The Tension between Explanatory and Biological Adequacy*

Hiroki Narita
Harvard University

A review of *Theoretical Comparative Syntax: Studies in Macroparameters*, Naoki Fukui. Routledge, London and New York, (2006). ISBN-13: 978-0415341035, USD185.00

1 Overview

Theoretical Comparative Syntax (2006, henceforth *TCS*) is a collection of Naoki Fukui's major works in generative biolinguistics written under the rubric of the *principles-and-parameters* (P&P) model of human language. Theoretical comparative syntax is the hallmark of the P&P approach, which one can easily see by reading any portion of this collection. Rather than aiming at a systematic summary of the collected papers, which is already provided both in the book's preface and in Ishii (2008), I would like to try to re-evaluate Fukui's work in the context of the *the minimalist program for (bio)linguistic theory*, a research program of approaching UG from below (that is, from a minimal set of assumptions; Chomsky 1995, 2007). I will specifically point out that Fukui's work has been always aiming at providing a restrictive theory of functional categories and parametric variations in human language, crucially acknowledging either explicitly or implicitly the fundamental tension between explanatory adequacy and what I will call *biological adequacy*.

I will use square brackets to refer to page numbers and chapters in *TCS*, in addition to those in the original publications.

2 Functional Categories in the Pursuit of Biological Adequacy

Chomsky (2005, 2007) reminds us that the design of the faculty of language (FL), or of any biological system for that matter, should be attributed to three factors: (i) genetic endowment, (ii) external data, and (iii) physical and mathematical ('computational' in particular, in the case of digital computational systems like language) principles that are not specific to FL. Under the current formulation, UG, a theory of the initial state of FL, meets the condition of *explanatory adequacy* if it provides an encompassing description of factor (i), constructed in such a way that it maps linguistic data (factor (ii)) to descriptively adequate grammars of acquired I-languages under the effect of factor (iii) (Chomsky 1965, 2008). The early generative enterprise regarded explanatory adequacy as the ultimate goal for linguistic theory, and it went in the direction of enriching UG under the pressure of descriptive adequacy, a criterion of encompassing description of some I-languages. However, once the P&P model reconciled the tension between descriptive and explanatory adequacy, biolinguists started to seek a yet deeper level of explanation of human language, beyond explanatory adequacy, by asking *why* FL is the way it is, not many other imaginable ways. This is essentially a question of the ontogeny and phylogeny of FL, and the answer to this *why*-question would be

*I am grateful to Naoki Fukui, Koji Fujita, Terje Lohndal, Bridget Samuels, Toru Ishii, and Cedric Boeckx for their helpful comments and suggestions.

formulated in biophysical terms (not FL-specific ones), with the hope for the eventual unification of biolinguistics with other "core" natural sciences such as biology and physics. Then, let us say that a theory of FL meets the condition of *biological adequacy*[1] if it provides an explanation for how the emergence of FL was/is biologically possible in the evolution/development of human beings. The minimalist program can and should be seen as a research agenda that seeks a (more) biologically adequate theory of FL by attributing the effects of what has been postulated as constituting factor (i) to factor (iii). The less we can show UG (the model of factor (i)) contains, the closer we get to the goal of biological adequacy.

The 80s' and 90s' practice of theoretical comparative syntax in the P&P framework provides an explosion of unforseen descriptive studies of various I-languages, a tremendous success in the thousands of years of linguistic inquiry, which, however, results in postulating various complications in UG: FL-specific principles with possible parametric variations, uninterpretable features ('viruses' in Uriagereka's (1998) terms) triggering dislocation and their again parametrically variable distributions, abstract functional categories with possibly vacuous semantic and/or phonetic content, and so on. This line of UG-enrichment was natural in the context of the earlier pursuit of explanatory adequacy (an encompassing description of UG-effects), seen then as the ultimate goal for linguistic theory, but once the yet higher goal of biological adequacy is taken into consideration, it becomes obvious that postulating hypothetical constructs in UG to achieve descriptive or explanatory adequacy actually poses a corresponding serious problem to be addressed at the level of biological adequacy.

Take the recent "inflation of functional categories" [3] as a concrete example. Postulating a new functional category X will complicate UG in various ways: first of all, UG should provide a proper theoretical description of X: To define the working of X, we should postulate:

(1) A bundle of features of X that collectively determine:
   a. what category X takes as its complement
   b. what kind of elements X attracts or selects as its Spec(s)
   c. how many Specs X can take
   d. how X contributes to LF- and PF-interpretation

And so on. Moreover, we should come up with some non-stipulative explanation of:

(2) a. why X emerges in FL at all
   b. how the parametric properties of X, if any, are acquired through experience for each I-language.

Notice that virtually all the past proposals simply assume the full set of functional categories as predetermined properties of UG, thus setting the minimalist goal of biological adequacy more remote from our biolinguistic enterprise.

Quite accurately describing the state of affairs, Fukui notes, "Given their usefulness as a descriptive tool, ... functional elements have sometimes been overused in syntactic analyses, particularly in the late 1980s, a situation that is reminiscent of the overuse of grammatical transformations in the 1970s or parameters in the early 1980s," [3] a statement that is no less true even in the current proliferation of the so-called *cartog-*

[1] We may alternatively call this desideratum *evolutionary adequacy*, a term suggested independently by Longobardi (2003) and Fujita (2007, in press) with more or less the same import.

raphy project (Cinque 1999, 2002, Rizzi 2004). The full set of earlier language-specific or construction-specific transformational rules, postulated with an eye towards meeting observational or descriptive adequacy, once seemed to set the goal of explanatory adequacy hopelessly remote from the early practice of generative grammar. However, the generative enterprise finally overcame the tension between descriptive and explanatory adequacy by giving birth to the P&P approach to language acquisition. Early transformational rules are now regarded just as "taxonomic artifacts" without any theoretical significance, whose descriptive effects are to be deduced from interactions of UG-wired principles and parameters. The lesson to be learned is that ad hoc descriptive specifics are likely to be eventually reduced to simpler and deeper theoretical constructs with a broader range of application. Fukui's passage above expresses a reasonable hunch that essentially the same might be true for the recent overuse of functional categories, too. Indeed, all the past formulations of each and every functional category have been very FL-specific (if not I-language-specific) and 'meaning'-specific ('topic', 'mood', 'aspect', etc., if not construction-specific). The additional brute assumption that these categories are UG-fixed universals would resolve the significant question of explanatory adequacy in its technical sense, i.e., an encompassing description of the first factor that suffices to determine I-language from available data, but it crucially begs the minimalist question of biological adequacy.[2]

The minimalist program is an attempt to show how much of the properties of FL we can attribute to the third factor, minimizing UG-stipulations with the hope for a (more) biologically adequate theory of human language. The *strong minimalist thesis* (SMT) that FL is optimal in terms of the third factor is held as the guiding principle for the minimalist pursuit of biological adequacy (see Chomsky 2007 and Narita 2009c for some clarifications on the SMT). As it stands now, the cartography of functional categories is definitely FL-specific, hence unexplained in terms of the third factor. And even if we further stipulate that each of these functional categories is there to enhance, say, expressiveness for the CI performance system (see, e.g., Miyagawa 2009 for an explicit statement of this hypothesis), such a teleological/functional explanation for (2a) is at best partial, and it still begs the rest of the questions in (1)-(2).

Advocates of the cartographic approach claim that a highly articulated cartography is necessary to achieve sufficient descriptive and/or explanatory adequacy. We should carefully scrutinize each of such arguments empirically and theoretically (see the discussion below), and seek to find a way to overcome the difficulties the cartography expansion necessarily poses (see (1)-(2)) for biological adequacy. We should rather regard the descriptive technicalities in the cartographic approach not as a final explanation but as a first descriptive approximation of the facts to be explained in terms of the three factors in the language design, with the significance of the third factor emphasized (Chomsky 2005).

3 Linear Ordering

Fukui is of course not the only researcher who has been aware of the fundamental tension between the inflation of functional categories (on demand of descriptive pressures) and the minimalist goal of biological adequacy. Thus, for example, Chomsky

[2]Of course, simply trading descriptive burdens from functional categories to some post-syntactic covert 'type-shifting' operations does not do any good to this situation; essentially the same question arises for such other language-specific operations.

(1995:240) argues, "Postulation of a functional category has to be justified, either by output conditions (phonetic and semantic interpretation) or by theory-internal arguments. It bears a burden of proof, which is often not so easy to meet." He actually famously manages to provide a theory-internal argument against postulating a functional category with null LF-interpretation, AGR, based on the principle of Full Interpretation. We should apply such a strong minimalist scrutiny to other functional categories as well. And of course, now well-accepted reluctance to attribute null interpretation to an abstract functional category (e.g., AGR) does not by any means imply willingness to attribute an arbitrarily isolated 'semantic content' to a newly stipulated functional category.

In reality, the tension between explanatory and biological adequacy that any cartography expansion inevitably poses is rather rarely addressed seriously, even within the minimalist camp. It should be pointed out in this context that Kayne's (1994) *Linear Correspondence Axiom* (LCA), a proposal that was very dominant in the late 90's, has been providing a strong theoretical motivation for such cartographic expansion. The reason is that, in order for the LCA to work, syntax must be equipped with the following three properties: (A) it has no distinction between Specs and adjuncts (Kayne 1994:Ch. 3), (B) it obeys a strict X-bar schema where any projection of a single head can host up to only one complement and one Spec/adjunct,[3] disallowing multiple Specs/adjuncts per head (ibid, Ch. 2), and (C) precedence-relations in PF-strings must be in strict one-to-one correspondence to c-command-relations, framed in terms of the universal Spec-head-complement (S-H-C) order (ibid). If (A)-(C) hold, then a logical consequence is that any 'deviations' from the S-H-C template, say a surface head-final word order or overt adjuncts, must be each reanalyzed as involving a separate functional head attracting its complement or selecting another Spec. Thus, if we keep assuming the LCA, the existing variety of word order in an I-language must be seen as evidence for many covert functional projections in that I-language. Indeed, Kayne himself argues that his LCA-based theory should be regarded as providing a partial answer to the question why there are so many functional heads, which he claims is that "functional heads make landing sites available." (ibid, 29-30) In this way, the LCA, though ingenious, has been a big patron of the cartography expansion in UG.

Of course, the LCA is originally proposed as an explanatory principle that deduces a number of apparently unrelated conditions in syntax, effects of the traditional X-bar theory being one,which in itself is a very desirable result, and many researchers attempt to revamp the Kaynean LCA in various terms, including Chomsky (1994, 1995), Epstein et al. (1998), Uriagereka (1999, 2009), Moro (2000), Guimarães (2000), Nunes (2004), Richards (2004), Sheehan (2009) and Kayne (2009), to name just a few (but see also Narita 2009b). However, the fifteen years of investigation has shown that the ramifications of imposing the universal S-H-C template *à la* the LCA are rather daunting, the cartography expansion being a serious one. To illustrate the situation with Japanese, a strictly head-final language, Kayne's strict universal S-H-C word order forces us to analyze all the instances of surface S-C-H word order in this

[3]Under the Bare Phrase Structure theory of Chomsky (Chomsky 1994 et seq.) where Merge and labeling should be recursively applicable, forbidding multiple Specs will require stipulations, departing from minimalist desiderata. In fact, there have been provided a number of empirical arguments for the existence of multiple Specs, including Fukui (1986), Speas (1986), Fukui and Speas (1986 [Ch. 1]), Chomsky (1995, 2000, 2001), Ura (1996), Saito and Fukui (1998 [Ch. 8]), Fukui and Takano (1998 [Ch. 7], 2000 [Ch. 11]), to name just a few.

language as involving obligatory movement of some complement (often remnant) XP to an intermediate covert functional category. This movement must always apply regardless of the categorial status of the XP. We don't know even how to formulate such a peremptory movement requirement in the current theoretical framework, since any movement/attraction operation is considered to be selective for certain syntactic elements, e.g., ϕ-feature bearers (but see §4 below). Even abstracting away from this feature-selection problem, we cannot do anything but further postulating ad hoc uninterpretable features or the like on ad hoc functional categories, again departing from the goal of biological adequacy. As Fukui and Takano (1998: 33 [137]) conclude, "We cannot think of any independent motivation for movement of complements other than the very reason for getting the surface order right (the C-H order), and it looks as though the postulated functional category attracts complements of any type just to ensure the correct word order under the LCA."

Head-finality is just one instance of the rather commonly attested deviations from the S-H-C template. It is true that any such deviations can be techically analyzed in conformity with the LCA as long as we add as many functional categories and viruses thereof as needed to the cartography. However, if we were to take that path, namely the marriage of the LCA and the cartographic expansion, the machinery that such analyses employ—covert functional categories and massive application of phrasal (remnant) movements into their Specs—would become just too powerful to rule out *any* surface word order, thus such a cartographic escape, presumably necessary to store the LCA from the difficulties in its crosslinguistic coverage, in effect nullifies Kayne's (2004) and Cinque's (2005) arguments for the LCA from typological gaps in the attested surface word order variations. And the massive overgeneration, inherent to the marriage of the LCA and the cartographic approach, can be blocked only by further stiplations, again departing from the minimalist goal of biological adequacy. See Ackema and Neeleman (2002), Richards (2004), and Abels and Neeleman (2009) among others for much relevant discussion.

As for the PF-linearization mechanism, Fukui and Takano (1998 [Ch. 7]) propose an alternative linearization theory to Kayne's LCA (see also Takano 1996). They argue that computations in the overt (pre-Spell-Out) component and computations in the phonological component constitute a symmetric mirror image in the sense that the latter decomposes and linearizes in a top-down fashion the syntactic structures that the former has built up by recursive application of Merge and labeling in a bottom-up fashion. Simplifying somewhat, their linearization algorithm is stated in (3), where + indicates the phonological concatenation relation:

(3) Linearization (Fukui and Takano 1998 [Ch. 7]: (16), modified):
$\Sigma = \{\alpha, \beta\}$, α an X^{max} constituent, is mapped to $\alpha + \beta$ at PF.

For example, if a structure of the form [$_{XP}$ ZP [$_{X'}$ X YP]] is sent to the phonological component, it will be recursively decomposed into a sequence of ZP + [$_{X'/XP}$ X YP], and then into ZP + YP + X. As a result, this linearization algorithm will always yield a universal S-C-H word order, in contrast to the Kaynean S-H-C one.

If the universal template is rather S-C-H with possible multiple Specs, as Fukui and Takano propose contra Kayne, then the Kaynean need for postulating ad hoc obligatory movement targeting ad hoc functional categories in Japanese and other

head-final languages disappears.[4] Rather, the burden of the crosslinguistic coverage is now on head-initial S-H-C word orders in languages like English in their approach. Fukui and Takano claim that such a surface S-H-C word order is to be derived by movement of H to an intermediate Spec of some covert category. The relevance of such head-to-Spec movement, including V-to-(Spec,)v raising, is independently argued for by some past proposals (Toyoshima 2000, 2001, Matushansky 2006; see Fukui and Takano 1998 [Ch. 7], 2000 [Ch. 11] for further discussion), but it should be noted that the notion of syntactic head-movement, let alone syntactic head-to-Spec movement, is in itself under much controvercy in the literature, so Fukui and Takano's linearization mechanism really depends on the proper characterization of head-movement, among other things. See Chomsky (2001), Boeckx and Stjepanović (2001), Harley (2004) among others for the view that head-movement is primarily a post-syntactic morphophonological phenomenon. See Matushansky (2006), Vicente (2007), Gallego (2007), Boeckx (2008), Uriagereka (2008), and Roberts (forthcoming) for various arguments for restoring head-movement as syntactic. See also Narita (2009a,d, in progress).

In the end, though, one may call into question the existence in itself of an exceptionless 'universal template' for linear ordering in the first place, be it Kayne's S-H-C one or Fukui and Takano's S-C-H one. We have seen that the Kaynean universal S-H-C template poses a number of unfavorable consequences on grammars of various I-languages, and more or less the same might well be the case for Fukui and Takano's S-C-H template, too.

Moreover, there seem to be a number of cases where values of 'head-parameter' correlate, limitedly but systematically, with syntactic consequences (Fukui 1993 [Ch. 4], Saito and Fukui 1998 [Ch. 8], Richards 2004). For example, Fukui and Saito observe that head-parametric directionality correlates with the (un)availability of costless optional movement operations: head-initial (VO) languages allow optional rightward dislocations like extraposition and heavy NP-shift that are more or less absent in head-final (OV) languages, and the opposite, optional leftward dislocation like scrambling is more readily applicable in head-final/OV languages than head-initional/OV ones. Further, Richards (2004) also argues, based on a crosslinguistic survey of object-shift and 'short-distance' vP-internal scrambling in Germanic languages, that so-called Holmberg's (1986) Generalization (a generalization that V-raising holds as a necessary condition for object-shift), widely attested in head-initial/VO languages but seemingly inapplicable in head-final/OV languages, should be seen as a local order preservation effect of head-parameter (see also Fox and Pesetsky 2005). Although the conjecture now widely held by the majority of researchers is that linear order does not play any role in the computation of narrow syntax, as proposed by Chomsky (1995:334) in opposition to Kayne (1994), such limited but systematic relevance of 'head-parametric' linear order variations to syntactic computation still constitute a cluster of puzzles to be solved, to my eyes.

4 Free Merge

Chomsky (2000:§3.5) regards (a) uninterpretable features of lexical items (LIs) (i.e., viral properties typically associated with functional categories) and (b) the ubiquitous

[4]See Ishii (2008) for a proposal that the certain flexibility of word order of adjuncts can be seen as another corollary of Fukui and Takano's theory.

dislocation property as "two striking examples" of imperfections in human language. He then speculates that FL comes to adopt (a) as the mechanical implementation of (b), with the hope of reducing two imperfections to one, while he implicitly assumes his earlier model that the dislocation operation Move is a costful 'last resort' applying only when necessary to ensure virus-checking.

However, it has been recognized since Chomsky (2004) that the Bare Phrase Structure theory (Chomsky 1994 et seq.) provides arguably the simplest possible conception of Move: the recursively applicable operation, Merge, is so free and unconstrained that it applies freely and indistinctively to any two terms α and β, irrespective of whether they are independent SOs (*external* Merge, EM) or one is part of the other (*internal* Merge, IM, yielding Move under the 'copy/remerge' theory of movement (Chomsky 1993)) (see Saito and Fukui 1998 [Ch. 8] for the costless nature of free/optional internal Merge such as scrambling). Therefore, IM should be "as free as EM," (Chomsky 2008:140) and there should not be any stipulation that differentiates the cost of application for IM and EM (see already Fukui and Speas 1986 [Ch. 1], Fukui 1988a, and Saito and Fukui 1998 [Ch. 8]). Stipulations of viral "EPP" properties are thus eliminated in favor of the generalized *edge-feature* of LIs, an undeletable feature that allows its bearer to be subject to unbounded Merge, be it IM or EM (Chomsky 2008; see also Narita 2009a,d, in press, in progress, and Fukui 2008, forthcoming).

From this perspective, it should be concluded that we cannot blame the existence of viruses on dislocation anymore. Correspondingly, Chomsky's (2000) earlier reasoning that viruses are justified as actual triggers of another 'imperfection', displacement, should be eliminated as a misguided stipulation. We are thus left again with viruses qua imperfections. The minimalist question, then, is why UG has to assume such imperfections. We have to either (i) give up the minimalist goal of biological adequacy, or (ii) try to eliminate viruses from UG as unreal taxonomic artifacts, or (iii) aim at providing an explicit hypothesis for how they enter into UG in fact as a part of a "best way" to satisfy design specifications of FL. Some considerations along these lines are to be discussed below.

5 Arguments from Japanese Syntax

Fukui is one of the few biolinguists who have always been trying to argue against the inflation of viral functional categories in syntactic theory (see especially Fukui and Sakai 2003 [Ch. 13]:§2), for both conceptual and empirical reasons. On conceptual grounds, Fukui is well aware that the inflation of functional categories will complicate UG in an undesirable way, a caution that actually dates well before the advent of the minimalist program (Chomsky 1993, 1995): see, e.g., Fukui (1986, 1988a). Cast in minimalist terms, he argues with Hiromu Sakai that "In the minimalist program, every device in UG (entity, principle, etc.) that is employed in characterizing languages has to be closely and critically examined to determine to what extent it can be eliminated in favor of a principled account based on the interface conditions or general principles of economy/optimality. Thus, functional categories, too, should face such a minimalist critique." (Fukui and Sakai 2003:326-327)

Fukui never fails to support his conceptual reservation about the universalist cartography expansion by convincing empirical argumentation, most notably based on facts in Japanese syntax. In fact, the chapters in *TCS* can be, and should be, read as providing a number of empirical reasons to doubt the universalist conception of viral

functional categories. All corners of Fukui's work emphasize his claim, highly relevant to the present discussion, that Japanese lacks any convincing evidence for viral functional categories in its lexicon.

The lack of ϕ-feature agreement in Japanese is one of the many examples. Viral ϕ-feature checking triggered by functional categories like T, D, and v is considered to be responsible for narrowly syntactic Case-feature-checking in I-languages like English, but it is argued at length that morphological case-marking in Japanese is not contingent on any viral ϕ-feature checking operation (see in particular Fukui and Sakai 2003 [Ch.13]: §§4-5 and references cited therein). The existence of multiple nominative/genitive constructions points to the same conclusion: Case-marking does not need any last-resort trigger, thus, as long as the structure can receive appropriate interpretation at LF (such as 'predication', 'topic-comment', 'aboutness', etc.), infinitely many NPs are allowed to be generated into outer, Case-markable Spec-positions, creating multiple Spec configurations. Recall that the attested multiple Spec configurations in various I-languages like Japanese constitute one of the major reasons to depart from Kayne's original LCA that bans multiple Specs and adjuncts per head (see also note 3).

Moreover, although it was once customary in the 80's and 90's to assume that surface in-situ *wh*-phrases are actually covertly attracted to CP-Spec at LF even in *wh*-in-situ languages like Japanese, following the original insight of Huang (1982), it is now known that Japanese *wh*-in-situ obeys neither subjacency (Deguchi and Kitagawa 2002, Kitagawa 2006) nor the ECP (Fukui 1988b [Ch. 2]), both canonical diagnostics of syntactic A'-movement. See also Tomioka (2007) for a proposal that the so-called LF-intervention effects induced by focal/'anti-topic' elements in Japanese (and Korean) do not necessarily require an LF-extraction analysis of *wh*-in-situ, either. Today, it is even more difficult to provide any convincing argument for covert *wh*-movement in Japanese, given that minimalism now tries to dispense with countercyclic LF-movement per se.

Similar considerations also apply to the absence of head-movement in Japanese. The lack of determiners and corresponding N-to-D raising in Japanese, which receives independent support in Hajime Hoji and his colleagues' work (Hoji 2003, Ueyama 1998 and references cited therein), is argued for by Fukui and Speas (1986 [Ch. 1]) and Fukui (1995 [Ch. 6]), and has been shown to derive a number of seemingly unrelated properties of nominals in Japanese (Fukui and Takano 2000 [Ch. 11]). Koizumi's (2000) argument for the existence of overt V-to-v or V-to-T verb-raising in Japanese is also argued to be untenable by Fukui and Sakai (2003 [Ch. 13]).

Further, the existence of truly optional movement like scrambling in Japanese has been always puzzling for the conception of movement as a last resort (Chomsky 1986). Scrambling is purely optional (Saito 1989), and quite unselective with respect to the categorial status of the scrambled constituents, a state of affairs which is difficult to capture in the last-resort conception of movement. Instead of stipulating an ad hoc "scrambling feature" or its equivalent (see, e.g., Grewendorf and Sabel 1999), Fukui provides various proposals to attribute the apparent "costless" nature of scrambling in Japanese to some more general (parametric) properties of this I-language: for example, Fukui (1988a) proposes that scrambling can be seen as movement to an optionally created outer Spec of clausal projections, available in Japanese for the same reason as the Spec-positions for the multiple subjects (Fukui and Speas's (1986 [Ch. 1]) Relativized X-bar theory was one of the necessary hypotheses for this proposal); see also Fukui (1993 [Ch. 4]) and Saito and Fukui (1998 [Ch. 8]).

Readers are referred to the original papers collected in *TCS* for relevant details,

but suffice it to say that all these data strongly suggest that various viral functional categories attested in other I-languages like English are either all absent in Japanese, or, to say the least, "very defective"/"inactive," if they really exist at all.

What is intriguing in Fukui's observations is the finding that, unless forced otherwise by the second factor, FL will end up being like Japanese, i.e., employing no viral functional categories. That is, employment of viruses qua imperfections is not a universal 'must' in the recipe of language. This state of affairs casts a rather serious doubt on the universalist conception of viral functional categories as innately fixed UG-primitives. The P&P logic forces us to attribute any such variations to the second factor, i.e., the difference in external data. Indeed, Fukui and Sakai (2003, [Ch. 13]) argue for their *Visibility Guideline for Functional Categories*, which states that functional categories must be acquired/learned by taking cues from overt, detectable evidence from primary linguistic data (see already Thráinsson 1996).[5] The insight behind this proposal should be clear: although UG itself has the potential to employ viral functional categories as needed, it will not do so unless forced by overt evidence in the second factor. To wit, language learners are "minimalist" in the sense that they are inclined to construct the simplest possible lexicon of their target I-languages, without any extraneous entities other than required by overt evidence detectable in their experience.[6]

6 Variations and Imperfections

Admittedly, Fukui's hypothesis that Japanese lacks any viral functional categories (see also Kuroda 1988, 1992, Hoji 2003) has not received much attention it deserves. It is rather "rarely challenged," not really because there exist many serious counterarguments against it, but rather because any such extraneous viral functional categories are anyway quite convenient and useful for descriptive purposes. Fukui and Sakai (2003 [Ch. 13]:§2.2) point out that this seems to be the reason behind the fact that many linguists working on Japanese syntax often start their work by *presupposing* the existence of the set of viral functional categories that are claimed by some researchers to exist in some other languages, without serious argumentation or justification from Japanese-internal facts. This situation is nowadays no less true in the field of theoretical comparative syntax in general. The source of such practices has been, again, arguably the general failure to address the significant question of biological adequacy.

It is sometimes claimed that such a move of enriching UG is to be justified as a minimalist desideratum. For example, Miyagawa (2009) and many others claim that assuming the viral functional categories and virus-checking operations that are claimed to be found in other "rich-agreement" languages is in fact desirable in minimalist terms, building his argument on Chomsky's conjecture that "[a]ny [parametric] variation is a prima facie imperfection." (Chomsky 2001:2) However, given that hierarchically ordered viral functional categories are prima facie imperfections in UG (recall that adding one functional category in the UG-cartography will require further

[5]Detectability in their proposal varies from morphophonological marking or overt movement to neighborhoods, though movement/IM should not be treated in terms of virus-checking anymore, as discussed above.

[6]One might argue that Fukui and Sakai's Visibility Guideline would give birth to an intricate cartographic analysis of, say, complex "rich-agreement" languages like Bantu. Even so, unless supported by a dubious stipulation that external data is so uniform across languages that we can reasonably expect convergence of the resultant cartography in every language, this argument does not support any extraneous cartography in languages like Japanese.

complications in UG to fix (1)-(2)), contriving invariance at the cost of importing such other imperfections might not be the best minimalist move. Thus, another conceivable minimalist approach would start its investigation by assuming the smallest possible set of predetermined parameters *and* the smallest possible set of predetermined viruses and functional categories in UG at the same time, and ask whether such a maximally simple theory of FL will suffice or not (that is, to approach UG from below).

The conventional reaction to the apparent discrepancy between Japanese syntax and, say, English syntax is to pursue the possibility that Japanese abstractly exhibits as many viruses and checking operations thereof as English, but now the SMT poses questions from an opposite perspective: Can't grammars of I-languages be universally as simple and parsimonious as that of Japanese? Can't we do away with viral functional categories in grammars of I-languages in general as we more easily can, it seems, in that of Japanese? And if the answers are really negative, why not?[7]

A certain number of proposals on the market in fact touch on these questions in various ways: consider, e.g., Chomsky's (2008) hypothesis that unvalued features qua viruses are the device to attributte 'phase-head'-hood to a certain set of LIs, typically C and v*, for the reasons explicated by Richards (2007), a hypothesis that might partially justify the existence of unvalued features (but not of any particular functional categories) in syntax (see also Narita 2009c for discussion). Boeckx (to appear) sketches a different approach that attempts to eliminate virus-checking/valuation operations as reflexes of phase-by-phase Transfer. Bobaljik's (2008) proposal that ϕ-agreement in general is in fact a post-syntactic morphophonological operation can also be seen as an attempt to reduce the descriptive burden of syntactic virus-checking operations. See also Uriagereka's (1999) and Narita's (2009a,d) argument that morphological redundancy/agreement can be rationalized as an anchor to 'glue together' separately Transferred/Spelled-Out cycles at the interfaces. All these hypotheses are to be contested empirically in terms of descriptive, explanatory and, most importantly, biological adequacy.

7 Concluding Remarks

Just as "[i]t is not necessary to achieve descriptive adequacy before raising questions of explanatory adequacy," (Chomsky 1965:36) it is not necessary to postpone the questions of biological adequacy in the absence of a full description of the UG-mechanisms that suffice to derive descriptively adequate grammars of I-languages from external data. On the contrary, the models and hypotheses which we use to describe UG should be carefully selected, in such a way that they can help us construct a biologically adequate model of FL, thus situating biolinguistics favorably for eventual unification with the other natural sciences. It is pointed out in this paper that universalist stipulations of viruses and cartography expansion are a residue of the earlier pre-minimalist practice of enriching UG from descriptive pressures, and that they go against the minimalist pursuit of biological adequacy. They are often claimed to achieve some descriptive and/or explanatory adequacy, in which case we should regard these descriptive technicalities not as a final explanation but as a first descriptive approximation of the facts to be explained in terms of the three factors in the language design (Chomsky 2005).

[7] It does not matter whether Fukui's specific hypothesis on Japanese syntax eventually turns out to be wrong, in which case we can raise essentially the same questions in relation to a hypothetical language, call it Japanese', that is characterized without any viruses.

Fukui's hypotheses presented in *TCS* are still just a first approximation of the relevant problems to be addressed in due course, which await further investigations and refinements in terms of descriptive, explanatory, and biological adequacy. First of all, concerns for descriptive adequacy lead us to seek a theory that can systematically capture the set of interrelated Japanese facts summarized in §5. Correspondingly, an explanatorily adequate theory of FL would have to capture the systematic differences between Japanese and other languages such as English. Such a tension between descriptive and explanatory adequacy can be reconciled by a clumsy UG that stipulates quite a few viral functional categories as predetermined universals, but we saw that the minimalist pursuit of biological adequacy disregards such a move as unexplanatory, since minimalism seeks UG with maximal simplicity and generality so that it can be plausibly embedded into the biophysical world. Rather, *TCS* as a whole points to an overarching but yet rarely addressed hypothesis that viral functional categories qua imperfections can be parametrically absent in some of the possible steady states of FL. Either (i) disregarding this claim by importing these viral functional categories as predetermined UG-universals calling for a parameter-free theory, or (ii) simply stating this state of affairs as an effect of UG-wired parameters is undesirable in the minimalist pursuit of biological adequacy.

It is now widely recognized that the P&P approach to language acquisition finally suggests a logical solution to the earlier (but still present) tension between descriptive and explanatory adequacy, by incorporating a finite but sufficiently large number of FL-specific principles and parameters into UG. Taking advantage of this historical knowledge, we can at least ask whether we can hope to find, eventually, a promising resolution to the tension between explanatory and biological adequacy, which may be homologous to the P&P resolution or not. Minimalism at the present stage hints at only half of the forthcoming answer: we can hope to attribute the effect of earlier UG-principles to that of the third factor, so that we can reduce the burden of the first factor. What about the other half of UG-constituents, i.e., parameters? Well, parameters qua predetermined 'switch-boxes' may be "a prima facie imperfection" (Chomsky 2001:2), but do we really have to complicate UG just in order to posit the prima facie counterfactual absence of variation? Can't we rather pursue the possibility that UG is rather so minimal and underspecified, due to the scarce genetic support, that it happens to allow more than one 'optimal solution' to legibility conditions? Or, perhaps better, can we hope to make a 'third-factor' sense of the varied modes of optimization? Consider, e.g., the hypothesis that the principle of *economy of derivation* requires that syntax chooses the least costly derivation to reach the interfaces (Chomsky 1995:138-145). It is nowadays customary to trivialize such global economy considerations by restricting the search domain locally in various ways (Collins 1997, Chomsky 2000, 2008). Such a move is claimed to have some empirical support, which may be the case, but Fukui (1996 [Appendix]) suggests that it is also conceivable that these types of localization are rather instances of heuristic 'computational tricks' (Chomsky 1995:162) by which FL is designed to make use of (probably taking various cues from external data) in order to overcome the potential computational intractability of this global economy principle. Fukui (1996 [Appendix]) suggests that the Minimal Link Condition of Chomsky (1995), a condition characterized in terms of virus-checking, can be regarded as just one instance of such heuristic computational tricks. We might hope to generalize such a consideration to other localizing computational tricks, too, such as phase-by-phase cyclicity, probably determined by the assignment of viruses to phase-head LIs

in some I-languages (Richards 2007, Chomsky 2008). Along this line of reasoning, we might even justify the adoption of viruses and their variable distributions as one of the possible but not exhaustive options to meet the global optimization requirement.

All of these considerations should be investigated and refined empirically, always under the tripartite criteria of descriptive, explanatory, and biological adequacy.

References

Abels, Klaus, and Ad Neeleman. 2009. Universal 20 without the LCA. In *Merging features: Computation, interpretation and acquisition*, ed. Josep M. Brucart, Anna Gavarró, and Jaume Solà, 60–80. Oxford: Oxford University Press.

Ackema, Peter, and Ad Neeleman. 2002. Effects of short-term storage in processing rightward movement. In *Storage and computation in the langauge faculty: Studies in theoretical psycholinguistics*, ed. Sieb Nooteboom, Fred Weerman, and Frank Wijnen, 219–256. Kluwer.

Bobaljik, Jonathan David. 2008. Where's phi? Agreement as a post-syntactic operation. In *Phi-Theory: Phi features across interfaces and modules*, ed. Daniel Harbour, David Adger, and Susana Béjar, 295–328. Oxford: Oxford Unviersity Press.

Boeckx, Cedric. 2008. Elementary syntactic structures: a minimalist inquiry. ms. Harvard University.

Boeckx, Cedric. to appear. On the locus of asymmetry in UG. A special issue of the *Journal of Catalan Linguistics*. Ed. by Jordi Fortuny and Ángel Gallego.

Boeckx, Cedric, and Sandra Stjepanović. 2001. Head-ing toward PF. *Linguistic Inquiry* 32:345–355.

Chomsky, Noam. 1965. *Aspects of the theory of syntax*. Cambridge, Mass: MIT Press.

Chomsky, Noam. 1986. *Knowledge of language*. New York: Praeger.

Chomsky, Noam. 1993. A minimalist program for linguistic theory. In *The view from Building 20: Essays in linguistics in honor of Sylvain Bromberger*, ed. Ken Hale and Samuel J. Keyser, 1–52. Cambridge, MA.: MIT Press.

Chomsky, Noam. 1994. Bare phrase structure. *MIT Occasional Papers in Linguistics* 5:Department of Linguistics and Philosophy, MIT. Reprinted in G. Webelhuth, ed. (1995), Malden: Blackwell, *Government and Binding Theory and the Minimalist Program*, 383-439.

Chomsky, Noam. 1995. *The minimalist program*. Cambridge, Mass: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: the framework. In *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*, ed. Roger Martin, David Michaels, and Juan Uriagereka, 89–155. Cambridge, Mass: MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A life in language*, ed. Michael Kenstowicz, 1–52. Cambridge, MA.: MIT Press.

Chomsky, Noam. 2004. Beyond explanatory adequacy. In *Structures and beyond: The cartography of syntactic structures*, ed. Adriana Belletti, volume Vol. 3, 104–131. New York: Oxford University Press.

Chomsky, Noam. 2005. Three factors in the language design. *Linguistic Inquiry* 36:1–22.

Chomsky, Noam. 2007. Approaching UG from below. In *Interfaces + recursion = language? Chomsky's minimalism and the view from semantics*, ed. U. Sauerland and H.-M. Gärtner. Mouton de Gruyter.

Chomsky, Noam. 2008. On phases. In *Foundational issues in linguistic theory*, ed. Robert

Freidin, Carlos Otero, and Maria Luisa Zubizarreta, 133–166. Cambridge, MA.: MIT Press.
Cinque, Guglielmo. 1999. *Adverbs and functional heads: A cross-linguistic perspective*. Oxford: Oxford University Press.
Cinque, Guglielmo. 2002. *Functional structure in DP and IP: The cartography of syntactic structures, vol. 1*. Oxford: Oxford University Press.
Cinque, Guglielmo. 2005. Deriving Greenberg's Universal 20 and its exceptions. *Linguistic Inquiry* 36:315–332.
Collins, Chris. 1997. *Local economy*. Cambridge, MA.: MIT Press.
Deguchi, Masanori, and Yoshihisa Kitagawa. 2002. Prosody and wh-questions. In *Proceedings of NELS 32*, ed. M. Hirotani, 73–92. GLSA, University of Massachusetts at Amherst.
Epstein, Samuel David, Erich M. Groat, Ruriko Kawashima, and Hisatsugu Kitahra. 1998. *A derivational approach to syntactic relations*. Oxford: Oxford University Press.
Fox, Danny, and David Pesetsky. 2005. Cyclic linearization of syntactic structure. *Theoretical Linguistics* 31:1–45.
Fujita, Koji. 2007. Facing the logical problem of language evolution. *English Linguistics* 24(1):78–108.
Fujita, Koji. in press. A prospect for evolutionary adequacy: Merge and the evolution and development of human language. *Biolinguistics* .
Fukui, Naoki. 1986. A theory of category projection and its applications. Ph.D. dissertation. MIT.
Fukui, Naoki. 1988a. Deriving the differences between English and Japanese: A case study in parametric syntax. *English Linguistics* 5:249–270.
Fukui, Naoki. 1988b. LF-extraction of *naze*: some theoretical implications. *Natural Language and Linguistic Theory* 4:503–526. Reprinted in Fukui (2006).
Fukui, Naoki. 1993. Parameters and optionality. *Linguistic Inquiry* 24:399–420. Reprinted in Fukui (2006).
Fukui, Naoki. 1995. The principles-and-parameters approach: A comparative syntax of English and Japanese. In *Approaches to language typology*, ed. Masayoshi Shibatani and T. Bynon, 327–371. Oxford: Oxford University Press. Reprinted in Fukui (2006).
Fukui, Naoki. 1996. On the nature of economy in language. *Cognitive Studies* Bulletin of the Japanese Cognitive Sciense Society, 3:51–71. Reprinted in Fukui (2006).
Fukui, Naoki. 2006. *Theoretical comparative syntax: Studies in macroparameters*. Dordrecht: Routledge.
Fukui, Naoki. 2008. Gengo-no kihonenzan-o meguru oboegaki [A note concerning basic operations in language]. In *Gengokenkyuu-no genzai: keishiki-to imi-no intaafeisu [The state of the art in linguistic research: the syntax-semantics interface]*, ed. Yoshiaki Kaneko, Akira Kikuchi, and Daiko Takahashi, 1–21. Tokyo: Kaitakusha.
Fukui, Naoki. forthcoming. Merge and bare phrase structure. In *The Oxford handbook of linguistic minimalism*, ed. Cedric Boeckx. Oxford: Oxford University Press.
Fukui, Naoki, and Hiromu Sakai. 2003. The Visibility Guideline for Functional Categories: Verb raising in Japanese and related issues. *Lingua* 113:321–375. Reprinted in Fukui (2006).
Fukui, Naoki, and Margaret Speas. 1986. Specifiers and projection. *MIT Working Papers in Linguistics* 8:128–172. Reprinted in Fukui (2006).
Fukui, Naoki, and Yuji Takano. 1998. Symmetry in syntax: Merge and Demerge. *Journal of East Asian Linguistics* 7:27–86. Reprinted in Fukui (2006).

Fukui, Naoki, and Yuji Takano. 2000. Nominal structure: an extension of the Symmetry Principle. In *The derivation of VO and OV*, ed. Peter Svenonius, 219–254. Amsterdam: John Benjamins. Reprinted in Fukui (2006).

Gallego, Ángel J. 2007. Phase theory and parametric variation. Ph.D. dissertation. Universitat Autònoma de Barcelona.

Grewendorf, Günther, and Joachim Sabel. 1999. Scrambling in German and Japanese: Adjunction versus multiple specifiers. *Natural Language and Linguistic Theory* 17:1–65.

Guimarães, Maximiliano. 2000. In defense of vacuous projections in bare phrase structure. *University Of Maryland Working Papes In Linguistics* 9:90–115.

Harley, Heidi. 2004. Merge, conflation and head movement: The first sister principle revisited. In *Proceedings of NELS 34*, ed. Keir Moulton and Matthew Wolf, 239–254. Amherst, MA.: GLSA. U. Mass Amherst: GSLA.

Hoji, Hajime. 2003. Falsifiability and repeatability in generative grammar: A case study of anaphora and scope dependency in Japanese. *Lingua* 113:377–446.

Holmberg, A. 1986. Word order and syntactic features in the Scandinavian languages and English. Ph.D. dissertation. Stockholms Universitet.

Huang, C.-T. James. 1982. Logical relations in Chinese and the theory of grammar. MIT.

Ishii, Toru. 2008. On the nature and structure of principles and parameters: A review of Fukui (2006). *English Linguistics* 25:151–174.

Kayne, Richard S. 1994. *The antisymmetry of syntax*. Cambridge, MA.: MIT Press.

Kayne, Richard S. 2004. Antisymmetry and Japanese. In *Variation and universals in biolinguistics*, ed. L. Jenkins, 3–35. Elsevier B. V.

Kayne, Richard S. 2009. Antisymmetry and the lexicon. *Linguistic Variation Yearbook* 8:1–31.

Kitagawa, Yoshihisa. 2006. Wh-scope puzzles. In *Proceedings of NELS 35*, ed. L. Bateman and C. Ussery, 73–92. GLSA, University of Massachusetts at Amherst.

Koizumi, Masatoshi. 2000. String vacuous overt verb raising. *Journal of East Asian Linguistics* 9:227–285.

Kuroda, S.-Y. 1988. Whether we agree or not: A comparative syntax of English and Japanese. In *Papers from the second international workshop on japanese syntax*, ed. W. J. Poser, 103–143. Stanford, Calif.: CSLI Publications. Reprinted in S.-Y. Kuroda (1992).

Kuroda, S.-Y. 1992. *Japanese syntax and semantics: collected papers*. Dordrecht: Kluwer.

Longobardi, Giuseppe. 2003. Methods in parametric linguistics and cognitive history. *Linguistic Variation Yearbook* 3:101–138.

Matushansky, Ora. 2006. Head movement in linguistic theory. *Linguistic Inquiry* 37:69–109.

Miyagawa, Shigeru. 2009. *Why agree? why move?: Unifying agreement-based and discourse configurational languages*. Cambridge, MA.: MIT Press.

Moro, Andrea. 2000. *Dynamic antisymmetry*. Cambridge, MA.: MIT Press.

Narita, Hiroki. 2009a. Cyclic Transfer in service of recursive Merge. ms. Harvard University.

Narita, Hiroki. 2009b. The H-α schema and locality: the LCA or the edge-feature? Paper presented at the Conference on Minimalist Approaches to Syntactic Locality, the Research Institute for Linguistics of the Hungarian Academy of Sciences, Budapest, Hungary, 26-28 August 2009.

Narita, Hiroki. 2009c. How syntax naturalizes semantics: A review of Uriagereka (2008). *Lingua* 119:1767–1775.

Narita, Hiroki. 2009d. Multiple Transfer in service of recursive Merge. Paper presented at *The 32nd GLOW Colloquium*, April 15th-18th, 2009. Abstract published in *GLOW Newsletter #62*, 89-91.
Narita, Hiroki. in press. Full interpretation of optimal labeling. *Biolinguistics*.
Narita, Hiroki. in progress. Full interpretation of optimal derivations. ms., Harvard University.
Nunes, Jairo. 2004. *Linearization of chains and sideward movement*. Cambridge, MA.: MIT Press.
Richards, Marc D. 2004. Object shift, scrambling, and symmetrical syntax. Ph.D. dissertation. University of Cambridge.
Richards, Marc D. 2007. On feature inheritance: An argument from the phase impenetrability condition. *Linguistic Inquiry* 38:563–572.
Rizzi, Luigi. 2004. *The structure of CP and IP: The cartography of syntactic structures, vol.2*. Oxford: Oxford Unioversity Press.
Roberts, Ian. forthcoming. *Agreement and head movement: Clitics, incorporation, and defective goals*. Cambridge, MA.: MIT Press.
Saito, Mamoru. 1989. Scrambling as semantically vacuous A'-movement. In *Alternative conceptions of phrase structure*, ed. Mark R. Baltin and Anthony S. Kroch, 182–200. Chicago: University of Chicago Press.
Saito, Mamoru, and Naoki Fukui. 1998. Order in phrase structure and movement. *Linguistic Inquiry* 29:439–474. Reprinted in Fukui (2006).
Sheehan, Michelle. 2009. Sheehan, m (2009a) the final-over-final constraint as an effect of complement stranding. *Newcastle Working Papers in Linguistics 15*.
Speas, Margaret. 1986. Adjunctions and projections in syntax. Ph.D. dissertation. MIT.
Takano, Yuji. 1996. Movement and parametric variation in syntax. Ph.D. dissertation. University of California, Irvine.
Thráinsson, Höskuldur. 1996. On the (non-)universality of functional categories. In *Minimal ideas: Syntactic studies in the minimalist framework*, ed. Werner Abraham, Samuel D. Epstein, Höskuldur Thráinsson, and Jan-Wouter Zwart, 253–281. Amsterdam: John Benjamins.
Tomioka, Satoshi. 2007. Pragmatics of lf intervention effects: Japanese and korean wh-interrogatives. *Journal of Pragmatics* 39:1570–1590.
Toyoshima, Takashi. 2000. Heading for their own places. In *Proceedings of the 9th student conference in linguistics (scil9)*, ed. L. Veselinova, S. Robinson, and L. Antieau, 93–108. Cambridge, MA.: MITWPL.
Toyoshima, Takashi. 2001. Head-to-spec movement. In *The minimalist parameter: Selected papers from the Open Linguistics Forum, Ottawa 12-23 March 1997*, ed. G. M. Alexandrova and O. Arnaudova, 115–136. Amsterdam: John Benjamins.
Ueyama, Ayumi. 1998. Two types of dependency. Ph.D. dissertation. University of South California.
Ura, Hiroyuki. 1996. Multiple feature checking and grammatical function splitting. Ph.D. dissertation. MIT.
Uriagereka, Juan. 1998. *Rhyme and reason: An introduction to minimalist syntax*. Cambridge, MA.: MIT Press.
Uriagereka, Juan. 1999. Multiple Spell-Out. In *Working minimalism*, ed. S. D. Epstein and N. Hornstein, 251–282. Cambridge, MA.: MIT Press.
Uriagereka, Juan. 2008. *Syntactic anchors: On semantic structuring*. Cambridge: Cambridge University Press.

Uriagereka, Juan. 2009. Spell-bound: Dynamical frustration and the accordion model. ms. University of Maryland.
Vicente, Luis Tojo. 2007. The syntax of heads and phrases: a study of verb (phrase) fronting. Ph.D. dissertation. Leiden University.

Hiroki Narita
Harvard University, Department of Linguistics,
Boylston Hall, thirdoor,
Cambridge, MA02138, United States
E-mail address: narita@fas.harvard.edu