MOVEMENT AND THE SEMANTIC TYPE OF TRACES

A Dissertation Presented

by

ETHAN POOLE

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

September 2017

Linguistics

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In memory of my brother,

Matthew David Poole, 15 May 1993–14 May 2017.

ACKNOWLEDGMENTS

This dissertation is a beginning. It represents what I've learned so far about the semantics of movement and possible traces. Happy circumstances prevent me from working on this any longer. But this should not be taken to imply that I regard it in any way as a finished piece of work.

My foremost thanks goes to my committee: Rajesh Bhatt, Kyle Johnson, Barbara Partee, Ellen Woolford, and Daniel Altshuler. It was a pleasure and a privilege to work with them. I thank them for helping me to create something that I can be proud of and for encouraging me every step of the way. I learned a lot from them, and the pages of this dissertation have benefited tremendously from their knowledge and feedback, as have I personally.

I have worked with Rajesh my entire time at UMass, and he is largely the reason that I came to UMass. He served on both my generals papers and then still agreed to co-chair this dissertation. All of these projects were on vastly different topics, which should stand as testimony to Rajesh's unwavering enthusiasm and his unparalleled knowledge about all things syntax and semantics. He has had a tremendous influence on all of my work and on how I approach linguistics. I thank him for teaching me so much, for always pushing me to be more explicit about the details, and for his continuous support over the past five years.

Kyle has been a fantastic mentor, teacher, and advisor throughout my time at UMass. This dissertation would not exist in its present form if it were not for Kyle. I started this dissertation with a collection of clumsy observations about Paul Postal's "antipronominal contexts"; the fact that this dissertation is anything more than that is largely because of Kyle. He constantly forced me to think about my dissertation work in the broader context, but also helped me work through the many problems that materialized along the way. He did all of this while on sabbatical and travelling around the globe. As we met for the last time before my defense, I realized that I'm going to greatly miss meeting with Kyle every week.

Barbara needs no introduction. She is encouraging and inspirational, but at the same time tough and critical. Her criticism greatly improved this dissertation, in particular chapters two and four. I learned a lot about semantics and academia from Barbara while writing this dissertation.

I'm happy that she was willing to serve on my committee even though it was about "syntax, with some semantics" and even though she is technically retired.

I first worked with Ellen on my first generals paper on quirky subjects. Throughout my time at UMass, she has been instrumental in shaping my outlook on many topics in linguistics, and whatever ability I have to coherently organize a linguistic argument is due to Ellen's feedback and very patient guidance. I'm happy that she served on my committee, even though in her eyes, it was about "semantics, with some syntax".

Although Daniel and I didn't have the chance to meet regularly while I was writing this dissertation, I'm grateful that he agreed to be my outside member and that he pressed me on the more philosophical and higher-level issues at my defense.

Portions of this work were presented at GLOW 40, WCCFL 35, the 2017 LSA Annual Meeting, and the University of Massachusetts Amherst. I thank the audiences for their comments and questions. I have also discussed this work with many people, who provided valuable feedback. I would like to acknowledge Sakshi Bhatia, Michael Yoshitaka Erlewine, Hsin-Lun Huang, Tim Hunter, Rodica Ivan, Beste Kamali, Stefan Keine, Angelika Kratzer, Petr Kusliy, Andrew McKenzie, Jon Ander Mendia, Troy Messick, David Pesetsky, Maribel Romero, Peter Svenonius, Coppe van Urk, and Katia Vostrikova. Many thanks to the English speakers around the department for sharing judgements, to Stefan Keine for German judgements, and to Georgia Simon for Y-movement judgements. This work was financially supported by the National Science Foundation Graduate Research Fellowship under NSF DGE-1451512 and by a UMass Summer Dissertation Research Fellowship.

UMass is a very special place to study linguistics. This dissertation owes a great debt to many people at UMass whose names don't appear on the cover sheet. In particular, I want to thank Seth Cable and Angelika Kratzer for teaching me semantics and Brian Dillon for teaching me how to run experiments. For the many wonderful and inspiring classes, I thank Rajesh Bhatt, Seth Cable, Brian Dillon, Alex Drummond, Ilaria Frana, Lyn Frazier, Jeremy Hartman, Vincent Homer, Kyle Johnson, Angelika Kratzer, Magda Oiry, Barbara Partee, Joe Pater, Tom Roeper, Peggy Speas, Tamina Stephenson, Ellen Woolford, and Kristine Yu. Finally, I thank Tom Maxfield and Michelle McBride for helping me avoid countless administrative pitfalls.

Before coming to UMass, I got my start at the University of Minnesota, in the world's greatest city of Minneapolis. I am greatly indebted to my undergraduate advisor Hooi Ling Soh, who taught me most of what I know about syntax and helped me get to where I am today. I also thank my other linguistic professors at the U of M: Jean-Philippe Marcotte, Brian Reese, and Nancy Stenson. At the U of M, I also studied Scandinavian languages and Finnish. Special thanks goes to Lena Norrman, who was a great mentor and friend while in the Twin Cities (*tusen tack!*). I would also like to thank the Scandinavian faculty there for shaping my general outlook and approach to life: Kaaren Grimstad, Poul Houe, Daniel Karvonen, and Anatoly Liberman. Thanks to Zachary Johnson, my first boss, for teaching me programming.

There are lots of other people who have made graduate school such a good experience. First, I would like to thank my cohort Hsin-Lun Huang, Jon Ander Mendia, Amanda Rysling, and Megan Somerday. Hsin-Lun, Jon Ander, and Megan were true friends throughout all of graduate school. I'm saddened that we now all live in different corners of the globe. Megan, as many people can attest to, is someone who changes your life for the better through her general cheerfulness, generosity, and honesty, and I thank her for helping me to be myself. For hanging out in Northampton or at conferences, chats in the department, discussions about linguistics, and general good times over the last five years, I would like to thank Carolyn Anderson, Caroline Andrews, Athulya Aravind, Nico Baier, Michael Becker, Sakshi Bhatia, Elizabeth Bogal-Allbritten, Thuy Bui, Isabelle Charnavel, Mike Clauss, Tracy Conner, David Erschler, Michael Erlewine, Lena Fainleib, Doreen Georgi, Hannah Greene, Alex Göbel, Claire Halpert, Chris Hammerly, Ivy Hauser, Aron Hirsch, Lisa Hofmann, Coral Hughto, Tim Hunter, Anton Karl Ingason, Rodica Ivan, Jyoti Iyer, Stefan Keine, Allie Kleber, Petr Kusliy, Leland Kusmer, Nick LaCara, Andrew Lamont, Ted Levin, Nick Longenbaugh, Haixia Man, Marlijn Meijer, Fernanda Mendes, Mythili Menon, Claire Moore-Cantwell, Andy Murphy, Gereon Müller, Mark Norris, Yohei Oseki, Jason Overfelt, Deniz Özylıdız, Yangsook Park, Presley Pizzo, Omer Preminger, Martin Salzmann, Hannah Sande, Anisa Schardl, Einar Freyr Sigurðsson, Georgia Simon, Walter Sistrunk, Shayne Sloggett, Brian Smith, Saurov Syed, Coppe van Urk, Andrew Weir, Becky Woods, Teresa Maria Xiqués, Liz Yockey, and Michelle Yuan. Special thanks to Thuy Bui, my fellow Minnesota alum, for her unconventional way of boosting my self-esteem. Thanks to Lauren Winans, Oliver Northrup, and Roumi Pancheva for showing me the treasures of LA whenever I was in town during my last year visiting some German. I will miss having Georgia Simon as a roommate; it was a great three years. Thanks to Anisa Schardl and Jim Cathey for keeping my love of Finnish alive with our little Finnish reading group, and to Geordie, honorary member for a couple years (*kiitos!*). Vielen Dank an Ute und Steffen für all den Spaß und die schönen Erlebnisse, die ich dank euch in Deutschland hatte.

The year spent writing my dissertation was a difficult year. I want to especially thank Sakshi and Katia for their constant encouragement and emotional support, in addition to Rajesh and Kyle, Stefan, Georgia, Jyoti, Megan, and Jon Ander.

My family deserves a special thanks, especially my parents, Irene and David; my step-parents, Dawn and Alan; my grandparents, Jean, Jack, and Kuniko; my Aunt Helen; and my cousins and oldest friends, Amanda and Anna. Their love and support has kept me going all these years, despite being so far from home. My brother, Matthew, passed away while I was writing this dissertation. I don't know if I will ever really recover from that, but this dissertation is dedicated to his memory.

For Stefan, there is no adequate way of acknowledging his contributions to my life and to my having managed to finish this dissertation. I thank him for his love and support.

ABSTRACT

MOVEMENT AND THE SEMANTIC TYPE OF TRACES

SEPTEMBER 2017

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This dissertation argues that there are only two possible semantic representations of movement: (i) a λ-bound variable, i.e. trace, ranging over an individual semantic type, such as entities and degrees, or (ii) reconstruction back into the launching site of movement. Even though natural language has expressions over higher types, these expressions cannot be represented as traces, which only range over individual types. I call this constraint the Trace Interpretation Constraint. The novel empirical motivation for this constraint comes from a detailed investigation of movement targeting DPs that denote properties, a kind of higher-type expression. I observe that such movement obligatorily reconstructs and argue that the absence of nonreconstructed readings entails that movement cannot map onto traces ranging over properties. This investigation is complemented by existing and novel arguments against traces ranging over generalized quantifiers, another kind of higher-type expression.

A second core claim of this dissertation is that the Trace Interpretation Constraint cannot be circumvented by type shifting an individual-type trace into a higher type, which I call the Trace Rigidity Principle. I show that there is a class of expressions that cannot be type shifted into property denotations, namely anaphoric definite descriptions, and argue that this class of expressions properly includes traces under Trace Conversion, thereby providing independent

support for the Trace Rigidity Principle. According to the Trace Interpretation Constraint and the Trace Rigidity Principle, movement is tightly restricted in how it can be semantically interpreted.

This dissertation also explores the dichotomy between the two representations permitted by the Trace Interpretation Constraint: leaving an individual-type trace and reconstruction. I develop a syntax and semantics of movement under which this choice is not free, but deterministic and does not require special LF interpretation rules. Therefore, a given movement derivation maps onto one and only one semantic representation. I argue that a deterministic system of movement requires multidominant representations. I demonstrate that this system of movement accounts for a number of disparate reconstruction phenomena without further ado.

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CHAPTER 1

INTRODUCTION

Movement has played an integral role in the development of linguistic theory. One of the pivotal discoveries about movement is that when an expression moves, it leaves behind something in its launching site. Chomsky (1973) proposed that what is left behind is a *trace*; since Chomsky (1993, 1995b), it has been standardly assumed that the launching site is instead occupied by a *copy*. The shift to copy-theoretic conceptions of movement gives rise to an immediate semantic puzzle: a structure that contains two copies of a moved expression cannot be straightforwardly composed semantically. There are two available and readily employed options, either (i) interpret both copies by converting the lower copy into a λ-bound variable (1a)—or something richer, like a bound definite description (e.g. Engdahl 1980, 1986; Fox 2002)—or (ii) interpret only the lower copy (1b).[1] Let us refer to the first option in (1a) as LEAVING A TRACE, where the λ-bound variable is the trace, and the second option in (1b) as RECONSTRUCTION.

(1) [**Which book**] did Nina read [**which book**]?

a. *Leaving a trace*
[**Which book**] [λx [did Nina read x]]?

b. *Reconstruction*
[~~which book~~] did Nina read [**which book**]?

This dissertation investigates in detail two questions about the semantics of movement: (i) What semantic types can traces range over? (ii) What regulates the choice between leaving a trace (1a) and reconstructing (1b)? In a nutshell, I motivate the highly restrictive constraint that traces can only range over individual semantic types, like entities (e) but not properties ($\langle e,t\rangle$), and develop a

[1] Note that the choice between (1a) and (1b) does not necessarily depend on the Copy Theory of Movement.

system in which the choice between (1a) and (1b) is deterministic and reduces to the internal makeup of a movement chain. The next two sections 1.1 and 1.2 of this introduction chapter elaborate on these proposals in somewhat greater detail, while section 1.3 outlines how the argumentation proceeds in the dissertation.

1.1 (Im)possible traces

The main claim of this dissertation is that traces only range over individual semantic types, such as entities (e) and degrees (d). Even though natural language has expressions over higher types, like properties ($\langle e, t\rangle$) and generalized quantifiers ($\langle et, t\rangle$), these expressions cannot be represented as traces. I call this constraint the TRACE INTERPRETATION CONSTRAINT, given in (2) (see also Chierchia 1984; Landman 2006).

(2) **TRACE INTERPRETATION CONSTRAINT**
$^*[\ \mathrm{DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots\ ]\ ]$, where σ is not an individual type

A second core claim of this dissertation is that the Trace Interpretation Constraint cannot be circumvented in the semantics by type shifting an individual-type trace into a higher type. I call this constraint the TRACE RIGIDITY PRINCIPLE, given in (3) (see also Landman 2004).

(3) **TRACE RIGIDITY PRINCIPLE**
Traces cannot be type shifted.

These constraints together conspire to force movement either to map onto a trace ranging over an individual type (4) or to reconstruct by putting the moved expression back in its launching site (5). All other representations are ill-formed.

(4) $[\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_1 \ldots\ ]\ ]$

(5) $[\ \_\_\__1 \ldots [\ \ldots [\ \mathrm{DP}\ ]_1 \ldots\ ]\ ]$
reconstruct

The crucial motivation for these proposals comes from a series of original observations about what I call **Π-POSITIONS**. These are syntactic environments where a DP denotes a property, i.e. type $\langle e, t\rangle$ (or intensional $\langle s, \langle e, t\rangle\rangle$). The four Π-positions that form the empirical base of the investigation are the pivot of an existential construction (6a), the color term of a change-of-color verb (6b), the name argument of a naming verb (6c), and predicate nominals (6d). Despite their surface heterogeneity, what these four environments have in common is that they require a property-type DP.

(6) *Π-positions*

a. *Existential constructions*
There is [**a potato**]$_{\langle e,t\rangle}$ in the pantry.

b. *Change-of-color verbs*
Megan painted the house [**magenta**]$_{\langle e,t\rangle}$.

c. *Naming verbs*
Irene called the cat [**Snowflake**]$_{\langle e,t\rangle}$.

d. *Predicate nominals*
Erika became [**a teacher**]$_{\langle e,t\rangle}$.

What is crucial about Π-positions is that they can be targeted by movement. Thus, they provide a testing ground for the hypothesis that only (4) and (5) are possible semantic representations of movement: Π-positions are type-incompatible with entity traces and thus the only mode of interpretation for them should be to reconstruct. As I will show, Π-positions can be targeted by movement, but only if that movement does not shift scope. This general claim manifests in two ways. First, movement types that obligatorily shift scope cannot target Π-positions. Second, movement types that otherwise optionally shift scope can target Π-positions, but only if they do not shift scope. For example, it can be shown that topicalization obligatorily shifts scope and accordingly it cannot target Π-positions (7a). On the other hand, *wh*-movement shifts scope optionally, but when it targets a Π-position, the moved *wh*-phrase must take scope in the launching site of movement (7b). This derives a movement asymmetry first observed in Postal (1994), but goes beyond it to show that it crosscuts movement types.

(7) *Π-positions and movement*

a. *Topicalization*
***Magenta**$_1$, Megan painted the house ___$_1$.

b. *Wh-movement* *how many ≫ should; ✓should ≫ how many
[**How many colors**]$_1$ should Megan paint the house ___$_1$?

Π-positions reveal that the semantic representation of scope-shifting movement is incompatible with property positions. Under my proposal, movement can be interpreted in one of two ways. Leaving a type-*e* trace (as in (4)) would shift scope, but such a trace does not furnish the property meaning required by Π-positions, yielding ungrammaticality. Reconstruction (as in (5)) obviates this problem by placing the moved expression back in the launching site of movement at LF. Thus, if a DP would not ordinarily violate the property requirement of Π-positions, then it will not do so under reconstruction either. What this incompatibility between Π-positions and scope-shifting movement entails is that movement cannot map onto a property trace ranging over type $\langle e, t\rangle$, as schematized in (8). If such a representation were available, it would salvage scope-shifting movement and at the same time be compatible with Π-positions. The fact that such meanings are unavailable tells us that such a representation is ungrammatical. Therefore, (4) and (5) are the only possible representations of movement.

(8) *No property traces*

$^{*}[\ \mathrm{DP}_1\ \lambda f_{\langle e,t\rangle} \ldots [\ \ldots [\ f_{\langle e,t\rangle}\ ]_1 \ldots]\,]$

I supplement this argument against property traces with independent evidence that even apparent quantification over properties must take scope in situ and thus cannot undergo QR.

The reason why Π-positions are important to understanding the semantics of movement is that they provide the missing puzzle piece to the Trace Interpretation Constraint. It is well-known that DPs come in three semantic guises: entities (*e*), properties ($\langle e, t\rangle$), and generalized quantifiers ($\langle et, t\rangle$) (Partee 1986). Previous research on possible traces, in particular Romero (1998) and Fox (1999), focused on the division between entity and generalized-quantifier traces, the two unmarked argument types. The conclusion reached there was that movement cannot leave a generalized-quantifier trace (9).

(9) *No generalized-quantifier traces*

$^{*}[\ \mathrm{DP}_1\ \lambda f_{\langle et,t\rangle} \ldots [\ \ldots [\ f_{\langle et,t\rangle}\ ]_1 \ldots]\,]$

Π-positions complete the "triangle", providing the evidence that property traces are also ungrammatical and thus supplying the crucial final piece of the argument that the constraint on possible traces is against *any* higher-type trace—i.e. the Trace Interpretation Constraint.

Π-positions also provide the empirical motivation for the Trace Rigidity Principle, according to which traces cannot be type shifted. I observe that while some seemingly type-*e* expressions can occur in Π-positions, *anaphoric definite descriptions* are prohibited in Π-positions. This is illustrated in (10b), where a definite description in a Π-position, here a change-of-color verb, is unable to covary with an indefinite in a quantificational sentence, a configuration known to require an anaphoric definite. The sentence is infelicitous because the simple uniqueness condition on nonanaphoric definites is not satisfied in the context. Examples like (10b) reveal that definite descriptions in Π-positions cannot be anaphoric.

(10) *No anaphoric definites in Π-positions*
Every time Irene picks out *a color* for the bathroom, . . .
a. ✓Helen complains that **the color/shade** is too bright.
b. #Helen has to paint the room [**the color/shade**]$_{\Pi\text{-pos}}$.

I draw a connection between this generalization and the independently-motivated hypothesis of Trace Conversion, wherein the lower copies of a movement chain are interpreted at LF by converting them into definite descriptions with a variable (Engdahl 1980, 1986; Sauerland 1998, 2004; Fox 1999, 2002, 2003). Under Trace Conversion, "traces" are thus anaphoric definite descriptions. I propose that while expressions can in principle achieve the property denotation required for Π-positions via type shifting, anaphoric definite descriptions—and hence traces—do not have licit property denotations under type shifting. I then develop a syntactic analysis of this incompatibility wherein type shifters are in complementary distribution syntactically with the strong definite determiner (in the sense of Schwarz 2009), the pivotal piece required to construct an anaphoric definite description. Consequently, a derivation can use either a strong-definite determiner with a DP or a type shifter on that DP, but never both; this derives the Trace Rigidity Principle.

1.2 Traces vs. reconstruction

According to the Trace Interpretation Constraint and the Trace Rigidity Principle, movement may either map onto a trace ranging over an individual semantic type (11) or reconstruct by putting the moved expression back in its launching site at LF (12).

(11) $[\ \text{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_1 \ldots\ ]\ ]$

(12) $[\ \underline{\quad}_1 \ldots [\ \ldots [\ \text{DP}\ ]_1 \ldots\ ]\ ]$
reconstruct

I argue that the choice between (11) and (12) is not free, but deterministic. Thus, a given movement derivation maps onto one and only semantic representation. I then develop a system in which the semantic behavior of a movement step depends entirely on the identity of the moving element: moving a DP versus moving a QP (question-particle phrase; in the sense of Cable 2007, 2010). Moving a DP results in a trace over type *e* (13). DP-movement is interpreted via Trace Conversion, wherein the lower copies of a movement chain are converted into anaphoric definite descriptions (Engdahl 1980, 1986; Sauerland 1998, 2004; Fox 1999, 2002, 2003).

(13) *Movement of a DP*

$$[\ \text{DP}_1 \ldots [\ \ldots \text{DP}_1 \ldots\ ]\ ] \rightsquigarrow_{\text{LF}} [\ [_{\text{DP}}\ \text{D NP}\ ]_1\ \lambda x_e \ldots [\ \ldots \underbrace{[_{\text{DP}}\ \text{the}\ [\lambda y\ .\ y = x]\ \text{NP}\ ]_1}_{\text{Trace Conversion}} \ldots\ ]\ ]$$

By contrast, moving a QP results in reconstruction of everything except the Q head (14). The interpretation of QP-movement follows from the Q head being unable to semantically compose with its complement, forcing the two to disassociate at LF.

(14) *Movement of a QP*

$$[\ [_{\text{QP}}\ \text{Q XP}\ ]_1 \ldots [\ \ldots [_{\text{QP}}\ \text{Q XP}\ ]_1 \ldots\ ]\ ] \rightsquigarrow_{\text{LF}} [\ \underbrace{[_{\text{QP}}\ \mathbf{Q}\ \cancel{\text{XP}}\ ]_1}_{\text{Interpret Q}} \ldots [\ \ldots \underbrace{[_{\text{QP}}\ \cancel{\text{Q}}\ \mathbf{XP}\ ]_1}_{\text{Interpet XP}} \ldots\ ]\ ]$$

Therefore, movement that shifts scope is movement of a DP and movement that reconstructs is movement of a QP. The interesting outcomes of this proposal materialize when individual steps of QP-movement and DP-movement are chained together. I will show that it is possible for QP-movement to *follow* DP-movement (15a), but not vice versa (15b).

(15) a. *QP-movement following DP-movement*

QP-mvt Build QP

✓[[$_{\text{QP}}$ Q DP$_1$]$_2$ . . . [[$_{\text{QP}}$ Q DP$_1$]$_2$ . . . [. . . DP$_1$ . . .]]]

DP-mvt

b. *DP-movement following QP-movement*

DP-mvt

*[DP$_1$ . . . [[$_{\text{QP}}$ Q DP$_1$]$_2$ . . . [. . . [$_{\text{QP}}$ Q DP$_1$]$_2$ . . .]]]

QP-mvt

Under this proposal, whether a movement chain shifts scope reduces to whether it contains an initial step of DP-movement. This allows different movement types to be stated in terms of different sequences of DP-movement and QP-movement, which I will show, given the possibility of DP-movement preceding QP-movement, reduces to whether the movement targets DPs or QPs.

This DP/QP-movement system is implemented in a multidominant syntax, building on Johnson (2012, 2014), which I argue is necessary to build structures like (15a) without resorting to counter-cyclicity. The upshot of this system is that there are no special rules at LF for interpreting movement, such as Trace Conversion—thus, (13) will also be revised. The structure built for movement in the narrow syntax serves the needs of the PF and LF interfaces without further interface-level modification. Presented along the way are many arguments in favor of this multidominant conception of movement from the perspective of how movement is interpreted.

I then apply the DP/QP-movement system to four disparate reconstruction phenomena: the Π-position asymmetry, Late Merge effects, focus intervention, and VP/AP movement. These phenomena divide into two classes: *reconstruction-forcing* conditions and *reconstruction-blocking* conditions. Reconstruction-forcing conditions are environments that are incompatible with the semantic output of DP-movement, namely a definite description, which is type *e*. They disallow any movement that shifts scope, i.e. is not QP-movement (16).

(16) *Reconstruction-forcing condition*

*[[$_{\text{DP}}$ D NP] . . . [. . . [[$_{\text{DP}}$ the NP]] . . .]]

Incompatible with type *e*

Reconstruction-blocking conditions, on the other hand, require that the moving expression or some subpart of it be outside the scope of another element in the structure. They target DPs and hence achieve this scope-shifting with DP-movement, which by definition does not reconstruct. This is schematized in (17), where α must be outside the scope of β.

(17) *Reconstruction-blocking condition*
$[\ [_{\text{DP}}\ \text{D NP}\ \alpha\ ] \ldots [\ \beta \ldots [\ \ldots [_{\text{DP}}\ \text{the NP}\ ] \ldots]\ ]\ ]$ DP, $\alpha \gg \beta$

The ease with which the DP/QP-movement system accounts for these reconstruction phenomena provides independent support for the DP/QP-movement system and its account of the dichotomy between traces and reconstruction. The result is a restrictive theory of movement and its semantics.

1.3 Roadmap

- Chapter 2 *"Movement of properties"* carries out a comprehensive investigation of Π-positions and their interactions with movement. The conclusion reached is that movement cannot map onto a property trace. I show the analysis proposed here is superior to previous analyses of Π-positions.

- Chapter 3 *"Properties of movement"* argues that the ban on property traces is part of a more general constraint on movement: the Trace Interpretation Constraint. The chapter then develops a syntax and semantics of movement that integrates the Trace Interpretation Constraint and the possibility of reconstruction, providing a means of analyzing different movement types and reconstruction phenomena like Π-positions.

- Chapter 4 *"Moving and shifting"* motivates the Trace Rigidity Principle based on the behavior of definite descriptions in Π-positions and develops an analysis of nominal type shifting to account for the Trace Rigidity Principle.

- Chapter 5 *"Nature of the Trace Interpretation Constraint and its consequences"* discusses the nature of the Trace Interpretation Constraint. I present two hypotheses about why the Trace Interpretation Constraint holds: one in terms of economy and another in terms of the syntax and semantics of DPs. I conclude by discussing some open questions that emerge from the proposals developed in this dissertation.

CHAPTER 2

MOVEMENT OF PROPERTIES

2.1 Introduction

This chapter investigates movement that targets DPs with property denotations, i.e. DPs of semantic type $\langle e, t \rangle$.[1] I show that a given movement step cannot target a property-type DP if that movement shifts scope. Thus, movement that targets a property-type DP must reconstruct. A consequence of this restriction is that some movement types are categorically precluded from targeting property-type DPs because they obligatorily shift scope and cannot reconstruct. I argue that this restriction on moving property-type DPs follows from the unavailability of traces ranging over properties (18), so that reconstructing is the only way of avoiding a semantic-type mismatch. The investigation carried out in this chapter provides the empirical foundation for the rest of the dissertation.

(18) $^*[\ \mathrm{DP}_1\ \lambda f_{\langle e,t\rangle} \ldots [\ \ldots [\ f_{\langle e,t\rangle}\ ]_1 \ldots]\ ]$

The point of departure will be an $\overline{\mathrm{A}}$-movement asymmetry in English discovered by Postal (1994), which has received little systematic attention in the literature. Postal makes the rather striking observation that there are syntactic environments in English that can be targeted by some types of $\overline{\mathrm{A}}$-movement, but not others. For example, in an existential construction, *wh*-movement can target the postverbal position (19b), but topicalization cannot (19c).

(19) a. There is **a potato** in the pantry. *Baseline*

b. ✓**What**$_1$ is there ___$_1$ in the pantry? *Wh-movement*

c. *[**A potato**]$_1$, there is ___$_1$ in the pantry. *Topicalization*

---

[1] For the sake of simplicity, I treat properties in purely extensional terms, which reduces them to sets of entities. This treatment is overly simplistic, but it will suffice for most of this dissertation. I discuss the issue of representing properties in natural language in section 4.5 of chapter 4.

The asymmetry illustrated in (19) comprises a diverse set of syntactic environments, e.g. existential constructions, change-of-color verbs, naming verbs, and predicate nominals. I will refer to these environments as **Π-positions**. The asymmetry also extends to other types of $\overline{\text{A}}$-movement, such as relative-clause formation and *tough*-constructions. An analysis of Π-positions is tasked with answering the following two questions: (i) Why are Π-positions the syntactic environments to exhibit the movement asymmetry? (ii) What characterizes the movement-type division that Π-positions distinguish?

Postal (1994) develops an analysis of Π-positions based on the observation that Π-positions are unable to host weak pronouns like *it* and *she* (20a), a property that he labels ANTIPRONOMINALITY. He proposes that *wh*-movement and topicalization differ in what they leave behind in the launching site of movement: *wh*-movement leaves a trace (20b), while topicalization leaves a covert resumptive pronoun (20c). Therefore, topicalization cannot target Π-positions because what it leaves behind, viz. a pronoun, violates antipronominality.

(20) *Postal's (1994) analysis of Π-positions*

a. *Antipronominality*
*There is **it** in the pantry.

b. *Wh-movement leaves a trace*
✓**What**$_1$ is there $\boldsymbol{t}_1$ in the pantry?
wh

c. *Topicalization leaves a covert resumptive pronoun*
*[**A potato**]$_1$, there is ~~**it**~~$_1$ in the pantry.
topic

Under Postal's analysis, there is no explanation for *why* Π-positions are antipronominal, which in turn calls into question accounting for the distinction between *wh*-movement and topicalization in terms of pronouns when antipronominality itself lacks an explanation. For Postal, the environments and the movement types are arbitrary and amount to little more than two lists. The root cause of the Π-position asymmetry has hitherto remained unaccounted for.[2]

[2] Stanton (2016) analyzes a similar set of facts in terms of antipronominality. Because her data differs somewhat from Postal's data, I will hold off on discussing her data and analysis until section 2.6.2. However, note that the analysis that I develop in this chapter will be able to extend to her data as well.

I will argue that the Π-position asymmetry has nothing to do with pronouns. I will advance two novel generalizations, one concerning the Π-positions themselves and another concerning the movement-type division, thereby addressing the two questions raised above. First, the apparently heterogeneous syntactic environments that exhibit the asymmetry are environments where the DP denotes a PROPERTY, i.e. semantic type $\langle e, t \rangle$ (21a). To support this characterization, I will appeal to independent arguments in the literature that these positions host property-type DPs. I will also show that this generalization encompasses antipronominality because weak pronouns do not have property denotations. Second, movement that targets a Π-position must reconstruct; or, more precisely, movement cannot target a Π-position if that movement shifts scope (21b). The movement types that *cannot* target Π-positions, e.g. topicalization, can be shown to obligatorily shift scope, while the movement types that *can* target Π-positions, e.g. *wh*-movement, can be shown to only optionally shift scope. Crucially, I will show that the latter movement types can only target Π-positions when they do *not* shift scope, i.e. when they reconstruct. These generalizations are summarized in (21).[3]

(21) **Π-POSITION GENERALIZATIONS**

a. **Property generalization**
DPs in Π-positions must denote properties (semantic type $\langle e, t \rangle$).

b. **Scope generalization**
Movement that shifts scope cannot target Π-positions.

From these two generalizations, what Π-positions reveal is that the semantic representation of scope-shifting movement is incompatible with property positions. Under standard semantic assumptions (e.g. Heim and Kratzer 1998), in order to shift scope, movement must leave a variable of semantic type e in the launching site of movement and insert a λ-abstraction binding that variable below the landing site. This type-e variable, or trace, is incompatible with Π-positions, which require a property ($\langle e, t \rangle$). This semantic-type mismatch yields ungrammaticality, thereby preventing scope-shifting movement from targeting Π-positions (22). Movement that does not shift scope instead

[3] The generalizations in (21) might seem reminiscent of "predicate" movement of VPs and APs, which obligatorily reconstructs (Huang 1993; Takano 1995; Heycock 1995). However, even though VPs and APs are called "predicates", under modern standard assumptions, they are in fact semantically *propositions*, not properties. Thus, Π-positions cannot obviously be subsumed under predicate movement, despite their superficial similarities; DPs with property meanings are distinct objects from VPs and APs. See section 3.4.4 of chapter 3 for additional discussion.

reconstructs syntactically. Thus, if a DP would not ordinarily violate the property requirement of a Π-position, then it will not do so under reconstruction either (23).

(22) *Scope shifting ⇏ Π-positions*

$$^{*}[\ \mathrm{DP}_1\ \lambda x_e \ldots [\ldots [\ x_e\ ]_{\Pi\text{-pos}} \ldots]\ ]$$

type e trace

(23) *Reconstruction ⇒ Π-positions*

$$✓[\ \_\_\__{1} \ldots [\ldots [\ \mathrm{DP}_1\ ]_{\Pi\text{-pos}} \ldots]\ ]$$

reconstruct

I will argue that the incompatibility between Π-positions and scope-shifting movement further entails that movement cannot map onto a property trace ranging over type $\langle e, t\rangle$, as schematized above in (18). If such a representation were available, it would salvage scope-shifting movement and at the same time be compatible with Π-positions. The fact that such meanings are unavailable tells us that such a representation is ungrammatical. This prohibition against property traces will set the stage for the subsequent chapters of this dissertation.

Against this backdrop, Π-positions are an instance where movement must reconstruct in order to avoid a semantic-type mismatch that would occur if the moved DP were not interpreted in its base-generated position. Some movement types, e.g. topicalization, are unable to target Π-positions because they cannot reconstruct. This analysis thus derives the movement asymmetry that Postal (1994) observed, but it also derives the more nuanced empirical picture encapsulated in the scope generalization. An important consequence of this enriched empirical picture is that it shifts the discussion away from Postal's (1994) characterization of the Π-position asymmetry as a division between movement types. I discover that rather, what is at stake in the Π-position asymmetry is *scope*, namely whether a movement step reconstructs. This criterion crucially crosscuts movement types. I will show that the existing analyses of Π-positions, Postal (1994) and Stanton (2016), are unable to account for the full range of facts about the Π-position asymmetry uncovered in this chapter precisely because they rest on a categorical distinction between movement types—a problem that my analysis does not face.

The chapter proceeds as follows: Section 2.2 presents the core facts: the apparent division of $\overline{\mathrm{A}}$-movement into two types and the syntactic environments ("Π-positions") that diagnose this division. In section 2.3, I argue that what characterizes Π-positions is that the DPs in these positions denote properties. In section 2.4, I show that the division of $\overline{\mathrm{A}}$-movement revealed by Π-positions is coextensive with whether the movement shifts scope. Section 2.5 argues that the Π-position asymmetry results from the type-*e* trace required for movement to shift scope being incompatible with the property-type requirement of Π-positions, thereby yielding a semantic-type mismatch and ungrammaticality. Section 2.6 compares the analysis developed here to the two previous analyses of Π-positions: Postal (1994) and Stanton (2016).

2.2 Π-positions

Postal (1994) observes that $\overline{\text{A}}$-movement types in English divide into two classes based on the possible launching sites of such movement.[4] This division only manifests itself in a set of special syntactic environments, e.g. existential constructions, wherein one movement class can target the special environments and the other movement class cannot. This section introduces Postal's chief observations about this $\overline{\text{A}}$-movement asymmetry, interleaved with some novel observations of my own. Moving forward, it will be helpful to have some descriptive terminology for the moving pieces making up this phenomenon. Let us adopt the terminology in (24).[5]

(24) a. **Π-position**
A syntactic position exhibiting Postal's $\overline{\text{A}}$-movement asymmetry.

b. **W-movement**
Movement type that can target Π-positions, e.g. *wh*-movement.

c. **T-movement**
Movement type that cannot target Π-positions, e.g. topicalization.

Note that W-movement and T-movement are descriptive terms and will not bear any significance in the analysis. I will also use the term "Π-position" interchangeably to refer to the actual syntactic position exhibiting the asymmetry and to the construction containing that position, disambiguating when necessary.

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4 Postal (1994) is also reprinted with minor modifications in Postal (1998). I only cite the 1994 paper in what follows.

5 Postal (1994) refers to the environments as antipronominal contexts and the two movement classes as A-type and B-type extractions. Stanton (2016) also adopts this terminology. I have elected to use the more neutral term of Π-position, where the "Π" is intended to allude to "property". For the movement classes, I have changed the terminology to avoid confusion between, in his terminology, A-type $\overline{\text{A}}$-extractions and *A-movement*, instead opting for something more mnemonic.

Section 2.2.1 starts out by discussing some of the precautions that must be taken when working with topicalization in English. Then, the subsequent sections introduce the four Π-positions: existential constructions (§2.2.2), change-of-color verbs (§2.2.3), naming verbs (§2.2.4), and predicate nominals (§2.2.5).[6] We will consider two W/T-movement pairings discovered by Postal (1994): *wh*-movement compared to topicalization and restrictive relative clauses (RCs) compared to appositive RCs. While *wh*-movement and restrictive-RC formation are W-movements, topicalization and appositive-RC formation are T-movements.[7]

In addition to the two W/T-movement pairings from Postal (1994), we will consider two other T-movements. The first one is the formation of *tough*-constructions, which Chomsky (1977) shows to invoke $\overline{\text{A}}$-movement (of a null operator) in the embedded clause. I will contrast *tough*-constructions with their corresponding nonmovement expletive counterparts. Postal mentions in passing that *tough*-constructions, and other constructions that were thought to involve "object deletion" (Lasnik and Fiengo 1974), appear to pattern as T-movements. I will show that this pattern indeed extends to all the Π-positions.[8] The second new T-movement is Quantifier Raising (QR), which I will diagnose via inverse scope over the subject and negation. For existential constructions, it is well-known from Williams (1984) that the pivot cannot be targeted by QR. I will show that the impossibility of QR generalizes to the other Π-positions as well. As a disclaimer, I will distinguish QR for scope shifting and QR for interpreting quantifiers. Although these two functions of QR ordinarily coalesce (in English), we will see that this does not hold for Π-positions: quantificational DPs can occur in Π-positions, but they do not enjoy the scopal mobility that QR would afford. As such, we are interested in only the scope-shifting function of QR; how quantificational DPs are interpreted in Π-positions is discussed in section 2.5.4. QR being a T-movement will be important in drawing the scope generalization in section 2.4 and developing the analysis in section 2.5.

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[6] Postal (1994) does not provide complete paradigms, so the Π-position paradigms that I present are my own.

[7] Postal (1994) discusses other environments that exhibit the $\overline{\text{A}}$-movement asymmetry, which I do not discuss here. As far as I can tell, the generalizations reached based on the four Π-positions in this chapter extend to the other cases.

[8] A contentious question in the *tough*-construction literature is what exactly is moving in a *tough*-construction: the matrix subject itself (the long-movement analysis) or a null operator that establishes a proxy link with the matrix subject (the base-generation analysis). I will show that the embedded gap in a *tough*-construction cannot correspond to a Π-position. We know that *something* is moving from this position (Chomsky 1977). This will suffice for present purposes to show that whatever movement underlies the formation of a *tough*-construction, it is a T-movement.

2.2.1 Controlling for topicalization

Before proceeding to the data, it is worth briefly addressing some challenges presented by topicalization in English. First, topicalization is a rather marked structure in English, which makes it difficult for many speakers to judge whether an instance of topicalization is ungrammatical or merely infelicitous. Second, the linear order achieved by topicalization is usually string-compatible with two other information-structure movements: focus movement (25) and Y(iddish)-movement (26). Focus movement has a fairly limited distribution.[9] Y-movement is dialectal, which I indicate with '%', but some uses have entered mainstream American English.[10, 11]

(25) *Focus movement*
[**Macadamia nuts**]$_1$ they're called ___$_1$. [Prince 1981:249]

(26) *Y-movement*

a. % [**Egg creams**]$_1$ you want ___$_1$, **bananas**$_2$ you'll get ___$_2$. [Ross 1967:483]

b. % [**A finger**]$_1$ I wouldn't lift ___$_1$ for him! [Prince 1981:249]

c. A: How's your son?
B: %Don't ask! [**A sportscar**]$_1$ he wants ___$_1$! [Prince 1981:260]

I control for these complications by using question–answer scenarios that license topicalization exclusively, and neither focus movement nor Y-movement. These contexts utilize the question–answer congruence conditions on CONTRASTIVE TOPICS (Constant 2014, and references therein). A contrastive topic (CT) denotes what the question-under-discussion is about and implies that there are other questions about different topics; in other words, a CT denotes a topic and implies a family-of-questions. In English, a CT prosodically bears a rising accent and is followed by a low-rising pause. In the control contexts that we will be interested in, the CT is paired with an EXHAUSTIVE

9 My impression is that younger English speakers do not productively have focus movement.

10 Y-movement presents an interesting comparison to topicalization because, unlike topicalization, it is purported to reconstruct. Consider the sentence in (i).

(i) [**Many girlfriends**]$_1$, Sally doesn't have ___$_1$.

Under Y-movement, *many* in (i) can take scope below negation because the moved DP *many girlfriends* can reconstruct, but under topicalization, it cannot. Thus, a DP fronted from a Π-position may be compatible with a Y-movement parse, but not a topicalization parse (see in particular fn. 23 and fn. 39). This makes it all the more important to control for the difference between Y-movement and topicalization.

11 Thanks to Barbara Partee for bringing Y-movement to my attention.

FOCUS, a phrase that denotes the answer to the question and prosodically bears a high accent. Constant (2014) observes that the topicalization position in English readily hosts a CT (27), but not an ordinary exhaustive focus (28). Small caps represent prosodic prominence, and an ellipsis represents a long, low-rising pause.

(27) *Topicalization can host a contrastive topic*

A: What about the beans and the salad?
Who brought *those*?

B: [The BEANS]$_{\text{CT}}$ . . . [FRED]$_{\text{Exh}}$ brought. [Constant 2014:83]
L+H* L+H% H* L-L%

(28) *Topicalization cannot host an exhaustive focus*

A: What did Fred bring?

B: # [The BEANS]$_{\text{Exh}}$, Fred brought. [Constant 2014:84]

These control contexts are prosodically and semantically incompatible with focus movement and Y-movement. First, the CT must appear with an exhaustive focus. Therefore, there are always two prosodically prominent constituents if the CT is being used felicitously—in fact, having two prosodic prominences is often considered to be definitional of English topicalization (Gundel 1974; Prince 1981; Constant 2014). This prosodic contour is incompatible with focus movement and Y-movement, whose prosody mappings only contain a clause-initial prosodic prominence (Prince 1981). Second, a CT can never appear in a *thoroughly exhaustive answer* to the entire issue at hand (Constant 2014). Thus, the answer in (27) might exhaustively answer what Fred brought, but it does not resolve who brought the salad, and hence it does not resolve the entire issue at hand. If CT prosody were applied to *the beans* in (28), it would be felicitous only if the speaker were unsure whether Fred brought other things. This partial-answer interpretation is incompatible with focus movement and Y-movement (Prince 1981).

Furthermore, to alleviate the difficulty of topicalization judgements, after giving each Π-position paradigm, I will include a comparison between the ungrammatical target sentence with topicalization from a Π-position and a minimally different, yet grammatical sentence with topicalization from one of the other argument positions in the structure. These minimal pairs will help us to more convincingly see that the syntactic environments identified in Postal (1994) indeed cannot be targeted by topicalization.

2.2.2 Existential constructions

W-movements can target the postverbal position in an existential construction—called the PIVOT—, but T-movements cannot (29).[12]

(29) a. *Baseline*
There is **a potato** in the pantry.

b. *Wh-movement*
✓**What**$_1$ is there ___$_1$ in the pantry?

c. *Topicalization*
*[**A potato**]$_1$, there is ___$_1$ in the pantry.

d. *Restrictive RC*
✓Gloria saw the **potatoes**$_1$ [$_{RC}$ that there were ___$_1$ in the pantry].

e. *Appositive RC*
*Gloria saw the **potatoes**$_1$, [$_{RC}$ which there were ___$_1$ in the pantry].

f. *Tough-construction*
i. *[**A potato**]$_1$ was impossible [for there to be ___$_1$ in the pantry].
ii. ✓It was impossible [for there to be **a potato** in the pantry].

QR cannot target the pivot of an existential construction. Consequently, the pivot must take in situ scope below other scope-bearing elements, such as modals (30) and negation (31).[13] Williams (1984) was the first to observe this incompatibility between QR and existential constructions. In particular, he observed that the pivot must scope below modals, which crucially have immobile

[12] Note that *which* can be used with both restrictive and appositive RCs, while *that* can only be used with restrictive RCs. I reserve *which* for RCs interpreted and pronounced prosodically as appositives.

[13] A possible exception to this generalization are summative readings of existential constructions where the pivot intuitively appears to scope above the modal (i). For example, (i.a) has a reading where three outcomes are possible in the relevant elections, not that the relevant elections could end up having three outcomes instead of one. Summative readings are possible only with relational nouns.

(i) a. There could be **three outcomes** to these elections.

b. There can be **three winners** at this point in the race. [Francez 2007:32–33]

No existing theory of existential constructions can explain these readings, including Francez (2007) who first observed them. See Francez (2015) for more discussion of summative existentials.

scope (30a). This incompatibility contrasts with the subject of the corresponding copula construction, which can freely scope above or below a modal (30b), presumably because A-movement to subject position, [Spec, TP], can reconstruct.

(30) *No QR over modals* [Williams 1984:152]

a. There *must* be **someone** in his house. ✓must ≫ someone; *someone ≫ must

b. **Someone** *must* be in his house. ✓must ≫ someone; ✓someone ≫ must

The same pattern holds for negation: the pivot cannot take inverse scope over negation via QR (31a), which is otherwise generally available (31b). A context is provided in (31c) in which the wide-scope reading of *two tractors* is true and the narrow-scope reading is false, thereby testing exclusively for the wide-scope reading achievable via QR. In this context, (31a) is false and (31b) is true, which crucially shows that the pivot of an existential construction cannot QR over negation.

(31) *No QR over negation*

a. There are*n't* **two tractors** in the barn. ✓not ≫ two; *two ≫ not

b. I did*n't* see **two tractors** in the barn. ✓not ≫ two; ✓two ≫ not

c. *Wide-scope context*
There are four tractors. Tractors #1 and #2 are in the barn, while tractors #3 and #4 are still out in the field. I look into the barn.

Turning to topicalization, even in a question–answer context that licenses topicalization, topicalizing the pivot is ungrammatical (32). However, as shown in (33), it is possible to topicalize the post-pivot material—called the CODA—in an equivalent context.

(32) *Topicalization* ***cannot*** *target the pivot*
Context: Gloria is making a salad for lunch at her friend's house, but does not know where everything is located in the kitchen.

A: What about a knife and a cutting board?
Where can I find *those*?

B: *[A cutting BOARD]$_{\text{CT}}$ . . . there is [on the TABLE]$_{\text{Exh}}$.

(33) *Topicalization* ***can*** *target the coda*

Context: Gloria is helping her friend reorganize their kitchen. Before entering the messy kitchen, she wants to start by taking an inventory of what is on all of the surfaces.

A: What about on the table and on the counter?
What is there on *those*?

B: ✓[On the TABLE]$_{\mathrm{CT}}$ . . . there is [a cutting BOARD]$_{\mathrm{Exh}}$.

Given the semantic similarity between an existential construction and its corresponding copula construction (e.g. *There is a potato in the pantry* and *A potato is in the pantry*), one might expect the subject position of a copula construction to be a Π-position.[14] However, the prohibition against being targeted by T-movements does not hold for a copula construction corresponding to an expletive construction. The subject position of a copula construction can be targeted by W-movements and T-movements alike (34).[15] Note that the sentences in (34) use nonlocal environments to avoid string-vacuous movement.

(34) *Copula constructions are not Π-positions*

a. *Baseline*
Gloria said (that) **a potato** was in the pantry.

b. *Wh-movement*
✓**What**$_1$ did Gloria say ___$_1$ was in the pantry?

c. *Topicalization*
✓[**A potato**]$_1$, Gloria said ___$_1$ was in the pantry.

d. *Restrictive RC*
✓Gloria saw the **potatoes**$_1$ [$_{\mathrm{RC}}$ that ___$_1$ were in the pantry].

e. *Appositive RC*
✓Gloria saw the **potatoes**$_1$, [$_{\mathrm{RC}}$ which ___$_1$ were in the pantry].

---

[14] This point is not to imply that existential constructions are equivalent to copula constructions or that all existential constructions even have copula equivalents, as the pairs in (i) and (ii) demonstrate. (ii) is from Barbara Partee, who attributes it to one of her graduate classes at MIT.

(i) a. ✓There was space in the room.
b. ??Space was in the room. [McNally 2011:1836]

(ii) a. ✓There was nothing to do.
b. *Nothing was to do.

[15] *Tough*-constructions are not given in (34) because, independently, a *tough*-construction cannot be formed on the subject position, e.g. **John*$_1$ *is tough to* ___$_1$ *please Mary*.

2.2.3 Change-of-color verbs

W-movements can target the COLOR TERM of a change-of-color verb, e.g. *paint*, *turn*, and *dye*, but T-movements cannot (35).

(35) a. *Baseline*
Megan painted the house **magenta**.

b. *Wh-movement*
✓[**What color**]$_1$ did Megan paint the house ___$_1$?

c. *Topicalization*
***Magenta**$_1$, Megan painted the house ___$_1$.

d. *Restrictive RC*
✓Jyoti liked the **color**$_1$ [$_{RC}$ that Megan had painted the house ___$_1$].

e. *Appositive RC*
*Jyoti liked that **color**$_1$, [$_{RC}$ which Megan had painted the house ___$_1$].

f. *Tough-construction*
i. ***Magenta**$_1$ was fun [(for Megan) to paint the house ___$_1$].
ii. ✓It was fun [(for Megan) to paint the house **magenta**].

There is no general prohibition against T-movements targeting color terms. A color term can be topicalized (36) or head an appositive RC (37) if it does not occur with a change-of-color verb. The prohibition on T-movements targeting color terms applies exclusively to those color terms that are arguments of change-of-color verbs.

(36) *Color terms can otherwise be topicalized*
{ **Green** / **that color** }$_1$, he never discussed ___$_1$ with me. [Postal 1994:164]

(37) *Color terms can otherwise head appositive RCs*
He never discussed { **green** / **that color** }$_1$ with me, [$_{RC}$ which ___$_1$ is his favorite color].

The ungrammaticality of topicalizing the color term of a change-of-color verb becomes starker when it is contrasted with topicalizing the object instead. Compare (38) and (39), which utilize the question–answer contexts that license topicalization. (38) provides the baseline that topicalizing the object is perfectly acceptable and natural in context. In comparison, (39) topicalizes the color term, but this yields a drop in acceptability, which I analyze as ungrammaticality.[16]

(38) *Topicalization **can** target the object*
Context: The neighborhood is having all twenty of the houses painted by a talented artist named Megan. Each house will be painted a unique color. There are twenty choices of color in total, so one for each house.

A: What about the Nelsons' and Connors' houses?
Which color did Megan paint *those (houses)*?

B: ✓[The NELSONS' house]$_{\text{CT}}$ . . . Megan painted [magenta]$_{\text{Exh}}$.

(39) *Topicalization **cannot** target the color term*
Context: The neighborhood is having all twenty of the houses painted by a talented artist named Megan. Each house will be painted a unique color. There are twenty choices of color in total, so one for each house.

A: What about magenta and cerulean?
Whose house did Megan paint *those (colors)*?

B: *[MAGENTA]$_{\text{CT}}$ . . . Megan painted [the NELSONS' house]$_{\text{Exh}}$.

QR cannot target the color term of a change-of-color verb. As shown in (40a), it is impossible for a quantified color term to QR over the subject.[17] Here, I include the adjective *different* in order to bias towards the inverse-scope reading in which there is a different contractor for each color. I use the #-mark to indicate that *different* is infelicitous if the sentence were uttered out-of-the-blue—because it lacks the distributed reading that QR could achieve. Of course, there is a felicitous reading of *different* in (40a) in which *different* is interpreted as different with respect to something

[16] Some speakers who I have consulted accept topicalizing the color term of a change-of-color verb, yet still do not allow an appositive RC to be formed on one. For these speakers (35c) and (39) are both grammatical, while (35e) remains ungrammatical. These same speakers find the contrast between *wh*-movement and topicalization for all the other Π-positions. Against the generalization developed in section 2.3, one possible explanation for this discrepancy is that these speakers might be coercing color terms into *kinds*, in the sense of Chierchia (1998), or treating them as adverbials, as Kratzer (2005) proposes for some German (pseudo-)resultatives.

[17] (40a) can describe multiple events of painting, e.g. one painting for each color. One might have the impression that this must involve QR of the quantified color term over the existentially-quantified event variable. However, we can argue that this hypothesis is wrong. The multiple-event reading follows from standard assumptions about cumulativity and plural verbs, without any need to invoke QR (Kratzer 2008; Krifka 1986, 1992). For example, a multiple-event reading is possible with simple conjunction of color terms (i), which is what one would expect given the cumulativity of natural-language predicates.

(i) Megan painted the house **magenta and chartreuse**.

previously mentioned in the discourse, e.g. another contractor, but this reading is irrelevant for our purposes because it is not an inverse-scope reading. As shown in (40b), the object can nevertheless QR over the subject.

(40) *No QR over the subject*

a. *A (#different) contractor* painted the house **every color**. ✓a ≫ every; *every ≫ a

b. *A (different) contractor* painted **every house** that ugly green. ✓a ≫ every; ✓every ≫ a

Even though the color term cannot QR over the subject, which fixes their scope relationship, the color term can scope either above the object (41a) or below the object (41b).

(41) *Scope of the color term and the object*

a. Megan painted [*a (different) house*] [**every color**]. Color ≫ Object

b. Megan painted [*every house*] [**a (different) color**]. Object ≫ Color

To maintain the generalization that QR is a T-movement, I propose that by default, the color term scopes above the object. The two form a small clause and hence stand in a siblinghood relationship.[18] Thus, the object is not an argument of the verb, but rather an argument of the color term. Accordingly, (41a) is the default scope relationship without any QR having occurred (42a). When the object scopes over the color term, as in (41b), the object has undergone QR to some higher position above the color term (42b). Therefore, the variation in scope between the color term and the object in (41) is derived *without* QRing the color term.

(42) a. *Color term ≫ Object*

[paint [[*a house*] **every color**]] (=41a)

b. *Object ≫ Color term*

[*every house*$_1$ [paint [[___$_1$] **a color**]]] (=41b)

QR

[18] Strictly speaking, a small-clause structure is not the only way for the color term to scope over the object by default. There could be silent material between the color term and the object, though we might consider such a structure a small clause of sorts. The color term could also be above the VP, which would contain the verb and the object. The propertyhood of the color term that I will argue for in section 2.3 is more suggestive of a small-clause structure.

The proposal in (42) receives independent support from the fact that the object can QR over the subject (40b), but the color term cannot (40a). Under this analysis, the reason that the color term cannot QR over the subject is because it cannot QR at all.[19]

Thus far, (40)–(42) have shown that the color term cannot QR over the other arguments of a change-of-color verb. In addition, the color term cannot QR over other scope-bearing elements, which (43) illustrates with negation. The only possible interpretation of (43) is where the color term *only two colors* takes narrow scope with respect to negation, which is paraphrased in (43a). Missing is the wide-scope reading paraphrased in (43b). For comparison, the object can QR over negation, and thus both the narrow-scope and wide-scope readings are available (44).

(43) *Color term **cannot** QR over negation*
Megan did*n't* paint the house **only two colors**.

a. ✓*Narrow-scope reading* — not ≫ only two
It is not the case that there are two colors x and y such that Megan painted the house x and y and no other color.

b. * *Wide-scope reading* — only two ≫ not
There are two colors x and y such that Megan did not paint the house x and y, but she painted the house all other colors.

(44) *Object **can** QR over negation*
Megan did*n't* paint **only two houses** that ugly green.

a. ✓*Narrow-scope reading* — not ≫ only two
It is not the case that there are two houses x and y such that Megan painted x and y, and no other house, that ugly green.

b. ✓*Wide-scope reading* — only two ≫ not
There are two houses x and y such that Megan did not paint x and y that ugly green, but she painted all the other houses that ugly green.

The judgements for (43) are delicate because of the temptation to incorrectly equate the contrast between the narrow-scope and wide-scope readings with the specificity of the color term. Impor-

[19] Another conceivable analysis of the discrepancy between (40) and (41) is that there are two QR-positions: one position above the subject and another position above the object, but below the subject. The color term would only have access to the lower QR-position such that it can scope above the object, but not the subject. I do not see any independent motivation for such an analysis, and it has the undesirable consequence of forcing a bifurcation in the otherwise simple generalization that QR is a T-movement.

tantly, the truth conditions of the narrow-scope reading are verifiable under models both where the two colors are *known* (e.g. red and blue) and where they are *unknown* (e.g. any two colors). Part of this superficial complication is rooted in the set of colors being infinite. However, we can construct a scenario with a finite set of colors, which allows us to verify that the wide-scope reading is absent in (43). Consider such a scenario in (45), where there are only four possible colors.

(45) *The painting*
Megan was hired to paint a house in her neighbourhood. She was provided with four colors of paint: barn-red, colonial-blue, oatmeal, and cream.

In this scenario, the narrow-scope reading is true iff Megan uses at least three colors, thereby leaving at most one color unused. The wide-scope reading is true iff Megan leaves exactly two colors unused, thereby using exactly two colors to paint the house. The crucial ingredient in (45) is the even number of colors because it forces the narrow-scope reading to be true only when the wide-scope reading is false, and vice versa. Now consider the two contexts in (46) prefaced with the scenario in (45). These contexts instantiate the narrow-scope and wide-scope readings respectively.

(46) a. *Narrow-scope context*
Megan painted the house colonial-blue, oatmeal, and cream. She didn't use the barn-red paint.

b. *Wide-scope context*
Megan painted the house barn-red and cream. She didn't use the colonial-blue and oatmeal paints.

While (43) can felicitously describe the narrow-scope context in (46a), it cannot felicitously describe the wide-scope context in (46b). Its infelicity in (46b) confirms that (43) indeed lacks the wide-scope reading, where the color term would have needed to QR over negation. This is further support that QR cannot target the color term and thus is a T-movement.

2.2.4 Naming verbs

W-movements can target the NAME ARGUMENT of a naming verb, e.g. *name*, *call*, and *baptize*, but T-movements cannot (47).

(47) a. *Baseline*
Irene called the cat **Snowflake**.

b. *Wh-movement*
✓[**What name**]$_1$ did Irene call the cat ___$_1$?

c. *Topicalization*
***Snowflake**$_1$, Irene called the cat ___$_1$.

d. *Restrictive RC*
✓Helen disliked the **nickname**$_1$ [$_{RC}$ that Irene always called the cat ___$_1$].

e. *Appositive RC*
*Helen disliked that **nickname**$_1$, [$_{RC}$ which Irene always called the cat ___$_1$].

f. *Tough-construction*
i. ***Snowflake**$_1$ was fun [(for Irene) to call the cat ___$_1$].
ii. ✓It was fun [(for Irene) to call the cat **Snowflake**].

The name argument behaves analogously to the color term of a change-of-color verb. Here, I only briefly review the facts; see section 2.2.3 for a more detailed discussion of the equivalent data with change-of-color verbs. As with color terms, there is no general prohibition against T-movements targeting names (48)–(49). This prohibition only applies to names occurring with naming verbs.

(48) *Names can otherwise be topicalized*
Raphael$_1$, we never discussed ___$_1$ as a possible name for him. [Postal 1994:164]

(49) *Names can otherwise head appositive RCs*
We never discussed **Raphael**$_1$ as a possible name for him,
[$_{RC}$ which ___$_1$ is my favorite name].

Additionally, the topicalization asymmetry found with change-of-color verbs between the color term, i.e. the Π-position, and the object generalizes to naming verbs as well. While topicalizing the name argument is ungrammatical (50), it is nevertheless possible to topicalize the object (51).

(50) *Topicalization **cannot** target the name argument*
Context: Rodica really likes Harry Potter and cats. She has named all of her many cats after a main character in Harry Potter.

A: What about Dumbledore and Minerva?
Which cats did Rodica name *those*?

B: *[MINERVA]$_{CT}$ . . . Rodica named [the orange TABBY]$_{Exh}$.

(51) *Topicalization **can** target the object*
Context: Rodica really likes Harry Potter and cats. She has named all of her many cats after a main character in Harry Potter.

A: What about the black cat and the orange tabby?
What character names did Rodica name *those*?

B: ✓[The orange TABBY]$_{CT}$ . . . Rodica named [MINERVA]$_{Exh}$.

QR cannot target the name argument of a naming verb. Parallel to the color term of a change-of-color verb, the name argument cannot QR over the subject (52) or negation (53), but it can scope either above or below the object (54).[20]

(52) *No QR over the subject*

a. *A (#different) child* called the cat **every nickname**. ✓a ≫ every; *every ≫ a

b. *A (different) child* called **every cat** Garfield. ✓a ≫ every; ✓every ≫ a

(53) *No QR over negation*

a. Irene did*n't* call the cat **only two nicknames**. ✓not ≫ only two; *only two ≫ not

b. Irene did*n't* call **only two cats** Garfield. ✓not ≫ only two; ✓only two ≫ not

(54) *Scope of the name and the object*

a. Irene called *a (different) cat* **every nickname**. Name ≫ Object

b. Irene called *every cat* **a (different) nickname**. Object ≫ Name

[20] Here is a context for (53) in which the wide-scope reading of *only two nicknames* is true, but the narrow scope-reading is false: "Irene likes four nicknames for her cat: Kätzchen, Gatita, Kitty, and Nekochan. She can't decide on exactly one nickname, so she calls her cat both Kitty and Nekochan for short." (53) cannot be used felicitously in this context, which shows that the name argument cannot QR over negation.

The analysis proposed for the scope variation with change-of-color verbs in section 2.2.3 applies to naming verbs as well: the name argument and the object form a small clause.[21] By default, the name argument takes scope over the object without any QR having occurred (55a). When the object scopes over the name argument, the object has undergone QR to some higher position above the name argument (55b).

(55) a. *Name* $\gg$ *Object*
[call [[*a cat*] **every nickname**]] (=54a)

b. *Object* $\gg$ *Name*
[*every cat*$_1$ [call [[___$_1$] **a nickname**]]] (=54b)
QR

Therefore, the variation in scope between the name argument and the object in (54) is derived without QRing the name argument. Accordingly, the reason that the name argument cannot QR over the subject is because it cannot QR at all.

2.2.5 Predicate nominals

W-movements can target PREDICATE NOMINALS, but T-movements cannot (56).[22] There are a number of constructions with predicate nominals, but I focus on *become X*, shown below in (56), and *make X out of Y*.

(56) a. *Baseline*
Erika became **a teacher**.

b. *Wh-movement*
✓[**What (kind of teacher)**]$_1$ did Erika become ___$_1$?

c. *Topicalization*
*[**A math teacher**]$_1$, Erika became ___$_1$.

d. *Restrictive RC*
✓Georgia liked the **kind of teacher**$_1$ [$_{RC}$ that Erika had become ___$_1$].

e. *Appositive RC*
*Georgia liked that **kind of teacher**$_1$, [$_{RC}$ which Erika had become ___$_1$].

---

21 As we will see in section 2.3.3, Matushansky (2008) independently proposes a small-clause analysis of naming verbs.

22 The ungrammaticality of forming an appositive RC on a predicate nominal was first noted in Klein (1976) for Dutch.

f. *Tough-construction*
   i. *[**A teacher**]$_1$ was tough [(for Erika) to become ___$_1$].
   ii. ✓It was tough [(for Erika) to become **a teacher**].

Turning our attention to the construction *make X out of Y*, where there is an additional argument to contrast with the predicate nominal—which I call the object for the sake of simplicity—, topicalizing the predicate nominal is ungrammatical (57), but it is possible to topicalize the object argument (58).[23]

(57) *Topicalization* ***cannot*** *target the predicate nominal*
Context: Every year Erika is responsible for training a math teacher, an English teacher, and a biology teacher for Amherst's local middle school. The student selection is very slim, so the job is challenging.

A: What about a math teacher and an English teacher?
Who did Erika make *those* out of?

B: *[A MATH teacher]$_{\text{CT}}$ . . . Erika made out of [ALEX]$_{\text{Exh}}$.

(58) *Topicalization* ***can*** *target the object*
Context: Every year Erika is responsible for training a math teacher, an English teacher, and a biology teacher for Amherst's local middle school. The student selection is very slim, so the job is challenging.

A: What about Alex and Pat?
What did Erika make out of *them*?

B: ✓[ALEX]$_{\text{CT}}$ . . . Erika made [a MATH teacher]$_{\text{Exh}}$ out of.

QR cannot target a predicate nominal. For a predicate nominal to be quantificational, it must occur with a *kind*-nominal, e.g. *kind*, *sort*, and *type*, which roughly denote second-order properties (i.e. properties of properties). *Kind*-nominals will be discussed in section 2.5.4; until then, I will set aside this issue and focus on the scope facts. By now, the QR pattern should be familiar: The predicate nominal (PN) cannot QR over the subject (59) or negation (60), but it can scope either above or below the object (61).

[23] A few people have asked me about examples like (i), where a predicate nominal is fronted in a contrastive context:

(i) %Erika may be a talented professor, but [**a good administrator**]$_1$, she is not ___$_1$.

I suspect that these examples are Y-movement, as they have a similar prosody, but they would constitute a use that is more widely accepted amongst mainstream English speakers. These examples are nevertheless puzzling and warrant more research in the future. For some cursory discussion of these cases, see Postal (1994:165-166).

(59) *No QR over the subject*

a. *A (#different) student* became **every kind of teacher**. ✓a ≫ every; *every ≫ a

b. i. *A (#different) instructor* made **every kind of teacher** out of Erika.
✓a ≫ every; *every ≫ a

ii. *A (different) instructor* made a talented teacher out of **every student**.
✓a ≫ every; ✓every ≫ a

(60) *No QR over negation*

a. Erika did*n't* become **only one kind of teacher**. ✓not ≫ only one; *only one ≫ not

b. i. Erika did*n't* make **only one kind of teacher** out of Alex.
✓not ≫ only one; *only one ≫ not

ii. Erika did*n't* make a talented teacher out of **only one student**.
✓not ≫ only one; ✓only one ≫ not

(61) *Scope of the predicate nominal and the object*

a. Erika made **every kind of teacher** out of *a different student.* PN ≫ Object

b. Erika made **a different kind of teacher** out of *every student.* Object ≫ PN

The analysis proposed for the variation in scope with change-of-color verbs in section 2.2.3 applies to predicate-nominal constructions with multiple arguments as well.[24] By default, the predicate nominal takes scope over the object without any QR having occurred (62a). When the object scopes over the predicate nominal, the object has undergone QR to some higher position above the predicate nominal (62b).

(62) a. *Predicate nominal ≫ Object*
[make [**every kind of teacher** [out of **a student**]]] (=61a)

b. *Object ≫ Predicate nominal*
[*every student*$_1$ [make [**a kind of teacher** [out of ___$_1$]]]] (=61b)
QR

[24] Barbara Partee (p.c.) points out to me that the small-clause analysis in (62) may not capture Bach's (1980) observation about the different argument structures of predicate-nominal verbs like *strike as* and *consider*, e.g. *John strikes me as an idiot* vs. *I consider John an idiot*. Bach observes that only the latter group can form a passive. He accounts for this contrast (roughly) in terms of the order in which the verb combines with its arguments. My claim here is that a small-clause structure captures the scope variation with *make X out of Y* in (61)—and also the analogous scope facts with change-of-color verbs and naming verbs. Nothing precludes different structures containing predicate nominals, or Π-positions more broadly. While they do not occur in the limited dataset that I consider here, I expect such different structures to emerge in future research into Π-positions.

Therefore, the scope variation between the predicate nominal and the object in (61) is derived without QRing the predicate nominal. Accordingly, the reason that the predicate nominal cannot QR over the subject is because it cannot QR at all.

2.2.6 Section summary

This section has introduced the four Π-positions: existential constructions, change-of-color verbs, naming verbs, and predicate nominals. We discovered that W-movements, such as *wh*-movement, can target these syntactic positions, but T-movements, such as topicalization and QR, cannot. These findings are summarized in (63).

(63) *Π-position summary*

	Existentials	Color verbs	Naming verbs	Predicate nominals
Wh-movement	✓	✓	✓	✓
Restrictive RCs	✓	✓	✓	✓
Topicalization	✗	✗	✗	✗
Appositive RCs	✗	✗	✗	✗
Tough-constructions	✗	✗	✗	✗
QR	✗	✗	✗	✗

Postal (1994) observes that one common property of Π-positions—other than exhibiting the asymmetry between W-movements and T-movements—is that they are ANTIPRONOMINAL, i.e. they reject pronouns like *it* and *she* (64). As mentioned in the introduction to this chapter, antipronominality is not itself an explanation of the Π-position asymmetry unless there is some *independent* explanation for why Π-positions are antipronominal. Although I will defer a comprehensive discussion of Postal's analysis until section 2.6.1, antipronominality as an empirical observation constitutes a further piece of the puzzle that any analysis of Π-positions must explain. To this effect, it is also important to draw attention to the fact that antipronominality does not extend to strong pronouns like *that*. As shown in (64), *that* can occur in Π-positions—excluding existential constructions, which are independently incompatible with all pronouns due to the Definiteness Restriction. Thus, antipronominality is not as simple as a ban on pronouns.

(64) *Π-positions are antipronominal*

a. *Existential constructions*
Gloria bought *a potato*, and there is { ***it** / ***that** } in the pantry.

b. *Change-of-color verbs*
Megan liked *the color magenta*, and she painted the house { ***it** / ✓**that** }

c. *Naming verbs*
Irene liked *the name Snowflake*, and she called the cat { ***it** / ✓**that** }.

d. *Predicate nominals*
Erika wanted to become *a teacher*, and she became { ***it** / ✓**that** }.

The following two sections address the most pertinent questions: what characterizes Π-positions (§2.3) and what characterizes movement that cannot target a Π-position (§2.4). I will argue that Π-positions host property-type DPs and movement cannot target Π-positions if it shifts scope. The combination of these two generalizations will lead to the analysis in section 2.5 that Π-positions cannot be targeted by scope-shifting movement because the type-*e* trace necessary to shift scope is incompatible with the property requirement of Π-positions. This analysis will derive antipronominality for free because weak pronouns do not have property denotations and thus violate the property requirement of Π-positions.

2.3 Property generalization

This section argues that the common denominator unifying Π-positions is that they host DPs that denote PROPERTIES, i.e. DPs with denotations of semantic type $\langle e, t \rangle$, as summarized in (65).

(65) **Property generalization**
DPs in Π-positions must denote properties (semantic type $\langle e, t \rangle$).

The arguments for this characterization of Π-positions come from the respective literatures on each of the Π-positions introduced in section 2.2—though I take the liberty of assuming that predicate nominals denote properties, as this is the well-accepted and standard analysis (e.g. Williams 1983; Partee 1986). The arguments for the property generalization (65) are therefore *independent* from the Π-position asymmetry. In other words, we can go beyond characterizing Π-positions in terms of their inaccessibility to T-movements. Under this characterization, what makes Π-positions special is that they host DPs with a "nonstandard" denotation, under the assumption that the standard denotations of DPs are entity-type (e) and generalized-quantifier-type ($\langle et, t\rangle$).

It is worth making explicit what this section is and what it is not. The goal of this section is to argue that *propertyhood* plays an important role in the semantics of constructions containing a Π-position and that this propertyhood is what characterizes being a Π-position. Thus, I do not provide complete analyses of each Π-position, as such would take us too far afield. Rather, I adopt cursory analyses that give us something concrete to work with and capture the bare essentials. There are aspects of each analysis that could be implemented differently, but as far as I can tell, these alternatives would not have a bearing on the propertyhood of Π-positions. The reason that I have included this disclaimer is so that the reader does not dwell on the details and lose sight of the broader picture: the property generalization in (65).

Moreover, for the sake of simplicity, I treat properties in purely *extensional* terms, which reduces them to sets of entities. This treatment of properties is overly simplistic, but it will suffice for most of this dissertation, in particular to build the property generalization in (65). I revisit in section 4.5 of chapter 4 the issue of representing properties in natural language.

2.3.1 Existential constructions

Existential constructions are famously subject to the Definiteness Restriction (DR), sometimes called the Definiteness Effect, which prohibits certain types of DPs from being the pivot (Milsark 1974, 1977). The DPs that can be the pivot are, roughly speaking, the indefinites (66a). The DR prohibits the pivot from being "necessarily quantificational" DPs (66b) and definite descriptions (66c), which include demonstratives, pronouns, and proper names—excluding some special cases that we will see below shortly.

(66) *Definiteness Restriction*

a. *Acceptable pivots*
There is/are { **a** / **two** / **many** / **no** } **potato(es)** in the pantry.

b. *No quantificational DPs*
*There is/are { **each** / **every** / **most** / **both** } **potato(es)** in the pantry.

c. *No definite descriptions*
*There is { **the potato** / **that potato** / **it** / **Mr. Potato Head** } in the pantry.

Milsark (1974, 1977) introduces the labels WEAK and STRONG to refer to the DPs that, respectively, can and cannot occur as the pivot of an existential construction. Most of the work on existential constructions has been to expound on the weak–strong distinction, and it is generally considered that the underlying semantics of existential constructions rests in part on whatever drives the DR.

2.3.1.1 Definiteness Restriction is not only about determiner semantics

The standard approach to the DR is to attribute the weak–strong distinction to some semantic property of determiners. According to this approach, the reason that *every potato* is not a possible pivot of an existential construction is due to some property of the determiner *every*. Prominent analyses that fall under this umbrella include Barwise and Cooper (1981) and Keenan (1987). To illustrate, let us consider Keenan's (1987) analysis. He proposes that only the determiners that are EXISTENTIAL, as defined in (67), can occur in an existential construction.[25]

(67) A determiner D is EXISTENTIAL iff for every model $\mathcal{M}$, where $\mathcal{E}$ is the domain of entities in $\mathcal{M}$, and for every $\mathrm{A}, \mathrm{B} \subseteq \mathcal{E}$, $\mathrm{B} \in \mathrm{D}(\mathrm{A})$ iff "universal property" $\in \mathrm{D}(\mathrm{A} \cap \mathrm{B})$.

According to the definition in (67), *some* is an existential determiner (68a), but *every* and *the* are not (68b, c). Therefore, only the former can occur as the pivot of an existential construction.

(68) *Testing for existential determiners*

a. **Some** potatoes are in the pantry. $\Leftrightarrow$ **Some** potatoes which are in the pantry exist.

b. **Every** potato is in the pantry. $\not\Leftrightarrow$ **Every** potato which is in the pantry exists.

c. **The** two potatoes are in the pantry. $\not\Leftrightarrow$ **The** two potatoes which are in the pantry exist.

The problem for the standard approach is that there are well-documented counterexamples to an analysis of the DR exclusively in terms of determiner semantics. These arguments come from McNally's (1992, 1997, 1998) work, which I briefly review here. First, a necessarily quantificational

[25] A few relevant points about Keenan's analysis: First, the universal property is the property that every entity has, e.g. $[\lambda x \,.\, x = x]$; it is sometimes called "Mercy". Second, under Keenan's (1987) analysis, the ability to be the pivot of an existential construction extends to determiners formed from the basic existential determiners by Boolean combinations. Third, Keenan (2003) shows that existential determiners can be reduced to those determiners that are conservative on both their first and second arguments.

DP headed by a strong determiner can be the pivot if it quantifies over NONPARTICULARS, as shown in (69b) and (69d).

(69) *Pivots quantifying over nonparticulars*

a. *There was **every doctor** at the convention.

b. ✓There was **every kind of doctor** at the convention.

c. *There were **most books** in the library.

d. ✓There were **most sorts of books** in the library. [McNally 1998:358]

Second, a definite description can occur as the pivot if the DP is an INDEFINITE POSSESSIVE (70) or the sentence is a LIST EXISTENTIAL (71).[26]

(70) *Indefinite possessives as the pivot*

a. There was **someone's book** lying on the desk.

b. There was **the mother of a student** waiting outside. [McNally 1998:373]

(71) *List existentials*

a. A: Who showed up?
B: Well, there was **Alex**. [McNally 2011:1834]

b. A: What shall we dig up this year?
B: Well, there are **the peonies**. [McNally 1998:366]

Any analysis of the DR that outright bans determiners like *every* and *the* from heading the pivot—as do the analyses based on determiner semantics like Barwise and Cooper (1981) and Keenan (1987)—undergenerates in (69)–(71). These analyses incorrectly predict that (69b), (69d), (70), and (71) should all be ungrammatical. What these first two arguments bring to light is that there are exceptions to both the quantificational DPs and the definite descriptions that are ordinarily ruled out by the DR. These exceptions alone discredit reducing the DR to determiner semantics.

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[26] For list existentials, see Milsark (1974, 1977), Rando and Napoli (1978), and McNally (1992, 1997). Similar contexts to list existentials, where definite descriptions are allowed to be the pivot, are reminder contexts (i) (Lumsden 1988; Ward and Birner 1995) and presentational superlatives (ii) (Holmback 1984). All of these usages do not preserve under negation or in polar questions (Keenan 2003).

(i) Well, yes, there's always Canada.

(ii) Yikes, there's the fattest cat I've ever seen.

Third, crosslinguistically, there are languages that in fact allow the pivot to be a definite description, but nevertheless prohibit it from being a necessarily quantificational DP. One such language is Catalan: definite descriptions can be the pivot (72a), but necessarily quantificational DPs cannot (72b), unless they quantify over nonparticulars (72c). Thus, Catalan parallels English with respect to necessarily quantificational DPs, though the two differ on definite descriptions.

(72) *Catalan*

a. *Definite description*

✓Hi havia **la Joana** a la festa.
there was the Joan to the party
'There was Joan at the party'

b. *Quantificational DP*

*Hi havia **cada cotxe** a la cursa.
there was each car at the race

c. *Quantificational DP over nonparticulars*

✓Hi havia **tota classe de cotxes** a la cursa.
there was every class of cars at the race
'There were all kinds of cars in the race' [McNally 1998:367]

The crosslinguistic variation in the reach of the DR is tightly constrained: a language either behaves like Catalan or it behaves like English. (McNally 1992, 1997, 1998).[27] We crucially do not find languages where necessarily quantificational DPs can be the pivot. The only point of crosslinguistic variation is whether or not the pivot can be a definite description. This typology is summarized in (73).

(73) *Typology of the Definiteness Restriction*

	+Definites	−Definites
+Quant. DPs	✗	✗
−Quant. DPs	Catalan	English

[27] This is not to suggest that there are not other points of crosslinguistic variation in existential construction. Here, I am only considering the pivot, but languages differ with respect to the expletive, copula, and coda as well.

The discrepancy between languages like English and languages like Catalan suggests that the restriction on necessarily quantificational DPs is independent from the restriction on definite descriptions, wherein the latter restriction is operative in English, but not in Catalan. Moreover, the fact that all languages seem to disallow the pivot from being a quantificational DP suggests that this restriction is more deeply ingrained in the semantics of existential constructions than is the restriction on definite descriptions. It is precisely these intuitions that McNally's (1992, 1997, 1998) analysis of existential constructions captures.

2.3.1.2 McNally's proposal

McNally (1992, 1997, 1998) proposes that the DR is part semantic and part pragmatic. The semantic part is that the pivot denotes a *property* and hence must have a licit property denotation. An existential construction then means that the property denoted by the pivot is INSTANTIATED (74).[28] For the sake of simplicity, I only present the extensional rendition in her 1998 paper.

(74) *Semantics of an existential construction*
For all models $\mathcal{M}$, $[\![\text{NP}]\!]^{\mathcal{M},g} \in [\![\text{There be}]\!]^{\mathcal{M},g}$ iff $[\![\text{NP}]\!]^{\mathcal{M},g}$ is nonempty. [McNally 1998:376]

The property denotation required by the semantics in (74) is achieved via nominal type shifting of the pivot. Because not every DP has a licit property denotation, the property-type requirement has the effect of restricting the kinds of DPs that can occur as the pivot, in particular the kinds of quantificational DPs. Type shifting to achieve a property denotation will be discussed at length in section 4.2 of chapter 4. For now, I focus on the outcome of type shifting and its ramifications for the DR, which is schematized in (75). Under type shifting, weak determiners like *some* can head the pivot and strong determiners like *every* cannot, because *some NP* has a valid property

[28] Francez (2007) argues against McNally's instantiation analysis of existential constructions based on examples like the following where the meaning does not require or even precludes instantiation in some space and time:

(i) a. There is **a three personed God** *in Christianity.*
b. There was **a disaster** *prevented.* [Francez 2007:34]

As I see it, in these examples, the coda invokes modality, i.e. the instantiation is in some space, time, *and* world. Therefore, (i.a) means something like: in all the worlds compatible with the tenets of Christianity, a three personed God is instantiated. I ignore the role of the coda in the main text for the sake of simplicity, but examples like (i) show that a full semantics of existential constructions must take into account the coda as well.

denotation (75a), but *every NP* does not (75b). Crucially, the property-type requirement does *not* ban definite descriptions, which also have licit property denotations under type shifting (75c).

(75) a. *some NP* $\Rightarrow_{\text{shift}}$ ✓property denotation $\Rightarrow_{(74)}$ ✓pivot

b. *every NP* $\not\Rightarrow_{\text{shift}}$ ✗property denotation $\not\Rightarrow_{(74)}$ ✗pivot

c. *the NP* $\Rightarrow_{\text{shift}}$ ✓property denotation $\Rightarrow_{(74)}$ ✓pivot

The mechanics in (75) are reminiscent of Heim's (1987) proposal that the DR is the result of the constraint in (76) against individual variables in the pivot position.[29] Strong DPs require QR, which would leave an individual variable thereby violating (76), while weak DPs can be interpreted in situ without QR because they (can) denote properties.

(76) *There be x, where x is an individual variable. [Heim 1987:23]

Because the property-type requirement does not block definite descriptions, there must be some additional constraint for these DPs. This is where the pragmatic part of the DR enters the picture. McNally proposes that the prohibition on definite descriptions is the result of the pragmatic requirement that the pivot introduce a new discourse referent (77).

(77) *Pragmatics of an existential construction*
The use of *There be* is felicitous in a context C only if the NP α serving as its argument carries the condition that any discourse referents it licenses be novel. [McNally 1998:385]

Because a definite description is generally felicitous only in a discourse where its referent is given, a definite description would violate (77) and hence cannot be the pivot of an existential construction.[30]

Part of the motivation behind the pragmatic restriction, McNally argues, is that it is reasonable that a pragmatic restriction (i) could be relaxed under special circumstances and (ii) could vary across languages. The first of these explains list existentials in English, and the second explains the

[29] In the syntactic literature, a similar idea lives in Williams' (1994) proposal that in an existential construction, the expletive *there* is the subject and the pivot is the predicate.

[30] There are more elaborate theories of the pragmatics of existential constructions and the DR, which one could adopt in place of the simple constraint in (77). One family of analyses attributes the DR to the discourse referent status of the pivot, as does (77) (e.g. Abbott 1993; Ward and Birner 1995; Zucchi 1995). Another family of analyses instead attributes the DR to the nontopical nature of the pivot and the unconventional information structure associated with existential constructions (e.g. Borschev and Partee 2002; Mikkelsen 2002; Francez 2007; Hu and Pan 2007; Partee and Borschev 2007).

difference between English and Catalan. Let us take each in turn. First, according to McNally's analysis, the special discourse factors in a list existential obviate (77), thereby allowing a definite description to be the pivot. Such an explanation is possible because nothing *semantically* bars a definite description from being the pivot. Second, the crosslinguistic variation follows from the pragmatic restriction in (77) being operative in English, but not in Catalan. Therefore, the bifurcation of the DR into a semantic requirement and a pragmatic requirement allows us to account for the differences between English and Catalan, while maintaining that the *semantics* of existential constructions is uniform across languages. Analyses of the DR that outright prohibit definite descriptions offer no obvious explanation of list existentials and the crosslinguistic variation.

Recall examples like (69b), repeated below in (78a), where the pivot can be headed by a strong determiner iff it quantifies over nonparticulars. McNally argues that such pivots quantify over properties and are interpreted via QR, as schematized in (78b). Because (78b) involves quantification over properties, and not entities, the pivot position still contains a property.

(78) *McNally's proposal for quantificational pivots*

a. There was **every kind of doctor** at the convention. (=69b)

QR

b. [**every kind of doctor**]$_{\langle\langle et,t\rangle,t\rangle}$ $\lambda f_{\langle e,t\rangle}$ [there be $f_{\langle e,t\rangle}$ at the convention]

In the LF in (78b), the pivot takes scope over the existential quantification. This matches the intuition that (78a) means something like every doctor-kind was instantiated at the convention. However, this analysis predicts that pivots quantifying over properties/nonparticulars should also be able to take scope over other scope-bearing elements in the sentence. This prediction is *not* borne out, as shown in (79a), where *every kind of doctor* still cannot scope over negation. (79b) shows that both scopes are available in the corresponding copula construction. (79c) and (79d) show the same contrast for *only one kind of doctor*.

(79) *Quantificational pivots cannot QR over negation*

a. There was*n't* **every kind of doctor** at the convention. ✓not $\gg$ every; *every $\gg$ not

b. **Every kind of doctor** was*n't* at the convention. ✓not $\gg$ every; ✓every $\gg$ not

c. There was*n't* **only one kind of doctor** at the convention.
✓not ≫ only one; *only one ≫ not

d. **Only one kind of doctor** was*n't* at the convention.
✓not ≫ only one; ✓only one ≫ not

If pivots that quantify over properties are interpreted via QR, the wide-scope reading of *every kind of doctor* should be available in (79a), contrary to fact. Thus, what (79) entails is that even when the pivot appears to be quantificational, it still cannot undergo QR, contra McNally. Consequently, we need some other mechanism for interpreting quantificational pivots that does not involve QR (or minimally does not shift scope). For now, I set this issue aside and will return to it in section 2.5.4.

2.3.2 Change-of-color verbs

Change-of-color verbs are textbook cases of resultatives. A resultative is a complex predicate comprising a verb and an adjective. The adjective denotes the resultant state achieved by the event, and it may be predicated only of the immediately postverbal NP (e.g. Levin and Rappaport Hovav 1995). For example, in (80a), the metal became flat as the result of Nancy's hammering; in (80b), the teapot became empty as the result of Amanda's drinking; and in (80c), with a change-of-color verb, the house became magenta as the result of Megan's painting.

(80) a. Nancy *hammered* the metal **flat**.
b. Amanda *drank* the teapot **empty**.
c. Megan *painted* the house **magenta**.

Adjectives standardly denote properties, so there is already reason to believe that the color term of a change-of-color verb denotes a property. What makes change-of-color verbs atypical resultatives stems from the dual life of color terms as adjectives and nouns. For instance, the color term *magenta* can serve both as an adjective in, e.g., *the magenta house* and as a noun in, e.g., *Megan's favorite color is magenta*, without any obvious morphosyntactic differences. This behavior is unlike ordinary adjectives, such as *flat* and *empty*. The difference between color terms and other adjectives also manifests itself in constituent questions, as illustrated in the contrast between (81a) and (81b). In (81a), *what* can be used to ask about the resultant state of Megan's painting, i.e. the color that she painted the house. However, the same does not apply in (81b), where *what* cannot as easily refer to the resultant state of Amanda's drinking. To the extent that (81b) is acceptable at all, it requires a context that delineates the resultant states over which *what* ranges, e.g. empty and half-empty.

(81) a. **What**$_1$ did Megan paint the house ___$_1$?

b. ??**What**$_1$ did Amanda drink the teapot ___$_1$?

Moreover, the color term of a change-of-color verb can unambiguously be a noun, as illustrated in (82), where the color term occurs with a determiner and, in the case of (82b), a relative clause.

(82) a. Megan painted the house **a very bright shade of purple**.

b. Megan painted the house **a purple that complemented the shutters**.

Despite the resultant state being a noun, (82a) and (82b) still have the semantics of a resultative. In (82a), the house became a very bright shade of purple as the result of Megan's painting. In (82b), the house became a purple that complemented the shutters as the result of Megan's painting. Therefore, even though the color term of a change-of-color verb is (or can be) a nominal syntactically, it retains a meaning akin to that of an adjective, viz. a property. Achieving a property meaning from a nominal will be addressed in section 4.2 of chapter 4 in the context of nominal type shifting.

According to virtually any analysis of resultatives, the resultant state denotes a property, so there is no need to adopt a particular analysis for our purposes here. Consequently, beyond identifying that change-of-color verbs are resultatives, there is nothing else to say in support of the property generalization in (65).[31]

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[31] Postal's (1994) claim is only that change-of-color verbs are Π-positions. However, if the common denominator unifying Π-positions is that they host property-type DPs and change-of-color verbs fit into this generalization because they are resultatives, then the resultant state in a resultative should be a Π-position more generally. Testing this prediction is complicated by the fact that nominal resultant states are generally less acceptable than color terms are with change-of-color verbs. Nevertheless, of the speakers who I have consulted, the speakers who accept the baseline in (ia) find the expected contrasts between W-movements and T-movements in the rest of the paradigm in (i) as well.

(i) a. *Baseline*
Nancy hammered the metal **the required flatness**.

b. *Wh-movement*
✓[**How flat**]$_1$ did Nancy hammer the metal ___$_1$?

c. *Topicalization*
*[**The required flatness**]$_1$, Nancy hammered the metal ___$_1$.

d. *Restrictive RC*
✓Laura inspected the **flatness**$_1$ [$_{RC}$ that Nancy had hammered the metal ___$_1$].

2.3.3 Naming verbs

In most semantic theories, proper names are either rigid designators (e.g. Kripke 1980) or definite descriptions (e.g. Frege 1952; Russell 1911; Burge 1973; Bach 1981; Geurts 1997; Elbourne 2005).[32, 33] Although there has been a substantial amount of work investigating proper names, the empirical scope has been predominately limited to proper names in *argument positions*. However, proper names behave differently when they occur as the name argument of a naming verb, such as those in (83) (Matushansky 2008).

(83) a. Irene **called** the cat *Snowball*.

b. Helen **nicknamed** the dog *Odie*.

c. The priest **baptized** the child *Brigid*.

d. I am **named** *Ethan*.

The italicized proper names in (83) do not refer to individuals with those names, but rather to the names themselves. This fact can be observed independently with *wh*-movement: while *what* can refer to a name position, *who* cannot (84). Since *who* can only refer to an individual, (84) shows that the name position cannot denote an individual.

(84) { **What / *Who** }$_1$ did the priest baptize the child ___$_1$?

To refer to a name is to refer to the sequence of sounds that make up the name (or possibly to the name's orthography). For example, in (83b), the denotation of *Odie* involves reference to the phonological string [owdij]. In this respect, proper names in the name position are metalinguistic.

---

e. *Appositive RC*
*Laura inspected the **flatness**$_1$, [$_{RC}$ which Nancy had hammered the metal ___$_1$].

f. *QR*
Nancy *wants* to hammer the metal **the flattest**. ✓want ≫ -est; *-est ≫ want

For the sake of simplicity, I will continue to focus only on change-of-color verbs, rather than resultatives more generally, because the judgements are more widely shared for the former. In addition, the status of resultatives as Π-positions does not have a large bearing on the core proposals of this dissertation. I leave a more careful exploration of the facts in (i) for future research.

32 For a review of the previous literature and additional references about proper names, see Matushansky (2008). The focus here in this section is only on naming verbs.

33 Though Montague treats proper names as generalized quantifiers, this treatment is internally motivated for technical reasons. The first meaning postulate in Montague (1973) effectively makes them rigid designators.

Nevertheless, it is not possible to reduce them to pure, unanalyzable quotation. One convincing piece of evidence against such an analysis is the incompatibility of the name argument with explicit indications of quotation (Matushansky 2008). Consider the contrast between (85a) and (85b). The italicized expression *four* in (85a) is simple mention of a proper name; its metalinguistic status is confirmed by the fact that it can be preceded by *the word*, an explicit indication of quotation. However, as shown in (85b), the name argument is incompatible with such indicators. This fact suggests that proper names with naming verbs cannot be reduced to quotation.

(85) a. **(The word)** *four* has four letters.

b. Irene nicknamed the dog **(*the name)** *Odie*.

The status of the name argument raises the possibility that naming verbs are ditransitives (86a). However, Matushansky (2008) argues that the name argument in fact denotes a *property* and thus naming verbs project a small-clause structure (86b) and are not ditransitives.

(86) a. *Ditransitive analysis of naming verbs*

[$_{v\mathrm{P}}$ v [[the dog] [$_{\mathrm{VP}}$ name Odie]]]

b. *Small-clause analysis of naming verbs*

[$_{v\mathrm{P}}$ v [$_{\mathrm{VP}}$ name [$_{\mathrm{SC}}$ [the dog] Odie]]]

I review some of Matushansky's (2008) arguments below, many of which are based on the syntactic profile of naming verbs crosslinguistically. Note that I only present a small subset of her data, and I have simplified glosses in some instances.

2.3.3.1 Names with definite articles

First, in languages where proper names in argument positions can appear with a definite article, they cannot do so with naming verbs. This fact is shown in (87) for German (for many dialects) and in (88) for Pima (Uto-Aztecan). In (87a) and (88a), the proper name appears with a definite article in an argument position. However, in (87b) and (88b), the definite article disappears when the proper name occurs in the name position of a naming verb.

(87) *German (dialectal)*

a. Ich habe **den Karl** gesehen.
I have the Karl seen
'I have seen Karl'

b. Ich habe ihn **(*den)** Karl genannt.
I have him the Karl called
'I called him Karl' [Matushansky 2008:580]

(88) *Pima*

a. John 'o ñeid **heg Mary**.
John AUX.IPFV see DET Mary
'John sees Mary'

b. Hegam Pimas gamhu ha'ab 'ab 'e- 'a'aga **'oob**.
those Pimas over.there side DX ANA say Apache
'Those Pimas on the other side [of the border] call themselves Apache'
[Matushansky 2008:580]

2.3.3.2 Predicate marking

Second, in some languages, the name argument is overtly marked as a predicate. For example, in Welsh, predicates must appear with the special predicative particle *yn* (89a, b). In a naming construction, the name argument appears with *yn* as well (89c).

(89) *Welsh*

a. Mae Siôn ***(yn)** ddedwydd.
is Siôn PRT happy
'Siôn is happy'

b. Y mae Siôn **yn** feddyg.
PRT is Siôn PRT doctor
'Siôn is a doctor'

c. Enwyd ef **yn Siôn** arôl ei dad.
name.PASS he PRT Siôn after his father
'He is named Siôn after his father' [Matushansky 2008:582]

Moreover, in Korean, the name argument appears with the actual copula *-i* (90).

(90) *Korean*

ku-nun caki-uy ttal-lul **Miran-i-la-ko** pwull-ess-ta.
he-TOP SELF-GEN daughter-ACC Miran-be-ASSERT-QUOT call-PAST-DECL
'He called his daughter Miran' [Matushansky 2008:582]

2.3.3.3 Predicative case

Third, in languages where predicates consistently bear a certain morphological case, the name argument in a naming construction must bear this case as well. One such language is Finnish, where change-of-state predicates bear translative case (91a). In a naming construction, the proper name must also bear translative case (91b).

(91) *Finnish*

a. Me maalasi-mme seinä-n **keltaise-ksi**.
we painted-1PL wall-ACC yellow-TRANS
'We painted a/the wall yellow'

b. Me kutsu-mme William Gatesi-a **Billi-ksi**.
we call-1PL William Gates-PTV Billy-TRANS
'We call William Gates Billy' [Matushansky 2008:584]

Similarly, in Russian, predicates bear instrumental case (92a). In a naming construction, the proper name can also bear instrumental case (92b).[34]

(92) *Russian*

a. Ja sčitaju ee **lingvistkoj**.
I consider her linguist.INSTR
'I consider her a linguist'

b. Ee okrestili **Annoj**.
her baptized.PL Anna.INSTR
'They baptized her Anna' [Matushansky 2008:585]

[34] In Russian, the name argument can also bear nominative case; see Matushansky (2008) for discussion.

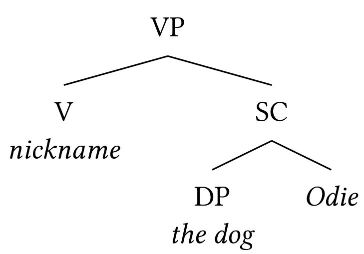
2.3.3.4 Matushansky's proposal

Based on this evidence, Matushansky (2008) concludes that the name argument of a naming verb denotes a *property*. She proposes that proper names are two-place functions whose arguments are an individual x and a NAMING CONVENTION R (93). Thus, a proper name denotes the set of individuals who bear that name according to some naming convention.

(93) $[\![\text{Odie}]\!] = \lambda x_e\, \lambda \mathrm{R}_{\langle e,\langle n,t\rangle\rangle} \,.\, \mathrm{R}(x)([\text{owdij}])$
(where n is a sort of semantic type e; a phonological string)

With a naming verb, the naming convention is supplied by the naming verb itself. For example, *baptize* provides the naming convention of baptism, and *nickname* provides the naming convention of nicknaming. To illustrate, the derivation of the naming verb in (83b) with *nickname* is given in (94). The semantic derivation proceeds straightforwardly via Function Application.

(94) *Derivation of a naming verb*
Helen nicknamed the dog Odie. (=83b)



a. $[\![\text{nickname}]\!] = \lambda f_{\langle\langle e,\langle n,t\rangle\rangle,t\rangle}\, \lambda w \,.\, \exists \mathrm{R}[\textsc{nickname}(w)(\mathrm{R}) \wedge f(\mathrm{R})]$

b. $[\![\text{SC}]\!] = [\![\text{Odie}]\!]\,([\![\text{the dog}]\!]) = \lambda \mathrm{R}_{\langle e,\langle n,t\rangle\rangle} \,.\, \mathrm{R}(\text{the dog})([\text{owdij}])$

c. $[\![\text{VP}]\!] = [\![\text{nickname}]\!]\,([\![\text{SC}]\!])$
$= \lambda w \,.\, \exists \mathrm{R}[\textsc{nickname}(w)(\mathrm{R}) \wedge \mathrm{R}(\text{the dog})([\text{owdij}])]$
Paraphrase: There exists a relation R such that R is a nicknaming convention and R holds between the dog and the phonological string [owdij].

Matushansky takes her analysis one step further. She argues that proper names *always* enter the derivation as properties and that the alternative individual-type and generalized-quantifier-type denotations of proper names in argument positions are derived. Outside of naming verbs, the naming convention is supplied contextually. Variations of this view have been advanced by Burge (1973), Bach (1981), and Geurts (1997), amongst many others. For our purposes, it is only important that proper names denote properties in the name position of a naming verb. Therefore, it is not necessary for our purposes to adopt the stronger stance that proper names always start out as properties, though I find such a prospect promising.

2.3.4 Section summary

The generalization to emerge about Π-positions from the literatures on existential constructions, change-of-color verbs, and naming verbs is given in (95).[35]

(95) **Property generalization**
DPs in Π-positions must denote properties (semantic type $\langle e, t\rangle$).

The property generalization in (95) answers two questions about Π-positions: First, it answers what characterizes Π-positions, a question left unanswered in Postal (1994); see section 2.6.1 for discussion. To an extent, it also explains the surface heterogeneity of Π-positions and why a unified characterization remained elusive. Even though Π-positions all involve propertyhood, this fact is not evident until one delves deeper into the semantics of constructions containing a Π-position, as I have done in this section. Second, it gives us a handle on why Π-positions are antipronominal: weak pronouns like *it* cannot denote a property, while strong pronouns like *that* can. This fact can be observed independently using the verb *consider*, whose second argument must denote a property (96). This account of antipronominality will be discussed more in section 2.5.

(96) *Weak pronouns cannot denote a property*
Donald thinks that he is a success, but no one else considers him { ✓**that** / ***it** }.

One question that the property generalization raises is whether all positions hosting property-type DPs are Π-positions. There are a number of proposals in the literature involving property-type DPs: opaque objects of intensional verbs (Zimmermann 1993; van Geenhoven and McNally 2005), incorporated nominals (van Geenhoven 1998), Russian small nominals (Pereltsvaig 2006), and

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[35] For the sake of simplicity, I group name positions with the other Π-positions as denoting a property of type $\langle e, t\rangle$, even though they denote functions of type $\langle e, \langle\langle e, nt\rangle, t\rangle\rangle$ (functions mapping entities to sets of naming conventions). This difference has no significant effect on the analysis, but it does foreshadow the Trace Interpretation Constraint in chapter 3 that movement can only map onto traces over individual types. Accordingly, the reason that Π-positions are special is not as much that they host property-type DPs, but that they host DPs that are not type e.

Russian genitive of negation (Partee and Borschev 2004; Kagan 2007, 2013; Partee et al. 2011, 2012). The prediction is that they should behave like Π-positions, though if the purported property-type DPs do not behave like Π-positions, one might interpret that as a call for an alternative analysis of them. In this sense, the Π-position asymmetry can also be employed as a diagnostic of property-type DPs. However, I have not carried out this empirical work, so it remains an area for future research. As such, the property generalization in (95) is narrowly formulated to only encompass the syntactic positions discovered by Postal (1994).

2.4 Scope generalization

This section argues that a movement step cannot target a Π-position if that movement shifts the scope of the moved DP, as summarized in (97). In other words, movement that targets a Π-position must reconstruct.

(97) **Scope generalization**
Movement that shifts scope cannot target Π-positions.

For movement to shift scope means that at LF, the moved DP takes scope in the position achieved by movement, which, for all overt forms of movement, is the DP's surface syntactic position. If movement does not shift scope, the scope of the moved DP at LF mismatches its surface position in that it takes scope in its position prior to movement, viz. its base-generated position. This dichotomy is schematized in (98) where the check mark represents the moved DP's position at LF.

(98) a. *Movement that shifts scope*
$[\ \underline{\checkmark}_1 \ldots [\ \ldots \underline{}_1 \ldots]\ ] \rightsquigarrow$ Cannot target Π-positions

b. *Movement that does **not** shift scope*
$[\ \underline{}_1 \ldots [\ \ldots \underline{\checkmark}_1 \ldots]\ ] \rightsquigarrow$ Can target Π-positions

According to the scope generalization (97), the difference between W-movements and T-movements reduces to scope: T-movements obligatorily shift scope, but W-movements do so only optionally. I make the novel observation that W-movements can only target Π-positions when they do not shift scope. This observation crucially reveals that the Π-position asymmetry is not about movement types, but rather about scope, a criterion that crosscuts movement types. As will be discussed in section 2.6, this recharacterization is problematic for the two existing analyses of the Π-position asymmetry, Postal (1994) and Stanton (2016), which both rest on a categorical distinction between W-movements and T-movements, a kind of analysis that cannot draw a distinction *within* W-movements.

The section proceeds by showing that the scope generalization (97) holds for the movement types discussed in section 2.2: topicalization (§2.4.1), *wh*-movement (§2.4.2), relative clauses (§2.4.3), and *tough*-constructions (§2.4.4). As QR shifts scope by definition, nothing additional needs to be said to incorporate it into (97). For relative clauses and *tough*-constructions, it may not be the case that the overt element corresponding to the gap position is actually the element undergoing movement. Rather, the dependency might be mediated via some other (null) element that undergoes movement. However, there is still *some* kind of dependency involving movement between these two elements, so the question is whether or not whatever forms this dependency allows taking scope in the gap position, abstracting away from specifics.

2.4.1 Topicalization

Topicalization in English obligatorily shifts the scope of the moved DP.[36] This behavior is notably distinct from other movement types called "topicalization" in other languages, e.g. German V2-fronting, which are indeed able to reconstruct. The same disclaimers from section 2.2.1 apply here: (i) topicalization is a movement type and (ii) there are other movement types (for some English speakers) that achieve the same linear order, but have different prosody and pragmatics. I control for the latter complication using the question–answer scenario in (102), which is modelled after the ones used to probe topicalization and Π-positions in section 2.2.

To illustrate the crucial scope behavior in English, consider the possible interpretations of the baseline sentence in (99). When *some student* takes scope in situ below *every teacher*, then (99) is true iff for each teacher, there is some student who that teacher likes (99a). These truth conditions are satisfied both in a scenario where the student is the *same* student for each teacher and, crucially, in a scenario where the student is a *different* student for each teacher. On the other hand, when

[36] This fact about English must have been long observed, but I have not been able to track down a reference.

some student scopes above *every teacher*, then (99) is true iff there is a single student who every teacher likes (99b); it is not true in a scenario where the student is different for each teacher.

(99) *Every teacher* likes **some student** in the first week.

a. *Narrow-scope reading* every ≫ some
For every teacher x, there is some student y such that x likes y.

b. *Wide-scope reading* some ≫ every
There is some student y such that for every teacher x, x likes y.

Topicalizing *some student*, as in (100), bleeds the narrow-scope reading in (99a). The only possible interpretation of (100) is the wide-scope reading, where *some student* takes scope in the landing site of topicalization, above *every teacher*. Consequently, (100) is true iff there is a single student that every teacher likes.

(100) *Topicalization obligatorily shifts scope* *every ≫ some; ✓some ≫ every
[**Some student**]$_1$, *every teacher* likes ___$_1$ in the first week.

Because topicalization obligatorily shifts scope, it can even force a reading that would otherwise be marginal to be the only available reading. In (101a), the most natural interpretation is where *every dessert* scopes below *no one*. This reading is true in a scenario where for every person x at the party, x ate some (or none) of the desserts, but no one person ate all of them. The other logically possible reading, where *every dessert* scopes above *no one*, is marginal at best.[37] This reading would only be true in a scenario where no dessert was touched at all. When *every dessert* is topicalized over *no one*, as in (101b), the only reading to survive is the stronger reading, where no dessert was touched at all. Thus, topicalization bleeds the more natural narrow-scope reading in (101), forcing the moved DP to take scope in the landing site of movement.

[37] It is claimed that QR cannot cross a negative quantifier. However, there is an entailment relationship, at least in (101a), that makes such a claim impossible to test. In (101a), any scenario where the inverse-scope reading is true is also a scenario where the surface-scope reading is true. In other words, if every dessert is such that no one touched it, it is also the case that there is no person who touched every dessert. To test for the availability of the inverse-scope reading, we would need a scenario where the inverse-scope reading is true and the surface-scope reading is false, but no such scenario exists. Nevertheless, the fact that this strong reading is the only reading in (101b) is thus all the more surprising.

(101) a. *No one* touched **every dessert** at the party. ✓no ≫ every; ?every ≫ no

b. [**Every dessert**]$_1$, *no one* touched ___$_1$ at the party. *no ≫ every; ✓every ≫ no
(Paraphrase: No dessert was touched at the party.)

The same kind of question–answer scenario employed to examine topicalization and Π-positions in section 2.2 can be applied to these scope cases as well; see section 2.2.1 for an explanation of these contexts. Consider the question–answer scenario in (102). The baseline response in (102B) shows that sans movement, *at least two book reports* can scope below and thus covary with *every student* to produce the intended reading where every student does her or his own book reports. Topicalizing *at least two book reports* in (102C) forces it to take scope in the landing site of movement. Consequently, it cannot covary with *every student* and lacks the intended reading available in (102B). The only possible reading of (102C) is one in which all the students somehow do the same book reports—a nonsensical reading. Crucially, there is nothing illformed about topicalizing *at least two book reports* in (102). (102D) shows that topicalization is perfectly acceptable when the wide-scope reading of the topicalized DP produces a felicitous response, which follows in (102D) because *at least two book reports* does not need to be in the scope of any particular quantificational expression for the intended reading.[38] Therefore, the answer in (102C) is bad only because the topicalized DP must take scope in the landing site of topicalization, thereby bleeding the intended covarying reading.

(102) Context: During the school year, students have to do some science projects and some book reports to advance to the next grade.

A: What about science projects and book reports?
When do students have to do *those*?

B: ✓Every student has to do [AT LEAST TWO BOOK REPORTS] in [THE FALL SEMESTER].

C: #[AT LEAST TWO BOOK REPORTS] . . . every student has to do in [THE FALL SEMESTER].

D: ✓[AT LEAST TWO BOOK REPORTS] . . . the class does together in [THE FALL SEMESTER].

[38] For instance, in my elementary school, each class would do a book report together as a class that involved decorating the classroom door and performing a skit. (102D) would be a felicitous response in this case.

Moreover, a well-known fact about topicalization is that an NPI cannot be topicalized (103). This fact follows from topicalization obligatorily shifting scope, thereby forcing the NPI to be outside the scope of its licensor.[39]

(103) *NPIs cannot be topicalized*

a. ✓Sophia did not eat **any pizza**.

b. *[**Any pizza**]$_1$, Sophia did not eat ___$_1$.

In sum, topicalization, a T-movement, obligatorily shifts scope. According to the scope generalization, this is the reason why it cannot target a Π-position (104).[40]

(104) *Topicalization*

$[_{\text{TopicP}}\ \overset{\checkmark}{\_\_}_1$ Topic [... [... $\overset{*}{\_\_}_1$ ...]]] ⇝ Cannot target Π-positions

topic

(105) *Topicalization cannot target a Π-position*

a. *Existential constructions*

*[**A potato**]$_1$, there is ___$_1$ in the pantry. (=29c)

b. *Change-of-color verbs*

***Magenta**$_1$, Megan painted the house ___$_1$. (=35c)

c. *Naming verbs*

***Snowflake**$_1$, Irene called the cat ___$_1$. (=47c)

d. *Predicate nominals*

*[**A math teacher**]$_1$, Erika became ___$_1$. (=56c)

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[39] In general, $\bar{\text{A}}$-movement cannot target NPIs in English (the situation is more complex with A-movement; see Uribe-Etxebarria 1994), which might provide an independent explanation of (103b). However, (103) illustrates an interesting contrast between topicalization and Y-movement: Y-movement can in fact target NPIs. Thus, for speakers with Y-movement, there is a grammatical parse of the string in (103b) as Y-movement; the prosody will differ accordingly. For other English speakers, such as myself, there is no way to rescue (103b).

[40] A possibly related fact is that topicalization freezes the scope of the moved element such that further covert scope shifting is not possible (Lasnik and Uriagereka 1988). For example, the speakers who accept inverse scope of *every problem* in (i.a) conversely do *not* accept inverse scope in (i.b), where *every problem* has been topicalized. If part of the function of topicalization is to give an element a particular scope, it is reasonable to expect that covertly changing that scope would be prohibited, though the specifics warrant further consideration.

(i) a. *Someone* thinks that Mary solved **every problem**. ✓some ≫ every; %every ≫ some

b. *Someone* thinks that **every problem**$_1$, Mary solved ___$_1$. ✓some ≫ every; *every ≫ some

2.4.2 *Wh*-movement

Wh-movement in constituent questions optionally shifts the scope of the moved DP. In order to probe scope in constituent questions, we will use *how many*-questions because, in addition to the *wh*-meaning component, *how many* independently carries its own existential quantification that can vary in scope (Kroch 1989; Cinque 1990; Cresti 1995; Rullmann 1995; Frampton 1999). To illustrate, consider the *how many*-question in (106), which has both wide-scope and narrow-scope readings relative to the modal *should*. Under the wide-scope, *de re* reading (106a), it is assumed that there is a certain set of books that Nina should read; the speaker is asking how many such books there are. A possible answer to the wide-scope reading is: 'Three books, namely *Aspects*, *Lectures on Government and Binding*, and *The Minimalist Program*'. Under the narrow-scope, *de dicto* reading (106b), there is no assumption that there are any specific books that Nina should read. Rather, it is assumed that she should read a certain number of books, without having any particular books in mind. A possible answer to the narrow-scope reading is: 'Three books, any three'.[41, 42]

(106) *Wh-movement optionally shifts scope*

[**How many books**]$_1$ should Nina read ___$_1$ this summer?

a. *Wide-scope reading* — how many ≫ should

i. For what number *n*: There are *n*-many particular books *x* such that Nina should read *x* this summer.

ii. $[\![(106)]\!](w_0) = \{p : \exists n \in \mathbb{N}[p = \lambda w\ .\ \exists X[\textsc{book}^*_w(X) \wedge \#X = n \wedge \textsc{should}_w(\lambda w'\ .\ \textsc{read}^*_{w'}(X)(\text{Nina}))]]\}$

b. *Narrow-scope reading* — should ≫ how many

i. For what number *n*: It is necessary for there to be *n*-many books *x* such that Nina reads *x* this summer.

ii. $[\![(106)]\!](w_0) = \{p : \exists n \in \mathbb{N}[p = \lambda w\ .\ \textsc{should}_w(\lambda w'\ .\ \exists X[\textsc{book}^*_{w'}(X) \wedge \#X = n \wedge \textsc{read}^*_{w'}(X)(\text{Nina})])]\}$

The wide-scope and narrow-scope readings of (106) can be paraphrased as the questions in (107a) and (107b) respectively.

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[41] In the readings that I have labelled 'wide-scope' and 'narrow-scope', the number *n* is interpreted *de re*. There is another reading where the number is interpreted *de dicto*, e.g. *How many books should Nina read this summer? As many as you do*. For the sake of simplicity, I do not discuss this reading.

[42] For the sake of readability, I abbreviate modal denotations, e.g. $\textsc{should}_w(p) \Leftrightarrow \forall w'[w' \in f(w) \rightarrow p(w')]$, where f projects a modal domain.

(107) a. *Wide-scope paraphrase of (106)*
How many books are there that Nina should read this summer?

b. *Narrow-scope paraphrase of (106)*
What is the number such that Nina should read that many books this summer?

The scope ambiguity in (106) is the result of the fact that *wh*-movement only optionally shifts scope, as opposed to obligatorily shifting scope like topicalization does. Thus, when the *wh*-phrase *how many books* in (106) undergoes *wh*-movement, the resulting structure maps onto one of two LFs, which differ in the scope of *how many*'s existential quantification; these LFs are sketched in (108). I assume that the *wh*-meaning component comes from the question operator—depicted throughout this chapter as Q—and hence does not reflect the scope of *how many*; see section 3.3.4 of chapter 3 for discussion and a full implementation in terms of Q(uestion)-particles. In the first LF (108a), *how many books* takes scope in the landing site of movement, thereby yielding the wide-scope reading in (106a). In the second LF (108b), *how many books* takes scope in the launching site of movement, thereby yielding the narrow-scope reading in (106b).

(108) a. *Wide-scope LF of (106)*
[Q_n [$\exists$ n-many books]$_1$ [should [Nina read ___$_1$ this summer]]] (=106a)
wh

b. *Narrow-scope LF of (106)*
[Q_n ___$_1$ [should [Nina read [$\exists$ n-many books]$_1$ this summer]]] (=106b)
wh

Even though *wh*-movement can ordinarily shift scope, when it targets a Π-position, scope shifting is rendered impossible. A *wh*-phrase in a Π-position must take scope in its base position, i.e. the Π-position, and cannot take scope in the landing site of *wh*-movement. This is illustrated in the set of examples in (109), where the wide-scope reading of *how many* relative to the modal *should* is absent. They can only ask about a general amount without having a particular set in mind.

(109) *Wh-movement from a Π-position cannot shift scope*

a. *Existential constructions* *how many ≫ should; ✓should ≫ how many
[**How many questions**]$_1$ *should* there be ___$_1$ on the exam?

b. *Change-of-color verbs* *how many ≫ should; ✓should ≫ how many
[**How many colors**]$_1$ *should* Nina paint the house ___$_1$?

c. *Naming verbs* *how many ≫ should; ✓should ≫ how many
[**How many nicknames**]$_1$ *should* Nina call the cat ____$_1$?

d. *Predicate nominals* *how many ≫ should; ✓should ≫ how many
[**How many kinds of teacher**]$_1$ *should* Nina become ____$_1$?

To appreciate the absence of the wide-scope reading in (109), let us take a closer look at existential constructions and change-of-color verbs specifically; the discussion will generalize to naming verbs and predicate nominals. Starting with existential constructions, compare the existential construction in (109a) with its corresponding copula construction in (110), where *how many* is able to scope above or below *should*. Paraphrases of the (hypothetical) wide-scope and narrow-scope readings of (109a) and (110) are given in (111).

(110) *Copula equivalent of (109a)* ✓how many ≫ should; ✓should ≫ how many
[**How many questions**]$_1$ *should* ____$_1$ be on the exam?

(111) a. *Narrow-scope paraphrase* ✓existential (109a); ✓copula (110)
What is the number such that it is necessary that that many questions be on the exam?

b. *Wide-scope paraphrase* *existential (109a); ✓copula (110)
How many questions are there such that it is necessary that they be on the exam?

Consider the appropriateness of (109a) and (110) in two different scenarios where I am a TA and the professor is preparing the final exam. In the first scenario, she wants to know the number of questions that I think the exam should have so that the grading is manageable on my end; the identity of the questions does not matter at this point. Both (109a) and (110) are appropriate in this context because they both have a narrow-scope reading, as paraphrased in (111a). In the second scenario, the professor has asked me to pick out from a workbook the questions that I think should be on the exam. She wants to know the number of questions that I have selected so that she can gauge the amount of time that the exam room should be reserved for. Thus, she is asking about the cardinality of a set that exists in the actual world, the set of questions that I have picked. While the copula construction in (110) is appropriate in this context, the existential construction in (109a) is not. This contrast reflects that (110) but not (109a) has a wide-scope reading where *how many* scopes above *should*, as paraphrased in (111b). Therefore, the existential construction in (109a) only has a narrow-scope reading of *how many*, while the copula construction in (110) is ambiguous in scope, as are ordinary *how many*-questions. This difference follows from the fact that *wh*-movement cannot shift scope when it targets a Π-position, thereby forcing a narrow-scope reading of *how many*.

The same pattern can be observed for change-of-color verbs. (113) provides paraphrases of what the narrow-scope and wide-scope readings would be of the question in (109b), repeated below in (112). Only the narrow-scope reading in (113a) is a possible interpretation of the question.

(112) *Change-of-color verbs* *how many ≫ should; ✓should ≫ how many
[**How many colors**]$_1$ *should* Nina paint the house ___$_1$? (=109b)

(113) a. *Narrow-scope paraphrase of (112)*
✓What is the number such that it is necessary that Nina paint the house that many colors?

b. *Wide-scope paraphrase of (112)*
*How many colors are there such that it is necessary that Nina paint the house those colors?

The judgements in (113) are somewhat delicate. Nevertheless, the same pattern of judgements can be observed—perhaps more convincingly—using an attitude predicate like *want*. Consider the pair of sentences in (114) against the context in (115), which distinguishes the *de re* (wide-scope) and *de dicto* (narrow-scope) construals of *how many colors*.

(114) a. *Π-position* *how many ≫ want; ✓want ≫ how many
[**How many colors**]$_1$ does Nina *want* [to paint the wall ___$_1$]?

b. *Non-Π-position* ✓how many ≫ want; ✓want ≫ how many
[**How many colors**]$_1$ does Nina *want* [to use ___$_1$ for painting the wall]?

(115) Nina has the desire to use two colors of paint on her wall in order to make it striped. Nina is also colorblind. She goes to the store and buys two cans of paint, which she believes to be different colors. However, unbeknownst to her, they are in fact the same color. She wants to use the paints that she bought at the store to paint the wall.

a. *De dicto construal:* Two colors ✓(114a); ✓(114b)

b. *De re construal:* One color *(114a); ✓(114b)

It is felicitous to answer both (114a) and (114b) with the *de dicto* answer ‘two colors’, where Nina has the *de dicto* desire to paint the wall with two colors. Thus, in both sentences, *how many* can take scope in its base position below *want*. However, the *de re* answer ‘one color’ is a possible answer only to (114b), and not to (114a). The absence of a *de re* construal of *how many colors* in (114a) shows that *wh*-movement is unable to shift scope when it targets a Π-position.

The absence of a wide-scope reading when *wh*-movement targets a Π-position is corroborated by the ungrammaticality of *wh*-movement from a Π-position across a *wh*-island boundary, a fact observed by Postal (1994).[43] *Wh*-islands have the special property that they force elements extracted out of them to take wide scope, as schematized in (116) (Longobardi 1987; Kroch 1989; Cinque 1990; Rullmann 1995; Cresti 1995).

(116) *Wh-islands force wide scope*
[$\overset{\checkmark}{\_\_}_1$ . . . [whether . . . $\overset{*}{\_\_}_1$ . . .]]
wh

This property is illustrated in (117), where *how many books* is extracted out of a *wh*-island headed by *whether*. Unlike ordinary *how many*-questions, (117) is not ambiguous in scope. It only has a wide-scope reading where the speaker is asking how many books there are of which it is true that you wonder whether Nina read them. It cannot be used to ask for the number *n* such that you wonder whether Nina read *n*-many books.[44]

(117) *Wh-islands force wide scope*
[**How many books**]$_1$ do you wonder [whether Nina read ___ $_1$ this summer]?

a. *Wide-scope reading* how many ≫ wonder
For what number *n*: There are *n*-many particular books *x* such that you wonder whether Nina read *x* this summer.

b. *Narrow-scope reading* wonder ≫ how many
*For what number *n*: You wonder whether Nina read *n*-many books this summer.

I do not seek to explain this property of *wh*-islands, merely to exploit it as a diagnostic. The logic is as follows: Since Π-positions force narrow scope and *wh*-islands force wide scope, the two should be mutually exclusive, i.e. *wh*-movement from a Π-position embedded inside a *wh*-island should

[43] To my knowledge, Frampton (1999), originally distributed in 1990, was the first to observe that *wh*-movement cannot target the pivot of an existential construction across a *wh*-island.

[44] The *wh*-movement out of the *wh*-island in (117) also loses the superintensional reading mentioned in fn. 41 (Rullmann 1995). Thus, it cannot be answered with ‘as many as you do’.

be ungrammatical. This prediction is borne out, as shown in (118), where it is contrasted with *wh*-movement of another constituent in the same construction, which is indeed possible.

(118) *Wh-movement cannot target a Π-position in a wh-island*

a. *Existential constructions*

i. *[**How many books**]$_1$ do you wonder [whether there are ___$_1$ on the table]?

ii. ?[**Which table**]$_1$ do you wonder [whether there are books on ___$_1$]?

b. *Change-of-color verbs*

i. *[**Which color**]$_1$ do you wonder [whether Nina painted the house ___$_1$]?

ii. ?[**Which house**]$_1$ do you wonder [whether Nina painted ___$_1$ that ugly green]?

c. *Naming verbs*

i. *[**Which nickname**]$_1$ do you wonder [whether Nina calls the cat ___$_1$]?

ii. ?[**Which cat**]$_1$ do you wonder [whether Nina calls ___$_1$ Garfield]?

d. *Predicate nominals*

i. *[**Which kind of teacher**]$_1$ do you wonder [whether Nina made ___$_1$ out of Mary]?

ii. ?[**Which student**]$_1$ do you wonder [whether Nina made a math teacher out of ___$_1$]?

A similar pattern of ungrammaticality can be observed with negative islands. Negative islands force *how many* to take wide scope above negation, as schematized in (119) (Kroch 1989; Cinque 1990; Rullmann 1995).[45]

(119) *Negative islands force wide scope of how many*

[$\overset{\checkmark}{\rule{1.5em}{0.4pt}}_1$ ... [not ... $\overset{*}{\rule{1.5em}{0.4pt}}_1$ ...]]

wh

This property of negative islands is illustrated in (120), where *how many books* is extracted over negation. Missing is the (ill-defined) narrow-scope reading in (120b).

[45] Where *wh*-islands and negative islands differ is that *wh*-islands block all forms of reconstruction, whereas negative islands do not. This is illustrated in (i) with Condition A (and perhaps variable binding).

(i) a. *[Which picture of **herself**$_2$]$_1$ did John wonder [whether **every/no woman**$_2$ likes ___$_1$]?

b. ✓[Which picture of **herself**$_2$]$_1$ does **no woman**$_2$ like ___$_1$?

(120) *Negative islands force wide scope of how many*
[**How many books**]$_1$ did Nina not read ___$_1$?

a. *Wide-scope reading* how many ≫ not
For what number n: There are n-many particular books x such that Nina did not read x.

b. *Narrow-scope reading* not ≫ how many
*For what number n: It is not the case that Nina read n-many books.

The explanation of this property of negative islands is unimportant for our purposes here, but Rullmann (1995) provides a relatively straightforward explanation: the question asks for a maximal degree and this maximality would be undefined under negation, thereby forcing wide scope. The logic of using negative islands as a diagnostic is analogous to that of *wh*-islands: Since negative islands force *how many* to take wide scope and Π-positions force *how many* to take narrow scope, the two should be mutually exclusive. This prediction is borne out, as shown in (121), where it is contrasted with *wh*-movement of another constituent in the same construction across negation, which is indeed possible. Note that, with a special prosody, simple clausal negation leaves a kind of emphatic reading in the existential construction in (121a.i); this generalizes to the other Π-positions as well (not shown). Although this reading is not a genuine negation reading, and therefore not relevant to the task at hand, I use *no one* in the other examples to avoid it outright.

(121) *Wh-movement cannot target a Π-position in a negative island*

a. *Existential constructions*
   i. *[**How many books**]$_1$ aren't there ___$_1$ on the table?
   ii. ✓[**How many tables**]$_1$ aren't there books on ___$_1$?
   iii. *[**How many books**]$_1$ did no one want there to be ___$_1$ on the table?
   iv. ✓[**How many tables**]$_1$ did no one want there to be books on ___$_1$?

b. *Change-of-color verbs*
   i. *[**How many colors**]$_1$ did no one paint their house ___$_1$?
   ii. ✓[**How many houses**]$_1$ did no one paint ___$_1$ lime green?

c. *Naming verbs*
   i. *[**How many nicknames**]$_1$ did no one call their cat ___$_1$?
   ii. ✓[**How many cats**]$_1$ did no one call ___$_1$ Garfield?

d. *Predicate nominals*
   i. *[**How many kinds of teacher**]$_1$ did no one make ___$_1$ out of a student?
   ii. ✓[**How many students**]$_1$ did no one make a math teacher out of ___$_1$?

In sum, *wh*-movement can successfully target a Π-position only when it does not shift the scope of the moved DP (122a). When *wh*-movement does shift scope, it patterns as a T-movement in that such extraction from a Π-position is ungrammatical (122b).

(122) *Wh-movement*

a. [Q $\_\_\__1$ . . . [. . . $\overset{\checkmark}{\_\_\_}_1$ . . .]] ⇝ Can target Π-positions
wh

b. [Q $\overset{\checkmark}{\_\_\_}_1$ . . . [. . . $\_\_\__1$ . . .]] ⇝ Cannot target Π-positions
wh

2.4.3 Relative clauses

The scope-shifting contrast between topicalization and *wh*-movement is paralleled in relative clauses (RCs) as well: restrictive RCs allow the relativized element to take scope in the embedded gap position, while appositive RCs do not. Abstracting away from the specific details, I will assume that the relativized element moves from the embedded gap position to the edge of the RC, from where it establishes some kind of syntactic dependency with the external head, e.g. matching followed by deletion (Sauerland 1998) or projecting movement into NP (Bhatt 2002). This dependency creates a λ-abstraction that binds a variable inside the relativized element, thereby creating a predicate that can semantically compose with the NP.[46] The relativized element is a full DP lacking quantificational force that is headed by a (potentially null) relative pronoun (Kayne 1994; Bianchi 1999; Bhatt 2002). This structure is schematized in (123). I will be concerned with whether the movement step inside the RC, which I call the "formation" step for short, allows the relativized element can take narrow scope in the embedded gap position.

matching→deletion or projecting movement

(123) $[_{DP}$ NP λ_1 $[_{CP}$ DP_1 . . . [. . . DP_1 . . .]]]

movement to clause edge

46 There are several possible explanations of where this λ-abstraction comes from: the relative complementizer; the relative pronoun; or, as Bhatt (2002) proposes, the byproduct of projecting movement of the NP. Either way, the result allows us to assume a relatively standard semantics of RCs while also accounting for reconstruction of the nominal head.

In a restrictive RC, the relativized element can take scope in the embedded gap position. For example, in (124), modelled after an Italian example in Bianchi (1999), the relativized element *two patients* can take scope in the embedded gap position, below *every doctor*. Thus, (124) has a reading where for every doctor, two separate patients were telephoned.

(124) *Restrictive-RC formation does not have to shift scope* ✓two ≫ every; ✓every ≫ two
I telephoned the **two patients**$_1$ [$_{\text{RC}}$ that *every doctor* will examine ___$_1$].

While (124) shows that the relativized element can take scope in the embedded gap position, it does not allow us to determine whether the relativized element can also take wide scope relative to *every doctor*, i.e. whether restrictive-RC formation can ever shift scope. Although (124) in principle has a reading where *two patients* scopes over *every doctor*, such that only two patients were telephoned in total, this wide-scope reading entails the narrow-scope reading. Thus, there is no scenario in which the wide-scope reading of (124) is true and the narrow-scope reading of (124) is false.

To see that restrictive-RC formation can scope, it is necessary to look at slightly more complicated examples with scope-bearing adjectival modifiers. Bhatt (2002) observes that adjectival modifiers like *first* and *only* inside the nominal head create distinct 'low' readings (125a, 126a) and 'high' readings (125b, 126b). These two readings correspond to the scope of the relativized element. The low reading corresponds to the relativized element taking scope in the embedded gap position, while the high reading corresponds to it taking scope at the edge of the RC.[47]

(125) *Low and high readings with 'first'*
the **first book**$_1$ [$_{\text{RC}}$ that John said Tolstoy had written ___$_1$]

a. *Low reading* say ≫ first
   i. the x such that John said that the first book that Tolstoy had written was x
   ii. Scenario: John said that the first book that Tolstoy had written was *War and Peace.* Hence, the NP is *War and Peace.* (i.e. order of *writing* matters, order of *saying* is irrelevant)

[47] Deriving the low readings in (125)–(128) is nontrivial. I follow Bhatt (2002) in assuming that the nominal head is simply not interpreted in its high position, so that *the* composes directly with the RC, but this is not entirely obvious. This problem is independent of Π-positions and thus does not change the scope generalization, but Π-positions might provide some insight into the correct solution. I leave this issue for future research.

b. *High reading* first ≫ say

i. the first book about which John said that Tolstoy had written it

ii. Scenario: In 1990, John said that Tolstoy had written *Anna Karenina*; in 1991, John said that Tolstoy had written *War and Peace*. Hence, the NP is *Anna Karenina*. (i.e. order of *saying* matters, order of *writing* is irrelevant) [Bhatt 2002:57]

(126) *Low and high readings with 'only'*
the **only book**$_1$ [$_{RC}$ that John said that Tolstoy had written ___$_1$]

a. *Low reading* say ≫ only
the *x* such that John said that '*x* is the only book that Tolstoy wrote'

b. *High reading* only ≫ say
the only book about which John said that Tolstoy had written it [Bhatt 2002:57]

Bhatt (2002) also shows that NPI licensing can disambiguate between the two readings. As shown in (127a), the adjectival modifiers *first* and *only* can license NPIs in RCs. Putting an NPI in the embedded clause forces the adjectival modifier to have a low reading (127b, c), whereas putting an NPI in the higher clause forces the high reading (127d, e). Thus, there are syntactic locality effects with NPI licensing in RCs when the licensor is in the nominal head, roughly clausematehood, which we can exploit to tease apart the low and high readings.

(127) *Disambiguation with NPI licensing*

a. This is the **only/first book**$_1$ [$_{RC}$ that I have **ever** read ___$_1$].

b. the **only book**$_1$ [$_{RC}$ that John said that Tolstoy had **ever** written ___$_1$] *high, ✓low

c. the **first book**$_1$ [$_{RC}$ that John said that Tolstoy had **ever** written ___$_1$] *high, ✓low

d. the **only book**$_1$ [$_{RC}$ that John **ever** said that Tolstoy wrote ___$_1$] ✓high, *low

e. the **first book**$_1$ [$_{RC}$ that John **ever** said that Tolstoy wrote ___$_1$] ✓high, *low

[Bhatt 2002:60]

Therefore, (125)–(127) show that restrictive RCs optionally shift the scope of the relativized element, as evidenced by the possibility of distinct low and high readings. Unlike (124), the low and high readings that adjectival modifiers create do not stand in an entailment relationship.

Crucially, when restrictive-RC formation targets a Π-position, only the low reading of an adjectival modifier survives (128).[48] The '*' in (128) indicates that the reading is unavailable.

(128) *Π-positions only permit the low reading*

a. *Existential constructions*
   the **only books**$_1$ [$_{RC}$ that John said (that) there were ___$_1$ on the table]
   i. *Low reading* — say ≫ only
   ✓the x such that John said that 'x are the only books that there are on the table'
   ii. *High reading* — only ≫ say
   *the only books about which John said that there (them) were on the table

b. *Change-of-color verbs*
   the **first color**$_1$ [$_{RC}$ that John said (that) Mary had painted the house ___$_1$]
   i. *Low reading* — say ≫ first
   ✓the x such that John said that 'x is the first color that Mary had painted the house'
   ii. *High reading* — first ≫ say
   *the first color about which John said that Mary had painted the house (that)

c. *Naming verbs*
   the **first name**$_1$ [$_{RC}$ that John said (that) Mary had nicknamed the cat ___$_1$]
   i. *Low reading* — say ≫ first
   ✓the x such that John said that 'x is the first name that Mary had nicknamed the cat'
   ii. *High reading* — first ≫ say
   *the first name about which John said that Mary had nicknamed the cat (that)

d. *Predicate nominals*
   the **first kind of teacher**$_1$ [$_{RC}$ that John said (that) Mary had become ___$_1$]
   i. *Low reading* — say ≫ first
   ✓the x such that John said that 'x is the first kind of teacher that Mary had become'
   ii. *High reading* — first ≫ say
   *the first kind of teacher about which John said that Mary had become (that)

The judgements in (128) are delicate and complicated.[49] To help with this, the context in (129) differentiates the low and high readings of *first* with a change-of-color verb: the first color said is *blue*, while the first color that Mary painted the house is actually *green*. (129a) is unacceptable in this context, which indicates that it lacks the high reading, which would be true.

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[48] I find that the acceptability in (128) improves when there is no *that* heading the lowermost clause.

[49] Only one person I have spoken with about these judgements disagrees with them. That said, I have not conducted a comprehensive judgement survey.

(129) Context: On Tuesday, John said that Mary painted the house blue, and then on Wednesday, he said that Mary painted the house green. Mary first painted the house green.

a. ??The **first color**$_1$ [$_{RC}$ that John said Mary had painted the house ___$_1$] was blue.

The unavailability of the high reading in (128) can further be confirmed using NPI licensing. As shown in (130), an NPI in the higher clause of the RC is ungrammatical when the embedded gap corresponds to a Π-position. This fact follows if the high reading is absent, thereby preventing the adjectival modifier from being clausemates with the NPI to license it.

(130) *NPI licensing confirms the absence of the high reading*

a. *Existential constructions*
   i. ✓the **only books**$_1$ [$_{RC}$ that John said that there **ever** were ___$_1$ on the table]
   ii. *the **only books**$_1$ [$_{RC}$ that John **ever** said that there were ___$_1$ on the table]

b. *Change-of-color verbs*
   i. ✓the **first color**$_1$ [$_{RC}$ that John said that Mary had **ever** painted the house ___$_1$]
   ii. *the **first color**$_1$ [$_{RC}$ that John **ever** said that Mary had painted the house ___$_1$]

c. *Naming verbs*
   i. ✓the **first name**$_1$ [$_{RC}$ that John said that Mary had **ever** nicknamed the cat ___$_1$]
   ii. *the **first name**$_1$ [$_{RC}$ that John **ever** said that Mary had nicknamed the cat ___$_1$]

d. *Predicate nominals*
   i. ✓the **first kind of teacher**$_1$ [$_{RC}$ that John said that Mary had **ever** become ___$_1$]
   ii. *the **first kind of teacher**$_1$ [$_{RC}$ that John **ever** said that Mary had become ___$_1$]

Therefore, analogous to *wh*-movement, a restrictive RC can successfully be formed on a Π-position only when the movement step inside the RC does not shift scope. When it does shift scope, it patterns as a T-movement in that such extraction from a Π-position is ungrammatical.[50]

Turning to appositive RCs, the relativized element cannot take scope in the embedded gap position. For example, in (131), *two patients* cannot take scope below *every doctor*, unlike its restrictive RC counterpart in (124). Consequently, (131) is only true in a situation where exactly two patients were telephoned.

(131) I telephoned the **two patients**$_1$, [$_{RC}$ who/which *every doctor* will examine ___$_1$].
✓two ≫ every; *every ≫ two

Moreover, scope-bearing adjectival modifiers cannot take scope inside the RC at all. For example, in (132), *first* cannot refer to the first saying or the first writing; rather, it must refer to the first of something in the matrix clause or the context.

(132) the **first book**$_1$, [$_{RC}$ which John said Tolstoy had written ___$_1$]

Facts like (131) and (132), in concert with other facts not discussed here, are taken in the literature to indicate that, despite their surface similarities, restrictive and appositive RCs bear a substantially different relationship with their host than one another (starting with Ross 1967; Rodman 1972, 1976; Emonds 1979; Jackendoff 1977; and continued by many others). While restrictive RCs attach to NP, appositive RCs attach to DP (or potentially elsewhere; though see de Vries 2002, 2006). Thus, in

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[50] An unresolved question is whether or not restrictive-RC formation across a *wh*-island boundary is possible with Π-positions. The example in (i) shows that a *wh*-island blocks the low reading of an adjectival modifier.

(i) a. the **first book**$_1$ [$_{RC}$ that John wondered [whether Tolstoy had written ___$_1$]] ✓high; *low
b. the **only book**$_1$ [$_{RC}$ that John wondered [whether Tolstoy had written ___$_1$]] ✓high; *low

The prediction is that because *wh*-islands force wide scope and Π-positions force narrow scope, the two should be mutually exclusive. The judgements are, however, not very clear (ii). Most of my consultants, myself included, find them degraded, but not completely unacceptable. I do not have anything to say about this, but it highlights the need for a more comprehensive judgement survey of RCs and Π-positions in the future.

(ii) a. ??the **books**$_1$ [$_{RC}$ that John wondered [whether there were ___$_1$ on the table]]
b. ?the **color**$_1$ [$_{RC}$ that John wondered [whether Mary had painted the house ___$_1$]]
c. ?the **name**$_1$ [$_{RC}$ that John wondered [whether Mary had nicknamed the cat ___$_1$]]
d. ?the **kind of teacher**$_1$ [$_{RC}$ that John wondered [whether Mary had become ___$_1$]]

an appositive RC, what appears to be the "nominal head" is in fact not, which explains why *two patients* in (131) and *first book* in (132) cannot take scope inside the RC.

There are a variety of other asymmetries between restrictive and appositive RCs that have been documented in the literature in support of an appositive RC having a null head. I show two more below, but the reader is referred to de Vries (2002:ch. 6) for a thorough list. First, a restrictive RC allows the antecedent to receive an idiomatic interpretation that would only be licensed in the embedded gap (133a), while an appositive RC blocks such interpretations (133b) (Vergnaud 1974; Bianchi 1999).

(133) *Only restrictive RCs allow idiomatic interpretations* [Vergnaud 1974]

a. *Restrictive RCs*
✓The **horrible face**$_1$ [$_{RC}$ that Harry *made* ___$_1$ at Peter] scared him.

b. *Appositive RCs*
*The **horrible face**$_1$, [$_{RC}$ which Harry *made* ___$_1$ at Peter], scared him.

Second, an anaphor in the antecedent can be bound by an R-expression inside the RC in a restrictive RC (134a), but not in an appositive RC (134b).[51] Italics indicate coreference.

(134) *Only restrictive RCs allow anaphor binding* [de Vries 2002:194]

a. *Restrictive RCs*
✓The **picture of *himself***$_1$ [$_{RC}$ that *John* likes ___$_1$] is on the wall.

b. *Appositive RCs*
*That **portrait of *himself***$_1$, [$_{RC}$ which *John* painted ___$_1$ last year], is expensive.

Important for our purposes, however, is not what happens external to the RC, but what happens *internal* to the RC, crucially at the embedded gap position. Following de Vries (2002, 2006), I assume that appositive RCs are DPs headed by a null NP; this DP is then attached to the host DP.[52] The relativized element moves from the embedded gap to the edge of the RC and then the null NP raises

[51] A logophoric reading might be possible in (134b), but this would require a sufficient context to license such an interpretation. Out of the blue, (134b) is ungrammatical.

[52] De Vries (2002, 2006) proposes that the attachment is a special kind of coordination, thus making the appositive RC and its host a syntactic constituent. However, the structure in (135) is compatible with more articulated semantic theories of appositive RCs and their attachment in Potts (2005) or Schlenker (2010, 2013), which are not dependent on the internal structure of the RC.

to form the null nominal head, as schematized in (135). Under this proposal, the internal syntax of restrictive and appositive RCs is the same, which would explain, e.g., why they always share the same clause type within a language.

(135) *Structure of appositive RCs*

$[_{\text{DP}}\ \varnothing_{\text{NP}}\ \lambda_1\ [_{\text{CP}}\ [\text{ which } \varnothing_{\text{NP}}\ ] \ldots [\ \ldots [\text{ which } \varnothing_{\text{NP}}\ ] \ldots]\,]\,]$

In the process of forming an appositive RC, it is the movement step to the edge of the RC that "shifts scope". At this point in the exposition, it may not be clear what it means for something null to shift scope. This will become more explicit in the next section: it leaves a type *e* variable.

In summary, restrictive and appositive RCs mirror the asymmetry between *wh*-movement and topicalization: Restrictive-RC formation optionally shifts scope, but when it targets a Π-position, scope shifting is blocked (136). Appositive-RC formation obligatorily shifts scope, thereby rendering Π-positions completely inaccessible targets (137).

(136) *Restrictive relative clauses*

a. $[_{\text{DP}}\ \text{NP}\ \lambda_1\ [_{\text{CP}}\ \_\__1 \ldots [\ \ldots \overset{\checkmark}{\_\_}_1 \ldots]\,]\,]$ ⇝ Can target Π-positions

b. $[_{\text{DP}}\ \text{NP}\ \lambda_1\ [_{\text{CP}}\ \overset{\checkmark}{\_\_}_1 \ldots [\ \ldots \_\__1 \ldots]\,]\,]$ ⇝ Cannot target Π-positions

(137) *Appositive relative clauses*

$[_{\text{DP}}\ \text{NP}\ \lambda_1\ [_{\text{CP}}\ \overset{\checkmark}{\_\_}_1 \ldots [\ \ldots \overset{*}{\_\_}_1 \ldots]\,]\,]$ ⇝ Cannot target Π-positions

2.4.4 *Tough*-constructions

In a *tough*-construction, the surface subject of the *tough*-predicate, i.e. the *tough*-subject, cannot reconstruct for scope into the corresponding embedded gap position (e.g. Postal 1974; Epstein 1989; Fleisher 2013; Poole et al. 2017). I will review three arguments for this conclusion below. I will sidestep the issue of whether the *tough*-subject is directly linked to the embedded gap via movement or whether it is indirectly linked via a null operator that undergoes movement to the edge of the embedded infinitival clause. Chomsky (1977) shows that the dependency schematized in (138) invokes at least a step of $\overline{\text{A}}$-movement within the embedded clause. Thus, we can ask, in a theory-neutral sense, whether this (movement) dependency allows scope reconstruction—and it does not.[53]

(138) **Alex**$_1$ is tough [to please ___$_1$].
tough-dependency

First, it is well-known that an indefinite *tough*-subject cannot take scope below the *tough*-predicate, unlike canonical A-raising, as shown in (139) (Postal 1974; Epstein 1989).

(139) *No reconstruction for scope of indefinites*

a. *A-raising*
Someone$_1$ seems to be sick ___$_1$. ✓some ≫ seems; ✓seems ≫ some

b. *Tough-constructions*
Someone$_1$ was difficult to please ___$_1$. ✓some ≫ difficult; *difficult ≫ some

Second, the *tough*-subject cannot be interpreted opaquely with respect to the *tough*-predicate (140a), i.e. it lacks a *de dicto* reading (Poole et al. 2017). For comparison, a *de dicto* reading is available in the corresponding expletive construction (140b), and other types of $\overline{\text{A}}$-movement allow for reconstruction of world-variable binding (140c).

(140) *No reconstruction for world-variable binding*

a. *Tough-constructions*
[A **unicorn**$_{w_0, *w_1}$]$_2$ was easy$_{w_1}$ for Alex to ride ___$_2$. ✓transparent; *opaque

b. *Expletive constructions*
It was easy$_{w_1}$ for Alex to ride a **unicorn**$_{w_0, w_1}$. ✓transparent; ✓opaque

c. *Wh-movement*
[Which **unicorn**$_{w_0, w_1}$]$_2$ did Alex want$_{w_1}$ Sue to ride ___$_2$? ✓transparent; ✓opaque

Third, in a *how many*-question, if the quantity expression is the *tough*-subject, it cannot take embedded scope below the *tough*-predicate (141) (Fleisher 2013; Poole et al. 2017).

[53] The arguments showing that the *tough*-subject cannot reconstruct are often taken as arguments for the base-generation analysis of *tough*-constructions. The logic is straightforward: if there is no movement chain linking the embedded gap to the *tough*-subject, there is no means for the *tough*-subject to reconstruct into the embedded gap position. Though I am partial to such arguments (see Keine and Poole to appear), the *tough*-subject not being able to reconstruct is a *fact*, which is independent of the correct analysis of *tough*-constructions.

(141) *No reconstruction for scope of how many*

a. *Tough-constructions* ✓how many ≫ easy; *easy ≫ how many
[**How many books**]$_1$ are easy for the company to publish ___$_1$?

b. *Expletive constructions* ✓how many ≫ easy; ✓easy ≫ how many
[**How many books**]$_1$ is it easy for the company to publish ___$_1$?

In sum, (139)–(141) show that the *tough*-subject cannot reconstruct into the embedded gap position of a *tough*-construction. Thus, like topicalization, this pattern can be described as *tough*-construction formation "obligatorily shifting scope" (142).

(142) *Tough-constructions*
[✓___$_1$ is tough [. . . *___$_1$ . . .]] ⇝ Cannot target Π-positions
tough-dependency

(143) *Tough-construction formation cannot target a Π-position*

a. *Existential constructions*
*[**A potato**]$_1$ was impossible [for there to be ___$_1$ in the pantry]. (=29f)

b. *Change-of-color verbs*
***Magenta**$_1$ was fun [(for Megan) to paint the house ___$_1$]. (=35f)

c. *Naming verbs*
***Snowflake**$_1$ was fun [(for Irene) to call the cat ___$_1$]. (=47f)

d. *Predicate nominals*
*[**A teacher**]$_1$ was tough [(for Erika) to become ___$_1$]. (=56f)

2.4.5 Section summary

This section has shown that T-movements shift scope obligatorily, while W-movements shift scope only optionally. Crucially, W-movements cannot shift scope when they target Π-positions. This generalization is summarized in (144).

(144) **Scope generalization**
Movement that shifts scope cannot target Π-positions.

The scope generalization makes an important advance from Postal (1994): the distinction between W-movements and T-movements is not an absolute distinction. It is not the case, as assumed in Postal (1994), that W-movements can invariably target Π-positions. Rather, they can only target

Π-positions when they do not shift the scope of the moved element. This crucially changes the empirical puzzle from how Postal characterizes it (in addition to Stanton 2016). Instead of being about an arbitrary distinction between *types* of movement—i.e. some types can target Π-positions and others cannot—the Π-position asymmetry is about *individual steps* of movement, namely whether that movement step reconstructs. Because T-movements always shift scope and cannot reconstruct, no instance of a T-movement can ever target Π-positions. On the other hand, W-movements shift scope only optionally. Only when an instance of a W-movement reconstructs and does not shift scope, can it target a Π-position. Although whether a given movement type can reconstruct is not yet explained, (144) nevertheless allows us to describe W-movements and T-movements in terms *independent* from the Π-position asymmetry itself. More importantly, (144) shows us that the correct analysis of the Π-position asymmetry does not rest on a categorical distinction between W-movements and T-movements because such an analysis is unable to draw a distinction *within* W-movements. As will be discussed in section 2.6, this is problematic for the existing analyses in Postal (1994) and Stanton (2016) because they are based on the premise that the Π-position asymmetry diagnoses a distinction between movement types.

2.5 Analysis of the Π-position asymmetry

Against the backdrop of the two novel generalizations advanced in sections 2.3 and 2.4, we are now in a position to account for the Π-position asymmetry. The two generalizations will serve as the foundation of the analysis. The property generalization provides an independent characterization of what makes an environment a Π-position (145a). The scope generalization answers what characterizes movement that cannot target Π-positions, which encompasses the distinction between W-movements and T-movements (145b).

(145) **Π-position Generalizations**

a. **Property generalization**
DPs in Π-positions must denote properties (semantic type $\langle e, t\rangle$).

b. **Scope generalization**
Movement that shifts scope cannot target Π-positions.

The section proceeds as follows: Section 2.5.1 lays out the proposal. In section 2.5.2, I walk through some derivations to explicitly illustrate how the proposal accounts for the Π-position asymmetry. Section 2.5.3 argues that the Π-position asymmetry reveals that movement cannot map onto traces ranging over properties. Section 2.5.4 discusses interpreting quantificational DPs in Π-positions.

2.5.1 Proposal

To begin developing the proposal, let us first consider the interpretation of movement. The standard semantic mechanism for interpreting movement is to replace the launching site with a variable and insert a λ-abstraction binding this variable immediately below the landing site, as schematized in (146) (e.g. Beck 1996; Heim and Kratzer 1998; Sauerland 1998).

(146) [**every book** [λx_e [some student read x_e]]] every ≫ some

The λ-abstraction will force the moving element to take scope in the landing site. Moreover, because the variable left behind by movement is semantic type *e*, if the moving element is a generalized quantifier, the λ-abstraction binding the type-*e* variable will force the quantification to have scope in the landing site of movement. Thus, for example, in (146), *every book* takes scope above *some student* because movement lands above *some student*.

What about movement that does not shift scope? Movement that does not shift scope instead RECONSTRUCTS. Reconstruction means that the moved element behaves as if that movement has been undone at LF. There are a handful of theories about how reconstruction obtains. I will assume the copy-theoretic approach to reconstruction wherein reconstruction means that the lower copy but not the higher copy is interpreted at LF (Chomsky 1993, 1995b); see section 3.2.1 of chapter 3. Under the Copy Theory of Movement, movement creates copies in both the launching and landing sites of movement. The scope-shifted meaning comes about by interpreting the higher copy using the λ-abstraction–variable relation discussed above (147a), while the reconstructed meaning comes about by interpreting only the lower copy and ignoring the higher copy (147b).[54]

[54] The example in (147) is overly simplistic, but serves for illustration. More will need to be said about replacing the lower copy with a variable and about interpreting quantificational DPs that reconstruct; see chapter 3.

(147) *Copy Theory of Movement*

[[**every book**] [some student read [**every book**]]]

a. *Interpret higher copy ⇒ Scope-shifted meaning*

[**every book** [λx_e [some student read x_e]]] — every ≫ some

b. *Interpret lower copy ⇒ Reconstructed meaning*

[~~every book~~ [some student read **every book**]] — some ≫ every

Turning to Π-positions, the type-*e* trace required for scope-shifting movement is incompatible with Π-positions because it does not provide the property meaning ($\langle e,t\rangle$) that is expected by Π-positions. This semantic-type mismatch in turn yields ungrammaticality, thereby preventing scope-shifting movement from targeting Π-positions (148). On the other hand, because movement that does not shift scope reconstructs, if a DP would not ordinarily violate the property requirement of Π-positions, then it will not do so under reconstruction either (149).

(148) *Scope shifting ⇏ Π-positions*

*[DP_1 λx_e . . . [. . . [x_e $]_{\Pi\text{-pos}}$ . . .]]

type *e* trace

(149) *Reconstruction ⇒ Π-positions*

✓[$\_\__1$ . . . [. . . [DP_1 $]_{\Pi\text{-pos}}$ . . .]]

reconstruct

According to this analysis, Π-positions are an instance where movement must reconstruct in order to avoid a semantic-type mismatch that would occur if the moved DP were not interpreted in its base-generated position. T-movements are thus unable to target a Π-position at all, as sketched in (150), because they cannot reconstruct.[55]

(150) *T-movements*

a. *Topicalization*

*$[_{\text{TopicP}}$ DP_1 λx_e [Topic . . . [. . . [x_e $]_{\Pi\text{-pos}}$ . . .]]]

b. *Appositive relative clauses*

*$[_{\text{DP}}$ NP λ_1 $[_{\text{CP}}$ DP_1 λx_e . . . [. . . [x_e $]_{\Pi\text{-pos}}$ . . .]]]

[55] In (150b) and (151b), the λ-abstraction created external to the RC binds the relativized element that itself saturates a λ-abstraction that binds the lowermost copy; this is the standard procedure of interpreting cyclic movement. Moreover, following the discussion in section 2.4.4, (150c) abstracts over the underlying derivation of *tough*-constructions.

c. *Tough-constructions*

$*[\ \mathrm{DP}_1\ \lambda x_e\ [\text{ is tough } [\ \ldots\ [\ x_e\ ]_{\Pi\text{-pos}}\ \ldots\ ]\,]\,]$

W-movements, on the other hand, can target a Π-position, but to do so, they must reconstruct into that Π-position, as sketched in (151).

(151) *W-movements*

a. *Wh-movement*

i. $\checkmark[\ \mathrm{Q}\ \_\__1 \ldots [\ \ldots [\ \mathrm{DP}_1\ ]_{\Pi\text{-pos}} \ldots\ ]\,]$

reconstruct

ii. $*[\ \mathrm{Q}\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_{\Pi\text{-pos}} \ldots\ ]\,]$

b. *Restrictive relative clauses*

reconstruct

i. $\checkmark[_{\mathrm{DP}}\ \mathrm{NP}\ \lambda_1\ [_{\mathrm{CP}}\ \_\__1 \ldots [\ \ldots [\ \mathrm{DP}_1\ ]_{\Pi\text{-pos}} \ldots\ ]\,]\,]$

ii. $*[_{\mathrm{DP}}\ \mathrm{NP}\ \lambda_1\ [_{\mathrm{CP}}\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_{\Pi\text{-pos}} \ldots\ ]\,]\,]$

Unlike Postal's (1994) analysis of Π-positions, this analysis does not appeal to separate primitive movement operations. Rather, the Π-position asymmetry follows from the property-type requirement of Π-positions being incompatible with the type-*e* variable that a step of scope-shifting movement leaves in the Π-position at LF. Thus, the syntactic uniformity of $\overline{\mathrm{A}}$-movement is preserved. Of course, whether a given movement type can reconstruct is still unexplained. Though any analysis of movement types will have to stipulate this fact irrespective of Π-positions, more importantly, as shown in section 2.4, *reconstruction crosscuts movement types.* Assigning separate primitive operations to T-movements and W-movements cannot capture this pattern, in particular that W-movements cannot target Π-positions when they do not reconstruct.

The property and scope generalizations are in fact interconnected: It is precisely because Π-positions host property-type DPs that they cannot be targeted by scope-shifting movement.

That is, the property generalization *implies* the scope generalization. Therefore, the restriction on Π-positions can be stated more generally as the constraint in (152).[56]

(152) **Π-POSITION RESTRICTION**
$^{*}[\ x\ ]_{\Pi\text{-pos}}$, where x is an element of type e

(152) has the advantage of being more general than a constraint on movement itself. Thus, in addition to accounting for the movement asymmetry, it captures why Π-positions are antipronominal: weak pronouns like *it* cannot denote a property and hence violate the constraint in (152). Strong pronouns like *that*, on the other hand, face no such problem because they can denote a property. As mentioned in section 2.3.4, this fact can be observed independently using the verb *consider*, whose second argument must denote a property. While a weak pronoun is ungrammatical with *consider*, a strong pronoun is not (153).

(153) *Weak pronouns cannot denote a property* (=96)
Donald thinks that he is a success, but no one else considers him { ✓**that** / ***it** }.

Despite the fact that we can observe this fact independently of Π-positions, there still needs to be some kind of explanation for why strong but not weak pronouns can have property meanings. This question will be taken up in chapter 4. Nevertheless, an important point that I wish to draw attention to here is that once we establish that Π-positions denote properties, we in fact expect the movement asymmetry discovered by Postal (1994) to manifest in exactly the way that it does because the semantics of scope-shifting movement violates the Π-position Restriction in (152), i.e. the semantics of propertyhood and the semantics of scope-shifting movement are inherently incompatible.

An interesting question that arises from this analysis is why DPs that would appear to be semantic type *e*, e.g. definite descriptions, can occur in Π-positions, as they should violate the Π-position Restriction. This problem is illustrated in (154) with a list existential, which, unlike ordinary, run-of-the-mill existential constructions, allows definite descriptions to be the pivot (Milsark 1974, 1977; McNally 1992, 1997).

---

[56] The Π-position Restriction in (152) bears a strong resemblance to Heim's (1987) formulation of the Definiteness Restriction. Thus, (152) can be seen as a superset of her generalization.

(154) *Definite descriptions in Π-positions*
A: What food is left in the pantry?
B: Well, there is **the potato**.

This puzzle will be discussed in chapter 4, where it serves as the point of departure for motivating the Trace Rigidity Principle, according to which traces cannot be type shifted. The short answer is that these DPs are not type e, but actually type $\langle e, t\rangle$, a denotation that they achieve via nominal type shifting (in the sense of Partee 1986). I will argue that while most DPs can be type shifted into the property meaning required by Π-positions, a certain class of DPs cannot, and this class of DPs crucially includes traces.

2.5.2 Illustrating the proposal

This section illustrates how the proposal from section 2.5.1 accounts for the Π-position asymmetry by looking at derivations of examples that instantiate the ungrammatical schema in (148) and the grammatical schema in (149). Before proceeding, however, I briefly walk through how leaving a trace of type e forces a moved DP to take scope in the landing site of movement, while reconstruction forces it to take scope in the launching site of movement. This will be familiar to many readers; they may skip directly to the derivations involving Π-positions.

Let us start by considering the *how many*-question in (155), the example used in section 2.4.2 to illustrate that *wh*-movement optionally shifts scope. (155) has both a wide-scope and a narrow-scope reading. In the wide-scope reading, *how many books* takes scope over the modal *should* (155a); this is the scope-shifted reading. In the narrow-scope reading, *how many books* takes scope in its base position, below *should* (155b); this is the reconstructed, non-scope-shifted reading.

(155) [**How many books**]$_1$ should Nina read ___$_1$ this summer? (=106)

a. *Wide-scope reading* how many ≫ should
For what number n: There are n-many particular books x such that Nina should read x this summer.

b. *Narrow-scope reading* should ≫ how many
For what number n: It is necessary for there to be n-many books x such that Nina reads x this summer.

For the purposes of illustration, let us adopt a simple choice-function semantics for constituent questions and *how many*. First, the *wh*-phrase introduces a choice function, which is a function that, when applied to a nonempty set, returns a member of that set (Reinhart 1997). Because, for a given set, there are at least as many choice functions over that set as there are elements in it, the resulting question meaning is equivalent to the standard Hamblin/Karttunen question semantics wherein questions denote sets of propositions that are possible answers to that question (Hamblin 1973; Karttunen 1977). Existential closure applies to the choice function introduced by the *wh*-phrase. Therefore, the constituent question in (156a) has the denotation in (156b). The set of answers will be functions that return a cat from the set of all cats.[57]

(156) *Choice-function semantics for constituent questions*

a. [**Which cat**]$_1$ did Mary adopt ___$_1$?

b. $\lambda w_0\, \lambda p_{\langle s,t\rangle}\ .\ \exists f^{\text{CF}}[\, p = \lambda w\ .\ \text{Mary adopted } f(\text{cat}) \text{ in } w]$
Paraphrase: What is the (choice) function f such that the following proposition is true: Mary adopted the x picked out by f from the set of cats.

A syntacticized version of the choice-function semantics is given in (157), where the question operator Q handles the existential closure and the question formation (the $p = q$ part). For the sake of simplicity, I will assume that Q is inserted at the top of the structure and has a means of ensuring that it targets the choice function introduced by the *wh*-phrase; see section 3.3.4 of chapter 3 for a more thorough implementation in terms of Cable's (2007, 2010) Q-particle.

(157) *Syntacticized choice-function semantics*

a. $[\![\text{which NP}]\!] = \lambda w\ .\ f([\![\text{NP}]\!](w))$

b. $[\![\text{Q}]\!] = \lambda q_{\langle s,t\rangle}\, \lambda w_0\, \lambda p_{\langle s,t\rangle}\ .\ \exists f^{\text{CF}}[\, p = q]$

Second, following Hackl (2001), *many* is an existential quantifier with an extra argument for a degree, where the degrees being measured are cardinalities (158a). Let us assume that *how* ranges over degrees (158b) and serves as the argument to *many* (158c).

---

[57] Semantic types: *e* for entities, *s* for situations/worlds, *d* for degrees, and *t* for truth values. I assume the following notational conventions: w and s are of type s, w_0 is reserved for the world of evaluation, f^{CF} is a choice function f, and $\sigma\tau$ abbreviates $\langle\sigma,\tau\rangle$. I mark predicates taking plural arguments with the *-operator. For readability, I abbreviate modal denotations, e.g. $\textsc{should}_w(p) \Leftrightarrow \forall w'[w' \in f(w) \to p(w')]$, where f projects a modal domain.

(158) *Semantics of 'how many' questions*

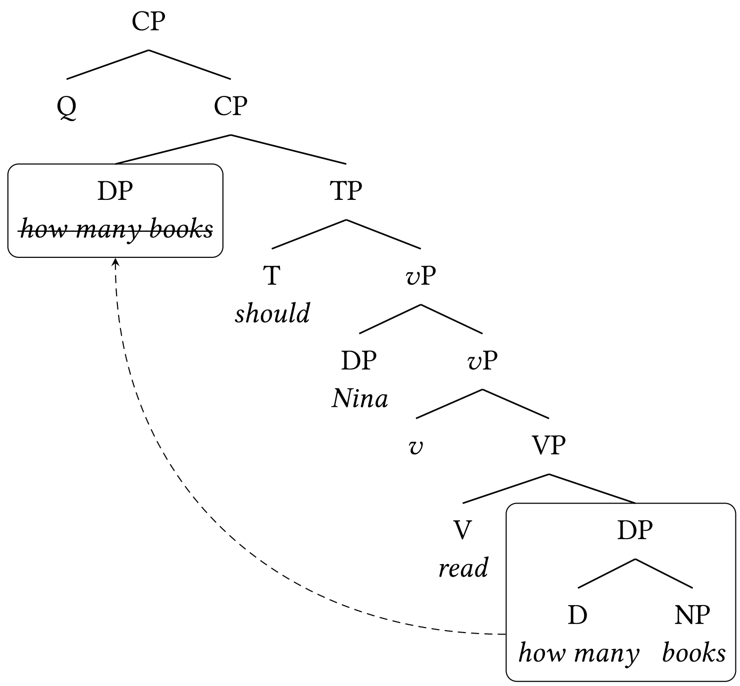
a. $[\![\text{many}]\!] = \lambda n_d\, \lambda P_{\langle e,st\rangle}\, \lambda Q_{\langle e,st\rangle}\, \lambda w\,.\, \exists x[\#x = n \wedge P(x)(w) \wedge Q(x)(w)]$

b. $[\![\text{how}]\!] = f(D_d)$ (where D_d is the domain of degrees)

c. $[\![\text{how many}]\!] = [\![\text{many}]\!]([\![\text{how}]\!])$
$= \lambda P_{\langle e,st\rangle}\, \lambda Q_{\langle e,st\rangle}\, \lambda w\,.\, \exists x[\#x = f(D_d) \wedge P(x)(w) \wedge Q(x)(w)]$

Let us start with the reconstructed reading. (159) shows the reconstructed derivation of (155b), where *how many books* takes narrow scope in the launching site of *wh*-movement, which is also its base-generated position. Note that because (155) involves modality, generalized quantifiers are treated as type $\langle\langle e,st\rangle,st\rangle$. I have also glossed over two details unimportant for the present purposes: the semantic composition of *read* and *how many*[58] and the subject-related A-movement of *Nina* from [Spec, *v*P] to [Spec, TP].

(159) *Reconstructed derivation of (155)* should ≫ how many



a. $[\![\text{how many books}]\!] = \lambda Q_{\langle e,st\rangle}\, \lambda w\,.\, \exists x[\#x = f(D_d) \wedge \textsc{book}^*_w(x) \wedge Q(x)(w)]$

b. $[\![v\text{P}]\!] = \lambda w\,.\, \exists x[\#x = f(D_d) \wedge \textsc{book}^*_w(x) \wedge \textsc{read}^*_w(x)(\text{Nina})]$

c. $[\![\text{TP}]\!] = \lambda w\,.\, \textsc{should}_w\big(\lambda w'\,.\, \exists x[\#x = f(D_d) \wedge \textsc{book}^*_{w'}(x) \wedge \textsc{read}^*_{w'}(x)(\text{Nina})]\big)$

[58] It may be the case that *how many books* has to move to an intermediate position to be interpreted, e.g. [Spec, *v*P] or that *read* must be lifted to a higher type to combine with a generalized quantifier.

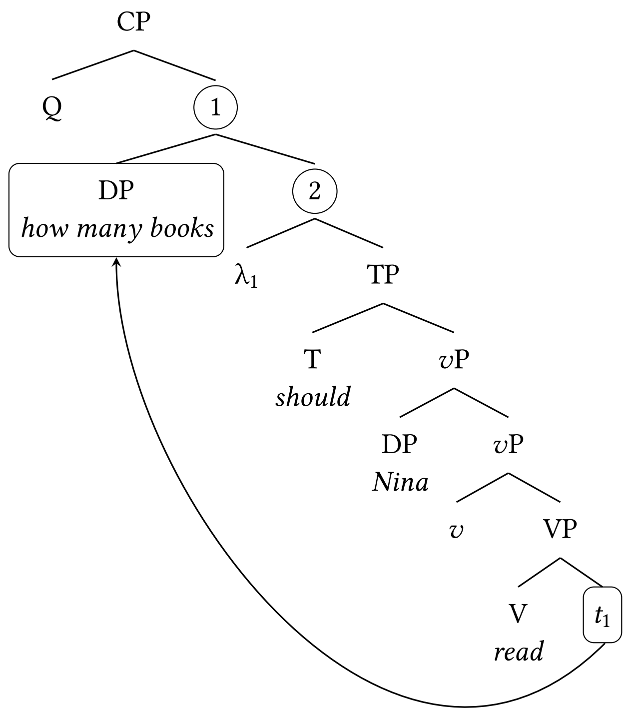
d. $[\![\text{CP}]\!] = \lambda w_0\, \lambda p_{\langle s,t\rangle} \,.\, \exists f^{\text{CF}}\big[\, p = \lambda w \,.\, \textsc{should}_w(\lambda w' \,.\, \exists x[\#x = f(\text{D}_d) \wedge \textsc{book}^*_{w'}(x) \wedge \textsc{read}^*_{w'}(x)(\text{Nina})])\big]$

Paraphrase: What is the choice function f such that the following proposition is true: In every modal alternative where what should happen does, there are n-many books x, where n is a degree picked out by f, such that Nina reads x.

In (159), *how many books* undergoes *wh*-movement to [Spec, CP], where it is eventually pronounced at PF. At LF, however, the higher copy is not interpreted, only the lower copy; hence, *how many books* reconstructs. The semantic derivation in (159) proceeds as follows: First, *how many books* introduces a choice function ranging over degrees that serve as cardinalities (159a). Second, *how many books* composes with *read* and *Nina* to yield the proposition "There are n-many books x such that Nina reads x" (159b). Third, *should* takes this proposition as its argument (159c). Fourth, the question operator Q applies existential closure over the choice function f and forms the question nucleus using the proposition denoted by TP (159d). In the end result, *how many* scopes below *should*, thereby deriving the reconstructed reading.

(160) shows the scope-shifted derivation of (155a), where *how many books* takes wide scope with respect to the modal *should*, in the landing site of *wh*-movement in [Spec, CP]. The important difference to pay attention to between (159) and (160) is that (160) invokes a λ-abstraction–variable relation (i.e. a trace) between the launching and landing sites of movement. This in turn requires that we consider the assignment function g. The relation between Q and the *wh*-phrase remains identical to as before in (159), except now the *wh*-phrase is interpreted in the landing site of movement.

(160) *Scope-shifted derivation of (155)* how many ≫ should



a. $[\![t_1]\!]^g = g(1)$

b. $[\![v\mathrm{P}]\!]^g = \lambda w\,.\,\textsc{read}^*_w(g(1))(\mathrm{Nina})$

c. $[\![\mathrm{TP}]\!]^g = \lambda w\,.\,\textsc{should}_w\big(\lambda w'\,.\,\textsc{read}^*_{w'}(g(1))(\mathrm{Nina})\big)$

d. $\left[\!\left[② \right]\!\right]^g = \lambda x_e\,\lambda w\,.\,\textsc{should}_w\big(\lambda w'\,.\,\textsc{read}^*_{w'}(x)(\mathrm{Nina})\big)$

e. $[\![\text{how many books}]\!] = \lambda Q_{\langle e,st\rangle}\,\lambda w\,.\,\exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge Q(x)(w)]$

f. $\left[\!\left[① \right]\!\right]^g = \lambda w\,.\,\exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge \textsc{should}_w(\lambda w'\,.\,\textsc{read}^*_{w'}(x)(\mathrm{Nina}))]$

g. $[\![\mathrm{CP}]\!]^g = \lambda w_0\,\lambda p_{\langle s,t\rangle}\,.\,\exists f^{\mathrm{CF}}\big[\,p = \lambda w\,.\,\exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge$
$\textsc{should}_w(\lambda w'\,.\,\textsc{read}^*_{w'}(x)(\mathrm{Nina}))]\big]$

Paraphrase: What is the choice function f such that the following proposition is true: There are n-many books x, where n is a degree picked out by f, such that in every modal alternative where what should happen does, Nina reads x.

In (160), *how many books* undergoes *wh*-movement to [Spec, CP], just as it did in the narrow-scope derivation. However, at LF, it is the higher copy that is interpreted, instead of the lower copy. This involves interpreting the lower copy as a variable that is bound by a λ-abstraction inserted directly below the landing site of movement. The semantic derivation in (160) thus proceeds as follows: First, the lower copy of *how many books* is interpreted as an assignment-dependent variable (160a). Second, the trace composes with *read* and *Nina* to yield the assignment-dependent proposition

"Nina read $g(1)$", where $g(1)$ is what the assignment returns for the index 1 (160b). Third, *should* takes this proposition as its argument (160c). Fourth, the λ-abstraction created by movement maps the index 1 to the λ-bound variable x (160d). Fifth, *how many books* takes 2 as its argument (160f). Last, the question operator Q applies existential closure over the choice function f and forms the question nucleus using the proposition denoted by 1 (160g). In the end result, *how many* scopes above *should*, thereby deriving the shifted-scope reading.

Now that we have seen how a trace (i.e. λ-abstraction–variable relation) and reconstruction respectively yield the scope-shifted and non-scope-shifted readings, let us turn to Π-positions. Recall from section 2.4.2 that, even though *how many*-questions in principle have both narrow-scope and wide-scope readings, only the narrow-scope reading survives when *how many* originates in a Π-position, i.e. reconstruction is obligatory. Consider the existential construction in (161) in which *how many books* only has a narrow-scope reading.

(161) [**How many books**]$_1$ *should* there be ___$_1$ on the table?
*how many ≫ should; ✓should ≫ how many

Before looking at the two logically possible derivations of (161), we need to make one simplifying assumption, namely that *how many books* has the property denotation in (162a), in addition to its ordinary generalized-quantifier denotation in (162b). In chapter 4, I will argue that the property denotation is *derived* from the generalized-quantifier denotation via nominal type shifting (in the sense of Partee 1986), but we will take it as an assumption for now. Again, as we dealing with modality, I treat properties as type $\langle e, st\rangle$ to simplify the derivation.

(162) a. *Property denotation (via type shifting)*
$[\![\text{how many books}]\!] = \lambda x_e\, \lambda w\ .\ \#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x)$

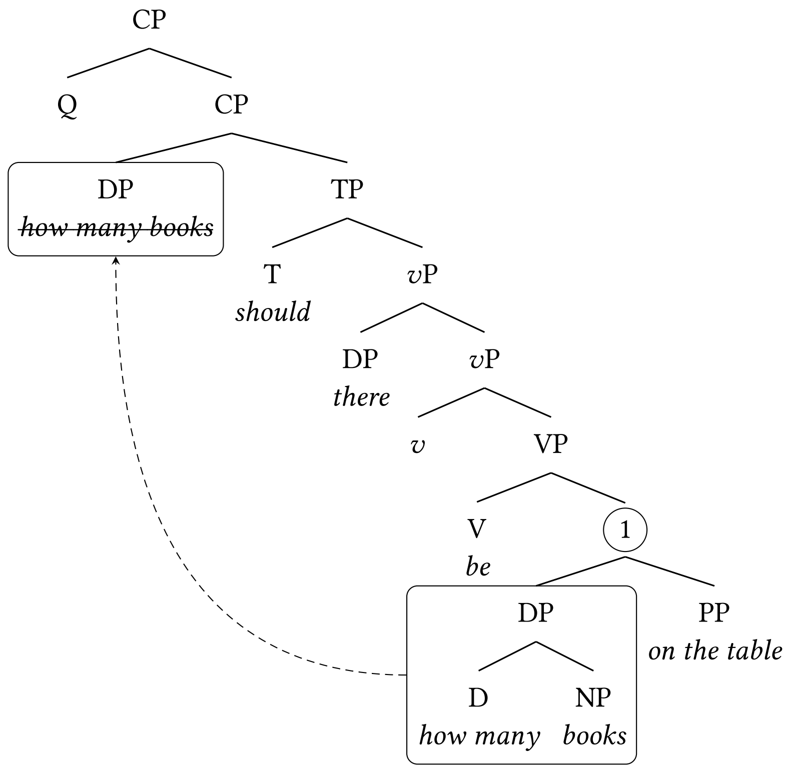
b. *Generalized-quantifier denotation*
$[\![\text{how many books}]\!] = \lambda \mathrm{Q}_{\langle e,st\rangle}\, \lambda w\ .\ \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge \mathrm{Q}(x)(w)]$

(163) shows the reconstructed derivation of (161)—the only grammatical derivation—where *how many books* takes narrow scope in the launching site of *wh*-movement, i.e. the Π-position.[59]

[59] (163) places the expletive *there* in [Spec, vP] and essentially treats it as a scope marker (see Williams 1983). Nothing critical hinges on this choice, it is purely for expository purposes; though, see Deal (2009) for arguments that *there* is in fact generated low.

Therefore, although the *wh*-phrase moves to [Spec, CP] and is eventually pronounced there, only the lower copy is interpreted at LF, thereby yielding reconstruction.

(163) *Reconstructed derivation of (161)*



a. $[\![\text{on the table}]\!] = \lambda x_e\, \lambda w\, .\, \textsc{on-the-table}^*_w(x)$

b. $[\![\text{1}]\!] = \lambda x_e\, \lambda w\, .\, \#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge \textsc{on-the-table}^*_w(x)$

c. $[\![v\mathrm{P}]\!] = \lambda w\, .\, \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge \textsc{on-the-table}^*_w(x)]$

d. $[\![\mathrm{TP}]\!] = \lambda w\, .\, \textsc{should}_w\big(\lambda w'\, .\, \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_{w'}(x) \wedge \textsc{on-the-table}^*_{w'}(x)]\big)$

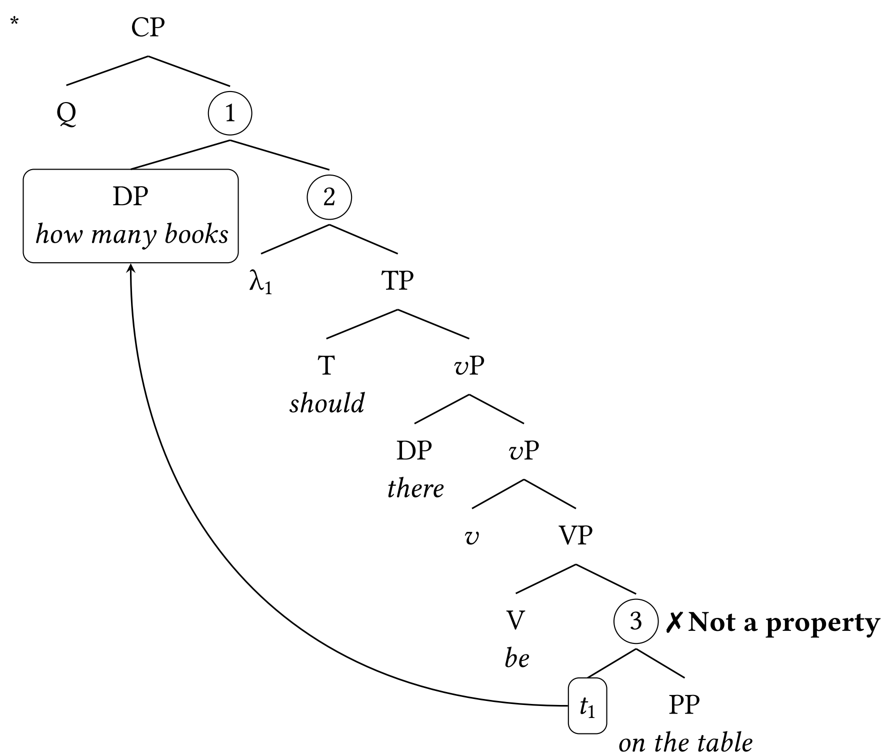
e. $[\![\mathrm{CP}]\!] = \lambda w_0\, \lambda p_{\langle s,t\rangle}\, .\, \exists f^{\mathrm{CF}}\big[p = \lambda w\, .\, \textsc{should}_w(\lambda w'\, .\, \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_{w'}(x) \wedge \textsc{on-the-table}^*_{w'}(x)])\big]$

Paraphrase: What is the choice function f such that the following proposition is true: In every modal alternative where what should happen does, there are n-many books on the table, where n is a degree picked out by f.

The semantic derivation in (163) proceeds as follows: First, *how many books* composes with *on the table* via predicate conjunction, as both are type $\langle e, st\rangle$ (163b). Second, the property denoted by 1 feeds the existential semantics, which I have treated as simple existential closure for the sake of illustration (163c). Third, the resulting proposition serves as the argument of *should* (163d). Last, the question operator Q applies existential closure over the choice function f and forms the question nucleus (163e). In the end result, *how many* scopes below *should*, thereby deriving the reconstructed reading.

(164) shows the scope-shifted derivation of (161), where *how many books* takes wide scope in the landing site of *wh*-movement, above the modal *should*. At LF, the higher copy is fully interpreted, while the lower copy is interpreted as a variable bound by a λ-abstraction inserted immediately below the landing site. This variable is semantic type *e* and therefore cannot feed into the semantics of existential constructions, which requires a property; see section 2.3.1. In the case of (164), when the type *e* variable combines with the PP *on the table*, the result is not a property—in fact, the variable saturates *on the table*, returning a proposition. Consequently, the structure in (164) is ungrammatical.

(164) *Scope-shifted derivation of (161)*



2.5.3 No property traces

We can and should ask why movement out of Π-positions, as in (164), cannot map onto a trace ranging over properties, where the moved DP denotes either a property or a generalized quantifier over properties, as schematized in (165).

(165) *Property traces are ungrammatical*

a. $^{*}[\ \mathrm{DP}_{\langle e,t\rangle} \quad \lambda f_{\langle e,t\rangle}\ [\ \ldots f \ldots\ ]\ ]$

b. $^{*}[\ \mathrm{DP}_{\langle\langle et,t\rangle,t\rangle}\ \lambda f_{\langle e,t\rangle}\ [\ \ldots f \ldots\ ]\ ]$

Empirically, if (165a) and (165b) were not ungrammatical, they would derive the wrong scope facts; see sections 2.2 and 2.4. Even in instances that involve apparent quantification over properties, these quantifiers over properties cannot take scope over other scope-bearing elements in the sentence, as shown in (166) for existential constructions.

(166) *Quantificational pivots cannot scope high* (=79)

a. There was*n't* **every kind of doctor** at the convention. ✓not ≫ every; *every ≫ not

b. There was*n't* **only one kind of doctor** at the convention.
✓not ≫ only one; *only one ≫ not

This unavailability of wide-scope is expected if (165b), where a generalized quantifier over properties has undergone QR, is an unavailable representation. Moreover, if a trace ranging over properties is unavailable in (165b), then we can generalize that it is also unavailable in (165a). Thus, what the ungrammaticality of scope-shifting movement targeting Π-positions ultimately reveals is that the syntax–semantics mapping does not permit movement to map onto property traces.

However, there are no *logical* reasons why a property trace should be blocked, given that our semantic machinery can generate such LFs. Exploring this question will be the main topic of chapter 3. I will show that the prohibition on property traces is part of the more general restriction that movement can only map onto traces over individual semantic types, which I call the Trace Interpretation Constraint (167).

(167) Trace Interpretation Constraint

$^{*}[\ \mathrm{DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots\ ]\ ]$, where σ is not an individual type

2.5.4 Quantificational DPs in Π-positions

An open question is how quantificational DPs are interpreted in Π-positions. To recapitulate, sections 2.2, 2.4, and 2.5.3 provided abundant evidence that quantificational DPs in Π-positions cannot be targeted by QR or other scope-shifting movement. This fact indicates that a standard analysis where the quantificational DP undergoes QR in order to be interpreted is not feasible for Π-positions. Thus, we are forced into an analysis where quantificational DPs in Π-positions are interpreted in situ.[60] However, working out the precise mechanics behind this in situ process is challenging, and I can only sketch an avenue towards an analysis here.

Let us briefly consider the types of quantificational DPs that can occur in Π-positions. They divide into two classes. The first class are DPs in which the NP is headed by what Partee (1986) terms an ATTRIBUTE NOUN, e.g. *color*, *length*, and *size*. Though Partee does not mention them, we can also add nouns like *name* and *nickname* to the class of attribute nouns. Some examples of attribute nouns in Π-positions are given in (168); (168d) is from Williams (1983) and is discussed in Partee (1986).

(168) *Attribute nouns in Π-positions*

a. There was [every **size** of dress]$_{\Pi\text{-pos}}$ at the store.

b. Megan painted the house [every **color**]$_{\Pi\text{-pos}}$.

c. Irene has called the cat [every **nickname**]$_{\Pi\text{-pos}}$.

d. The house has been [every **color**]$_{\Pi\text{-pos}}$.

Intuitively, attribute nouns express properties of properties. For example, ⟦color⟧ includes ⟦red⟧, ⟦green⟧, and ⟦blue⟧, which are themselves properties of objects in a given world. What is special about attribute nouns is that they can occur in predicative contexts as bare DPs. For instance, as shown in (169), they can occur as postnominal modifiers.[61]

[60] One possibility is that quantificational DPs in Π-positions can undergo QR, but only to a position that would not affect scope. However, this solution is unsatisfactory because it would posit an arbitrary operation just like QR, except not able to target any proposition-denoting node, like QR can.

[61] Partee (1986) observes that there is considerable individual variation in judgements about attribute nouns, which suggests that it is a fairly idiosyncratic lexical property. My own judgements mostly align with hers.

(169) *Attribute nouns as postnominal modifiers*
a dress { that size / that color / that length / that price /
*that material / *that design / ?that pattern / *that origin } [Partee 1986:133]

Attribute nouns can also occur in copula constructions, as shown in (170c). (170c) is particularly instructive because the entities in ⟦color⟧ are colors, not shirts. In some sense, the meaning of (170c) is a combination of the meanings of (170a) and (170b).

(170) *Attribute nouns in copula constructions*

a. This shirt is blue.

b. Blue is a nice color.

c. This shirt is **a nice color**. [Partee 1986:133]

What (169) and (170) show is that it must be possible to utilize the extensions of attribute nouns as properties, either because the objects in their extensions *are* properties or because they can be converted into properties. We will return to this matter shortly.

The second class of quantificational DPs that can occur in Π-positions are *kind*-nominal constructions, e.g. *every kind of bird* and *birds of every kind*. *Kind*-nominal constructions are characterized by the inclusion of a *kind*-nominal, like *kind*, *sort*, and *type*. Some examples of *kind*-nominal constructions in Π-positions are given in (171).

(171) *Kind-constructions in Π-positions*

a. There was [every **kind** of linguist $]_{\Pi\text{-pos}}$ at the LSA.

b. Megan painted the house [both **shades** of blue $]_{\Pi\text{-pos}}$.

c. Erika had been [every **kind** of teacher $]_{\Pi\text{-pos}}$ at the elementary school.

Similar to attribute nouns, *kind*-nominal constructions express properties of properties (see Wilkinson 1991; Zamparelli 1995, 1998, 2000; Carlson 1977). For example, consider *every kind of bird*. Its extension, i.e. ⟦every kind of bird⟧, intuitively includes things like ⟦sparrow⟧ and ⟦magpie⟧, which are themselves properties of objects in a given world. It also intuitively includes things like "small birds", "large birds", and "birds that my mother likes", however one elects to represent these. This begets the question of whether ⟦every kind of bird⟧ should range over KINDS—in the technical sense, for which I will use small caps to disambiguate. We will return to this question shortly, but it is worth pointing out that if *kind*-nominal constructions do range over KINDS, what qualifies as a KIND would have to be broad and context-dependent, not just 'natural kinds' (Carlson 1977; Wilkinson 1991; Chierchia 1998).

There are obvious similarities between attribute nouns and *kind*-nominal constructions, namely that *kind*-nominals might belong to the class of attribute nouns. Wilkinson (1991) argues for such a reduction (see also Zamparelli 1995, 2000). I will also assume such a reduction in what follows, adopting Wilkinson (1991), but motivating it will take us too far afield because *kind*-nominal constructions present many unrelated complications of their own. The reader is referred to Wilkinson (1991) and Zamparelli (1995, 2000). Be that as it may, the quantificational DPs that can occur in Π-positions are those whose extensions involve properties at some level of abstraction.

Against this backdrop, I present sketches of two possible analyses of quantificational DPs in Π-positions. The analyses differ in how they model the denotations of attribute nouns and *kind*-nominal constructions. Crucially, neither solution requires QR of the DP for it to be interpreted. For the sake of simplicity, I focus on change-of-color-verbs, but both analyses generalize to the other Π-positions as well.

The first analysis rests on two assumptions. First, it takes a very extensional view of attribute nouns and *kind*-nominal constructions. The logic is that ⟦color⟧ includes things like ⟦red⟧ and ⟦blue⟧ (172a), and the extensions of these expressions are sets of entities (172b). Therefore, ⟦color⟧ includes these sets of entities as well (172c). In the same vein, *kind of birds* ranges over sets of birds (173).

(172) *Extension of attribute nouns*

a. $[\![\text{color}]\!] = \{[\![\text{red}]\!], [\![\text{blue}]\!], \ldots\}$

b. $[\![\text{red}]\!] = \{\text{Clifford, fire trucks}, \ldots\}$

c. $[\![\text{color}]\!] = \{\{\text{Clifford, fire trucks}, \ldots\}_{\text{red}}, \{\text{Babe, blueberries}, \ldots\}_{\text{blue}}, \ldots\}$

(173) *Extension of kind-nominal constructions*

$[\![\text{kind of birds}]\!] = \{\{b_1, b_2, \ldots\}_{\text{sparrow}}, \{b_3, b_4, \ldots\}_{\text{magpie}}, \ldots\}$

Second, these sets of entities can be directly quantified over. Under this analysis, then, the quantifier *every* has (174) as one of its denotations, which I represent as $every_{\mathcal{E}}$.

(174) *Quantifier over sets*
$[\![\text{every}_{\mathcal{E}}]\!] = \lambda P_{\langle\langle e,t\rangle,t\rangle}\, \lambda Q_{\langle\langle e,t\rangle,t\rangle}\, .\ \forall\mathcal{E}[P(\mathcal{E}) \rightarrow Q(\mathcal{E})]$

The derivation of quantificational DPs in Π-positions under this proposal is illustrated in (175). The analytical 'trick' in (175) is that because *every*$_{\mathcal{E}}$ quantifies over sets, its two arguments are sets of sets, i.e. generalized quantifiers. This allows it to take the object directly as its argument.[62] For the sake of simplicity, I depict the object as having been lifted into a generalized-quantifier meaning.

(175)

1

DP DP

every *color* *the house*

a. $[\![\text{every}_{\mathcal{E}}\ \text{color}]\!] = \lambda Q_{\langle\langle e,t\rangle,t\rangle}\, .\ \forall\mathcal{E}[\textsc{color}(\mathcal{E}) \rightarrow Q(\mathcal{E})]$

b. $[\![\text{the house}]\!] = \lambda P_{\langle e,t\rangle}\, .\ P(\iota x[\textsc{house}(x)])$

c. $[\![1]\!] = \forall\mathcal{E}[\textsc{color}(\mathcal{E}) \rightarrow [\lambda P_{\langle e,t\rangle}\, .\ P(\iota x[\textsc{house}(x)])](\mathcal{E})]$
$= \forall\mathcal{E}[\textsc{color}(\mathcal{E}) \rightarrow \mathcal{E}(\iota x[\textsc{house}(x)])]$

This analysis is unsatisfactory because it assumes second-order quantification, which is controversial, and requires a new category–type correspondence.[63] However, it shows that in a very extensional framework, quantificational DPs in Π-positions do not require much extra machinery.

The second analysis assumes that ⟦color⟧ and ⟦kind of birds⟧ range over KINDS, or entity correlates of properties (176)–(177). Because KINDS cannot be directly predicated of other entities, the predication relationship is instead established with Chierchia's (1984) π-operator (178).

(176) *Extension of attribute nouns*
$[\![\text{color}]\!] = \{\textsc{red}^k, \textsc{blue}^k, \textsc{green}^k \ldots\}$

(177) *Extension of kind-nominal constructions*
$[\![\text{kind of birds}]\!] = \{\textsc{sparrow}^k, \textsc{magpie}^k, \textsc{peacock}^k \ldots\}$

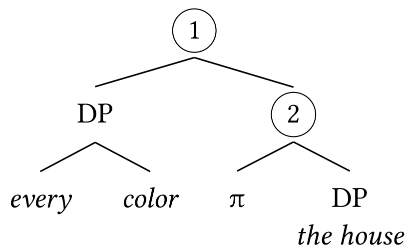
[62] In existential constructions, the quantificational DP would take the copula or existential predicate as its argument.

[63] The new category–type correspondence would not be terribly different from the [±A] feature that Partee (1986) proposes for attribute nouns, though its ramifications would be more widespread in the grammar.

(178) $[\![\pi]\!] = \lambda x\, \lambda y\, .\, \pi(y)(x)$
(where $\pi(y)(x)$ means to apply the property corresponding to y to x) [Chierchia 1998]

The derivation of quantificational DPs in Π-positions under this proposal is illustrated in (179). The upshot of the proposal is that it is much cleaner and only uses ordinary quantification over entities.

(179)



a. $[\![\text{every color}]\!] = \lambda Q_{\langle e,t\rangle}\, .\, \forall x[\textsc{color}(x) \rightarrow Q(x)]$

b. $[\![2]\!] = \lambda y\, .\, \pi(y)(\text{the house})$

c. $[\![1]\!] = \forall x[\textsc{color}(x) \rightarrow \pi(x)(\text{the house})]$

In summary, I have sketched two possible analyses of quantificational DPs in Π-positions, but ultimately the problem of quantificational DPs in Π-positions remains an open problem. It is worth pointing out that while the second analysis may look appealing, it does require a slight revision to the characterization of Π-positions. Rather than being positions where DPs host properties, they are positions that host DPs with property correlates. The effects of this recharacterization at the moment are unclear and are left for future research.

2.6 Previous analyses

There are two previous accounts of the Π-position asymmetry: Postal (1994) and Stanton (2016). Note that Stanton (2016) deals with different data, though data which parallel the environments that Postal discovered. This section discusses these analyses against the backdrop of the enriched empirical picture of Π-positions developed in this chapter. Both Postal (1994) and Stanton (2016) base their analyses on antipronominality and a categorical distinction between W-movements and T-movements. I will show that for these reasons, in particular the latter, their analyses are inferior to the analysis developed in section 2.5.

2.6.1 Postal (1994)

This section discusses Postal's (1994) analysis of the Π-position asymmetry in light of the discoveries made in this chapter. Some of these points have already been made in the preceding sections, so there will be some repetition. Postal develops an analysis of the Π-position asymmetry based on antipronominality. He proposes that W-movements and T-movements differ in what they leave behind in the launching site of movement: W-movements leave a trace (180a), while T-movements leave a covert resumptive pronoun (180b). Therefore, T-movements cannot target Π-positions because what they leave behind, viz. a pronoun, violates antipronominality.

(180) *Postal's (1994) analysis of Π-positions*

a. *W-movements leave a trace*
✓**What**$_1$ is there $\boldsymbol{t}_1$ in the pantry?
W-mvt

b. *T-movements leave a covert resumptive*
* [**A potato**]$_1$, there is ~~it~~$_1$ in the pantry.
T-mvt

There are several problems with Postal's analysis. First, as mentioned at the outset of this chapter, Postal does not offer an explanation for *why* Π-positions are antipronominal. He treats it as an arbitrary property that some syntactic environments happen to have. Thus, under his analysis, the movement types that leave behind pronouns amount to a list. This in turns calls into question accounting for the distinction between W-movements and T-movements in terms of pronouns. It could be the case that what underlies the movement asymmetry also independently underlies antipronominality—this is what I argued in section 2.5 in linking them both to the propertyhood of Π-positions. Second, as mentioned in section 2.2.6, antipronominality does not encompass all pronouns. In particular, it does not extend to strong pronouns like *that*. As shown in (181), *that* can occur in Π-positions—excluding existential constructions, which are independently incompatible with all pronouns due to the Definiteness Restriction. Thus, antipronominality is not as simple as a ban on pronouns.[64]

---

[64] Postal (1994) does make the claim that antipronominality is only sensitive to weak pronouns, but his only example to motivate this claim is the acceptability of *It was her that they hired*. He claims that *her* is in a predicate-nominal

(181) *Only weak pronouns trigger antipronominality*

a. *Existential constructions*
Gloria bought *a potato*, and there is { ***it** / ***that** } in the pantry.

b. *Change-of-color verbs*
Megan liked *the color magenta*, and she painted the house { ***it** / ✓**that** }

c. *Naming verbs*
Irene liked *the name Snowflake*, and she called the cat { ***it** / ✓**that** }.

d. *Predicate nominals*
Erika wanted to become *a teacher*, and she became { ***it** / ✓**that** }.

Third, being antipronominal does not entail being a Π-position. Postal himself observes that there are syntactic environments that block pronouns, but nevertheless allow both W-movements and T-movements, as shown in (182).

(182) *Antipronominality does not entail being a Π-position*

a. *Baseline*
*Thuy attended the University of Minnesota, but Rodica did not attend **it**.

b. *Wh-movement*
✓[**What university**]$_1$ did Thuy attend ___$_1$ for her undergrad?

c. *Topicalization*
✓[**The University of Minnesota**]$_1$, Thuy attended ___$_1$ for her undergrad.

(182) undermines the simple analysis that Postal otherwise presents. If the reason that T-movements cannot target Π-positions is that they violate antipronominality, then (182c) should be ungrammatical, contrary to fact. Postal responds to this problem by tweaking antipronominality so that it is specifically a prohibition on covert resumptive pronouns—the things left behind by T-movements, and only T-movements—and that this asymmetrically entails prohibiting overt pronouns.[65] Robbing his analysis of its independent support, this amounts to little more than restating that T-movements cannot target Π-positions.

position despite being a pronoun. However, this is very clearly a cleft construction, not a predicate-nominal position. As such, I do not know exactly what he intends by this claim.

[65] This revised version of antipronominality is Postal's "wide" and "narrow" distinction in antipronominal contexts. Narrow antipronominal contexts prohibit only overt pronouns, while wide antipronominal contexts (what I have been calling Π-positions) prohibit both covert and overt pronouns.

Because Postal's analysis rests on a categorical distinction between movement types, it is unable to account for the scope generalization from section 2.4. Admittedly, one may rescue Postal's analysis, on an analytical level, by saying that W-movements leave a covert resumptive pronoun whenever they shift scope. The meanings of "trace" and "covert resumptive pronoun" would still need substantiated on such an analysis. If "trace" were taken to mean reconstruction and "covert resumptive pronoun" a type-*e* variable, the analysis arrived at would be equivalent to what I proposed in section 2.5. Such an analysis is of course *not* what Postal proposes, and it would be antithetical to the larger point of his paper. The central claim of Postal (1994) is that $\overline{\text{A}}$-movement is not uniform, contra Chomsky (1977). His logic is that because $\overline{\text{A}}$-movement types divide into two groups on some metric, namely whether they can target Π-positions, there must be two movement primitives accounting for this division, and hence $\overline{\text{A}}$-movement is not syntactically uniform. In this chapter, I have shown that the relevant distinction for the Π-position asymmetry—reconstruction—crosscuts movement types. Thus, one cannot draw the conclusion that the Π-position asymmetry diagnoses a movement-type division in the $\overline{\text{A}}$-domain.[66] Moreover, the analysis developed in this chapter directly demonstrates that the Π-position asymmetry can be accounted for without resorting to separate primitives. In particular, I have shown that the Π-position asymmetry is a byproduct of two extraneous factors: (i) the semantic nature of Π-positions, viz. DPs in Π-positions denote properties, and (ii) whether the movement step leaving the Π-position reconstructs. Under my analysis, the syntactic uniformity of $\overline{\text{A}}$-movement is preserved.

2.6.2 Stanton (2016)

Stanton (2016) analyzes a similar set of data to Postal's (1994) in terms of antipronominality. Unlike Postal, she provides an explanation for why the environments that she examines are antipronominal and also tries to reduce the movement-type division to something else, namely the possibility of pied-piping. There are a number of problematic aspects about the analysis in Stanton (2016), which I will discuss, but the most severe problem is that it does not extend to the data from Postal

[66] Regarding the A/$\overline{\text{A}}$-distinction, there is a substantial body of literature arguing that the various distinctions between A-movement and $\overline{\text{A}}$-movement follow from different extraneous factors, rather than two separate primitive operations; see van Urk (2015) and Keine (2016) for recent overviews. The approach that I have pursued in this chapter to the Π-position asymmetry is in the same vein.

(1994) or the property and scope generalizations advanced in this chapter. However, the analysis from section 2.5 can extend to her data without further ado.

Stanton discovers that some movement types cannot strand a preposition in a certain class of temporal and locative PPs. The movement types that can and cannot preposition-strand divide into what I have been calling W-movements and T-movements respectively. Let us start by considering the data underlying her proposal. The first set of environments are temporal PPs. Temporal PPs that select for "interval" DPs, e.g. *Monday* and *5:00pm*, allow preposition-stranding when targeted by W-movements, but not T-movements (183). This pattern contrasts with temporal PPs that select for "event" DPs, e.g. *John's party* and *Christmas dinner*, which allow preposition-stranding with both W-movements and T-movements alike (184).[67]

(183) *Interval-selecting temporal PPs*

a. *Baseline*
✓John went swimming in **December**.

b. *Wh-movement*
i. ✓[**Which month**]$_1$ did John go swimming in ___$_1$?
ii. ✓[**In which month**]$_1$ did John go swimming ___$_1$?

c. *Restrictive RC*
✓The **month**$_1$ [$_{RC}$ that John went swimming in ___$_1$] was cold.

d. *Topicalization*
i. ***December**$_1$, John went swimming in ___$_1$.
ii. ✓[**In December**]$_1$, John went swimming ___$_1$.

e. *Tough-construction*
***December**$_1$ is tough [to swim in ___$_1$]. [Stanton 2016:90]

(184) *Entity-selecting temporal PPs*

a. *Baseline*
✓We left after **John's talk**.

b. *Wh-movement*
i. ✓[**Which talk**]$_1$ are we leaving after ___$_1$?
ii. ✓[**After which talk**]$_1$ are we leaving ___$_1$?

[67] The baselines and minimal pairs without preposition-stranding in (183)–(186), I came up with.

c. *Restrictive RC*
✓The **talk**$_1$ [$_{RC}$ we're leaving after ___ $_1$] should be really good.

d. *Topicalization*
i. ✓[**John's talk**]$_1$, we're leaving after ___ $_1$.
ii. ✓[**After John's talk**]$_1$, we're leaving ___ $_1$.

e. *Tough-construction*
✓[**John's talk**]$_1$ will be easy [to leave after ___ $_1$]. [Stanton 2016:93]

The second set of environments are locative PPs. Locative PPs that select for "location" DPs, e.g. *the fourth floor* and *10,000 feet*, allow preposition-stranding when targeted by W-movements, but not T-movements (185).[68] This pattern contrasts with locative PPs that select for "entity" DPs, e.g. *the forest* and *the box*, which allow preposition-stranding with both W-movements and T-movements (184).

(185) *Location-selecting locative PPs*

a. *Baseline*
✓We found cake on **the fourth floor**.

b. *Wh-movement*
i. ✓[**Which floor**]$_1$ did we find cake on ___ $_1$?
ii. ✓[**On which floor**]$_1$ did we find cake ___ $_1$?

c. *Restrictive RC*
✓The **floor**$_1$ [$_{RC}$ that we found cake on ___ $_1$] was deserted.

d. *Topicalization*
i. *[**The fourth floor**]$_1$, we found cake on ___ $_1$.
ii. ✓[**On the fourth floor**]$_1$, we found cake ___ $_1$.

e. *Tough-construction*
*[**The fourth floor**]$_1$ is easy [to find cake on ___ $_1$]. [Stanton 2016:97]

(186) *Entity-selecting locative PPs*

a. *Baseline*
✓Michelle's cat hid in **the cardboard box**.

---

[68] The T-movements in (185) have grammatical readings where *the fourth floor* has an entity reading instead of a location reading. For example, (185d) is grammatical if *the (fourth) floor* refers to the actual ground and not the level of a building (here, I find the entity reading better without *fourth*). Thus, the preposition-stranding asymmetry in (185) really depends on the interpretation of the DP.

b. *Wh-movement*

i. ✓[**Which box**]$_1$ did Michelle's cat hide in ___$_1$?

ii. ✓[**In which box**]$_1$ did Michelle's cat hide ___$_1$?

c. *Restrictive RC*

✓The **box**$_1$ [$_{RC}$ that Michelle's cat hid in ___$_1$] was made of cardboard.

d. *Topicalization*

i. ✓[**That cardboard box**]$_1$, Michelle's cat hid in ___$_1$.

ii. ✓[**In that cardboard box**]$_1$, Michelle's cat hid ___$_1$.

e. *Tough-construction*

✓[**Cardboard boxes**]$_1$ are easy [for cats to hide in ___$_1$]. [Stanton 2016:91]

The parallels with the Π-position asymmetry are fairly straightforward, so we might consider PPs selecting for interval and location DPs to be Π-positions. Stanton observes that like Postal's Π-positions, interval and location DPs are antipronominal, but only in these PPs and not in other positions (187). Thus, as with Π-positions, what is special is the position. The event and entity DP counterparts are not subject to antipronominality (188).

(187) *Interval-selecting and location-selecting PPs are antipronominal*

a. *John visited his family **in June,** and Mary visited her family **in it**, too.

b. *I ate dinner **on the fourth floor**, and John ate dinner **on it**, too.

c. ✓I spent **June** at the pool, but John spent **it** in his office. [Stanton 2016:92, 96]

(188) *Event-selecting and entity-selecting PPs are **not** antipronominal*

a. ✓I left **after John's party**, and Mary left **after it**, too.

b. ✓I ate dinner **on the wooden table**, and John ate dinner **on it**, too. [Stanton 2016:92, 96]

The logic underlying Stanton's (2016) analysis of the movement asymmetry in (183) and (185) is identical to Postal's logic: T-movements create a representation that violates antipronominality, while W-movements do not.

Following Postal (1966) and Abney (1987) (amongst others), Stanton assumes that pronouns are determiners that lack an NP complement (*cf.* Elbourne 2005). She proposes that prepositions selecting for interval and location DPs have some kind of dependency with the NP in their DP complement. A pronoun is unable to satisfy this dependency because, by definition, they are just determiners, thereby giving rise to the antipronominal effect. Prepositions selecting for event and entity DPs, on the other hand, do not have this dependency and thus are not subject to antipronominality. This in turn requires that some prepositions have two versions, one that selects for an event/entity DP or one that selects for an interval/location DP, e.g. *after* and all the locative prepositions. What is the NP relevant for this dependency? Stanton proposes that interval DPs contain a silent nominal TIME and location DPs contain PLACE (Kayne 2005). Thus, interval-selecting and location-selecting prepositions require that their complements contain one of the respective silent nominals, which she speculates is a "semantic requirement".[69]

According to Stanton, the movement asymmetry with these PPs is due to the NP being forced to countercyclically late-merge *after* the DP has vacated [Comp, PP] via movement, thereby leaving in [Comp, PP] what is equivalent to a pronoun and bleeding the preposition's access to the NP. Late Merge of NP is what Takahashi and Hulsey (2009) term WHOLESALE LATE MERGER (WLM). Under Stanton's analysis, the asymmetry between W-movements and T-movements is derived from WLM being obligatory with T-movements and prohibited with W-movements. Working within an optimality-theoretic syntax, Stanton proposes that WLM is a violable preference such that MERGE prefers to apply as late as possible (189).[70]

(189) **MERGELATE**
Assign one violation for each possible merge site x' whose mother node c–commands x, where x is the position where NP is merged. [Stanton 2016:107]

Following Takahashi and Hulsey (2009), WLM is constrained by the need for an NP to have Case, formulated as the constraint GETCASE in (190). For English, this "case" can in principle be either abstract Case or morphological case, though I will assume that it is the former. WLM is possible as long as the NP gets Case at some point in the derivation.

(190) **GETCASE**
Assign one violation if NP is caseless. [Stanton 2016:107]

---

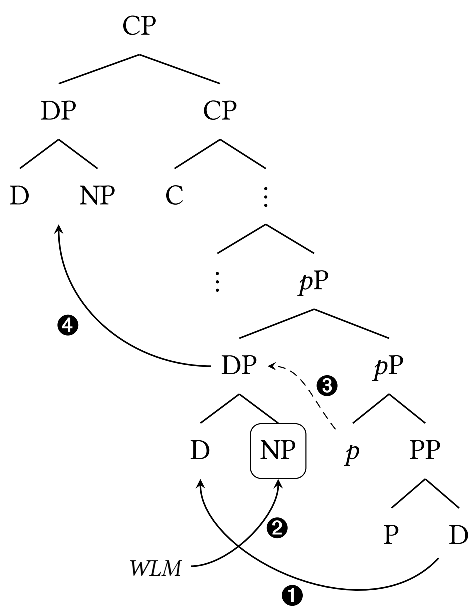
[69] I do not know what Stanton intends by "semantic requirement", and she does not elaborate on it.

[70] I have reformulated her version of MERGELATE so that it does not contain a conditional, which I am unsure how EVAL would handle.

GetCase outranks MergeLate. Thus, the derivation prefers to merge an NP as late as possible, while still being valued for Case. This preference interacts with how Case is assigned inside PPs. Stanton proposes that PPs have a *p*P shell, where *p* can assign Case either via Agree or via Spec–Head. This flexibility in Case assignment is crucial for her analysis.

For T-movements, the most harmonic derivation is the one where the NP is merged with D in [Spec, *p*P]. From this position, the entire DP can be assigned Case by *p* in a Spec-Head configuration, satisfying GetCase. This derivation is schematized in (191). The competing derivation where the NP is merged in [Comp, PP], i.e. where there is no WLM, incurs one more violation of MergeLate than the winning candidate (192).

(191) *WLM derivation of a T-movement*



❶ Move D to [Spec, *p*P].

❷ Late-merge the NP to D.

❸ *p* assigns Case to DP.

❹ DP moves to [Spec, CP].

(192) GetCase ≫ MergeLate

		GetCase	MergeLate
a.	$[_{pP}\ [\text{ D NP }]_1\ p\ [_{PP}\ \text{P}\ \cancel{[\text{ D NP }]_1}\ ]\ ]$		$n+1$ (W)
b. ☞	$[_{pP}\ [\text{ D NP }]_1\ p\ [_{PP}\ \text{P}\ \cancel{[\text{ D }]_1}\ ]\ ]$		n
c.	$[\ [\text{ D NP }]_1 \ldots [_{pP}\ \cancel{[\text{ D }]_1}\ p\ [_{PP}\ \text{P}\ \cancel{[\text{ D }]_1}\ ]\ ]\ ]$	* (W)	$n-1$ (L)

If the P head in (191) is one that selects for interval or location DPs, WLM of the NP in [Spec, *p*P] means that the P head does not have access to the NP, resulting in ungrammaticality. Moreover, because nothing comes between [Comp, PP] and [Spec, *p*P], except the heads themselves, (i) the NP will still trigger Condition C violations as expected and (ii) other factors like variable binding and quantifier scope can never force the NP to be merged any lower. Consequently, with T-movements, the NP will always be merged into the structure late, after D has moved to [Spec, *p*P].

For Stanton (2016), the crucial distinction between W-movements and T-movements is pied-piping.[71] W-movements target QPs and therefore allow pied-piping (following Cable 2007, 2010), while T-movements instead only target DPs.[72] Stanton proposes that WLM into a QP is ruled out because it is "too countercyclic". To implement this proposal, she posits an additional constraint, *TooLate in (193), which outranks MergeLate.

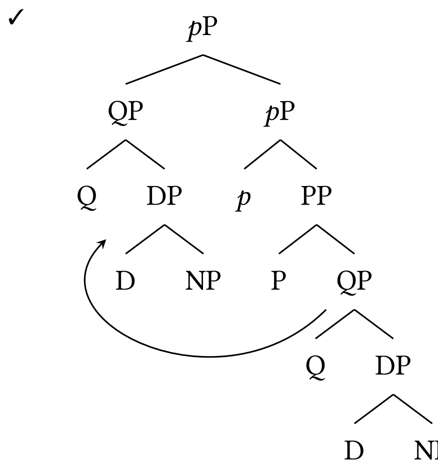
(193) ***TooLate**
Assign one violation if the relationship established by late-merge is not the structurally highest of its type. [Stanton 2016:116]

According to *TooLate, an NP cannot be late-merged into a QP because NP merging with D creates a complementation relationship which is not the structurally highest of its type within a QP, since Q and DP also stand in a complementation relationship. For W-movements, *TooLate thus forces the NP to be merged with D in [Comp, PP] (194). In this configuration, *p* assigns Case to the entire DP via Agree. The competing derivation where the NP is late-merged in [Spec, *p*P] violates *TooLate (195).

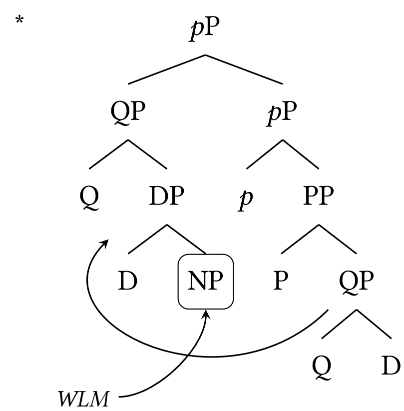
[71] A problem that Stanton (2016) struggles with is that some T-movements allow pied-piping; see Stanton 2016:113–114.

[72] In some respects, this proposal is similar to the one that I will advance in sections 3.3 and 3.4.1 of chapter 3 for independent reasons. However, in my proposal, the relevant distinction between moving a QP and moving a DP is how they are interpreted. That said, my analysis in chapter 3 faces the same pied-piping problem as Stanton's analysis that some T-movements allow pied-piping.

(194) *W-movement without WLM*



(195) *W-movement with WLM*



*TooLate ensures that W-movements leave the P head with access to the NP. Thus, when the P head in (194) is one that selects for interval or location DPs, it has access to the NP and yields a grammatical derivation. In summary, according to Stanton's analysis, the preposition-stranding asymmetry with interval and location DPs results from the interplay of three constraints: MergeLate, GetCase, and *TooLate. This interplay forces the NP to be late-merged with T-movements and not late-merged with W-movements. Late-merging the NP in the case of T-movements leaves just a D head in [Comp, PP], which is equivalent to a pronoun and thus violates antipronominality.

While the analysis in Stanton (2016) derives the preposition-stranding asymmetry, it faces both empirical and theoretical problems. Let us start with the theoretical considerations. First, a minor point, yet one still worth mentioning, is that her conception of Late Merge, which is pivotal for her analysis, has no analogue in non-optimality-theoretic syntax. Even so, it is unclear why the grammar would prefer to merge NPs late when it seems to prefer to do everything else as early as possible (e.g. Pesetsky 1989). This conception of Late Merge is also quite different from what is standardly assumed in the literature. Whereas traditionally Late Merge is forced in order to avoid what would be an *ungrammatical* derivation, e.g. to obviate Condition C, Stanton's Late Merge is forced in order to avoid what would be a *grammatical* derivation, i.e. the NP being in [Comp, PP].

Second, there is no technically-definable domain for the constraint *TooLate. Stanton states that the domain is the root node, but once the QP has merged with P, the QP is no longer a root node. Relatedly, the relationship between *p* and its specifier is presumably a complementation relationship. Thus, it is unclear why *TooLate would not apply to DPs moved to [Spec, *p*P], preventing WLM with T-movements as well.

Third, the idea that Late Merge is prohibited in cases that are "too countercyclic", which underlies the constraint *TooLate, is suspect. As Sportiche (2015) emphasizes, the pervasiveness of countercyclicity is the inescapable problem with Late Merge: once one admits Late Merge as the explanation of Lebeaux effects, one is simply forced to accept unbounded cyclicity as part of syntax. Consider the example in (196), where *he* can corefer with *Picasso*, obviating Condition C. According to Late Merge, this derivation involves late-merging the relative clause containing *Picasso* after *wh*-movement has occurred. What is special about (196) is that the DP *the man*, to which the relative clause must be late-merged, is the recursive complement of a complement of the main head noun *criticism*. As such, none of the material intervening between *criticism* and *the man* can itself be late-merged—because complements cannot be late-merged—and thus Late Merge must target a DP that is at least four embeddings deep.

(196) *Lebeaux effects are unbounded*
[Whose criticism of Mary's rendition of (...) the claim [that you formulated (...) the hypothesis [that Henri [met a man [who knew **Picasso**$_2$]]]]]$_1$ did **he**$_2$ endorse ___$_1$?
[Sportiche 2015:20]

If there existed any constraint on Late Merge being too countercyclic, it would certainly apply in cases like (196), but nevertheless (196) is a grammatical sentence of English.

It should be clear by now that many crucial aspects of the analysis in Stanton (2016), in particular the silent nominals in interval and location DPs and how Case is assigned in *p*P-shells, are ad hoc assumptions engineered to coerce the preposition-stranding asymmetry into a WLM analysis (and then claim that it provides evidence for WLM). In fact, WLM might be the only piece of the analysis that is independently justified, but even the version of WLM presented in Stanton (2016) is notably different from what Takahashi and Hulsey (2009) propose; see the above three points.

Empirically, the WLM analysis in Stanton (2016) does not extend beyond the preposition-stranding cases to the Π-positions from Postal (1994).[73] For example, one of Stanton's strongest

[73] As Rajesh Bhatt (p.c.) has pointed out to me, one might think that because Stanton's (2016) analysis involves WLM of NP and NPs denote properties, her analysis is the "syntactic" version to my more "semantic" analysis involving propertyhood. However, this is not the case. Whether or not a DP contains an NP has no bearing on its semantic

arguments for the sensitivity of interval-selecting PPs to the presence of an NP is their incompatibility with a bare *what* (197a). However, exactly the opposite judgement holds for existential constructions (197b) (Heim 1987). And change-of-color verbs are equally compatible with either a bare *what* or a D-linked *what NP* (197c).

(197) a. *Interval-selecting PPs*
[What *(**holiday**) $]_1$ does your family eat turkey on ___$_1$? [Stanton 2016:122]

b. *Existential constructions*
[What (***picture**) $]_1$ is there ___$_1$ on the wall?

c. *Change-of-color verbs*
[What (**color**) $]_1$ did you paint the house ___$_1$?

If Π-positions are not sensitive to the presence of an NP, as (197b) and (197c) suggest, there is no way to extend the WLM analysis to them, since that dependency is what the analysis rests on. On the other hand, one might find an alternative explanation of the ungrammaticality of (197a), such as pragmatic competition with English's temporal-specific *wh*-phrase *when*.

Setting (197) aside, the WLM analysis additionally cannot capture the scope generalization from section 2.4. Under the WLM analysis, the NP merges with D in [Comp, PP] for W-movements and in [Spec, *p*P] for T-movements. However, any operator that scopes over [Spec, *p*P] will also scope over [Comp, PP] and vice versa, given their adjacency. Being in one position or the other will have no effect on scope relations. Moreover, even if the two positions involved somehow did matter for scope—e.g. if the point of WLM was actually higher than [Spec, *p*P]—there is no way to force the NP to merge with D in the higher position with W-movements because *TooLate categorically blocks such a derivation for QPs. In other words, there is no way to give W-movements the representation of T-movements. Because of this categorical distinction between movement types, the WLM analysis cannot explain why W-movements behave like T-movements, i.e. cannot target Π-positions, when they shift scope.

The conservative approach is to treat Stanton's and Postal's environments as distinct phenomena, despite their similarities. Under such an approach, Stanton's (2016) WLM analysis might

type under anyone's theory. We have also seen that English has pronouns that can denote properties, and under Stanton's analysis, pronouns are determiners without NPs.

account for the preposition-stranding asymmetry and the property-based analysis developed in this chapter would account for Postal's environments. However, it is possible to analyze interval-selecting and location-selecting PPs as positions where DPs denote properties, under Stanton's own characterization of these DPs, thereby providing a unified analysis. Stanton argues that interval and location DPs are *coordinate-denoting* DPs, while event and entity DPs are *concrete* DPs. To exemplify this distinction, she provides the contrast between *Monday* and *John's party*: while *Monday* is defined in terms of the amount of time that it occupies, *John's party* takes up a portion of time, but its length does not define it. A similar contrast can be made in the domain of locatives. Consider the Swedish city of Kiruna. Because of destructive mining activity, Kiruna is currently being moved three kilometres to the east to avoid the city caving in. The location reading of *Kiruna* refers to the spatial coordinates that it occupies at the time of reference, whereas the entity reading refers to the city itself whether it is uttered now (2017) or in 2033 when the city will have (hopefully) finished moving to its new location. To capture Stanton's characterization, interval and location DPs do not denote one single coordinate, but rather a set of coordinates. A set of coordinates crucially has a characteristic function, i.e. a *property denotation.* With these pieces in place, the denotations in (198) and (199) capture her characterization of interval-selecting and location-selecting PPs in terms of property-denoting expressions.

(198) *Interval PPs as selecting for properties*

a. $[\![\text{in}_{\textsc{temp}}]\!] = \lambda \text{P}\, \lambda e\ .\ \tau(e) \subseteq \text{P}$ (where τ maps an event onto its runtime)

b. $[\![\text{December}]\!] = \lambda x\ .\ x$ is a temporal coordinate in December

(199) *Location PPs as selecting for properties*

a. $[\![\text{on}_{\textsc{loc}}]\!] = \lambda \text{P}\, \lambda e\ .\ \textsc{location}(e) \subseteq \text{P}$

b. $[\![\text{the fourth floor}]\!] = \lambda x\ .\ x$ is a spatial coordinate on the fourth floor

Under the denotations in (198) and (199), the analysis of Π-positions developed in section 2.5 directly extends to Stanton's preposition-stranding cases.[74] Thus, while a unified analysis of Stanton's and Postal's environments is possible under the analysis developed in this chapter, such a unification is impossible under Stanton's (2016) analysis.

[74] One difference between Stanton's and Postal's environments is QR. The PP cases seem to allow for wide-scope readings via QR (i), unlike Postal's environments (see section 2.2). However, this scope mobility might be due to the fact that the PPs themselves can undergo movement, and thus it is not the property-denoting interval or location DP that move. Independent support for this analysis comes from the fact that these PPs are of the kind that can be stranded by VP ellipsis, unlike Postal's environments (ii).

(i) *A (different) child* found cake on **every floor**. ✓a ≫ every; ✓every ≫ a

(ii) a. ✓Rose found cheesecake **on the first floor**, and Dorothy did ⟨~~find cheesecake~~⟩ **on the second floor**.

b. *Rose painted the room **yellow**, and Dorothy did ⟨~~paint the room~~⟩ **green**.

CHAPTER 3

PROPERTIES OF MOVEMENT

3.1 Introduction

This chapter argues that even though natural language has expressions over semantic higher types, these expressions cannot be represented as traces, and then explores the dichotomy between leaving a trace and reconstruction.[1] Chapter 2 showed that when movement targets a property-type DP, it must reconstruct because the entity trace that movement would otherwise map onto is incompatible with a position requiring a property-denoting expression. This requirement to reconstruct is what gives rise to the Π-position asymmetry: some movement types, e.g. topicalization, cannot reconstruct and therefore can never target property-type DPs, i.e. Π-positions. The investigation in chapter 2 then ended with the broader conclusion that movement cannot map onto traces ranging over properties. If such a representation were available, then property-type DPs would be able to take scope higher than their base-generated position via overt or covert movement, which chapter 2 showed to (surprisingly) be impossible. This chapter explores this ban on property traces, asking what the *movement of properties* reveals about the *properties of movement*.

Section 3.2 starts out by situating the prohibition on property traces from chapter 2 within the broader context of the semantics of movement. I argue that the semantic-type constraint on possible traces is more pervasive and more general. Not only can movement not map onto traces over PROPERTIES (200a), it also cannot map onto traces over GENERALIZED QUANTIFIERS (200b).

(200) a. *No property traces*

$$^{*}[\ \mathrm{DP}_1\ \lambda f_{\langle e,t\rangle}\ \ldots\ [\ \ldots\ [\ f_{\langle e,t\rangle}\ ]_1\ \ldots\ ]\ ]$$

[1] A brief terminological note: I will continue to use the terms "variable" and "trace" interchangeably to refer to the λ-bound variable that movement creates at LF when it does not reconstruct.

b. *No generalized-quantifier traces*

$^*[\ \mathrm{DP}_1\ \lambda f_{\langle et,t\rangle} \ldots [\ \ldots [\ f_{\langle et,t\rangle}\ ]_1 \ldots]\ ]$

The arguments for the ungrammaticality of generalized-quantifier traces (200b) come from Romero (1998) and Fox (1999). They show that (200b) incorrectly predicts that semantic reconstruction (e.g. quantifier scope) can happen in the absence of syntactic reconstruction (e.g. Condition C). Taken together, the more general constraint to emerge is that movement can only map onto traces over individual semantic types, such as entities (*e*) and degrees (*d*). I call this constraint the Trace Interpretation Constraint (TIC), given in (201) (see also Chierchia 1984; Landman 2006).

(201) **Trace Interpretation Constraint**
$^*[\ \mathrm{DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots]\ ]$, where σ is not an individual type

Moreover, I will bolster the TIC with additional novel empirical arguments against generalized-quantifier traces from ACD, extraposition, and parasitic gaps, where the availability of higher-type traces would overgenerate interpretations.

The worldview to emerge from the TIC is that movement only has two possible semantic representations: mapping onto an individual-type trace (202) or reconstructing (203). All other representations are ill-formed.

(202) *Mapping onto a trace*

$[\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_1 \ldots]\ ]$

(203) *Reconstruction*

$[\ \underline{\quad}_1 \ldots [\ \ldots [\ \mathrm{DP}\ ]_1 \ldots]\ ]$

reconstruct

Against this backdrop, in section 3.3, I develop a syntax and semantics of movement where the choice between (202) and (203) is not free, but *deterministic*. Thus, a given movement derivation maps onto one and only one semantic representation. I propose that the semantic behavior of a movement step depends entirely on the identity of the moving element: moving a DP versus moving a QP (question-particle phrase; in the sense of Cable 2007, 2010). Moving a DP results in a trace over type *e* (204) (with analogues for other individual types). DP-movement is interpreted via

Trace Conversion, wherein the lower copies of a movement chain are converted into anaphoric definite descriptions (Engdahl 1980, 1986; Sauerland 1998, 2004; Fox 1999, 2002, 2003).

(204) *Movement of a DP*

$$[\ \mathrm{DP}_1 \ldots [\ \ldots \mathrm{DP}_1 \ldots]\ ] \rightsquigarrow_{\mathrm{LF}} [\ [_{\mathrm{DP}}\ \mathrm{D\ NP}\ ]_1\ \lambda x_e \ldots [\ \ldots \underbrace{[_{\mathrm{DP}}\ \mathrm{the}\ [\lambda y\ .\ y = x]\ \mathrm{NP}\ ]_1}_{\text{Trace Conversion}} \ldots]\ ]$$

Moving a QP results in reconstruction of everything except the Q head (205). The interpretation of QP-movement follows from the Q head being unable to semantically compose with its complement, forcing the two to disassociate at LF.

(205) *Movement of a QP*

$$[\ [_{\mathrm{QP}}\ \mathrm{Q\ XP}\ ]_1 \ldots [\ \ldots [_{\mathrm{QP}}\ \mathrm{Q\ XP}\ ]_1 \ldots]\ ] \rightsquigarrow_{\mathrm{LF}} [\ \underbrace{[_{\mathrm{QP}}\ \mathbf{Q}\ \cancel{\mathrm{XP}}\ ]_1}_{\text{Interpret Q}} \ldots [\ \ldots \underbrace{[_{\mathrm{QP}}\ \cancel{\mathrm{Q}}\ \mathbf{XP}\ ]_1}_{\text{Interpet XP}} \ldots]\ ]$$

Therefore, movement that shifts scope is movement of a DP and movement that reconstructs is movement of a QP. The interesting outcomes of this proposal materialize when individual steps of QP-movement and DP-movement are chained together. I will argue that it is possible for QP-movement to *follow* DP-movement, but not vice versa. This is because a QP shell can be constructed on top of an already moved DP (206a), but a QP layer cannot be shaved off or left behind to render accessible the DP that it contains (206b).

(206) a. *QP-movement following DP-movement*

QP-mvt Build QP

$$✓[\ [_{\mathrm{QP}}\ \mathrm{Q\ DP}_1\ ]_2 \ldots [\ [_{\mathrm{QP}}\ \mathrm{Q\ DP}_1\ ]_2 \ldots [\ \ldots \mathrm{DP}_1 \ldots]\ ]\ ]$$

DP-mvt

b. *DP-movement following QP-movement*

DP-mvt

$$^*[\ \mathrm{DP}_1 \ldots [\ [_{\mathrm{QP}}\ \mathrm{Q\ DP}_1\ ]_2 \ldots [\ \ldots [_{\mathrm{QP}}\ \mathrm{Q\ DP}_1\ ]_2 \ldots]\ ]\ ]$$

QP-mvt

Under this proposal, which I call the DP/QP-movement system, DP-movement is semantically equivalent to QR. The difference between the two is that DP-movement may manifest overtly, a difference that I will attribute to linearization. Consequently, whether a movement chain shifts scope reduces to whether it invokes an initial step of QR, i.e. DP-movement. This allows different movement types to be stated in terms of different sequences of DP-movement and QP-movement, which I will show, given the possibility of DP-movement preceding QP-movement, ultimately reduces to whether the movement targets DPs or QPs. These proposals are all implemented in a multidominant syntax, building on Johnson (2012, 2014). The structures in (204)–(206) will therefore look somewhat different, but crucially they can be built without resorting to counter-cyclicity. Presented along the way are many arguments in favor of this multidominant conception of movement. Additionally, I will show that the DP/QP-movement system (i) accounts for the typology of movement types in English and crosslinguistically and (ii) handles the interpretation of crossclausal movement better than a standard copy-theoretic conception of movement does.

In section 3.4, I then apply the DP/QP-movement system to a number of disparate reconstruction phenomena and show that they follow without further ado: the Π-position asymmetry (§3.4.1), Late Merge (or "Lebeaux") effects (§3.4.2), focus intervention (§3.4.3), and bona fide predicate movement of VPs and APs (§3.4.4). What these applications show is that a system of movement where the choice between leaving a trace (which is constrained by the TIC) and reconstruction is a deterministic choice yields widespread empirical coverage beyond the reconstruction properties of movement itself.

3.2 Trace Interpretation Constraint

This section motivates the Trace Interpretation Constraint (TIC) in (207) that, unless it reconstructs—which we will soon see means to reconstruct syntactically—, movement can only map onto traces ranging over individual types, e.g. entities (*e*) and degrees (*d*).

(207) **Trace Interpretation Constraint**
$^{*}[\ \mathrm{DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots\ ]\ ]$, where σ is not an individual type

The first half of the TIC (207) was motivated in chapter 2, where I argued, based on the Π-position asymmetry, that movement cannot map onto property traces. Properties are, however, not the only kind of higher-type expression in the entity domain; the other kind of higher-type expression is a generalized quantifier (208) (Partee 1986).[2]

(208) *Types of DP denotations*

e	Entity	*(individual type)*
$\langle e, t\rangle$	Property	*(set of entities)*
$\langle\langle e, t\rangle, t\rangle$	Generalized quantifier	*(set of properties, i.e. set of sets of entities)*

The second half of the argument thus concerns whether movement can map onto a trace ranging over generalized quantifiers. Arguments against generalized-quantifier traces come from Romero (1998) and Fox (1999). Their arguments are couched in terms of the dichotomy between so-called "syntactic" and "semantic" theories of reconstruction, so section 3.2.1 begins by introducing these two contrasting theories. Section 3.2.2 then presents Romero's and Fox's arguments against the semantic theory of reconstruction, the key component of which are generalized-quantifier traces. Section 3.2.3 takes stock of the overarching generalization to emerge: the Trace Interpretation Constraint (207). In section 3.2.4, I reinforce the TIC with additional novel empirical arguments against generalized-quantifier traces with data from ACD, extraposition, and parasitic gaps.

3.2.1 Syntactic vs. semantic theories of reconstruction

Recall from section 2.4.2 of chapter 2 that *wh*-movement optionally shifts the scope of the moved DP. For example, in (209) (repeated from (106)), *how many books* has two possible scopes with respect to the modal *should*. Under the wide-scope reading (209a), it is assumed that there is a certain set of books that Nina should read; the speaker is asking how many such books there are. A possible answer to the wide-scope reading is: 'Three books, namely *Aspects*, *Lectures on Government and Binding*, and *The Minimalist Program*'. Under the narrow-scope reading (209b), there is no assumption that there are any specific books that Nina should read. Rather, it is assumed that she should read a certain number of books, without having any particular books in mind. A possible answer to the narrow-scope reading is: 'Three books, any three'.

[2] As in chapter 2, I will continue to treat properties in purely extensional terms. For discussion of representing properties in natural language, see section 4.5 of chapter 4.

(209) *Wh-movement optionally shifts scope*

[**How many books**]$_1$ should Nina read ____ $_1$ this summer? (=106)

a. *Wide-scope reading* how many ≫ should

i. For what number n: There are n-many particular books x such that Nina should read x this summer.

ii. $[\![(209)]\!](w_0) = \{p : \exists n \in \mathbb{N}[\, p = \lambda w \,.\, \exists X[\textsc{book}^*_w(X) \wedge \#X = n \wedge \textsc{should}_w(\lambda w' \,.\, \textsc{read}^*_{w'}(X)(\text{Nina}))]]\}$

b. *Narrow-scope reading* should ≫ how many

i. For what number n: It is necessary for there to be n-many books x such that Nina reads x this summer.

ii. $[\![(209)]\!](w_0) = \{p : \exists n \in \mathbb{N}[\, p = \lambda w \,.\, \textsc{should}_w(\lambda w' \,.\, \exists X[\textsc{book}^*_{w'}(X) \wedge \#X = n \wedge \textsc{read}^*_{w'}(X)(\text{Nina})])]\}$

The scope ambiguity in constituent questions like (209) follows from the possibility of reconstructing the moved *wh*-phrase. Reconstructing into the launching site of movement yields the narrow-scope reading (209b). Otherwise, the *wh*-phrase takes wide scope in the landing site of movement (209a). There are two predominant theories in the literature about how reconstruction ensues: the "syntactic" theory of reconstruction (SynR) and the "semantic" theory of reconstruction (SemR). Let us consider each theory in turn.

According to SynR, reconstruction means that at LF a moved element is syntactically put back into the position that it occupied before movement had occurred. In other words, a reconstructed element behaves like the movement has been undone because it has actually been undone. Analyses that fall under the umbrella of SynR include ignoring the higher copy of a movement chain under the Copy Theory of Movement (210) (Chomsky 1993, 1995b) or positing a special operation like LF-Lowering that can apply to a moved element at LF (211) (Chomsky 1976; May 1977, 1985; Longobardi 1987; Cinque 1990). I assumed the copy-theoretic analysis of reconstruction in chapter 2 and will continue to do so.

(210) *Reconstruction by ignoring copies (SynR)*

[$\mathbf{DP}_1$ . . . [Op [. . . $\mathbf{DP}_1$ . . .]]]

a. *Interpret higher copy ⇒ Wide scope*

[$\mathbf{DP}_1$ . . . [Op [. . . $\cancel{\mathrm{DP}_1}$ . . .]]] $\mathrm{DP}_1 \gg \mathrm{Op}$

b. *Interpret lower copy ⇒ Narrow/reconstructed scope*
$[\ \cancel{\mathrm{DP}_1} \ldots [\ \mathrm{Op}\ [\ \ldots \mathbf{DP}_1 \ldots\ ]\ ]\ ]$ $\qquad$ $\mathrm{Op} \gg \mathrm{DP}_1$

(211) *Reconstruction by LF-Lowering (SynR)*
$[\ \mathbf{DP}_1 \ldots [\ \mathrm{Op}\ [\ \ldots \underline{\quad}_1 \ldots\ ]\ ]\ ]$

a. *Interpret structure as-is ⇒ Wide scope*
$[\ \mathbf{DP}_1 \ldots [\ \mathrm{Op}\ [\ \ldots \underline{\quad}_1 \ldots\ ]\ ]\ ]$ $\qquad$ $\mathrm{DP}_1 \gg \mathrm{Op}$

b. *Lower DP at LF ⇒ Narrow/reconstructed scope*
$[\ \underline{\quad}_1 \ldots [\ \mathrm{Op}\ [\ \ldots \mathbf{DP}_1 \ldots\ ]\ ]\ ]$ $\qquad$ $\mathrm{Op} \gg \mathrm{DP}_1$
LF-Lowering

Both ignoring copies (210) and LF-Lowering (211) produce the same result: the moved element is semantically *and* syntactically back in the launching site of movement at LF. This means that it will behave as reconstructed for both scope and binding. Scope reconstruction follows from the standard assumption that logical scope is read off LF, while binding-theoretic reconstruction follows from the standard assumptions (i) that the conditions on binding are defined in terms of c–command (Chomsky 1981) and (ii) that Binding Theory applies at LF (Lebeaux 1990, 2009). See section 2.5.2 of chapter 2 for a step-by-step derivation of reconstruction according to SynR.

According to SemR, reconstruction means that the variable left behind by movement is a generalized-quantifier trace, which has the effect of the moved element taking scope at the trace position (Rullmann 1995; Cresti 1995). Movement can produce two kinds of traces: an entity trace of type *e* or a generalized-quantifier trace of type $\langle et, t\rangle$. Following Rullmann (1995), I will call these 'small' *t* and 'big' T traces respectively. The former is the kind of trace that we standardly use in syntax and semantics, but the latter is a unique innovation of SemR. While a small *t* trace yields its standard wide-scope, nonreconstructed reading (212a), a big T trace instead yields the narrow-scope, reconstructed reading (212b). The important point to observe about SemR is that when a moved element reconstructs for scope, it is not *syntactically* back in that position; the reconstruction is achieved purely via the semantic machinery.

(212) *SemR analysis of reconstruction*

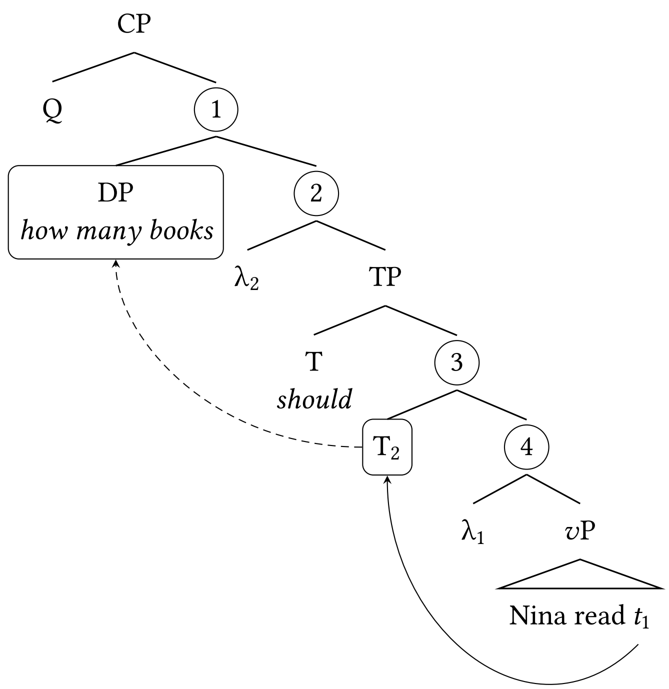
a. *Small trace ⇒ Wide scope* $\qquad$ $\mathrm{DP}_1 \gg \mathrm{Op}$
$[\ \mathrm{DP}_1 \ldots [\ \mathrm{Op}\ [\ \ldots t_1 \ldots\ ]\ ]\ ] \rightsquigarrow_{\mathrm{LF}} [\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \mathrm{Op}\ [\ \ldots x_e \ldots\ ]\ ]\ ]$

b. *Big trace* ⇒ *Narrow/reconstructed scope* $\mathrm{Op} \gg \mathrm{DP}_1$

$[\ \mathrm{DP}_1 \ldots [\ \mathrm{Op}\ [\ \ldots \mathrm{T}_1 \ldots]\,]\,] \rightsquigarrow_{\mathrm{LF}} [\ \mathrm{DP}_1\ \lambda \mathcal{Q}_{\langle et,t\rangle} \ldots [\ \mathrm{Op}\ [\ \ldots \mathcal{Q}_{\langle et,t\rangle} \ldots]\,]\,]$

We have already seen derivations involving small t traces; see section 2.5.2 of chapter 2. Derivations involving big T traces are somewhat more involved because of the trace being a higher type. The derivation of the *how many*-question in (209) using a big T trace is given in (213) (ignoring the role of the question operator).[3,4] Because (209) involves modality, generalized quantifiers are treated in (213) as type $\langle\langle e, st\rangle, st\rangle$. Moreover, to simplify the derivation, I assume that *how many books* undergoes an initial step of movement that leaves a small t trace, which in turn produces a semantic object that can then compose with a generalized quantifier. Nothing critical hinges on this assumption; we could also have inflated the semantic type of verbs, as Rullmann (1995) does.

(213) *Interpreting a big T trace in SemR*



a. $[\![4]\!]^g = \lambda x_e\, \lambda w\,.\, \textsc{read}^*_w(x)(\mathrm{Nina})$

---

[3] Semantic types: e for entities, s for situations/worlds, d for degrees, and t for truth values. I assume the following notational conventions: w and s are of type s, w_0 is reserved for the world of evaluation, f^{CF} is a choice function f, and $\sigma\tau$ abbreviates $\langle\sigma, \tau\rangle$. I mark predicates taking plural arguments with the *-operator. For readability, I abbreviate modal denotations, e.g. $\textsc{should}_w(p) \Leftrightarrow \forall w'[w' \in f(w) \rightarrow p(w')]$, where f projects a modal domain.

[4] As in previous derivations, (213) glosses over the subject related A-movement of *Nina* from [Spec, *v*P] to [Spec, TP].

b. $[\![\mathrm{T}_2]\!]^g = [g(2)]_{\langle\langle e,st\rangle,st\rangle}$

c. $[\![③]\!]^g = [\boldsymbol{g(2)}](\lambda x_e\, \lambda w\ .\ \textsc{read}^*_w(x)(\text{Nina}))$

d. $[\![\mathrm{TP}]\!]^g = \lambda w\ .\ \textsc{should}_w\big([\boldsymbol{g(2)}](\lambda x_e\, \lambda w\ .\ \textsc{read}^*_w(x)(\text{Nina}))\big)$

e. $[\![②]\!]^g = \lambda \mathcal{Q}_{\langle\langle e,st\rangle,st\rangle}\, \lambda w\ .\ \textsc{should}_w\big(\boldsymbol{\mathcal{Q}}(\lambda x_e\, \lambda w\ .\ \textsc{read}^*_w(x)(\text{Nina}))\big)$

f. $[\![\text{how many books}]\!] = \lambda \mathrm{P}_{\langle e,st\rangle}\, \lambda w\ .\ \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge \mathrm{P}(x)(w)]$

g. $[\![①]\!]^g = \lambda w\ .\ \textsc{should}_w\big(\boldsymbol{[\lambda \mathrm{P}_{\langle e,st\rangle}\, \lambda w\ .\ \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_w(x) \wedge \mathrm{P}(x)(w)]]}$
$(\lambda x_e\, \lambda w\ .\ \textsc{read}^*_w(x)(\text{Nina}))\big)$
$= \lambda w\ .\ \textsc{should}_w\big(\lambda w'\ .\ \exists x[\#x = f(\mathrm{D}_d) \wedge \textsc{book}^*_{w'}(x) \wedge \textsc{read}^*_{w'}(x)(\text{Nina})]\big)$

The crucial step of the derivation occurs at ①. Ordinarily, a moved generalized quantifier takes its sister as its argument because the λ-abstraction over type *e* created by movement produces an element of type $\langle e, st\rangle$, which is the correct semantic type to serve as the argument to a generalized quantifier. However, in (213), the λ-abstraction below the generalized quantifier *how many books* is instead *over generalized quantifiers*, so that *how many books* actually serves as the argument of its sister, substituting for the λ-bound variable $\mathcal{Q}$ and yielding the reconstructed reading. The semantic derivation in (213) thus proceeds as follows: First, starting from the point where the *v*P has been composed, the λ-abstraction created by the first step of movement abstracts over the small *t* trace, mapping the index 1 to the λ-bound variable *x* (213a). Second, the big T trace is interpreted as an assignment-dependent variable over generalized quantifiers (213b). Third, the big T trace takes ④ as its argument, which is of the correct type ($\langle e, st\rangle$) (213c). Fourth, *should* takes the resulting proposition as its argument (213d). Fifth, the λ-abstraction created by the second step of movement abstracts over the big T trace, mapping the index 2 to the λ-bound variable $\mathcal{Q}$ (213e). At this point, one can see that the generalized quantifier that will saturate $\mathcal{Q}$ will scope below *should*, thereby deriving the reconstructed reading. Finally, *how many books* does precisely that; it serves as the argument of ②, substituting for $\mathcal{Q}$. It then takes what corresponds to the *v*P as its argument, yielding the proposition in (213g).

3.2.2 Evidence against the semantic theory of reconstruction

Romero (1998) and Fox (1999) make the pioneering discovery that scope reconstruction feeds binding-theoretic reconstruction, the latter of which is evaluated with Condition C connectivity.

I will call this discovery the SCOPE–CONDITION C CORRELATION (SCC) (214). According to the SCC, when a moved element reconstructs for scope, it is necessarily evaluated for Condition C in the reconstructed position where it has taken scope. Therefore, semantic reconstruction entails syntactic reconstruction.

(214) SCOPE–CONDITION C CORRELATION
The reconstructed scope of a moved element determines its Condition C connectivity.

This section reviews the evidence for this correlation, following primarily the presentation in Romero (1998). Importantly, we will see that the SCC provides evidence against SemR because SemR incorrectly predicts that a moved element should be able to reconstruct semantically, while not reconstructing syntactically. Because SemR amounts to the availability of generalized-quantifier traces, the SCC in turn provides evidence against their existence.

3.2.2.1 Creation verbs

Heycock (1995) observes the contrasts in (215) and (216) involving creation verbs, e.g. *invent* and *come up with*, in intensional contexts. In each example, the moved *wh*-phrase contains an R-expression coindexed with a pronoun that c–commands the launching site of movement, but only (215a) and (216a) with creation verbs are ungrammatical.[5]

(215) a. *[How many stories about **Diana**$_2$]$_1$ is **she**$_2$ likely to invent ___$_1$?
b. ✓[How many stories about **Diana**$_2$]$_1$ is **she**$_2$ really upset by ___$_1$? [Heycock 1995:558]

(216) a. *[How many lies aimed at exonerating **Clifford**$_2$]$_1$ is **he**$_2$ planning to come up with ___$_1$?
b. ✓[How many lies aimed at exonerating **Clifford**$_2$]$_1$ did **he**$_2$ claim **he**$_2$ had no knowledge of ___$_1$? [Heycock 1995:558]

The semantics of creation verbs idiosyncratically permit only the reconstructed-scope reading in (215a) and (216a). The wide-scope, nonreconstructed reading is ruled out by its pragmatic oddity. For example, consider the implausibility of the wide-scope reading of (215a), given in (217). How

[5] All of the examples in this section (§3.2.2) involving Condition C rely on contrasts between minimally different examples. The Condition C examples with a check mark (✓) are sometimes considered degraded in the literature, though never completely ungrammatical.

can someone be likely to invent a story that is presupposed to already exist? They cannot, and hence this anomalousness rules out the wide-scope reading.

(217) *Hypothetical wide-scope reading of (215a)*
#For what number n: There are n-many particular stories x about Diana such that Diane is likely to invent x. [Romero 1998:91]

The only plausible scope of *how many* in (215a) and (216a) is below the creation verb. By deduction then, the reason that (215a) and (216a) are ungrammatical is because they violate Condition C. This rationale is confirmed by the grammaticality of replacing the R-expression in the *wh*-phrase with an anaphor, thereby not violating any binding conditions (218).

(218) *Swapping the R-expression and pronoun*
a. ✓[How many stories about **herself**$_2$]$_1$ is **she**$_2$ likely to invent ___$_1$?
b. ✓[How many lies aimed at exonerating **himself**$_2$]$_1$ is **he**$_2$ planning to come up with ___$_1$?

Therefore, in these examples with creation verbs, semantic reconstruction for scope feeds Condition C connectivity, i.e. syntactic reconstruction, as predicted by the SCC. Condition C is obviated in (215b) and (216b) because the *wh*-phrase has the option of taking wide scope, thereby placing the R-expression outside the c–command domain of the offending antecedent at LF. This strategy is unavailable in (215a) and (216a) because of the idiosyncratic semantics of creation verbs; Condition C is hence necessarily violated, rendering the sentences ungrammatical.

3.2.2.2 Embedding the offending antecedent

Huang (1993) and Takano (1995) observe that the distance between the R-expression in the moved phrase and the offending antecedent appears to matter for Condition C reconstruction. When the R-expression and the offending antecedent are clausemates, the Condition C violation is "stronger" than when they are separated by a clause boundary (219).

(219) a. *Offending antecedent in the matrix clause*
*[How many pictures of **John**$_2$]$_1$ does **he**$_2$ think [that I like ___$_1$]?

b. *Offending antecedent in the embedded clause*

✓[How many pictures of **John**$_2$]$_1$ do you think [that **he**$_2$ will like ___$_1$]?

[Romero 1998:92]

Romero (1998) shows that the amelioration of Condition C provided by embedding the offending antecedent is contingent on the scope of the moved *wh*-phrase. While (219b) is indeed a grammatical string, it is only grammatical provided that the *wh*-phrase takes wide scope; the narrow-scope reading is absent. Simply embedding the offending antecedent does not in and of itself ameliorate Condition C. Rather, Condition C is ameliorated iff the *wh*-phrase containing the R-expression takes scope in a position higher than the offending antecedent, outside of its c–command domain, which is possible only when the offending antecedent is in an embedded clause.

There are two relevant test configurations where the judgements are sharper: The first configuration uses *wh*-movement over a *wh*-island boundary to force the *wh*-phrase to take wide scope (see section 2.4.2 of chapter 2) (220). The second configuration uses the quantifier *per month* to induce a rate reading, which strongly biases the *wh*-phrase towards taking narrow scope (221). When the offending antecedent is clausemates with the R-expression in the matrix clause, both configurations are ungrammatical (220)–(221).[6]

(220) *Wh-island forces wide scope*

*[How many pictures of **John**$_2$]$_1$ does **he**$_2$ wonder [whether I like ___$_1$]?

(*Intended:* For what number n: There are n-many pictures x of John such that John thinks that I like x.) [Romero 1998:92]

(221) *Rate reading forces narrow scope*

*[How many pictures of **Neil Young**$_2$]$_1$ does **he**$_2$ think [that the newspaper should publish ___$_1$ per month]?

(*Intended:* For what number n: Neil Young thinks that it should be the case that, every month, there are n-many pictures x of Neil Young such that the newspaper publishes x.)

[Romero 1998:92]

When the offending antecedent is embedded, the scope of the *wh*-phrase containing the R-expression determines whether there is a Condition C violation. In the *wh*-island configuration, where the

[6] (219a) and (220) are ungrammatical either because Condition C involves clausematehood or because they violate Condition B under a theory of binding like Reinhart and Reuland (1993). I do not take this issue up here.

wh-phrase must take wide scope, there is no Condition C violation once the offending antecedent has been embedded (222). However, in the rate-reading configuration, where the *wh*-phrase takes narrow scope, there is a Condition C violation even when the offending antecedent has been embedded (223).

(222) *Wide scope and an embedded offending antecedent*
✓[How many pictures of **John**$_2$]$_1$ do you wonder [whether **he**$_2$ will like ___$_1$]?
(*Paraphrase:* For what number *n*: There are *n*-many pictures *x* of John such that you wonder whether John will like *x*.) [Romero 1998:93]

(223) *Narrow scope and an embedded offending antecedent*
*[How many pictures of **Neil Young**$_2$]$_1$ do you think [that **he**$_2$ should publish ___$_1$ per month]?
(*Intended:* For what number *n*: You think that it should be the case that, every month, there are *n*-many pictures *x* of Neil Young such that Neil Young publishes *x*.) [Romero 1998:93]

To further emphasize this point, contrast the ungrammatical (223) with the grammatical (224), where the R-expression and the pronoun are swapped. This contrast shows that the reason why (223) is ungrammatical is that it violates Condition C.

(224) *Swapping the R-expression and pronoun*
✓[How many pictures of **himself**$_2$]$_1$ do you think [that **Neil Young**$_2$ should publish ___$_1$ per month]? [Romero 1998:93]

What these data show is that reconstruction for scope feeds Condition C connectivity. Thus, a Condition C violation ensues only when the *wh*-phrase reconstructs into a position where the offending antecedent then c–commands the R-expression at LF. Movement to a position above the offending antecedent avoids a Condition C violation if the moved element takes scope in the landing site and does not reconstruct. This strategy is possible in (219b) and (222), but impossible in (223) because the rate reading forces the *wh*-phrase to take narrow scope, from where it is c–commanded by the offending antecedent at LF. Therefore, embedding the offending antecedent does not necessarily ameliorate Condition C, pace Huang (1993) and Takano (1995). It does so only when the *wh*-phrase takes scope in a position higher than the offending antecedent, as predicted by the SCC.

3.2.2.3 Late Merge effects

Lebeaux (1990) famously observed that *wh*-movement amnesties Condition C for an R-expression in an adjunct that is attached to the moved *wh*-phrase (225a) (also van Riemsdijk and Williams 1981). This amnesty, however, does not extend to an R-expression embedded in the complement of a *wh*-phrase, which still triggers a Condition C violation (225b). This contrast is standardly called LATE MERGE EFFECTS (or "Lebeaux" effects, for something more theory-neutral) because the standard analysis is that adjuncts, but not complements, can be countercyclically late-merged onto a *wh*-phrase *after* movement has occurred. For the present purposes, the precise mechanics behind Late Merge effects are not important; though see section 3.4.2.

(225) *Late Merge effects*

a. ✓[How many pictures [$_{\text{ADJUNCT}}$ that **John**$_2$ took]]$_1$ did **he**$_2$ buy ___$_1$?

b. *[How many pictures [$_{\text{COMPLEMENT}}$ of **John**$_2$]]$_1$ did **he**$_2$ buy ___$_1$? [Romero 1998:95]

Romero (1998) observes that the amnesty of Condition C provided by Late Merge requires that the *wh*-phrase take wide scope in the landing site of movement. For example, consider (226) where *John* and *he* are coindexed and *John* is contained in an adjunct to *how many pictures.* (226) is a grammatical string because the relative-clause adjunct can be late-merged onto *how many pictures* so that the pronoun *he* never c–commands the R-expression *John* throughout the course of the derivation. However, (226) is only grammatical provided that *how many* takes wide scope (226a); the narrow-scope reading is conspicuously absent (226b).

(226) *Amnesty via Late Merge forces wide scope*

[How many pictures [$_{\text{ADJUNCT}}$ that **John**$_2$ took in Sarajevo]]$_1$ does **he**$_2$ want the editor to publish ___$_1$ in the Sunday Special?

a. *Wide-scope reading*

✓For what number *n*: There are *n*-many particular pictures *x* that John took in Sarajevo such that John wants the editor to publish *x*.

b. *Narrow-scope reading*

*For what number *n*: John wants the editors to publish in the Sunday Special (any) *n*-many pictures that John took in Sarajevo. [Romero 1998:96]

The narrow-scope reading in (226b) would require reconstructing the *wh*-phrase. Under the fairly reasonable assumption that reconstruction cannot strand adjuncts, reconstructing the *wh*-phrase entails reconstructing its adjuncts as well. By deduction, the reason that the narrow-scope reading is unavailable is because reconstructing the entire *wh*-phrase puts the R-expression back into the c–command domain of the offending antecedent, thereby triggering a Condition C violation. This is supported by the fact that when the R-expression and the pronoun are swapped, as in (227), the narrow-scope reading reappears, since reconstruction would not create a configuration violating Condition C in this case.

(227) *Swapping the R-expression and pronoun*
✓[How many pictures [$_{\text{ADJUNCT}}$ that **he**$_2$ took in Sarajevo]]$_1$ does **John**$_2$ want the editor to publish ___$_1$ in the Sunday special? [Romero 1998:96]

Therefore, Late Merge effects also support the SCC that scope reconstruction feeds Condition C connectivity.

3.2.2.4 Binding pronominal variables

Fox (1999) observes that reconstruction for pronominal variable binding also feeds Condition C connectivity, as predicted by the SCC. To illustrate, contrast the two examples in (228). In both (228a) and (228b), the *wh*-phrase reconstructs so that the pronoun *he* can be bound by the quantificational expression *every student*. Where they differ is in whether the pronoun *she*, which is coindexed with the R-expression *Ms. Brown* in the *wh*-phrase, c–commands the launching site of movement, where the *wh*-phrase crucially must reconstruct for variable binding. When the offending antecedent c–commands the launching site, reconstruction for variable binding is impossible (228a), but when it does not c–command the launching site, reconstruction is possible (228b).

(228) a. *Pronoun c–commands launching site*
*[Which of the books that *he*$_2$ asked **Ms. Brown**$_3$ for]$_1$ did **she**$_3$ give *every student*$_2$ ___$_1$?

b. *Pronoun does not c–command launching site*
✓[Which of the books that *he*$_2$ asked **Ms. Brown**$_3$ for]$_1$ did *every student*$_2$ get ___$_1$ from **her**$_2$? [Fox 1999:174]

The pattern in (228) follows directly if the *wh*-phrase is evaluated for Condition C in its reconstructed position: In (228a), reconstruction for variable binding places the R-expression *Ms. Brown* in the c–command domain of the coindexed pronoun *she*, which triggers a Condition C violation. However, in (228b), because the offending pronoun does not c–command the launching site of movement, the *wh*-phrase can reconstruct without triggering a Condition C violation. In the same manner as seen in the previous sections, (228a) can be made grammatical by swapping the R-expression and the pronoun so that reconstruction is possible without inducing a Condition C violation (229).

(229) *Swapping the R-expression and pronoun* [Fox 1999:174]
✓[Which of the books that *he*$_2$ asked **her**$_3$ for]$_1$ did **Ms. Brown**$_3$ give *every student*$_2$ ___$_1$?

Reconstruction for pronominal variable binding is a form of scope reconstruction because it requires that the bound variable be in the logical scope of its binder at LF. Therefore, the fact that reconstruction for variable binding feeds Condition C connectivity, i.e. syntactic reconstruction, supports the SCC.

3.2.2.5 Binding world variables

Not only does reconstruction for pronominal variable binding determine Condition C connectivity, reconstruction for world variable binding does as well. Sharvit (1998) observes that Condition C connectivity depends on the transparency or opacity of the moved *wh*-phrase. Crucially, it is in fact possible for a *wh*-phrase to take narrow scope with respect to an intensional operator and still avoid a Condition C violation as long as the *wh*-phrase is interpreted as *transparent* to that operator. In other words, the world variable in the *wh*-phrase must be bound by an operator higher than the intensional operator (or be a free variable), even though the *wh*-phrase takes quantificational scope below that operator.[7]

For example, in (230), *how many students* can take scope below the attitude predicate *hope*. Given the data that we have seen thus far motivating the SCC, we would not expect this to be a possible scope of *how many* because the R-expression *Anton* being coindexed with the pronoun *he* should yield a Condition C violation. Crucially, however, this narrow-scope reading is possible

[7] This is the so-called "third" reading in the *de re*/*de dicto* literature: nonspecific and transparent.

only if the *wh*-phrase is interpreted as transparent to *hope* (230a).[8] Missing is the narrow-scope opaque reading, where Anton believes that the individuals are students, but, unbeknownst to him, they are not students in the actual world (230b). A wide-scope reading of *how many students* is of course also possible, but the *wh*-phrase is then necessarily interpreted as transparent (230c).

(230) [How many students who hate **Anton**$_2$]$_1$ does **he**$_2$ hope ___$_1$ will buy him$_2$ a beer?

a. *Narrow scope, transparent*
✓For what number n: In all of Anton's bouletic alternatives w', there are n-many x that are students who hate Anton in the actual world and that will buy him a beer in w'.

b. *Narrow scope, opaque*
*For what number n: In all of Anton's bouletic alternatives w', there are n-many x that are students who hate Anton in w' and that will buy him a beer in w'.

c. *Wide scope, transparent*
✓For what number n: There are n-many x that are students who hate Anton in the actual world and in all of Anton's bouletic alternatives w', x will buy him a beer in w'.

[Sharvit 1998]

In all the examples considered thus far, the narrow-scope reading has been assumed to be an opaque reading because this is the most natural interpretation. However, (230) shows that quantificational scope and intensionality can be teased apart in the right circumstances, and then it is intensionality that dictates Condition C connectivity. The opaque reading in (230b) is derived by reconstructing the entire *wh*-phrase below the intensional operator, as schematized in (231). Thus, the R-expression *Anton* will be c–commanded by the coindexed pronoun *he*, triggering a Condition C violation.

(231) *LF of the narrow-scope opaque reading*
*[**he**$_1$ hope$_{w'}$ [$_{\text{CP}}$ … [how many students$_{w'}$ who hate **Anton**$_1$] …]]

[8] This raises the question of whether any other examples that Romero (1998) gives as ungrammatical are in fact grammatical if the NP is interpreted transparently; see Romero (1998:100, fn. 21). I can only report preliminary findings here. The relevant configuration is the Late Merge examples in section 3.2.2.3. Like (230), these examples involve relative clauses, which can be late-merged (note that the examples in section 3.2.2.4 have relative clauses, but not modal operators). My judgement is that (226) does have a grammatical narrow-scope, transparent reading in a scenario like the following: John is holding a stack of 100 photos in his hands and wants the editor to publish 50 of them, but unbeknownst to him, these are his own pictures from Sarajevo. I leave this topic for future research; though for some preliminary exploration, see Keine and Poole (forthcoming).

On the other hand, a transparent reading is derived by leaving the NP content above the intensional operator so that its world variable is not bound by that operator.[9] In particular, the narrow-scope transparent reading is derived by reconstructing *how many* while leaving the rest of the *wh*-phrase above the intensional operator. Romero (1998) proposes that this "split" reconstruction is possible because *how many NP* is equivalent to *how many of the NP* such that *the NP* can scope separately from *how many*. Therefore, to derive the reading in (230a), the *wh*-phrase reconstructs, but then *the students who hate Anton* QRs to a position above *hope*, as schematized in (232).[10] The result is that (i) the *wh*-phrase is interpreted as transparent to *hope*, (ii) *how many* takes quantificational scope below *hope*, and (iii) *Anton* is outside the c–command domain of *he*, avoiding a Condition C violation. Crucially, this split reconstruction is not available if the world variable needs to be bound by the intensional operator in order to derive an opaque reading.

(232) *LF of the narrow-scope transparent reading*
✓[[the students$_{w_0}$ who hate **Anton**$_1$] λx [**he**$_1$ hope$_{w'}$ [$_{\text{CP}}$ . . . [how many of x] . . .]]]

In sum, parallel to pronominal variable binding, reconstruction for world variable binding feeds Condition C connectivity, i.e. syntactic reconstruction, as predicted by the SCC.

3.2.2.6 Section summary

This section has reviewed five pieces of evidence in support of the Scope–Condition C Correlation (SCC) that scope reconstruction feeds binding reconstruction. Crucially, the SCC allows us to differentiate SynR and SemR empirically. The core insight of the SCC is that scope and Condition C are read off the same structure. If a moved DP takes scope in the launching site of movement (233a)—i.e. if it reconstructs—, then it is also evaluated for Condition C in the launching site (233b).

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9 More accurately, a transparent reading *can* be derived with this derivation precisely because the world variable is not bound by the intensional operator. The same reading can still be derived by reconstructing the entire *wh*-phrase below the intensional operator, but then Condition C will also be evaluated for the entire *wh*-phrase in this position. Therefore, in the case of (230a), this derivation would be ungrammatical.

10 A similar structure is proposed in Heycock (1995:565) for degree questions. It would also be relatively straightforward to execute in the Neglect theory of Sportiche (2015).

(233) a. *Structure that scope sees*

[$\underset{}{\checkmark}$ ...]:

[___$_1$ ... [Op ... [pronoun$_2$ [... ✓___$_1$ ...]]]]

b. *Structure that Condition C sees*

*[___$_1$ ... [Op ... [**pronoun**$_2$ [... [$_{\text{DP}}$ ... **R-expression**$_2$ ...]$_1$ ...]]]]

In the same vein, if a moved DP takes scope in the landing site of movement (234a), then it is also evaluated for Condition C in the landing site (234b).

(234) a. *Structure that scope sees*

[✓___$_1$ ... [Op ... [pronoun$_2$ [... ___$_1$ ...]]]]

b. *Structure that Condition C sees*

✓[[$_{\text{DP}}$ ... **R-expression**$_2$ ...]$_1$ ... [Op ... [**pronoun**$_2$ [... ___$_1$ ...]]]]

Let us consider how SynR and SemR fare with respect to the SCC. According to SynR, syntactic and semantic reconstruction are one and the same such that a moved element that reconstructs semantically also reconstructs syntactically. As schematized in (235), when the moved DP contains an R-expression, any coindexed DP that c–commands the launching site will then trigger a Condition C violation because the syntactic material of the moved DP is present in the reconstructed position. Therefore, the SCC follows under SynR without further ado.

(235) *Correct prediction of SynR (should be ungrammatical)*

*[~~[DP ... R-exp2 ...]1~~ ... [Op ... [**pronoun**$_2$ ... [$_{\text{DP}}$ ... **R-exp**$_2$ ...]$_1$ ...]]]

reconstruct

On the other hand, according to SemR, semantic reconstruct does *not* entail syntactic reconstruction. SemR thus predicts that a moved element should be able to reconstruct semantically, while not reconstructing syntactically, a prediction falsified by the SCC (236).

(236) *Incorrect prediction of SemR (should be ungrammatical)*

✓[[$_{\text{DP}}$ ... **R-expression**$_2$ ...]$_1$ $\lambda\mathcal{Q}_{\langle et,t\rangle}$ ... [Op ... [**pronoun**$_2$ ... $\mathcal{Q}_{\langle et,t\rangle}$ ...]]]

The correlation between semantic and syntactic reconstruction is unpredicted under SemR. There is no way to derive the correlation under SemR other than stipulating it; see Romero (1998:108–114) for discussion. Thus, following Romero (1998) and Fox (1999), I take the SCC as discrediting SemR and supporting SynR as the correct theory of scope reconstruction.[11] Importantly, because SemR amounts to the existence of generalized-quantifier traces, the SCC in turn shows that generalized-quantifier traces do not exist.

3.2.3 Putting together the pieces

This section has argued that there are no generalized-quantifier traces (237b). The evidence came from the correlation between scope reconstruction and binding reconstruction, as discovered by Romero (1998) and Fox (1999), a correlation which generalized-quantifier traces are unable to predict. This prohibition on generalized-quantifier traces is complemented by the generalization from chapter 2 that there are no property traces (237a).

(237) a. *No property traces*

$$^{*}[\ \mathrm{DP}_1\ \lambda f_{\langle e,t\rangle}\ \ldots [\ \ldots [\ f_{\langle e,t\rangle}\ ]_1 \ldots]\,]$$

b. *No generalized-quantifier traces*

$$^{*}[\ \mathrm{DP}_1\ \lambda f_{\langle et,t\rangle}\ \ldots [\ \ldots [\ f_{\langle et,t\rangle}\ ]_1 \ldots]\,]$$

While property and generalized-quantifier traces are prohibited, simple traces over entities are of course allowed, as this is how scope-shifted readings of movement are derived. In sum, of the possible denotations for DPs, the only possible trace that movement can map onto ranges over the simple individual type e. The overarching generalization to emerge is that even though natural language has expressions over higher types, these expressions cannot be represented as traces.

[11] For some discussion of Lechner (1998), who argues that we need both SynR and SemR, see section 5.4.5 of chapter 5.

I call this constraint the Trace Interpretation Constraint (TIC), given in (238) (see also Chierchia 1984; Landman 2006).[12]

(238) **Trace Interpretation Constraint**
$^*[\ \mathrm{DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots\ ]\ ]$, where σ is not an individual type
(i.e. traces must be individual types)

Though the argumentation has focused on the entity domain, and will continue to do so for the most part, the TIC is formulated more generally to include all individual types.[13] For instance, it predicts that movement can map onto a degree trace of type d, but not $\langle d, t\rangle$ or $\langle d, \langle e, t\rangle\rangle$, etc. As far as I know, this prediction holds for the various theories of degree constructions currently on the market (e.g. Heim 1985, 2001; Bhatt and Pancheva 2007).

The remainder of this chapter is devoted to exploring the ramifications of the TIC for the grammar more broadly. Section 3.3 develops a syntax and semantics for movement centered around addressing the dichotomy between movement leaving a trace and reconstructing. In section 3.4, I apply this system to a host of reconstruction phenomena and show that it explains them without further stipulation. Before proceeding, however, the last part of this section provides additional empirical arguments against higher-type traces that bolster the empirical base of the TIC.

3.2.4 More arguments against higher-type traces

This section provides three additional arguments against the existence of higher-type traces, in particular generalized-quantifier (GQ) traces. Each argument follows the same logic: there is some fact for which a type-e trace has been proposed, crucially for purposes unrelated to scope, and if this trace were a higher semantic type, the original purpose of the trace would remain fulfilled, but the wrong scope would ensue.

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[12] Chierchia (1984) and Landman (2006) propose similar constraints to the TIC, except on possible *variables*, not *traces*. We will see in chapter 4 that there is reason to believe traces are more than just variables; rather, they are anaphoric definite descriptions. For discussion of their proposals and a comparison with the TIC, see section 5.2 of chapter 5.

[13] An alternative, which Landman (2006) advocates for, is to treat the different individual types as sorts on a general semantic type. However, a semantics with different individual types (type theory) can trivially be recast as a semantics with one type that is sorted (first-order many-sorted theory) and vice versa, so I do not see how to tease these apart.

3.2.4.1 Antecedent Contained Deletion

The first argument concerns Antecedent Contained Deletion (ACD). It is standardly assumed that ellipsis is resolved in ACD configurations by moving the object covertly to a VP-external position (Sag 1976; Larson and May 1990; Fox 2002). The resulting representation satisfies the parallelism requirement on ellipsis and avoids the infinite-regress problem (239).

(239) *ACD derivation*

$$[\ \text{Subj}\ [\ \lambda_1\ \underbrace{[_{\text{VP}}\ \text{V}\ t_1]}_{\text{antecedent VP}}\ ]\ [_{\text{DP}}\ \text{NP}\ [_{\text{RC}}\ \lambda_2 \dots \underbrace{\langle \text{V}\ t_2 \rangle}_{\text{elided VP}}\ ]\ ]_1\ ]$$

This analysis is independently motivated by the observation in Sag (1976) and Larson and May (1990) that the object in ACD configurations obligatorily takes scope above the VP. To illustrate, consider the paradigm in (240). In the baseline sentence in (240a), *every painting that Sakshi painted* can scope above or below the intensional verb *want*. On the narrow-scope reading, Katia is an admirer of Sakshi's and has the *de dicto* desire to own any painting that Sakshi has painted. On the wide-scope reading, Katia wants a certain set of paintings, which happen to all be painted by Sakshi, possibly unbeknownst to Katia. The equivalent narrow-scope reading disappears in the ACD example in (240b). Only a wide-scope reading survives, where Katia wants a certain set of paintings, all of which Sakshi also wants. In the absence of ellipsis, the narrow-scope reading reappears. Thus, (240c) has a reading where Katia has the *de dicto* desire to have any painting that Sakshi also wants.

(240) *ACD forces scope shifting*

a. *Baseline*
Katia wanted every painting that Sakshi painted. ✓want ≫ every; ✓every ≫ want

b. *ACD*
Katia wanted every painting that Sakshi did Δ. *want ≫ every; ✓every ≫ want

c. *No ellipsis*
Katia wanted every painting that Sakshi wanted. ✓want ≫ every; ✓every ≫ want

This scope pattern follows if the movement of the object to a VP-external position leaves a trace of type *e*, i.e. is QR. Thus, covert movement of the object leaving a type-*e* trace not only creates a suitable antecedent for ellipsis, it also makes a nontrivial, correct prediction about the scope of the object. Now, consider if the covert movement step instead mapped onto a GQ-trace. As schematized in (241), a GQ-trace would still provide a suitable antecedent for ellipsis—assuming that the movement in the relative clause could also leave a GQ-trace, a possibility that one admitting GQ-traces into the grammar is forced to contend with.

(241) *ACD derivation with GQ-traces*

$$[\text{ Subj } [\ \lambda_1\ \underbrace{[_{\text{VP}}\ \text{V T}_1]}_{\text{antecedent VP}}\ ]\ [_{\text{DP}}\ \text{DP } [_{\text{RC}}\ \lambda_2 \ldots \underbrace{\langle \text{V T}_2 \rangle}_{\text{elided VP}}\ ]\ ]_1\ ]$$

However, a GQ-trace would not derive the scope pattern in (240). Crucially, QR is not done in ACD configurations in order to give the object a certain scope; this can be done without ACD, as illustrated by (240c). Rather, QR is done to provide a suitable antecedent for ellipsis, for which at least type-e and type-$\langle et, t \rangle$ traces would suffice. If the only possible trace that movement can map onto is type e, in accordance with the Trace Interpretation Constraint (TIC), the scope facts in (240) follow directly. On the other hand, if there are higher-type traces, then they would have to be blocked in ACD.

3.2.4.2 Extraposition

The second argument concerns extraposition and is thus related to the ACD argument under Fox's (2002) proposal that ACD involves extraposition. Williams (1974) observes that extraposition of an adjunct from a DP forces that DP to take scope at least as high as the extraposition site. Fox and Nissenbaum (1999) call this Williams's Generalization.[14] To illustrate, first consider the baseline sentence in (242), which has two readings. On the first reading, I have read all the books in some certain set before you read them. You may have read some of the individual books first, but I finished the full set of books first. On the second reading, for each book, I read that book before you read it. This scope ambiguity correlates with the position of *every book*. The first reading results from *every book* being contained in the antecedent for ellipsis, i.e. below *before*. The second

[14] Bhatt and Pancheva (2007) also show that Williams's Generalization holds for degree adjuncts.

reading results from *every book* having moved above the ellipsis site and binding variables in both the antecedent and elided VPs, i.e. above *before*.

(242) I read every book [before you did Δ]. [Fox 2002:72]

The sentence in (243a) without extraposition is ambiguous in the same way as (242). However, the sentence in (243b), where the relative clause has been extraposed, is not ambiguous. It only has the second reading from (242), where *every book* takes scope above *before*.

(243) a. I read every book **that John had recommended** [before you did Δ].
b. I read every book [before you did Δ] **that John had recommended**. [Fox 2002:72]

Fox and Nissenbaum (1999) propose that extraposition involves a derivation where the adjunct late-merges to the host DP after it has undergone covert movement to the extraposition site. This movement leaves a trace of type *e*, i.e. is QR, thereby accounting for Williams's Generalization. Again, consider if the covert movement step instead mapped onto a GQ-trace. A GQ-trace would still allow for a Late Merge analysis of extraposition, but it would not derive Williams's Generalization. Although the reason that an adjunct extraposes is somewhat mysterious, it is presumably not done to give the host DP a certain scope, which can be achieved without extraposition, as illustrated by (243a). If the only possible trace that movement can map onto is type *e*, in accordance with the TIC, the scope facts in (243) follow directly.[15] On the other hand, if there are higher-type traces, then they would have to be blocked in extraposition.

3.2.4.3 Parasitic gaps

The third argument concerns parasitic gaps. Following Nissenbaum (2000), a parasitic gap is derived by a null operator moving from the parasitic gap position to the edge of the adjunct clause, the result of which is a λ-abstraction that binds a variable located in the gap position (244). This predicate then conjoins with the λ-abstraction created by $\overline{\text{A}}$-movement.

[15] Assuming that adjuncts are a higher semantic type, the TIC also blocks whatever type of trace would be required to move just the adjunct, perhaps independently forcing Fox and Nissenbaum's (1999) Late Merge analysis.

(244) *Derivation of a parasitic-gap construction*

$[\ \mathrm{Op}_1\ [\ \ldots\ t_1\ \ldots\ ]\ ] \rightsquigarrow_{\mathrm{LF}} [\ \lambda x\ [\ \ldots\ x\ \ldots\ ]\ ]$ [Nissenbaum 2000]

If the trace forming a parasitic-gap construction could be a GQ-trace, it would be possible for a moved quantificational expression to take scope inside the adjunct clause. This prediction is somewhat difficult to test given independent constraints on where parasitic gaps can appear, but consider the sentence in (245). To the extent that (245) is acceptable, *how many people* cannot take scope below *want*. This hypothetical reading can be paraphrased as follows: what is the number *n* such that there are *n*-many people that John blackmailed because in all of his doxastic alternatives, there are *n*-many people that John extorts for money. Such a reading might be used, e.g., in a scenario where John is blackmailing people in order to extort their spouses.

(245) *Scope in parasitic-gap constructions* ✓how many ≫ want; *want ≫ how many

?[**How many people**]$_1$ did John blackmail ___$_1$
[because he wanted to extort *pg* for money]?

The lack of this reading follows directly if the movement in a parasitic-gap construction must leave a type-*e* trace because no other type is available, as per the TIC. On the other hand, if there are higher-type traces, then they would have to be blocked in parasitic-gap constructions.

The crux of these arguments is that a grammar with higher-type traces would have to restrict their distribution in an ad hoc manner. However, according to the Trace Interpretation Constraint, the scope facts in ACD, extraposition, and parasitic gaps follow because if movement must be used to achieve some means, the only trace available to that movement ranges over an individual type.

3.3 Traces vs. reconstruction

The view to emerge from the Trace Interpretation Constraint (TIC) is that movement only has two possible semantic representations: mapping onto an individual-type trace (246) or reconstructing (247). All other representations are ill-formed.

(246) *Mapping onto a trace*

$$[\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_1 \ldots]\ ]$$

(247) *Reconstruction*

$$[\ \underline{\quad}_1 \ldots [\ \ldots [\ \mathrm{DP}\ ]_1 \ldots]\ ]$$

reconstruct

Against this backdrop, this section develops a syntax and semantics of movement where the choice between (246) and (247) is not free, but *deterministic.*[16] Thus, a given movement derivation maps onto one and only one semantic representation. For reasons that will be clear shortly, I call this system the DP/QP-MOVEMENT SYSTEM. I start in section 3.3.1 by sketching a copy-theoretic version of the proposal, which is intended to lower the barrier of entry to the full multidominant version and illustrate the main ideas. We will see that the copy-theoretic version is unable to generate some of the syntactic structures required, which will drive us towards multidominance. The multidominant implementation is developed across sections 3.3.2–3.3.7. Section 3.3.8 ends by discussing the typology of movement both within English and crosslinguistically that the DP/QP-movement system predicts.

3.3.1 A copy-theoretic sketch of the proposal

The core proposal is that the syntactic and semantic behavior of a movement step depends entirely on the identity of the moving element. Limiting ourselves to the entity domain, I will focus on the contrast between moving a DP and moving a QP (i.e. question-particle phrase; Cable 2007, 2010).[17] Under the proposal, these are the two types of phrases that allow entity-denoting expressions to be displaced at PF or LF. For shorthand, I will refer to them as DP-MOVEMENT and QP-MOVEMENT, but they should be understood as movement of DPs and QPs respectively and not as primitives in

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[16] This section is an exposé of using multidominance to solve a new problem. I thank Kyle Johnson for the many meetings spent discussing the ideas here and apologize if they are clumsily executed.

[17] QP should not be confused with quantifier phrase.

any sense.[18] The properties of some other phrase types under movement—namely VPs, APs, and DegPs—will be discussed in section 3.4.4.

Moving a DP maps onto a λ-abstraction that binds a variable of type *e*, i.e. an entity trace (248). In particular, DP-movement is interpreted via Trace Conversion, wherein the lower copy of movement is converted into an anaphoric definite description (Engdahl 1980, 1986; Sauerland 1998, 2004; Fox 1999, 2002, 2003). Thus, the λ-bound variable is a subpart of the definite description; it translates into an identity function (249), which composes with the NP via conjunction.

(248) *Movement of a DP*

$$[\ \mathrm{DP}_1 \ldots [\ \ldots \mathrm{DP}_1 \ldots]\ ] \rightsquigarrow_{\mathrm{LF}} [\ [_{\mathrm{DP}}\ \mathrm{D\ NP}\ ]_1\ \lambda x_e \ldots [\ \ldots \underbrace{[_{\mathrm{DP}}\ \text{the}\ \textsc{id}\text{-}x\ \mathrm{NP}\ ]_1}_{\text{Trace Conversion}} \ldots]\ ]$$

(249) *Identity function*

$$[\![\textsc{id}\text{-}x]\!] = \lambda y_e\ .\ y = x$$

Moving a QP results in reconstruction of everything except the Q^0 head (250). The interpretation of QP-movement follows from the semantics of the Q^0 head. It only composes with proposition-denoting expressions, and therefore it cannot semantically compose with its own complement, thereby forcing the two to disassociate at LF. This process is equivalent to Kotek's (2014) Q-fission.

(250) *Movement of a QP*

$$[\ [_{\mathrm{QP}}\ \mathrm{Q\ XP}\ ]_1 \ldots [\ \ldots [_{\mathrm{QP}}\ \mathrm{Q\ XP}\ ]_1 \ldots]\ ] \rightsquigarrow_{\mathrm{LF}} [\ \underbrace{[_{\mathrm{QP}}\ \mathbf{Q}\ \cancel{\mathrm{XP}}\ ]_1}_{\text{Interpret Q}} \ldots [\ \ldots \underbrace{[_{\mathrm{QP}}\ \cancel{\mathrm{Q}}\ \mathbf{XP}\ ]_1}_{\text{Interpet XP}} \ldots]\ ]$$

Therefore, movement that shifts scope is movement of a DP and movement that reconstructs is movement of a QP. Interesting interactions emerge when DP-movement and QP-movement are chained together. I will argue that while QP-movement can *follow* DP-movement, it cannot *precede* DP-movement. For now, we must take as assumptions that the derivation in (251a) is grammatical, while the derivation in (251b) is ungrammatical. In the multidominant implementation, these will not have to be taken as assumptions. Crucially, (251a) is the important structure that cannot be generated under a copy-theoretic approach to movement.

[18] DP-movement should not be confused with NP-movement in the sense of van Riemsdijk and Williams (1981).

(251) a. *QP-movement following DP-movement*

QP-mvt Build QP

✓[[$_{QP}$ Q DP$_1$]$_2$ … [[$_{QP}$ Q DP$_1$]$_2$ … [… DP$_1$ …]]]

DP-mvt

b. *DP-movement following QP-movement*

DP-mvt

*[DP$_1$ … [[$_{QP}$ Q DP$_1$]$_2$ … [… [$_{QP}$ Q DP$_1$]$_2$ …]]]

QP-mvt

Under the DP/QP-movement system, DP-movement is semantically equivalent to QR. The difference between the two is that DP-movement may manifest overtly, a difference that I will attribute to linearization. Thus, drawing this connection to QR, whether a movement chain shifts scope reduces to whether it invokes an initial step of QR, i.e. DP-movement.

This proposal therefore allows different movement types to be stated in terms of different sequences of DP- and QP-movement. To illustrate, consider *wh*-movement and topicalization. Sections 2.4.1 and 2.4.2 showed that *wh*-movement can optionally shift the scope of the moved DP, while topicalization must do so obligatorily. According to my proposal, these scope facts reflect different syntactic derivations. *Wh*-movement has two possible derivations: one with DP-movement followed by QP-movement (252a) and one with only a step of QP-movement (252b). Only when the derivation includes DP-movement is the scope of the *wh*-phrase shifted; otherwise, it takes scope in situ.

(252) *Two derivations for wh-movement*

a. *QP-movement following DP-movement* *wh*-phrase ≫ Op

QP-mvt Build QP

[$_{CP}$ [$_{QP}$ ***wh***$_1$]$_2$ C^0_Q … [[$_{QP}$ ***wh***$_1$]$_2$ … [Op … [… ***wh*** …]]]]]

DP-mvt

b. *Just QP-movement* Op ≫ *wh*-phrase

[$_{CP}$ [$_{QP}$ ***wh***]$_1$ C^0_Q … [Op … [… [$_{QP}$ ***wh***]$_1$ …]]]]

QP-mvt

Topicalization, on the other hand, only has a derivation involving DP-movement (253). Therefore, it obligatorily shifts the scope of the moved DP.

(253) *Derivation of topicalization*

$[_{\text{TopicP}}$ $\mathbf{DP}_1$ Topic^0 ... [Op ... [... $\mathbf{DP}_1$ ...]]] DP $\gg$ Op

DP-mvt

The difference between the derivations for *wh*-movement and topicalization ultimately reduces to the category targeted by the final movement step. Following contemporary Minimalist syntax, I assume that it is a probe that drives the movement. *Wh*-movement is driven by a probe targeting a QP (254a), while topicalization is driven by a probe targeting a DP (254b).[19] Because a QP shell can be constructed on top of a moved DP, the *wh*-movement probe is oblivious to whether the *wh*-phrase has undergone prior DP-movement. It can happen or it can not happen; the *wh*-probe will only see the QP. The topicalization probe is likewise blind to whether the DP that it targets has undergone prior DP-movement. Notwithstanding, the step of DP-movement that the topicalization probe itself triggers will render any intermediate steps of DP-movement superfluous because the DP will take scope in the landing site of topicalization regardless, by virtue of being DP-movement.

(254) a. *Wh-movement probe*
C^0_Q: [•Q•]

b. *Topicalization probe*
Topic^0: [•D•]

Accordingly, the "*wh*-movement" and "topicalization" parts of the movement derivation really only constitute the final movement step that the relevant probe triggers. DP-movement—what is essentially QR—can freely occur before that final movement step takes place. We will see in section 3.4 that this optional step of DP-movement is linked to a number of reconstruction phenomena. In sum, under this proposal, different movement types do not constitute different primitives, but rather amount to distinct syntactic derivations, which in turn are caused by movement-driving probes targeting different phrase types.

The following four sections flesh out the details of the proposal sketched here. Section 3.3.2 introduces Johnson's (2012, 2014) parallel-Merge multidominant syntax that the proposal is implemented in. Section 3.3.3 demonstrates how these multidominant structures can be linearized.

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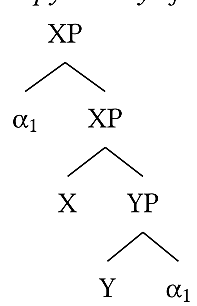
19 A bullet feature [•X•] is satisfied by merging a projection of X. The notation comes from Heck and Müller (2007).

In sections 3.3.4 and 3.3.5 respectively, I work through QP-movement and DP-movement in detail. Section 3.3.6 discusses chaining together individual instances of QP-movement and DP-movement, including which combinations are possible and which are not. Section 3.3.7 discusses crossclausal movement. In section 3.3.8, I then discuss how these pieces account for different movement types within and across languages.

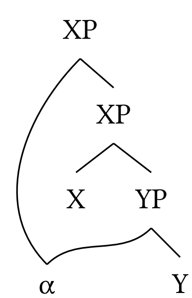
3.3.2 Building structures with Parallel-Merge

As background, I will assume familiarity with the Copy Theory of Movement (CTM), wherein a trace is a copy of the moved element (Chomsky 1993, 1995b). An established challenge for the CTM is how to deal with copy identity. For copies to do even the minimal amount of work necessary requires that two conditions be met: (i) exactly one copy of an element must be pronounced at PF and (ii) at least one copy of an element must be interpreted at LF. The problem is that satisfying these conditions requires knowing whether a syntactic object is a copy of another syntactic object—and the Copy Theory of Movement does not give copy identity. Existing analyses of how to satisfy these two conditions are forced to concede copy identity as a stipulation (e.g. Nunes 2004 for PF and Sportiche 2015 for LF). One prevalent response to this problem, which I will pursue here, is that instead of merging copies (255a), movement is really merging a single syntactic object in multiple syntactic positions (255b).[20] This approach is called multidominance.[21]

(255) a. *Copy Theory of Movement*



b. *Multidominance*



[20] For ease of presentation, the order of heads, complements, and specifiers in multidominant graphs will be depicted in whichever order is convenient. It should not be read as implying a particular linearization.

[21] See Engdahl (1986); Gärtner (1997, 2002); Nunes (2001); Starke (2001); Zhang (2004); Frampton (2004); Citko (2005); van Riemsdijk (2006); Bachrach and Katzir (2009); de Vries (2009); Johnson (2012, 2014); amongst many others.

Displacement in both theories is the surface manifestation of linearization forcing an element to phonologically appear in only one of its syntactic positions (Nunes 2004). The difference between the CTM and multidominance is that in multidominance, identity is simple selfhood. Therefore, in (255b), the grammar does not have to do or know anything special to determine that α in [Comp, YP] and α in [Spec, XP] are instantiations of the same syntactic object because they *are* the same syntactic object. The same ease cannot be said of (255a). The CTM requires keeping some record of a syntactic object and its copies, which would violate Inclusiveness.

Multidominant structures are built using a version of Internal MERGE like (256), commonly referred to as "re-MERGE".

(256) *Internal MERGE as re-MERGE*
MERGE$(\alpha, \gamma) = \{\alpha, \gamma\}$, where $\gamma \subseteq \alpha$

There are two problems with the formulation of MERGE in (256), which will lead us to adopt a more nuanced version of multidominance. First, it violates the EXTENSION CONDITION, as formulated in (257), according to which the arguments to MERGE must be root nodes. The Extension Condition derives the cyclicity of structure building in the syntax: MERGE always extends the structure.[22] In (256), γ is by definition not a root node because it is a subpart of α.

(257) **EXTENSION CONDITION**
MERGE is only defined for root nodes.

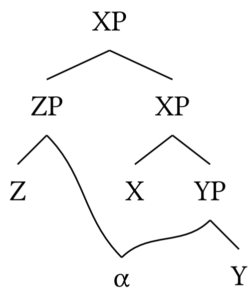
Second, the re-MERGE theory requires two separate versions of MERGE: one version that only applies to root nodes (External MERGE) and another version that applies to a root node and one of its subparts (256) (Internal MERGE).

Johnson (2012, 2014) proposes a solution to these problems of the re-MERGE theory. Instead of multidominant structures like (255b), the multidominant structures are actually like (258). There are four things to observe about (258): (i) α is merged with *two separate heads* Y^0 and Z^0, (ii) Y^0 and Z^0 project their own YP and ZP respectively, (iii) YP is merged in the structure as normal,

[22] An avenue that one could pursue is to relax the Extension Condition such that only one of MERGE's arguments needs to be a root node, but this would entail that MERGE is an asymmetric relation. This is an undesirable concession if MERGE is to be a simple operation, as assumed in the Minimalist Program.

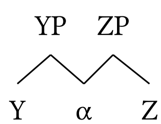
and (iv) ZP is merged in the "landing site" of movement. The result is that α still exists in two syntactic positions, but the violation of the Extension Condition in (255b) is circumvented by using ZP as a "shell". Consequently, in (258), all instances of Merge involve only root nodes. There is no violation of the Extension Condition, and only one version of Merge is needed.

(258) *Johnson's (2012, 2014) multidominant syntax*



The technical machinery needed to build structures like (258) is Parallel-Merge (Citko 2005). The basic idea behind parallel-Merge is that applications of Merge can happen *simultaneously* to create structures like (259) with two separate root nodes sharing a subpart.[23]

(259) *Parallel-Merge*



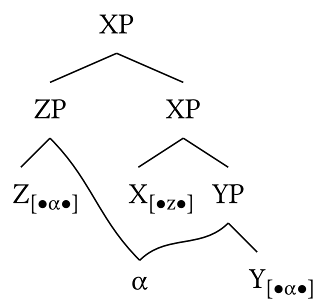
After the structure in (259) has been constructed, the YP merges with X^0 to form XP and finally ZP merges with this XP, resulting in (258). Again, because of parallel-Merge, all instances of Merge in this derivation involve only root nodes, thereby satisfying the Extension Condition. One of the important questions thus becomes the identity of the shell ZP in different movement types. In sections 3.3.4 and 3.3.5, I will extend on Johnson's (2012, 2014) proposal that QP and DP are two such shell projections that facilitate movement dependencies.

Johnson (2012, 2014) is not explicit about what motivates the creation of a movement dependency, i.e. invoking parallel-Merge. Following standard assumptions in minimalist syntax, I assume that movement is (abstractly) motivated by features. To distinguish movement-driving probes, I make

[23] There are other ways of conceiving of parallel Merge, such as van Riemsdijk's (2006) grafting, but I do not discuss them here because it would take us too far afield. The precise mechanics of how to arrive at the structure in (259) is not crucial to our purposes here.

use of the "bullet" and "star" notation for features (Heck and Müller 2007). Bullet features are structure-building features which trigger MERGE (potentially after AGREE); they are notated as [•F•]. Star features are pure-agreement features which are satisfied by AGREE alone and do not invoke movement; they are notated as [⋆F⋆]. For example, in the structure in (258), the creation of the movement dependency is driven by a [•z•]-feature on X (following Bare Phrase Structure, XP *is* X), which the ZP satisfies by merging in its specifier, and α is shared by Z and Y, thereby satisfying their individual [•α•]-features. This is schematized in (260).

(260) *Bullet features drive "movement"*



For the sake of simplicity, I will continue to use nonmultidominance vocabulary like "launching site" and "landing site", even though there is no movement per se in multidominance.

Over the course of this chapter, we will see that the parallel-MERGE multidominant syntax when paired with an explicit semantics provides two novel benefits: First, it allows us to develop a deterministic syntax–semantics mapping for movement. Under this system, whether a movement dependency maps onto a trace or reconstructs depends solely on the syntactic derivation underlying the dependency, rather than being a free choice made at LF. As a consequence, the Trace Interpretation Constraint (TIC) can be baked into the system while not affecting reconstruction. Second, different movement types can be stated in terms of different syntactic derivations. This will narrow down the range of answers to and make predictions about why some movement types cannot reconstruct. I will show that these benefits are not available under the CTM without permitting pervasive countercyclicity. At the same time, the parallel-MERGE syntax, in particular the importance it places on the Extension Condition, will limit the range of possible movement derivations, and thus movement types, in novel—and I will argue, correct—ways.

3.3.3 Linearizing multidominant structures

This section sketches an algorithm for linearizing the parallel-MERGE multidominant structures introduced in the previous section. The algorithm was developed in Johnson (2016), though I have made minor improvements to some of the formulations. This section is intended as a proof of concept to show that linearizing multidominant structures is in principle possible, though what is presented here may not necessarily be the exact algorithm. Nonetheless, I will assume this algorithm throughout the remainder of the chapter for the sake of concreteness.

The linearization algorithm generates a set of possible orderings of the VOCABULARY ITEMS in a given structure, e.g. $x < y$ or $y < x$. This set of orderings is then submitted to a series of constraints that rule out illicit orderings. To accommodate multidominance, these constraints make reference to the notion of a PATH: a set of nodes between some node α and the root node in the structure. There are two preliminary components to the linearization algorithm: First, when a structure is to be linearized, the algorithm picks out a set of paths Π for the vocabulary items in the structure (261a). For the sake of simplicity, I will treat the vocabulary items as being the terminal nodes. Second, the constraints make use of the relation d, which maps a phrase p onto the set of vocabulary items containing p in their path (261b)–(261c). In other words, the d-relation returns the terminal nodes that a phrase dominates given a particular set of paths.

(261) Let Σ be a structure, W be the set of vocabulary items w in Σ, and P be the set of phrases p in Σ.

a. $\Pi(\Sigma)$ is a set of paths formed from members of W.

b. $d(p) = \{w \mid w \in \text{W} \land \exists\pi \in \Pi[p \in \pi(w)]\}$

c. $d(w) = w$

The set of orderings that the linearization algorithm generates must satisfy three constraints: TOTALITY ensures that every vocabulary item in the structure has a path in Π (262). ANTISYMMETRY prohibits the linearization from containing any contradictions (263). Finally, CONTIGUITY guarantees (i) that every path is represented in the linearization and (ii) that a path is linearized uniformly with respect to other elements *not* in that path (264).

(262) **Totality**
For every $w \in W$, $\Pi(\Sigma)$ must contain a $\pi(w)$.

(263) **Antisymmetry**
A linearization cannot have both $x < y$ and $y < x$.

(264) **Contiguity**
Every $\pi \in \Pi(\Sigma)$ must be a path in which for every $p \in \pi$ that has a daughter $p' \notin \pi$, then the linearization contains ordering such that one of the following is true:

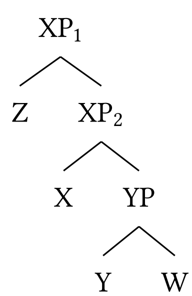
a. $\forall x, y\,[(x \in d(p) - d(p') \wedge y \in d(p')) \rightarrow x < y]$

b. $\forall x, y\,[(x \in d(p) - d(p') \wedge y \in d(p')) \rightarrow y < x]$

The choice between (264a) and (264b)—what is essentially headedness—is a language-specific preference. There is further room in the algorithm for other language-specific preferences to affect the linearization, namely via the selection of path when a vocabulary item has multiple possible paths, i.e. is multidominated, as will be illustrated below shortly.

To illustrate how the path-based linearization algorithm works, let us start by examining how the simple non-multidominant structure in (265) is linearized. Because the structure does not invoke multidominance, there are only two possible linearizations, based on headedness.

(265)



First, consider the largest possible set of paths Π that satisfies Totality, given in (266). It contains a path for each vocabulary item. Every vocabulary item only has one possible path in (265) because there is no multidominance. Therefore, (266) is the only possible Π for the structure in (265).

(266) *Set of paths Π for (265)*

a. $\pi(Y) = \{YP, XP_2, XP_1\}$

b. $\pi(W) = \{YP, XP_2, XP_1\}$

c. $\pi(X) = \{XP_2, XP_1\}$

d. $\pi(\mathrm{Z}) = \{\mathrm{XP}_1\}$

Second, based on the set of paths Π in (266), the *d*-relations are calculated in (267). Only the *d*-relations for phrases are shown, given that the *d*-relation of a vocabulary item is trivially itself.

(267) *d-relations for (266)*

a. $d(\mathrm{XP}_1) = \{\mathrm{Z}, \mathrm{X}, \mathrm{W}, \mathrm{Y}\}$

b. $d(\mathrm{XP}_2) = \{\mathrm{X}, \mathrm{W}, \mathrm{Y}\}$

c. $d(\mathrm{YP}) = \{\mathrm{W}, \mathrm{Y}\}$

The set of paths Π in (266) and the *d*-relations in (267) allow a given linearization to be evaluated for Contiguity. Assume that the language in question linearizes heads to the left of their complement, like English. The correct linearization then is the set of orderings in (268).

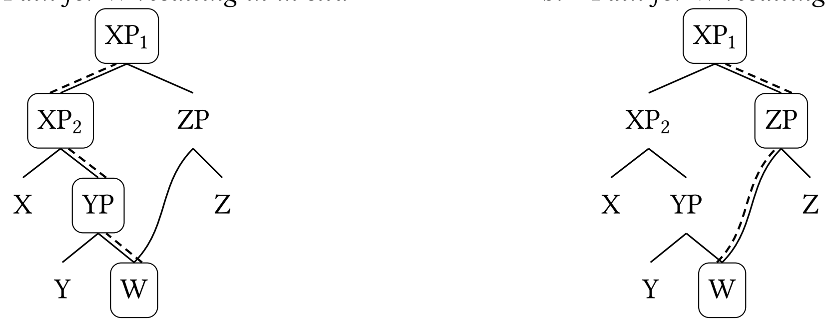
(268) *Linearization of (265)*

$$\left\{ \begin{array}{lll} \mathrm{Z} < \mathrm{X} & \mathrm{X} < \mathrm{Y} & \mathrm{Y} < \mathrm{W} \\ \mathrm{Z} < \mathrm{Y} & \mathrm{X} < \mathrm{W} & \\ \mathrm{Z} < \mathrm{W} & & \end{array} \right\}$$

All of the orderings in (268) satisfy Contiguity. For illustration, consider the path $\pi(\mathrm{X})$, which contains the phrases XP_1 and XP_2 (266c). The phrase XP_2 has a daughter YP which is not in $\pi(\mathrm{X})$. Therefore, all the vocabulary items that have YP in their path, namely W and Y (267c), must be ordered uniformly with respect to X. This condition holds in (268) because it contains the orderings X < Y and X < W, and not, e.g., X < Y and W < X. The reader can verify that Contiguity holds for the other paths in (266) given the linearization in (268), as well.

With a multidominant structure, an element that has been merged in multiple positions will have available to it multiple paths. This allows for different linearizations, contingent on the path chosen to be in Π. For example, consider the structure in (269) where W is both the complement of Y and the complement of Z. W has two possible paths to the maximal projection XP_1. If Π contains the path in (269a), then the linearization will be identical to the one in (268) because the paths in Π will be the same (modulo the addition of ZP). However, if Π instead contains the path in (269b), then W must be linearized contiguously with Z in order to satisfy Contiguity, which crucially results in W appearing displaced in the surface string.

(269) a. *Path for W resulting in in situ* b. *Path for W resulting in displacement*



Consider the path $\pi(\mathrm{W})$ in (269b), which contains the phrases ZP and XP_1. The phrase XP_1 has a daughter XP_2 that is not in $\pi(\mathrm{W})$. Therefore, to satisfy Contiguity, every vocabulary item that has XP_2 in its path, namely X and Y, must be ordered uniformly with respect to Z and W. There are two possible linearizations satisfying this condition: one where W and Z are linearized to the right (270a) and another one where W and Z are linearized to the left (270b).

(270) *Possible linearizations of (269b)*

a. $\{\mathrm{X} < \mathrm{W}, \mathrm{Y} < \mathrm{W}, \mathrm{X} < \mathrm{Z}, \mathrm{Y} < \mathrm{Z}, \ldots\}$

b. $\{\mathrm{W} < \mathrm{X}, \mathrm{W} < \mathrm{Y}, \mathrm{Z} < \mathrm{X}, \mathrm{Z} < \mathrm{Y}, \ldots\}$

A linearization containing the orderings Y < W and Z < Y, where W follows Y but Z precedes Y, would violate Contiguity. The decision between (270a) and (270b) is language-specific. For example, one language might prefer its Zs to the left, while another language might prefer them to the right. What is important to the algorithm is that both options in (270) satisfy Contiguity and hence are valid linearizations.

3.3.4 QP-movement

Constituent questions crosslinguistically vary on two dimensions: (i) whether the *wh*-phrase stays in situ or moves to the clause edge and (ii) the presence of a special question morpheme, which I will call a Q-particle (following Hagstrom 1998; Kishimoto 2005; Cable 2007, 2010). All four factorial possibilities are instantiated across the world's languages:[24] Japanese is a *wh*-in-situ language

[24] Another type of language is one that appears to be *wh*-in-situ on the surface, but *wh*-phrases actually undergo covert movement to the clause edge at LF. Cable (2007, 2010) proposes that Sinhala (Indo-Aryan; Sri Lanka) is such a language. In the interest of not going too far afield, I will not discuss such languages in the main text. However, note that Japanese and Hindi do *not* fall under this classification. Following Kotek (2014), I assume that genuine

with a Q-particle *ka* (271a). Hindi-Urdu (henceforth Hindi) is a *wh*-in-situ language lacking a Q-particle (271b). Tlingit (Na-Dene; Alaska, British Columbia, Yukon) is a *wh*-fronting language with a Q-particle *sá* (271c).[25] Finally, English is a *wh*-fronting language lacking a Q-particle (271d).

(271) *Crosslinguistic variation in constituent questions*

a. *Japanese* [−*wh*-mvt] [+Q-particle]

John-ga	**nani-o**	kaimasita	**ka**?
John-NOM	what-ACC	bought.polite	Q

'What did John buy?' [Hagstrom 1998:15]

b. *Hindi* [−*wh*-mvt] [−Q-particle]

raam-ne	**kyaa**	khaa-yaa	thaa?
Ram-ERG	what	eat-PFV	be.PAST

'What did Ram eat?' [Mahajan 1990:125]

c. *Tlingit* [+*wh*-mvt] [+Q-particle]

[**Daa**	**sá**]$_1$	i	éesh	___$_1$	al'óon?
what	Q	your	father		he.hunts.it

'What is your father hunting?' [Cable 2010:13]

d. *English* [+*wh*-mvt] [−Q-particle]

What$_1$ did Mary eat ___$_1$?

I adopt Cable's (2007, 2010) proposal that all the constituent questions in (271) actually involve Q-particles. In languages like Hindi and English, the Q-particle just has no overt realization and thus is silent. The Q-particle contributes both syntactically and semantically to the formation of a constituent question. Let us consider each role in turn.

Syntactically, the presence of the Q-particle is what drives interrogative movement of the *wh*-phrase to the clause edge. This connection is more transparent in Tlingit, the main language of Cable's study. Tlingit is a *wh*-fronting language, but what is important is that the Q-particle *sá* fronts along with the *wh*-phrase, rather than appearing at the leftmost or rightmost edge of the clause, like the Japanese Q-particle *ka* does (see (271a)). Cable supports this generalization with a

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wh-in-situ can be diagnosed with focus-intervention effects (see section 3.4.3). Both Japanese and Hindi constituent questions are subject to intervention and thus are true *wh*-in-situ languages (Japanese: Hoji 1985 and Hagstrom 1998; Hindi: Beck 1996, 2006 and Keine 2016). To the best of my knowledge, it is still unknown whether or not Sinhala constituent questions are subject to intervention (see Hagstrom 2004).

[25] Following Cable (2007, 2010), I do not gloss any of the verbal morphology in Tlingit (not that I could).

number of arguments, three of which I will review here. First, despite Tlingit's fairly flexible word order, the *wh*-phrase along with the Q-particle must appear linearly before the predicate in order to receive a question interpretation (272). When they appear after the predicate, as in (272c), only a *wh*-indefinite interpretation is possible.

(272) *Wh-phrase must appear before the predicate*

a. ✓**Daa sá** kéet *axá*?
what Q killer.whale he.eats.it
'What do killer whales eat?'

b. ✓Kéet **daa sá** *axá*?
killer.whale what Q he.eats.it

c. *Kéet *axá*? **daa sá**.
killer.whale he.eats.it what Q
Intended: 'What do killer whales eat?
Okay: A killer whale will eat anything. [Cable 2010:24–26]

Second, in a long-distance question, the *wh*-phrase and the Q-particle must appear to the left of the main predicate (273a) and cannot appear in their lower base position (273b).

(273) *Long-distance questions require long-distance movement*

a. ✓[**Daa sá**]$_1$ haa kóo at latóowu haa yawsikaa [___$_1$ wutootoowú]?
what Q our teacher he.told.us we.read.it
'What did our teacher tell us to read?'

b. *Haa kóo at latóowu haa yawsikaa [**daa sá** wutootoowú]?
our teacher he.told.us what Q we.read.it [Cable 2010:29]

Third, the *wh*-phrase and the Q-particle travel together and cannot be separated (274).

(274) *Wh-phrase and Q-particle travel together*

a. ✓**Daa sá** iyatéen?
what Q you.can.see.it
'What can you see?'

b. ***Daa** iyatéen **sá**?
what you.can.see.it Q [Cable 2010:35]

Cable concludes based on these data that the *wh*-phrase and the Q-particle move from their base position to the clause edge in Tlingit constituent questions.

Like English, in Tlingit, the *wh*-phrase may pied-pipe additional material along with it to the clause edge. The Q-particle *sá* always appears at the right edge of the fronted constituent (275).

(275) *Tlingit pied-piping*

a. [**Aadóo** yaagú sá] ysiteen?
who boat Q you.saw.it
'Whose boat did you see?'

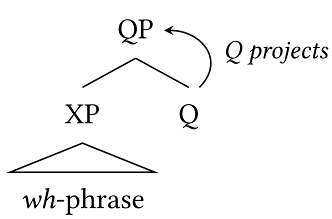
b. [**Daak̲w** keitl sá] asháa?
which dog Q it.barks
'Which dog is barking?'

c. [**Goo**déi wugootx̲ sá] has oowajée i shagóonich?
where.to he.went Q they.think your parents.ERG
'Where do your parents think that he went?'

d. [[$_{CP}$ **Wáa** kwligeyi] x̲áat sá] i tuwáa sigóo?
how it.is.big.REL fish Q your spirit it.is.happy
'How big a fish do you want?' (Literally: 'A fish that is how big do you want?')

[Cable 2010:32–33]

Cable argues that the constituent moving in Tlingit constituent questions is a projection headed by the Q-particle itself. The Q-particle merges with a constituent that properly contains the *wh*-phrase, and it projects a further phrasal layer, namely a QP (276).

(276)


Interrogative movement to the clause edge hence does not target a *wh*-phrase directly, but rather a QP, or more precisely Q-features (277).

(277) *Tlingit interrogative movement is Q-movement*

a. [[$_{QP}$ **Aadóo** yaagú **sá**$_{Q}$]$_{1}$ . . . [___$_{1}$ ysiteen]]? (=275a)

b. [[$_{QP}$ **Daak̲w** keitl **sá**$_{Q}$]$_{1}$ . . . [___$_{1}$ asháa]]? (=275b)

c. [[$_{QP}$ **Goodéi** wugootx̲ **sá$_Q$**]$_1$ ... [has oowajée ___$_1$ i shagóonich]]? (=275c)

d. [[$_{QP}$ **Wáa** kwligeyi x̲áat **sá$_Q$**]$_1$ ... [i tuwáa ___$_1$ sigóo]]? (=275d)

The main advantage of the Q-movement analysis of pied-piping is that it achieves the same result of feature percolation without the problematic mechanism (see Heck 2004 for discussion of the problems with feature percolation). Moreover, the analysis for Tlingit extends to English pied-piping as well, as schematized in (278). In each example, what moves to the clause edge is not the *wh*-phrase—or some larger constituent up to which the *wh*-feature has percolated—, but rather a QP that contains the *wh*-phrase. The difference between Tlingit and English is that only in Tlingit is the Q-particle overtly realized.

(278) *English interrogative movement is Q-movement*

a. [[$_{QP}$ Q **what**]$_1$ did Mary eat ___$_1$]?

b. [[$_{QP}$ Q **whose** sandwich]$_1$ did Mary eat ___$_1$]?

c. [[$_{QP}$ Q at **which** table]$_1$ did Mary eat the sandwich ___$_1$]?

As exemplified in (275), the range of pied-pipeable material in Tlingit is greater than that in English. For example, Tlingit can pied-pipe clausal material (275c), while English cannot. A large part of the Q-movement analysis involves regulating where in the structure the Q-particle can merge, and this factor is subject to crosslinguistic variation. I will limit our focus to English; the reader is referred to Cable (2007, 2010) for more detailed discussion. Cable argues that English belongs to the class of Limited Pied-Piping Languages (279), where the Q-particle must agree with the *wh*-phrase and this Agree-relationship is sensitive to locality.

(279) **Limited Pied-piping Languages**

If the Q-particle must Agree with the *wh*-word it c-commands, then a *wh*-word cannot be dominated in the sister of Q by islands or lexical categories (e.g. NP, AP, VP). Thus, limited pied-piping languages are those where Q/*wh*-agreement must occur. [Cable 2010:147]

The limiting locality constraint on English pied-piping thus is that the Agree-relationship between the Q-particle and the *wh*-phrase cannot cross lexical heads, which explains the piped-piping distribution in (280). Note that this requires treating prepositions as functional material.

(280) *English pied-piping cannot cross lexical material*

a. ✓I wonder [[$_{\text{DP}}$ **whose** pictures]$_1$ John brought ___$_1$].

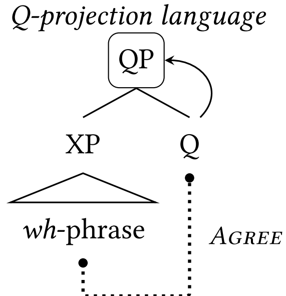
b. *I wonder [[$_{\text{NP}}$ pictures of **whom**]$_1$ John brought ___$_1$].

c. *I wonder [[$_{\text{AP}}$ proud of **whom**]$_1$ John was ___$_1$].

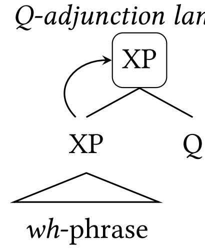
d. *I wonder [[$_{\text{VP}}$ eaten **what**]$_1$ John has ___$_1$]. [Cable 2010:151]

Regarding *wh*-in-situ languages, Cable proposes that in such languages, the Q-particle instead *adjoins* to a constituent containing the *wh*-phrase and does not project its own phrasal QP-layer. Whether the Q-particle adjoins or projects is a language-specific parameter. The two possible resulting structures are schematized in (281).

(281) a. *Q-projection language*

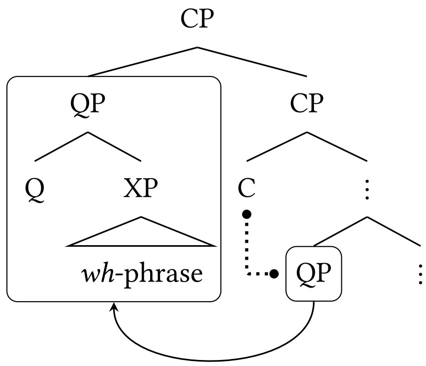


b. *Q-adjunction language*

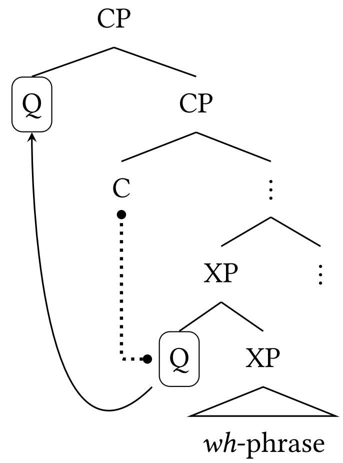


In both kinds of languages, the *wh*-probe on C^0 targets Q-features to move to the clause edge, i.e. [Spec, CP]. In a Q-projection language, like Tlingit and English, the *wh*-probe searches into the structure, finds the QP, and moves the entire QP to [Spec, CP], thereby resulting in a *wh*-fronting language (282). In a Q-adjunction language, like Japanese and Hindi, the *wh*-probe searches into the structure, but only finds the Q-particle itself, which it moves to [Spec, CP], thereby resulting in a *wh*-in-situ language (283). Again, in English and Hindi, the Q-particle has no overt realization, obscuring its syntactic role in forming a constituent question.

(282) *Q-projection language*



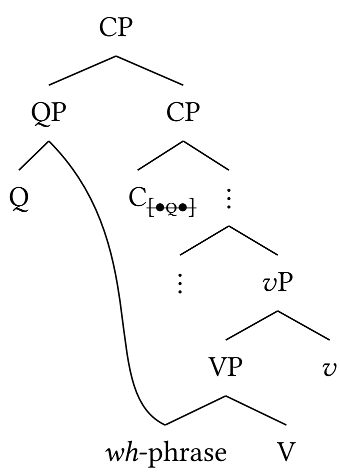
(283) *Q-adjunction language*



As we will see below shortly, once we transition to the parallel-MERGE multidominant syntax, the distinction between Q-adjunction and Q-projection languages becomes unnecessary. Instead, in all languages, the Q-particle projects a phrasal QP-layer, but languages differ in whether or not the *wh*-phrase is linearized contiguously with the Q-particle.

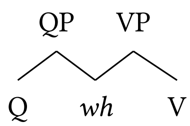
Implementing Cable's (2007, 2010) Q-particle proposal in multidominance yields the structure in (284), where the *wh*-phrase occupies both its ordinary base position (here, the internal argument of the verb) and the complement position of QP (Johnson 2012, 2014). The QP is merged directly in [Spec, CP], satisfying the [•Q•]-feature on the question complementizer C^0. Thus, the "shell" projection in the movement dependency is the QP.

(284) *Q-particles under multidominance*

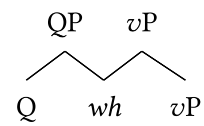


The structure in (284) involves the *wh*-phrase being merged in parallel with Q^0 and the sister of its base position, e.g. V^0 for an object (285a) and *v*P for a subject (285b).[26] These instances of Merge all involve only root nodes and result in two root nodes sharing the *wh*-phrase. The two resulting root nodes are then merged into the structure like normally.

(285) a. *Wh-phrase in object position*



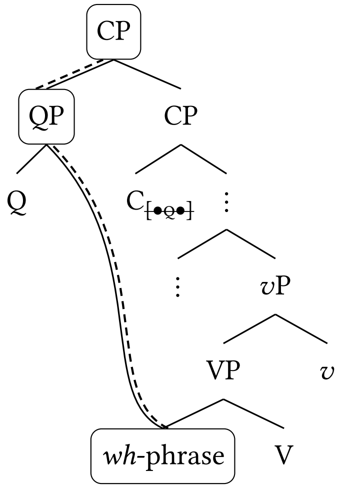
b. *Wh-phrase in subject position*



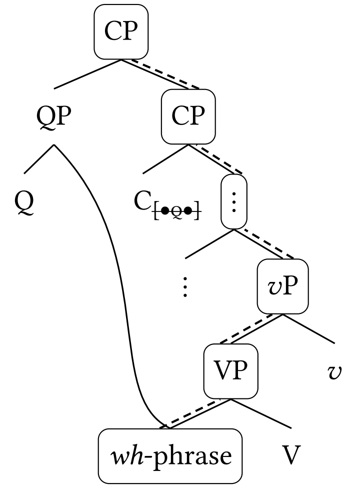
Displacement in constituent questions is purely the byproduct of linearization, in particular which path for the *wh*-phrase is passed into the linearization algorithm (see section 3.3.3). In *wh*-fronting languages, like Tlingit and English, there is a language-specific preference to linearize a *wh*-phrase in [Spec, CP], contiguous with the Q-particle. This preference is encoded by choosing the path for the *wh*-phrase through the QP, as schematized in (286). By selecting the path through QP, the algorithm returns a linearization with the *wh*-phrase displaced in the surface string. On the other hand, in *wh*-in-situ languages, like Japanese and Hindi, there is no such preference, and the chosen path for the *wh*-phrase is through its base position, as schematized in (287). The resulting linearization hence places the *wh*-phrase in situ. The Q-particle will nevertheless be linearized via the only path available to it, i.e. through the QP, but it will not be linearized contiguously with the *wh*-phrase; this is the behavior of the Japanese Q-particle *ka*.

[26] An advantage of the parallel-Merge structures in (285) is that they straightforwardly account for how a *wh*-phrase satisfies subcategorization requirements: it merges with the subcategorizing head directly, like it normally would if it were not a *wh*-phrase. Subcategorization requires an extra stipulation under a standard copy-theoretic conception of movement because the QP would always intervene between the *wh*-phrase and the subcategorizing head.

(286) *Wh-fronting language*



(287) *Wh-in-situ language*



Consequently, under parallel-Merge multidominance, constituent questions have a uniform syntax across languages.[27] Surface differences in constituent questions crosslinguistically are the result of (i) whether the Q-particle is overt and (ii) whether the *wh*-phrase is linearized contiguously with the Q-particle. The upshot of this syntactic uniformity is that the *semantics* of constituent questions can be treated uniformly as well, irrespective of how a constituent question is linearized.

At LF, the Q-particle establishes a long-distance semantic dependency with the *wh*-phrase. QP-movement does not alter the scope of the *wh*-phrase. Modulo a prior step of DP-movement, as will be discussed in section 3.3.6, the *wh*-phrase thus necessarily takes scope in situ. I will entertain two possibilities about the long-distance dependency instantiated: existential closure over choice functions (288a) (Engdahl 1980, 1986; Reinhart 1997) or percolation of focus alternatives (288b) (Beck 2006; Beck and Kim 2006; Cable 2007, 2010; Kotek 2014). The squiggle arrow in (288b) indicates the percolation of focus alternatives.

[27] Something equivalent to the Q-adjunction structure is also possible in the parallel-Merge multidominant syntax. The Q-particle would be merged in the left periphery, but not merged with the *wh*-phrase. The relationship between the Q-particle and the *wh*-phrase would hence need to be handled solely via Agree. This is roughly the analysis that Hagstrom (1998) proposes for *wh*-in-situ languages. Cable's (2007, 2010) proposal where the Q-particle starts out lower and moves to the left periphery is impossible under parallel-Merge multidominance because the relevant structure cannot be created without violating the Extension Condition. Regardless, neither of these options is necessary to derive *wh*-in-situ languages given that the distinction can be handled purely in terms of linearization.

(288) *Q-particles at LF*

a. *Choice functions*

[Q . . . [Op . . . [. . . f(*wh*-phrase) . . .]]] Op ≫ DP

$\exists f^{CF}$

b. *Focus alternatives*

[Q . . . [Op . . . [. . . *wh*-phrase . . .]]] Op ≫ DP

Under both possiblities, the Q-particle and the *wh*-phrase disassociate at LF: the Q-particle is interpreted in [Spec, CP], the landing site of movement, and the *wh*-phrase is interpreted in its base position. This disassociation is equivalent to Kotek's (2014) proposal that the Q-particle and the *wh*-phrase separate at LF through a process that she dubs Q-FISSION (289). However, under the parallel-MERGE multidominant syntax, there is no need to posit a separate operation to achieve this disassociation. As will be exemplified below, because the *wh*-phrase exists in two positions in the structure, it may be interpreted in only one of those positions.

(289) *Kotek's (2014) Q-fission*

[Q [*wh*-phrase [. . . QP . . .]]]

We have already seen the choice-function semantics in action in section 2.5.2, but I will review it again here in our multidominance framework. According to the choice-function semantics of constituent questions, the *wh*-phrase introduces a CHOICE FUNCTION (290). Because, for a given set, there are at least as many choice functions over that set as there are elements in it, the resulting question meaning is equivalent to the standard Hamblin/Karttunen question semantics wherein questions denote sets of propositions that are possible answers to that question (Hamblin 1973; Karttunen 1977).

(290) **CHOICE FUNCTION**

A function f is a CHOICE FUNCTION (f^{CF}) if it applies to any nonempty set and yields a member of that set. [Reinhart 1997:372]

Existential closure applies to the choice function introduced by the *wh*-phrase. Therefore, the constituent question in (291a) has the denotation in (291b). The set of answers will be functions that return a cat from the set of all cats. Note that given the definition of a choice function, the choice function f in (291b) must return a cat and cannot return, e.g., a dog because a dog would not be in the set of cats.

(291) *Choice-function semantics for constituent questions* (=156)

a. [**Which cat**]$_1$ did Mary adopt ___$_1$?

b. $\lambda w_0\, \lambda p_{\langle s,t\rangle}\; .\; \exists f^{\text{CF}}[\, p = \lambda w\; .\; \text{Mary adopted } f(\text{cat}) \text{ in } w\,]$
Paraphrase: What is the (choice) function f such that the following proposition is true: Mary adopted the x picked out by f from the set of cats.

A syntacticized version of the choice-function semantics is given in (292).[28] The Q-particle handles both the existential closure of the choice function and the question formation (the $p = q$ part). Crucially, even though Q^0 merges with a *wh*-phrase in the syntax, the result is a semantic-type mismatch. Q^0 only composes with the proposition-denoting question nucleus, thereby forcing the *wh*-phrase to be interpreted only in its lower position. Finally, the existential closure must target the choice function that the *wh*-phrase introduces, and not something else. I assume that the sisterhood relationship between Q^0 and the *wh*-phrase is sufficient to enforce this connection, perhaps via the local Agree-relation between the two (see (281a)).[29]

(292) *Syntacticized choice-function semantics* (=157)

a. $[\![\text{which NP}]\!] = \lambda w\; .\; f([\![\text{NP}]\!](w))$

b. $[\![\text{Q}]\!] = \lambda q_{\langle s,t\rangle}\, \lambda w_0\, \lambda p_{\langle s,t\rangle}\; .\; \exists f^{\text{CF}}[\, p = q\,]$

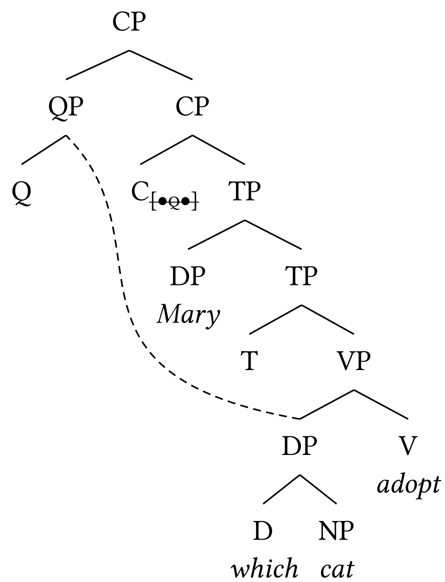
To illustrate, the derivation of (291) is shown in (293).[30] A dashed line is used to indicate that the *wh*-phrase is not interpreted in the complement position of QP—descriptively it reconstructs.

[28] Note that C^0 plays no role in the choice-function semantics of constituent questions, even though it is what drives interrogative movement in the narrow syntax. This will hold for the focus-alternative semantics as well.

[29] It is worth pointing out that Reinhart (1997) does not provide a compositional semantics for her choice-function analysis of constituent questions.

[30] For the sake of simplicity, I ignore intensionality within the DP and do not depict *v*P in what follows.

(293) *Derivation of (291) with choice-function semantics*



a. $[\![\text{which cat}]\!] = f(\text{cat})$

b. $[\![\text{adopt}]\!] = \lambda x_e\, \lambda y_e\, \lambda w\ .\ \textsc{adopt}_w(x)(y)$

c. $[\![\text{VP}]\!] = [\![\text{adopt}]\!]\,([\![\text{which cat}]\!])$
$\quad = \lambda y_e\, \lambda w\ .\ \textsc{adopt}_w(f(\text{cat}))(y)$

d. $[\![\text{TP}]\!] = [\![\text{VP}]\!]\,([\![\text{Mary}]\!])$
$\quad = \lambda w\ .\ \textsc{adopt}_w(f(\text{cat}))(\text{Mary})$

e. $[\![\text{CP}]\!] = [\![\text{Q}]\!]\,([\![\text{TP}]\!])$
$\quad = \lambda w_0\, \lambda p_{\langle s,t\rangle}\ .\ \exists f^{\text{CF}}\big[\, p = \lambda w\ .\ \textsc{adopt}_w(f(\text{cat}))(\text{Mary})\big]$

The semantic derivation in (293) proceeds as follows: First, *adopt* composes with *which cat* and then with *Mary* via Function Application (293c,d). The result is the proposition "Mary adopted $f(\text{cat})$". At this point in the derivation, the choice function f introduced by the *wh*-phrase is a free variable; it will need to be bound in the course of the derivation. Second, the complementizer C^0 passes the denotation upwards to the Q-particle, which takes the proposition denoted by TP as its argument. It applies existential closure over the choice function f and forms the question nucleus using the proposition denoted by TP (293e).

According to the focus-alternative semantics of constituent questions, the *wh*-phrase denotes a set of ALTERNATIVES. For the sake of concreteness, I will adopt a simplified implementation of Kotek (2014), which itself builds on the semantics in Beck (2006) and Beck and Kim (2006). Following the standard alternative semantics developed in Rooth (1985, 1992), natural-language expressions have both an ordinary value ($[\![\ldots]\!]^o$) and a focus-semantic value ($[\![\ldots]\!]^f$). F-marked constituents have as their focus-semantic value a set of *alternatives* to the expression's ordinary denotation. If an expression is not F-marked, its focus-semantic value is the singleton set containing its ordinary value. This is stated in the Terminal Nodes semantic-composition rule in (294a). Focus-semantic values compose pointwise with each other using the recursive definition of Function Application in (294b). The focus alternatives "percolate" up the structure until a focus-sensitive element, e.g. *only* or the Q-particle, makes use of them or resets the focus-semantic value.

(294) *Semantic-composition rules in alternative semantics*

a. **Terminal Nodes**

$$[\![\alpha_\tau]\!]^f = \begin{cases} \{[\![\alpha_\tau]\!]^o\} & \text{if } \alpha \text{ not F-marked} \\ \text{a subset of } D_\tau & \text{if } \alpha \text{ F-marked} \end{cases}$$

b. **Function Application**

$$\left[\!\!\left[\begin{array}{c} \alpha_\tau \\ \wedge \\ \beta_{\langle\sigma,\tau\rangle} \quad \gamma_\sigma \end{array} \right]\!\!\right]^f = \begin{cases} \left\{ b(g) \;\middle|\; b \in [\![\beta]\!]^f,\; g \in [\![\gamma]\!]^f \right\} & \text{if } \alpha \text{ not F-marked} \\ \text{a contextually-determined subset of } D_\tau & \text{if } \alpha \text{ F-marked} \end{cases}$$

What makes a *wh*-phrase special is that it has no ordinary value (295a), but its focus-semantic value is a set of alternatives (295b). The alternatives correspond to the possible answers to the short question denoted by the *wh*-phrase.

(295) *Alternative semantics of wh-phrases*

a. $[\![\text{what}]\!]^o$ is undefined

b. $[\![\text{what}]\!]^f = \{x_e : x \in \text{nonhuman}\}$

The focus alternatives introduced by a *wh*-phrase percolate up the structure. However, because a *wh*-phrase lacks an ordinary value, any structure containing a *wh*-phrase also lacks an ordinary value. This violates the Principle of Interpretability (296).

(296) **Principle of Interpretability**

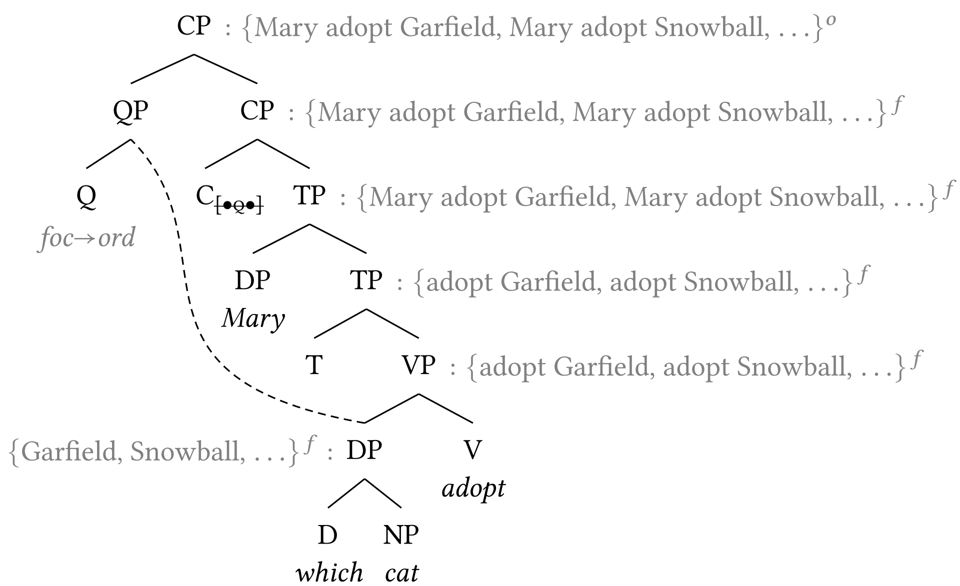
An LF must have an ordinary semantic interpretation. [Beck 2006; Beck and Kim 2006]

Kotek (2014) proposes that structures containing a *wh*-phrase must be interpreted using a Q-particle. The Q-particle takes a set of propositions as its argument and returns that set as the ordinary semantic value (297).[31] By shifting the focus-semantic value to the ordinary value, the Q-particle results in the structure satisfying the Principle of Interpretability. Thus, the Q-particle indirectly remedies a problem introduced by a *wh*-phrase's lack of an ordinary value. As with the choice-function semantics, even though Q^0 merges with a *wh*-phrase in the syntax, the two do not compose together semantically. Q^0 only composes with the proposition-denoting question nucleus, thereby forcing the *wh*-phrase to be interpreted only in its lower position.

(297) *Q-particle with alternative semantics*
$[\![\text{Q } \alpha]\!]^o = [\![\alpha]\!]^f$

The result of Q-particle is a set of propositions that are possible answers to the question. To illustrate, the derivation of (291) under the focus-alternative semantics is shown in (298).

(298) *Derivation of (291) with alternative semantics*



a. $[\![\text{which cat}]\!]^o$ is undefined
$[\![\text{which cat}]\!]^f = \{x_e : x \in \text{cat}\}$
$= \{\text{Garfield, Snowball}, \ldots\}$

[31] Kotek (2014) also proposes that the Q-particle rewrites the focus value to be the singleton set containing the focus value of its sister: $[\![\text{Q } \alpha]\!]^f = \{[\![\text{Q } \alpha]\!]^o\}$. This is used to derive the semantics of questions with multiple *wh*-phrases, which will not concern us here.

b. $[\![\text{VP}]\!]^o$ is undefined

$[\![\text{VP}]\!]^f = \{\lambda y_e\, \lambda w\, .\, \textsc{adopt}_w(x)(y) : x \in \text{cat}\}$
$= \{y \text{ adopted Garfield}, y \text{ adopted Snowball}, \ldots\}$

c. $[\![\text{TP}]\!]^o$ is undefined

$[\![\text{TP}]\!]^f = \{\lambda w\, .\, \textsc{adopt}_w(x)(\text{Mary}) : x \in \text{cat}\}$
$= \{\text{Mary adopted Garfield, Mary adopted Snowball}, \ldots\}$

d. $[\![\text{CP}]\!]^o = [\![\text{TP}]\!]^f = \{\lambda w\, .\, \textsc{adopt}_w(x)(\text{Mary}) : x \in \text{cat}\}$
$= \lambda p_{\langle s,t\rangle}\, .\, \exists x[\textsc{cat}(x) \wedge p = \lambda w\, .\, \textsc{adopt}_w(x)(\text{Mary})]$

The semantic derivation in (298) proceeds as follows: First, *which cat* introduces a set of alternatives as its focus-semantic value (298a). Second, these focus alternatives compose pointwise with *adopt* and *Mary* (298b,c), resulting in a TP whose focus-semantic value is a set of propositions. Because *which cat* has an undefined ordinary value, the TP likewise is undefined for an ordinary value. If the derivation were to stop here, it would violate the Principle of Interpretability because the LF would lack an ordinary semantic interpretation. Third, the Q-particle takes the focus-semantic value of its sister and returns it as the ordinary value. The end result is a set of propositions that are possible answers to the question (298d).

There are two reasons why I entertain different options for the semantics of the Q-particle. First, it shows that both semantics are in principle compatible with my proposals in this chapter. Thus, the syntax and semantics of movement developed in this chapter do not require one to choose between a choice-function or focus-alternative semantics for constituent questions; this decision can be made independently. Second, although the alternative semantics is generally more suitable for our purposes, it faces a handful of unresolved problems, the greatest of which, in my opinion, is FUNCTIONAL QUESTIONS. Its advantage is that it straightforwardly accounts for focus-intervention effects, which will be discussed in section 3.4.3. There is not necessarily a principled choice-function account of focus intervention.[32] However, consider the question in (299a) with the quantificational phrase *no woman*. It is possible to answer (299a) with a phrase representing a FUNCTION like *her first picture*, which when given a woman, returns her first picture (Engdahl 1980, 1986; Groenendijk

[32] That said, one could analyse focus intervention as a syntactic phenomenon where interveners and *wh*-phrases bear the same licensing feature such that an intervener blocks licensing a *wh*-phrase across it, as Kratzer and Shimoyama (2002) suggest.

and Stokhof 1984).[33] Under the choice-function semantics of constituent questions, functional readings can be easily accommodated by Skolemizing the choice function (299c), in effect passing it a variable that is bound by the quantifier that yields the functional reading.

(299) *Functional questions*

a. [**Which picture (of herself$_2$)**]$_1$ does *no woman*$_2$ like ___$_1$?

b. her first picture, her prom picture, . . .

c. *Skolemized choice functions*
$\lambda w_0\, p_{\langle s,t\rangle}\,.\, \exists f^{\text{CF}}[p = \lambda w\,.\, \neg\exists x[\textsc{woman}_w(x) \wedge \textsc{like}_w(f_x(\text{picture}))(x)]]$

Functional questions crucially require reconstruction of the *wh*-phrase so that a variable inside the *wh*-phrase can be bound by the quantifier (300).

(300) *Functional questions require reconstruction*
[Q *no woman* λx [x like [**which picture of** x]]

It is this reconstruction that the focus-alternative semantics cannot handle. While the variable in the *wh*-phrase needs to be bound by the quantifier, that same quantifier can also be an *intervener*, as the quantifier *no* is in (299a). According to the alternative semantics, the *wh*-phrase being in the scope of an intervener like *no* should result in ungrammaticality, as it does in other configurations, e.g. English superiority-violating multiple-*wh* questions (301) (examples based on Pesetsky 2000), but it does not.

(301) *Negative quantifiers otherwise intervene*

a. *[*Which boy*]$_1$ did **no girl** give [*which book*] to ___$_1$?

b. ✓[*Which boy*]$_1$ did **the girl** give [*which book*] to ___$_1$?

Focus intervention will be discussed in greater detail in section 3.4.3. The point to take away now is that both the choice-function semantics and the focus-alternative semantics are in principle

[33] Importantly, as Engdahl (1980, 1986) argues, functional answers cannot be reduced to pair–list answers. For example, functional answers are possible with quantifiers that do not allow pair–list answers, such as *no* in (299a). Thus, "*Mary doesn't like the red picture, Susan doesn't like the blue picture, . . .*" is not a felicitous answer to (299a). Functional answers have an independent status.

compatible with the proposals developed in this chapter. I leave resolving which semantics is the correct one to future research.

In sum, constituent questions involve Q-particles. The Q-particle merges with the *wh*-phrase and projects a QP that itself merges in [Spec, CP]. At LF, because the Q-particle cannot semantically compose with the *wh*-phrase with which it has merged, the two disassociate: the Q-particle is interpreted in [Spec, CP] and the *wh*-phrase is interpreted in its base position. The result is that the scope of the *wh*-phrase does not change as a consequence of QP-movement; it acts as if it has reconstructed.

3.3.5 DP-movement

As seen in the previous section, there is not really a sense in which QP-movement creates a "trace" because the constituent being shared across the two projections is only interpreted in its lower position, i.e. it obligatorily reconstructs. Rather, "traces" are the result of DP-movement, a general scope-shifting mechanism wherein two DPs share an NP, thereby forming a movement dependency across them. At LF, DP-movement creates a λ-abstraction over a variable of semantic type e such that if the moving DP is quantificational, it will take scope upstairs in the landing site of movement.

Let us begin the discussion assuming the copy-theoretic approach to movement. Downstairs copies of moved quantificational DPs cannot be interpreted as is at LF. These structures are standardly rendered interpretable by converting the downstairs copy to an anaphoric definite description (Engdahl 1980, 1986; Sauerland 1998, 2004; Fox 1999, 2002, 2003). The technical apparatus performing this operation is Trace Conversion, a special LF rule that comprises two parts: insertion of a variable (302a) and determiner replacement (302b). The inserted variable is bound by the λ-abstraction introduced below the landing site of movement. I will refer to this variable as the index (Elbourne 2005). Replacing the determiner converts the DP into a definite description.[34] Thus, the output of Trace Conversion is an anaphoric definite description.

[34] It is not necessary that Determiner Replacement literally insert the lexical item *the*. It is only necessary that it inject the semantics of anaphoricity and make the lower copy type e. The determiner *the* is merely a convenient shorthand. This is a misunderstanding in Sportiche (2015), who argues for replacing Trace Conversion with restricted bound variables—which is exactly what Trace Conversion produces.

(302) **Trace Conversion**

a. *Variable Insertion*
(Det) Pred → (Det) [[Pred] [$\lambda y \,.\, y = g(n)$]]
(where g is the assignment function)

b. *Determiner Replacement*
(Det) [[Pred] [$\lambda y \,.\, y = g(n)$]] → the [[Pred] [$\lambda y \,.\, y = g(n)$]]   [Fox 1999, 2002, 2003]

The predicate denoted by the NP and the index function combine via Predicate Modification, as both are functions of type $\langle e,t \rangle$. The definite determiner then composes with this conjoined predicate, introducing a uniqueness presupposition (303a) and returning the (maximal) entity for which the predicate holds (303b), which crucially must be the entity identified by the index.

(303) *Semantics of the definite determiner*

$$[\![\text{the}]\!]^{g} = \lambda \mathrm{P} : \underbrace{\exists! x[\mathrm{P}(x)]}_{\text{presupposition}} \,.\, \underbrace{\iota x[\mathrm{P}(x)]}_{\text{assertion}}$$

a. Presupposition: There is a unique x for which $\mathrm{P}(x)$ is true.

b. Assertion: The unique x such that $\mathrm{P}(x)$ is true.

To illustrate, a schematic derivation is given in (304) in which the universal DP *every cat* QRs above the existential subject *a child* to derive the inverse-scope reading, where there is a different child for each cat. At PF, the lower copy is unpronounced, and hence the movement is covert (304a). At LF, Trace Conversion applies to the lower copy, minimally altering it so as to render the structure interpretable, yet maintain a dependency between the upstairs and downstairs copies (304b), e.g. as opposed to outright ignoring one of the copies.

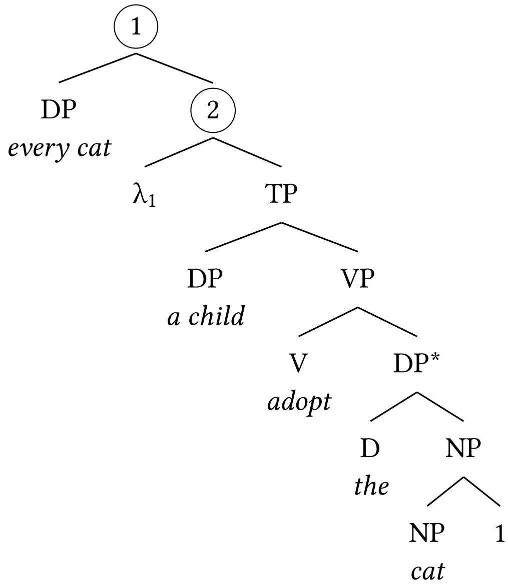
(304) *Trace Conversion derivation*
[[$_{\text{DP}}$ **every cat**]$_1$ [[$_{\text{DP}}$ a child] [$_{\text{VP}}$ adopted [$_{\text{DP}}$ **every cat**]$_1$]]]

a. *PF: Pronounce the lower copy*
[[$_{\text{DP}}$ **~~every cat~~**]$_1$ [[$_{\text{DP}}$ a child] [$_{\text{VP}}$ adopted [$_{\text{DP}}$ **every cat**]$_1$]]]

b. *LF: Apply Trace Conversion*
[[$_{\text{DP}}$ **every cat**] λ_1 [[$_{\text{DP}}$ a child] [$_{\text{VP}}$ adopted [$_{\text{DP}}$ **the [$\boldsymbol{\lambda y \,.\, y = g(1)}$] [cat]**]$_1$]]]

The semantic derivation of (304) is provided in (305). For the sake of explicitness, I include the presupposition introduced by the definite determiner throughout the entire derivation, but it might be read more easily by substituting the shorthand in (306) for the more verbose (305c). The result of the presupposition is that the nodes above the starred DP to which Trace Conversion has applied are only defined if $g(1)$ returns a cat.

(305) *Semantic derivation of (304)*



The nodes from DP upwards are defined iff* $\textsc{cat}(g(1)) = 1$.

a. $[\![1]\!]^g = \lambda x_e \,.\, x = g(1)$

b. $[\![\text{NP}]\!]^g = \lambda x_e \,.\, \textsc{cat}(x) \wedge x = g(1)$

c. $[\![\text{DP}]\!]^g$ is defined only if $\exists! x[\textsc{cat}(x) \wedge x = g(1)]$;
where defined, $[\![\text{DP}]\!]^g = \iota x[\textsc{cat}(x) \wedge x = g(1)]$

d. $[\![\text{VP}]\!]^g = \lambda y_e : \exists! x[\textsc{cat}(x) \wedge x = g(1)] \,.\, \textsc{adopt}(\iota x[\textsc{cat}(x) \wedge x = g(1)])(y)$

e. $[\![\text{a child}]\!]^g = \lambda P_{\langle e,t\rangle} \,.\, \exists z[\textsc{child}(z) \wedge P(z)]$

f. $[\![\text{TP}]\!]^g$ is defined only if $\exists! x[\textsc{cat}(x) \wedge x = g(1)]$;
where defined, $[\![\text{TP}]\!]^g = \exists z[\textsc{child}(z) \wedge \textsc{adopt}(\iota x[\textsc{cat}(x) \wedge x = g(1)])(z)]$

g. $\left[\!\!\left[2 \right]\!\!\right]^g = \lambda y_e : \exists! x[\textsc{cat}(x) \wedge x = y] \,.\, \exists z[\textsc{child}(z) \wedge \textsc{adopt}(\iota x[\textsc{cat}(x) \wedge x = y])(z)]$

h. $[\![\text{every cat}]\!]^g = \lambda P_{\langle e,t\rangle} \,.\, \forall y[\textsc{cat}(y) \rightarrow P(y)]$

i. $\left[\!\!\left[1 \right]\!\!\right]^g = \forall y[\textsc{cat}(y) \rightarrow \exists z[\textsc{child}(z) \wedge \textsc{adopt}(\iota x[\textsc{cat}(x) \wedge x = y])(z)]]$

(306) *Shorthand for Trace Conversion*
$[\![\text{DP}]\!]^g = g(1)$ if $\textsc{cat}(g(1)) = 1$, otherwise undefined

The semantic derivation in (305) proceeds as follows: First, the NP *cat* and the index (305a) conjoin via Predicate Modification (305b). Second, the definite determiner introduced by Trace Conversion takes this conjoined NP as its argument. It returns the unique entity x such that x is a cat and x is equal to whatever $g(1)$ returns (305c). It also presupposes this entity's existence. In other words, the definite description returns $g(1)$ as long as $g(1)$ is a cat. Third, the definite description composes with *adopt* and *a child* via Function Application to yield the assignment-dependent proposition "There exists z such that z is a child and z adopted $g(1)$" (305d, f). Fourth, the λ-abstraction created by QR maps the index 1 to the λ-bound variable y (305g). Due to the presupposition introduced by the definite determiner, this λ-abstraction is a partial function whose domain is restricted to cats. Finally, the quantifier *every cat* takes 2 as its argument, yielding the final proposition (305i) and vacuously satisfying the presupposition.

There are several sources of independent empirical motivation for Trace Conversion and having the lower copy be a definite description that retains the NP, as opposed to being a simple variable. First, QR cannot bleed Condition C, which would be possible if the lower copy of QR were interpreted as a simple variable lacking lexical material. For example, in (307), the inverse-scope reading where *every rumor* takes scope above *a different neighbor* (still) forces disjoint reference between *her* and *Susan*. This follows from Trace Conversion because the launching site of movement still contains a copy of *Susan*, thereby triggering a Condition C effect (307a). It does not follow though if the launching site contains a simple variable (307b).

(307) *QR does not bleed Condition C*

*A different neighbour told **her**$_1$ every rumor about **Susan's**$_1$ parents. every ≫ a

a. *Trace Conversion: Predicted to be ungrammatical*
[[every rumor about **Susan's**$_1$ parents] λx [a different neighbour told **her**$_1$
[the [$\lambda y \,.\, y = x$] rumor about **Susan's**$_1$ parents]]]

b. *Simple variable: Predicted to be grammatical*
[[every rumor about **Susan's**$_1$ parents] λx [a different neighbour told **her**$_1$ x]]

Second, Sauerland (1998) observes that retaining the downstairs NP accounts for some otherwise puzzling facts about ACD resolution. Consider the pair of sentences in (308). If the downstairs copy in the elided VP were translated into a simple variable, ACD resolution should be possible in both (308a) and (308b) under parallelism with the antecedent VP, contrary to fact.

(308) *Antecedent VP* = $[\![\text{visit } x]\!]^f$

a. *I visited a city near the lake John did ⟨visit x⟩.

b. ✓I visited a city near the city John did ⟨visit x⟩. [Sauerland 1998]

However, if the downstairs NP is retained, as it is under Trace Conversion, the antecedent and elided VPs match under parallelism in (309b), but not (309a). This is the correct prediction.

(309) *Antecedent VP* = $[\![\text{visit the city } x]\!]^f$

a. *I visited a city near the lake John did ⟨visit the lake x⟩.

b. ✓I visited a city near the city John did ⟨visit the city x⟩. [Sauerland 1998]

Third, Trace Conversion forces quantifiers to be conservative (Fox 2001, 2002; Bhatt and Pancheva 2007). Because the NP restrictor is also interpreted in the scope of the quantifier as a presupposition that projects, everything in the scope will necessarily be a member of the restrictor. More precisely, the scope will denote a partial function defined only for elements that are members of the restrictor set. This equivalence is shown in (311) (from Fox 2001).

(310) **Conservativity**
$\mathrm{D}(\mathrm{A})(\mathrm{B}) \Leftrightarrow \mathrm{D}(\mathrm{A})(\mathrm{A} \cap \mathrm{B})$
(e.g. Every cat is orange ⇔ Every cat is an orange cat)

(311) a. $\mathrm{D}(\mathrm{A})(\mathrm{B}) =$ *(by conservativity)*

b. $\mathrm{D}(\mathrm{A})(\mathrm{A} \cap \mathrm{B}) =$ *(by presupposition projection)*

c. $\mathrm{D}(\mathrm{A})(\mathrm{A} \cap [\lambda x : \mathrm{A}(x)\ .\ \mathrm{B}(x)]) =$ *(by conserativity)*

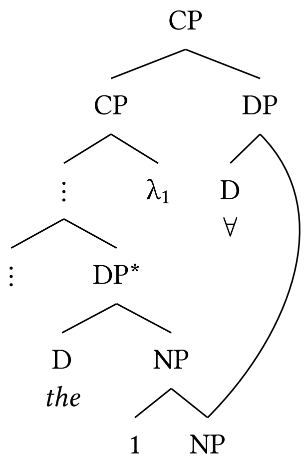
d. $\mathrm{D}(\mathrm{A})(\lambda x : \mathrm{A}(x)\ .\ \mathrm{B}(x)) =$ *(by denotation of 'the')*

e. $\mathrm{D}(\mathrm{A})(\lambda x\ .\ \mathrm{B}(\text{the}\,[\mathrm{A}x]))$ □

For example, in (304)–(305), everything in the scope of the universal quantifier *every cat* will be a cat (technically be a member of $[\![\text{cat}]\!]$) because of the presupposition introduced by the definite determiner. Given the equivalence in (311), Trace Conversion will also derive trivial meanings for nonconservative quantifiers, like *only* if it were a determiner—another desirable consequence.

Johnson (2012, 2014) proposes that, under multidominance, Trace Conversion is baked into the narrow syntax. The quantificational DP is merged upstairs in the position where it takes scope, and the anaphoric definite description, which is usually the output of Trace Conversion, is merged downstairs. The two DPs share an NP-restrictor as the output of parallel-Merge. This proposal is illustrated in (312). The semantics for (312) are identical to Trace Conversion, e.g. (305), because the NP is interpreted in both of its positions.

(312) *Trace Conversion under multidominance*



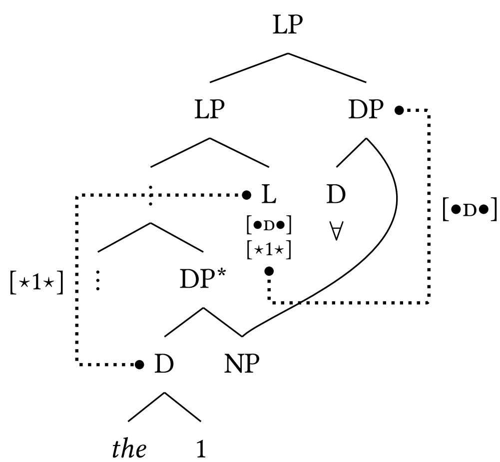
The nodes from DP upwards are defined iff* $[\![\text{NP}]\!](g(1)) = 1$.

There are two immediate advantages to this proposal. First, it dispenses with Trace Conversion as an ad hoc LF rule. Second, although Trace Conversion could in principle apply to any DP at LF, as nothing restricts it to movement chains, this problem does not extend to Johnson's proposal because the equivalent of Trace Conversion is only invoked as an inherent part of *forming* movement dependencies, not as an LF rule to rescue an uninterpretable structure that the narrow syntax has (for some reason) generated.

The idea that the quantificational component of a quantificational expression is introduced in its scope position is not new. Johnson cites a number of authors who have made this argument, but as far as I see it, this idea is equivalent to Montague's (1970, 1973) quantifying-in rule, only with modern machinery. The question then becomes how a DP is linearized in one position if its various pieces are dispersed across the structure. For instance, (305) is not linearized as "every cat a child adopted the cat", or some variation thereof. Johnson proposes that the covertness of the movement is the result of the morphology. The basic idea is that *the* is pronounced as *every* by virtue of appearing in a structure in which it is associated with the semantics of *every*. I will present an implementation of this idea based loosely on Fox and Johnson (2016), but I will be more explicit about the machinery involved than they are.

Let us assume that quantificational DPs are introduced by a functional head L, which bears an index [⋆i⋆] and a selectional feature [•D•]. The index on L must be checked in the syntax with a matching index elsewhere in the structure (Kratzer 2004), and hence it is represented as a star feature in our notation. This checking of indices happens with the downstairs definite description; thus, the index presumably must be an argument of the determiner (see also Schwarz 2009). The selectional feature on L is satisfied by merging the quantificational DP in [Spec, LP]. Thus, there are two independent Agree-relationships: one between L and the downstairs definite description and another between L and the upstairs quantificational DP, as schematized in (313).

(313)



The nodes from DP upwards are defined iff* $[\![\mathrm{NP}]\!](g(1)) = 1$.

Assuming some form of feature unification (Pesetsky and Torrego 2004; Kratzer 2009), the Agree-chain mediated by L gives the definite determiner access to at least one identifying feature of the upstairs quantificational determiner, namely its counterpart to L's selectional feature [•D•]. Thus, the Vocabulary Items in (314) and the NP selecting its path through the downstairs DP for the linearization algorithm result in the movement being covert. Moreover, since L needed some feature to agree with the downstairs DP, this feature being the index means that L can also translate into the λ-abstraction that binds the index (315).

(314) *Vocabulary Items*

a. $\left[\sqrt{\text{THE}}, [\text{D:EVERY}]\right] \leftrightarrow$ /every/

b. $\sqrt{\text{EVERY}} \leftrightarrow \varnothing$

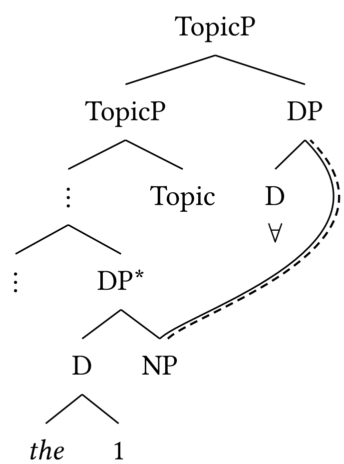
(315) *λ-abstraction functional head*

$$[\![\mathrm{L}_{[\star i \star]}\ \alpha]\!]^{g} = \lambda x\ .\ [\![\alpha]\!]^{g[i \to x]}$$

For the sake of simplicity, I will not depict these Agree-relationships going forward, with the understanding that behind the scenes, this particular setup allows the movement to be covert.

I propose that DP-movement follows Johnson's (2012, 2014) proposal for Trace Conversion: the "moved" DP is merged upstairs, a definite description is merged downstairs, and the two share an NP across them. DP-movement may be overt or covert. QR instantiates the covert option and follows the derivation above in (313). Topicalization, on the other hand, instantiates the overt option, which is driven by the idiosyncratic demands of Topic^0 to linearize its specifier to the left (316).[35]

(316) *Topicalization as overt DP-movement*



The nodes from DP upwards are defined iff* $[\![\mathrm{NP}]\!]\,(g(1)) = 1$.

Having both overt and covert linearization options for DP-movement in English suggests that the definite determiner involved in forming a DP-movement dependency is more abstract than the exact lexical root $\sqrt{\textsc{the}}$, e.g. a maximality operator, but I leave this issue for future work.

[35] It is of course possible to front phrases other than DPs in English. In section 3.4.4, I will argue that fronting VPs and APs is distinct from topicalizing DPs. This leaves fronting of PPs. Here, I propose that PP-fronting is a case of DP-topicalization wherein prepositions in English are part of the extended nominal projection (excluding perhaps their particle uses), something like case clitics. PPs are introduced by dedicated functional heads that house their semantics, akin to what Morzycki (2005) proposes for other kinds of modifiers, but they are themselves of the same semantic types as ordinary nominals. This sketch obviously requires more exploration, but it would explain the nominal-like behavior of some PPs, such as allowing an element to bind outside of them.

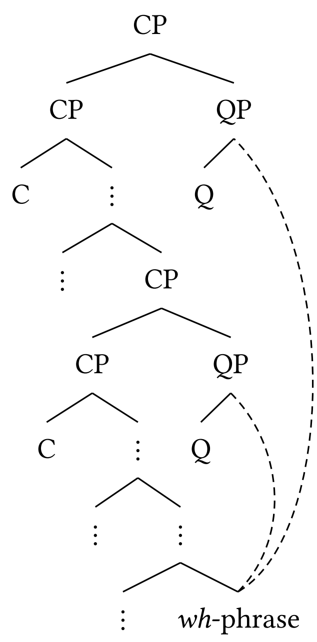
3.3.6 Chaining QP-movement and DP-movement

QP-movement and DP-movement may be chained together to create complex movement derivations. There are four logically possible combinations comprising two steps: QP→QP (§3.3.6.1), DP→DP (§3.3.6.2), DP→QP (§3.3.6.3), and QP→DP (§3.3.6.4). I will show that given the syntax and semantics of QP-movement and DP-movement proposed above, only DP→DP and DP→QP constitute valid movement chains. These two possible pairs then generalize to more complex movement chains; for example, DP→DP→QP is a possible movement chain, but not DP→QP→DP.

3.3.6.1 QP→QP chain

Parallel-MERGE is able to generate a QP→QP movement chain: the *wh*-phrase is merged in parallel with its base position and two separate Q-particles. The resulting two QPs are then merged into the structure separately. The structure of a QP→QP movement chain is schematized in (317).

(317) *QP→QP movement chain*



While a QP→QP movement chain is syntactically licit, it is not clear that it is possible semantically. Recall the two possible semantics entertained for the Q-particle in section 3.3.4: existential closure over choice functions (318a) and percolation of focus alternatives (318b).

(318) *Q-particle semantics*

a. *Choice-function semantics*
$[\![\mathrm{Q}]\!] = \lambda q_{\langle s,t \rangle}\, \lambda w_0\, \lambda p_{\langle s,t \rangle}\ .\ \exists f^{\mathrm{CF}}[\, p = q\,]$ (=292)

b. *Focus-alternative semantics*
$[\![\mathrm{Q}\ \alpha]\!]^{o} = [\![\alpha]\!]^{f}$ (=297)

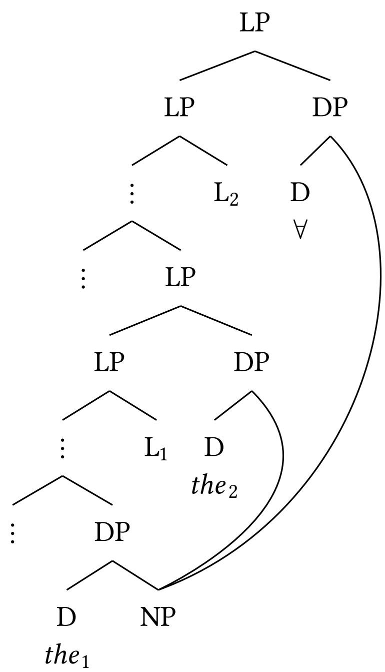
According to either of these semantics, a QP→QP movement chain would require the intermediate Q-particle to be semantically vacuous for the higher Q-particle to derive a matrix question by applying existential closure to the choice function or catching the focus alternatives associated with the *wh*-phrase. The needs of the *wh*-phrase are satisfied as long as there is at least one semantically contentful Q-particle. However, the grammar has no means of "looking ahead" to ensure that the semantically contentful Q-particle is the highest one and not an intermediate one. This is what presents a problem. Naturally, distinguishing between intermediate and criterial positions is not a new problem. For example, edge features are designed precisely to force elements to move to intermediate positions in anticipation of them needing to move to a subsequent position in some higher domain. In princip, such a solution could extend to QP→QP movement chains, but it would require the rather baroque stipulation that all and only Q-particles associated with an edge feature are semantically vacuous. If we are forced to acquiesce that English has two different Q-particles for constituent questions and relative clauses respectively, where pied-piping possiblities differ, then having a third Q-particle that is semantically vacuous becomes even less implausible, assuming that there is some means of regulating its distribution.

Moving forward, I will assume that a QP→QP movement chain is impossible because it is incompatible with the semantics of Q-particles. In actuality, it remains an open question. Nevertheless, whether a QP→QP movement chain is possible will not bear significantly on the main arguments in this chapter. The topic of QP→QP movement chains will come up again in section 3.3.7 in the context of crossclausal movement, where a QP→QP chain across a clause boundary would predict that long movement can reconstruct all the way into the base position. I will show that there is reason to believe that this kind of reconstruction is not available, which further suggests that a QP→QP movement chain is impossible.

3.3.6.2 DP→DP chain

A DP→DP movement chain is possible both syntactically and semantically. The NP is merged in parallel with three separate determiners, the lower two of which are definite determiners as part of the multidominance implementation of Trace Conversion. The structure of a DP→DP movement chain is schematized in (319).

(319) *DP→DP movement chain*



Semantically, the moved DP takes scope in the landing site of the final DP-movement step. In effect, the intermediate step has no semantic effect. A helpful way of conceptualizing the semantics of a DP→DP movement chain is in a procedural sense: the first step of DP-movement shifts scope to the intermediate position (320a) and then the second step shifts scope to the final position (320b).

(320) a. *First step of DP-movement*

$[\ \mathrm{Op}_2 \ldots [\ \mathbf{DP}_1 \ldots [\ \mathrm{Op}_3 \ldots [\ \ldots \_\_\__1 \ldots\ ]\ ]\ ]\ ]$ $\qquad \mathrm{Op}_2 \gg \mathbf{DP}_1 \gg \mathrm{Op}_3$

b. *Second step of DP-movement*

$[\ \mathbf{DP}_1 \ldots [\ \mathrm{Op}_2 \ldots [\ \_\_\__1 \ldots [\ \mathrm{Op}_3 \ldots [\ \ldots \_\_\__1 \ldots\ ]\ ]\ ]\ ]\ ]$ $\qquad \mathbf{DP}_1 \gg \mathrm{Op}_2 \gg \mathrm{Op}_3$

Therefore, a DP→DP movement chain requires that the lower two DPs be definite descriptions. One might wonder why this ordering necessity does not inherit the same problem as QP→QP chains, as discussed above. The reason that it does not is because the ordering is forced independently. Consider a singleton DP-movement step. First, the lower DP must be semantic type *e* in order for the semantic composition to proceed without crashing; a definite description is the minimal alteration that achieves type *e*. Second, the higher DP being a definite description and the lower DP being quantificational would result in vacuous quantification, which is ruled out by scope economy (Fox 2000). Thus, in a singleton DP-movement step, there are independent factors forcing the lower DP to be a definite description. These same factors extend to DP→DP movement chains, forcing them to have the correct ordering. Moreover, the components needed to form the chain, i.e. different determiners, are observable independently. The same kind of independent means of enforcing a particular semantic shape of the chain is unavailable in a QP→QP chain.

3.3.6.3 DP→QP chain

In addition to movement chains involving just QP-movement or DP-movement, it is also possible for a movement chain to consist of an initial step of DP-movement feeding a subsequent step of QP-movement. Such a DP→QP chain has two effects: First, it shifts the scope of the moved expression to the landing site of the initial DP-movement step. Second, it shrinks the region over which the *wh*-dependency is computed. Rather than being computed from the expression's base position, it is computed from the position achieved by DP-movement. These effects are schematized in (321) by comparing a singleton QP-movement step (321a) and a DP→QP movement chain (321b), where the squiggle arrows represent the *wh*-dependency.

(321) a. *Just QP-movement*

QP-mvt

[*wh*-phrase$_1$ . . . [Op . . . [. . . ___$_1$ . . .]]] Op ≫ *wh*-phrase

b. *DP-movement feeding QP-movement*

QP-mvt *DP-mvt*

[*wh*-phrase$_1$ . . . [___$_1$ . . . [Op . . . [. . . ___$_1$ . . .]]]] *wh*-phrase ≫ Op

In (321a), where the *wh*-phrase only undergoes QP-movement, the *wh*-phrase takes scope in its base position, and the *wh*-dependency is computed across the entire region between the base position and the landing site of QP-movement. On the other hand, in (321b), the *wh*-phrase takes scope in the landing site of DP-movement, and the *wh*-dependency is computed across the region between that position and the landing site of QP-movement. The crucial difference between (321a) and (321b) is whether the *wh*-dependency is computed over the operator Op (which stands in for any scope-bearing element). This difference will prove important in sections 3.4.2 and 3.4.3, which discuss Late Merge effects and focus intervention respectively, because the operator could be a DP coindexed with an R-expression in the moving element or a focus intervener.

The reason that *wh*-movement optionally shifts scope is because *wh*-movement is ambiguous between a derivation with a single step of QP-movement and a derivation with a DP→QP movement chain, only the latter of which shifts the scope of the *wh*-phrase to derive the wide-scope reading. To illustrate this, let us walk through the derivation of the wide-scope reading of (322).

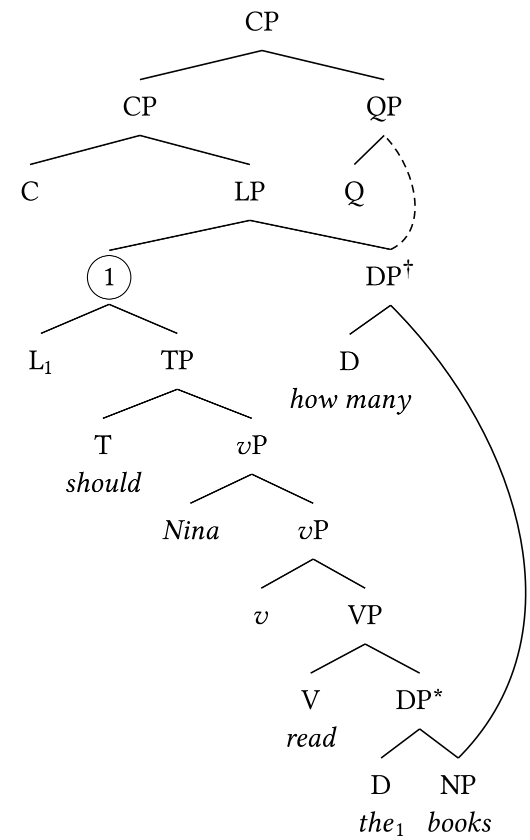
(322) [**How many books** $]_1$ should Nina read $\_\_\__1$ this summer? (=106)

a. *Wide-scope reading* how many ≫ should
For what number n: There are n-many particular books x such that Nina should read x this summer.

b. *Narrow-scope reading* should ≫ how many
For what number n: It is necessary for there to be n-many books x such that Nina reads x this summer.

The derivation of the wide-scope reading of (322) is given in (323), where the *wh*-phrase first undergoes a step of DP-movement to a position above the modal *should* and then undergoes a step of QP-movement to [Spec, CP].

(323) *DP→QP movement chain*



The nodes from DP upwards are defined iff* $[\![\text{book}]\!](g(1)) = 1$.

a. $[\![\text{DP}^*]\!]^g = \iota x[\textsc{book}^*(x) \wedge x = g(1)]$

b. $[\![v\text{P}]\!]^g = \lambda w\,.\,\textsc{read}^*_w(\iota x[\textsc{book}^*(x) \wedge x = g(1)])(\text{Nina})$

c. $[\![\text{TP}]\!]^g = \lambda w\,.\,\textsc{should}_w\big(\lambda w'\,.\,\textsc{read}^*_{w'}(\iota x[\textsc{book}^*(x) \wedge x = g(1)])(\text{Nina})\big)$

d. $[\![\text{①}]\!]^g = \lambda y\,\lambda w\,.\,\textsc{should}_w\big(\lambda w'\,.\,\textsc{read}^*_{w'}(\iota x[\textsc{book}^*(x) \wedge x = y])(\text{Nina})\big)$

e. $[\![\text{DP}^\dagger]\!]^g = \lambda \text{P}_{\langle e,st\rangle}\,\lambda w\,.\,\exists x[\#x = f(\text{D}_d) \wedge \textsc{book}^*(x) \wedge \text{P}(x)(w)]$

f. $[\![\text{LP}]\!]^g = \lambda w\,.\,\exists x\big[\#x = f(\text{D}_d) \wedge \textsc{book}^*(x) \wedge$
$\textsc{should}_w\big(\lambda w'\,.\,\textsc{read}^*_{w'}(\iota x[\textsc{book}^*(x) \wedge x = y])(\text{Nina})\big)\big]$

g. $[\![\text{CP}]\!]^g = \lambda w_o\,\lambda p\,.\,\exists f^{\text{CF}}\big[\,p = \lambda w\,.\,\exists x\big[\#x = f(\text{D}_d) \wedge \textsc{book}^*(x) \wedge$
$\textsc{should}_w\big(\lambda w'\,.\,\textsc{read}^*_{w'}(\iota x[\textsc{book}^*(x) \wedge x = y])(\text{Nina})\big)\big]\big]$

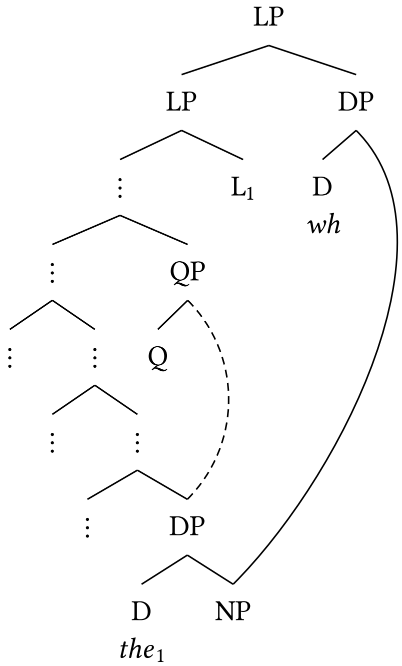
The semantic derivation in (323) proceeds as follows: First, *the books* composes with *read* and *Nina* to yield an assignment-dependent proposition (323b). Second, *should* takes this proposition as its argument (323c). Third, the L head introducing the *wh*-phrase translates into a λ-abstraction that maps the index 1 to the λ-bound variable x (323d). Fourth, *how many books* takes ① as its argument (323f). Last, the Q-particle applies its semantics, which here is existential closure over the choice function f introduced by *how many* and forming the question nucleus using the proposition denoted by 1 (323g). In the end result, *how many* scopes above *should*. Therefore, the ambiguity between QP and DP→QP movement derivations derives the optionality of scope shifting in English constituent questions. This ambiguity is obscured in the linearization because the final step of QP-movement always forces the *wh*-phrase to be linearized in [Spec, CP] regardless of the underlying derivation.

This analysis of scope in constituent questions highlights an advantage of the DP/QP-movement system developed here over more traditional conceptions of movement: there is no sense in which movement optionally reconstructs. That is, movement either reconstructs or does not reconstruct based solely on the underlying syntactic derivation—it is deterministic. A more traditional conception of movement wherein a given movement type, e.g. *wh*-movement, might optionally reconstruct has the disadvantage of having to state any conditions that block reconstruction as ad hoc constraints on reconstruction itself. As will be discussed in section 3.4, under the DP/QP-movement system, these reconstruction-blocking conditions simply target DPs and hence only interact with DP-movement, which by definition does not reconstruct.

3.3.6.4 QP→DP chain

While DP-movement may feed QP-movement, the inverse is not possible, where QP-movement feeds DP-movement. Such a QP→DP movement chain can in principle be generated by parallel-Merge, as schematized in (324).

(324) *QP→DP movement chain*



However, the structure in (324) is degenerate for two reasons. First, the Q-particle does not c–command the *wh*-phrase, which in turn creates two problems: (i) the Q-particle cannot establish an Agree-relation with the *wh*-phrase (as required under Cable's (2007, 2010) proposal), and (ii) the semantics of the Q-particle cannot successfully target the *wh*-phrase because it is not in its scope. Consequently, a QP→DP chain is ungrammatical on both syntactic and semantic grounds because the Q-particle and the *wh*-phrase bear no relation to one another. Second, unlike a DP→QP chain, the amount of structure being shared in a QP→DP chain does not stand in a proper-containment relation across the two movement steps. The lower step of QP-movement targets the DP, while the higher step of DP-movement targets the NP inside that DP. There is no link between the two movement steps and no sense in which the QP-movement is actually feeding the DP-movement. In other words, QP-movement does not furnish the right kind of element for DP-movement. Therefore, a QP→DP movement chain is impossible.

3.3.7 Crossclausal movement

An implication of the DP/QP-movement system is that crossclausal movement necessarily involves DP-movement. One of the central discoveries in generative syntax is that crossclausal movement is not created in one fell swoop (325a), but rather proceeds successive cyclically via the edges of intermediate clause boundaries (325b) (Chomsky 1973, 1977, 1981).

(325) *Successive-cyclic movement*

a. *[$_{CP}$ **Who**$_1$ did [$_{TP}$ Rose think [$_{CP}$ that [$_{TP}$ Blanche saw ~~**who**~~$_1$]]]]?

b. ✓[$_{CP}$ **Who**$_1$ did [$_{TP}$ Rose think [$_{CP}$ ~~**who**~~$_1$ that [$_{TP}$ Blanche saw ~~**who**~~$_1$]]]]?

Consequently, crossclausal movement requires a chain consisting of more than one movement step. Given that, as discussed in section 3.3.6, there are only two licit types of movement chains in the DP/QP-movement system, DP→DP and DP→QP, the intermediate steps in a crossclausal movement dependency must be DP-movement.

Although this implication might appear to be too restrictive, it does successfully derive the narrow-scope and wide-scope readings of a *wh*-phrase extracted out of the complement clause of an attitude predicate. To illustrate, consider the sentence in (326), in which *how many books* can take narrow or wide scope with respect to the attitude predicate *hope*.

(326) [**How many books**]$_1$ does Dorothy **hope** [$_{CP}$ that Sophia will read ___$_1$]?

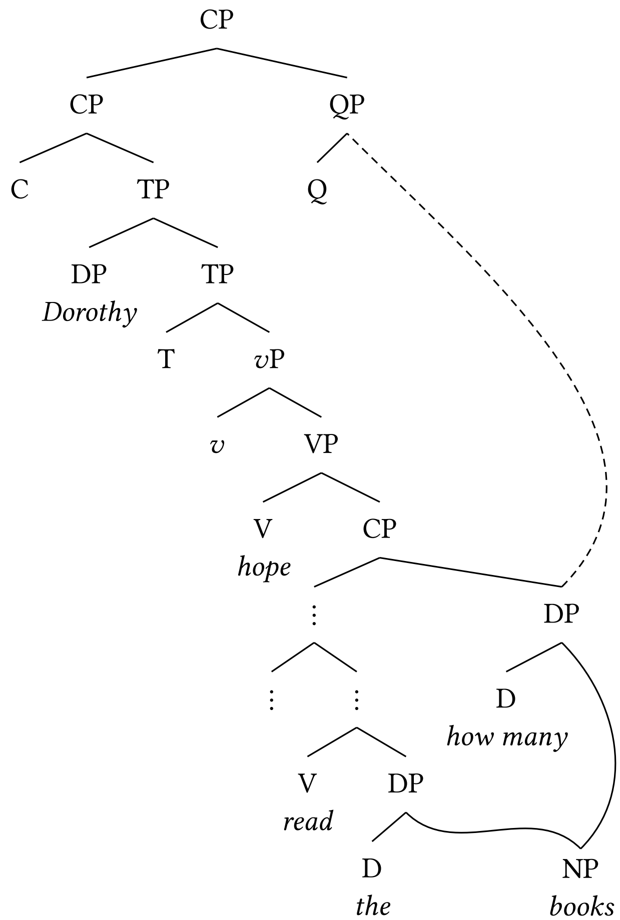
a. *Narrow-scope reading* hope ≫ how many
For what number *n*: In all of Dorothy's bouletic alternatives, there are *n*-many books *x* such that Sophia reads *x*.

b. *Wide-scope reading* how many ≫ hope
For what number *n*: There are *n*-many particular books *x* such that in all of Dorothy's bouletic alternatives, Sophia reads *x*.

The narrow-scope reading in (326a) follows from the DP→QP chain that is minimally necessary to move across a clause boundary. First, the *wh*-phrase undergoes DP-movement to [Spec, CP] in the embedded clause, i.e. the intermediate clause edge position. Second, it undergoes QP-movement to [Spec, CP] in the matrix clause, the criterial *wh*-position. This derivation is schematized in (327).

The *wh*-phrase *how many books* takes scope in the highest position achieved by DP-movement, which is in the scope of the attitude predicate *hope*.[36]

(327) *Narrow-scope derivation of (326)*



The wide-scope reading in (326b) involves a derivation with two steps of DP-movement. First, the *wh*-phrase undergoes DP-movement to the edge of the embedded clause. Second, it undergoes another step of DP-movement into the matrix clause, crucially above the attitude predicate *hope*. Finally, it undergoes QP-movement to [Spec, CP] in the matrix clause. This derivation is schema-

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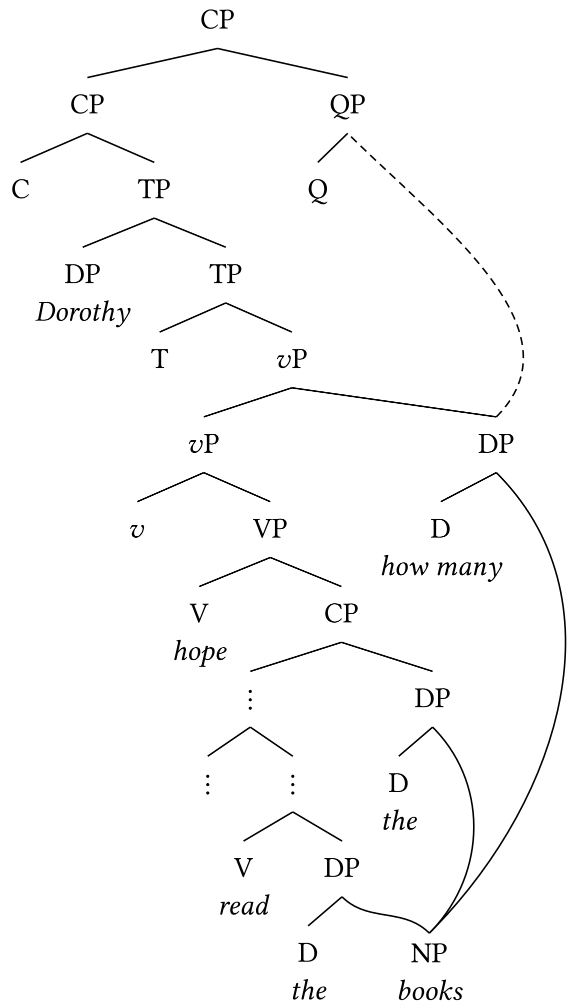
[36] This makes the prediction that crossclausal *wh*-movement should force the *wh*-phrase to take scope above all other elements in the embedded clause. This might prove problematic for things like binding, which I have not considered extensively here. With regards to the logical scope of quantifiers, it is difficult to test this prediction, but the relevant sentence is something like (i). It is unclear to me how to differentiate the reading of *how many* scoping below *hope* from the reading scoping below *want*.

(i) [**How many books**]$_1$ does Dorothy **hope** [$_{\text{CP}}$ ___$_1$ that [$_{\text{TP}}$ Sophia **wants** to read ___$_1$]]?

If this prediction turns out to be false, then the theory must permit QP→QP movement chains to account for the lack of scope shifting to the edge of the embedded clause in crossclausal movement.

tized in (328). The *wh*-phrase *how many books* takes scope in the highest position achieved by DP-movement, which is outside the scope of the attitude predicate *hope*.

(328) *Wide-scope derivation of (326)*



In recent minimalist syntax, successive cyclicity falls under the purview of Phase Theory (Chomsky 2000, 2001, 2004, 2008). According to Phase Theory, syntactic derivations are built in chunks known as PHASES, which are periodically shipped off to the interfaces, at which point they are rendered inaccessible to further syntactic operations. Only the edge of a phase remains accessible to operations outside of that phase. This restriction is formulated in the PHASE IMPENETRABILITY CONDITION (PIC) in (329), where the domain of a phase head is its complement and the edge is its specifier.

(329) **Phase Impenetrability Condition (PIC)**
In phase α with head H, the domain of H is not accessible to operations outside of α, only H and its edge are accessible to such operations. [Chomsky 2000:108]

According to the PIC, successive cyclicity follows from C^0 being a phase head. Thus, for an element in an embedded clause to remain accessible to material in a higher clause, it must first move to [Spec, CP] of the embedded clause to escape the phase.

A rarely addressed problem in Phase Theory is how to interpret a movement chain that spans two phases, if semantic interpretation proceeds by phase and assuming a standard copy-theoretic approach to movement. The core problem is that the grammar does not know how to interpret the lower copy until it has (i) encountered the higher copy and (ii) determined whether the movement reconstructs. To illustrate, consider the derivation of (326), repeated below in (330), at the point when the embedded clause has been constructed and the phase complement (TP) is shipped off to LF, as schematized in (331).

(330) [**How many books**]$_1$ does Dorothy **hope** [$_{\text{CP}}$ that Sophia will read ___$_1$]? (=326)
how many ≫ hope; hope ≫ how many

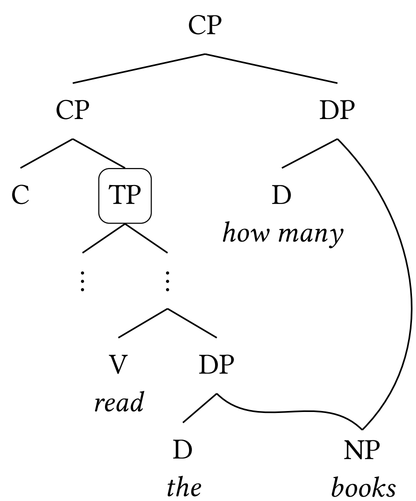
(331) *Interpreting movement dependencies under Phase Theory*
[$_{\text{CP}}$ [**how many books**]$_1$ that$_{\text{C}}$ $\underbrace{[_{\text{TP}} \text{ Sophia will read [\textbf{how many books}]}_1]}_{\text{phase complement}}$]

Immediately, two problems present themselves: First, the grammar has no way of knowing that *how many books* is a lower copy of an element to be introduced in a higher phase. The Copy Theory of Movement does not furnish this kind of information, and adding any kind of special diacritic signaling what is a (lower) copy would violate Inclusiveness; see section 3.3.2. Second, even if the grammar knew that *how many books* is a copy, it then has to decide whether to interpret it as is or to apply Trace Conversion. Selecting the former option would in turn require not interpreting the corresponding copies in higher phases (*and* knowing that they are copies, *and* presumably having access to the trace-converted copy in the lower phase, despite the PIC, so as to be able to make such a decision). One might counter that the choice between interpreting as is and applying Trace Conversion is a free choice. However, Trace Conversion cannot be a free operation without ascribing an optional definite interpretation to every single DP, including quantificational ones.

Since quantificational DPs do not all have such a meaning, the choice of how to interpret the lower copy cannot be a free one. Furthermore, limiting this choice to copies runs into the first problem that the grammar does not know that a copy is a copy. Avoiding these problems requires that LF delay interpreting structure sent to it until the sentence has been fully constructed so that LF has all of the relevant information available to it. This is not in the spirit of Phase Theory; there would then be no reason at all to ship structure off to the LF interface on a phase-by-phase basis.

These problems for Phase Theory do not carry over to the DP/QP-movement system. As discussed in section 3.3.2, multidominance does not face the problems associated with copy identity. More particularly, in the DP/QP-movement system, the intertwined nature of the syntax and semantics underlying the deterministic system of movement allows movement dependencies to be interpreted on a phase-by-phase basis. Consider again the derivation of (326)/(330) at the point when the embedded clause has been constructed and the phase complement (TP) is shipped off to LF, except now in the DP/QP-movement system, as schematized in (332).

(332) *DP/QP-movement system and Phase Theory*



The phase complement transfered to LF contains the bottom half of a DP-movement dependency. The bottom half is an anaphoric definite description. In the eyes of the grammar, it will be interpreted as such, and it is irrelevant that it is part of a movement dependency to be further constructed as the derivation proceeds.[37] The semantic value of the phase complement will, however, be assignment

[37] Here, I am assuming that the NP can be interpreted even though it is dominated by a DP that is outside the phase domain and thus not sent to LF at the same time as the NP. This assumption differs from O'Brien (2015), who argues

dependent until the next phase is sent to LF and interpreted. The DP/QP-movement system avoids the problems outlined above because (i) Trace Conversion is baked into the syntax (à la Johnson 2012, 2014) and (ii) reconstruction is not an optional process at LF, but rather is always the result of moving a QP.

Standardly, C^0 is not taken to be the only phase head; rather, v^0 is considered a phase head as well (Chomsky 2000, 2001, 2004, 2008). The DP/QP-movement system is incompatible with *v*P phases because obligatory successive-cyclic movement through [Spec, *v*P], being DP-movement, would bleed the ability to take scope in the embedded clause, below the matrix verb, which is necessary for deriving narrow-scope readings like (326a). I do not have much to say about this incompatibility, other than that I do not see it as a problem. *v*P phases are independently incompatible with an entire class of size-based locality constraints in the spirit of the Williams Cycle; for discussion of this problem, see Müller (2014b), (Keine 2016:ch. 6), and Poole (2016). Given the substantial and growing amount of evidence for a size-based locality constraint in syntax and the scant empirical evidence for *v*P phases (see Keine 2016:ch. 6 for an overview; also Williams 1974, 2003, 2013; Müller and Sternefeld 1993, 1996; Abels 2007, 2009, 2012a,b; Neeleman and van de Koot 2010; Müller 2014a,b), I take the incompatibility of the DP/QP-movement system with *v*P phases as a further argument—admittedly theory-internal—that *v*P is not a phase.

3.3.8 Typology of movement

Against the backdrop of the syntax and semantics of DP-movement and QP-movement laid out in sections 3.3.4–3.3.6, this section discusses the typology of movement types under the DP/QP-movement system. There are two dimensions of variation on which movement types are defined: The first dimension is the underlying syntactic derivation: a singleton QP-movement step, a singleton DP-movement step, a DP→DP chain, or a DP→QP chain. The second dimension is whether the movement is realized overtly or covertly, i.e. how the multidominance representation underlying the movement dependency is linearized.

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that in a multidominant syntax fashioned after Johnson (2012, 2014), a node must be completely dominated in its Spellout domain to be sent to the interfaces. O'Brien uses this condition to derive the behavior of movement out of *wh*-islands. However, O'Brien's (2015) Spellout domains are not identical to phase domains, so a reconciliation of these ideas might lie in teasing apart exactly what is sent to the interfaces at Spellout.

Section 3.3.8.1 discusses English movement types in the DP/QP-movement system. I propose that English movement types can be characterized solely in terms of (i) whether the movement targets QPs or DPs, (ii) an optional initial step of covert DP-movement, i.e. QR, and (iii) the landing site of the movement. Section 3.3.8.2 then discusses the crosslinguistic typology of constituent questions. This typology was partially addressed in section 3.3.4 while introducing QP-movement, but here I take into account the strategies employed across languages to shift the scope of the *wh*-phrase, which QP-movement does not itself do.

3.3.8.1 English movement types

Modulo covert QP-movement, English instantiates the factorial typology of movement derivations available in the DP/QP-movement system. The different possible derivations correspond to standard labels for different movement types. When QP-movement is involved, the movement is what we standardly would call *wh*-movement. Overt DP-movement is what we would call topicalization, and covert DP-movement is QR. This is summarized in (333); the probe and target columns in the table are explained below.[38]

(333) *Movement types in English*

Derivation	Overt	Name	Probe	Target
QP	✓	*wh*-movement	[•Q•]	[Spec, CP]
DP→QP	✓	*wh*-movement	[•Q•]	[Spec, CP]
DP	✓	topicalization	[•D•]	[Spec, TopicP]
DP	✗	QR	[•D•]	propositional node

The DP/QP-movement system and its typology for English in (333) captures the reconstruction properties and linearization of different movement types in English. Needless to say, there are other differences between English movement types that are not immediately captured. For instance, topicalization and QR clearly do not have the same meaning. While the DP/QP-movement system successfully captures that they both shift scope but differ in their linearization, it does not capture (i) the "topic" component of topicalization and (ii) that QR does not share this "topic" meaning.

[38] There are obviously more movement types in English than depicted in (333), e.g. relative clauses. I have simplified the picture for the sake of discussion.

Under the DP/QP-movement system, and as is fairly standard, such differences rather stem from the landing site of the movement, specifically the head that bears the movement-driving probe.[39] Thus, the "topic" part of topicalization comes from the semantic contribution of Topic^0, whatever that might be. In the same vein, some part of the meaning of *wh*-movement might come from the question complementizer C^0_Q that drives interrogative movement.[40] As for QR, its distribution is somewhat more free in that it can target roughly any node that denotes a proposition and whatever drives the movement does not contribute any meaning of its own.

Given that all of the movement types in (333) involve or can involve DP-movement, English movement derivations can be characterized in terms of (i) the identity of the final movement step and (ii) an optional initial step of DP-movement. The "*wh*-movement" and "topicalization" parts of the movement derivation thus only constitute the final movement step. DP-movement—what is essentially QR—can freely occur before that final movement step takes place. Let us call this the QR Hypothesis in (334).

(334) **QR Hypothesis**
Movement (in English) may be fed by QR.

The QR Hypothesis is possible because the second movement step in both QP→DP and DP→DP movement chains is oblivious to the movement history of the phrase that it targets. In both types of chains, the second step targets a DP for parallel-Merge, but it is indifferent to whether that DP is sharing its NP with another DP, i.e. is itself part of a DP-movement step (§§3.3.6.2, 3.3.6.3). Moreover, in a DP→DP movement chain, the moved DP takes scope in the landing site of the second step of DP-movement, thereby rendering the first step semantically superfluous (§3.3.6.2). We will see in section 3.4 that this optional step of DP-movement explains a number of disparate reconstruction phenomena.

Because only the final movement step in a movement derivation is needed to characterize English movement types, the difference between *wh*-movement, on one hand, and topicalization and

39 Differences in the locality profiles of movement types may also be attributed to their landing site (Williams 2003; Müller 2014b; Keine 2016).

40 Although the semantics of constituent questions proposed in section 3.3.4 attributed no meaning contribution to the complementizer, this does not preclude it from contributing something.

QR, on the other hand, ultimately reduces to the probe that drives the movement. *Wh*-movement is driven by a probe targeting a QP (335a), while topicalization and QR are driven by a probe targeting a DP (335b, c).

(335) a. *Wh-movement probe*
C^0_Q: [•Q•]

b. *Topicalization probe*
Topic^0: [•D•]

c. *QR probe*
L^0: [•D•]

To summarize, under the DP/QP-movement system, English movement types can be characterized solely in terms of three factors: (i) whether the movement probe targets QPs or DPs, (ii) an optional initial step of DP-movement, i.e. QR, and (iii) the landing site of the movement.

3.3.8.2 Crosslinguistic typology

The DP/QP-movement system also captures the crosslinguistic typology of constituent questions. Recall from section 3.3.4 that the difference between *wh*-fronting and *wh*-in-situ languages reduces to linearization. In *wh*-fronting languages, the path selected for the *wh*-phrase goes through the QP, forcing it to be linearized with the QP in [Spec, CP]. In *wh*-in-situ languages, the path selected for the *wh*-phrase instead goes through its base position, forcing it to be linearized in situ. Missing from this simple typology is how the *wh*-phrase takes scope in a position other than its base position, either covertly with QR or overtly with scrambling. Given that QP-movement does not alter the scope of the *wh*-phrase, this is the domain of DP-movement.

In many *wh*-in-situ languages, while the *wh*-phrase is typically in situ, it may also move. To illustrate, consider constituent questions in Hindi. In Hindi, the *wh*-phrase may appear in situ (336a), but it may also scramble into other positions (336b) (e.g. Mahajan 1990; Dayal 1996; Kidwai 2000).

(336) *Scrambling in Hindi constituent questions*

a. *Wh-phrase in situ*

raam-ne	**kis-ko**	ek	kitaab	dii?	[S **IO** DO V]
Ram-ERG	who-DAT	a	book	give.PFV	

'Who did Ram give a book to?'

b. *Wh-phrase scrambled*

kis-ko$_1$ raam-ne ___$_1$ ek kitaab dii? [**IO** S DO V]
who-DAT Ram-ERG a book give.PFV
'Who did Ram give a book to?' [Mahajan 1990:113]

Scrambling *kis-ko* 'who' in (336b) is DP-movement because it shifts the scope of the *wh*-phrase. I show two pieces of evidence for this scope shifting. First, scrambling the *wh*-phrase can obviate a focus-intervention effect (see section 3.4.3 for focus intervention). This is illustrated in (337) with a negative polarity item (NPI). In (337a), the subject is an NPI licensed by sentential negation. The *wh*-phrase is forced to be interpreted in the scope of negation—a focus intervener—, thereby causing an intervention effect. When the *wh*-phrase is scrambled over the subject and hence is not in the scope of negation, the intervention effect is obviated (337b).

(337) *Focus intervention in Hindi*

a. ?? [*kisi-bhii laṛke-ne*] **kis-ko** nahĩĩ dekh-aa? *QP*
some-NPI boy-ERG who-DOM not see-PFV
Intended: 'Who did no boy see?'

b. ✓**kis-ko**$_1$ [*kisi-bhii laṛke-ne*] ___$_1$ nahĩĩ dekh-aa? *DP→QP*
who-DOM some-NPI boy-ERG not see-PFV
'Who did no boy see?' [Keine 2016:118]

Second, the *wh*-phrase can bind a pronoun from the scrambled position, as shown in (338b).

(338) *Scrambling to bind in Hindi*

a. * [*uskii*$_1$ mãã-ne] **kis-ko**$_1$ ghar-se nikaal diyaa? *QP*
his mother-ERG who-DOM home-INSTR threw.out
Intended: 'Who$_1$ did his$_1$ mother throw out of the house?'

b. ✓**kis-ko**$_1$ [*uskii*$_1$ mãã-ne] ___$_1$ ghar-se nikaal diyaa? *DP→QP*
who-DOM his mother-ERG home-INSTR threw.out
'Who$_1$ did his$_1$ mother throw out of the house?' [Mahajan 1990:124]

Thus, in *wh*-in-situ languages with scrambling, like Hindi, QP-movement is covert, but DP-movement is overt. Therefore, in a DP→QP movement chain, like (337b) and (338b), the *wh*-phrase is linearized and takes scope in the position obtained by DP-movement.

It is also possible for DP-movement to be overt in a *wh*-fronting language, but it will not be observable with a DP→QP movement chain because the QP-movement, being overt itself, masks whether the DP-movement is overt or covert. Rather, one must look at multiple-*wh* questions, wherein only the higher *wh*-phrase fronts. Under the DP/QP-movement system, this means that the higher *wh*-phrase undergoes QP-movement and the lower *wh*-phrase does not, though the latter can still undergo DP-movement (see Kotek 2014 for a proposal along these lines). In English multiple-*wh* questions, the lower *wh*-phrase must appear in situ (339). However, in German multiple-*wh* questions, while the lower *wh*-phrase can appear in situ like English (340a), it can also scramble to a higher position in the Mittelfeld (340b).[41,42]

(339) *English multiple-wh questions*
Who$_1$ has already ___$_1$ read **which book**?

(340) *German multiple-wh questions*

a. *Wer* hat schon [**welches Buch**] gelesen?
who has already which book read
'Who has already read which book?'

b. *Wer* hat [**welches Buch**]$_1$ schon ___$_1$ gelesen?
who has which book already read
'Who has already read which book?' [Stefan Keine, p.c.]

Thus, while English and German both have overt QP-movement, only German has overt DP-movement of *wh*-phrases, allowing the lower *wh*-phrase to appear displaced. For evidence that the lower *wh*-phrase can take scope via DP-movement, i.e. *which book* in (339) can covertly take higher scope and *welches Buch* 'which book' in (340b) takes scope in the landing site of scrambling, see section 3.4.3. This claim about English and German is compatible with the well-known difference between the two languages: English has covert movement and German does not, being a more scope-rigid language with access to scrambling.

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41 Note that (333) and both sentences in (340) allow pair-list readings.

42 It has been claimed in the literature that *wh*-phrases cannot scramble in German (e.g. von Stechow and Sternefeld 1988:466; Fanselow 1990:117–118; Müller and Sternefeld 1993, 1996), but the cited examples are confounded by the information-structural constraints on the German Mittelfeld (for an overview of these constraints, see Müller 1999). When these confounds are controlled for, scrambling *wh*-phrases is indeed allowed, e.g. (340b); see Beck (1996); Wiltschko (1997); Fanselow (2004) for discussion.

In sum, the two factors relevant in the crosslinguistic typology of constituent questions are (i) whether QP-movement is overt or covert and (ii) whether DP-movement is overt (=scrambling) or covert (=QR). The typology is summarized in (341).

(341) *Crosslinguistic typology of constituent questions*

QP-movement	DP-movement	Language
overt	overt	German
overt	covert	English
covert	overt	Hindi, Japanese
covert	covert	??

It is unclear whether there is a language where both QP-movement and DP-movement are covert. To answer this question, we would need to look deeper into a *wh*-in-situ language that lacks scrambling—perhaps Mandarin[43]—and examine the scope possibilities in *how many*-questions. This is a topic for future research.

3.4 Application to reconstruction phenomena

This section applies the DP/QP-movement system developed in 3.3 to four reconstruction phenomena: the Π-position asymmetry (§3.4.1), Late Merge effects (§3.4.2), focus intervention (§3.4.3), and predicate movement of VPs and APs (§3.4.4). These phenomena divide into two classes: reconstruction-forcing conditions and reconstruction-blocking conditions. Reconstruction-forcing conditions are environments that are incompatible with the semantic output of DP-movement, namely a definite description, which is type *e*. Thus, they disallow any movement that shifts scope, i.e. is not QP-movement (342).

(342) *Reconstruction-forcing condition*

$$^{*}[\ [_{\text{DP}}\ \text{D NP}\ ]\ \ldots\ [\ \ldots\ \underbrace{[\ [_{\text{DP}}\ \text{the NP}\ ]\ ]}_{\text{Incompatible with type } e}\ \ldots\ ]\ ]$$

43 I looked preliminarily at Mandarin, but in such a short timespan, I did not reach any conclusions worth including here. Many thanks to Hsin-Lun Huang for answering (and enduring) my many questions about Mandarin.

Reconstruction-blocking conditions, on the other hand, require that the moving expression or some subpart of it be outside the scope of another element in the structure. They target DPs and hence achieve this scope-shifting with DP-movement, which by definition does not reconstruct. This is schematized in (343), where α must be outside the scope of β.

(343) *Reconstruction-blocking condition*
$[\ [_{DP}\ \text{D NP}\ \alpha\ ] \ldots [\ \beta \ldots [\ldots [_{DP}\ \text{the NP}\ ] \ldots]\ ]\ ]$ DP, $\alpha \gg \beta$

The ease with which the DP/QP-movement system accounts for these reconstruction phenomena—which I show in the coming sections—provides independent support for the DP/QP-movement system and its account of the dichotomy between leaving a trace and reconstructing.

3.4.1 Π-positions

Chapter 2 introduced a novel reconstruction phenomenon, the Π-position asymmetry, and explored its properties in detail.[44] I argued that DPs in Π-positions denote properties and hence are incompatible with elements of semantic type *e*, which is encoded in the Π-position Restriction (344).

(344) **Π-position Restriction**
$^{*}[\ x\ ]_{\Pi\text{-pos}}$, where x is an element of type e

As a result, a given step of movement cannot target a Π-position if it shifts the scope of the moved DP because scope shifting requires leaving a trace of type *e* (345). Therefore, movement that targets a Π-position must reconstruct (346). The important consequence of this restriction is that some movement types are categorically precluded from targeting Π-positions because they can never reconstruct, as shown in section 2.4, thereby giving rise to the Π-position asymmetry.

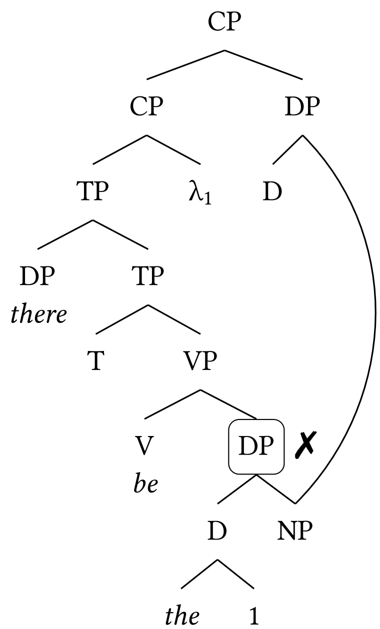
(345) *Scope shifting* $\nRightarrow$ *Π-positions*
$^{*}[\ \text{DP}_1\ \lambda x_e \ldots [\ldots [\ x_e\ ]_{\Pi\text{-pos}} \ldots]\ ]$ type *e* trace

(346) *Reconstruction* $\Rightarrow$ *Π-positions*
$^{\checkmark}[\ \underline{\quad}_1 \ldots [\ldots [\ \text{DP}_1\ ]_{\Pi\text{-pos}} \ldots]\ ]$ *reconstruct*

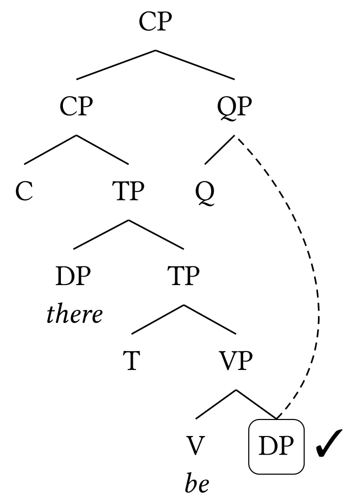
[44] To qualify that statement: Although the Π-position asymmetry was discovered by Postal (1994), viewing it in terms of reconstruction is novel.

The analysis that was proposed in chapter 2 translates rather unceremoniously into the DP/QP-movement system: DP-movement is incompatible with Π-positions because the resulting definite description is type *e* and thus violates the Π-position Restriction (347). Only QP-movement may target Π-positions, which entails that all movement targeting Π-positions reconstructs (348). Depicted in (347) and (348) is an existential construction.

(347) *DP-movement* ***cannot*** *target Π-positions*



(348) *QP-movement* ***can*** *target Π-positions*



Any movement chain involving DP-movement is ruled out from targeting Π-positions because a step of DP-movement targeting a Π-position results in ungrammaticality regardless of what happens subsequently. This includes entire movement types, like topicalization, which necessarily include a step of DP-movement; see section 3.3.8.1.

3.4.2 Late Merge effects

Late Merge effects (or "Lebeaux effects") refer to instances where Condition C is amnestied under $\overline{\text{A}}$-movement. Lebeaux (1990) famously observed that *wh*-movement amnesties Condition C for an R-expression in an adjunct that is attached to the moved *wh*-phrase (349a) (also van Riemsdijk and Williams 1981). This amnesty, however, does not extend to an R-expression embedded in the complement of a *wh*-phrase, which still triggers a Condition C violation (349b).

(349) *Late Merge effects* (=225)

a. ✓[How many pictures [$_{\text{ADJUNCT}}$ that **John**$_2$ took]]$_1$ did **he**$_2$ buy ___$_1$?

b. *[How many pictures [$_{\text{COMPLEMENT}}$ of **John**$_2$]]$_1$ did **he**$_2$ buy ___$_1$? [Romero 1998:95]

The amelioration of Condition C afforded by $\overline{\text{A}}$-movement is standardly analyzed in terms of countercyclicity, hence the name "Late Merge": the *wh*-phrase undergoes movement (350b), after which the adjunct is countercyclically merged to it (350c). Thus, the R-expression in the adjunct is never c–commanded by the coindexed pronoun, thereby avoiding a Condition C violation.

(350) *Late Merge derivation of (349a)*

a. *Structure prior to movement*
did **he**$_2$ buy [how many pictures]$_1$?

b. *Step One: Wh-movement*
[how many pictures]$_1$ did **he**$_2$ buy ___$_1$?

c. *Step Two: Late-merge adjunct*
[how many pictures [$_{\text{ADJUNCT}}$ that **John**$_2$ took]]$_1$ did **he**$_2$ buy ___$_1$?

Recall from section 3.2.2.3 that the amnesty of Condition C provided by Late Merge requires that the *wh*-phrase take wide scope in the landing site of movement (Romero 1998). This is illustrated in (351), where only the wide-scope reading of *how many* is possible. Late-merging the adjunct so that the pronoun *he* never c–commands the R-expression *John* in the adjunct, thereby avoiding a Condition C violation, bleeds the narrow-scope reading of *how many*.

(351) *Amnesty via Late Merge forces wide scope* (=226)
[How many pictures [$_{\text{ADJUNCT}}$ that **John**$_2$ took in Sarajevo]]$_1$ does **he**$_2$ want the editor to publish ___$_1$ in the Sunday Special?

a. *Wide-scope reading*
✓For what number *n*: There are *n*-many particular pictures *x* that John took in Sarajevo such that John wants the editor to publish *x*.

b. *Narrow-scope reading*
*For what number *n*: John wants the editors to publish in the Sunday Special (any) *n*-many pictures that John took in Sarajevo. [Romero 1998:96]

When the R-expression and the pronoun are swapped, the adjunct no longer needs to be late-merged to avoid triggering a Condition C violation, and the narrow-scope reading becomes available again. Thus, (352) has both the wide-scope reading in (351a) and the narrow-scope reading in (351b).

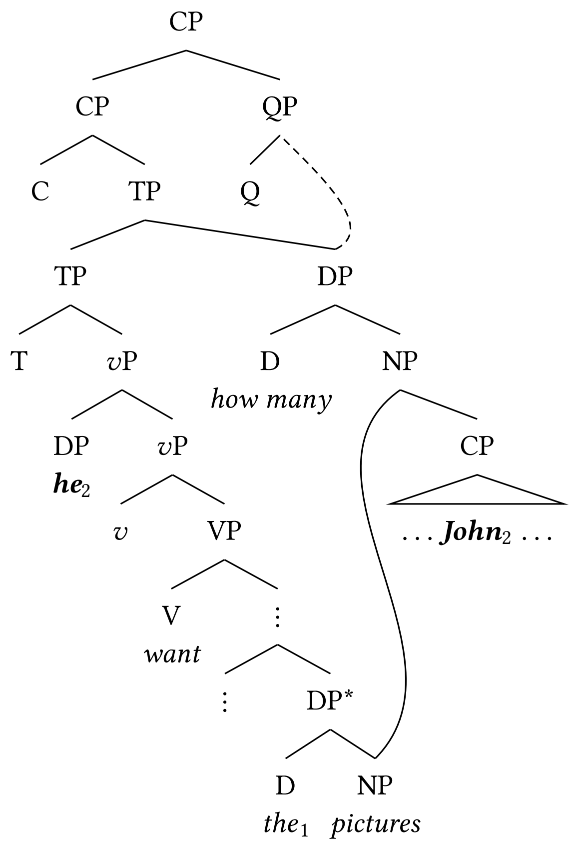
(352) *Swapping the R-expression and pronoun* (=227)

✓[How many pictures [$_{\text{ADJUNCT}}$ that **he**$_2$ took in Sarajevo]]$_1$ does **John**$_2$ want the editor to publish ___$_1$ in the Sunday special? [Romero 1998:96]

This behavior of Late Merge can be explained in terms of reconstruction: The narrow-scope reading in (351b) requires reconstructing the *wh*-phrase. Under the fairly reasonable assumption that reconstruction cannot strand adjuncts, reconstructing the *wh*-phrase entails reconstructing its adjuncts as well. By deduction, the reason that the narrow-scope reading is unavailable is because reconstructing the entire *wh*-phrase puts the R-expression back into the c–command domain of the offending antecedent, thereby triggering a Condition C violation. In sum, Late Merge blocks reconstruction.

In the DP/QP-movement system, this blocking effect follows from Late Merge interacting with DP-movement. In order to avoid a Condition C violation, the adjunct containing the R-expression must be outside the scope of the coindexed pronoun. Crucially, in a DP-movement step, there are *two* DPs, which allows the adjunct to be adjoined to the NP in the *higher* DP and hence not be in the c–command domain of the coindexed pronoun, as illustrated in (353) for the only grammatical parse of (351). This is also the structure that Johnson (2012) proposes for Late Merge, but in the context of ACD resolution. An advantage of this approach to Late Merge effects is that it does not invoke countercyclicity: (i) the NP *pictures* is merged in parallel with the definite determiner and the adjunct, (ii) the NP dominating the adjunct is merged with *how many*, and finally (iii) the two resulting DPs are merged in the launching and landing sites of the movement.

(353) *Derivation of (351) in the DP/QP-movement system*



The nodes from DP upwards are defined iff* $[\![\text{pictures}]\!](g(1)) = 1$.

In (353), the adjunct and crucially the R-expression *John* that it contains is not in the scope of the coindexed pronoun *he*, but this is achieved with a step of DP-movement. Thus, the *wh*-phrase takes scope in the landing site of that DP-movement step, thereby deriving Romero's (1998) observation. Semantically, the lower anaphoric definite description presupposes that the assignment function returns a picture(s) for the index 1. The higher DP then asserts that these pictures are pictures that John took in Sarajevo, thereby satisfying the presupposition.

3.4.3 Focus intervention

Focus intervention is the penalty that a *wh*-phrase incurs when at LF, it occurs in the scope of various interveners, as schematized in (354) (Beck 1996, 2006; Beck and Kim 2006; Cable 2007, 2010; Kotek 2014). The squiggle line indicates the region over which the *wh*-computation takes place. The class of interveners varies across languages, but it most often comprises negation, focus-sensitive items like *only*, and universal quantifiers like *every*.

(354) *Focus intervention schema*
*[C_Q . . . [**intv**. . . [. . . *wh*-phrase . . .]]]

It is easiest to observe focus intervention in *wh*-in-situ languages. Consider the contrast between the Korean sentences in (355). In (355a), the *wh*-phrase *nuku* 'who' occurs within the scope of *man* 'only'; this incurs an intervention effect, yielding ungrammaticality. However, when *nuku* is scrambled above the intervener in (355b), the intervention effect disappears and the sentence is grammatical because *nuku* is no longer in the scope of *man*.

(355) *Focus intervention in Korean*

a. *Minsu-**man** **nuku**-lûl po-ass-ni?
Minsu-only who-ACC see-PAST-Q
Intended: 'Who did only Minsu see?'

b. ✓**nuku**-lûl$_1$ Minsu-**man** ___$_1$ po-ass-ni?
who-ACC Minsu-only see-PAST-Q
'Who did only Minsu see?' [Beck 2006:3]

In *wh*-fronting languages, the fronting of the *wh*-phrase circumvents any intervention effect that would occur because the *wh*-phrase can take widest scope in the landing site of movement, above any potential intervener. This is illustrated in (356a) for English and (356b) for German.

(356) *No focus intervention in wh-fronting languages*

a. *English*
✓**Who**$_1$ did **only** Mary see ___$_1$?

b. *German*
✓**Wen**$_1$ hat **nur** die Maria ___$_1$ gesehen?
whom has only the Maria seen
'Who has only Maria seen?'

Focus intervention nevertheless occurs in *wh*-fronting languages, but it does so only in multiple-*wh* questions, where one of the *wh*-phrases fronts and the other(s) remains in situ. In German multiple-*wh* questions, when an intervener scopes above the in-situ *wh*-phrase, the resulting question is ungrammatical (357a). Scrambling the lower *wh*-phrase over the intervener, so that it scopes above it, ameliorates the intervention effect (357b).[45]

(357) *German multiple-wh questions*

a. *Wen hat **niemand** **wo** gesehen?
   whom has nobody where seen
   Intended: ‘Where did nobody see who?’

b. ✓Wen hat **wo** **niemand** gesehen?
   whom has where nobody seen
   ‘Where did nobody see who?’ [Beck 2006:4]

The situation in English is more nuanced than in German. In an ordinary English multiple-*wh* question, there are still no intervention effects (358a, c). However, Pesetsky (2000) argues that the lack of intervention holds only if the question obeys *superiority* (based on an observation initally made by É. Kiss 1986). When the question contains an intervener, the superiority-violating version of the question becomes ungrammatical (358d).[46,47] Pesetsky proposes that the ungrammaticality of a superiority-violating question containing an intervener is a focus-intervention effect.

(358) *English multiple-wh questions* [Kotek 2014:31]

a. ✓[*Which boy*]$_1$ ___$_1$ read **which book**? [+superiority] [−intv]

b. ✓[*Which book*]$_1$ did **which boy** read ___$_1$? [−superiority] [−intv]

c. ✓[*Which boy*]$_1$ did**n't** ___$_1$ read **which book**? [+superiority] [+intv]

d. *[*Which book*]$_1$ did**n't which boy** read ___$_1$? [−superiority] [+intv]

The difference between English and German, Pesetsky (2000) attributes to *covert movement*. In an English superiority-obeying multiple-*wh* question, the in-situ *wh*-phrase may move covertly to the left periphery, “tucking in” below the overtly moved *wh*-phrase, thereby avoiding an intervention

45 I am not entirely convinced that (357b) necessarily involves scrambling because *wo* ‘where’ is an adjunct and could be base-merged in different positions. However, this does not have a bearing on the argument in the main text.

46 In (358), [+superiority] represents a question obeying superiority and [−superiority] represents one that does not.

47 Pesetsky (2000) and Beck (2006) report that for multiple-*wh* questions with an intervener, some speakers report ungrammaticality, while others report that the question only loses its pair–list reading. I belong to the latter group. Kotek (2014) hypothesizes that the surviving single-pair reading is a kind of echo question.

effect (359). German, on the other hand, does not have access to this step of covert movement, so that the in-situ *wh*-phrase must be interpreted in situ (360) (irrespective of superiority).

(359) *Derivation of an English superiority-obeying multiple-wh question*

[*wh*-phrase$_1$ [*wh*-phrase$_2$ . . . [(**intv**) . . . [. . . *wh*-phrase$_1$ . . . *wh*-phrase$_2$ . . .]]]]

(360) *Derivation of a German multiple-wh question*

[*wh*-phrase$_1$ . . . [(***intv**) . . . [. . . *wh*-phrase$_1$ . . . *wh*-phrase$_2$ . . .]]]

An English multiple-*wh* question that violates superiority behaves analogously to a German multiple-*wh* question: the in-situ *wh*-phrase cannot move covertly to the left periphery and thus must be interpreted in situ, which yields sensitivity to focus intervention (361).[48]

(361) *Derivation of an English superiority-violating multiple-wh question*

[*wh*-phrase$_2$ . . . [(***intv**) . . . [. . . *wh*-phrase$_1$ . . . *wh*-phrase$_2$ . . .]]]

Kotek (2014) shows that the empirical landscape in English is somewhat broader than Pesetsky makes it out to be. She crucially observes that even in superiority-obeying questions, it is in fact possible to induce an intervention effect if the lower *wh*-phrase must scope below the intervener for independent reasons. I present her argument from Association with Focus. It is well-known that focus-sensitive operators like *only* associate with another constituent in their c–command domain that bears focus (Tancredi 1990). Aoun and Li (1993) observe that this association must hold at LF and hence blocks covert movement of a focused element, as illustrated in (362b) where focus association between *only* and *boy* prohibits *every boy* from undergoing QR to derive the inverse-scope reading.[49]

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[48] The superiority-violating derivation in (361) might involve, e.g., the higher *wh*-phrase not having a [wh]-feature such that the [wh]-probe on C can look past it in order to target the lower *wh*-phrase without violating Relativized Minimality. In the same vein, Kotek (2014) proposes that the higher *wh*-phrase does not project a QP such that the probe on C can look past it.

[49] (362) is taken from Erlewine (2014). It is based on an example in Aoun and Li (1993), fixing some confounds in their particular example. See Erlewine (2014:108–110) for discussion.

(362) *Association with Focus can block QR* [Erlewine 2014:109–110]

a. **Someone** wants to meet [**every boy in the room**].

✓someone ≫ every; ✓every ≫ someone

b. *Someone* wants to **only** meet [*every* [***boy*** $]_F$ *in the room*].

✓someone ≫ every; *every ≫ someone

Against this backdrop, Kotek uses Association with Focus to block covert movement of the lower *wh*-phrase in a multiple-*wh* question, thereby forcing it to remain in the scope of an intervener. The result is an intervention effect and hence ungrammaticality, as shown in (363b). The intended pair–list reading in (363b) can be paraphrased as: I can tell you all the pairings of students and books, such that the student read that book (but I don't know about articles).

(363) *Forcing intervention with Association with Focus*

a. I can tell you [which student read [**which book**]].

b. *Context:* The students in the class were supposed to read one book *and* one article. However, everyone got confused and read one book *or* one article. I've been reading everyone's squibs. I've finished all the ones about books, so:

*I can tell you [which student **only** read [*which* [***book*** $]_F$]]. [Kotek 2014:130]

According to Kotek's (2014) proposal, English superiority-violating questions are but one instance where a *wh*-phrase is forced to be interpreted in situ, thus yielding sensitivity to focus intervention. Kotek presents additional arguments from NPI licensing and binding that support this conclusion, which are not discussed here.[50]

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[50] There is a confound in Kotek's (2014) argument from binding that is worth mentioning. She argues based on examples like (i) that reconstruction for binding can force intervention. In (i), the binder of *herself* is *no girl* and hence *which picture of herself* must be interpreted in its scope. This reconstruction should induce an intervention effect because *no* is also an intervener. The fact that (i) lacks a pair–list reading would appear to support this assessment.

(i) Which boy gave **no girl**$_1$ [*which picture of* ***herself***$_1$]? [Kotek 2014:134]

The confound is that, as Kotek herself notes in a footnote, the question in (i) does have a licit functional reading. However, this is in fact the only reading that we expect because *no* independently does not allow pair–list readings (Engdahl 1980, 1986; Groenendijk and Stokhof 1984):

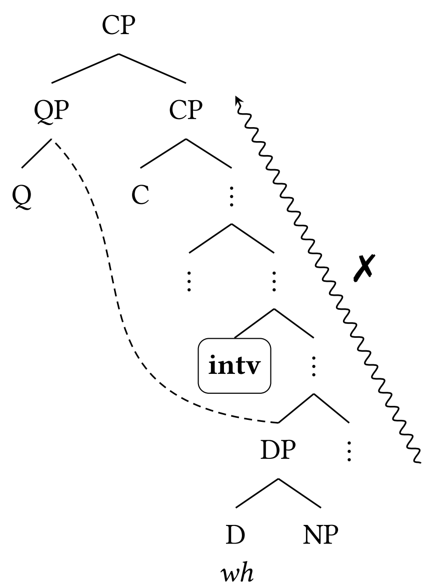
(ii) [Which picture (of **herself**$_1$)] does *no woman*$_1$ like? (=299)

*Mary doesn't like the red picture, Susan doesn't like the blue picture, . . .

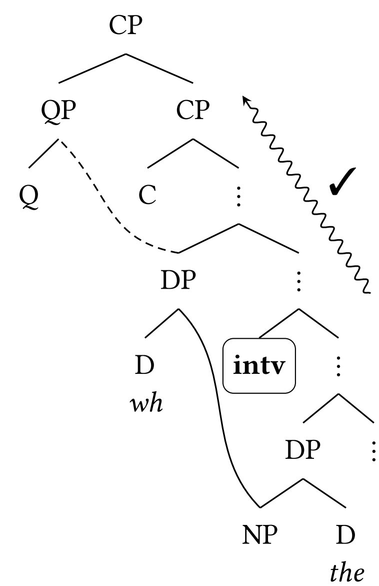
It might be the case that the reason why *no* does not allow pair–list readings is because it would induce an intervention effect. However, it would still be problematic for Kotek's (2014) proposed question semantics that the *wh*-phrase needs to be in the scope of the binder/intervener to generate a functional reading (and as the parentheses in (ii) indicate, an anaphor is not even necessary for a functional reading). Moreover, whatever mechanism permits

The picture to emerge is that focus intervention depends on the scope of *wh*-phrases with respect to various interveners. When a *wh*-phrase takes scope below an intervener, it results in ungrammaticality. If a *wh*-phrase takes scope above that intervener, the intervention effect is circumvented. Why a *wh*-phrase being in the scope of an intervener results in ungrammaticality is beyond the scope of this dissertation, though the reader is referred to Beck (2006); Beck's explanation requires a focus-alternative semantics for constituent questions, which section 3.3.4 showed was compatible with QP-movement. In the DP/QP-movement system, focus intervention is avoided by first taking a step of DP-movement to a position above the intervener, before doing QP-movement to [Spec, CP], i.e. a DP–QP movement chain. The *wh*-computation takes place over the region between the *wh*-word and the Q-particle (see sections 3.3.4 and 3.3.6.3). If the *wh*-phrase undergoes QP-movement directly from its base position, the *wh*-computation crosses the intervener, producing an intervention effect and ungrammaticality (364). DP-movement, however, places the *wh*-word above the intervener so that it does not interfere with the *wh*-computation (365).[51]

(364) *QP derivation ⇒ Intervention*



(365) *DP–QP derivation ⇏ Intervention*



functional readings in these cases would in principle allow (something like) pair–list readings as well, which can be analyzed as a special case of functional readings (as proposed by Engdahl 1980, 1986; Chierchia 1993).

[51] This proposal is similar to what Kotek (2014) proposes for the lower *wh*-phrase in a multiple-*wh* question. She proposes that the *wh*-phrase scrambles to a position above the intervener, from where the Q-particle moves to [Spec, CP]. The result is semantically equivalent to a DP–QP movement chain.

I do not seek here to develop a complete analysis of multiple-*wh* questions within the DP/QP-movement system, but I will sketch how it would account for the focus-intervention effects in (358): In superiority-obeying questions, both *wh*-phrases undergo DP-movement and then subsequent QP-movement, maintaining their base-generated order with respect to one another via "tucking in" (366). In superiority-violating questions, the lower *wh*-phrase first undergoes DP-movement to get above the higher *wh*-phrase; then, both *wh*-phrases undergo QP-movement (367). Since QP-movement does not shift scope, the lower *wh*-phrase in superiority-violating questions may be in the scope of an intervener, yielding sensitivity to focus intervention.

(366) *Derivation of a superiority-obeying question*

QP-mvt *DP-mvt*

[*wh*-phrase$_1$ [*wh*-phrase$_2$ . . . [___$_1$ [___$_2$ . . . [(**intv**) . . . [. . . ___$_1$ . . . ___$_2$ . . .]]]]]]

QP-mvt *DP-mvt*

(367) *Derivation of a superiority-violating question*

QP-mvt

[*wh*-phrase$_2$ [*wh*-phrase$_1$ . . . [___$_2$ . . . [(***intv**) . . . [. . . ___$_1$ . . . ___$_2$ . . .]]]]]

QP-mvt *DP-mvt*

3.4.4 Movement of VPs and APs

A well-known contrast in the reconstruction literature is the predicate/nonpredicate asymmetry (Barss 1986; Huang 1993; Heycock 1995; Takano 1995). The basic observation is that moving a VP or an AP—collectively called PREDICATES–displays binding-theoretic connectivity effects, while moving an ordinary argument does not (or does not as strongly).[52] This contrast is illustrated in (368) and (369) for Condition A and Condition C respectively. In (368), an anaphor in a moved argument can refer to an antecedent in either the matrix clause or the embedded clause (368a) (presumably being evaluated for Condition A in the intermediate [Spec, CP] position), but an anaphor in a moved predicate must refer to the antecedent closest to the gap position (368b, c). In (369), an R-expression in a moved argument does not result in a Condition C violation when a

[52] There is some disagreement in the literature about the status of arguments reconstructing for Condition C. However, this disagreement does not extend to predicates, for which the judgements about Condition C are stronger and more reliable, so this contention does not affect the reconstruction status of predicates.

coindexed pronoun c–commands the gap position (369a), but an R-expression in a moved predicate does (369b, c).[53]

(368) *Condition A* [based on Heycock 1995]

a. $[_{\text{DP}}$ Which pictures of **herself**$_{2/3}$ $]_1$ does **Sophia**$_2$ think that **Blanche**$_3$ admired ___$_1$?

b. $[_{\text{AP}}$ How proud of **herself**$_{*2/3}$ $]_1$ does **Sophia**$_2$ think that **Blanche**$_3$ is ___$_1$?

c. $[_{\text{VP}}$ Criticize **herself**$_{*2/3}$ $]_1$, **Sophia**$_2$ thinks that **Blanche**$_3$ will not ___$_1$.

(369) *Condition C* [based on Heycock 1995]

a. $[_{\text{DP}}$ Which allegations about **Sophia**$_2$ $]_1$ do you think that **she**$_{2/3}$ denied ___$_1$?

b. $[_{\text{AP}}$ How proud of **Sophia**$_2$ $]_1$ does **she**$_{*2/3}$ think that you are ___$_1$?

c. $[_{\text{VP}}$ Criticize **Sophia**$_2$ $]_1$, **she**$_{*2/3}$ thinks that you will not ___$_1$.

The generalization reached in the literature is that predicates obligatorily reconstruct, hence the connectivity effects, while arguments do so only optionally.

First and foremost, it is important to draw a distinction between predicates and Π-positions, despite the fact that they share a “nonargument” status and both reconstruct obligatorily (see chapter 2 for Π-positions). The terms “predicate” and “property” are often used interchangeably, but VPs and APs (or *v*P and *a*P in modern terms) crucially denote propositions $\langle s, t\rangle$ and not properties $\langle e, t\rangle$ (or intensional $\langle s, et\rangle$). The reason that VPs and APs are called “predicates” is because in the traditional sense, they take a subject. However, given the VP-Internal Subject Hypothesis (Fukui and Speas 1986; McCloskey 1997; amongst others), all of the arguments of VPs and APs are in fact saturated internally, and the subject position is a derived position. Consequently, VPs and APs denote propositions. This holds true even if the external argument is severed from the verb, in which case both VP and *v*P denote propositions (Kratzer 1996). Assuming uncontroversially that nonmaximal projections (i.e. bar levels in $\overline{\text{X}}$-theory) cannot be targeted for movement, moving a VP or an AP thus means moving a proposition-denoting node. Π-positions, on the other hand, host DPs that denote actual properties. If the open argument slot is ever saturated, it is done so external to the DP, unlike in VPs and APs. Therefore, Π-positions and the predicate/nonpredicate asymmetry prima facie cannot be reduced to one and the same phenomenon, though they may of

[53] Embedding the pronoun *she* in (369b) and (369c) does not improve coreference with the R-expression *Sophia*.

course share an underlying explanation, as I will suggest below. I will continue to use the term "predicate" to refer to VPs and APs.

The Trace Interpretation Constraint (TIC) provides a straightforward explanation of why predicates obligatorily reconstruct: a trace ranging over propositions $\langle s,t \rangle$ is not a possible trace (see also Landman 2006). Thus, there is no λ-abstraction available to movement that corresponds to the semantic type of VPs and APs. As such, they are forced to reconstruct. Below, I review two other approaches to predicate reconstruction, Takano (1995) and Heycock (1995), and then discuss how they compare to the analysis offered by the TIC.

Takano (1995) capitalizes on the fact that predicates have internal subject traces and argues that predicates must reconstruct to avoid the subject trace being unbound.[54] That is, because the subject is base-generated in [Spec, VP] or [Spec, AP] and then moves to [Spec, TP], moving the entire VP or AP would leave that trace unbound, violating the so-called Proper Binding Condition (370a) (Fiengo 1974, 1977; Saito 1985). Therefore, the moved predicate must fully reconstruct into its base position (370b), which gives rise to the binding connectivity effects.

(370) *Takano's (1995) analysis*
[$_{\text{AP}}$ How proud of **Sophia**$_2$]$_1$ does **she**$_{*2/3}$ think that you are ___$_1$?

a. *No reconstruction ⇒ Unbound subject trace*
*[how$_5$ [$_{\text{AP}}$ t_5 $\boldsymbol{t_4}$ proud of Sophia$_2$]$_1$ [does she$_2$ think that **you**$_4$ are t_1]]?

b. *Reconstruction ⇒ Binding connectivity*
*[how$_5$ [does **she**$_2$ think that you$_4$ are [$_{\text{AP}}$ t_5 t_4 proud of **Sophia**$_2$]$_1$]]?

The analysis in (370) explains predicate reconstruction insofar as VPs and APs have an internal subject trace. If the external argument is introduced by a dedicated functional head, i.e. v^0 and a^0, one must stipulate (or derive) that VPs and APs cannot be moved on their own, only *v*Ps and *a*Ps.

Heycock (1995) advances a different line of reasoning about predicate reconstruction. She argues that the predicate/nonpredicate distinction is part of a larger referential/nonreferential distinction, wherein predicates are subsumed under the class of nonreferential expressions. According to her

[54] Huang (1993) also links the predicate/nonpredicate asymmetry to a predicate-internal trace, but he proposes that the trace itself factors into Binding Theory and thus is relevant for evaluating Conditions A and C. Under his proposal, there is no actual reconstruction of the moved predicate. See Heycock (1995) and Takano (1995) for discussion of the problems with Huang's (1993) analysis.

proposal, it is nonreferential expressions that must reconstruct. This characterization combines the predicate asymmetry with some of her observations where *wh*-phrases must reconstruct in intensional contexts, such as in (371) with creation verbs (see also section 3.2.2.1).

(371) *Referential/nonreferential asymmetry* (=215)

a. *[How many stories about **Diana**$_2$]$_1$ is **she**$_2$ likely to invent ___$_1$?

b. ✓[How many stories about **Diana**$_2$]$_1$ is **she**$_2$ really upset by ___$_1$? [Heycock 1995:558]

Heycock proposes that moved nonreferential expressions have a special LF where the *wh*-word is in [Spec, CP] and the remainder of the *wh*-phrase (namely the NP) is in its base position (372a), thus giving rise to the binding connectivity effects. Referential expressions, on the other hand, leave an ordinary trace (372b). Though she does not discuss it in such terms, this implementation amounts to reconstruction for world-variable binding to achieve a *de dicto* interpretation, which is required in cases like (371a) because the *de re* reading is infelicitous (one cannot be likely to invent stories that already exist).

(372) *Heycock's (1995) analysis*
[How many stories about **Diana**$_2$]$_1$ is **she**$_2$ likely to invent ___$_1$?

a. *Nonreferential*
*[how many$_1$ [is **she**$_2$ likely to invent [t_1 stories about **Diana**$_2$]]]?

b. *Referential*
#[[how many stories about **Diana**$_2$]$_1$ [is **she**$_2$ likely to invent t_1]]?

While this proposal may account for reconstruction of nonreferential DPs where a *de dicto* reading is required, e.g. (371a), it is less clear how it accounts for reconstruction of VPs and APs. Heycock attempts to explain predicate reconstruction by drawing a connection between amount questions with creation verbs and degree questions based on their similar behavior in *wh*-islands. However, this evidence merely amounts to the fact that *wh*-islands block reconstruction. To argue that two things x and y have the same representation because an environment that always blocks reconstruction blocks x and y does not go much beyond stating that x and y must reconstruct.

Both Takano's (1995) and Heycock's (1995) proposals are compatible with the DP/QP-movement system and the TIC, though, if either were true, they would operate independently, outside the confines of the DP/QP-movement system. The analysis offered by the TIC, that there are no traces ranging over propositions $\langle s, t \rangle$, is arguably simpler. Moreover, unlike Takano's (1995) analysis, the TIC-based analysis is compatible with severed external arguments without further ado, because regardless of whether the moving node is a *v*P, VP, *a*P, or AP, it will be a proposition-denoting node. Within the DP/QP-movement system, this explanation of predicate reconstruction entails that moving VPs and APs is actually moving QPs, wherein the Q-particle has merged with the VP or AP. With respect to moving APs, there is already reason to believe that QPs are involved because degree questions necessarily involve pied-piping: the *wh*-word *how* is a DegP, but it is the entire AP that must front. For predicate fronting outside of constituent questions, we are forced to say that this movement is also QP-movement and thus categorically different from topicalizing a DP, which might explain why the two do not share the same kind of meaning.

CHAPTER 4

MOVING AND SHIFTING

4.1 Introduction

The previous two chapters developed the hypothesis that movement can only map onto traces ranging over individual semantic types, e.g. entities (e), and never onto traces ranging over higher types, e.g. properties ($\langle e, t\rangle$) and generalized quantifiers ($\langle et, t\rangle$). This hypothesis is formalized as the Trace Interpretation Constraint (TIC), repeated in (373).

(373) **Trace Interpretation Constraint**
$^*[\text{ DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots\ ]\ ]$, where σ is not an individual type

Amongst other things, the TIC is what gives rise to the Π-position asymmetry from chapter 2. On one hand, the property trace required for scope-shifting movement to target Π-positions is an ungrammatical trace according to the TIC. On the other hand, the entity trace that the TIC does allow is incompatible with the property-type requirement of Π-positions. These two factors force reconstruction.

The TIC raises the possibility that the grammar could use an entity trace, but perform some operation on the trace in order to render it compatible with Π-positions. Such an operation would amount to type shifting an entity trace into a property denotation. This chapter argues that such a rescue procedure does *not* happen and that traces cannot be type shifted, a principle which I call the Trace Rigidity Principle (TRP) in (374) (see also Landman 2004).[1]

(374) **Trace Rigidity Principle**
Traces cannot be type shifted.

[1] Landman (2004) independently proposes a similar constraint that variables of type σ cannot be type shifted into $\langle\sigma, t\rangle$. Unfortunately, his work on indefinites came to my attention too late to allow a genuine comparison. However, we reach the same conclusion based on different data. I take this convergence to be encouraging.

Without the TRP, the TIC would effectively be vacuous and unobservable because it could always be circumvented under the surface. Because the TIC can in fact be observed, there is already reason to believe that the TRP holds. Nevertheless, what this chapter will show is that there is a class of expressions that cannot be type shifted into property denotations and this class of expressions *properly includes* traces, thereby providing independent evidence for the TRP.

The discussion starts with the related concern that at first glance, the Π-position Restriction in (375) from chapter 2 appears to undergenerate because it is in fact possible for seemingly type-*e* elements to occur in Π-positions, as shown in (376). Note that the existential construction in (376a) is a so-called list existential, where the Definiteness Restriction is relaxed, allowing the pivot to be a definite description (see section 2.3.1 of chapter 2).

(375) **Π-position Restriction**
$*[\ x\ ]_{\Pi\text{-pos}}$, where x is an element of type e

(376) *Π-positions allow some definite descriptions*

a. *Existential constructions*
A: What food is left in the pantry?
B: Well, there is **the potato**.

b. *Change-of-color verbs*
Megan painted the house **that hideous shade of purple**.

c. *Naming verbs*
Irene called the cat **that dumb nickname**.

d. *Predicate nominals*
Erika became **the CEO**.

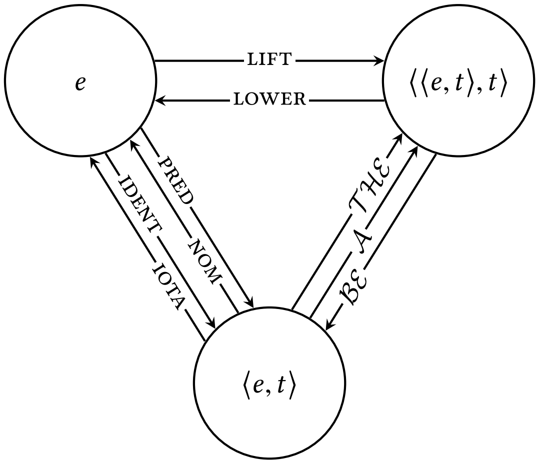
Section 4.2 argues that DPs obtain a property denotation via nominal type shifting (in the sense of Partee 1986), which explains why the sentences in (376) are grammatical. Thus, there is indeed an operation available to coerce expressions into property denotations, namely type shifting. However, type shifting must not be permitted to apply in the case of traces; otherwise, it would circumvent the TIC and the Π-position asymmetry would not exist. This is the restriction encoded in the TRP.

To address this question, section 4.3 takes a deeper look into the kinds of definite descriptions that can occur in Π-positions and shows that not all of them are allowed. In particular, *anaphoric definite descriptions* are prohibited in Π-positions. I draw a connection between this generalization about definites and the scope generalization from chapter 2, arguing that the scope generalization can be subsumed under this new definite generalization if we adopt Trace Conversion—or its multidominant analogue in the DP/QP-movement system of chapter 3. According to Trace Conversion, the lower copies of a movement chain are interpreted at LF by converting them into anaphoric definite descriptions (Engdahl 1980, 1986; Sauerland 1998, 2004; Fox 1999, 2002, 2003). Crucially, then, traces are a proper subset of anaphoric definite descriptions. Accordingly, it is anaphoric definite descriptions that cannot be type shifted, giving rise to both the restriction on definites and the ban on scope-shifting movement. In section 4.4, I then develop a syntactic analysis of the TRP, couched within Schwarz's (2009) distinction between strong and weak definites. I propose that type shifters are in complementary distribution syntactically with the strong-definite determiner, the pivotal piece required to construct an anaphoric definite description. A derivation can use either a strong-definite determiner with a DP to build an anaphoric definite description or a type shifter on that DP to achieve a property denotations, but never both, thereby deriving the TRP. Section 4.5 concludes by taking a step back and discussing the representation of properties in natural language against the backdrop of the more complete analysis of Π-positions.

4.2 Type shifting to property

Partee (1986) argues that DPs have three types of denotations: individuals (type e), properties (type $\langle e, t \rangle$), and generalized quantifiers (type $\langle et, t \rangle$). She proposes a set of semantic type shifters that allow DPs to flexibly shift from one type to another. This theory of DP interpretation is depicted in (377) in what is standardly called the Partee Triangle. The circles represent the domains of the three types of nominal denotations, and the arrows represent the various type shifters that map from one domain onto another.

(377) **Partee Triangle**



The core set of type shifters is given in (378). They are closely connected with the type theory and the algebraic structure of the nominal model-theoretic domains; see Partee (1986) for discussion.

(378) *Core set of nominal type shifters* [Partee 1986]

a.	LIFT:	$j \to \lambda P \,.\, P(j)$	total; injective
b.	LOWER:	maps a principal ultrafilter on its generator	partial; surjective
c.	IDENT:	$j \to \lambda x \,.\, x = j$	total; injective
d.	IOTA:	$P \to \iota x[P(x)]$	partial; surjective
e.	NOM:	$P \to {}^{\cap}P$	almost total; injective
f.	PRED:	$x \to {}^{\cup}x$	partial; surjective

The type shifters that are important for our purposes are IDENT (378c), PRED (378f), and $\mathcal{BE}$, the last of which is one of the "natural" type shifters proposed by Partee (1986), which will be given below. These two functors allow shifting into the property domain from the entity and generalized-quantifier domains respectively.

The functor IDENT is a total function that maps any element onto its singleton set. The functor PRED maps the entity-correlate of a property onto the corresponding property (Chierchia 1984). For example, PRED maps ⟦goodness⟧ to ⟦good⟧ and ⟦green⟧ the noun to ⟦green⟧ the adjective. Not every property has an entity correlate, and not every entity corresponds to a property. Therefore, PRED is a partial function and is of limited interest for our purposes, but worth mentioning nonetheless because it could be used in some instances to get the right denotation, e.g. the color term of a change-of-color verb. For entities that do not correspond to a property, they can still shift into the property domain by first using LIFT and then using $\mathcal{BE}$. LIFT is a total function that shifts an entity into a generalized quantifier by mapping it onto the principal ultrafilter that it generates (378a).

$\mathcal{BE}$ is a homomorphism between $\langle et, t\rangle$ and $\langle e, t\rangle$ viewed as Boolean structures (379). It is also the unique homomorphism that makes the diagram in (380) commute, i.e. $\mathcal{BE} \circ$ LIFT = IDENT.

(379) a. $\mathcal{BE}(\mathcal{P}_1 \cap \mathcal{P}_2) = \mathcal{BE}(\mathcal{P}_1) \cap \mathcal{BE}(\mathcal{P}_2)$

b. $\mathcal{BE}(\mathcal{P}_1 \cup \mathcal{P}_2) = \mathcal{BE}(\mathcal{P}_1) \cup \mathcal{BE}(\mathcal{P}_2)$

c. $\mathcal{BE}(\neg\mathcal{P}) = \neg\mathcal{BE}(\mathcal{P})$

(380)
$$\begin{tikzcd} e \arrow[rr, "\textsc{lift}"] \arrow[dr, "\textsc{ident}"'] & & \langle\langle e,t\rangle,t\rangle \arrow[dl, "h"] \\ & \langle e,t\rangle & \end{tikzcd}$$

$\mathcal{BE}$ applies to a generalized quantifier, finds all of the singleton sets therein, and collects the elements of these singleton sets into a set (381).[2] This is shown in (381) both with Montague's (1970, 1973) Intensional Logic and partly with set notation. The commutativity of (380) thus follows because LIFT applied to an entity x yields a generalized quantifier with only one singleton set, $\{x\}$.

(381) $\mathcal{BE} = \lambda\mathcal{P}_{\langle et,t\rangle}\,\lambda x_e\,.\,\mathcal{P}([\lambda y\,.\,y = x])$ *In Montague's Intensional Logic*

$= \lambda\mathcal{P}_{\langle et,t\rangle}\,\lambda x_e\,.\,\{x\} \in \mathcal{P}$ *In (partly) set notation*

Not every generalized quantifier has singleton sets in its domain.[3] For such DPs, $\mathcal{BE}$ returns the empty set, a result which is degenerate. $\mathcal{BE}$ yields nontrivial results for DPs denoting proper principal filters (i.e. definite descriptions) and DPs classified by Keenan (1987) as EXISTENTIAL.[4] To illustrate, consider the model in (382).

[2] $\mathcal{BE}$ is the denotation that Montague (1970, 1973) proposes for English *be*. For Montague, all DPs denote generalized quantifiers, so such a denotation for *be* is required. However, as Partee emphasizes, $\mathcal{BE}$ and *be* are independent. Analyzing *be* as meaning $[\lambda \mathrm{P}_{\langle e,t\rangle}\,\lambda x_e\,.\,\mathrm{P}(x)]$ and $\mathcal{BE}$ as deriving the property meaning (i) accounts for *be* with adjectives and locatives and (ii) allows for $\mathcal{BE}$ to be used to give predicate readings for DPs in noncopular positions.

[3] This restriction is what constrains, for instance, the DPs that can occur as the pivot of an existential construction (McNally 1992, 1997, 1998); see section 2.3.1.2.

[4] A determiner D is EXISTENTIAL iff for every model and for every $\mathrm{A}, \mathrm{B} \subseteq \mathcal{E}$, $\mathrm{B} \in \mathrm{D}(\mathrm{A})$ iff "universal property" $\in \mathrm{D}(\mathrm{A} \cap \mathrm{B})$ (Keenan 1987) (the universal property is sometimes called "Mercy"). According to this definition, *some* is existential (Some potatoes are on the counter. $\Leftrightarrow$ **Some** potatoes which are on the counter exist.), but *every* is not (Every potato is on the counter. $\not\Leftrightarrow$ **Every** potato which is on the counter exists).

(382) a. $\mathcal{E} = \{\text{Snowball } (s), \text{Mittens } (m), \text{Nekochan } (n), \text{Odie } (o)\}$

b. $[\![\text{cat}]\!] = \{s, m, n\}$
$[\![\text{dog}]\!] = \{o\}$

Against the model in (382), the extensions of some quantificational DPs are given in (383), where the singleton sets are boxed. For example, the extension of *every cat* is the set of sets of which every cat is a member (383a), while the extension of *some cat* is the set of sets of which at least one cat is a member (383d). (Thus, there are also sets in their extensions which contain the dog Odie.)

(383) a. $[\![\text{every cat}]\!] = \big\{\{s, m, n, o\}, \{s, m, n\}\big\}$

b. $[\![\text{every dog}]\!] = \big\{\boxed{\{o\}}, \ldots\big\}$

c. $[\![\text{the dog}]\!] = \big\{\boxed{\{o\}}, \ldots\big\}$

d. $[\![\text{some cat}]\!] = \big\{\{s, m, n, o\}, \{s, m, n\}, \{s, m\}, \boxed{\{s\}, \{m\}, \{n\}}, \ldots\big\}$

e. $[\![\text{two cats}]\!] = \big\{\{s, m, n, o\}, \{s, m, n\}, \{s, m\}, \boxed{\{s \oplus m\}, \{m \oplus n\}}, \ldots\big\}$

f. $[\![\text{most cats}]\!] = \big\{\{s, m, n, o\}, \{s, m, n\}, \{s, m\}, \{s, n\}, \{m, n\}, \ldots\big\}$

Weak DPs like *some cat* and *two cats* have singletons in their domains (383d,e) and hence have licit property denotations under $\mathcal{BE}$. Note that for plurals, e.g. *two cats*, the singletons in their domain will always be *pluralities*, thereby only licensing collective readings. Distributive readings of plurals will not be singletons, and $\mathcal{BE}$ ignores them accordingly. Definite descriptions also have a singleton in their domain (383c), namely their singleton generator, and thus have licit property denotations under $\mathcal{BE}$ as well.[5] Strong DPs like *every cat* and *most cats* do not have singletons in their domains (383a,f) and hence do not have licit property denotations under $\mathcal{BE}$. An exception to this fact is when the domain of entities only contains one entity of the restrictor set. In this case, both *every NP* and *most NPs* will have a singleton in their domain (383b). However, in such a situation, there is something illformed about using *every NP* and *most NPs* instead of *the NP* (see Partee 1986:127). Whatever principle results in this illformedness—perhaps a presupposition that

[5] Singular definites are an instance where treating properties extensionally leads to an unsatisfactory analysis, or at least an oversimplification. For example, under this system of type shifting, $\mathcal{BE}([\![\text{the evening star}]\!])$ returns the same set as $\mathcal{BE}([\![\text{the morning star}]\!])$, failing to capture that these two properties have different meanings (Frege's famous example). As with seemingly every domain in natural-language semantics, a fully satisfactory analysis of type shifting ultimately must be intensional. The same problem extends to plural definites and mass nouns. Nevertheless, I will continue to assume an extensional system because it greatly simplifies exposition; see section 4.5 for some discussion.

the cardinality of the domain is greater than one—presumably also rules out these DPs having a valid property denotation under $\mathcal{BE}$.

I propose that DPs never start out denoting properties. A property denotation is always achieved by type shifting from an individual denotation (e) or a generalized-quantifier denotation ($\langle et, t\rangle$). Consequently, Π-positions require a type shifter for the structure to semantically compose, as schematized in (384). For the sake of simplicity, I will generally assume that the type shifter used is $\mathcal{BE}$, though nothing critical hinges on this.[6]

(384) *Π-positions require type shifters*

a. *Existential constructions*
There is [$\mathcal{BE}$(**a potato**)] in the pantry. $\langle et, t\rangle \rightarrow \langle e, t\rangle$

b. *Change-of-color verbs*
Megan painted the house [PRED(**magenta**)]. $e \rightarrow \langle e, t\rangle$

c. *Naming verbs*
Irene called the cat [$\mathcal{BE}$(**Snowflake**)]. $\langle et, t\rangle \rightarrow \langle e, t\rangle$

d. *Predicate nominals*
Erika became [$\mathcal{BE}$(**a teacher**)]. $\langle et, t\rangle \rightarrow \langle e, t\rangle$

Partee (1986) is agnostic about which type of nominal denotation—if any—is underlying, though she does consider $\langle e, t\rangle$ to be "marked" and e and $\langle et, t\rangle$ to be "unmarked". A similar stance is taken in Zamparelli (1995, 2000). The intuition is that there is something special about property-type DPs. However, neither Partee nor Zamparelli derives this marked status of $\langle e, t\rangle$. According to my proposal, a property-type DP is marked because it is necessarily derived. Section 4.4 will also show that property-type DPs being necessarily derived serves to limit their distribution, further explaining their marked status.

The present proposal that property-type DPs are necessarily derived might be too strong. First, there are existing proposals that indefinites are inherently type $\langle e, t\rangle$ (e.g. Landman 2004). Second, Bittner and Hale (1995) argue that no type-shifting operation can create new associations of semantic type with syntactic category. What they aim to explain is why cardinality expressions in Warlpiri have definite readings, unlike their counterparts in other languages. Bittner and Hale argue

[6] Barbara Partee (p.c.) points out to me that *Erika became the one and only teacher in the new school* is a good example of where $\mathcal{BE}$ is more appropriate than the other possible type shifters because it seems to be non-presuppositional.

that these expressions belong to the same syntactic category as common nouns and proper names in Warlpiri: category N. Because proper names are basically of type e and are also of category N, under their proposal, all category N expressions in Warlpiri can be type shifted to type e. The same does not hold, e.g., in English because proper names are not of category N. Bittner and Hale's (1995) constraint would predict that to type shift a DP into $\langle e,t\rangle$, there would have to already be some DPs in the language whose basic meaning is of type $\langle e,t\rangle$. This is at odds with the present proposal. What I will propose in the rest of this chapter is compatible with a weaker proposal that only *some* DPs, namely definite descriptions, are never born type $\langle e,t\rangle$ and must shift into property meanings. However, it seems to me that the generality of the present proposal is preferable to maintaining Bittner and Hale's (1995) constraint because property DPs in English are marked and the present proposal explains why. Moreover, because NPs are type $\langle e,t\rangle$, if there are DPs whose basic meaning is of type $\langle e,t\rangle$, it would mean that there are some determiners in English, perhaps null, that are semantically vacuous. Under the present proposal, there do not have to be semantically vacuous determiners in English.[7]

Let us take stock and look ahead. We now have an explanation for why seemingly type-e (or $\langle et,t\rangle$) expressions can occur in Π-positions: they are type shifted into property meanings. However, thus far, nothing prevents these same type shifters from applying to traces, an idea for which there is precedent in Partee (1986). The next section (§4.3) introduces a third generalization about Π-positions: they prohibit anaphoric definite descriptions. I argue that the ban on anaphoric definite descriptions and the ban on scope-shifting movement are one and the same under Trace Conversion, wherein traces are anaphoric definite descriptions. I then propose a syntactic account of the complementarity of type shifting and anaphoric definite descriptions in section 4.4.

4.3 Π-positions prohibit anaphoric definites

While some type-e (and technically type-$\langle et,t\rangle$) expressions can occur in Π-positions as a result of property denotations being derived via type shifting, as discussed in the previous section (§4.2), it is not the case that Π-positions permit *all* type-e expressions. As such, this means that not all

[7] Thanks to Rajesh Bhatt (p.c.) for pointing this out to me.

expressions can type shift into property denotations. This section observes that Π-positions prohibit anaphoric definite descriptions, as summarized in (385). Thus, it must be the case that anaphoric definites cannot be type shifted to type $\langle e, t \rangle$.[8] Following Schwarz's (2009) terminology, I will call anaphoric definite descriptions STRONG DEFINITES and nonanaphoric definite descriptions WEAK DEFINITES.[9]

(385) **Definite generalization**
Π-positions prohibit anaphoric (= strong) definite descriptions.

I will further argue that the ban on strong definites in Π-positions (385) extends to encompass traces if we adopt Trace Conversion. This will make possible the analysis of the Trace Rigidity Principle (TRP) in the next section.

Testing for the felicity of strong definites in Π-positions requires some amount of indirect reasoning, which is worth spelling out explicitly. Examples like (386) show that definite descriptions are in principle allowed in Π-positions, but they do not reveal what *kinds* of definite descriptions.

(386) *Π-positions allow some definite descriptions* (=376)

a. *Existential constructions*
A: What food is left in the pantry?
B: Well, there is **the potato**.

b. *Change-of-color verbs*
Megan painted the house **that hideous shade of purple**.

c. *Naming verbs*
Irene called the cat **that dumb nickname**.

d. *Predicate nominals*
Erika became **the CEO**.

It is possible to create contexts where only a strong definite would be felicitous. There are two properties that distinguish strong definites from weak definites, which can be used to create such contexts: (i) strong definites must have an antecedent and (ii) they do not have to satisfy the

[8] See section 5.3.3 of chapter 5 for possible evidence that anaphoric definites also cannot be type shifted to $\langle et, t \rangle$.

[9] The literature on definites is extensive, and I do not do it justice here. The reader is referred to Schwarz (2009) and the references therein.

standard uniqueness requirement of (weak) definites (Schwarz 2009). We will see that when these two conditions are satisfied and controlled for, definite descriptions become unacceptable in Π-positions. Because definite descriptions can occur in Π-positions, but not in these contexts that allow only strong definites, we can reason that it must be the case that the definite descriptions in Π-positions are necessarily weak definites. With this logic in mind, I show three pieces of evidence below that support the generalization in (385). To corroborate that the three diagnostics used are genuine diagnostics for strong/weak definites, I include German examples for comparison. In German, strong and weak definites display an overt morphosyntactic distinction: the determiner in weak definites contracts with prepositions (387a) (contingent on case and gender), but not in strong definites (387b) (Schwarz 2009).

(387) *German strong/weak definite distinction*

a. Hans ging **zum** **Haus**
   Hans went to.the$_{\text{WEAK}}$ house
   'Hans went to the house'

b. Hans ging **zu dem** **Haus**
   Hans went to the$_{\text{STRONG}}$ house
   'Hans went to the house' [Schwarz 2009:7]

A note on judgements is in order: In the following English examples, definite descriptions in Π-positions are less acceptable than definite descriptions in non-Π-position counterparts when in contexts that only license strong definites. Many of the examples can be improved by replacing *the* with *that*, which will be discussed in the next section.

First, a strong definite can refer to a previously mentioned indefinite. Starting with a German baseline, (388) shows that the definite *dem Mann* can refer back to the indefinite *einen Ornithologen*, but only if it is a strong definite, as reflected in the inability of the determiner to contract with the preposition. The weak definite is disallowed because its uniqueness requirement is not guaranteed to be satisfied, since there may be many men in the seminar under discussion.[10] Unlike the weak

[10] In a scenario where there is only one man in the seminar, the weak definite is felicitous in (388), as its uniqueness requirement is satisfied. The same reading exists for the cases in (389)–(392).

definite, the strong definite is able to convey that the intended referent is the indefinite in the preceding sentence, despite the descriptions of the two (i.e. the NPs) being different.

(388) *German*

Maria hat *einen Ornithologen* ins Seminar eingeladen.
Maria has an ornithologist to.the seminar invited

Ich halte {**#vom** / ✓**von dem**} **Mann** nicht sehr viel.
I hold of.the$_{\text{WEAK}}$ of the$_{\text{STRONG}}$ man not very much

'Maria has invited an ornithologist to the seminar. I don't think very highly of the man.'

[Schwarz 2009:31]

Turning to English, in (389a), the definite *the shade*, or even *the color*, can refer back to the indefinite *a shade of red*. In this context, there may be multiple shades or colors that Dorothy finds too dark or other colors that Blanche picked out. Thus, it is not the case that *the shade* and *the color* are conveying their referent based on uniqueness. As shown in (389b), a definite description in a Π-position (here, a change-of-color verb) in the same context is infelicitous. What this infelicity discloses is that the definite in (389b) must be a weak definite and its uniqueness requirement is not being satisfied.

(389) *Change-of-color verbs*

Blanche picked out *a shade of red* for the living room.

a. ✓But Dorothy thought that **the shade/color** was too dark.

b. #And Dorothy painted the room [**the shade/color**]$_{\Pi\text{-pos}}$.

(390)–(392) show that the same contrast holds for the other Π-positions as well.[11]

(390) *Existential constructions*

Susan saw *a congresswoman* walk into the cabinet room.

a. ✓So, **the congresswoman** was at the cabinet meeting.

b. #So, in the cabinet meeting, there was (at least) [**the congresswoman**]$_{\Pi\text{-pos}}$.

[11] The examples in (390) and (395) are list existentials and thus already somewhat marked. It is possible though to construct a parallel example to show that a definite in the list existential is in principle felicitous: *Who was in the cabinet meeting? Well, there was the congresswoman.* This implies that the cabinet meeting had only one congresswoman. A similar reading is available in (390). Thus, (390) is only infelicitous if the cabinet meeting is presumed to have more than one congresswoman.

(391) *Naming verbs*

My mother liked *one of the names* in the baby book.

a. ✓My grandmother had wanted to give **the name** to my uncle.

b. #My grandmother had wanted to call my uncle [**the name**]$_{\Pi\text{-pos}}$.

(392) *Predicate nominals*

Anna decided on *a type of doctor* to become.

a. ✓**The type** made a lot of money.

b. #And she became [**the type**]$_{\Pi\text{-pos}}$.

The second piece of evidence is that a strong definite can covary with an indefinite in a quantificational sentence. For example, in (393a), *the color* or *the shade* can covary with *a color*, even though the situations being quantified over, Irene picking out colors, presumably contain more than one color and thus would not satisfy the uniqueness requirement. This kind of covariance requires an anaphoric relationship with the quantifier, which a weak definite cannot achieve. As shown in (393b), a definite description in a Π-position (here, a change-of-color verb) in the same context is infelicitous. As above, this infelicity indicates that the definite in (393b) must be a weak definite and its uniqueness requirement is not being satisfied. In an equivalent context, German requires a strong definite (394).

(393) *Change-of-color verbs*

Every time Irene picks out *a color* for the bathroom, . . .

a. ✓Helen complains that **the color/shade** is too bright.

b. #Helen has to paint the room [**the color/shade**]$_{\Pi\text{-pos}}$.

(394) *German*

In jeder Bibliothek, die *ein Buch über Topinambur* hat, sehe ich
in every library that a book about topinambur has look I

{**#im** / ✓**in dem** } **Buch** nach, ob man Topinambur grillen kann.
in.the$_{\text{WEAK}}$ in the$_{\text{STRONG}}$ book PRT whether one topinambur grill can

'In every library that has a book about topinambur, I check in the book whether one can grill topinambur.' [Schwarz 2009:33]

(395)–(397) show that the same contrast holds for the other Π-positions as well.

(395) *Existential constructions*

In every hotel room with *an ugly lamp*, . . .

a. ✓**the lamp** is on the dresser.

b. #there is [**the lamp**]$_{\Pi\text{-pos}}$ on the dresser.

(396) *Naming verbs*

Every time that my mom found *a new puppy name*, . . .

a. ✓my dad vetoed **the name**.

b. #she nicknamed the family dog [**the name**]$_{\Pi\text{-pos}}$.

(397) *Predicate nominals*

In every store with *a rare type of plant*, . . .

a. ✓my aunt bought **the rare type**.

b. #my aunt bought a plant that was [**the rare type**]$_{\Pi\text{-pos}}$.

The third piece of evidence is that while the previous two sets of examples show that strong definites are *ungrammatical* in Π-positions, the inverse can likewise be observed: weak definites are *grammatical* in Π-positions. There are certain contexts that require a weak definite. One such context is so-called bridging contexts where there is a part–whole relation between a definite description and the individuals and events in the preceding discourse, which is sufficient to satisfy the uniqueness requirement of the (weak) definite. A couple representative examples are given in (398). In (398b), for instance, the definite *the steering wheel* is understood as the unique steering wheel in the driving situation.

(398) *Bridging uses of definites*

a. John bought a book today. **The author** is French.

b. John was driving down the street. **The steering wheel** was cold. [Schwarz 2009:6]

The reader is referred to Schwarz (2009) for discussion of why these contexts require weak definites and how the uniqueness requirement is satisfied in them. As shown in (399), bridging contexts in German require a weak definite.[12]

(399) *German*

Der	**Kühlschrank**	war	so	groß,	dass	der	Kürbis	problemlos
the	fridge	was	so	big	that	the	pumpkin	without.a.problem

{✓**im**	/ #**in**	**dem** }	**Gemüsefach**	untergebracht	werden	konnte.
in.the$_{\text{WEAK}}$	in	the$_{\text{STRONG}}$	crisper	stowed	be	could

'The fridge was so big that the pumpkin could easily be stowed in the crisper'

[Schwarz 2009:52]

(400) and (401) show that bridging contexts allow definite descriptions in existential constructions and change-of-color verbs respectively. Constructing part–whole relations for names and predicate nominals is less straightforward—and (401) with change-of-color verbs is already pushing it—, so they are not tested. Nevertheless, not only is there evidence that Π-positions prohibit strong definites, (400) and (401) provide direct evidence that Π-positions allow weak definites.

(400) *Existential constructions*
A: What did you like about *the fridge*?
B: Well, there was [**the spacious vegetable crisper**]$_{\Pi\text{-pos}}$.

(401) *Change-of-color verbs*
(At the paint store, color palettes contain an accent color and several other matching colors.) Rose went to the store and picked out *the color palette* for the bathroom. The next morning, she painted the south-facing wall **the accent color**.

---

[12] There is also a kind of bridging context that requires a strong definite, where instead of a part–whole relation, it is a producer–product relation:

(i)

Das	**Theaterstück**	missfiel	dem	Kritiker	so	sehr,	dass	er	in	seiner	Besprechung	kein	gutes
the	play	displeased	the	critic	so	much	that	he	in	his	review	no	good

Haar	{#**am**	/ ✓**an**	**dem** }	**Autor**	ließ.
hair	on.the$_{\text{WEAK}}$	on	the$_{\text{STRONG}}$	author	left

'The play displeased the critic so much that he tore the author to pieces in his review.' [Schwarz 2009:53]

A similar contrast holds in Π-positions as well, as demonstrated in (ii). I do not discuss these cases in the main text because Schwarz's (2009) analysis of why producer-product relations require a strong definite and part–whole relations require a weak definite is too complicated for our purposes.

(ii) A: What did the critic not like about *the play*?
B: #Well, there was **the author** who is a snob.

We now have two generalizations about what is not allowed in Π-positions: the scope generalization (402a), which reduces to an incompatibility with type-*e* traces, the only type of trace available according to the Trace Interpretation Constraint (TIC), and the definite generalization (402b).

(402) a. **Scope generalization**
Movement that shifts scope cannot target Π-positions.

b. **Definite generalization**
Π-positions prohibit anaphoric (= strong) definite descriptions.

I propose that these two generalizations are one and the same because "traces" are in fact anaphoric definite descriptions, i.e. strong definites. The idea that traces are related to anaphoric definite descriptions is quite old; see Engdahl's (1980, 1986) early work on the semantics of questions. However, the idea is best known now as Trace Conversion, according to which downstairs copies of moved DPs are rendered interpretable at LF by converting them into definite descriptions with a variable (403) (Sauerland 1998, 2004; Fox 1999, 2002, 2003).

(403) a. *Standard traces*
$[\,[\,\textbf{every cat}\,]_1\ \lambda x\ [\text{ a child adopted }[\,\boldsymbol{t_x}\,]_1\,]\,]$

b. *Traces as anaphoric definites*
$[\,[\,\textbf{every cat}\,]_1\ \lambda x\ [\text{ a child adopted }[\,\textbf{the cat}\ \boldsymbol{x}\,]_1\,]\,]$

The technical apparatus performing this operation is a special LF rule that comprises two parts: insertion of a variable (404a) and determiner replacement (404b). The inserted variable is bound by the λ-abstraction introduced below the landing site of movement. The result is an anaphoric definite description, i.e. a strong definite.

(404) Trace Conversion

a. *Variable Insertion*
$\text{(Det) Pred} \rightarrow \text{(Det) } [\,[\text{Pred}]\ [\,\lambda y\ .\ y = g(n)\,]\,]$
(where g is the assignment function)

b. *Determiner Replacement*
$\text{(Det) } [\,[\text{Pred}]\ [\,\lambda y\ .\ y = g(n)\,]\,] \rightarrow \text{the } [\,[\text{Pred}]\ [\,\lambda y\ .\ y = g(n)\,]\,]$ [Fox 1999, 2002, 2003]

Trace Conversion was discussed more extensively in section 3.3.5 of chapter 3, where I also argued that Trace Conversion should be integrated into the narrow syntax under a multidominant system of movement (following Johnson 2012, 2014). For our purposes here, the choice between a copy-theoretic or multidominant conception of Trace Conversion is inconsequential, though see section 3.3 in chapter 3 for arguments in favor of the multidominant one. Most important here is that if traces are strong definites, the scope generalization is subsumed under the definite generalization, more accurately characterizing the class of expressions prohibited in Π-positions. Accordingly, the TRP can be revised to (405) to encompass this combined generalization.

(405) **Trace Rigidity Principle** *(revised)*
Traces cannot be type shifted.
$\rightsquigarrow$ Anaphoric definite descriptions cannot be type shifted.

4.4 Anaphoric definites and type shifting

Under the revised version of the Trace Rigidity Principle (TRP) from the previous section, the question of why strong definites (including traces) are disallowed in Π-positions translates into the question of why strong definites cannot be type shifted into property denotations. One possibility that can be immediately set aside is linking the incompatibility directly to anaphoricity. As mentioned above, many of the infelicitous examples of definite descriptions in Π-positions are improved when *the* is replaced with *that*, as illustrated in (406) with a change-of-color verb.

(406) Blanche picked out *a shade of red* for the living room.
a. #But Dorothy thought that **the shade/color** was too dark.
b. ✓But Dorothy thought that **that shade/color** was too dark.

While a definite description *the NP* cannot establish an anaphoric relation in a Π-position (406a), *that NP* can do so (406b). It is not entirely clear where *that NP* fits within the strong/weak definite distinction, but (406) nevertheless shows that anaphoricity alone cannot be responsible for the TRP. Rather, it must be something specific about definite descriptions with the determiner *the* that underlies the TRP. In this section, I develop a syntactic analysis of the TRP, capitalizing on one aspect that has been argued to differ between strong and weak definites: their determiners. That is, strong and weak definites use different determiners, which in many languages, including English, have the same overt realization. In a nutshell, the proposal is that nominal type shifters, e.g. $\mathcal{BE}$, and the strong-definite determiner are in *complementary distribution*. This complementarity has two crucial effects: (i) type-shifted definites are necessarily weak definites and (ii) a derivation cannot apply both Trace Conversion and a type shifter to the same DP, thereby deriving the TRP and its revised version.

Schwarz (2009) proposes that the strong/weak definite distinction results from having two separate definite determiners (407). In (407), I provide Schwarz's more standard denotations that return an expression of type-e and also denotations that return a generalized quantifier.[13] Both determiners are associated with uniqueness, represented by the ι-operator. However, the strong-definite determiner also has an INDEX (407). The anaphoricity of the strong-definite determiner derives from the index, which can be bound or valued contextually in the same manner as a pronoun, thereby picking out a particular referent rather than relying on uniqueness alone.[14]

(407) *Schwarz's (2009) weak and strong definite determiners*

a. $[\![\text{the}_{\text{WEAK}}]\!] = \lambda P_{\langle e,t \rangle} \,.\, \iota x[P(x)]$
$= \lambda P_{\langle e,t \rangle}\, \lambda Q_{\langle e,t \rangle} \,.\, Q(\iota x[P(x)])$

b. $[\![\text{the}_{\text{STRONG}}]\!] = \lambda y_e\, \lambda P_{\langle e,t \rangle} \,.\, \iota x[P(x) \wedge x = y]$
$= \underbrace{\lambda y_e}_{\text{index}}\, \lambda P_{\langle e,t \rangle}\, \lambda Q_{\langle e,t \rangle} \,.\, Q(\iota x[P(x) \wedge \underbrace{x = y}_{\text{index}}])$

In some languages, the weak-definite and strong-definite determiners have unique realizations or are individually subject to special morphological operations. For example, as discussed in the previous section, in German, the determiner in weak definites contracts with prepositions, but not in strong definites (408). With two separate determiners, this morphological operation can straightforwardly be implemented as the fusion rule in (409) that targets only the weak-definite

[13] Schwarz's (2009) denotations are intensional and include a situation variable. As we are working in an extensional system, I have simplified the denotations.

[14] Two problems with Schwarz's (2009) analysis are that it allows strong definites without antecedents and it predicts some incorrect overlap in the distribution of strong and weak definites. These areas of overgeneration stem from the index of the strong-definite determiner being too permissive. Schwarz suggests that these problems might be solved with a better notion of antecedent; see Schwarz (2009:276–286) for discussion. However, these problems do not directly affect Π-positions because under the analysis being developed in this section, a strong definite is not prohibited in a Π-position *pragmatically*, but rather *syntactically*. Nevertheless, it is important to highlight that there may be more to strong definites than simply having an index and that the analysis developed here does not preclude such a possibility.

determiner (ignoring gender and case, which regulate whether there is a contracted morphological form). Without a separate determiner for weak definites, it is less clear how one would account for the semantic conditioning on the contraction.[15]

(408) *German strong/weak definite distinction* (=394)

In jeder Bibliothek, die *ein Buch über Topinambur* hat, sehe ich
in every library that a book about topinambur has look I

{#**im** / ✓**in dem** } **Buch** nach, ob man Topinambur grillen kann.
in.the$_{\text{WEAK}}$ in the$_{\text{STRONG}}$ book PRT whether one topinambur grill can

'In every library that has a book about topinambur, I check in the book whether one can grill topinambur.' [Schwarz 2009:33]

(409) *German contraction (fusion) rule*

P [D_{WEAK} . . .] → [P+D_{WEAK} . . .

(ignoring case and gender for simplicity)

Crucially, Trace Conversion requires the *strong-definite determiner* in order to establish a connection between the upstairs moved DP and the downstairs definite description. Within the strong/weak definite distinction, Trace Conversion, however, operates somewhat differently. Rather than having two separate rules, one for inserting a variable and another for replacing the determiner, there is only a single rule that replaces the determiner in the downstairs DP with the strong-definite determiner, as this determiner contains the variable, i.e. the index. The index is what is then bound by the λ-abstraction created by movement, as schematized in (410).

(410) *Trace Conversion with the strong-definite determiner*

$$[\ \text{DP}_1\ \lambda x \ldots [\ \ldots \overbrace{[_{\text{DP}}\ \text{the}^{\text{STRONG}}_{x}\ \text{NP}\ ]_1} \ldots\ ]\ ]$$

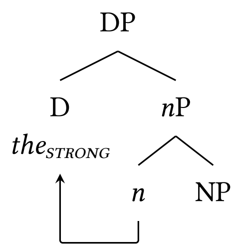
This is roughly the implementation of Trace Conversion that I presented in section 3.3.5 of chapter 3. Note that either the standard copy-theoretic conception or the multidominant conception of Trace

[15] For instance, if the index y were encoded as an identity function $[\lambda x\ .\ x = y]$ that conjoins with the NP, as in the standard version of Trace Conversion, the German contraction rule would have to look inside the complement of DP to determine whether D can contract with P, which would be an atypical morphological rule.

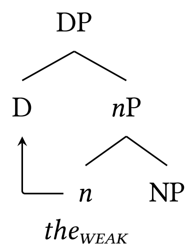
Conversion is compatible with the analysis being developed in this section; I present both versions below for concreteness.

The syntactic analysis of the TRP breaks down into two pieces. First, I propose that the weak-definite and strong-definite determiners occupy distinct syntactic positions in the functional structure of a nominal. The strong-definite determiner occupies D^0 (411), and the weak-definite determiner occupies some lower functional head, which I label n^0 for convenience (412).[16,17] In English, n^0 raises to D^0 to form a complex head, which spells out as *the* regardless of whether n^0 or D^0 is the head that contains the determiner (413).

(411) *Strong definite*



(412) *Weak definite*



(413) *English Vocabulary Items*

a. $[\mathrm{D} + \sqrt{\textsc{the}}_{\textsc{weak}}] \leftrightarrow$ /the/

b. $[\sqrt{\textsc{the}}_{\textsc{strong}} + n] \leftrightarrow$ /the/

The denotations of the definite determiners in (407) do not permit an *n*P headed by $the_{\textit{WEAK}}$ to serve as the semantic argument of $the_{\textit{STRONG}}$. Therefore, a given DP can only contain one of the definite determiners. A possibility that this nominal structure raises, however, is that a strong definite is formed on top of a weak definite, a possibility that I will comment on at the end of this section.

Independent evidence for there being two syntactic positions for determiners comes from the Mainland Scandinavian languages, where there are two definite determiners which can sometimes cooccur. To illustrate, consider the Swedish paradigm in (414). A definite description is standardly formed with the definite suffix (414b), but if the definite description contains an adjective, it must occur with both the definite suffix and a separate definite article (414d). Thus, a definite description

[16] The determiner *that* might also be in n^0, explaining why *that NP* can occur in Π-positions in anaphoric contexts.

[17] The structures in (411) and (412) might fit into a more articulated nominal structure like that of Zamparelli (1995, 2000). For similar proposals that the strong/weak definite distinction is syntactically encoded, see Patel-Grosz and Grosz (2017) and Cheng et al. (2017).

modified by an adjective bears "double definiteness" (*dubbel bestämdhet*). Norwegian exhibits the same pattern as Swedish. Danish lacks the double definite, though in the same contexts, it uses the definite article rather than the definite suffix and thus still has both determiners.

(414) *Swedish double definite*

a. en sjuksköterska
   a nurse

b. sjuksköterska-**n**
   nurse-DEF

c. en sjösjuk sjuksköterska
   a seasick nurse

d. **den** sjösjuka sjuksköterska-**n**
   DEF seasick nurse-DEF

It has been noted in the literature that the two markers of definiteness in Mainland Scandinavian correspond to different properties associated with definiteness: the suffix corresponds to uniqueness and the article to roughly anaphoricity (Julien 2005; LaCara 2011; Goodwin Davies 2016).[18] The arguments for these correlations are based on cases more complicated than the paradigm in (414), wherein the definite description occurs with a modifier and only one of the definite markers, e.g. *svenska språk-**et*** 'the Swedish language' and ***det** språk som talas i Sverige* 'the language that is spoken in Sweden'. I interpret these correlations as an analogue of the strong/weak definite distinction, though one not yet fully understood, in part because of the adjective's role in establishing uniqueness (though see Goodwin Davies 2016).[19] For our purposes here, the double definite indicates the necessity for two separate heads for determiners.

The second piece of the proposal is that nominal type shifters also occupy D^0, competing with the strong-definite determiner for the same syntactic slot. As such, a DP can either include the strong-definite determiner or a nominal type shifter, but never both. This complementary

[18] In the Scandinavian literature, the definite suffix is considered to correspond to "specificity" and the definite article to "uniqueness", but these terms have different meanings from the literature on definites.

[19] Goodwin Davies (2016) argues that the definite morphology in Swedish does not correspond to the strong/weak definite distinction. However, her argument is based on the two types of bridging contexts in Schwarz (2009). Because we still do not understand why the different bridging contexts require a strong or weak definite, I do not consider them a good test case and thus do not rule out the possibility that the definite morphology in Swedish does correspond to the strong/weak definite distinction.

distribution has two crucial consequences. First, a definite description that has been type shifted is necessarily a weak definite because the only definite determiner that can occur alongside a type shifter is *the*$_{WEAK}$, as schematized in (415).[20] This accounts for the observation from section 4.3 that definite descriptions in Π-positions are infelicitous in contexts that only license strong definites and hence are necessarily weak definites.

(415) *Type-shifted definites are always weak definites*

a. $[_{\mathrm{DP}}$ (SHIFTER) $[_{n\mathrm{P}}$ the$_{\text{WEAK}}$ NP $]]$ ⇝ Weak definite; Type shifting possible

b. $[_{\mathrm{DP}}$ the$_{\text{STRONG}}$ $[_{n\mathrm{P}}$ n^0 NP $]]$ ⇝ Strong definite; Type shifting impossible

This articulated nominal structure also accounts for the difference in behavior of *it*-pronouns (weak pronouns) and *that*-pronouns (strong pronouns) in Π-positions. Recall from chapter 2 that weak pronouns like *it* cannot occur in Π-positions, but strong pronouns like *that* can. Note that the terminology here is confusing because the two strong/weak distinctions do not match up, the pronominal distinction being based on the ability to bear stress. Nevertheless, the pronominal distinction can be accounted for by assuming that pronouns are definite descriptions (Elbourne 2005), *it*-pronouns are strong definites (i.e. *it* is a D^0), and *that*-pronouns are weak definites (i.e. *that* is an n^0). Thus, only *that*-pronouns can be type shifted.[21]

Second, Trace Conversion and type shifting cannot apply to one and the same DP. In a Π-position, it is a lose-lose situation. On one hand, if the converted trace contains a type shifter, e.g. $\mathcal{BE}$, to achieve the required property denotation, the only definite determiner available is *the*$_{WEAK}$, which has no variable for the λ-abstraction to bind (416). The result is vacuous quantification and thus ungrammaticality. On the other hand, if the converted trace contains the strong-definite determiner, there is a variable for the λ-abstraction to bind, but the DP does not denote a property and runs afoul of the property requirement of Π-positions (417). Consequently, because either option results in ungrammaticality, the only option left for movement targeting a Π-position is to reconstruct.

[20] To use $\mathcal{BE}$ for weak definites requires that *the*$_{WEAK}$ return a generalized quantifier or that D^0 can be $\mathcal{BE} \circ$ LIFT. (407a) provided a denotation for *the*$_{WEAK}$ that returns a generalized quantifier.

[21] This is similar to Patel-Grosz and Grosz's (2017) proposal that the personal/demonstrative pronoun distinction in German reduces to the weak/strong definite distinction. Their analysis might extend to English, keeping in mind that "weak" and "strong" in reference to English pronouns are backwards from the weak/strong definite distinction.

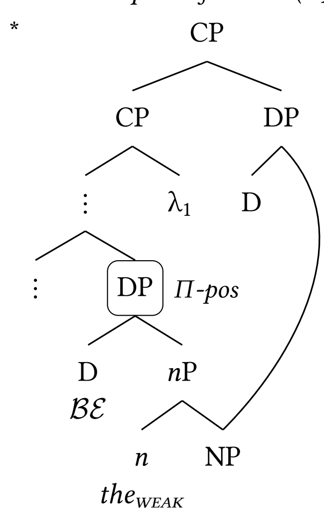
(416) $^*[\ \mathrm{DP}_1\ \lambda x \ldots [\ [_{\mathrm{DP}}\ \mathcal{BE}\ [_{n\mathrm{P}}\ \text{the}_{\textsc{weak}}\ \mathrm{NP}\ ]\ ]_1\ ]_{\Pi\text{-pos}}\ ]$ ✓ Property ✗ Quantification

?? *no variable to bind*

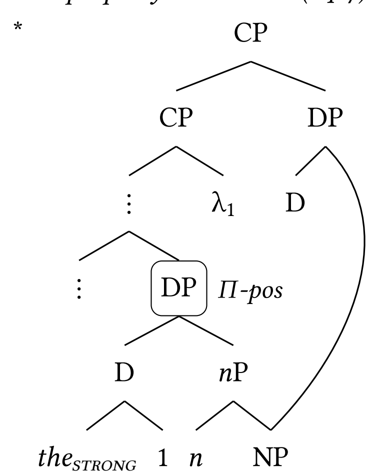
(417) $^*[\ \mathrm{DP}_1\ \lambda x \ldots [\ [_{\mathrm{DP}}\ \text{the}_x^{\textsc{strong}}\ [_{n\mathrm{P}}\ n^0\ \mathrm{NP}\ ]]_1\ ]_{\Pi\text{-pos}}\ ]$ ✗ Property ✓ Quantification

This analysis manages to derive both the definite generalization and the scope generalization from one stipulation, namely the complementary distribution of the strong-definite determiner and nominal type shifters. There are several ways to implement this complementarity; I will describe the two extremes. Under the copy-theoretic conception of Trace Conversion, Trace Conversion and type shifting could be viewed as LF operations that replace the downstairs determiner in D^0. Applying them in succession would erase the output of whichever applied first, both orders being ungrammatical. Under the multidominant conception of Trace Conversion from section 3.3.5 of chapter 3, the complementarity is simple syntactic complementarity, as schematized in (418) and (419); neither Trace Conversion nor nominal type shifting would be LF operations.

(418) *Vacuous quantification (=416)*



(419) *No property denotation (=417)*



Partee (1986) is agnostic about where type shifters live in the grammar. According to (418)–(419), at least some type shifters exist in the narrow syntax because they are in complementary distribution with the strong-definite determiner. However, this does not entail that *all* type shifters exist in the syntax. Because they are just functors from one domain to another, it is within reason that the grammar instantiates them in different and multiple domains. What this analysis shows is that placing some type shifters in the narrow syntax allows us to straightforwardly derive (i) some of the distributional properties of property-denoting DPs and (ii) the TRP.

One might wonder whether there is any independent reason to believe that the strong-definite determiner and nominal type shifters are in complementary distribution. An idea that floats around in the literature is that English *the* is an overt type shifter, e.g. a overt ι-operator or an overt encoding of the "natural" type shifter $\mathcal{THE}$ (e.g. Partee 1986; Chierchia 1998). If this were to hold of the strong-definite determiner, then it would compete with the property-yielding type shifters for the D^0 slot because it is itself a type shifter. Such an analysis might additionally allow for a decomposition of strong and weak definites. For instance, the weak-definite determiner might yield a Russellian definite that maps any singleton to itself and any nonsingleton to the empty set (see Winter 2001). The strong-definite determiner would then apply to this definite, adding the index and perhaps shifting it from type $\langle et, t\rangle$ to type e (see Winter 2000 for a proposal along these lines). I leave exploring this idea for future research.

4.5 Representing properties in natural language

Throughout this dissertation, I have treated properties in purely extensional terms as type $\langle e, t\rangle$, which reduces them to sets of entities. Properties are, however, intensional objects. In the tradition of Montague (1970, 1973), they should minimally be modelled as denoting intensions: functions from possible worlds to sets of entities, i.e. type $\langle s, \langle e, t\rangle\rangle$ (where s is the type of possible worlds). Thus, for example, rather than denoting the set of entities that are green, the property *green* denotes a function that maps each possible world to the set of entities in that world that are green. Whether properties are modelled as $\langle e, t\rangle$ or $\langle s, \langle e, t\rangle\rangle$ does not have a significant bearing on the proposals in this dissertation. The Trace Interpretation Constraint will prohibit traces of either type, and the nominal type shifters could be modified to work with intensions, rather than extensions. Moreover, under a fairly standard world-variable approach to intensionality where the world argument is locally saturated by a world variable, traces in property positions would always have the possibility of being extensional. An analysis of the Π-position asymmetry based on a fully intensional treatment of properties would thus still need to take into account the extensions of properties; in other words, have an analysis comparable to the one developed here. In short, treating properties in purely extensional terms has made the exposition throughout this dissertation much simpler without sacrificing too much.

However, treating properties as denoting Montegovian intentions, i.e. functions from possible worlds, inherits a well-known problem with the logical equivalency of intensions licensing invalid inferences under attitude predicates. Consider the classical contrast between *circle* and *locus of points equidistant from a point*. These two properties will always pick out the same set of entities in any given world. Thus, the propositions containing them in (420a) and (420b) respectively are logically equivalent.

(420) a. ⟦this shape is a circle⟧ = $\{w$: this shape is a circle in $w\}$

b. ⟦this shape is a locus of points equidistant from a point⟧ = $\{w$: this shape is a locus of points equidistant from a point in $w\}$

If attitude predicates involve relations between individuals and propositions, then believing (420a) should entail believing (420b) because the two propositions are logically equivalent. However, as shown by the acceptability of (421), believing (420a) and at the same time not believing (420b) is noncontradictory.

(421) Rose believes that the shape is a circle, but she does not believe that the shape is a locus of points equidistant from a point.

Although the problem of logical equivalency and attitude predicates is fundamentally rooted in modelling intensions in terms of possible worlds, it is also more directly related to properties given that (i) the equivalency of (420a) and (420b) stems from the logical equivalency of the properties *circle* and *locus of points equidistant from a point* and that (ii) propositions can be construed as 0-place properties.[22] There are various solutions to this problem, which individuate propositions more finely (e.g. Barwise and Perry 1983; Lewis 1972; Cresswell and von Stechow 1982; Cresswell 1985), though they are complicated and nuanced. For most aspects of natural-language semantics,

[22] Chierchia (1984:24–37) discusses some other problems with properties and Montegovian intentions, though they are about VPs. I suspect that some of these arguments do not hold as much weight under an event semantics.

propositions construed as sets of possible worlds (or perhaps situations) provides a sufficient level of abstraction. Thus, I do not see too much harm in modelling properties as type $\langle s, \langle e, t \rangle \rangle$.[23]

[23] An alternative to treating properties as denoting intensions that is worth briefly mentioning is the Property Theory developed in Chierchia (1984) and Chierchia and Turner (1988). The two core tenets of Property Theory are that (i) properties come in unsaturated and saturated guises and (ii) saturated properties form part of the entity domain. If we follow the "Fregean" approach in Chierchia and Turner (1988) wherein properties are unsaturated when they are predicated of entities, as in Π-positions, then the proposals so far do not change significantly. We might equate the clash between the strong-definite determiner and type shifters argued for in this chapter to instead be a clash between the strong-definite determiner and whatever makes predicates out of nominalized properties.

CHAPTER 5

NATURE OF THE TRACE INTERPRETATION CONSTRAINT AND ITS CONSEQUENCES

5.1 Introduction

The previous chapters argued for two constraints on the interpretation of movement: the Trace Interpretation Constraint (TIC) in (422), according to which traces only range over individual semantic types, like entities (e) and degrees (d), and the Trace Rigidity Principle (TRP) in (423), according to which traces cannot be type shifted. The TRP is effectively a subcomponent of the TIC because if the TRP were not to hold, then the TIC could be circumvented by type shifting an individual-type trace into a higher type, thereby rendering the TIC unobservable and superfluous. Thus, in what follows in this chapter, I will assume that the TIC encompasses the TRP.

(422) **Trace Interpretation Constraint**
$^*[\ \mathrm{DP}_1\ \lambda f_\sigma \ldots [\ldots [\ f_\sigma\ ]_1 \ldots]\ ]$, where σ is not an individual type

(423) **Trace Rigidity Principle**
Traces cannot be type shifted.

The picture to emerge is that movement is tightly restricted in how it can be semantically interpreted. In particular, according to the TIC and the TRP, movement only has two possible representations: mapping onto a trace ranging over an individual semantic type (424) or reconstructing the moved expression back into its launching site (425). All other representations are ill-formed. I argued in chapter 3 that the choice between leaving a trace and reconstructing is deterministic and reduces to the category of the moving expression: DP in (424) and QP (question-particle phrase) in (425).

(424) *Mapping onto a trace*

$$[\ \mathrm{DP}_1\ \lambda x_e \ldots [\ \ldots [\ x_e\ ]_1 \ldots]\ ]$$

(425) *Reconstruction*

$$[\ \underline{\quad}_1 \ldots [\ \ldots [\ \mathrm{DP}\ ]_1 \ldots]\ ]$$

reconstruct

While the claim that the TIC is a universal constraint on the interpretation of movement dependencies successfully derives the range of facts presented in this dissertation, we might nevertheless ask about the nature of such a constraint and *why* it holds in the first place. This final chapter takes up this topic. Due to the metatheoretical nature of this question, it is not possible to answer it conclusively on the basis of empirical evidence alone, but it warrants consideration because it helps us to sharpen our understanding of the TIC.

I start out in section 5.2 by discussing the scope of the TIC, in particular whether it stands alone or belongs to a broader constraint on variables in natural language, as claimed in its predecessors, Chierchia (1984) and Landman (2006). I argue that because traces are more than just variables—they are anaphoric definite descriptions—the TIC cannot be directly subsumed under a general constraint on variables. In section 5.3, I then present two possible hypotheses about why the TIC holds. The first hypothesis is that the TIC is a reflex of economy at the syntax–semantics interface, wherein the path of least effort is to always map movement to the same kind of trace. The second hypothesis is that the TIC is an artefact of the syntax and semantics of DPs, namely that of anaphoric definite descriptions, which includes traces. This second hypothesis rests on the analysis of type shifting developed in chapter 4, with a few additional assumptions. Section 5.4 ends the dissertation by discussing some of the open questions about Π-positions and about the particular worldview of possible traces developed in this dissertation. These questions serve as avenues for future research.

5.2 Scope of the Trace Interpretation Constraint

The Trace Interpretation Constraint (TIC) is stated narrowly as a constraint on *possible traces*. At first glance, it might be considered a constraint on bound variables in the context of movement, which raises the question of whether the TIC stands alone as its own constraint or belongs to a more general constraint on *possible variables.*[1] There are two similar proposals to the TIC in the literature (its predecessors, if you will), Chierchia (1984) and Landman (2006), which are stated in terms of possible variables. In this section, I review these two proposals and argue that the TIC cannot be subsumed under either proposal because traces are not just variables, but rather anaphoric definite descriptions.

Chierchia (1984) develops an interpretive system in which there are variables over entities (e) and properties ($\langle e,t\rangle$), but not over semantic types higher than properties. What he proposes is that there are "no functor anaphora" (426).

(426) **No Functor Anaphora**
There are no anaphora over functors. [Chierchia 1984]

Let us unpack this claim, which first requires understanding some of the motivation behind Chierchia's (1984) system. The overarching goal of his interpretive system is to handle nominalizations, whereby properties are represented as nominal expressions, rather than as their canonical predicative verbal forms. For example, consider *is nice* and its gerundive counterpart *being nice* in (427). Both *is nice* and *being nice* are representations of the property NICENESS, and both can serve as the predicate in an act of predication, as shown in (427a) and (427b) respectively. Under standard assumptions, both would therefore be of a verbal category, e.g. VP, and denote an expression of type $\langle e,t\rangle$. However, as shown in (427c) and (427d), *being nice* can also serve as the *subject* of an act of predication, including self-predication in the case of (427d).

(427) a. Mary **is nice**.
b. Sue accused Mary of **being nice**.
c. { **Being nice** / ***is nice** } is a quality.
d. { **Being nice** / ***is nice** } is nice.

If *being nice* is type $\langle e,t\rangle$, as (427b) suggests, then predicates would have to be ambiguous between $\langle e,t\rangle$ and $\langle et,t\rangle$ functions in order to allow both *Mary* and *being nice* to be the subject of a predication.

[1] I use the term "variable" here to refer exclusively to variables in LFs, therefore not including variables in the denotations of individual expressions.

Moreover, because type theory bans self-predication as meaningless, the grammaticality of (427d) with the gerundive *being nice* is unexpected and unaccounted for.

At its core, Chierchia's (1984) solution to the problem of nominalizations is to enrich the semantic ontology.[2] In Montague (1970, 1973), three basic domains (or categories) are assumed: entities, world-time pairs, and truth values. Meaningful expressions in the model are defined in terms of these three domains. Chierchia proposes adding properties as one of the basic domains so that there are the set of entities E, the set of properties P, and a map f from P into E. Under this theory, properties have ENTITY CORRELATES, which a gerundive roughly corresponds to. For example, $[\![\text{is nice}]\!] \in \text{P}$, $[\![\text{being nice}]\!] \in \text{E}$, and $f([\![\text{is nice}]\!]) = [\![\text{being nice}]\!]$. Functors are mappings between the basic domains, so a constraint against functor anaphora, as Chierchia proposes, amounts to only permitting variables that range over the basic domains, which includes entities and properties in Chierchia's system. The crucial difference then between Montague (1970, 1973) and Chierchia (1984) is that under Chierchia's system, properties are not functors. There are independent reasons in support of Chierchia's system—or something like it, e.g. Chierchia and Turner (1988)—which I will not review here; the reader is referred to Chierchia (1984) for discussion. Prima facie, the No Functor Anaphora constraint (426) seems to be on the right track empirically. There are pro-forms that appear to have APs (428a) and VPs (428b) as antecedents and deletion processes that target VPs (428c) and NPs (428d)—all of which can be broadly construed as "anaphora" and thus denoting or involving variables.

(428) *Candidates for higher-type anaphora*

a. *AP pro-form*
Those **little**$_1$ cars look good, but few **such**$_1$ cars are safe. [Landman 2006:33]

b. *VP pro-form*
Whenever Sophie **starts laughing**$_1$, Bill does **so**$_1$ too. [Landman 2006:33]

c. *VP ellipsis*
Whenever Sophie **starts laughing**$_1$, Bill does Δ_1 too.

d. *NP ellipsis*
Susan stole Mary's **hat**$_1$, but not Bill's Δ_1.

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[2] What I present here is very much an oversimplification, but it captures the fact that Chierchia's (1984) No Functor Anaphora constraint (426) is more than just a stipulation prohibiting higher-type variables.

At the same time, there do not seem to be anaphora for expressions like prepositions, complementizers, and determiners, which is precisely what No Functor Anaphora predicts.[3]

Landman (2006) argues for a stricter version of Chierchia's (1984) No Functor Anaphora constraint. The constraint that she proposes, the No Higher-Type Variables Constraint (NHTV) in (429), only allows individual variables of type *e*. Note that for Landman, the individual domain is partitioned into different sorts for entities, degrees, situations, etc., rather than having separate semantic types for these categories, but this is for the most part logically indiscernible from having separate semantic types.

(429) **No Higher-Type Variables Constraint**
Variables in the LFs of natural language are of type *e*. [Landman 2006]

The crucial arguments for the NHTV come from subjecting to closer scrutiny putative cases of higher-type variables in the domains of pro-forms and ellipsis, like those in (428). Landman shows that these cases can be recast either as variables over specialized individuals, namely kinds, or as deletion of fully articulated syntactic structure.[4] Discussing her arguments in full would take us too far afield, but I will briefly review her analysis of the pro-form *such* in order to illustrate the general shape of her arguments.

At first glance, *such* is a good candidate for a property pro-form. For example, in (430), *such* is anteceded by the boldfaced NPs, which could feasibly denote properties. Evidence that *such* is anteceded by NPs and not adjectives comes from examples like (431b). In (431b), *such* can only be anteceded by the NP *tall men*, which results in infelicity because women are not in the set of tall men.[5] This infelicity would not occur if *such* could be anteceded by the adjective *tall*.

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[3] Chierchia (1984) observes that certain adverbs are problematic for the No Functor Anaphora constraint. These adverbs are manner adverbs, locatives, and temporal modifiers, which, for instance, have pro-forms: *thus*, *there*, and *then*. Landman (2006) analyses these types of adverbs as referring to specialized individuals: event-kinds, locations, and times respectively (building on Landman and Morzycki 2003). Therefore, *thus*, *there*, and *then* denote variables over individuals, not functors.

[4] Landman (2006) looks briefly at movement, where her main point is that movement of VPs and APs reconstructs. This is a well-known fact; see section 3.4.4 of chapter 3. She does, however, observe one problematic case in the domain of movement: *as*-parentheticals. Potts (2002a,b) argues that *as*-parentheticals involve a null VP-operator that must move and leave a higher-type trace. However, LaCara (2016a,b) argues against Potts's analysis of *as*-parentheticals, crucially on independent grounds, and develops an analysis that does not make use of higher-type variables. See section 5.4.1.2 for some discussion.

[5] Siegel (1994) marks (431b) as ungrammatical, but it is not ungrammatical per se, just infelicitous or necessarily false.

(430) a. **Old ladies** . . . *such* ladies . . .

b. **People owning dogs** . . . *such* dogs . . .

c. **Cats without tails** . . . *such* cats . . . [Carlson 1977:370f.]

(431) a. All **tall men** believe that employers prefer *such* people.

b. # All **tall men** believe that employers prefer *such* women. [Siegel 1994:488]

Landman points out, based on an observation from Carlson (1977), that *such* cannot be anteceded by NPs that do not easily correspond to kinds. Thus, the sentences in (432) are infelicitous when uttered out of the blue.[6] The difference between the bare plurals in (430) and those in (432) is that the latter do not correspond to kinds, but rather pick out finite objects in the world.

(432) a. **People in the next room** . . . ??*such* people (are obnoxious) . . .

b. **Elephants that are standing there** . . . ??*such* elephants . . .

c. **Men that Jan fired this morning** . . . ??*such* men . . . [Carlson 1977:373]

In sum, Landman's (2006) analysis is that while *such* might appear to be a property pro-form on the surface, it actually refers to kinds, or entity correlates of properties (following Chierchia 1984, 1998; Chierchia and Turner 1988). The pattern in (432) crucially follows directly from the NHTV, but not the No Functor Anaphora constraint. Moreover, in the absence of the NHTV, we would expect to find pro-forms that are necessarily anteceded by properties and never by kinds, i.e. the inverse of *such*, but as far as we know, there are no such pro-forms. This is the kind of reasoning and inquiry that underlies Landman's (2006) argumentation for the NHTV.

The constraints posited by Chierchia (1984) and Landman (2006) both restrict the range of possible variables in LFs, whereas I have posited a constraint strictly about possible traces and motivated it using solely movement dependencies. The question then is whether traces are variables in the same sense as anaphors. In other words, should traces be modelled as simple assignment-dependent expressions like *such*, as illustrated in (433)?[7] If so, then traces would fall under the purview of Chierchia's and Landman's constraints.

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[6] The sentences in (432) are acceptable in contexts that make salient the relevant kind; see Landman (2006:48f).

[7] Landman (2006) analyzes *such* as being decomposed into *so* and *like*, where *like* enforces the sortal restriction of kinds. I have collapsed the two in (433) for the sake of illustration.

(433) *Anaphors are variables*
$[\![\text{such}_i]\!]^g = g(i)$, where $g(i)$ is a kind

However, we saw in chapters 3 and 4 that traces are more than just variables. Rather, traces are *anaphoric definite descriptions* that are created by applying Trace Conversion to the lower copy of a movement chain—or its multidominant analogue in the DP/QP-movement system developed in chapter 3. This is illustrated in (434).

(434) *Trace Conversion*
$[\ \text{DP}_1 \ldots [\ \ldots \text{DP}_1 \ldots\ ]\ ] \rightsquigarrow_{\text{LF}} [\ [_{\text{DP}}\ \text{D NP}\ ]_1\ \lambda x_e \ldots [\ \ldots \underbrace{[_{\text{DP}}\ \text{the}\ [\lambda y\ .\ y = x]\ \text{NP}\ ]_1}_{\text{Trace Conversion}} \ldots\ ]\ ]$

Consequently, the TIC cannot be subsumed under a constraint on possible variables, like Landman's (2006) NHTV. Be that as it may, there are of course similarities between the TIC and the NHTV. The fact that these two constraints are similar but motivated based on different empirical domains, I take as strongly suggesting that there is some shared generalization between the two. One possible path to pursue is treating anaphors as definite descriptions, akin to traces. Such a proposal already exists for pronouns (Elbourne 2005), but its tenability for present purposes rests on whether it can extend to nonnominal anaphors like *such* and *so*. I leave this question for future research. Unless such a deduction can be made about anaphors, the TIC stands alone as its own constraint.

5.3 Why the Trace Interpretation Constraint?

While the Trace Interpretation Constraint (TIC), repeated in (435), as a constraint on interpreting movement derives the range of facts presented in this dissertation, fully understanding the TIC involves understanding *why* it holds in the first place. Due to the metatheoretical nature of this question, it is not possible to answer it conclusively on the basis of empirical evidence alone, but it nevertheless warrants consideration because it helps us to sharpen our understanding of the TIC.

(435) Trace Interpretation Constraint
$^*[\ \text{DP}_1\ \lambda f_\sigma \ldots [\ \ldots [\ f_\sigma\ ]_1 \ldots\ ]\ ]$, where σ is not an individual type

Section 5.3.1 discusses why two proposals about possible traces briefly suggested in Fox (1999) do not explain the TIC, one of the proposals crucially being incompatible with Π-positions. I then turn to proposing two new hypotheses about why the TIC holds. The first hypothesis, in section 5.3.2, is that the TIC is a reflex of economy at the syntax–semantics interface. The second hypothesis, in section 5.3.3, is that the TIC is an artefact of the syntax and semantics of DPs, namely that of anaphoric definite descriptions. It is too early to adjudicate between the two hypotheses, but I will highlight the merits and downsides of each of them in order to lay the groundwork for future investigation. For the sake of simplicity, I set aside reconstruction in the discussion that follows; for the interplay between the TIC and reconstruction, see section 3.3 of chapter 3.

5.3.1 Against Fox's (1999) proposals

Recall from section 3.2.2 of chapter 3 that Fox (1999) argues against the semantic theory of reconstruction (Cresti 1995; Rullmann 1995) wherein movement may leave a generalized-quantifier (GQ) trace ($\langle et, t\rangle$), thereby deriving the effect of reconstructed scope. His argument is based on the Scope–Condition C Correlation: the reconstructed scope of a moved element determines its Condition C connectivity (see also Romero 1998). Semantic reconstruction is unable to account for this correlation without additional stipulations. Because semantic reconstruction amounts to the existence of GQ-traces, this correlation in turn shows that GQ-traces do not exist. Fox concludes that a moved DP may only leave a trace of type e, which is in effect the Trace Interpretation Constraint (TIC). He briefly suggests two possible reasons why this restriction might hold.[8]

5.3.1.1 All pro-forms range over individuals

The first possible reason that Fox suggests is that "traces, like pronouns, are always interpreted as variables that range over individuals" (Fox 1999:180), an idea that fits within Landman's (2006) No Higher-Type Variables Constraint. As discussed in section 5.2, the TIC cannot be subsumed under a constraint on variables because traces are not just variables, but anaphoric definite descriptions. This proposal inherits the same problem. It is also worth noting that it is not a trivial assumption that all pronouns, or more generally pro-forms, are interpreted as variables ranging over individuals.

[8] Fox (1999) suggests these two possible explanations in a footnote. Thus, I have had to extrapolate what it would take to implement them.

Some instances of anaphora that superficially appear to reference higher-type expressions are given in (436) (from Landman 2006).

(436) *Candidates for higher-type anaphora*

a. *Adjective phrase*
Those **little**$_1$ cars look good, but few **such**$_1$ cars are safe.

b. *Adverb phrase*
You have to dance this dance [**with a definite sense of pride and haughtiness**]$_1$, and if danced **thus**$_1$/**so**$_1$, the dance will be beautiful.

c. *Verb phrase*
Whenever Sophie **starts laughing**$_1$, Bill does **so**$_1$ too.

d. *Adjective phrase*
I thought she would be **happy**$_1$, but she certainly doesn't seem **so**$_1$. [Landman 2006:33]

Although Landman (2006) argues compellingly against analyzing the cases in (436) as involving higher-type variables and proposes instead that they involve reference to kinds (see section 5.2), my point here is that asserting that pro-forms always range over individuals requires buying into a particular analysis of cases like (436) and thus is a nontrivial assumption.

Regardless, even if pro-forms did always refer to individuals, it would still need to be explained *why*. There is nothing logically prohibiting higher-type variables in our semantic metalanguage. For instance, higher-type variables are independently needed in the denotations of many lexical items, including quantifiers (437).

(437) *Lexical denotations still involve higher-type variables*
$[\![\text{every}]\!] = \lambda P_{\langle e,t\rangle}\,\lambda Q_{\langle e,t\rangle}\,.\;\forall x[P(x) \rightarrow Q(x)]$

Therefore, Fox's (1999) first suggested proposal in and of itself is an incomplete answer to why the TIC holds, though it is worth pointing out that the two hypotheses that I present in sections 5.3.2 and 5.3.3 could be seen as encompassing this proposal.

5.3.1.2 Lowest compatible type

The second possible reason suggested by Fox is that "the semantic type of a trace is determined to be the lowest type compatible with the syntactic environment" (Fox 1999:180), an idea that he attributes to Beck (1996). According to this idea, GQ-traces are blocked because argument positions are compatible with expressions of type *e*, which is a lower type than $\langle et, t\rangle$. Let us formulate this constraint in a more general manner as the Lowest Type Constraint in (438).

(438) **Lowest Type Constraint**
Map an expression to the lowest type compatible with the position.

The appeal of this idea is that it reduces the TIC to external factors. However, it faces two rather substantial problems. The first problem is that the Lowest Type Constraint cannot account for Π-positions. A Π-position requires an expression denoting a property. According to the Lowest Type Constraint, a property trace should therefore be possible in a Π-position because it is of the lowest semantic type compatible with the property requirement. Chapter 2 showed, however, that the readings that a property trace would allow are unavailable in Π-positions.

The second problem is that GQ-traces do not necessarily have to occupy argument positions to derive reconstructed scope readings. They can also occupy intermediate positions—and, in fact, under Cresti's (1995) analysis, they must do so.[9] These intermediate positions are also positions where ordinary GQs can QR to. For example, in (439), *how many books* first moves to an intermediate position and then moves to the criterial *wh*-position in [Spec, CP]. The lower trace from the first step of movement is type *e* ('small' *t*), and the intermediate trace from the second step of movement is type $\langle et, t\rangle$ ('big' T). Because the intermediate GQ-trace is below the modal *should*, *how many books* takes scope below *should* as well; see section 3.2.1 for a detailed derivation.

(439) *GQ-traces in intermediate positions*
[[how many books]$_1$ λ_1 [should [$\mathbf{T_1}$ λ_2 [Nina read t_2]]]] should ≫ how many

Because the GQ-trace is introduced in the intermediate position, the compatibility conditions of the object position are no longer applicable to it. Rather, it would have to be the compatibility conditions on the *intermediate position* that matter, which presents some complications. First, the Lowest Type Constraint would have to apply to the GQ-trace even though it serves as the function

9 In Rullmann's (1995) analysis, verbs directly take arguments that are generalized quantifiers, rather than entities. This in turn requires that type-*e* traces be type shifted into generalized-quantifier types. The Lowest Type Constraint does not derive the TIC under this kind of analysis, which shows how tenuous such a constraint is in the first place.

and its sibling as the argument. It would be more intuitive for the Lowest Type Constraint to take into account the demands of the function, not the argument. If the constraint could force functions to be lower types, it is unclear why it would not apply to all functions and do something disastrous like force them to take only one argument. Second, the compatibility conditions on the intermediate position would have to be defined without jeopardizing ordinary GQs in the same configuration. For instance, the availability of type-*e* subjects should not preclude GQ-subjects, e.g. *Every girl left* should not be ungrammatical because *Mary left* is a possible sentence. To solve these complications, the Lowest Type Constraint would have to single out traces/variables in a way antithetical to the standard semantic composition rules. For example, according to the rule of Function Application (440), neither the order of the expressions nor their identities matter. Function Application blindly applies in whichever way the types work out.

(440) Function Application
If α is a branching node, $\{\beta, \gamma\}$ is the set of α's children, and $[\![\beta]\!]$ is a function whose domain contains $[\![\gamma]\!]$, then $[\![\alpha]\!] = [\![\beta]\!]([\![\gamma]\!])$. [Heim and Kratzer 1998:44]

Given that the semantic type of a trace's sibling is only available with respect to the trace in the composition rule for their shared parent node, the Lowest Type Constraint would have to be implemented in these such rules.[10] Modifying Function Application, and rules like it, so that the function cannot be a trace/variable amounts to little more than restating that traces cannot be higher types, i.e. restating the TIC. It would also raise the question of whether the semantic composition rules *should* care about the identity of the expressions involved in the rule—clearly an ad hoc and, as far as I can tell, not independently motivated conjecture. Thus, Fox's (1999) second suggested proposal about the TIC is also not a possible explanation for why it holds.

5.3.2 Hypothesis One: Economy

The first hypothesis that I explore here is that the Trace Interpretation Constraint (TIC) arises because it is the most economical option that natural language *could* manifest to link together

[10] An alternative is to implement the Lowest Type Constraint as a transderivational constraint over derivations, but this is problematic on independent grounds. For one, it would require a fairly different conception of the relation between syntax and semantics if we are to maintain that this relation is a homomorphism.

syntax and semantics. In particular, there is an interdependence between the necessity that syntax interface with semantics and the economy of said interface. It is this interdependence that ultimately begets the TIC. Under this proposal, the TIC is merely a reflex of a deeper level of economy in the grammatical architecture.

Metatheoretical considerations have played and continue to play a significant role in the development of the Minimalist Program (Chomsky 1993, *et seq*), and the question of why the TIC holds can be meaningfully addressed against the background of such considerations. Before the Minimalist Program, linguistic inquiry sought to answer two broad questions: (i) What does a speaker know when she knows her native language? (ii) What is the capacity that facilitates a speaker's acquisition of her native language? Underpinning the answers to these two questions is what we call Universal Grammar (UG) (Chomsky 1965), the 'cognitive organ' that maps auditory or visual input to an internalized grammar. This period of research can be characterized as attributing the totality of linguistic properties to UG. The Minimalist Program shifted the focus of linguistic theory to considering language in the broader context of cognition and (more recently) evolution,[11] giving prominence to a third question: Why does UG have the properties that it has? Implicit in this question are knowing what properties UG has, which of these properties can and cannot be deduced from extralinguistic cognitive principles (i.e. are not part of UG), and how these properties arose in the human species. It is against this third (set of) question(s) that I situate the first hypothesis about why the TIC holds.

The approach to answering the third question within the Minimalist Program is one of reduction, namely reducing phenomena down to more basic conditions. The motive is that the simpler the assumptions, the deeper their explanatory force. Embodied in this approach is the Strong Minimalist Thesis, the hypothesis that language is the 'optimal solution' to interface conditions. What does not contribute to the satisfaction of the interfaces is deemed (prima facie) unnecessary, which resulted in the reassessment of many of the rich structures proprietary to language posited in Government and Binding Theory and its sibling theories. This reductionist approach to linguistic inquiry leads to two major pillars of the Minimalist Program: economy and considerations of

[11] See Chomsky (2004, 2005, 2007).

VIRTUAL CONCEPTUAL NECESSITY.[12] Economy refers to the general principle of 'least effort' (Chomsky and Lasnik 1993). Classical principles like the Minimal Link Condition and the A-over-A condition are reflexes of economy. 'Virtual conceptual necessity', on the other hand, is admittedly a somewhat bloated term, but it simply refers to a domain that, to the extent that it is true, must be captured by linguistic theory. The 'virtual' underscores that it appears to be necessary given our current level of understanding, but it might very well be falsified as our understanding of language deepens. Moreover, while a virtual conceptual necessity bears less burden of proof, because we cannot imagine language without it, it does leave the door open for how to analyze it.

Let us consider a concrete example of these two concepts and their interplay before turning to movement. It is a fact that sentences comprise a potentially infinite number of distinct smaller pieces. To account for this fact, the grammar must include some procedure for putting together smaller units, and this procedure must be recursive. Therefore, this procedure is a virtual conceptual necessity. In minimalist syntax, this procedure is the operation MERGE (Chomsky 1995a). That is, MERGE fulfils the virtual conceptual necessity of a recursive structure-building operation. Furthermore, MERGE is argued to be an economical operation in that it is binary and symmetric. The binarity of MERGE in particular exemplifies the interplay between economy and virtual conceptual necessity in minimalist reasoning. It is a virtual conceptual necessity that MERGE apply to *at least* two objects; otherwise, it would not be able to build larger structures. However, it is not conceptually necessary for MERGE to be able to apply to *more than two objects* and hence an *n*-ary MERGE bears the burden of proof. According to minimalist reasoning, because MERGE must apply to at least two objects, it hence must apply to at most two objects. Chomsky (2005) bolsters this claim by suggesting that binary MERGE is also computationally economical. Granted, these particular hypotheses about MERGE might turn out to be incorrect, but the logic that gives rise to them provides a good demonstrations of the intertwined roles that economy and virtual conceptual necessity play in the Minimalist Program.

Now consider movement. If movement dependencies could map onto traces of more than one semantic type, a movement dependency could in principle have multiple possible LFs, as schematized in (441). The multiplicity of possible LFs would be uneconomical. The problem is

[12] For more extensive discussion of these concepts, see Boeckx (2006).

exacerbated by the fact that given the standard recursive definition of semantic types, it is unclear how n-many possible LFs would not escalate to $n + 1$-many possible LFs and so forth. It would be necessary to stipulate an upper bound.

(441) *Movement without the TIC*

$$[\ \mathrm{DP}_1 \dots [\ \dots \mathrm{DP}_1 \dots\ ]\ ] \rightarrow \begin{cases} [\ \mathrm{DP}_1\ \lambda x_e \quad \dots [\ \dots x_e \quad \dots\ ]\ ] \\ [\ \mathrm{DP}_1\ \lambda x_{\langle e,t\rangle} \ \dots [\ \dots x_{\langle e,t\rangle} \ \dots\ ]\ ] \\ [\ \mathrm{DP}_1\ \lambda x_{\langle et,t\rangle} \dots [\ \dots x_{\langle et,t\rangle} \dots\ ]\ ] \\ \bullet\bullet\bullet \end{cases}$$

However, according to the TIC, this overabundance of LFs for movement does not exist. Movement dependencies map onto one and only one LF: a trace ranging over type *e*, as schematized in (442).[13, 14] Thus, the TIC is an economy constraint. When the grammar maps syntax to semantics, the path of least effort is to always map movement to the same kind of trace.

(442) *Movement with the TIC*

$$[\ \mathrm{DP}_1 \dots [\ \dots \mathrm{DP}_1 \dots\ ]\ ] \longrightarrow [\ \mathrm{DP}_1\ \lambda x_e \dots [\ \dots x_e \dots\ ]\ ]$$

There is another way of reasoning towards the same conclusion: We independently know that movement must be able to map onto traces over type *e*; thus, it is a virtual conceptual necessity. By deduction, the simplest system then is one in which movement *only* maps onto traces over type *e* and no others. The TIC provides the empirical support for this hypothesis.

The TIC being an economy constraint does not necessarily explain why it holds, other than that economy constraints seem to be an inherent part of natural language. Thus, we can still speculate further about the TIC's origins. Here, I suggest that we consider the necessity of LF. Because sentences are pairings of sound and meaning, the grammar must interface with sound and meaning. These interfaces—what we call PF and LF—are thus virtual conceptual necessities. We

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[13] As mentioned at the outset of this section, I am setting aside the possibility of reconstruction.

[14] I have simplified the above discussion by only considering entities, but "type *e*" should be understood as "an individual type". Knowing the relevant individual type is its own separate problem. I am sympathetic to the idea that there are not different semantic types per se, just sorts on a general semantic type like SITUATIONS (in the sense of Kratzer 1989); see fn. 13 in chapter 3. This is the approach advocated for by Landman (2006), though she reduces everything to entities; see section 5.2. Under this approach, the semantics of individual expressions would care about sorts, but the syntax and the syntax–semantics interface would not. As I focus primarily on the entity domain throughout this dissertation, I leave exploring this problem and solution to future research.

now have two independently well-reasoned claims: (i) the TIC belongs to the class of economy constraints and (ii) the LF-interface is a virtual conceptual necessity. I propose that these two claims are two sides of the same coin; they are interconnected in the same way that economy and virtual conceptual necessity are interconnected for Merge. On one hand, the grammar is forced to instantiate a mapping from syntax to semantics for movement dependencies, and on the other hand, it just happens to produce the most economical option—this is not a coincidence. If a virtual conceptual necessity is some isolatable component that must have arisen in the course of human evolution to endow us with natural language—a reasonable stance—, then the pattern to emerge is that these virtual conceptual necessities trend towards the economical options. We saw this trend with Merge, and now we see it with the semantics of movement. Under this proposal, the TIC arises from the need to link syntax with semantics, i.e. structure with meaning, because this link is necessarily an economical link and the TIC is the most economical option.

This first hypothesis is of course speculative. However, it is just one way of conceiving of why it is the TIC that holds of natural language and not something else. In particular, it is a way consistent with the goals and assumptions of the Minimalist Program. It is also a very strong hypothesis in that it predicts no crosslinguistic variation in possible traces, which may or may not stand the test of time. That said, I think that it provides the most *interesting* answer and follow-up questions, and hence deserves consideration.

5.3.3 Hypothesis Two: Syntax and semantics of DPs

The second hypothesis about why the Trace Interpretation Constraint (TIC) holds is that it is an artefact of the syntax and semantics of DPs. More specifically, anaphoric definite descriptions, what I will call strong definites in contrast to nonanaphoric weak definites (following Schwarz 2009), are necessarily of semantic type *e* as a result of this particular syntax and semantics. Because traces are strong definites (see section 4.3 of chapter 4), traces are therefore never of higher semantic types either.

This hypothesis builds on the analysis of nominal type shifting developed in chapter 4. In chapter 4, I proposed that nominal type shifters and the strong-definite determiner are in complementary distribution syntactically; they both occupy D^0.[15] This complementarity has two crucial effects. First, type-shifted definites are necessarily weak definites because the only definite determiner that can cooccur with a type shifter is the weak one (443).

(443) *Type-shifted definites are always weak definites*

a. $[_{\mathrm{DP}}$ (SHIFTER) $[_{n\mathrm{P}}$ $\mathrm{the}_{\textsc{weak}}$ NP]] ⇝ Weak definite; Type shifting possible

b. $[_{\mathrm{DP}}$ $\mathrm{the}_{\textsc{strong}}$ $[_{n\mathrm{P}}$ n^0 NP]] ⇝ Strong definite; Type shifting impossible

Second, a derivation cannot apply both Trace Conversion and a type shifter to one and the same DP because Trace Conversion requires the strong-definite determiner, which competes for the same syntactic slot as type shifters. Thus, in an environment that requires a type-shifted denotation, such as Π-positions, traces are ungrammatical (444).

(444) *Traces cannot be type shifted to properties*

$$^*[\ \mathrm{DP}_1\ \lambda x \ldots [\ \overbrace{[_{\mathrm{DP}}\ \mathrm{the}_x^{\textsc{strong}}\ [_{n\mathrm{P}}\ n^0\ \mathrm{NP}\ ]]}_1\ ]_{\Pi\text{-pos}}\ ]$$

The other important piece of the analysis in chapter 4 is the proposal that property-type DPs are necessarily derived. In other words, DPs never start out denoting properties. Rather, a property denotation is always achieved by type shifting from an entity denotation (e) or a generalized-quantifier denotation ($\langle et, t\rangle$). Because strong definites cannot be type shifted (443b)—traces included (444)—, they can never have property denotations.

If the TIC is broken down into a ban on property traces and a ban on generalized-quantifier traces, then the analysis of type shifting and property denotations in chapter 4 derives one half of the TIC, namely the ban on property traces. We can account for the other half of the TIC by assuming that strong definites are never born as generalized quantifiers, only as type-e expressions. Since strong definites cannot be type shifted, there is in turn no means for them to obtain a generalized-quantifier denotation, thereby preventing generalized-quantifier traces. Note that extending this claim about generalized-quantifier denotations to all DPs would be too strong, as

[15] For the sake of simplicity, I only present the copy-theoretic version of the type-shifting analysis. See section 4.3 of chapter 4 for the multidominant version.

there are DPs that are clearly born as generalized quantifiers, e.g. *most NPs.* As such, the claim must be limited to strong definites.

Additionally, the proposal that strong definites are only type-e should be independently observable in nonmovement contexts. Although this prediction is somewhat difficult to test, one possible test case is conjunction with expressions that are bona fide generalized quantifiers. To conjoin with generalized quantifiers, type-e expressions need to be lifted into $\langle et, t\rangle$ meanings (Partee and Rooth 1983). The prediction is that only weak definites may conjoin with generalized quantifiers because only weak definites can be type shifted. We can use the same indirect reasoning from section 4.3 of chapter 4 to test this prediction. In a context requiring a strong definite, a definite description conjoined with a generalized quantifier should be infelicitous because the conjunction forces it to be a weak definite, whose uniqueness requirement is not satisfied in the context. (445a) executes this test using covariance with an indefinite in a quantificational sentence, one of the environments identified by Schwarz (2009) to require a strong definite. The judgement is somewhat difficult, and I can only report my own judgement, which is that (445a) is degraded when it includes *and every encyclopedia.* The sentence becomes acceptable again when *the book* is replaced with *that book* (445b), which is also predicted under the analysis developed in chapter 4.

(445) *Strong definites* ***cannot*** *conjoin with generalized quantifiers*

a. In every library with *a book about topinambur*, I look in **the book (??and every encyclopedia)** to see whether one can grill topinambur.

b. In every library with *a book about topinambur*, I look in **that book (and every encyclopedia)** to see whether one can grill topinambur.

Conversely, in contexts where the uniqueness requirement of a weak definite is satisfied, such as part–whole bridging contexts (Schwarz 2009), a definite description should be able to conjoin with a generalized quantifier because weak definites can be type shifted, unlike strong definites.[16] This prediction is borne out, as shown in (446).

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[16] Another possibility is that weak definites can be born as generalized quantifiers, unlike their strong definite counterparts, though this does not change the predictions.

(446) *Weak definites* ***can*** *conjoin with generalized quantifiers*
The town was so big that **the church (and every municipal building)** was impossible to find.

If the judgements in (445) and (446) generalize to other English speakers, then this second hypothesis about the TIC has a strong piece of evidence in its favor.

There are two potential downsides to this second hypothesis. The first is that in some sense, the TIC would be an accidental property of strong definites. It is missing the "deeper" explanation of the first hypothesis in section 5.3.2.[17] However, this downside might turn out to be an advantage as we learn more about reconstruction and the semantics of movement in languages other than English, which is currently an open question; see section 5.4.5. Tying the explanation of the TIC to the syntax and semantics of DPs means that any crosslinguistic variation in possible traces might be accounted for in terms of variation in what kinds of DPs can be constructed in the language. The second potential downside is that this hypothesis does not automatically extend to domains other than entities, such as degrees and situations. While these domains have not featured prominently in this dissertation, we would lose the straightforward explanation that the TIC provides about why VPs and APs obligatorily reconstruct; see section 3.4.4 of chapter 3.

5.4 Open questions

This section discusses some of the open questions about Π-positions and about the particular worldview of possible traces developed in this dissertation. These questions serve as avenues for future research.

5.4.1 Moving verbs and verb phrases

It is not difficult to develop analyses that involve higher-type traces, but the question is whether such traces are absolutely necessary. Various proposals exist in the literature that employ higher-

[17] One line of reasoning to link together the two hypotheses in sections 5.3.2 and 5.3.3 is that economy forces only individual-type traces, which in turn causes strong definites to only be type *e*. A similar line of reasoning can be found in phonological theory before the advent of Optimality Theory. It was known that languages have phonological constraints, but under a rule-based phonology, it was a rule that repaired the constraint violation. It was hypothesized that the constraint is what gives rise to the rule. However, this line of thinking only goes so far.

type traces over verbs or verb phrases, e.g. types $\langle e,t\rangle$ or $\langle e,\langle e,t\rangle\rangle$, three of which I list in this section: head movement in the German long passive, *as*-parentheticals, and sloppy VPs under ellipsis. In the cases of *as*-parentheticals and sloppy VPs under ellipsis, there are already arguments in the literature against the particular analyses involving higher-type traces, crucially for reasons independent of possible traces.

5.4.1.1 Head movement and verb clusters

Traditionally, head movement is believed to have no semantic effects. However, Keine and Bhatt (2016) argue that the LONG PASSIVE in German involves semantically-contentful head movement. The long passive is a construction in which the matrix verb is passivised and the embedded object receives nominative case (447a), in contrast to the local passive, where the object retains accusative case (447b). Keine and Bhatt (2016) crucially observe that in the long passive, the matrix verb obligatorily takes scope in the position of the embedded verb. As such, all elements in the embedded nonfinite clause take scope above the matrix verb. For example, in (447a), *nur einem einzigen Studenten* 'only one student' takes scope above *vergessen* 'forgotten', even though it is not the DP that gets promoted to nominative case.

(447) a. *Long passive*

Erst	gestern	wieder	wurde	*der*	*Fritz*	**nur**	**einem**	**einzigen**	**Studenten**
just	yesterday	again	was	the	Fritz.NOM	only	a	single	student.DAT

vorzustellen vergessen.
to.introduce forgotten

'Just yesterday it was forgotten to introduce Fritz to only one student'

*forget ≫ only; ✓only ≫ forget

b. *Local passive*

Erst	gestern	wieder	wurde	*den*	*Fritz*	**nur**	**einem**	**einzigen**	**Studenten**
just	yesterday	again	was	the	Fritz.ACC	only	a	single	student.DAT

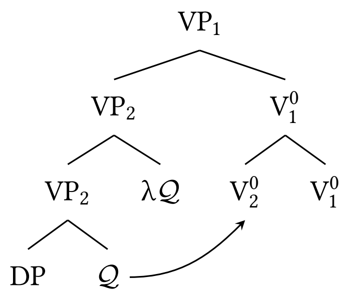
vorzustellen vergessen.
to.introduce forgotten

'Just yesterday it was forgotten to introduce Fritz to only one student'

✓forget ≫ only; *only ≫ forget [Keine and Bhatt 2016:1456]

Keine and Bhatt (2016) propose that the German long passive involves the embedded verb head-raising to the matrix verb, forming a verb cluster. The resulting verb cluster is interpreted via function composition. The movement of the embedded verb leaves a verbal trace, whose λ-binder immediately sits below the verb cluster. The verb cluster saturates this λ-abstraction, the result of which is the entire verb cluster, including the matrix verb, taking scope below everything in the embedded nonfinite clause.

(448) *Keine and Bhatt's (2016) proposal*



They hypothesize that verb-cluster formation happens in order to avoid violating Distinctness (in the sense of Richards 2010), in particular having more than one maximal head of the same type in a given Spell-out domain. There are two points worth mentioning: First, the trace left behind by the embedded verb is not a copy, and it is unclear whether it could be a copy and also derive the intended semantic effects. Second, the semantic effects can equally be achieved by *lowering* the matrix verb to the embedded verb. This would still avoid violating Distinctness and would violate the Extension Condition no more than ordinary head movement does.

5.4.1.2 *As*-parentheticals

Potts (2002a,b) argues that *as*-parentheticals, like in (449), involve a null VP-operator that moves to the clause edge, leaving a verbal trace, as schematized in (450). The motivation behind this analysis is that *as*-parentheticals do not display the properties of VP ellipsis, but do show properties of movement, e.g. they are island sensitive. This is a puzzle that Landman (2006) acknowledges as challenging for a constraint against higher-type variables/traces, but does not solve.

(449) Mary kissed a pig, as John also will Δ. [LaCara 2016a:1]

(450) *Potts' (2002a,b) analysis of as-parentheticals*
[as [$_{\text{CP}}$ Op$_{\text{VP}}$ [John also will t_{VP}]]]

However, for reasons independent of possible traces, LaCara (2016a,b) recently argues against Potts's analysis of *as*-parentheticals and in defense of an analysis involving VP ellipsis. Under his analysis, the island sensitivity is still due to movement of a null operator, but this operator instead ranges over kinds. Crucially, there is no higher-type trace in LaCara's (2016a,b) analysis.

5.4.1.3 Sloppy VPs under ellipsis

Hardt (1999) and Schwarz (2000) observe what appear to be sloppy readings of VPs under ellipsis, which have been argued to support the pro-form analysis of ellipsis. Consider the example in (451), where the elided VP may be interpreted as "want to clean" even though there is no antecedent of "want to clean", only "want to cook" and "clean".

(451) When John had to cook, he didn't want to Δ. When he had to clean, he didn't Δ, either. [Schwarz 2000]

Schwarz likens such cases to sloppy readings of pronouns in ellipsis sites. He analyzes (451) as the VP being a variable that is bound by an overt VP that fronts at LF, as schematized in (452).

(452) a. [$_{\text{VP}}$ cook]$_1$ λ_1 [when he had to t_1, he didn't want to t_1]
b. [$_{\text{VP}}$ clean]$_1$ λ_1 [when he had to t_1, he didn't ⟨~~want to t_1~~⟩]

There are a number of problems with this analysis that have been documented in the literature (see e.g. Schwarz 2000; Sauerland 2004; Tomioka 2008), which I do not review here. The reader is referred to Tomioka (2008) for an alternative analysis involving deletion of fully articulated syntactic structure.

5.4.2 Functional questions

As discussed in section 3.3.4 of chapter 3, there are constituent questions where the answer can be a function (Engdahl 1980, 1986; Groenendijk and Stokhof 1984). These are called FUNCTIONAL QUESTIONS. Consider the question in (453a) with the quantificational phrase *no woman.* It is possible to answer (453a) with a phrase representing a function like *her first picture*, which when given a woman, returns her first picture. Under the choice-function semantics of constituent questions, functional readings can be easily accommodated by Skolemizing the choice function (453c), in effect passing it a variable that is bound by the quantifier that yields the functional reading.

(453) *Functional questions*

a. [**Which picture (of herself$_2$)**]$_1$ does *no woman*$_2$ like ___$_1$?

b. her first picture, her prom picture, . . .

c. *Skolemized choice functions*
$\lambda w_0\, p_{\langle s,t\rangle}\ .\ \exists f^{\text{CF}}[p = \lambda w\ .\ \neg\exists x[\textsc{woman}_w(x) \wedge \textsc{like}_w(f_x(\text{picture}))(x)]]$

I claimed in section 3.3.4 of chapter 3 that functional questions require reconstruction of the *wh*-phrase so that a variable inside the *wh*-phrase can be bound by the quantifier (454).

(454) *Functional questions require reconstruction*
[Q *no woman* λx [x like [**which picture of** x]]

Sauerland (1998, 2004) presents an alternative analysis in which movement of the *wh*-phrase to [Spec, CP] introduces a λ-abstraction over choice functions. This λ-abstraction binds a choice-function variable in the lower copy, which is itself converted into a definite description via Trace Conversion (455). This choice function can be Skolemized, thereby allowing for functional questions like (453a).

(455) *Sauerland's (1998, 2004) choice-function analysis*
[[$_{\text{DP}}$ which picture]$_1$ λf [no woman λx [x like [$_{\text{DP}}$ the picture $f(x)$]$_1$]]]

Under Sauerland's (1998, 2004) analysis, the question is whether this λ-abstraction over choice functions counts as a "trace" for the Trace Interpretation Constraint. The answer is unclear because the lower copy of the *wh*-phrase is itself still type e. While I do not have an answer for this question, I would like to highlight that a pure reconstruction analysis as in (454) with a Q-particle is a viable alternative to abstraction over choice functions, and the question does not arise.

5.4.3 Antecedent Contained Deletion

Antecedent Contained Deletion (ACD) is a class of ellipsis constructions in which the elided material is contained within its antecedent. A representative example is given in (456).

(456) Katia $\underbrace{\text{read every book that Sakshi did } \overbrace{\langle \cancel{\text{read } t} \rangle}^{\text{elided VP}}}_{\text{antecedent VP}}$.

If the DP *every book that Sakshi did* were interpreted in its base position in (456), there would be no suitable antecedent to license ellipsis. The antecedent VP would both not be parallel to the elided VP and run into the problem of infinite regress. The standard approach to this problem is for the DP hosting the ellipsis site (henceforth the SOURCE DP) to evacuate the VP. I will assume the analysis of ACD in Fox (2002): the source DP evacuates to a VP-external position via QR (457a), after which the relative clause containing the ellipsis site is late-merged onto the source DP (457b).

(457) *ACD derivation*

a. *Step 1: Move DP out of the VP*
$[\text{ Subj } [_{\text{VP}} \text{ V } \mathbf{DP}_1 \text{] } \mathbf{DP}_1 \text{]}$
QR

b. *Step 2: Late-merge relative clause*
$[\text{ Subj } \underbrace{[_{\text{VP}} \text{ V } \mathbf{DP}_1 \text{]}}_{\text{antecedent VP}} [_{\text{DP}} \text{ NP } [_{\text{RC}} \ldots \langle \cancel{\text{V DP}} \rangle \text{]]}_1 \text{]}$
Late Merge

The result of the source DP evacuating the VP is a suitable antecedent for ellipsis. This movement is covert and therefore typically assumed to be QR. Evidence in favor of this view comes from the observation by Sag (1976) and Larson and May (1990) that the source DP obligatorily takes scope above the VP; this evidence was also discussed in section 3.2.4 of chapter 3. Consider the paradigm in (458). In the baseline sentence in (458a), *every painting that Sakshi painted* can scope above or below the intensional verb *want*. On the narrow-scope reading, Katia is an admirer of Sakshi's and has the *de dicto* desire to own any painting that Sakshi has painted. On the wide-scope reading, Katia wants a certain set of paintings, which happen to all be painted by Sakshi, possibly unbeknownst to Katia. The equivalent narrow-scope reading disappears in the ACD example in (458b). Only a wide-scope reading survives, where Katia wants a certain set of paintings, all of which Sakshi also wants. In the absence of ellipsis, the narrow-scope reading reappears. Thus, (458c) has a reading where Katia has the *de dicto* desire to have any painting that Sakshi also wants.

(458) *ACD forces scope shifting* (=240)

a. *Baseline*
Katia wanted every painting that Sakshi painted. ✓want ≫ every; ✓every ≫ want

b. *ACD*
Katia wanted every painting that Sakshi did Δ. *want ≫ every; ✓every ≫ want

c. *No VPE*
Katia wanted every painting that Sakshi wanted. ✓want ≫ every; ✓every ≫ want

This scope pattern follows if the movement of the source DP to a VP-external position leaves a trace of type *e*, or, in other words, if the movement is QR.

ACD is the poster child of QR. Unlike other duties ascribed to QR, such as allowing quantifiers to take scope covertly, it is very difficult to satisfy the parallelism requirements of ellipsis and avoid the infinite-regress problem without some QR-like movement of the source DP out of the antecedent VP (though see Cormack 1984; Jacobson 1992). Turning to Π-positions, the problem is that DPs in Π-positions can host an ellipsis site in an ACD configuration. This is illustrated in (459) for change-of-color verbs (459a), naming verbs (459b), and predicate nominals (459c).[18]

(459) *ACD with Π-positions*

a. Megan painted the house **the (same) color** that Jyoti did Δ.

b. Irene called the cat **the (same) nickname** that Helen did Δ.

c. Erika became **the (same) kind of teacher** that Gloria did Δ.

The availability of ACD with Π-positions is at odds with (i) the extensive arguments from chapter 2 that QR cannot target Π-positions and (ii) what we know about ACD involving QR. While I do not have a solution to this problem, I can make an interesting observation about ACD in Π-positions that suggests that something more complicated is happening. The observation concerns the scope

[18] It is unclear what ACD with an existential construction would look like. The sentence in (i) is my best attempt to construct an example, which is ungrammatical.

(i) *There should be those kinds of books on the table that there should ⟨~~be those kinds of books~~⟩ in the cabinet.

of the object (e.g. *the house* in (459a)) when the source DP is a Π-position: the object must scope above the VP along with the Π-position. This suggests an analysis where what moves is something properly containing the Π-position and the object. A candidate is the small clause containing them, so I will refer to this as the SMALL-CLAUSE ANALYSIS. However, I leave working out the details to future research. Similar analyses have been pursued by Wold (1995) for ACD with comparatives (also Bhatt and Pancheva 2007) and by Landman (2006) for ACD with *such-as* relatives.

Judging the scope of two DPs with respect to an intensional verb in an ACD configuration is challenging. To alleviate this difficulty and make the judgements sharper, I make use of NPI licensing, which has a scope-trapping effect with ACD resolution.[19] The diagnostic works as follows: (i) For the NPI to be licensed at LF, the source DP cannot move out of the scope of the licensor. (ii) When the source DP is embedded inside a nonfinite clause, either the embedded or matrix VP can in principle serve as the antecedent provided that the source DP evacuates it. (iii) Embedding the NPI licensor forces the ACD to resolve to the embedded VP. Consider the sentences in (460), where the source DP—a Π-position—is headed by the NPI *any*, whose licensor is in the matrix clause. As expected, the ellipsis in (460) can resolve either to the embedded VP ('low resolution') or the matrix VP ('high resolution') because the negation is above both of them. Tense matching can be used to bias towards one of the resolutions: present tense in the relative clause biases towards low resolution (460a) and past tense biases towards high resolution (460b). I will mark tense mismatches as being ungrammatical to streamline the paradigms.

(460) *High negation*

a. *Tense bias: Low*
John did**n't** want to <u>paint</u> the house **any** shade of red that Mary <u>does</u> Δ.
✓Δ = paint the house
* Δ = want to paint the house (*tense mismatch*)

b. *Tense bias: High*
John <u>did</u>**n't** want to paint the house **any** shade of red that Mary <u>did</u> Δ.
* Δ = paint the house (*tense mismatch*)
✓Δ = want to paint the house

[19] Many thanks to Kyle Johnson (p.c.) for drawing my attention to this diagnostic.

Moving the negation from the matrix clause to the embedded clause constrains the range of positions to which the source DP can move and still have the NPI licensed. Thus, in (461), the ACD is forced to resolve to the embedded VP so that the NPI remains in the scope of negation.

(461) *Low negation*

a. *Tense bias: Low*
John wanted to **not** paint the house **any** shade of red that Mary does Δ.
✓Δ = paint the house
* Δ = want to not paint the house

b. *Tense bias: High*
*John wanted to **not** paint the house **any** shade of red that Mary did Δ.
* Δ = paint the house (*tense mismatch*)
* Δ = want to not paint the house

(460) and (461) show that the diagnostic works as intended for ACD with Π-positions. However, they do not discern between the small-clause analysis and the analysis where QR targets the Π-position because the NPI is located in the Π-position. Both analyses thus predict that the NPI licensor being in the embedded clause blocks the high resolution of the ACD.

The surprising observation arises when the NPI is not in the Π-position, but the object. The small-clause analysis predicts that because the scope of the object and the Π-position covary, the NPI should continue to constrain ACD resolution as it does in (461). The alternative analysis where QR targets the Π-position, on the other hand, predicts that an NPI in the object should have no effect on ACD resolution. Let us start with the baseline in (462), where the negation is located in the higher clause. As both analyses predict, low and high ellipsis resolutions are possible in (462), modulo tense matching.

(462) *High negation*

a. *Tense bias: Low*
John did**n't** want to paint [**any** houses] [the shade of red that Mary does Δ].
✓Δ = paint some houses
* Δ = want to paint some houses (*tense mismatch*)

b. *Tense bias: High*
John did**n't** want to paint [**any** houses] [the shade of red that Mary did Δ].
* Δ = paint some houses (*tense mismatch*)
✓Δ = want to paint some houses

Against this backdrop, the target sentence is given in (463), where the negation has been moved to the embedded clause. Crucially, only the low resolution is possible in (463); the ellipsis in the relative clause cannot resolve to the matrix VP. This is what the small-clause analysis predicts.

(463) *Low negation*

a. *Tense bias: Low*
John wanted to **not** paint [**any** houses] [the shade of red that Mary does Δ].
✓Δ = paint some houses
* Δ = want to not paint any houses

b. *Tense bias: High*
*John wanted to **not** paint [**any** houses] [the shade of red that Mary did Δ].
* Δ = paint some houses (*tense mismatch*)
* Δ = want to not paint any houses

The high resolution of ACD being blocked in (463) is unexpected under an analysis where the Π-position QRs to resolve ACD. However, it follows directly from the small-clause analysis: in order to achieve the high resolution, the entire small clause would have to move to a position above the matrix VP, which would place the NPI in the object outside the scope of its licensor in the embedded clause. I take this result as compelling evidence in favor of the small-clause analysis.[20]

(464) and (465) show that the same ACD-resolution pattern found for change-of-color verbs extends to naming verbs and predicate nominals respectively. For predicate nominals, I have used *make X into Y*. The small-clause analysis applies to verbs like *become*—the small clause contains the subject and the predicate nominal—but these cases cannot be tested along the same lines as change-of-color verbs.

[20] A question that I have not explored is whether small-clause movement would allow Π-positions to covertly take scope, in contradiction with the arguments in section 2.2 of chapter 2. A relevant judgement is whether (i.a) has the *de dicto* desire reading that (i.b) does. My judgements are not so clear, and neither are anyone's who I have asked.

(i) a. John wanted to paint the house every color that Mary did Δ.

b. John wanted to paint the house every color that Mary wanted to paint the house.

(464) *Naming verbs*

a. *Negation: high; Tense bias: high*
John did**n't** want to call [**any** cats] [the nicknames that Mary did Δ].
* Δ = call some cats (*tense mismatch*)
✓Δ = want to call some cats

b. *Negation: low; Tense bias: high*
*John wanted to **not** call [**any** cats] [the nicknames that Mary did Δ].
* Δ = call some cats (*tense mismatch*)
* Δ = want to not call any cats

c. *Negation: low; Tense bias: low*
John wanted to **not** call [**any** cats] [the nicknames that Mary does Δ].
✓Δ = call some cats
* Δ = want to not call any cats

(465) *Predicate nominals*

a. *Negation: high; Tense bias: high*
John did**n't** want to make the same kind of teacher out of [**any** students] [that Mary did Δ].
* Δ = make out of some students (*tense mismatch*)
✓Δ = want to make out of some students

b. *Negation: low; Tense bias: high*
*John wanted to **not** make the same kind of teacher out of [**any** student] [that Mary did Δ].
* Δ = make out of some students (*tense mismatch*)
* Δ = want to not make out of any students

c. *Negation: low; Tense bias: low*
John wanted to **not** make the same kind of teacher out of [**any** students] [that Mary does Δ].
✓Δ = make out of some students
* Δ = want to not make out of any students

This scope pattern of the object when the source DP is a Π-position does not follow from the simple QR analysis. Rather, it suggests a more complicated analysis where what moves to resolve the ellipsis is a larger constituent that properly contains the Π-position and the object, e.g. the small clause. I leave pursuing this question and this analysis to future research.

5.4.4 A-movement

A topic that has been left unmentioned in this dissertation is A-movement. First, the DP/QP-movement system of chapter 3 inherits from Johnson (2012, 2014) the problem of not having an analysis of A-movement. Thus, A-movement is an open problem for the DP/QP-movement system; see Johnson (2014) for some discussion.

Second, can A-movement target Π-positions? Since A-movement can reconstruct, the prediction is that it should be able to target Π-positions. However, this prediction cannot be tested in English because there are no A-movement types that could even in principle target them. On one hand, A-raising verbs like *seem* and *appear* only target the subject, or in the case of existential constructions, the expletive *there*. On the other hand, passivisation always targets the object (466a). Because English passives are asymmetric, no conclusions about Π-positions can be drawn from the ungrammaticality of (466b).

(466) *Passivisation and Π-positions*

a. [The house]$_1$ was painted ___$_1$ **magenta**.

b. ***Magenta**$_1$ was painted the house ___$_1$.

These limitations stem from A-movement in English being fairly limited in that it cannot skip over intervening arguments. Testing the prediction about Π-positions and A-movement would require something akin to A-scrambling, which English does not have.

5.4.5 Reconstruction and Π-positions crosslinguistically

The proposals in this dissertation have been motivated primarily based on English. The existing reconstruction literature is larger focused on English as well. It is an open question whether the proposals in this dissertation withstand crosslinguistic scrutiny.

As far as I know, no one has observed anything similar to the Π-position asymmetry in another language, and my cursory look at a few languages turned up nothing.[21] It may be that English is special in this regard, but not enough crosslinguistic work has been done yet to draw this

[21] Many thanks to Rodica Ivan, Stefan Keine, and Ekaterina Vostrikova for discussing Romanian, German, and Russian respectively with me at various points.

conclusion. From the perspective of Postal (1994) and Stanton (2016), one might think to look for environments that are incompatible with pronouns and then work backwards to check for a movement asymmetry. Such an approach would work insofar as pronouns and movement types behave in the given language identically to their English counterparts. I suspect that this is very rarely the case. Chapter 2 showed that it is a constellation of independent properties about English that give rise to the Π-position asymmetry: (i) having positions where DPs must denote properties, (ii) having movement types for which reconstruction is optional or prohibited, and (iii) having pronouns that cannot denote properties. Properties (i) and (ii) are necessary and sufficient to have the Π-position asymmetry, whereas the absence of (iii) would only change the empirical signature. Regarding (i), the promising candidates for property-denoting positions crosslinguistically are predicate nominals and resultatives. Regarding (ii), the promising candidates for nonreconstructing movement types are *wh*-movement, which presumably can but does not have to reconstruct, and appositive RCs. The analogues of other English movement types are likely to reconstruct, e.g. movement types called "topicalization", or have different underlying structures, e.g. *tough*-constructions. As for antipronominality, there are many reasons why an environment could reject a pronoun, e.g. prosody. I would therefore caution against drawing any conclusions in a given language based on antipronominality alone. The Π-position asymmetry is fundamentally a movement asymmetry, and thus (i) and (ii) are the cornerstones.

Moreover, regarding generalized-quantifier traces, Lechner (1998) argues based on German that they must exist alongside syntactic reconstruction, which is at odds with the English facts (see section 3.2 of chapter 3). Therefore, in addition to Π-positions, the existence of generalized-quantifier traces needs tested in other languages as well.

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