

The relation between syntax and phonetics is indirect: The case of contrastive focus prosody

Part One: Introduction

(1) Contrastive focus involves:

- (a) the introduction of set of alternative expressions which differ in the specification of one (or more) constituent(s) of the expression—call it/them the focus constituent(s) (cf. Rooth 1992, 1996a):

{ Mary spent five [guilders], Mary spent five [marks], Mary spent five [lira],
Mary spent five [francs], }

- (b) the selection/foregrounding of one alternative, namely of one instantiation of the focus component(s), e.g.

Mary spent five [francs]_{FOCUS}

(2) Various uses of contrastive focus

- In a correction

(You gave him five guilders)

=> No, I gave him five [francs]_{FOCUS}

- In association with a focus-sensitive particle

(John David was pretty reliable, and that guy Gus did a lot of good work.)

=> But we *only* hired [Manny]_{FOCUS} to work on the annex.

- In a pairing of alternatives

(These European currencies are still pretty confusing.)

=> Yeah, I tried to put five [euros]_{FOCUS} into the Heathrow railway ticket machine

(but it only took [pounds]_{FOCUS})

(3) “Informational focus” is not a type of contrastive focus:

- An “informational focus” constituent is simply a constituent that is *discourse-new*, i.e. *not given* in the discussion (cf. Schwarzschild 1999).
- It does not involve alternatives.
- [A “broad focus” sentence is all-new, consisting entirely of constituents that are discourse-new.]

(I always feel at a loss when I arrive at a foreign airport.)

=> But last week I managed to put five euros into the Roissy railway ticket machine

(and the right ticket came out)

(4) *Contrastive focus is a property that must be given syntactic representation* on the grounds that, depending on the language:

- It may affect syntactic movement (Kiss 1998 and many others)
- It may be expressed with—spelled out with-- segmental or tonal morphemes.

“Informational focus” shows no such special properties; it represents the default case.

(5) So we will assume, with Rooth 1992, 1996a, that syntactic Focus-marking, or F-marking, is reserved for contrastive focus [contra Selkirk 1984, 1995 and others...]

Contrastive focus:

Yeah, I tried to put five [*euros*]_F into the Heathrow railway ticket machine

“Informational focus”:

=> But last week I managed to put five [*euros*] into the Roissy railway ticket machine.

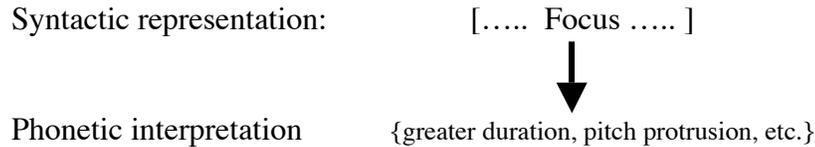
(6) Because of the representation of contrastive focus in the syntax, we might expect that interface principles in a grammar could associate contrastive focus with distinctive phonological or phonetic properties. And it seems that this is so.

For example, in many languages, but not all, *the property of contrastive focus is reported to be reflected in the phonetic interpretation of the focused constituent, e.g.,*

- greater protrusion of the pitch of a focused item,
- greater compression of pitch following a focused item,
- greater duration of the focused item
- more extreme realizations of vowel and consonant segments within a focus item.

The topic for today: how the theory of grammar defines the nature of the relation between the syntactic representation of contrastive focus and its phonetic interpretation.

(7) Is the syntactic property of contrastive focus (represented as a featural F-marking) directly realized, or spelled out, in terms of such phonetic properties?



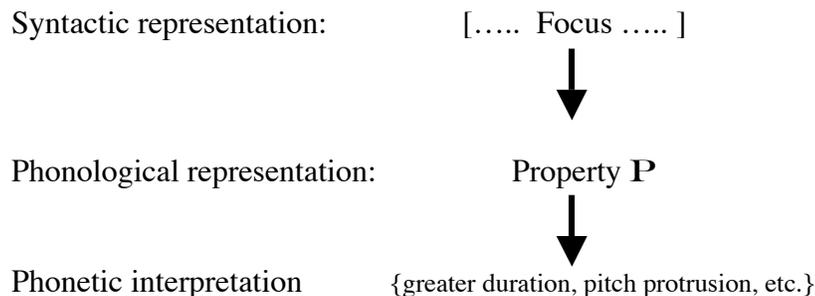
Recent proposals imply, or explicitly advocate, a direct relation in the grammar between contrastive focus and its phonetic expression, most notably between contrastive focus and pitch protrusion and compression (e.g. Xu, Xu and Sun 2004, Wang and Xu 2006 on Mandarin Chinese, Xu and Xu 2005 on English, Ishihara 2005 on Japanese).

(8) Criticism of proposals for a direct focus-phonetics relation in grammar

- They only restate the attested correlation between contrastive focus and specific phonetic properties.
- They do not characterize the full set, and *system*, of the prosody-related properties of contrastive focus, both phonological and phonetic

(9) Alternative: An *indirect theory* of the relation between syntactic Focus-marking and phonetics:

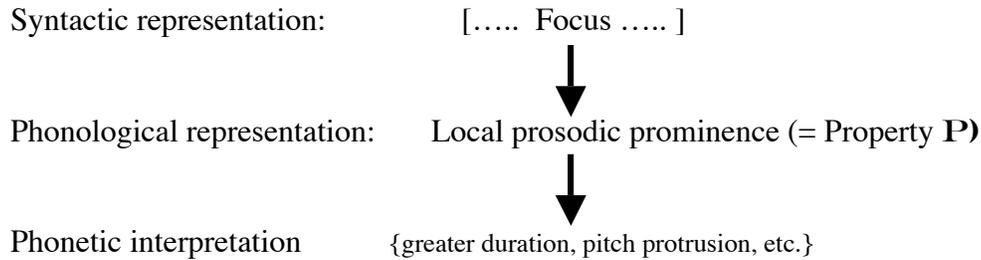
- (i) Focus-marking in syntactic representation is spelled out as some property **P** of the phonological representation.
- (ii) Property **P** is in turn assigned phonetic interpretation, giving rise to the phonetic properties that correlate with Focus



(10) Stress-based version of the indirect theory to be defended here:

If, in a particular language, contrastive focus is systematically reflected in phonetic interpretation, that focus-phonetics relation is mediated by the phonological representation of **local prosodic prominence (“stress”)** that is

assigned to a contrastive focus constituent by the grammar of that language
(Truckenbrodt 1995, Ladd 1996, Rooth 1996b).



(11) “**Contrastive Focus Prominence Rule**” (CFPR)

Version 1: Ladd 1996

A focus [F-marked] constituent occupies a metrically strong position.

[Assumes s/w-labelled metrical tree representation for stress]

Version 2: Truckenbrodt 1995, Rooth 1996b

An F-marked constituent is metrically/prosodically prominent within the focus domain.

[No particular theory of prosodic prominence representation assumed.]

NB: Construed as part of morphosyntactic Spell-Out (Chomsky 2000, 2005), the CFPR is not a universal, but a language-particular morphological *choice* for the spelling out of syntactic F-marking (cf. Selkirk 2008), a sort of prosodic morphology, if you will.

(12) Parallel to *prosodic constituent structure hypothesis* (Selkirk 1978, 1986, Nespor & Vogel 1982, 1986):

The apparent effect of syntactic constituent structure on phonological or phonetic phenomena is *indirect*, traceable to:

- (a) the effects of syntactic constituent structure on prosodic constituent structure in phonological representation
- (b) the sensitivity of phonological and phonetic phenomena to this prosodic constituent structure.

(See Kratzer & Selkirk 2007 for current proposal on syntax-prosodic constituency interface.)

Part Two: Predictions of this focus=prosodic prominence theory concerning phonological representation:

=> There should be qualitative, phonological, properties of contrastive focus which derive from the Contrastive Focus Prominence Rule (CFPR).

(13) Necessary effects on *stress prominence itself*, imposed by the CFPR:

- (i) *Presence of stress prominence.* **Some** level of stress will always be found on contrastive focus, in order to guarantee it has greater prominence than any surrounding material.
- (ii) *Patterns of stress prominence.* According to the CFPR, the **precise level of phrasal stress** borne by contrastive focus is syntagmatically determined, a function of the level of stress on the other constituents within the relevant local domain. For example, a focus will bear IP level stress if there is a MaP-level stress in the local domain.

(14) Possible effects of stress prominence on *other aspects of the phonological representation*, a consequence of language-particular ranking of universal constraints relating stress to other aspect of phonological representation:

- (iii) *Phonological phrasing:* Because phonological constraints on prosodic structure representation call for the *alignment of prosodic stress prominence and the corresponding prosodic constituent edge*, it is predicted that there should be a tendency for a prosodic phrase edge to appear at the edge of a contrastive focus (Truckenbrodt 1995, Selkirk 2002, 2006).
 - (iv) *Pitch accenting (tone):* Because phonological constraints on the relation between tone and stress prominence (Yip 2002) may, depending on the language, result in the default epenthesis (insertion) of tonal pitch accents on stresses at various levels (foot, prosodic word, minor phrase—see below), it is predicted that an (epenthetic) pitch accent should appear on a contrastive focus in such a language.
 - (v) *Maintenance of lexical contrasts:* Because positional faithfulness constraints (Beckman 1996) may have the consequence that an underlying lexical contrast finds surface realization only if it appears in a surface stressed position, we expect that in a language where faithfulness-in-stressed-position plays a role, contrastive focus constituents would show the appearance of lexical contrasts that are neutralized in non-stress position.
- This *integrated set of necessary and possible phonological effects* is part of the **system** of prosodic effects which a stress-based indirect theory of the contrastive focus-phonetics relation predicts would/could be found with contrastive focus.
 - Note, by contrast, that a direct theory of the contrastive focus-phonetics interface makes none of these predictions, simply because it posits no phonological representation —stress-based or otherwise-- for contrastive focus.

Below, I will review a subset of the evidence from English bearing on the *correctness of the above predictions about phonological representation*, specifically (iv) and (v).

A. Phonological evidence that contrastive focus introduces *some* level of stress: Contrastively focused function words appear in strong form in English, maintaining lexical contrasts.

(15) Fact: English function words have surface “strong forms” and “weak forms”. (“Contractions” are a variety of weak form.)

	Spelling	Strong	Weak
Pronouns	them	ðem	ðm, m
	him	hɪm	m
	you	juw	jə
Prepositions	at	æt	ət
	for	fɔr	fɪ
	to	tuw	tə
Complementizers	that	ðæt	ðət
	than	ðæn	ðn
	as	æz	əz
Auxiliaries	have	hæv	əv
	has	hæz	əz
	is	ɪz	ɪz
Modals	can	kæn	kɪn
	will	wɪl	wɪ

(16) Fact: Weak form function words have the phonological properties of stressless, non-foot-head syllables: *loss of lexical contrasts, appearance of syllabic sonorants*

- Neutralization of stressless lax vowels to schwa

(*té le*)_{F1} (*gràph*)_{F1} vs. *te* (*lé gra*)_{F1} *phy*
[tɛ₁ lə₂ græ₃f] [tə₁ le₂ grə₃ fɪ]

at (strong) vs. *at* (weak)
[æt] [ət]

- Realization of stressless lax vowel plus sonorant as a syllabic sonorant

a(*tó mic*) vs. (*á tom*)_{F1}
[ə t^ham₁ ɪk] [æ r_{m1}]

than (strong) vs. *than* (weak)
[ðæn] [ðn]

- Deletion of underlying /h/ from onset position

ve (*hi* *cu*)_{Ft} *lar* vs. (*vé* *hi*)_{Ft} *cle*
[və h₁ kjə lr] [vij ₁ kl]

has (strong) vs. *has* (weak)
[hæz] [əz]

him (strong) vs. *him* (weak)
[hm] [m]

(17) Fact: *Function words that are contrastively focused never appear in weak form.*

- a. I see [hm] [m]
I see [HIM]_{FOCUS} [him], *[m]
- b. She'll speak [fɔr] Sally. [fr]
She'll speak [FOR]_{FOCUS} Sally, [fɔr], *[fr]
not [TO]_{FOCUS} her.
- c. I know [ðæt] she's sick. [ðæt]
I know [THAT]_{FOCUS} she's sick; I was [ðæt], *[ðæt]
wondering [WHY]_{FOCUS} she's sick.

(18) Conclusion: *Focussed function words bear some degree of stress.* E.g.

(x) Minor Phrase
(x) (x) Prosodic Word
(x) (x) Foot
x x x Syllable
I see [HIM]_{FOCUS}

(19) Analysis, assuming the stress-based, indirect theory:

- The CFPR requires that a focused word be more prosodically prominent than other neighboring words.
- This ensures presence of at least minor phrase stress on a focused function word, since neighboring lexical words will have prosodic word stress
- That phrasal stress ensures the foot-head status of the focused function word, which will ensure the appearance of focused function word in its strong form.

B. The pattern of distribution of pitch accents in English sentences: Captured by phonological constraints on stress representation and on the stress-tone relation

(23) Fact: A pitch accent is necessarily present on any contrastively focused word in English. In declarative sentences it will be H* or L+H*, e.g.

I see [HIM]_{FOCUS}
|
H*

(24) Sketch of the proposed analysis:

- In English the phonological constraint system requires a syllable bearing phrasal stress to be associated with tone, namely a pitch accent. (cf. Ladd 1996, Selkirk 2000, Féry and Samek-Lodovici 2006).
- To satisfy the constraint system, tone (pitch accent) will be epenthesized onto phrase-stressed syllables (unless a morphemic pitch accent is available).
- Consequence for contrastive focus: Because, by hypothesis, a contrastive focus constituent always bears some degree of phrasal stress (due to the CFPR), a pitch accent will always be present on a contrastive focus.

(25) Support for the analysis:

- a. Reasons to think that stress-driven pitch accent insertion/epenthesis is a well-motivated phenomenon, cross-linguistically and in English.
- b. Independent evidence from non-Focus sentences in English that patterns of pitch accent distribution reflect a role for phonological constraints on the distribution of phrasal stress. (Cf. Ladd 1996 on “stress-first” account of pitch accenting in English, and Féry and Samek-Lodovici 2006.)

(26) Crosslinguistic evidence for stress-driven epenthesis of tone:

- a. Every head of foot (“stressed syllable”) bears predictable tone:
Singapore English (Siraj 2008), ...
- b. Every head of prosodic word (“word-stressed syllable”) bears predictable tone:
Cairene Arabic (Hellmuth 2007),
- c. Every head of prosodic phrase (“phrase-stressed syllable”) bears predictable tone:
Bengali (Hayes and Lahiri 1991, Selkirk 2006), ...

(27) **Prosodic Head:Tone Constraints** – a class of phonological markedness constraints

- a. **Hd(Ft): Tone** [“Foot-head-tone”]
The head syllable of a foot must bear tone.
- b. **Hd(PWd): Tone**
The head syllable of a prosodic word must bear tone.
- c. **Hd(MiP): Tone**
The head syllable of a minor phrase must bear tone
- d. And so on for heads of higher levels of prosodic phrase....

(28) **Universal ranking of Prosodic Head:Tone constraints:**

.... Hd(MiP): Tone >> Hd(PWd): Tone >> Hd(Ft): Tone

(29) **No Epenth Tone** (= Dep Tone (McCarthy and Prince 1995))

A tone in the surface phonological representation must have a correspondent in underlying representation

(30) **Crosslinguistic Typology (Optimality Theoretic) of Stress-Driven Pitch Epenthesis:**
Language-particular ranking of No Epenth Tone with Prosodic Head:Tone constraints

Singapore English:

(i) Hd(MiP): Tone >> Hd(PWd): Tone >> Hd(Ft): Tone >> *No Epenth Tone*

Cairene Arabic:

(ii) Hd(MiP): Tone >> Hd(PWd): Tone >> *No Epenth Tone* >> Hd(Ft): Tone

Standard English:

(iii) Hd(MiP): Tone >> *No Epenth Tone* >> Hd(PWd): Tone >> Hd(Ft): Tone

Next part of the argument: Providing evidence that pitch accents in standard English appear in position of phrasal stress.

Step One: Evidence that pitch accents in standard English are present on the head (main stress) of major phrase.

Step Two: Evidence that (optional) pitch accents, which appear in pre-main stress position within major phrase (i.e. in pre Hd(MaP) position), coincide with a lower level of phrase stress, namely head (main stress) of minor phrase.

(31) Experimental finding (Katz and Selkirk 2004):

In broad focus sentences, every major phase (MaP) contains a pitch accent located on the rightmost word stress or compound-word stress within the MaP.

Syntactic structure of the different 18 sentences uttered (in 2 repetitions) by 3 speakers:

Pronoun Verb [Complement 1] [Complement 2]

Tonal pattern found (using ToBI transcription):

(H*) H* L- (H*) H* L-L%

a. We hired [Manny] [to work on the [annex]]

(H*) H* L- H* L-L%

b. He took [Minnie] [to a [Mariners game]]

(H*) H* L- H* L-L%

c. They used [iron] [for [arrowheads]]

(32) Tone facts and what they imply:

(i) *Medial peripheral L- tone at right edge of Complement 1.* This indicates a parsing into two major (aka intermediate) phrases with break falling between the complements.

(	)	(	)	Major Phrase
We hired	[Manny]	[to work on the	[annex]]	
	L-		L-	

(ii) *Necessary presence of pitch accent on the rightmost word stress or compound word stress of the major phrase.* This is the location where main stress would be placed within major phrase by the standard sort of prosodic edge-head alignment constraints (McCarthy and Prince 1993), i.e.

Align Right (Edge MaP, Hd(MaP))

Align the right edge of a major phrase with the head of major phrase.

So placement of main stress of major phrase would explain the necessary appearance of epenthetic pitch accent, if location of pitch accent were indeed driven by phrase stress.

(	x	)	(	x	)	Major Phrase
We hired	[Manny]	[to work on the	[annex]]			
	H*	L-		H*	L-	

(iii) *Optional presence of pitch accent on content words appearing earlier in the major phrase.* This could be attributed to optional presence of minor phrase prominence preceding the head of Major Phrase (and epenthesis of pitch accent onto that lower level of phrasal stress prominence.)

Option A: pitch accent before head of Major Phrase

(		x	)	(		x	)	Major Phrase
(x)	(x)	(x)	Minor Phrase
We hired [Manny] [to work on the [annex]]									
	H*		H*	L-		H*	L-		

Option B: NO pitch accent before head of Major Phrase

(		x	)	(		x	)	Major Phrase
(x)	(x)	(x)	Minor Phrase
We hired [Manny] [to work on the [annex]]									
	H*	L-		H*	L-				

=> In all cases above, the high ranking of Hd(MiP):Tone [“Minor Phrase-head-tone”] proposed in (30-iii) for standard English, would explain the presence of pitch accents.

- Universally, head of Major Phrase necessarily coincides with the head of Minor Phrase, so pitch accent would be epenthesized whenever there’s a Major Phrase head.
- And any (optional) head of Minor Phrase appearing independent of Major Phrase head would also call for the presence of pitch accent.

Next step: Provide evidence that the presence of optional pitch accent preceding main stress of MaP is plausibly due to optional presence of minor phrase stress

(33) Caveat: Some of the optionality in presence of pitch accents is likely to be stylistic. The question is whether, among the options in appearance of pitch accents, there are tendencies that suggest that phonological constraints on prosodic stress organization are also at play. If so, this supports the hypothesis that pitch accents reflect the prosodic stress organization of the sentence, and in particular the location of minor phrase heads.

(34) *The Initiality Effect* (cf. Bolinger 1986, Shattuck-Hufnagel, Ostendorf & Ross 1994)

[The effect is visible with discourse-given elements and other words that would not carry Major Phrase prominence.]

- a. Preference for presence of pitch accent on a phrase-initial word.

(I'm looking for Emily.)

Èmily's góne.

?* Emily's góne.

Èmily's gone to schóol.

?* Emily's gone to schóol.

Compare phrase-medial position, where there's less preference for pitch accenting:

I think Èmily's góne.

ok I thínk Emily's góne.

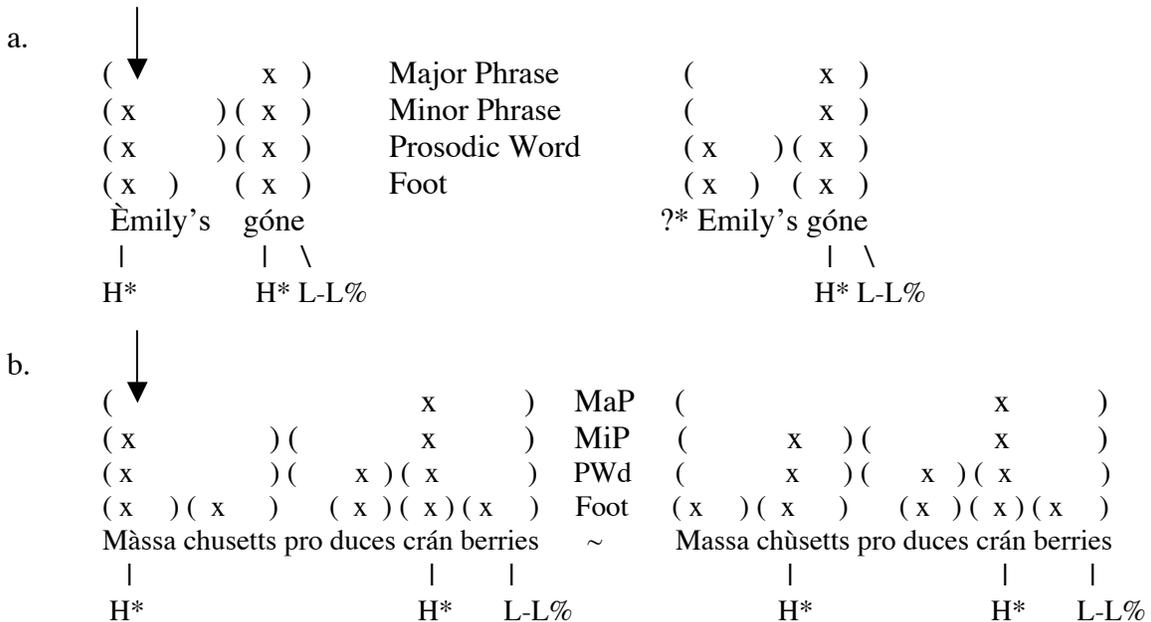
- b. Tendency for "early accent" within a word with pitch accent in initial position

(Besides apples, there isn't significant fruit production in Massachusetts.)

Màssachusetts produces cránberries! ~ Massachùsetts produces cránberries!

(35) (Hypothetical) stress configuration underlying the initiality effect:

Left edge secondary (minor phrase) prominence within major phrase



(36) **Align Left (Edge MaP, Hd(MiP))**

Align the left edge of MaP with the head syllable of MiP.

(37) An analogous initiality effect seen in word-level stress patterns:

- Fact: In words where there are options for the foot organization of pre-main stress syllables, English prefers the analysis with initial foot organization:

àbra ca dábra_t vs. * a bràca dábra_t
Tàta ma góuchi * Ta tàma góuchi

- Analysis (McCarthy and Prince 1993):

Align Left (Edge PWd, Hd(Foot))

Align the left edge of prosodic word with the head syllable of a foot.

- Bracketed grid representation shows parallel to the phrasal case:

↓	(	x	)	PWd	(	x)				
(	x	)	(	x	)	(	x	)	(	x)
x	x	x	x	x	x	x	x	x	x	x	x
à	bra	ca	dá	bra	*	a	brà	ca	dá	bra)

(38) Summary:

- There appears to be a *general initial prosodic strengthening effect*, capturable in a family of prosodic markedness constraints, each of which calls for a prosodic constituent π^n at a level n of prosodic organization to show a left-edge prominence of constituent π^{n-1} at the next level down in the prosodic hierarchy: **Align Left (Edge π^n , Hd (π^{n-1}))** [schema for constraint family]
- Prosodic stress theory thus provides an account of the pitch accent initiality effect, if we assume that the distribution of pitch accents is a reflection of the distribution of phrasal stress in English, as called for by Hd(MiP):Tone constraint, and the constraint ranking (30-iii).

Other stress-driven patterns in distribution of pitch accenting to be expected:

- *Avoidance of rhythmic clash* (“pitch accent clash”)—reported in Shattuck-Hufnagel et al (1994)
- *Avoidance of lapse* (Selkirk 1984, Kager 1988)—a too-long sequence of un-pitch accented words in pre-Major Phrase head position

Part Three: Predictions of this contrastive focus=prosodic prominence theory concerning phonetic interpretation:

(39) The Stress-Phonetics Homology Hypothesis

If, in a particular language, the scaling of some phonetic property is in general stress-sensitive—whether involving duration, pitch or spectral realization:

A higher level of prosodic prominence (“stress”), expressed in categorical, phonological terms, implies a quantitatively greater specification of that phonetic property, expressed in gradient terms. (Selkirk and Katz 2006).

For example, if a foot-head (“stressed”) syllable is phonetically interpreted with greater duration than a non-foot-head (“unstressed”) syllable, then the head syllable of a prosodic word or the head syllable of a prosodic phrase will show greater duration.

(40) If the Contrastive Focus Prominence Rule is at play in a language assigning focus local stress prominence, the Stress-Phonetics Homology predicts how phonetic scaling effects associated with contrastive focus fit into the overall system of phonetic scaling in a language.

Prediction I: *Degree of a phonetic scaling effect with contrastive focus*

Contrastive focus, whose level of stress is predicted to be locally maximal, is predicted to show greater degrees of any stress-sensitive scaling effect. In general, degree of a stress-sensitive phonetic scaling effect is predicted to be a reflection of patterns of (relative) prosodic prominence established in the language

Prediction II: *Presence of a phonetic scaling effect with contrastive focus*

A language is predicted to show durational effects of contrastive focus, for example, if it otherwise shows stress-sensitivity in duration.

Correctly predicted that standard English should show greater duration with contrastive focus (Cooper and Eady 1986; Katz and Selkirk 2004, in progress), because English shows durational effects of foot-head status (“stress”) (Fry 1955, Huss 1978 and others), as well as effects of presence of pitch-accentedness in non-contrastive focus contexts (Beckman 1986 and others)

Correctly predicted that in a language like Japanese, which does not show greater duration for pitch-accented syllables (Beckman 1986), even though these are arguable the head of a minor phrase (Ito and Mester 2007), a contrastive focus word will show no lengthening effects (Maekawa 1993).

Looking ahead:

=> The stress-based indirect theory of the contrastive focus-phonetics relation opens up a research agenda, with predictions about both the phonological and phonetic properties of contrastive focus cross-linguistically. Direct theories do nothing of the kind: they merely restate the observed correlations between contrastive focus and phonetic scaling.