The Final Form (FF) and π/λ-movement: A unification of PF and LF
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This paper proposes that PF and LF should be combined into a single Final Form (FF). This proposal also introduces a new understanding of movement, in which phonological π- and semantic λ-features of lexical items move separately. This system is more economical than the approach outlined in Hornstein, Nunes, and Grohmann (2005). It simplifies the Extension Condition, so that it applies to both overt and covert movement, and it more fully satisfies the Uniformity Condition. In addition, it provides a more complete explanation of the Preference Principle. Other benefits of the FF and π/λ-movement approach are outlined.

1 Introduction
A major feature of the Minimalist Program (MP), unsurprisingly, is that it seeks to be minimalist. There are two guiding economy principles that drive the MP (and other theoretical research): methodological economy, which states that a simpler and more elegant theory is better; and substantive economy, which stipulates that the derivation requiring the least effort is preferred (Hornstein, Nunes, & Grohmann 2005:8). These principles led to the elimination various elements of the GB system, such as DS, and SS, resulting in the MP architecture in which a derivation begins at Numeration and ends in two distinct forms, the PF and the LF (Hornstein, et al. 2005:72).¹

The minimalist architecture presented in Hornstein, et al. (2005) (hereafter referred to as “the standard theory”) states that a syntactic object is created by merging two objects at a time either externally (by introducing a new lexical item) or internally (by copying and moving a constituent from the existing tree) until the Numeration is exhausted and all features have been checked. At some point in the derivation, Spell-out occurs and the phonological form (PF) of the utterance is formed. After Spell-out, movement can continue, resulting in the logical form (LF). This split in the derivation via Spell-out is required in order to account for both overt and covert movement.

Overt movement (such as movement of the subject to Spec-TP in English) is motivated by strong features, and occurs before Spell-out. Covert movement (e.g. object movement to Spec-vP in English) results from weak feature checking after Spell-out. To ensure the proper timing of movements, the theory states that the PF cannot contain any unchecked strong features (but can have unchecked weak features), and that movement should happen as late in the derivation as possible (Procrastinate). This ensures that overt movement will happen before Spell-out, as it occurs as a result of strong features. Procrastinate

¹ This paper takes for granted the material up to and including Chapter 8 of Hornstein et al. (2005). I developed the ideas in this proposal based on class discussions, which were based on the textbook. Hornstein et al. cite many primary sources, including Chomsky (1993; 1995). When I wrote this paper, I was aware that there were other theories that derived PF from LF, but I did not know the particulars of these theories. We had not yet addressed topics such as Move-F, Agree, or multiple Spell-out, which are contained in Chapters 9 and 10 of Hornstein et al.
favors movement that happens after Spell-out, which results in all weak features being checked through covert movement.

This paper will address two main weaknesses of the standard theory: (i) conditions on the derivation that the standard theory stipulates are not always compatible with each other, and (ii) the standard theory is unable to explain why the Preference Principle should hold. This paper presents possible solutions to (i) and (ii) through a simplification of the architecture, eliminating the split in the derivation, and a new theory of movement. In this theory of movement, phonological π-features and semantic λ-features of lexical items move separately, based on properties of the formal features to which they are attached. This paper will first describe the new architecture. Second, it will discuss the weakness described in (i) and illustrate how movement of π-features (π-movement) provides a solution. Third, it compares the standard theory’s approach to the problem in (ii) with that of λ-feature movement in the new theory. Although the new approach to movement introduces a slight complication to the theory, I will conclude that the FF approach and π/λ-movement are more economical (both in terms of methodological and substantive economy) than the standard theory and that they give a more complete explanation of overt and covert movement as well as the Preference Principle.

2 A new architecture

In the standard theory, the derivational architecture splits at Spell-out, resulting in two separate forms, the PF and the LF. This paper proposes that it is possible, and even desirable, to eliminate the derivational divergence and combine the LF and the PF into a single syntactic object: the Final Form (FF).

(1) Derivational architecture

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Lexicon
  ↓
Numeration
  ↓
ChL
  ↓
FF
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As in the standard theory, this architecture merges two lexical items at a time in order to build a syntactic tree. External Merge combines an item from the Numeration with the existing tree. In contrast to the standard theory, internal Merge does not move a complete copy of a lexical item already in the tree, but involves movement of only certain features of the item. This movement is still motivated by the need to check formal features, and it is these features that move. Based on the properties of the formal features, phonological π- or semantic λ-features may move as well. This will be illustrated in the sections below, with π-movement in section 3, and λ-movement in section 4.
3 Overt versus covert movement

3.1 Limitations of standard theory

One of the weaknesses of the standard theory is that the conditions on the derivation it stipulates are not always compatible with each other; they are violated in order to achieve the distinction between overt and covert movement. For example, the Extension Condition states that overt applications of the operations Merge and Move can only target root syntactic objects (Hornstein et al. 2005: 123). This violates the Uniformity Condition, which states that the operations available in the covert component must be the same as those in the overt syntax (p. 74). Overt movement always targets root syntactic objects, but in covert movement, the item being moved must be inserted into an existing tree. This is illustrated in (2) and (3), shown in the order in which the movements would occur in a derivation. In (2), the subject you moves overtly to Spec-TP in order to check a strong \[EPP\] or \[Case\] feature, and merges with the root TP node. The derivation in (3) shows covert movement of the object to Spec-\(v\)P after Spell-out, in order to check a weak \[Case\] feature on the object DP and on the \(v\) head. Since it cannot merge with a root node, it is inserted into tree and creates a new \(v\) node in the spine. In both examples, (a) and (b) show the syntactic object before and after movement, respectively.

(2) Overt movement of subject

(a) \([T\[T\[you\]\[\[\[\text{read}\]\[\[D\text{ books}]]]]]]\)

(b) \([\[T\[you\]\[\[\[\text{read}\]\[\[D\text{ books}]]]]]]\)

(3) Covert movement of object (after Spell-out)

(a) \([C\[C\[you\]\[\[T\[\[\[\text{read}\]\[\[D\text{ books}]]]]]]]]\)

(b) \([C\[C\[you\]\[\[T\[\[\[\text{read}\]\[\[D\text{ books}]]]]]]]]\)

The Uniformity Condition also implies that lexical items can be externally merged after Spell-out. But the derivation will only converge if it does so using all the same items at both PF and LF (Hornstein et al. 2005:73). In practice, then, lexical items cannot be externally merged after Spell-out, and the Uniformity Condition again is not satisfied.

3.2 The new approach: movement of \(\pi\)-features

The architecture in (3) is not able to make the distinction between overt and covert movement if the standard theory of Copy and Merge is accepted. It requires a new take on movement. In this new view,

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2 Head adjunction is different from Merge and never satisfies the Extension Condition. A detailed discussion of this is outside the scope of this paper.
phonological $\pi$-features and semantic $\lambda$-features of lexical items are separate from formal features. This section will focus on $\pi$-features, and we will return to a discussion of $\lambda$-features in section 3.3 below.

In overt movement, $\pi$-features move when a strong formal feature needs to be checked. At FF, there must be phonological content in a checking relationship with every strong feature. For example, the [Wh] feature is strong on the C head in English, and moves the $\pi$-features of the highest WhP. The other WhPs all still move before FF in order to check their own weak [Wh] features, but they leave their $\pi$-features behind; there are already $\pi$-features in a checking relationship with the strong feature on the C head from the first WhP. In Bulgarian, on the other hand, the [Wh] feature is strong on the WhP. Therefore, when any WhP moves, it brings its $\pi$-features with it. Thus, all WhPs are pronounced in the Spec-CP position.

Copying features is less economical than movement of features, and is therefore only done when required. For example, in languages where multiple copies of the WhP are pronounced, such as Afrikaans, there is a strong [Wh] feature not only on the highest C head, but on the C head of each embedded clause as well. Since strong features require phonological content, the $\pi$-features of the WhP are copied as the WhP moves to each Spec-CP, and each copy is pronounced.

In covert movement, the $\pi$-features are left behind, because weak features only have the strength to move formal features. If no strong features are present, $\pi$-features remain in their merge position, which is where the lexical item will be pronounced. Other aspects of overt and covert movement are identical. Both overt and covert movement can happen at any point in the derivation, as needed. Both forms of movement target root syntactic objects, as seen in (4) and (5). These examples present the new theory’s approach to examples (2) and (3). Again, (4) and (5) are in the order in which movement would occur. In (4), the $\pi$-features stay in their original position because of weak [Case] features, resulting in covert movement of the object. In (5), strong features motivate overt movement of the subject, and the $\pi$-features are moved with it. For clarity, elements with $\pi$-features are in bold.³

(4) Covert movement of object

(a) $[[v, [v, [\text{read}+v]]] \text{[read]} [D [D \text{books}]]]]$

(b) $[[D [D \text{books}]] [v, [v, [\text{read}+v]]] \text{[read]} [D [D \text{books}]]]]$

(5) Overt movement of subject

(a) $[[T [T] [v, [\text{you}]] [v, [D \text{books}]] [v, [v, [\text{read}+v]]] \text{[read]} [D [D \text{books}]]]]]]$

(b) $[[T [\text{you}] [T [T] [v, [\text{you}]] [v, [D \text{books}]] [v, [v, [\text{read}+v]]] \text{[read]} [D [D \text{books}]]]]]]]]$

³ In (4) and (5), the object appears in a Spec-vP position that is lower than the theta position of the subject. I am assuming that features must be checked as soon as possible. The object moves as soon as the [Case] checking element is available. The subject merges with the root object, and so appears in a higher position.
Once all the items in the numeration are exhausted and all formal features have been checked, the derivation is complete. The A-I component interprets all and only the \(\pi\)-features in the FF (similarly, the C-I component interprets all the \(\lambda\)-features of an FF object—see section 4). This approach allows the Extension Condition and the Uniformity Condition both to be satisfied, as overt and covert movement are both available at any time in the derivation, and they both target root syntactic objects.

4 Evidence for \(\lambda\)-features: Binding and the Preference Principle

4.1 Movement of \(\lambda\)-features

Section 3 proposed \(\pi\)-features in order to account for the distinction between overt and covert movement. Once we posit that the A-P component only interprets \(\pi\)-features, the question arises as to what the C-I component interprets. One natural answer is that in addition to phonological \(\pi\)-features, each lexical item also has semantic \(\lambda\)-features. Again, copying and remerging features is more costly than simply moving them, and moving features is more costly than leaving them in place. Therefore, \(\lambda\)-features, similar to \(\pi\)-features, remain in their original merge position unless some formal feature motivates their movement, and copies are made only when absolutely necessary. It is unclear what would motivate \(\lambda\)-movement. It may be the case that formal features may be \(\lambda\)-strong or \(\lambda\)-weak. A feature that is (\(\pi\)-)weak but \(\lambda\)-strong would move \(\lambda\)-features but leave \(\pi\)-features behind. Alternatively, some formal features such as [Wh] or [Scope] may always motivate movement of \(\lambda\)-features, and strength is irrelevant. In this case, \(\lambda\)-features would only move when the relevant formal feature is present. It is as of yet unclear which alternative is more likely. For simplicity, I will assume the second alternative: some formal features always move \(\lambda\)-features, regardless of the formal feature’s strength. That \(\pi\)- and \(\lambda\)-features are indeed separate entities can be seen in an examination of Binding.

4.2 The standard theory’s approach to a binding puzzle

Take, for example, an ambiguous sentence such as (6a). The anaphor himself can be co-indexed with either John or Fred, giving the LF forms in (6b-c) in the standard theory (taken from Hornstein et al. 2005).

(6)  (a) John, wondered which picture of himself, Fred liked. (p. 250, ex. 8a)

(b) \([TP John, wondered [CP [which picture of himself,] [TP Fred liked [which picture of himself,]]]\\)

(c) \([TP John wondered [CP [which picture of himself,] [TP Fred liked [which picture of himself,]]]\\)

According to Principle A, the anaphor in (6) must be bound by its antecedent within its binding domain. To account for this, the standard theory requires the anaphor phrase to be reconstructed in (6c), so that it is bound at LF; there is no reconstruction in (6b), because the anaphor is bound by the antecedent John in
the higher clause. Thus, for anaphora, reconstruction is optional. In contrast, reconstruction is forced when similar sentences contain pronouns instead of anaphors.

(7) John, wondered which picture of him Fred liked. (p. 252, ex. 11)

The standard theory attempts to explain this with the Preference Principle, which states that restrictions should be limited in operator position, meaning that only the Wh word should remain in the higher position as a matter of economy. This principle holds for pronouns and r-expressions, but seems to be irrelevant for anaphora. To account for this, the standard theory requires anaphora to move covertly to a position where they can be licensed by their antecedents. When the anaphor is co-indexed with the subject of the higher clause, as in (6b), satisfying the Preference Principle would result in a broken chain and a violation of the Theta-Criterion and Full Interpretation. The derivation would therefore not converge and could not be compared with other derivations for economy purposes. Therefore, the less economical option of interpreting the anaphor in the higher position is chosen.

The Preference Principle can thus describe the difference between the reconstruction of anaphora and pronouns/r-expressions. But it is still unclear why this principle should hold in the first place (Hornstein et al. 2005: 265-268). Why it would be more economical to interpret the copy in the Merge position instead of the copy in Spec-CP is a mystery. Therefore, the standard theory can account for the differences in interpretation of anaphors and pronouns/r-expressions, but it cannot explain why the mechanisms behind their explanation are present.

4.3 The λ-feature explanation

In π/λ-movement, this difference is natural. Suppose anaphors have the feature [anaphor], which is only checked when locally bound by a co-indexed antecedent. The λ-features will only move to check this feature. If it is already checked in the lower position, the λ-features will remain there. This explains why both interpretations of (6) are possible. In contrast, pronouns and r-expressions do not have an [anaphor] feature that would motivate movement of their λ-features. They will therefore always be interpreted in the lower position. In these instances, the λ-features of the Wh-word move with the [Wh] feature, while the λ-features of the rest of the phrase stay behind. In contrast, the π-features of the entire Wh-phrase move because of the strength of the [Wh] feature. No reconstruction or deletion is required.

These examples provide empirical evidence in favor of the FF and π/λ-movement. They offer a more complete explanation of the difference between available interpretations of anaphora and pronouns in complex constructions than the standard theory posits. The Preference Principle can be explained by

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4 This approach requires co-indexation to be present in the Numeration.
the fact that movement of \( \lambda \)-features is less economical than leaving them in their original position. These examples also give evidence that \( \lambda \)-features exist and are separate from \( \pi \)-features.

5 Benefits of the new architecture and \( \pi/\lambda \)-movement

The new approach presented in sections 2, 3.2 and 4.3 provides improvements on the standard theory’s limitations listed in section 1. Movement of \( \pi \)-features allows us to simplify the Extension condition and apply it to all operations of Merge and Move.\(^5\) Overt and covert movement both target root syntactic objects, and there is no need for the insertion in (3). The Extension condition now satisfies the Uniformity condition, whereas they were incompatible in the standard theory. In addition, movement of \( \lambda \)-features gives a complete explanation of why the Preference Principle holds.

The new system also provides other benefits and simplifications to the theory. In the standard theory, the PF required strong features to be checked, but allowed weak features to remain unchecked. The LF did not allow any unchecked features, strong or weak. In the new system, there is no distinction. The only requirement is to check all features by the unified FF.

The FF model also removes certain aspects of the derivational process, resulting in greater methodological economy. Spell-out is eliminated, as there is no longer a split in the derivation. Procrastinate is unnecessary because movement happens at any point in the derivation, as the features require, and the system relies on substantive economy to create a preference for covert movement. Since overt movement requires the \( \pi \)-features to be moved with the formal feature being checked, covert movement is favored; less is moved, so less effort is required. Along these lines, the Preference Principle may also be irrelevant. Substantive economy states that it takes extra effort to move \( \lambda \)-features, so they will remain and be interpreted in their Merge position unless a formal feature requires them to move.

In addition, the standard theory states that copies not interpreted at the PF and LF interfaces are deleted. With \( \pi/\lambda \)-movement, copies are only created when required by the formal features, as when there are multiple strong [Wh] features in Afrikaans. These copies are all interpreted. There are no extraneous copies, so deletion is not required.

6 \( \pi/\lambda \)-movement or Copy+Merge

It is possible to see \( \pi/\lambda \)-movement as a complication to the theory. In the standard theory, lexical items are single units with features attached. When movement occurs, it applies to the entire item. Indeed, movement is really not movement at all. Instead, lexical items are copied and remerged. But in \( \pi/\lambda \)-movement, lexical items are composed of several different elements: \( \pi \)-features, \( \lambda \)-features, and formal

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\(^5\) Head adjunction is still an exception.
features. Movement of either π- or λ-features must be motivated by the independent movement of formal features. This adds a possibly less economical option in comparison to the standard theory.

The Copy theory of movement is not ideal in the FF approach. If π-features were copied each time they moved, the A-P component would be required to look for and pronounce all π-features paired with strong features. If no strong features were found, the π-features would be pronounced in their Merge position as a last resort. While this may be compatible with the FF approach, it puts an extra burden on the A-P component. It would be required to not only search for features, but it would have to remember what lexical items it had seen to know if the Merge position needed to be pronounced. It would also have to know where the Merge position was. However, if π-features can be moved without copying, the A-P component simply has to look for and pronounce all π-features, regardless of where they are found. The same is true for λ-features and the C-I component.

The FF approach may indeed be compatible with the standard Copy theory of movement, without stipulating separate π- and λ-features. However, this would still leave the A-P component the task of looking for strong features, and the C-I component would again need to resort to reconstruction or deletion. This would also leave us without an explanation for the Preference Principle. Therefore, although π- and λ-features may add a less economical component to movement, these slight complications may be desirable, especially when considering the benefits in section 5.

7 Conclusion

The FF and π/λ-movement approach has much potential as a syntactic model. Already, it is more economical than the standard theory, in terms of both substantive and methodological economy. It is able to capture the difference between overt and covert movement while satisfying the Uniformity condition and the Extension condition. It also provides an explanation of why the Preference Principle holds. However, it will take much more detailed research to determine if this model is able to account for the wide variety of phenomena that have been addressed using the standard theory.

8 References

