-takers are uniformly generalized quantifiers (Heim and Kratzer, 1998). I call this \exists -theory for easy reference.
 - In section 6, we will see how the \exists -theory of pied-piping derives exceptional scope and exceptional *de re* in a unified manner.

5.1 Step 1: Charlow (2019) on how to build complex scope-takers

- As mentioned above, Charlow collects the necessary ingredients for interpreting pied-piping structures from Heim's (2000) semantics for *wh*-questions.
 - Heim takes *wh*-questions to denote proposition sets (called *Hamblin sets*) (Hamblin, 1973; Karttunen, 1977, a.o.), as illustrated below for the *wh*-question in (14a).

- (14) if *w* is such that $\llbracket \text{cat} \rrbracket^w = \{\text{Ragu, Moku}\}$
- a. $\llbracket \text{which cat meowed} \rrbracket^w$
- b. $= \lambda p. \exists x: \llbracket \text{cat} \rrbracket^w(x) \ \& \ p = \lambda w'. \llbracket \text{meowed} \rrbracket^{w'}(x)$ (function notation)
- $= \lambda p. \exists x: x \in \{\text{Ragu, Moku}\} \ \& \ p = \{w': x \text{ meowed in } w'\}$ (hybrid notation)
- $= \{\{w': \text{Ragu meowed in } w'\}, \{w': \text{Moku meowed in } w'\}\}$ (set notation)

- Heim's (2000) semantics for *wh*-questions makes use of two ingredients: IDENT and Q:
 - IDENT forms proposition sets (Karttunen, 1977), also (Partee, 1986)
 - Q combines with a predicate and returns a scope-taker that is looking for a function from individuals to proposition sets.

- (15) LF for (14a) under Heim (2000)

- a.
-
- b. $\llbracket \text{IDENT} \rrbracket^w = \lambda p_{\langle s, t \rangle}. \lambda q_{\langle s, t \rangle}. p = q$
- $\llbracket \text{Q=which} \rrbracket^w = \lambda P_{\langle e, t \rangle}. \lambda R_{\langle e, \langle st, t \rangle \rangle}. \lambda p. \exists x: P(x) = 1 \ \& \ R(x)(p) = 1$

- Charlow adopts these two ingredients from Heim/Karttunen but defines them type-flexibly⁵ so that
 - IDENT can form sets of anything (i.e. not just proposition sets).⁶
 - Q can form a scope-taker out of any set (i.e. not just a set of individuals).

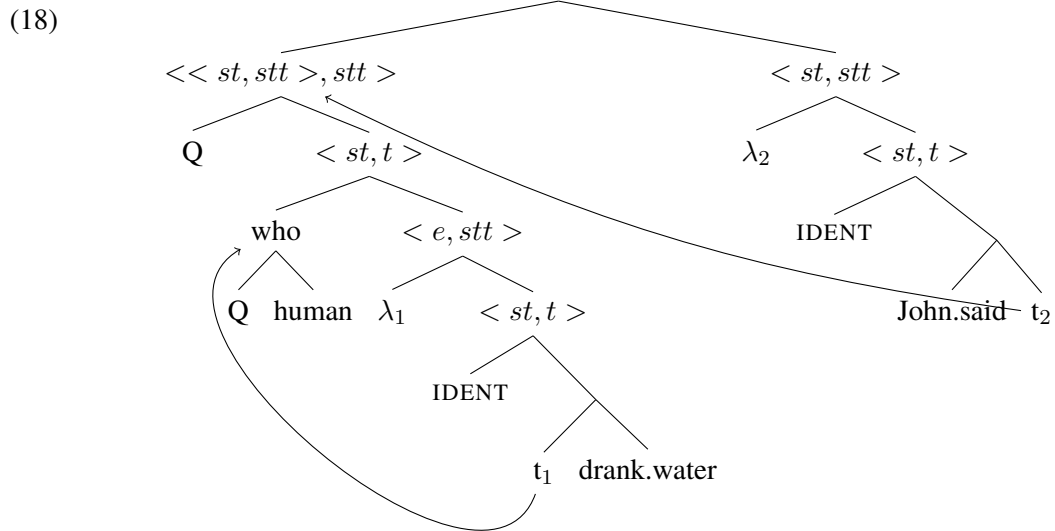
- (16)
- $\llbracket \text{IDENT} \rrbracket^w = \lambda M_{\langle s, \alpha \rangle} \cdot \lambda N_{\langle s, \alpha \rangle} \cdot M = N$
 - $\llbracket Q \rrbracket^w = \lambda P_{\langle \beta, t \rangle} \cdot \lambda R_{\langle \beta, \langle \gamma, t \rangle \rangle} \cdot \lambda p_\gamma \cdot \exists m: P(m) = 1 \ \& \ R(m)(p) = 1$

- Crucially, Charlow shows us that this type-flexibility is all we need to interpret pied-piping structures.
 - I illustrate this on an example of overt clausal pied-piping in Basque (Ortiz de Urbina, 1989) below.

(17) **Optional clausal pied-piping in Basque** [Duguine and Irurtzun (2014): e8-fn3]

- Nork**₁ esan du Jon₁ek [CP **t**₁ edan duela ura]?
 who.ERG say AUX Jon.ERG [drink AUX.COMP water.ABS]
 ‘Who did John say drank water?’ [regular *wh*-movement out of the finite clause]
- [CP **Nork** edan duela ura]₁ esan du Jon₁ek **t**₁?
 [who.ERG drink AUX.COMP water.ABS] say AUX Jon.ERG
 Lit: **Who drank water** did John say **t**?
 ‘Who did John say drank water?’ [*wh*-movement **pied-pipes** the finite clause]

- The LF for (17b) is given below (using English words for convenience)

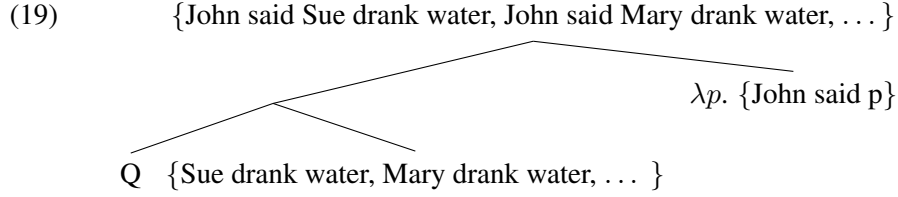


- In the LF above, we can observe that the type-flexibility of Q allows us to combine it with [who drank water] and build a complex scope-taker.

⁵Since I am assuming STI to represent intensionality here, the meanings I gave to IDENT and Q are slightly different Charlow's. Nothing hinges on this, though.

⁶This flexibility becomes useful e.g. when a DP island is pied-piped rather than a clause.

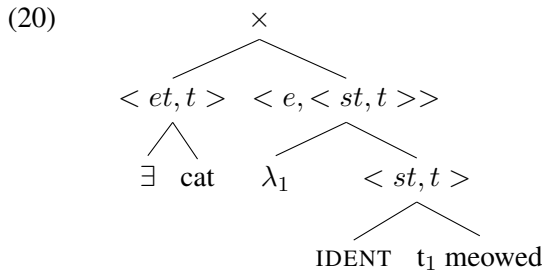
- To put it simply, the higher Q first combines with a set of propositions and then feeds each member of this proposition set into the function it subsequently composes with, as shown below.



- In the next section, I translate this theory of pied-piping into a setting where all scope-takers are generalized quantifiers, which I call the \exists -theory. The \exists -theory assumes a uniform (and hopefully more familiar) treatment of quantification.⁷

5.2 Step 2: \exists -theory: Charlow (2019) restated in a theory where all scope-takers are GQs

- As we have seen, Charlow, following Heim (2000), develops a system where complex scope-takers built via Q combine with functions into sets (in some sense, mimicking pointwise composition).
 - Charlow calls this ‘quantifying into sets’.
 - Under Charlow’s theory, *wh*-phrases and indefinites (traditionally ‘existential quantifiers’) are not generalized quantifiers but quantify into sets.
- I will now introduce the \exists -theory, which restates Charlow’s theory in a Heim&Kratzerian setting where all scope-takers are generalized quantifiers.
 - Charlow turns to Heim (2000) to collect the ingredients for building complex scope-takers
 - I will turn to Heim (2012); Fox (2012) for the same purpose.
- The well-known⁸ Fox-Heim proposal to compose Hamblin sets aims to **dispense with *wh*-phrases quantifying into sets**.
 - If *wh*-phrases are GQs, i.e. existential quantifiers of type $\langle et, t \rangle$ (Karttunen, 1977), we have a type-mismatch, as shown in (20): (cf. the higher type *wh*-phrases in Heim (2000))



(21)

$$\begin{aligned}
 \llbracket \exists \rrbracket^w &= \lambda P. \lambda Q. \exists x: P(x)=Q(x) = 1 \\
 \llbracket \text{IDENT} \rrbracket^w &= \lambda p_{\langle s, t \rangle}. \lambda q_{\langle s, t \rangle}. p = q
 \end{aligned}$$

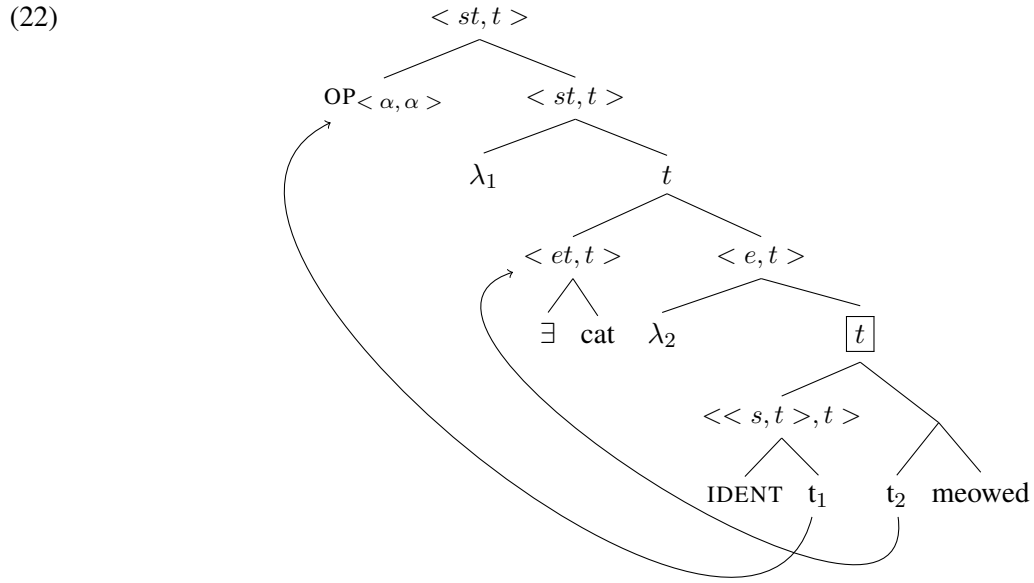
- Their solution: IDENT’s sister contains a propositional variable abstracted over at the root node. Let us assume that a null operator OP ($\lambda m.m$) is merged as IDENT’s sister. When OP moves out, it yields λ -abstraction.

⁷Moreover, Charlow’s system, in addition to Q and IDENT, also needs to invoke a closure operator \mathcal{f} , needed when we want to derive a truth value rather than a Hamblin set. The \exists -theory will not need \mathcal{f} .

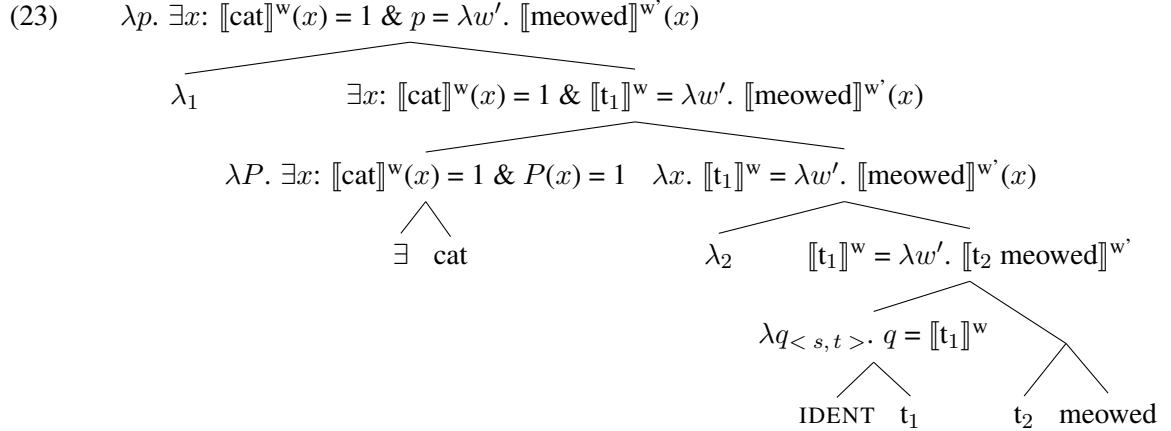
$\llbracket \mathcal{f} \rrbracket^w = \lambda Q_{\langle \langle s, t \rangle, t \rangle}. \exists p: Q(p) = 1 \ \& \ p(w) = 1$

⁸Dayal (2016) provides it as the baseline compositional semantics for *wh*-questions.

- As shown in (22), this additional λ -abstraction step resolves the type mismatch, creating a type t node right above IDENT! As a result, a GQ (in this case, which cat) can QR to this position.



- (23) shows that the right meaning is computed from this LF.



The \exists -theory of pied-piping

Once we define IDENT and \exists type flexibly, like Charlow does with IDENT and Q, we have a way to generate complex scope-takers, but without resorting to quantifying into sets.

- (24) $\llbracket \exists \rrbracket^w = \lambda P_{<\alpha, t>}. \lambda Q_{<\alpha, t>}. \exists m: P(m) = 1 \ \& \ Q(m) = 1$ (replaces Charlow's Q)
 $\llbracket \text{IDENT} \rrbracket^w = \lambda M_{<s, \alpha>}. \lambda N_{<s, \alpha>}. M = N$ (same as Charlow's IDENT)

The general recipe: IDENT forms sets, \exists builds existential quantifiers out of them.

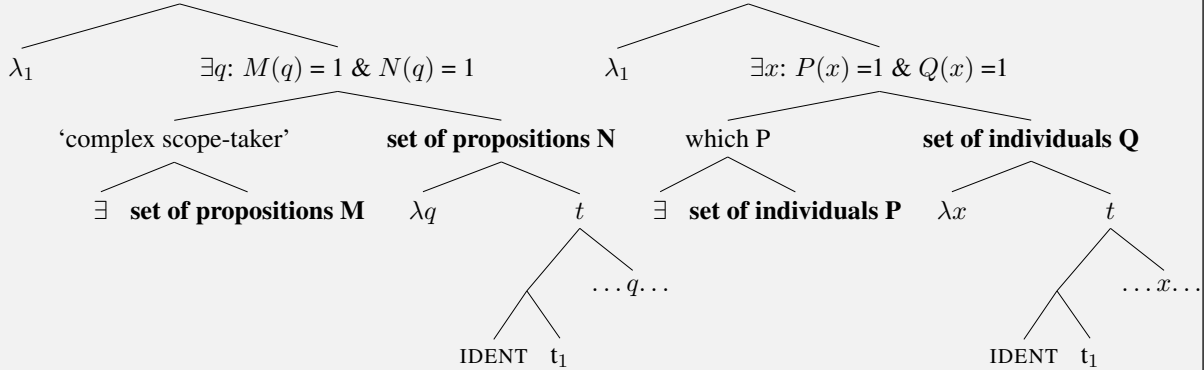
- What gets overtly fronted in (25) is an existential quantifier over propositions (built by merging \exists with what looks like a *wh*-question). It QRs and leaves a trace of type $\langle s, t \rangle$. See (26).

[illegible]

-
- $\lambda_3 \quad \exists q \exists x: \llbracket \text{human} \rrbracket^w(x) = 1 \ \& \ q = \lambda w'. \llbracket \text{drank.water} \rrbracket^{w'}(x) \ \& \ \llbracket t_3 \rrbracket^w = \lambda w'. \llbracket \text{said} \rrbracket^{w'}(q)(j)$
- $\exists \lambda p. \exists x: \llbracket \text{human} \rrbracket^w(x) = 1 \ \& \ p = \lambda w'. \llbracket \text{drank.water} \rrbracket^{w'}(x)$
 'who drank water'
- $\lambda q. \llbracket t_3 \rrbracket^w = \lambda w'. \llbracket \text{said} \rrbracket^{w'}(q)(j)$
 λ_2
- IDENT t_3 John.said t_2

13

Result: Without inventing any additional technology, we are able to interpret pied-piping structures. All we have done is define \exists and IDENT type-flexibly. A pied-piped constituent is no different from a *wh*-phrase! A complex scope-taker is simply an existential quantifier whose restriction is a set built in syntax. It takes scope just like simplex GQs, via QR.

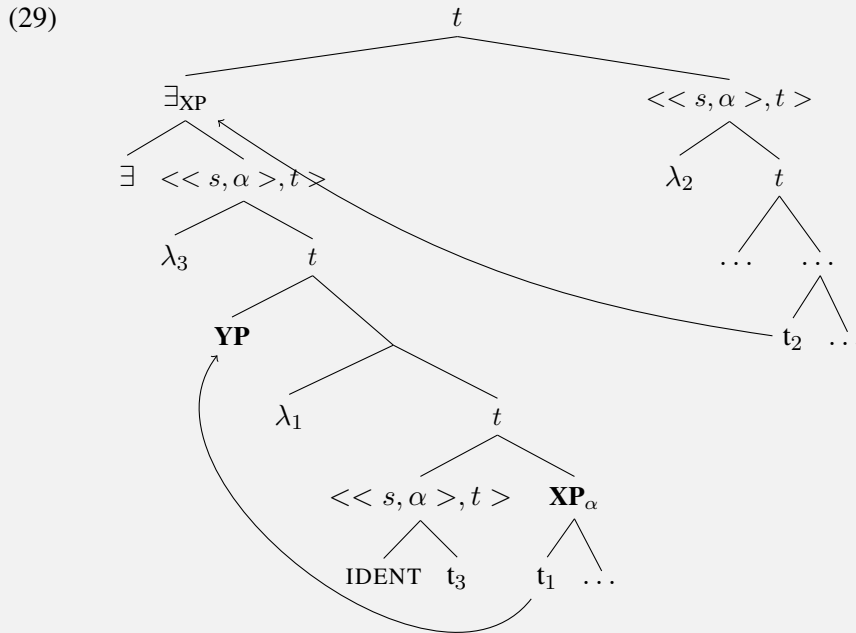


- To summarize, I have proposed the \exists -theory of pied-piping by translating Charlow's (2019) theory into a setting where all scope-takers are GQs. The \exists -theory defines "pied-piping" as follows:

(28) A YP is said to **pied-pipe** an XP iff

- XP is syntactically 'lifted' into an existential quantifier \exists_{XP} in a way that creates an **edge position**, i.e. a scope position of type t right above XP
- YP moves to the edge of XP
- \exists_{XP} QRs.

as schematized in (29)



6 Pied-piping in action

- I have ended section 4 by pointing out that we have to explain
 - how grammar generates semantic effects “by-passing” islands
 - why these effects are not fully symmetric for indefinites/*wh*-phrases vs. universal quantifiers
- I argue that pied-piping explains both. This assumption is all it takes:

(30) **Conjecture on island-insensitive scope and opacity effects**
 A YP in an island XP can exhibit scope or opacity effects that by-pass XP **only by moving to the edge of XP and pied-piping XP**.
 where notions of ‘edge’ and ‘pied-piping’ are as defined in (28)

- Crucially, the conjecture laid out in (30) **derives both exceptional scope and exceptional *de re*** in a unified manner. More specifically, I will show that
 - An indefinite or a *wh*-phrase pied-piping an island is able to scope out of it.
 - A universal quantifier pied-piping an island **fails to scope out of it**.
 - Regardless of the possibility of wide scope, a DP pied-piping an island XP will be *de re* relative to any intensional operator XP ends up above.

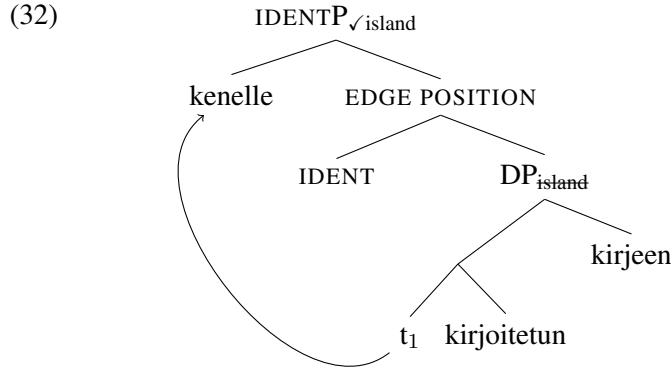
6.1 A note on the syntax of island pied-piping

- The notion of ‘edge’ in pied-piping has been extensively discussed in the literature, in particular focusing on overt *wh*-syntax (Richards, 2000; Heck, 2008; Cable, 2010; Richards, 2019, a.o.).
- For the present proposal, the notion of edge in pied-piping is **not only** relevant to overt instances of pied-piping, small-scale pied-piping, or pied-piping by *wh*-phrases. That is, I assume
 - Covert movement/pied-piping works just like overt movement/pied-piping
 - Any DP pied-piping an XP will move to the edge of XP, even when XP is an island!
- Huhmarniemi (2012) argues extensively that in Finnish a *wh*-phrase can pied-pipe an island iff it is at/moves to the edge of that island. See also the examples in (12)-(13).

(31) a. *_[island pojan **kenelle** kirjoittaman kirjeen] Pekka luki?
 boy.GEN who.ALL written.PTCP.ACC letter.ACC Pekka read
 ‘Who₁ is s.t. Pekka read the letter written by the boy to them₁?’
 [Huhmarniemi (2012): e329c]

b. _[island **kenelle** kirjoitetun kirjeen]₁ Pekka luki **t**₁?
 who.ALL written.PTCP letter.ACC Pekka read
 Lit: ‘**The letter written to whom** did Pekka read **t**?’
 ‘Who₁ is s.t. Pekka read the letter written to them₁?’ [Huhmarniemi (2010): e18]

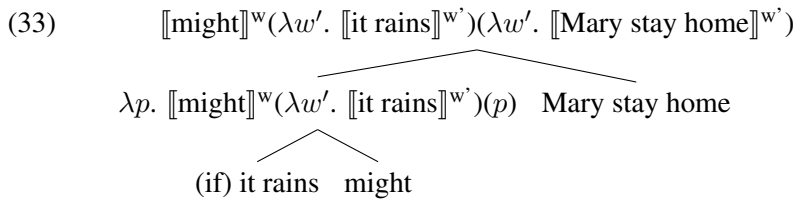
- What this edge position is is empirically not obvious. However, given the definition of pied-piping I proposed, this is what needs to be said (for interpretive purposes):
 - An edge position is **syntactically created** by merging an IDENT right above the island.
 - For concreteness, let us assume that merging an IDENT head above an island XP transfers the “islandhood”¹¹ of XP to the maximal projection of the IDENT head.
 - (32) illustrates the proposal on the simplified structure for the fronted constituent in (31b).



- As far as I can see, the hypothesized method of minimally redefining/extending the domain/boundary of an island will have no undesirable consequences. For example,
 - it will not license relativization out of islands
 - it will not make it possible for a DP in an island to reach its final scope position without carrying the island along with it (i.e. no ‘island-stranding’)
- Therefore, I assume that every instance of island pied-piping (covert or overt; by a *wh*-phrase or another kind of DP) involves movement to a created edge position in the manner described above.

6.2 Deriving exceptional scope via pied-piping

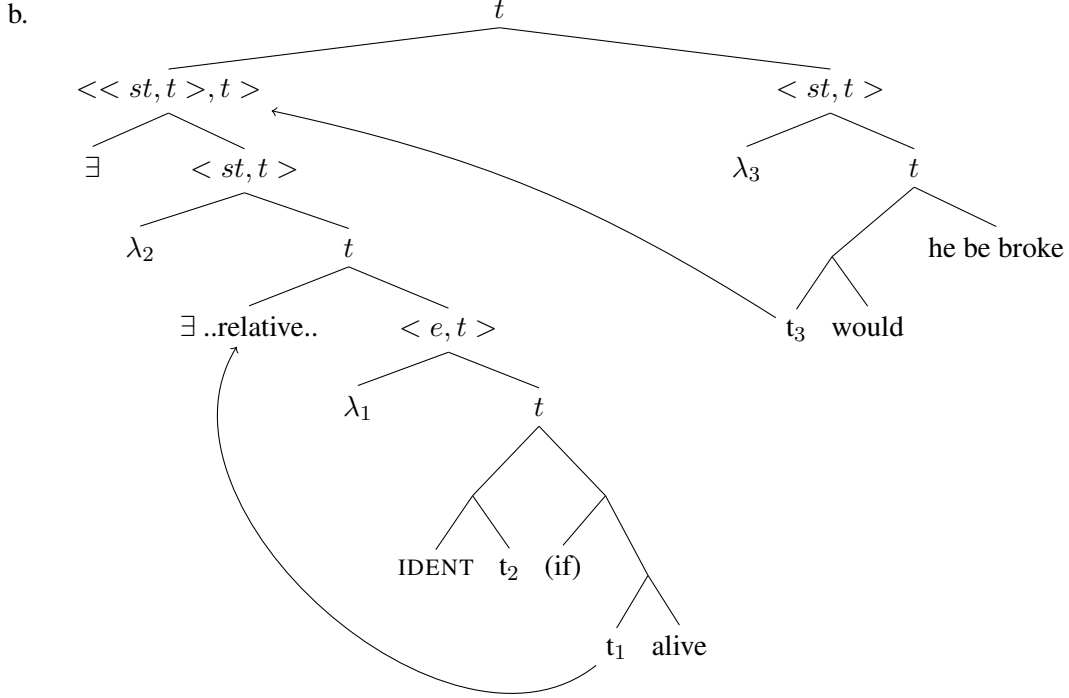
- Once we have the assumption that the only way to scope out of an island is to pied-pipe it, we explain
 - how indefinites and *wh*-phrases are able to scope out of islands
 - why universal quantifiers fail to scope out of islands
- Below I demonstrate how pied-piping derives exceptional scope out of an if-clause island (Charlow, 2019). I assume a simplified LF based on the modal-restrictor analysis of if-clauses (Kratzer, 1986; von Stechow and Heim, 2011).



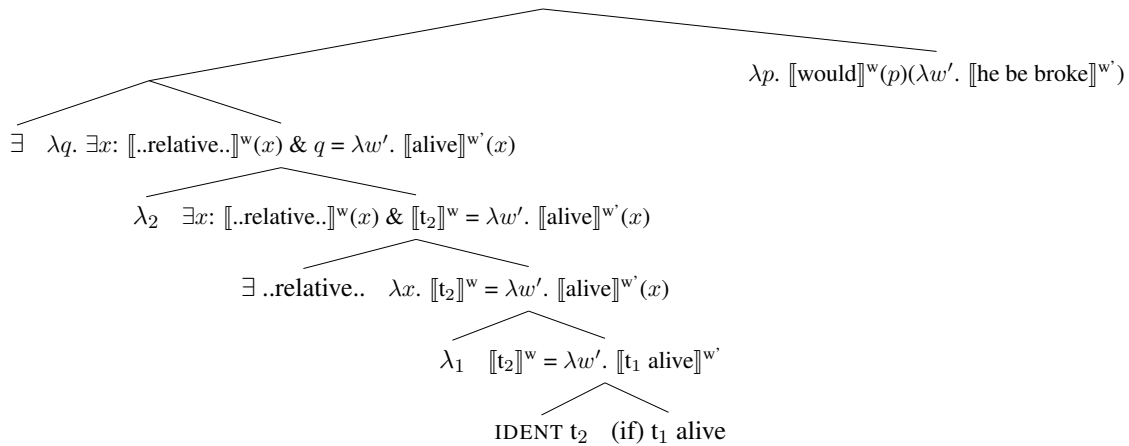
¹¹Whatever ‘islandhood’ amounts to. Unfortunately, I have nothing insightful to offer on this.

- **Indefinites.** The proposed LF for (34a) is in (34b). The indefinite *a dead relative of his* pied-pipes the if-clause island (in the manner the \exists -theory defines pied-piping). The meaning computed from this LF¹² has the indefinite scoping wide, as shown in (34c).

- (34) a. A: How come Bill is so rich? He hasn't worked a single day in his life!
 B: Well, if **a dead relative of his** were alive, he'd be broke.
 $\checkmark \exists x$: *x* is dead relative of Bill's & if *x* were alive, Bill would be broke.
 (context: Bill inherited all he has from *x*)



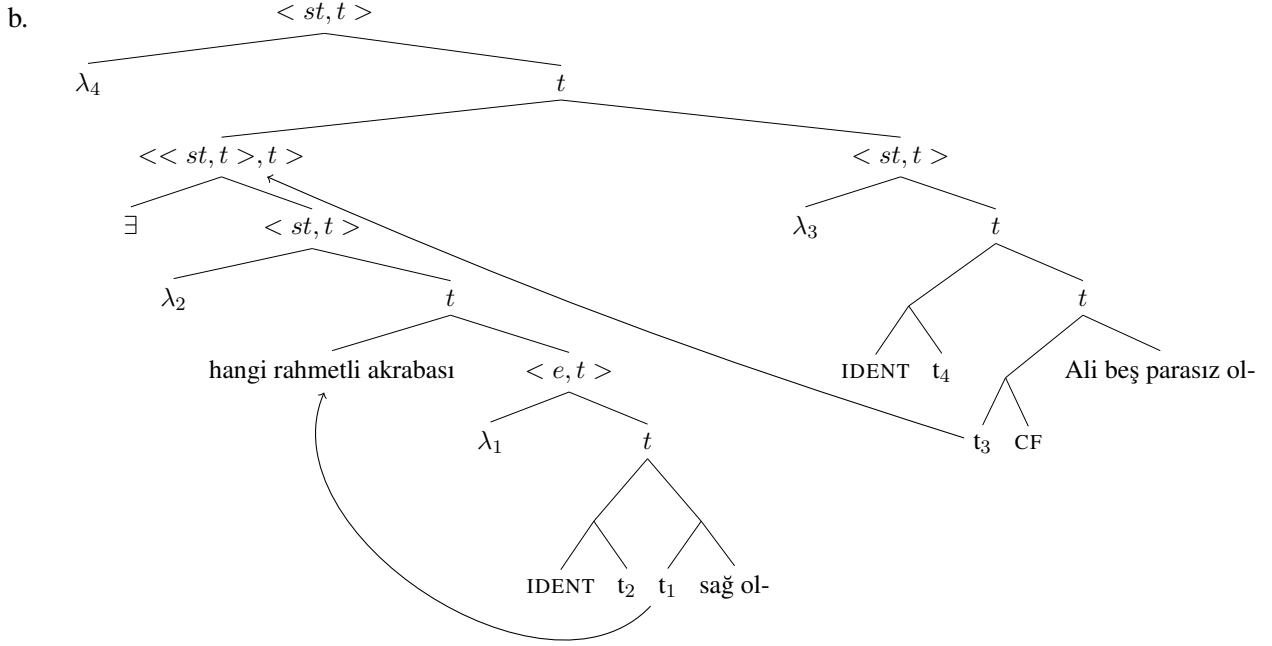
- c. $\exists q \exists x$: $\llbracket \text{dead relative of his} \rrbracket^w(x) \ \& \ [q = \lambda w'. \llbracket \text{alive} \rrbracket^{w'}(x)] \ \& \ \llbracket \text{would} \rrbracket^w(q)(\lambda w'. \llbracket \text{he be broke} \rrbracket^{w'})$



¹²true iff there is a dead relative of Bill's, and a set of worlds where that individual is alive, and in those worlds, Bill is broke.

- **wh-phrases.** In (35a), the *wh*-phrase takes matrix scope out of a conditional antecedent. The LF for (35a), given in (35b), is identical to the previous LF we gave for the wide scope indefinite except for the final scope position of the QR'ed island. The island QRs above an IDENT in (35b) because we want a Hamblin set, rather than a truth value. The meaning computed from this LF is given in (35c).

- (35) a. Ali [hangi rahmetli akrabası sağ ol-saydı] beş parasız ol-urdu?
 Ali which deceased relative.POS3SG alive be-CF broke be-CF
 Lit: 'Which x , x a deceased relative of Ali's, is such that if x were alive, Ali would be broke?'
 Turkish



- c. $\lambda p. \exists q \exists x: \llbracket \text{rahmetli akrabası} \rrbracket^w(x) = 1 \ \& \ [q = \lambda w'. \llbracket \text{sağ ol-} \rrbracket^{w'}(x)] \ \& \ [p = \lambda w'. \llbracket \text{CF} \rrbracket^{w'}(q)(\lambda w''. \llbracket \text{Ali beş parasız ol-} \rrbracket^{w''})]$
 \approx the set of propositions of the form 'in all q -worlds, Ali is broke',
 where q is a proposition of the form ' x is alive',
 where x is a deceased relative of Ali's.

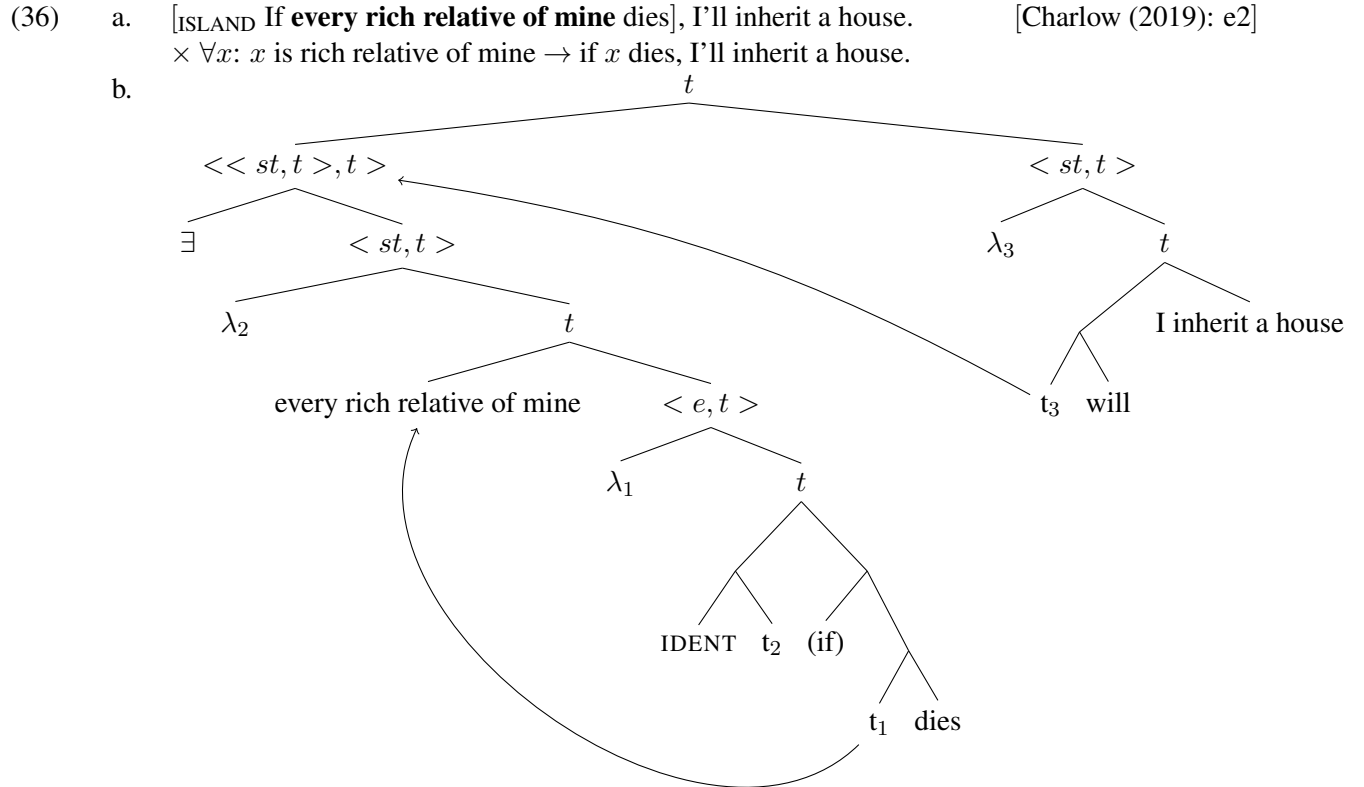
A pressing question: “So, you’re saying a *wh*-fronting language like Finnish does this overtly and a *wh*-in-situ language like Turkish does this covertly. Why can’t *all wh*-fronting languages (e.g. English) do this overtly?”

Tentative answer: This is pretty much an open question. But Huhmarniemi (2012) presents interesting clues from Finnish on when overt island pied-piping will be observed. A *wh*-phrase has to be the leftmost phrase of the island it is pied-piping. While in some cases we observe a *wh*-phrase end up as the leftmost phrase thanks to movement, it also seems clear that this movement *cannot* cross just anything. One interpretation of this state of affairs is consistent with the prediction in Fox and Pesetsky (2004): overt movement out of an island may not be barred if it is string-vacuous (and therefore does not yield contradictory linearization statements). Therefore, I tentatively hypothesize that overt island pied-piping by a *wh*-phrase is observed iff the *wh*-phrase can end up in the ‘edge’ position (as we defined it) string-vacuously. See also Chapter 6 in Demirok (2019).

Why do universal quantifiers fail to scope out of islands?

↪ An LF that has a universal quantifier trying to scope out of an island by pied-piping it has anomalous truth conditions that can never be satisfied.

- The LF in (36b) shows a legitimate attempt to derive exceptional scope for the universal quantifier ‘every rich relative of mine’ in (36a). However, this time the computed truth conditions given in (36c) are such that they can never be satisfied.



- c. $\llbracket (36b) \rrbracket^w = 1$ iff $\exists q \forall x: \llbracket \text{rich relative of mine} \rrbracket^w(x) \rightarrow [q = \lambda w'. \llbracket \text{dies} \rrbracket^{w'}(x)]$
 & $\llbracket \text{will} \rrbracket^w(q)(\lambda w'. \llbracket \text{I inherit a house} \rrbracket^{w'})$

- Why can’t these truth conditions be satisfied? Notice that the truth conditions in (36c) require there to be a q such that for every individual x where x is rich relative of the speaker, q is the set of worlds where x dies.¹³ Assuming that the set $\{x: \llbracket \text{rich relative of mine} \rrbracket^w(x) = 1\}$ contains more than one individual, we get a contradiction.¹⁴

Assumption: The only way for a quantifier to scope out of an island is to pied-pipe it.

Result: We explain the fact that universal quantifiers cannot scope out of islands.

¹³Suppose that the speaker has three rich relatives (Bill, Susan, Alex). Then, the truth conditions require there to be a proposition q such that q is ‘Bill dies’, ‘Susan dies’, ‘Alex dies’; which are distinct propositions!

¹⁴If the restrictor of *every* is a singleton, then we have a scopeless expression and cannot talk about wide scope anyway.

6.3 Deriving exceptional *de re* via pied-piping

- We described the problem of exceptional *de re* as in (37), and illustrated it with (38), where *everyone in this room* cannot scope out of the if-clause¹⁵ but is *de re* relative to the modal.

(37) The problem of exceptional *de re* (i.e. *de re* out of scope islands)
A DP **may be** transparent with respect to an intensional operator Ω even when it **cannot** semantically scope above Ω .

(38) If everyone in this room_{narrow scope+*de re*} were outside, it would be empty. [Keshet (2011): e6]

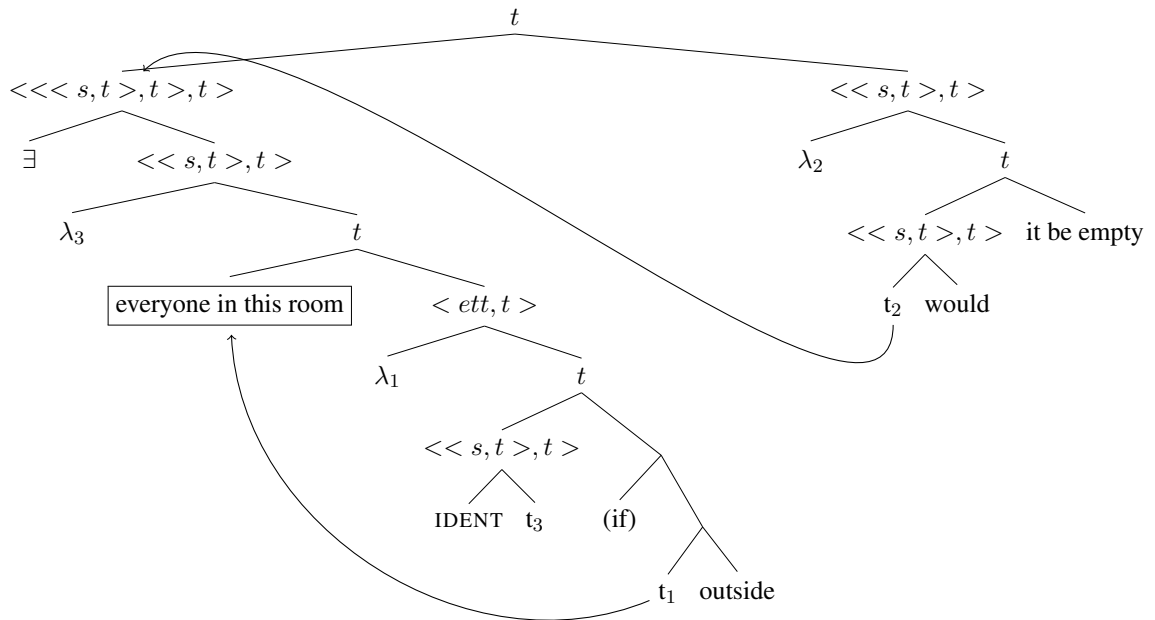
- I have pointed out that the real challenge behind deriving exceptional *de re* is the fact that *de re* obtains despite the **impossibility** of wide scope, which means that
 - *everyone in this room* ends up outside the intensional context created by the modal via movement
 - this movement cannot be scope-shifting, i.e. it is forced to leave a trace of type $\langle \langle e, t \rangle, t \rangle$.
- Under our current assumptions, this paradox simply dissolves. Given our conjecture, repeated in (39), deriving a *de re* construal for a DP inside an island requires the DP to pied-pipe that island.

(39) **Conjecture on island-insensitive scope and opacity effects**

A YP in an island XP can exhibit scope or opacity effects that by-pass XP only by moving to the edge of XP and pied-piping XP.

- Therefore, in (38), where *everyone in this room* has a *de re* construal relative to the modal, *everyone in this room* needs to pied-pipe the if-clause moving above the modal, as shown in (40).

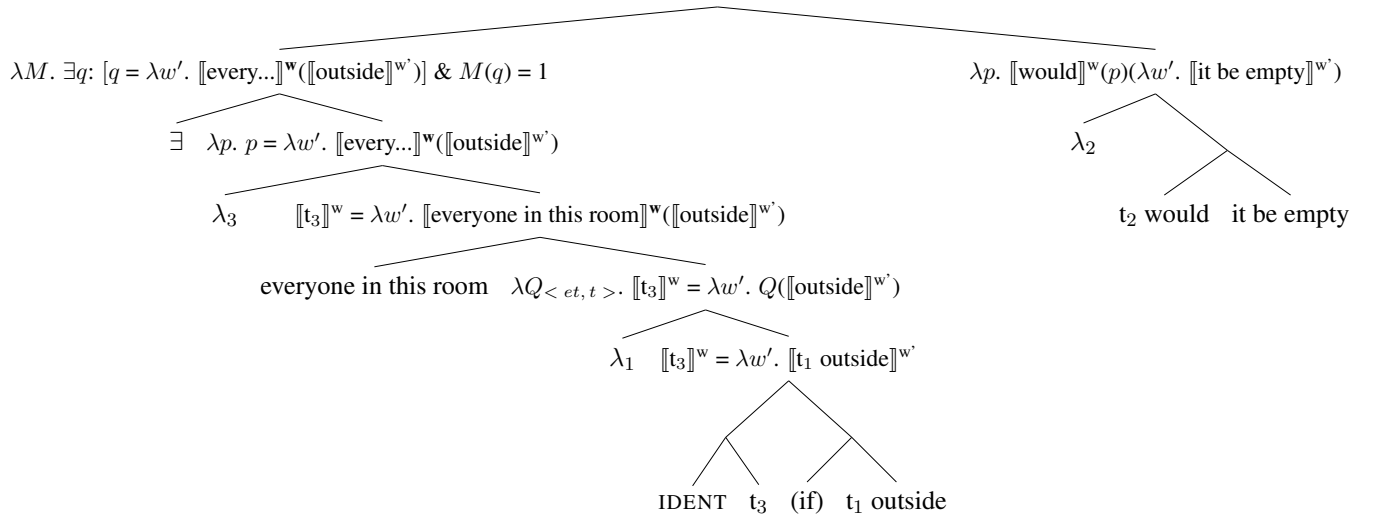
(40)



¹⁵(38) \neq 'every person x in this room is such that if x were outside, the room would be empty'

- As is probably clear now, the pied-piping derivation in (40) gives us exceptional *de re*:
[see also Elliott (2020)]¹⁶
 - It *does* yield a *de re* construal for the universal quantifier, as its syntactic position (in particular, being above the IDENT) makes it escape the intensional context created by the modal.
 - More importantly, it forces the universal quantifier to leave a trace of type $\langle \langle e, t \rangle, t \rangle$. As we have seen in the previous section, if a pied-piping universal quantifier leaves a trace of type e , it receives a wide scope construal, which in turn leads to anomalous truth conditions.
 - See the computed non-anomalous truth conditions in (41), where *everyone in this room* is *de re* and narrow scope.

(41) $\exists q: [q = \lambda w'. \llbracket \text{everyone in this room} \rrbracket^w(\llbracket \text{outside} \rrbracket^{w'})] \ \& \ \llbracket \text{would} \rrbracket^w(q)(\lambda w'. \llbracket \text{it be empty} \rrbracket^{w'})$



Result: Under the conjecture that grammar can only generate movement effects that by-pass islands via island pied-piping, the \exists -theory of pied-piping derives exceptional scope and exceptional *de re* in a unified manner.

DP inside an island
universal quantifier
indefinite

narrow scope+*de re*

wide scope+*de re*

✓
✓

×
✓

DP has a trace of type $\langle et, t \rangle$ DP has a trace of type e

¹⁶Elliott (2020) presents a novel theory of intensionality that links exceptional *de re* with exceptional scope, in a way similar to this paper. Elliott (2020) and the present paper, while they have been developed independently, have a common origin. They both take Charlow (2019) as their starting point and derive ‘exceptional’ effects via pied-piping. Despite this similarity, the two works assume entirely distinct intensional grammars. For Elliott, scope-taking is the very nature of how grammar compositionally handles intensionality— e.g., a definite description, taken to denote an individual concept, is turned into a scope taker of type $\langle \langle e, st \rangle, st \rangle$ so that it can compose with a VP of type $\langle e, st \rangle$. I leave it to future work to compare the two proposals.

A cautious conclusion: When we do not block the default possibility for scope reconstruction in semantics via higher type traces, **Scope Theory of Intensionality**, as it is laid out in von Stechow and Heim (2011), can be said to survive the core empirical challenges raised against it and therefore **may be an adequate system to represent intensionality in grammar**.

An even more cautious conclusion: It seems possible that grammar does not use any in-situ mechanisms (choice functions, pointwise composition, world pronouns etc.) to generate semantic effects that can be derived via movement.

7.2 Further questions & challenges

Q1: Keshet (2011) argues for a different version of STI, which he calls Split Intensionality. Do you make different predictions? Why the need for all this pied-piping?

The present proposal is similar to Keshet’s in that Keshet, too, proposes to derive exceptional *de re* via movement to some edge position. There is one not-very-important technical difference: under Keshet’s system quantifiers of type $\langle et, t \rangle$ end up having to combine with functions of $\langle e, st \rangle$ when they QR to this edge position. In the present proposal, the additional composition rule that enables this is not needed. In addition, there are two important differences between Split Intensionality and the \exists -theory:

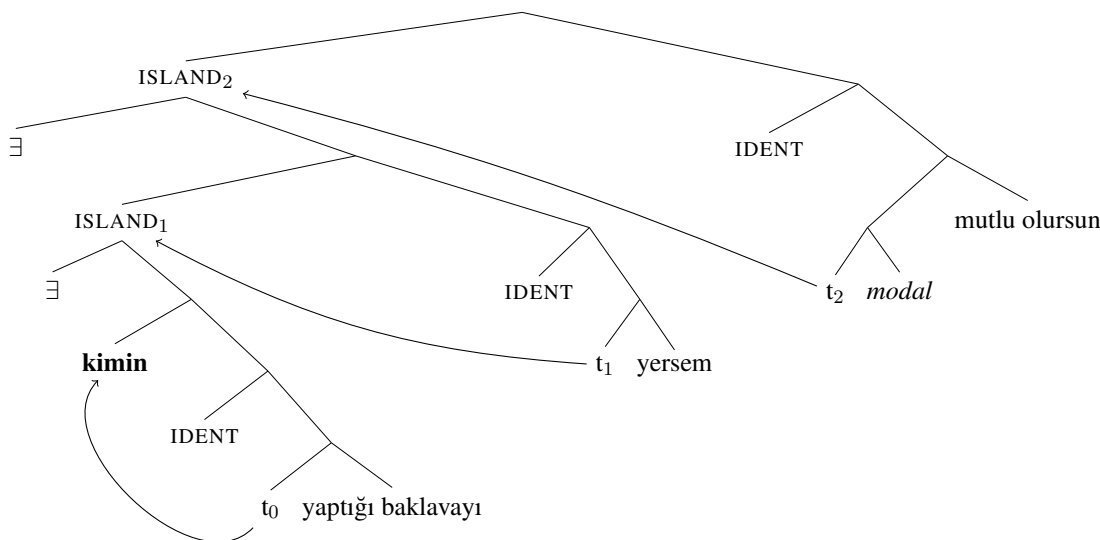
Diff.1 The \exists -theory implemented under STI promises to be a unified theory of exceptional scope and exceptional *de re*. Split Intensionality, on the other hand, is a theory designed exclusively to address the problem of exceptional *de re*, and it is agnostic on the problem of exceptional scope. Therefore, if an in-situ pseudo-scope mechanism is adopted to derive the exceptional scope of indefinites, Split Intensionality, on its own, fails to derive the *de re* construal that naturally co-occurs with exceptional wide scope.

Diff.2 Keshet makes an important empirical claim: a DP inside an island which itself is in another island cannot be *de re* relative to an intensional operator outside the outer island. Under the assumption that islands are immobile, Keshet’s system derives this. Notably, if this empirical claim is right, it cannot be derived under the \exists -theory. Here is why: pied-piping *can* be recursively applied, e.g. DP moves to the edge of Island₁, which subsequently moves to the edge of Island₂, and so forth. In this example, the opacity of DP will be determined by the LF-position of Island₂ (which contains Island₁ which contains DP). Therefore, the \exists -theory predicts that a DP inside an island which itself is in another island **can** be *de re* relative to an intensional operator outside the outer island. Keshet and Schwarz (2019) report that the empirical picture is not so clear but *do* point to data that goes against Keshet’s prediction. Grano (2019), too, challenge this empirical claim regarding the possible depth of exceptional *de re* in Keshet (2011).

What’s empirically more clear is that exceptional scope does not exhibit the claimed restriction on the possible depth of exceptional *de re*, as illustrated in (44). A simplified LF is given in (45) for the recursive pied-piping that will derive matrix scope for the deeply embedded *wh*-phrase.

- (44) [ISLAND₂ [ISLAND₁ **kimin** yaptığı baklavayı] yersem], mutlu olursun?
 who.GEN make.REL baklava.ACC eat.COND.1SG happy be.MODAL.2SG
 Lit: ‘[ISLAND₁ If I eat [ISLAND₁ the baklava that **who** made]], you will be happy?’

(45)



Q2: What about non-clausal pied-piping, e.g. DP pied-piping? Didn't von Stechow (1996) already show that interpreting pied-piping at LF doesn't give us the right meaning in *wh*-questions?

Both IDENT and \exists are type-flexible, which means that nothing in our semantics prevents DPs from being pied-piped. Anyway, we see this happening overtly in many (if not all) *wh*-fronting languages: e.g. *which girl's cat did you feed?*

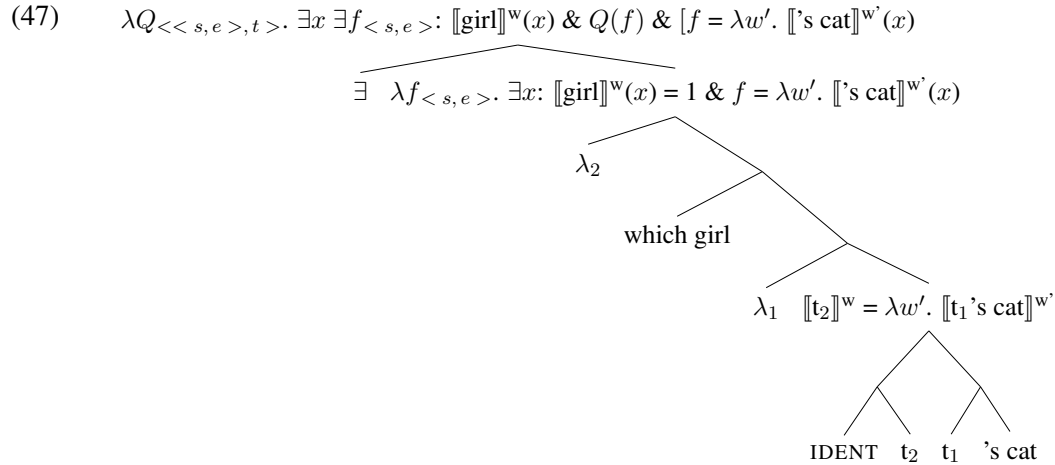
What von Stechow taught us is something about the meaning of *wh*-questions: a *wh*-question like (46) cannot mean (46b). He further claimed that to get the right meaning in (46a), the pied-pipee 's cat needs to be put back into the trace position so that it is not *de re*.

(46) $\llbracket \text{which girl's cat meowed} \rrbracket^w$

- a. $= \lambda p. \exists x: \llbracket \text{girl} \rrbracket^w(x) \ \& \ p = \lambda w'. \llbracket \text{meowed} \rrbracket^{w'}(\llbracket \text{'s cat} \rrbracket^{w'}(x))$
'which girl is such that her cat meowed?'
- b. $\neq \lambda p. \exists x: \llbracket \text{girl} \rrbracket^w(x) \ \& \ p = \lambda w'. \llbracket \text{meowed} \rrbracket^w(\llbracket \text{'s cat} \rrbracket^w(x))$
'which cat owned by a girl is such that it meowed?'

The meaning we gave to IDENT ensures that this is achieved in semantics, i.e. without having to rearrange the structure at LF. As shown in (47), since IDENT wants intensional arguments, the pied-pipee 's cat is prevented from being *de re*. When this existential quantifier that corresponds to *which girl's cat* QRs, its trace will be of type $\langle s, e \rangle$, which will be extensionalized locally¹⁷, and we will get (46a).

¹⁷This can be achieved via Extensionalizing FA (von Fintel and Heim, 2011) or via a freely available type-shifter that feeds the evaluation world to its sister: $\llbracket \text{ext} \rrbracket^w = \lambda f_{\langle s, \alpha \rangle}. f(w)$



Q3: Pied-piping can cause a bound pronoun to end up above its binder. Isn't this a fatal problem?

As was shown in Charlow (2019), a bound pronoun ending up above its binder as a result of pied-piping is not a fatal problem for the pied-piping approach. If the pronoun is part of the pied-pipee, its reconstruction can be achieved via higher type traces (Sternefeld, 2001b). In Chapter 5 of Demirok (2019), I discuss why semantic reconstruction for assignments is independently needed under STI and propose a way to implement it within a fairly syntactisized way.

Q4: You have silent \exists s. Doesn't that mean any NP that appears without an overt determiner should be interpretable as an existential quantifier? This is not possible in every language.

One way to make sure that an NP that appears without an overt determiner is not freely interpreted as an existential quantifier is to assume that the silent pronunciation of \exists is only licensed when its sister is not of type $\langle e, t \rangle$. We also need to have a way to tell which existential quantifiers get spelled-out as *wh*-phrases (i.e. in languages where they have different pronunciations from indefinites). Doing the latter in reference to structure/meaning alone proves to be a non-trivial task. Morphologically distinguishing indefinites and *wh*-phrases probably needs reference to non-semantic diacritic information (formal features). This might independently be needed to derive superiority effects concerning *wh*-phrases.

Q5: You have a type-neutral \exists . Is that any different from an existential closure operator that acts on sets or an existential closure operator that acts on a choice function variable?

They achieve the same thing but they work with different grammars. The \exists -theory only relies movement/QR, but pointwise composition or choice function analyses are typically recognized as enrichments on this base-line grammar. Things built via \exists are simply existential quantifiers and QR just like simplex GQs.

Q6: You only have traces in your LFs. What if I want to have copies interpreted via Fox’s Trace Conversion? We might need that to capture the Condition C facts.

This is not a trivial problem and remains as an open question. One challenge is to represent higher type traces as definite descriptions. As Danny Fox (p.c.) pointed out to me, the syntactic way of existentially ‘lifting’ syntactic expressions might actually help us out here. The bigger challenge, though, is the fact that *de re* obtains via movement under STI but lower copies will also need to be intensionally evaluated.

Q7: You have only talked about DPs pied-piping clauses. Doesn’t your theory of what can be *de re* depend on what can pied-pipe what?

Indeed. The question what kind of syntactic objects are mobile in syntax largely tells us what kind of syntactic objects can be *de re*. As Keshet (2011) argues, constraints on the *intensional flexibility* of syntactic objects are expected to follow from an independently needed theory of movement if our theory of intensionality isn’t based on binding. To put it simply, to be able to answer a question like ‘Can this system make an adverb *de re*?’, we need to answer the question ‘Can adverbs move?’. For example, Sauerland (2014) challenges the idea that STI has no problem with deriving the Main Predicate Constraint (Percus, 2000), arguing that main predicates *can* be moved, at least marginally. See also Elliott (2020) for a similar point.

(48) ?Be my father, my brother did.

[Sauerland (2014): e49]

While our theory on the restrictions on what can be *de re* does indeed depend on our understanding of what can move, I should add that even mobile syntactic objects can fail to be *de re*. For example, if the trace of the syntactic object moving out is forced to be intensional, movement will be unable to affect the intensional status of the moving object. This situation can arise, for example, when the trace is sister to a node looking for an intensional argument.

Acknowledgments

This paper is largely based on Chapter 4 of my dissertation (Demirok, 2019). I am indebted to my thesis supervisors Danny Fox, Sabine Iatridou, Norvin Richards, and Roger Schwarzschild. In addition, I have greatly benefited from discussions/correspondences with Simon Charlow, Luka Crnić, Patrick Elliott, Kai von Fintel, Elena Guerzoni, Paul Marty, and Sophie Moracchini, Deniz Özyıldız, Uli Sauerland.

Thank you to all! All errors are solely my responsibility.

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