The Modular Architecture of Grammar


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1. Introduction

The Modular Architecture of Grammar is the latest version of Automodular Grammar [henceforth AMG] (aka Autolexical Syntax), which Jerrold M. Sadock has been developing since early in the 1980s at the University of Chicago. His original idea, represented in the foundational article Sadock (1985) and in works in the 1980s (Sadock (1983, 1984, 1987, 1990)), is that grammar is specified by a handful of totally autonomous components, each of which has its own members and internal logic that defines and limits its own representation. What characterizes actual speech is, then, the simultaneous interaction of the multiple, informationally distinct kinds of grammatical representations that each one of the independent generative systems, or “modules,” produces in total ignorance of all others.

With this multi-modular view of grammar, notice that not only is redundancy in language taken for granted in AMG, but also mismatches among differing levels of representations are set up as the norm, not the exception. One may naturally raise questions as to (i) how many and what kinds of grammatical modules, or mini-grammars, are needed in the grammar of natural language, and (ii) how and where they interact with one another, including the typology of mismatch. Sadock provided answers to these questions in a series of works in the 1990s (Sadock (1991, 1994, 1996, 1998, ...)

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In this new book, he further justifies the presence of six autonomous modules—syntax, function-argument structure, role structure, linear order, morphology, and morphophonology—and elaborates the interface level, a poly-redundant generative lexicon, which produces values of several differentiated dimensions of a lexical item and also functions to check their compatibility so as to assure that an expression is correctly described in each dimension. The diagram below illustrates the automodular architecture of grammar: each module is independent from one another and is simultaneously an accessible to other modules as well (p. 6). The presence of phonology speaks for itself, so it is not shown and barely discussed in the book.

![Diagram of automodular architecture of grammar]

Although his previous work often adduces evidence for the automodular architecture from typologically different languages (he himself is an acknowledged expert of Greenlandic Eskimo), this nine chapter long book, approximately 230 pages in length, is mostly devoted to providing an automodular account of the major syntactic phenomena of English, including, but not limited to, raising, control, passive, word order (e.g. inversion, heavy constituent shift), island constraints, auxiliary verbs, and ellipsis phenomena including the tough construction.

Before proceeding to a brief summary of each chapter, let me provide two comments on the conceptual background of AMG so that the reader can understand where AMG is situated in the theoretical scene of contemporary
First, it is safe to say that AMG is a variant of generative grammar in the sense that it recognizes differences between formal and semantic structures, and it produces the expressions of a language by forming connections between distinct structural representations. However, it stands in stark contrast to classical Transformational Generative Grammar (Chomsky (1965)) and its subsequent versions (Chomsky (1981, 1995)) or alternatives (e.g. Halle and Marantz (1993)) in that one level of representation is never derived from another level of representation within a single generative component (i.e. syntax). Rather, AMG assumes that all grammatical modules stand on equal footing with one another, and that the grammar operates in constraining possible correspondences among differing modules. There is thus neither Movement nor Deletion, the effects of the former being modeled as discrepancies in order or constituency between two autonomous representations (e.g. the logical and syntactic representations), and of the latter being found in the presence of an element in one module for which there are no corresponding elements in some other module. From the perspective of the grammatical edifice being the sum of independently generated parallel representational modules, AMG shares much of its grammatical perspective and analysis with the Simpler Syntax framework (Jackendoff (2002); Culicover and Jackendoff (2005)), and to the extent that several levels of representation are simultaneously shared and that linguistic rules are declarative constraints, AMG shares much with Lexical Functional Grammar (Bresnan (2002)), Generalized Phrase Structure Grammar (Gazdar et al. (1985)), Head-driven Phrase Structure Grammar (Pollard and Sag (1994)), Role & Referential Grammar (Van Valin and Lapolla (1997)), and Optimality-Theoretic Syntax (the articles in Legendre, Grimshaw, and Vikner (2001)).

Second, though Sadock does not explicitly say this, AMG is a strong lexicalist theory in the sense that syntactic rules are not accessible to the internal structure of words, or to the morphological component in grammar. This is a logical consequence of the fully modular view of AMG—none of grammatical rules of different informational types interact. Thus, if “syntactic word formation,” refers to productivity, compositionality, and/or scope ambiguity within a word, it must automodularly be understood to be using terms of the morphological constituent structure (e.g. word, affix, and stem), and terms of the function-argument structure (e.g. proposition, argument, and predicate), the latter of which is very similar in spirit to the logical structure that researchers like James D. McCawley argued for to represent natural language semantics (McCawley (1981)). Under this model,
“syntactic word formation” is a misnomer. Since syntax (e.g. sentence structure) and morphology (e.g. word structure) can be two distinct formal modes of expressing the same propositional content, this automodular way of Lexical Decomposition makes perfect sense, and I would say that, despite radical technical and architectural differences from the 1960s, Sadock still remains within the conceptual orbit of the Generative Semantics model, in which there are two differing levels of constituent structure, one closer to near-universal logical structure (Deep Structure), and the other closer to language-specific overt form (Surface Structure).

2. Summary of Each Chapter

Chapter 0 “Introduction” (pp. 1–13) starts with a brief history of the architectural arrangement of generative grammar. As one of the significant contributors to the intellectual exercise, Sadock argues that the derivational metaphor intrinsic to mainstream syntactic theory is in fact unnecessary and even pernicious. Pointing out that no solid consensus has been achieved concerning the organization of grammar in the past half a century, he alternatively suggests a multi-modular view that deconstructs syntax into independent and irreducible factors, such as phonological, morphological, and semantic ones, and aligns the resulting multiple levels of representation in parallel, rather than drawing them from the same vocabulary in the representation of syntax. This may not strike the reader today as entirely novel, but Sadock’s original idea is to postulate that each one of the levels of analysis is an autonomous generative component all by itself, thereby completely eliminating feeding/bleeding relations between grammatical components with distinct informational status. In extending the Fodorian Modularity of Mind hypothesis, Sadock calls this “the Modularity of Grammar Hypothesis” (p. 4) and discusses the strength in terms of formalizability, concreteness, empirical coverage, and plausibility.

Chapter 1 “Autonomous Modularity: Syntax and Semantics” and Chapter 2 “The Interface” (pp. 24–72) introduce two autonomous modules: syntax, and function-argument structure [henceforth F/A], the latter being a dimension of analysis where quantificational expressions, scope differences, and binding effects are canonically accounted for. These two chapters illustrate the basic interface principles of AMG on the assumption that the generativity of these modules is formulated using order-free and context-free phrase structure grammar (pp. 14–23). Just as the phrase structure rules of syntax are supposed to produce an infinite set of sentences of the familiar sort (e.g.
S → NP, VP), the F/A constituent-structure grammar is also assumed to be capable of producing an infinite set of the logical structures of sentences with differing categories, such as propositions [Prop], arguments [Arg], and predicates [Pred]. (In reality, a handful of F/A types would be sufficient for natural language.) Under this view, lexical items such as sneeze and take are able not only to provide sets of instructions to the syntactic and F/A modules, but also to pull all (here, two) modular representations to match one another (“The Inter-modular Lexical Correspondence Principle”). For example, the lexical entry play, as in Ben plays the zither, redundantly specifies, among other things, the following two closely related representations: transitive syntax and transitive F/A. Note that the two structures below may seem to reflect a linear ordering of the elements in type structures, but actually the hierarchical relationships alone are what matters: linearization, the topic of Chapters 4 and 7, is not within the realm of syntax in AMG. Below, Fa and Faa are one-place and two-place predicates, indicated by a and aa respectively, with a standing for argument.

$$\text{(1)}$$

\[
\begin{array}{c|c}
\text{Syntax} & \text{F/A} \\
\hline
S & \text{Prop} \\
NP1(\text{Ben}) & VP \\
NP2(\text{the zither}) & TV \\
\text{Arg1 (BEN)} & \text{Pred [=Fa]} \\
\text{Arg2 (ZITHER)} & \text{Faa} \\
\text{ZITHER} & \text{PLAY}
\end{array}
\]

Given the grammatical architecture of AMG, one of the major functions of grammar is to draw these two autonomous representations together as closely as possible in such a way that Ben plays the zither means what it means but not what The zither plays Ben nor Mary tuned the zither mean. For this purpose, Sadock advances the following correspondence conditions as foundational principles in AMG. Namely, (i) an S (in syntax) corresponds to a Prop (in F/A), and (ii) an NP (in syntax) corresponds to an Arg (in F/A). If there is a VP node (e.g. English), it typically corresponds to a Pred [=Fa] in F/A as well. This categorial redundancy, or the relevant “Categorial Correspondence Conditions,” is summarized in the Table below (pp. 26–27).

$$\text{(2)}$$

<table>
<thead>
<tr>
<th>Syntax</th>
<th>F/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Prop</td>
</tr>
<tr>
<td>NP</td>
<td>Arg</td>
</tr>
<tr>
<td>(VP)</td>
<td>Pred [=Fa]</td>
</tr>
</tbody>
</table>
Correspondence conditions are not limited to categorial correspondences alone. They must also extend to relative structural positions of corresponding elements between modules, here, syntax and F/A. Sadock calls such conditions “Geometrical Correspondence Conditions” (p. 35), by which hierarchical relations such as dominance and c-command are maintained so as to assure that Ben plays the zither (in syntax) is mapped onto BEN PLAYS THE ZITHER (in F/A), but not THE ZITHER PLAYS BEN nor MARY TUNED THE ZITHER.

(3)

<table>
<thead>
<tr>
<th>Syntax</th>
<th>F/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP1</td>
<td>Arg1</td>
</tr>
<tr>
<td>NP2</td>
<td>Arg2</td>
</tr>
</tbody>
</table>

For expository purposes, the numerals 1 and 2 are used to represent intimate structural relationships between NP and Arg; NP1 and Arg1 are respectively the NP immediately dominated by an S, and the Arg combined with a Pred to form a Prop. Likewise, NP2 is a verb complement noun phrase and Arg2 is an internal argument. To put it in other terms, both the Categorial and Geometrical Correspondence Conditions strongly demand isomorphism between the grammatical modules, and this grammatical force is presumably universal within and across languages.

Having said that, I should hasten to draw the reader’s attention to the automodular thesis that syntax and semantics (among others) are each areas with their own generative capacities. What this suggests in the present context is that the syntax and the F/A of a lexical item are by no means required for producing identical structural representations. Indeed, a lexical item is allowed to produce a distinct representation module by module, so that there can naturally be mismatches between the syntactic and F/A modules. In what follows, I will examine raising and control verbs to briefly illustrate this point.

Consider, first, the raising-to-subject verb appear. While part of the syntax subcategorizes the verb as taking an infinitival VP (Melanie appears to limp), the predicator is a propositional modifier in the F/A structure (Fp below is the F/A counterpart of raising verbs, a one-place operator). There is thus an intrinsic discrepancy between the structural strings in syntactic and F/A representations of appear.
The principal function of the Categorial and Geometrical Correspondence Conditions in (2) and (3) is to provide harmonic alignment between the syntax-and-F/A structural discrepancy; S1 will align with Prop1, and VP[to]2 with Pred [=Fa] LIMP. Furthermore, since the Inter-modular Lexical Correspondence Principle assures that both the verb appear (in syntax) and the propositional modifier APPEAR (in F/A) correspond to each other, the remaining mismatch is the geometrical incongruence between NP (Melanie) and Arg (MELANIE). No movement whatsoever is involved here, but exactly the same effect of the raising-to-subject analysis is achieved by a set of interface principles that limits the degree of structural discordance between the autonomous syntactic and F/A representations. All raising verbs (except for factives) are also subcategorized for a clausal complement in syntax ([S1 It appears [S2 Melanie limps]]. In those cases, Prop2 in F/A (=4)) perfectly matches the clausal complement (=S2), so the pleonastic it, syntactically an NP but semantically a null Arg, is invoked for the otherwise unfilled syntactic subject position—which must be filled. Thus, this automodular description of raising-to-subject practically obviates Extraposition as it is found in the transformational literature.

By way of further illustration, suppose that this automodular treatment of raising verbs is on the right track. Then, the sole difference that subject-controlled equi verbs have is undoubtedly in their F/A structure, for their syntax is exactly the same as that of raising-to-subject verbs (i.e., They try to escape). Below are the syntax and the proposed F/A structure, where RHO (pronounced /rou/) is an Arg with no syntactic or phonological value (the index is to represent co-reference).
The reader may wonder why RHO is posited in F/A. It is automodularly needed to construct a well-formed F/A structure. Since the two predicates, TRY and ESCAPE, work together for the meaning of the sentence (=(5)), both of them have to combine with the correct sort of Args. The semantic subjects are identical between TRY and ESCAPE, but nevertheless, the understood subject of ESCAPE has to be represented in F/A despite having no representation in the syntax and phonology. The defective lexical item RHO, a mirror image of pleonastic it, is thus used to represent such an indexed subject (pp. 47–48). The exact distributions of RHO and the way its controller is determined are subject to further research (here, the controller is a lexical property of try: see Kathman (1994) for control phenomena). However, it’s worth mentioning that the F/A-semantic control proposed is diametrically opposed to PRO found in mainstream generative grammar, and AMG correctly characterizes control phenomena as syntactically monoclausal yet logico-semantically bi-propositional.

Chapter 2 also provides automodular treatments of cyclic interaction (e.g., They seem to have tried to escape), raising-to-object verbs, and object-controlled equi verbs (pp. 49–60), along with quantificational and existential expressions (pp. 60–66).

Chapter 3 (pp. 73–110) turns to “Role Structure” [RS], which may be identified with event structure and/or cognitive semantics in other frameworks. Sadock argues that while F/A represents purely combinatorial aspects of meaning, natural language is sensitive to certain aspects of the cognitive contents of Args, and there are some significant generalizations that cannot be captured unless reference to real-world “meaning” is made in the realm of grammar (e.g. passivizability, differential case-marking). RS is put forth to represent such a conceptual semantic level, where event types (i.e. the meaning of the predicator) and notions like Agent and Patient are structured to indicate truth relations such as entailment, synonymy, and contra-
diction. Drawing insights from Dowty (1991) and Faarland (1995), Sadock proposes that, in addition to a subordinate event (required by BELIEVE-type predicates), only three participant roles, proto-agent [AGT], proto-patient [PAT], and ancillary participant [ANC], are probably sufficient for the grammar of RS (i.e. Event → Type, Role, (Role), (Role), (Event); Role → AGT/PAT/ANC). The default Categorial and Geometrical Correspondence Conditions are accordingly extended to include the RS representation, as in the following Tables (pp. 78–81).

(6) Categorial Correspondence Conditions (default)

<table>
<thead>
<tr>
<th>Syntax</th>
<th>F/A</th>
<th>RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Prop</td>
<td>Event</td>
</tr>
<tr>
<td>NP</td>
<td>Arg</td>
<td>Role</td>
</tr>
</tbody>
</table>

(7) Geometrical Correspondence Conditions (default)

<table>
<thead>
<tr>
<th>Syntax</th>
<th>F/A</th>
<th>RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP1</td>
<td>Arg1</td>
<td>AGT</td>
</tr>
<tr>
<td>NP2</td>
<td>Arg2</td>
<td>PAT</td>
</tr>
</tbody>
</table>

By separating the RS level from the F/A level, AMG is capable of analyzing a sentence as a representation of two different kinds of semantics. For example, the agentless passive sentence Every tree was purposely felled is unambiguous contrary to its agentful counterpart Every tree was purposely felled by someone. From an F/A perspective, this implies the absence of ARG (associated with AGT), but the agentless passive sentence nonetheless makes the unstated AGT cognitively salient, allowing the adverb purposely to become interpretable (cf., RS*Every tree purposely felled (where “RS*” means semantically anomalous)). The presence of another defective lexical item <<AGT>> (unspecified agent) in RS is thus suggested in analogy to pleonastic it (in syntax) and the referential item RHO (in F/A). Of importance here is that the resemblance between active and passive sentences is automodularly captured at the level of cognitive content (or RS), but without drawing on similarities to syntactic or logical (or F/A) structure. In response to the analytical and empirical problems of attributing co-reference requirement to F/A structural configurations alone (e.g., John looks like he’s/*I’m ill; Mom said to come home), Sadock elevates RS to a fundamental linguistic construct and provides persuasive accounts of various grammatical phenomena from a RS perspective: included here are the subject-control verb promise, Visser’s generalization, controller shift, pseudo-passives, commercial transaction verbs such as buy and sell, the locative
alternation (hay-wagon), psych-predicates, and unaccusatives.

Chapter 4, “The Linear Order Component” [LOC] (pp. 111–146), coupled with Chapter 7, “Conflict Resolution” (pp. 205–222), concerns the linearization of constituents. In AMG, each module is an order-free phrase structure grammar. While the modules specify hierarchical relations among their constituent members (i.e. a mother and daughters), the linear order of the members are not specified within these modules. The LOC is hence the province of a separate dimension of representation, which, except for some language-particular ordering requirements (e.g. head-initial for English), does nothing more than to permit units of language to occur in a sequence (pp. 111–113). The separation of linear order from constituency may remind the reader of ID/LP rules in Gazdar et al. (1985), but ordering relations in LOC are more general in that they are not limited to phrases that are lexically headed, that is, to the sisters of constituents.

More specifically, the template-like LOC allows word order to be determined by competition among distinct demands of multiple grammatical modules, with some additional consideration given to rhetorical forces, processing efficiency, relative weight of constituents, iconicity, and prosodic factors. Sadock thus does not make a stronger contention for word order universals than pointing out the presence of “the Great Chain of Speaking” (p. 207), which ranks phonology, linear order, morphology, syntax, and semantics in this order, and enables a higher-ranked module’s requirements to prevail when a lower-ranked module’s requirements are at odds with the former. For example, the linear order requirement of English wh-interrogatives almost always overrides the syntactic requirement that places a wh-element in the object position (e.g., who did he dream that he met __?). Given that every sentence is constrained by the tri-modular Categorical and Geometric Correspondence Conditions, the wh-fronting, a requirement of LOC, necessarily violates the default harmonic alignment among the syntactic, F/A, and RS modules simultaneously. Nevertheless, this disharmony is allowed in the grammar of English because of the degraded acceptability of who did he have a dream that he met __? with more crossing association lines and the complex NP constraint violation (* who did he mention a dream that he met __?). Merely descriptive and perhaps too simplistic as this account may seem, Sadock conjectures that a sentence may be judged less acceptable to the degree that geometrical incongruence, or the number of crossing association lines, increases among alternative modular representations of the identical expression (pp. 142–146). If so, the source of our graded acceptability judgment lies not in factors relating to the individual
speaker’s performance but rather in the structural redundancy of grammar—an intriguing insight obtained by defying the methodological practice of Chomskian linguistics.

Chapters 4 and 7 also offer a model for dealing with other island phenomena and heavy constituent shift.

Chapter 5 discusses “Morphology” (pp. 147–180) as well as “Morphophonology” (pp. 150–154). In the automodular view of grammar, the word word is multiply ambiguous because a lexeme specifies distinct kinds of values in its multiple grammatical modules (there can be a syntactic word, an F/A-semantic word, a RS-semantic word, and a phonological word). Of concern in this chapter is the purely morphological word that is productively formed, as well as the phonological realization of productive morphological alternations (e.g. /x/ → /x-d/ for inflectional past tense). Much of what is traditionally called morphology is restricted to a finite list of relations in the lexicon, so that productive morphological facts are treated somewhere else, often within syntax. In contrast, all word formation is uniformly made in a completely independent manner from syntactic, semantic, and phonological information and influences in AMG. This is precisely because generativity is not restricted to a particular module, and morphology is, in the end, not syntax.

Two basic constituents that characterize this purely morphological module are “word” and “stem,” from which several morphological structures are built, again, with an order- and context-free phrase structure grammar, or simple rules of combination (pp. 147–150).

(8) a. stem → stem, M [morphological derivation]
    b. stem → word, M [morphological inflection]
    c. word → word, M [morphological cliticization]
    d. word → stem, M [morphological derivational cliticization]

If an element M (e.g. -er) is added to a stem (walk) and results in forming a stem (e.g. walk-er), we call such a process morphological derivation (= (8a)). On the other hand, if the same process produces a word (e.g. walk-ed), it is called morphological inflection (= (8b)). It should be noted that the morphological category of a lexical item does not always have to match its syntactic category, for each is separately generated in a different module along with semantic and phonological information. This demarcation between morphology and syntax enables us to define near, for instance, as morphologically an adjective (e.g. nearer) yet syntactically a preposition (e.g. The bus draws nearer its destination).

Morphological operations like past tense formation are also seen in the
past participle and passive formations. From a purely morphological standpoint, all of these word formations are similar in that they form morphological words. But, while the past participle form is morphologically identical to the passive participle (e.g. V-en), the latter, but not the former, undergoes simultaneous alternations in syntax and the F/A of its lexical entry, thereby yielding a partially distinct lexical item (see below). This lexical process is automodularly formulated as a lexical rule that captures the relationships between two sets of lexical entries in the lexicon (p. 152).

(9) lexical rule: agentless passive (English)

\[
\text{syntax: V in } [\text{VP } \_ \text{NP, } \Psi ] \rightarrow \text{syntax: V}[\text{PAV-P}] \text{ in } [\text{VP } \_ \Psi ]
\]

\[
\text{F/A: } F_{\phi a} \rightarrow \text{F/A: } F_{\phi}
\]

\[
\text{RS: TYPE, AGT, } \chi \rightarrow \text{RS: TYPE, } \text{<<AGT>>, } \chi
\]

\[
\text{morphology: stem } [V] \rightarrow \text{morphology: word } [V, \text{PST-P}]
\]

This example is given to give the flavor of an automodular analysis: the point of this lexical rule is that if there is a lexical item that satisfies the left side (e.g. many transitive verbs), there is another lexical item that lacks the number of NPs (in syntax) and Args (in F/A) by one while the AGT in RS is also backgrounded. Recognizing and providing productivity in morphology makes the lexical entries more complex than they were widely considered to be, but the advantage is that it results in a much simpler syntax with terminal nodes phrasal (XP), since lexical items under the present configuration are the very loci of formalizing meaningful constructions (i.e. actually creating phrasal elements). Much of Chapter 5 is devoted to details of such productive morphology and the poly-redundant generative lexicon, with special reference to auxiliary verbs including do-support, have, and negation.

In Chapter 6 “Gaps and Other Defective Elements” (pp. 183–204), Sadock deals with elliptical phenomena discussed under the rubric of VP deletion (pp. 187–194), comparative deletion (pp. 194–198), and the tough construction (pp. 198–204). Since the derivational process of “deletion” cannot be modeled in AMG, a deletion is instead characterized as “a gap” that makes its presence known at some level of structure but has no corresponding element in phonology. While what is not pronounced must always be understood semantically, how much syntactic and/or morphological information we need for a gap is the subject of many polemics and discussion in this chapter. Technical discussions would take us too far afield here, but in a nutshell, it is proposed that a gap is a lexical item that is positively present in the syntactic or morphological module (with its phonological domain null).
Chapter 8 “Some Final Observations” (pp. 223–230) touches on the history of the automodular program and points out a curious parallelism to the Simpler Syntax thesis that Ray Jackendoff and Peter Culicover have recently proposed on quite independent theoretical grounds.

3. Conclusion

Overall, Sadock successfully presents his long-held idea that grammar is specified by a handful of completely autonomous parallel modules, supporting this with the major syntactic phenomena of English. No prior knowledge of highly technical syntax and semantics is presupposed. Sadock often emphasizes similarities and dissimilarities between derivational and automodular approaches throughout the book, which will give the reader deep insights into the design of natural language, even if s/he has differences in her/his theoretical persuasion. In consequence, this book is intended for everyone. One limitation of this book is that, while Sadock discusses the ways that arbitrary differences across the grammatical modules are pulled and aligned to form actual utterance, it is not clear what principle allows (or disallows) particular mismatches in the grammar of English. Thus, astute formalists might find the automodular account of English “merely descriptive,” and this is where further research is called for.\(^1\) Despite this shortcoming, I have no doubt that this book will remain an important and insightful book for syntactic research in the 21st century.

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\(^1\) The interested reader is referred to Ueno (forthcoming, 2014) for such an attempt.
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