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REVIEW ARTICLE

Minimalist architectures

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Ray Jackendoff, *The architecture of the language faculty*. Cambridge, MA: MIT Press, 1997. Pp. xiv + 262.

In *The architecture of the language faculty* Jackendoff responds to the Minimalist Program (MP) of Chomsky (1995).[1] There are three major themes: the conceptual foundations of MP and its historical antecedents; the interfaces between syntactic structure, phonetic structure and conceptual structure, and the nature of the lexicon. The basic approach is that of Jackendoff (1983, 1990), with roots going back at least as far as Jackendoff 1975. In the first chapter Jackendoff sets out the more or less standard views about universal grammar and subjects them to a critical analysis. Chapters 2–4 focus on the various 'interfaces' between levels of representation, and on how the interface relations are reified in individual lexical entries. Chapters 5–7 explore the properties of various types of lexical entries and the relations between them. Chapter 8 concludes with a speculative essay on the relation between language and thought.

This book is a rich compilation of observations, analyses, suggestions, perspectives, speculations and proposals. One could easily write a review at least as long as the book, developing and responding to the many ideas that it contains. Since space here is limited, I will concentrate on the main conceptual and foundational issues that are addressed by the book. In many ways, Jackendoff's work points to significant departures from classical perspectives on the organization of grammar. I will focus some attention on those areas where even more radical steps might be worth pursuing.

1. The minimalist challenge

The advent of minimalism in the mainstream of syntactic theorizing highlights an interesting shift in scientific values. At least from the Aspects theory through Principles and Parameters theory it has often been remarked

[1] I would like to acknowledge the useful comments on an earlier draft of this review by Robert Borsley and an anonymous reviewer.

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that the syntax of natural language has some surprising, or at least abstract, non-obvious properties. One example is the transformational cycle, another is rule ordering, another is the ECP, and so on. Such properties are not predictable on the basis of 'common sense', and do not appear in any way to be logically necessary. The fact that they appear to be true of natural language thus tells us something, albeit indirectly, about the architecture of the language faculty in the human mind/brain. Or so the argument goes.

With the MP we see a shift to a deep scepticism about formal devices of traditional syntactic theory that are not in some sense reducible to 'virtual conceptual necessity'. Such a perspective thus explicitly rules out precisely the major theoretical achievements of the past. All of them. One fundamental challenge of minimalism from this perspective is to continue to account at least for the known phenomena of natural language while the descriptive apparatus has been radically reduced. It is not clear at this point to what extent such a 'conceptual minimalism' will produce revealing accounts of linguistic phenomena; it is possible in any case that it will shed some light on why grammars have the form that they do.[2]

Another aspect of the minimalist challenge can be characterized in terms of the mapping between sound and meaning, which we conventionally call 'syntax'. It is plausible that aspects of syntax are explained in virtue of the properties of the independent representations of sound and meaning into which syntactic representations are mapped. It is logically possible that there is some residue belonging to autonomous syntax per se. A plausible minimalism would seek to reduce this residue as much as possible, as suggested by Chomsky 1995, perhaps even entirely, as in the work of Dowty 1996. Conceptual minimalism, as characterized above, would take it as a desideratum that the autonomous residue is null.

A somewhat different view is one that takes the grammar not to be minimalist in some formal sense, but minimalist with respect to the linguistic experience of a language learner. The challenge is then to determine the minimal construction of Universal Grammar that will project a descriptively adequate mental representation of grammatical knowledge given sufficient linguistic experience.[3] The concerns here have a substantive empirical component, and are not purely conceptual. Elsewhere I have called this approach 'concrete minimalism' (Culicover 1998).

Jackendoff's approach is closest to this last one. He approaches the problem of determining the architecture of the language faculty 'from below' to determine the irreducible empirical constraints on a linguistic theory. For example, he argues in this book that the lexicon is not only the repository of idiosyncratic information about lexical items, it is the repository of regularities, semi-regularities, sound-meaning correspondences and mis-

[2] See Haegeman (1997) for discussion of this point.

[3] Culicover (1998) calls this approach 'concrete minimalism'.

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matches, and idiosyncratic information about individual phrases. But the (non-'syntactic') correspondence between sound and meaning that is represented in lexical entries is formally very similar, if not identical, to the ('syntactic') correspondence between form and meaning found in phrases and sentences. The upshot, he argues, is that minimalist syntax in the conceptual sense falls short of what a comprehensive linguistic theory has to account for.

This conclusion presumes that a linguistic theory has to account not only for the general and the regular, but also for the semi-regular and the idiosyncratic. Jackendoff makes the case that the semi-regular and the idiosyncratic are anything but marginal, accidental, and of no fundamental interest, even though they may not admit of particularly abstract characterizations. The architecture of the language faculty, on his view, must be capable of dealing with the full range of phenomena.[4]

2. The architecture

We can understand the phrase 'the architecture of the language faculty' in two ways. On the one hand, we can take it to refer to the structure of the actual device in the mind/brain that is responsible for the acquisition and use of language, the device in which knowledge of language is actually embodied. Call the architecture in this sense the 'Concrete Architecture', or CA. On the other hand, we can take it to refer to the organization of the linguist's description of the knowledge in the mind/brain. Call this the 'Abstract Architecture', or AA.

Suppose, as is customary, that we take linguistic theory to be a part of cognitive science, in the sense that it seeks to describe and explain a part of the mind/brain, the part that is concerned with language. On this construal of the enterprise of linguistic theory, the adequacy of one is closely linked to the adequacy of the other. Considerations such as the 'simplicity', 'generality' or 'elegance' of the AA, measured in precise ways, are valid as methodological tools only to the extent that they correspond to or illuminate some fundamental properties of CA.

By way of illustration, consider the following from Jackendoff's summary in Chapter 1 of the standard views about UG (Universal Grammar) and its relationship to language acquisition.

> What does UG consist of? Acquiring a mental grammar requires (1) a way to generate a search space of candidate mental grammars and (2) a way to determine which candidate best corresponds to the environmental input (i.e., a learning procedure). In principle, then, UG could involve either a

[4] We can contrast this view with the one expressed by Chomsky (1982: 68): 'I would see no point in studying grammar, if it did not turn out that there were a unifying, rather abstract explanatory theory'.

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> specified, constrained search space of a specialized, enriched learning procedure, or both. (5)

The metaphors of 'candidate', 'search' and 'determine' have been taken fairly literally in the literature (see, for example, Chomsky 1965 and Wexler & Culicover 1980). The standard, idealized, view is that of a device that selects from a set of available alternatives given a particular current state and a particular experience. But it is possible, perhaps even more natural, to think of language acquisition as carried out by an adaptive mechanism, one that lays down representations of linguistic knowledge piece by piece as a product of experience.[5] On such a view, for any sequence of linguistic experiences there is a development path or set of equivalent paths to a most highly valued grammar, in the sense of markedness theory (as in Chomsky (1965, for example; see also Battistella 1996). If the architecture of the end point of this development sequence embodies a computational system whose idealized description conforms more or less to some linguistic theory, then we would say that the AA of the language learning mechanism in the idealization must in principle be understood in terms of its conceptual dependence on the CA of the actual learning mechanism.

The relationship goes the other way, too. If we are right about how to characterize linguistic phenomena in grammatical terms, this tells us something about what CA looks like. An intriguing aspect of Jackendoff's general approach, and of a number of his specific proposals, is that certain plausible properties of AA have specific implications for CA, given certain assumptions about the latter and the about the relationship between the two. For example Jackendoff observes that his approach to the lexicon allows for and in fact requires a certain degree of redundancy, in contrast to Chomsky's idea of 'optimal coding'. Redundancy would permit the full representation of related lexical items, rather than representing the relationship between the two in derivational terms, for example. And, notes Jackendoff,

> Although perhaps formally not so elegant, a linguistic theory that incorporates redundancy may in fact prove empirically more adequate as a theory of competence, and it may also make better contact with a theory of processing. As a side benefit, the presence of redundancy may bring language more in line with other psychological systems, to my way of thinking a desideratum. (15)

[5] I am not suggesting here an empiricist view of language acquisition in which all knowledge of language is acquired by general purpose learning mechanisms, a point of view for which there is no good evidence. Rather, I am suggesting that the part of language that is acquired is not acquired instantaneously, but through an adaptive process. This is an empirical hypothesis about how the language acquisition device works. The instantaneous model of language acquisition (Chomsky 1986a) has proven to be an extraordinarily useful idealization for linguistic theory, but it does not lend itself to a satisfactory account of how language acquisition proceeds, in my view. See Culicover 1996 for some discussion.

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This last point is a crucial one. If we take seriously the idea that AA reflects CA, then the redundancy of the lexicon in the AA suggests that this part of the language faculty, at least, has an architecture that inherently allows for redundancy.

3. Interfaces

Consider the interfaces. A linguistic representation must be associated with the non-linguistic systems of motor-control, perception, and thought. In Chomsky's Minimalist Program two interface levels are distinguished, the 'articulatory-perceptual' and the 'conceptual-intentional'. Jackendoff argues in Chapter 2 that the proper way to characterize the first of these interfaces is in terms of 'correspondence rules' that relate phonetic and motor representations. Open to question are the nature of such rules (Jackendoff holds that they are not derivational), and the linguistic representations they are associated with. According to Jackendoff, phonology and syntax are related through correspondence rules, as are syntax and conceptual structure.[6]

In Chapter 2, Jackendoff argues for the independence of phonology and syntax on the grounds that syntactic and phonological primitives cannot be reduced to one another, and on the grounds that there are non-trivial mismatches between phonological organization and syntactic organization. It is conventionally held that syntax is the representation that mediates between sound and meaning. For Jackendoff syntax is a distinct level of representation.

Note that the greater the number of levels of representation, the greater the number of possible interface relations that either exist or must be explained away. One of the virtues of a minimalist approach is that it reduces the set of possibilities significantly. Pursuing this idea, one might plausibly question whether it might not be possible to understand 'syntax' as being embodied in the set of correspondences between sound and meaning, and not a distinct representation in the CA.[7] On such a view, a description of the linguistic knowledge (that is, the AA) could still usefully individuate syntax from sound and meaning, however.

Consider the idea that knowledge of language is embodied in a device whose architecture is that of an adaptive dynamical system, as suggested in Culicover (1996, 1998). As a learning device it has two key properties, from the present perspective. One is that it incorporates information about the relative frequency of instances, so that items (including pieces of structure)

[6] One would assume that there is also an interface between phonology and phonetics, although Jackendoff is not explicit on this point.

[7] In fact such an idea is not an entirely new one, having been articulated in various ways in variants of categorial grammar (Dowty 1996) and HPSG (Kathol 1995).

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that are encountered frequently have a more stable representation in the language faculty than those that are encountered infrequently. The other is that such a system generalizes locally when there are many similar elements that share a property. The regularity of the system thus corresponds closely, but not exactly, to the regularity of the input.

In order to illustrate how AA and CA could differ I will try to give an idea of what such a dynamical system might look like, recognizing that space limitations and the speculative nature of the approach inevitably mean that many more questions are raised than answered; for detail see Culicover (to appear) and Culicover & Nowak (in preparation). Suppose that linguistic knowledge is represented in the mind/brain as a set of TRAJECTORIES in a linguistic space (LSpace). Each word and grammatical formative in a sentence corresponds to some location in such a space, and the possible sentences are represented by trajectories that link such locations. Syntactic structure on this view is not represented as a property of the string of words, but in terms of the organization of the space in which the trajectories are represented. For example, syntactic categories correspond to regions of the space in which all words of the same category are clustered near one another. Phrasal categories are sets of trajectories that are anchored by a member of a lexical category (the head of the phrase).

A sentence of a phrase is a trajectory in LSpace, and a syntactic generalization is a set of trajectories that occupy a coherent region of paths in LSpace. For example, if V precedes NP in a language, then all trajectories corresponding to VP go from an element in the region where Vs are represented to the region of N, which anchors NPs. It is suggested in Culicover (1998) that a phrase structure representation for a phrase may be viewed simply as the symbolic description of a trajectory that passes through locations in the linguistic space that correspond to the traditional categories. For example, *cook the spaghetti* has the structure [$_{\text{VP}}$V NP], meaning that the trajectory passes through the location *cook* in the region of V, then to the location *spaghetti* in the region of N where first the determiner *the* is activated, and then the N *spaghetti* is activated. On this view, the organization of the trajectories is the concrete architecture that corresponds to the abstract architecture that is expressed in terms of phrase structure. Since there is structure in this representational system, movement and recursion must also be represented in principle, although the implementation is far from trivial.

LSpace simultaneously represents phonetic, syntactic and semantic properties of linguistic expressions. We may think of each level of linguistic representation as the projection of a trajectory in a multi-dimensional space onto a lower-dimensional space. On this view there are not distinct representations and mappings between them in the CA, only in the AA that seeks to describe the properties of LSpace in symbolic terms, as correspondences between properties of different types that hold of a particular system.

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Syntax as a distinct representation disappears in the dynamical systems architecture. In terms of the dynamical system, it makes no sense to speak of grammar-internal interfaces, since the trajectory is the only object in LSpace. (This is like saying that the cylinder is the 'interface' between the representation of the object as a circle in the x,y plane and as a rectangle in the x,z and y,z planes.) In effect, the trajectory itself is the simultaneous 'interface' between all properties of a linguistic expression.

Regarding the conceptual-intentional interface, Jackendoff argues in Chapter 3 (as he has elsewhere) that there are also correspondence rules that mediate between syntactic and conceptual structure representations. His main point here is that conceptual structure is not simply a transformed version of syntactic structure, but an independent representational system with its own primitives and rules of organization. The arguments are similar to those made for the articulatory-perceptual interface: the conceptual structure system has its own primitives and rules of organization, and is not isomorphic to the syntax in either respect. Again, Jackendoff's conclusion follows directly if there is no syntactic representation per se outside of the organizational structure of the correspondences between sound and meaning.

An important aspect of Jackendoff's view of conceptual structure is that 'conceptual structure [is] a central cognitive level of representation, interacting richly with other central cognitive capacities' (33).[8] In this regard conceptual structure is the counterpart to 'sound' in the 'mapping between sound and meaning', if we understand 'sound' more generally as 'sound or gesture'. If motor and perceptual events are related to the linguistic system at the level of phonetics, then by the same logic conceptual structures should be related to the linguistic system at some equivalent level, for example 'LF' in some sense. If phonetics is organized by an underlying phonology, then 'LF' is organized by an underlying syntax. For Chomsky 1986b and elsewhere, LF is in fact the (linguistic) interface with (non-linguistic) meaning. It does not seem that a reinterpretation and refinement of the roles of the various interface levels will avoid the classical organization of the linguistic system.

Although this conclusion seems to follow from the logic of Jackendoff's approach, he is nevertheless critical of Chomsky's understanding of LF as a representation that encodes those aspects of syntactic structure that are relevant for semantic interpretation. The primary motivation for Jackendoff's view is that semantic composition is not 'syntactically transparent', in the sense that the meaning of an expression is a simple function of the meanings of the parts, arranged in a particular syntactic structure. The arguments against syntactic transparency, given in Chapter 3, involve primarily (i) coercion (in the sense of Pustejovsky), as in *I'll have a coffee = I'll have a cup of coffee*; (ii) reference transfer, as in *The ham sandwich over there in the*

[8] For a contrasting view, see Bouchard (1995).

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corner wants some more coffee; (iii) the intensionality of modifier/head structures, such as Jackendoff's *fast car/fast typist/fast road*; and (iv) the role of conceptual structure in determining anaphor and variable binding.

The cases that Jackendoff summarizes in this chapter are interesting ones and must certainly be taken into account by any treatment of interpretation in a grammar. It is not entirely clear, however, that they undermine the view that there is a syntactic representation that encodes semantic properties of a sentence. It seems to be a matter of 'conceptual necessity' that the semantic properties of a sentence are somehow encoded in its syntactic structure, since it is through the syntactic structure that the sound-meaning correspondence is mediated. The question is, what aspects of meaning are explicitly encoded in the syntactic representation per se and what aspects are encoded in the correspondence rules that relate syntax to conceptual structure. To say that expressions of the form $[_{NP}[_{Adj}\,fast]N]$ have the conceptual structure representation 'fast for an N' is to say that this aspect of the meaning is encoded in the syntax. That NP may be used to refer to 'the person who is associated with NP' is encoded in the correspondence rule mapping the NP to its referent in conceptual structure. Similarly, it does not seem to be too far-fetched to say that *a coffee* can have the conventional (i.e. lexical) meaning of 'a cup of coffee'.

Another of Jackendoff's examples is *Mary began the book = Mary began to read the book* or more generally, *Mary began* [TO PERFORM CONTEXTUALLY APPROPRIATE ACTION ON] *X*. There does not seem to be any reason in principle why lexical entries cannot contain variables that must be contextually specified as part of the mapping between syntactic structure and conceptual structure. The fact that the nature of [TO PERFORM CONTEXTUALLY APPROPRIATE ACTION ON] *X* depends on the nature of X does not mean that the form of the sentence does not determine its meaning.

Another question is whether the same level of syntactic representation participates in the correspondence with PS and the correspondence with CS. In earlier syntactic theories there were several levels of syntactic representation, each of which in principle could determine properties of PS and CS. Jackendoff argues in Chapter 4 that there is a single such level, and that it is 'S-structure'. (In this regard his approach is close to other non-derivational theories such as GPSG, HPSG, and within the Chomskyan tradition, Koster 1987 and Brody 1995.) The conclusion that there is a single level follows from considerations of simplicity: it is computationally more complex to say that an element A in syntactic representation X and an element B in syntactic representation Y are the 'same' element A/B for the purpose of establishing the correspondence of A/B with a PS and a CS.

Jackendoff also argues that the relevant level for both PS and CS is S-structure. On this view, there can be no syntactic operations that affect the phonological form of a sentence but not the conceptual structure, and VICE

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VERSA. This last point is emphasized because it is equivalent to the claim that there is no level of LF, a view shared by other non-derivational theories (see above). The non-existence of LF is of course a welcome conclusion from the general perspective of minimalism, but it does raise the question of how to deal with the vast array of phenomena that LF has been implicated in, ranging from quantifier scope (May 1985) to 'covert' head-movements.

Jackendoff argues in Chapter 4 that quantifier scope is in fact a CS phenomenon, given that the relation 'α binds β' that appears to hold between syntactic constituents actually can hold between non-constituents when particular lexical items are involved. For example, the verb *buy* expresses two CS binding relations, one between the buyer of an object and the source of the money, the other between the seller of the object and the recipient of the money, even when the seller is not expressed overtly (as in *Robin bought the book*). It is true, of course, that the syntactic structure determines the logical relations expressed in CS, but these relations cannot be mirrored in the SS representation.

On the subject of covert head-movements Jackendoff has nothing to say. A natural extension of his analysis is based on the observation that the primary motivation for such movements, in the MP at least, is to preserve the principle that all features must be discharged at some point in a derivation, either prior to SPELL-OUT (if they are 'strong' features) or after SPELL-OUT, i.e. at LF, if they are 'weak' features. In either case there is an adjunction of some element, say V[+F], to a functional head H[+F] in the configuration [H X V Y]. Provided that this LF head movement has no semantic consequences (unlike quantifier raising), this use of LF seems to be purely formal. A plausible alternative interpretation of 'strong' and 'weak' is that in S-structure V[+F], where [F] is 'strong', appears in the position marked by H; that is, the structure is [V X Y]. When [F] is 'weak' it appears in the 'underlying' or 'canonical' position; that is, the structure is [X V Y]. If such movements can be dispensed with, then Jackendoff's elimination of LF may go through.[9]

4. Lexical entries

In Chapter 4 Jackendoff also discusses the lexical interface: 'the means by which lexical entries find their way into sentences' (82). On his view, a lexical entry is a triple of phonological, syntactic and semantic features, with correspondences between them. '[T]he formal role of lexical items is not that they are "inserted" into syntactic derivations, but rather that they license the correspondence of certain (near-) terminal symbols of syntactic structure with phonological and conceptual structures' (89–90). In effect, a lexical item

[9] The idea that there is no covert movement is consistent with minimalist approaches in which SPELL-OUT applies to LF, e.g. Brody 1995.

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is a little chunk of language, formally indistinguishable from the phrasal and sentential chunks.

A simple lexical entry is one that associates minimally structured phonological, syntactic and semantic representations, such as *cat*. The phonological representation corresponds to the sound of the word, the syntactic representation represents its syntactic features, including category, and the semantic representation gives the corresponding conceptual structure. The formalism allows in principle for each representation to be unbounded from above or below. For example, Jackendoff proposes that expressions such as *Hello* simply lack syntactic representations (and perhaps CS representations). Since each representation may have structure, the possibility exists to establish correspondences between the components of phonological, syntactic and conceptual structure representations, as well as between the representations themselves. This flexibility in turn gives rise to the possibility of 'mismatches' between representations, a point to which I return below in section 4.2.

On Jackendoff's doctrine of Representational Modularity, each representation that participates in a correspondence is licensed not through the correspondence, but in terms of well-formedness conditions stated over the representation. In contrast, in a strictly derivational theory in which syntax holds a privileged position (a 'syntactocentric theory' in Jackendoff's terms), the well-formed phonological and semantic representations are derived from the syntactic representations, and are in addition possibly subject to component-specific well-formedness conditions. His view is that

> there are three independent sources of discrete infinity: phonology, syntax, and semantics. Each of these components is a generative grammar in the formal sense, and the structural description of a sentence arises from establishing a correspondence among structures from each of the three components. (15).

4.1 *Unpredictability*

Chapters 5–7 deal with idiosyncracy in lexical representations. The question is, How do we handle the unpredictable knowledge about meaning associated with words and phrases? Jackendoff's view is that the lexicon is the repository of all knowledge about $\langle PS, SS, CS \rangle$ triples that is not rule-governed (i.e. by the syntax). It follows that the lexicon is not restricted to words, since there are phrases and bound morphemes that participate in such triples. On the other hand, there are words that are perhaps not stored in the lexicon, i.e. those whose form, syntactic properties and meaning can be computed entirely on the basis of their morphological structure.

A prime example is English derivational morphology. Jackendoff says 'the word *bananas* does not have to be listed in the lexicon, but the word *shelve*

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does' (1996). *Bananas* is the completely productive plural of *banana*, while *shelve* is the semi-productive verbalization of *shelf*. Completely productive morphology is the syntax of words, just as 'syntax' is the syntax of higher-level categories. But, as Jackendoff shows, it is difficult to separate out the productive part of semi-productive correspondences in the actual construction of a lexicon without in the end fully specifying all of the information that adheres to a lexical item, regardless of the degree of productivity. He concludes, therefore, that the degree of productivity is really a measure of the generality of the information in an entry with respect to other entries in the lexicon, and is not a qualitative architectural difference in how the forms are represented.

Recall that Jackendoff's general proposal regarding the architecture of the language faculty is that the organization of linguistic knowledge is not a matter of aesthetics or economy in an abstract sense, but is an empirical question with psycholinguistic underpinnings. In fact, he discusses psycholinguistic evidence bearing on the organization of the lexicon, citing results that are consistent with the assumption that irregular (verb) forms are stored and regular forms are generated on line (122). But note this evidence does not actually say anything about the architecture of this part of the language faculty, simply how it behaves with respect to frequency and with respect to regularity and irregularity.

Interestingly, we can explain Jackendoff's conclusions about AA from the dynamical systems perspective on CA. Suppose that all forms are represented in the part of the language faculty that contains 'lexical' knowledge as trajectories in LSpace. The representation for a regular form is different than that of an irregular form, in that the regular form is represented in a region of LSpace that is densely connected, so that forms that are rarely used entail trajectories that fall within a region of flow. Irregular forms are represented in a distinct region of LSpace where there is no broad region of flow.

We may think of this organization of LSpace in the following way: The plural in the regular case corresponds to a trajectory through the region associated with [s], while in the irregular case there is a distinct trajectory associated with *plural*. Figure 1 illustrates.

The plural is a region of the space that correlates with the PLURAL interpretation. Trajectories pass through this region to end with one of three 'tail' forms, two of which are shown here. An irregular plural is deflected to a unique or highly idiosyncratic tail. An entirely suppletive form would of course not have any overlap in the trajectories for singular and plural.

The methodological issue that arises here, one that is central in the minds of most linguists, is that of 'capturing generalizations'. Presumably, a regular phenomenon requires a rule and an irregular one does not, which should be represented by a difference in AA. But this does not mean that there are differences in the representation of individual cases in the CA. It may be simply that the representations for regular cases are organized

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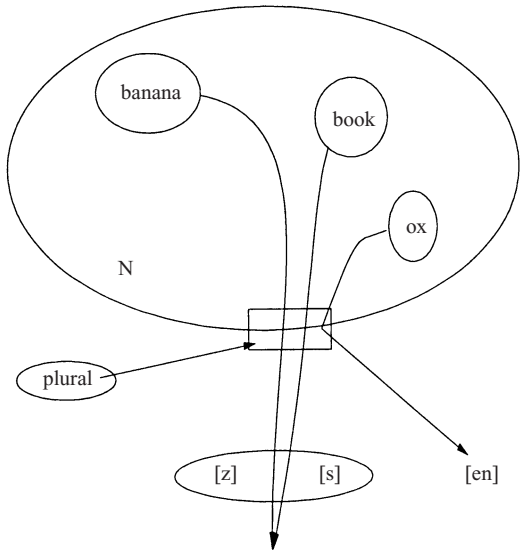


Figure 1
Plural trajectories

differently WITH RESPECT TO ONE ANOTHER than those of the irregular. In terms of the dynamical system, a generalization, or a 'rule', is the reorganization of a particular region in the space, so that arbitrary trajectories that have never been experienced are nevertheless indistinguishable from those on which the generalization is based, e.g. they acquire the same weight, while irregularity is a dissociation of trajectories in the space, the opposite of saturation. Thus, as suggested in Culicover 1998, grammar itself is not represented symbolically in LSpace, but is embodied in the configuration of LSpace.

4.2 *Mismatches*

One obvious question about Jackendoff's characterization of linguistic knowledge in terms of correspondences is whether there can be mismatches. On the view of lexical entries as triples ⟨PS, SS, CS⟩, it is in principle possible that a very simple CS may correspond to a complex PS and SS, that a simple SS may correspond to a complex PS and CS, that a simple PS may correspond to a complex SS and CS, and so on. In part this seems correct. For instance, idioms display close PS-SS correspondences, while the associated CS may be partly or entirely unanalyzable with respect to SS. In the case of an irregular verb (e.g. *went*) the simplex phonological representation corresponds to a syntactic representation Verb + Tense and a corresponding semantic representation PAST(GO).

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On the other hand, there appear to be limits on the extent to which one representation can diverge from the others, that is, limits on the idiomaticity of the ⟨PS, SS, CS⟩ correspondences. The examples discussed by Jackendoff suggest that there are at least four kinds of mismatch. One is of the *Hello* type, where a word lacks syntactic category and a literal interpretation. The other three lie in the SS-CS interface. One is where the meaning of a string of words is associated with the entire phrase, and is not a function of the meanings of the individual items. An example is *take NP to the cleaners*, meaning 'get all of NP's money'. The third is where the meaning of the phrase is more than is literally expressed by the individual items, as in *buy* and *begin a novel*.[10] The fourth is where the SS and the CS differ in configuration, as in the case of subordinating *and* (Culicover & Jackendoff 1997).

It therefore appears that characterizing the ⟨PS, SS, CS⟩ correspondences simply in terms of indices that match up the corresponding parts may not offer a sufficiently restrictive view of the architecture. Notice that the picture is significantly simplified if we take the correspondence to be just ⟨PS, CS⟩, where the syntactic structure is not a distinct representation, but 'embodied' in the rules of correspondence. On such a view, the primitive elements in the linguistic architecture are chunks of sound on the one hand and chunks of meaning on the other. The syntax on this view is a level of organization of the space in which these sound/meaning pairs are represented, not a distinct symbolic representation. It is possible on this view to have a correspondence between parts of the PS and parts of the CS that produces a PS-CS correspondence. Or it is possible that the correspondence holds simply between a entire complex PS and an entire CS but not the parts, which amounts to idiomaticity.

This interpretation of the architecture of the language faculty is hyperradically minimalist in that it eliminates SS entirely as a representation. On the other hand, it does not deny the existence of syntactic structure per se: it interprets it precisely in terms of the organization of the LSpace in which linguistic expressions are represented.

It is not clear that Jackendoff would want to go this far. But on the other hand, it is noteworthy that his book, entitled *The architecture of the language faculty*, has much to say about phonology, morphology and semantics, but very little to say about syntax as we commonly think of it. It may even be that syntactic structure makes an appearance in ⟨PS, SS, CS⟩ as a distinct level of representation for much the same reason as syntax is taken to be central in a derivational theory – as a matter of historical habit, not as a matter of empirical necessity.

[10] We might speculate that CS representations that correspond to no PS are also logically possible – they are inexpressible ideas.

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