Mental Activity, Memory, and Context

Syntagm and Discourse: Linearity in *Langue and Parole*

The "receptive" and "co-ordinative" faculties that Saussure refers to in the quotation which I discuss at the beginning of the previous lecture refer to the ways in which stimulus information — e.g. speech sounds–in the environment is picked up by the speaker's sensori-motor activity and then selectively correlated with groups of neurons in the individual's brain. This resonates very well with Edelman's discussion of the ways in which the world is selectively mapped onto repertoires of neural groups (see Lecture 6, Section 2). Saussure points out that it is "by means of" the receptive and co-ordinative faculties that " imprints *[empreintes]* which manage to be perceptibly the same for everyone" are found in the individual's brain. That is, the two faculties specified here are not to be confused with language itself. Rather, they designate, to borrow Edelman's terminology, the mapping of one's experience of language in the world onto the brain. Saussure's claim that "verbal images" are stored in each individual is less than exact in terms of modern brain science. More accurately, our current understanding of the brain tells us that what is stored are rich patterns of association which can be activated according to specific contextual requirements. Nevertheless, Saussure's formulation goes in the right direction. He understands that language is not be confused with either the receptive or co-ordinative faculties in the same way that it is not to be confused with either the world or neural repertoires in Edelman's theory. Importantly, Saussure also distinguishes between two distinct spheres which serve to generate "a certain order of values" (*CLG:* 170) in the language system. This is the distinction between syntagmatic and associative relations. These two kinds of relations characterise the internal

workings of the language as a system of values. In my view, they constitute an interface between the world and neural repertoires such that patterns of association stored as neural networks in the brain may be activated and enabled to emerge as context-dependent linguistic activity. This means that they actively orient particular associations of concept and acoustic image in relation to the higher-order social-semiological system in and through which speaker and listener are linked to each other in the circuit. In keeping with his view that *langue* is 'imprinted' and 'stored' in the brains of each of the individuals who belong to some "ensemble of individuals", Saussure argues that the two types of relations, both of which are "indispensable to the workings of *langue*" (*CLG:* 170), constitute "two forms of mental activity" (ibid.). He introduces the notion of syntagmatic relations as follows:

On the one hand, in discourse, words contract among themselves, in virtue of their enchainment, relationships founded on the linear character of langue, which excludes the possibility of pronouncing two elements at the same time […]. These are arranged the one after the other on the chain of parole. These combinations which are based on duration [l'étendue] may be called syntagms.
(CLG: 170)

On first reading, this passage may seem puzzling, even contradictory. Saussure speaks of "the linear character of *langue*". He also refers to the "chain of *parole*". Is there a contradiction here? Is not linearity, in Saussure's view, a property of the spoken chain in *parole?* The linearity Saussure speaks of is temporal. In *écriture,* on the other hand, syntagmatic relations are spatial, rather than temporal (CLG: 103). The linearity which Saussure refers to in the above passage is the Linear Time of 'quantitative' perception, as discussed in lecture 6, section 2. However, Saussure's discussion is much more subtle than is generally recognised. For example, Roy Harris's translation loses sight of a number of critically important

distinctions that Saussure makes. Here, by way of comparison, is Harris's translation of the same passage:

Words as used in discourse, strung together one after another, enter into relations based on the linear character of languages […]. Linearity precludes the possibility of uttering two words simultaneously. They must be arranged consecutively in spoken sequence. Combinations based on sequentiality may be called syntagms.
(Saussure/Harris 1983: 121)

My first point concerns Saussure's term discourse *[discours].* It is in discourse that words "contract" relationships with other words "in virtue of their enchainment". Saussure then points out that the process described thus far is "founded on the linear character of the language system *[la langue]*", and not "languages" as Harris would have it. The distinction which Saussure makes between discourse and the language system is critically important here. Discourse refers to the process–both actional and interpretative–whereby words, in virtue of the specific relations they enter into ("contract") with other words in the production of occasion-specific meanings both contextualise each other on account of their relations to each other in the chain at the same time that they enact their own discursive possibilities of enchainment. The point is that this discursive process, which is founded on the linear character of *langue,* is systemic in character. The linear character of *langue* is virtual. It is, after all, this systemic linearity that Saussure refers to in his discussion of his second principle of the 'linearity of the signifier' (*CLG:* 103; Saussure-Komatsu 1993: 289). Both this and the arbitrariness principle are systemic properties of *langue,* not *parole.* The linearity principle refers to the possible linear combinations which are permitted by the language system, rather than to the actual enchainment of words in real-time discourse. Thus, the impossibility of pronouncing two words at the same time is a systemic fact.

It is *langue* which specifies what is possible and impossible in the Linear Time of *parole.*

Saussure then says that the words which "contract" relations with other words are arranged on the "chain of parole". This is linear in the sense that it is sequentially organised as a succession of elements in real-time. Saussure points out, most importantly, that "these combinations"–that is, the relations contracted between words in discourse–have as their support in what Saussure, in French, calls *étendue,* which means something like 'temporal duration or extent'. I shall come back to the significance of this term shortly. But first, I should like to clarify the relationship between these syntagmatic "combinations" and the linearity of *parole.*

Saussure does not say that discourse is linear. The point is this: syntagmatic combinations or relations require some material means of spatio-temporal support in order that they may be manifested. This support is provided by the linearity of parole. However, the syntagmatic relations that are so supported are not necessarily linear in character. That is, the syntagmatic relations that are supported by the temporal succession of acoustic signifiers in *parole* are more abstract than the temporal succession of acoustic elements–the "line of time" (*CLG:* 103)–that supports them. Syntagmatic relations are interpreted as meaningful relations on the stratum of the signified. Linearity, or temporal succession, is a characteristic of the acoustic signifier. A syntagm may be "decomposed" into two or more "consecutive units", but syntagmatic relations are not founded on these. Instead, they are founded on the values the terms acquire by virtue of their relationships to each other in the syntagm. It is in this sense that the syntagm, as I pointed out above, is interpretative. It mediates, interpretatively speaking, between the real-time linearity of *parole* and the systemic linearity of *langue*. In so doing, functional values

are redistributed across the syntagmatic relationships that are contracted among the items in a particular syntagmatic context.

The key to understanding the distinction between syntagm and the spatio-temporal succession of elements lies in Saussure's use of the word 'relationship' *[rapport]*. Syntagms entail structural-functional relations between two or more items in the same syntagmatic relation on the basis of some functional criterion which relates them as parts in some larger whole. The relevant parts may be near or far to each other in space-time. Spatio-temporal proximity of elements may, of course, facilitate the construal of functional values for the elements in the syntagm, but this is not a necessary condition. What is necessary, as Saussure (*CLG:* 190) argues, is that an abstract grammatical relation which is construed on the basis of the syntagmatic associative relationships always and necessarily rests on "concrete entities" (*CLG:* 190). These are "a series of material elements that serve as a substrate" (*CLG:* 190) for the assignments of values to the items in some syntagmatic relation. The assignment of values to the elements in the syntagm refers to the processes of "delimiting" the syntagm into a series of units on the basis of their "sense" or "function" in short-term memory (see below).

… there are abstract entities which are not at all linguistic. Thus, we have said that if we try to take meanings [les significations] by themselves by radically detaching them from their sound support, their material support, one is no longer in linguistics, but in psychology. There are abstractions but since we are not in linguistics we cannot hear in this way the abstract entities of the language system [la langue]. By the same token, the sound taken on its own is not linguistic.
(Saussure-Komatsu 1993: 297)

The distinction that Saussure draws between linguistics and psychology shows very clearly that language occurs in the world in interaction between people. It is not an abstraction residing in the brain of the individual. Language has a material-corporeal basis to it and it emerges as the result of the contextualised association of sounds and meanings when people engage in linguistic activity. Thus, meanings abstracted from their physical-material means of expression are not linguistic even though they may exist in the brain of the individual. For this reason, they belong to a subjective, psychological domain not amenable to the techniques of linguistic analysis. This also suggests that, strictly speaking, there is no language in the brain but only associations of meanings which have the potential to be activated as linguistic meaning. In many respects, Saussure is in line with the most recent research findings of neuropsychologists on short-term memory concerning the relations between the syntagmatic values construed in some sequence and their perceptible physical-material means of support. Values in the syntagm are more abstract, higher-order relations that the concrete sounds which support them:

For normal subjects, the capacity of short-term memory (i.e., the number of items which can be immediately recalled exactly) is not determined by the physical properties of the stimulus. Rather it is affected by the subjects' ability to "chunk" or "re-code" it into higher-order units.
(McCarthy and Warrington 1990: 277)

That is, associative values in the long-term memory of *langue* can only be globally mapped onto a succession of elements that are registered as instances of perceptual categories in the real-time processes of phonation and audition, i.e. in *parole*. That is, in the sensori-motor activities of a brain-body complex.

Two Forms of Mental Activity: Aristotle's Theory of Memory and Syntagmatic and Associative Relations

Saussure's claim that syntagmatic and associative relations "correspond to two forms of our mental activity" (*CLG:* 170) recalls Aristotle's theory of association. Aristotle proposed one of the earliest theories of association in his *De Memoria et Reminiscentia.* Aristotle's was a theory of memory. It is not a precursor of the psychological theory of association developed by the British empiricists in the eighteenth century. This is an important distinction, for Saussure's notion of associative relations in *langue* shares some affinities with the Aristotelian notion, and in ways which are relevant to the place of the brain in Saussure's theory. But first a few words concerning Aristotle's theory of association in memory.

According to Aristotle, associations in memory are of three main types. The three types are: (1) association by contiguity; (2) association by similarity; and (3) association by contrast. Memory, in Aristotle's view, is an active process. This view is very far removed from the psychological theory of association developed by the British empiricists. In the following passage, Aristotle discusses how thoughts, or "movements", in his terminology, are functionally correlated to the "facts" in the world which one seeks to recall. Memory, in Aristotle's view, is a form of mental activity which is intentionally (psychically) directed to phenomena in the real world:

It often happens that, though a person cannot recollect at the moment, yet by seeking he can do so, and discovers what he seeks. This he succeeds in doing by setting up many movements, until finally he excites one of a kind which will have for its sequel the fact he wishes to recollect. For remembering … is the existence, potentially, in the mind of a movement capable of stimulating it to the desired movement, and this, as has been

said, in such a way that the person should be moved … from within himself, i.e. in consequence of movements wholly contained within himself.

But one must get hold of a starting-point. This explains why it is that persons are supposed to recollect sometimes by starting from mnemonic loci. The cause is that they pass swiftly in thought from one point to another, e.g. from milk to white, from white to mist, and thence to moist, from which one remembers Autumn [the 'season of mists'], if this be the season he is trying to collect.
(Aristotle 1965 [ca. 350 B.C.]: 329)

Aristotle's three types of associative relations may be seen as a precursor of Saussure's own theory of associative relations. Here is how Saussure introduces his notion of associative relations, as compared to the syntagmatic relations which he had introduced a paragraph or two earlier:

.. outside of discourse, words which afford something in common are associated in memory, and in this way groups are formed which are based on very different relationships.
(CLG: 171)

Syntagmatic relations depend on some spatial or temporal support and occur in the real-time discourse (see section 1). Associative relations, on the other hand, are "outside of discourse" and occur in memory (*CLG:* 171):

They are not supported by extension; their place is in the brain; they are part of that interior treasure which constitutes the language system in each individual.
(CLG: 171)

This is a crucial point. The distinction Saussure makes here does not rest on that between *langue* and *parole*. Both syntagmatic and associative relations, are "two forms of our mental activity, both indispensable to the functioning of *langue*" (*CLG:* 170). How, then, can both be forms of mental activity?

Connectionism and the Social-Semiological Shaping of Brain Function

The point to make in answer to this question is that both *langue* and *parole* have an individual and a social dimension (Lecture 6, section x). Furthermore, I have already argued that Saussure's discussion is not mentalistic: it does not presuppose a mind-body dualism. The Aristotelian turn in Saussure helps us to answer the question posed above. In my view, the answer to this question may also be further clarified by referring to recent developments in the neuropsychology and neurology of brain processes and functions. Harré and Gillett (1994: 80), for example, point out that these developments have, in recent years, lead to the development of a 'discursive psychology' which is, in part, inspired by Aristotle's conception of the human being as a social agent who acts and means in specific ecosocial contexts. Harré and Gillett also point out that these developments have lead to a renewed interest in the way that "discourse shapes the brain" (1994: 80). Recent advances in neural network theory, Harré and Gillett (1994: 82) argue, exhibit a "fruitful duality of interpretation". Along the same lines, Smolensky (1986a: 390) writes of a "certain ambiguity" –mind or brain–in the interpretation of connectionist models of cognition. Harré and Gillett comment on these developments as follows:

The neurological terminology is metaphorical in relation to the employment of the model as a grammar of the relevant discourses, and literal (or close to it) in relation to the employment of the model as an abstract representation of brain processes.
(Harré and Gillet 1994: 82)

I have already drawn attention to Saussure's claim that *langue* is 'imprinted' and 'stored' in the brains of the individuals in some ensemble in and through the practices of *parole*. Saussure's claim is strikingly reminiscent of recent developments in the theory of neural connectionism. However, it should be pointed out that the theory of connectionism has its basis in the the recent challenges to the symbolic paradigm that have taken place in cognitive science (e.g. Smolensky 1988). It goes back, say, to the work of Thorndike (1913), who was a contemporary of Saussure. In any case, the salient point concerns the way in which the brain stores experience, not as fixed images to be retrieved, but as meanings that have structured "the experience and the responses made by the individual to aspects of the events experienced" (Harré and Gillet, 1994: 81). Social-semiological processes shape brain function (Lecture 6). What is common to Aristotle's theory of memory, Saussure's notion of syntagmatic and associative relations as forms of mental activity, and recent developments in the theory of neural group selection (Edelman) and connectionism (Rumelhart et al, Smolensky) is that all of these approaches articulate a coherent alternative to the formal information processing models of cognition, based, as these are, on the computational metaphor.

Connectionism is currently providing new theoretical impetus to the idea that the discursive shaping of brain functions is not based on all-or-nothing and context-independent categories, as in formal information processing models, but on a functional and dynamic orientation to the contextual richness and diversity of real-time discursive activities. The view that the

brain is structured and organised in and through the social-semiological practices in which the individual participates in *parole* is, in my view, already present in Saussure. Saussure carefully avoids any specification of the actual neuroanatomical, neurophysiological, and neuropsychological processes that might be involved. In part, this is certainly due to the limitations of his own knowledge in these areas.

More importantly, however, there is a fruitful ambiguity in Saussure's discussion of syntagmatic and associative relations. That is, they are both forms of mental activity as well as being social-semiological in character. In upholding this ambiguity, Saussure avoids a simple physicalist reduction of the latter to physical brain processes. There is no separate ontological realm of 'mind' in Saussure's account. Rather, social-semiological processes in *parole* shape brain function and the *langue interieure* stored in the brain at the same time that the brain-body complex directly participates in these same processes. The dual status of *parole* as referring, simultaneously, to both individual combinations as signifying acts and the neurophysiological processes of phonation and audition that are the material substrate of these precisely captures this fact (*CLG:* 30-1).

Syntagmatic and Associative Relations and Mental Models of Discourse

How are both syntagmatic and associative relations forms of mental activity if the latter occur "outside of discourse"? Saussure's solution to this problem takes the following form:

Syntagmatic relations are in praesentia; they rest on two or more terms equally present in an effective series. On the other hand, associative

relations unite terms in absentia in a virtual mnemonic series.
(CLG: 171)

This passage is so well known and so frequently alluded to that a standard interpretation has tended to obscure the real significance of the distinctions Saussure makes. The standard interpretation proceeds along the following lines: syntagmatic relations are concerned with 'what goes with what' in some actual sequence in discourse; associative relations with the possible choices that the speaker might have made, but did not, in some context. This interpretation is highly misleading. First, the notion of associative relations has nothing to do with the 'choice' of a given linguistic item in any positive sense. 'Choice', in Saussure's account, has to do with the conscious execution of a given syntagm, rather than the associative groups that configure to produce it (see below). Secondly, the standard interpretation does not account for the fruitful ambiguity that I referred to above. Thirdly, it fails to see that the perspective adopted is that of *langue* and not *parole*. That is, the distinction between syntagmatic and associative does not translate into the distinction between 'potential' and 'actual'. I shall now inquire further into the implications of these three points.

The material support — the substrate–that Saussure speaks of is critically important to the continuity of consciousness in the real-time processes of social semiosis. Edelman invokes the role of the hippocampus as the crucial organ of succession which provides "a means for registering the actual succession of such perceptual categorisations yielding a short-term memory [which] is even more critical to consciousness and its continuity" (1989: 127). The actual temporal or spatial order of concrete entities in the syntagm relates the sensori-motor processes involved in phonation and audition to the categorisation of units in short-term memory at the same time that these are linked to the associative relations that are

stored in long-term memory. Thus, 'in praesentia' relates to the ability to establish a temporal or spatial ordering of the material elements that are then semiotically construed as values in the syntagm. By the same token, the establishing of such relations in short-term memory is necessary for their semiotic re-categorisation in the long-term memory of stored values in *langue interieure*–'in absentia'. 'Discourse', as Saussure defines it, is the real-time process of assembling the syntagm in short-term memory as a concrete temporal or spatial succession of elements that may be apprehended by a perceiving consciousness.

The syntagm, Saussure argues, constitutes "an effective series". They are 'latent' types. That is, pre-fabricated typical linguistic units of varying dimensions. They are a repertoire of ready-made types that language users may draw on and adapt and modify according to specific contextual requirements. That is why they are said to be "effective". Associative relations, on the other hand, constitute a "virtual mnemonic series". The relevant distinction is that between 'effective' and 'virtual' in relation to Saussure's claim that syntagmatic and associative relations are both forms of mental activity. 'Effective' does not mean 'actual'. It means something like 'able to be effected' or 'potentially effective', i.e. in discourse. Only *parole* is 'actual' in the sense of being materially instantiated and enacted. The specific mental activity which Saussure designates with the term syntagmatic cannot be actual in this sense. As one of two forms of mental activity, syntagmatic relations organise discursive activity in the brain on the basis of the typical patterns and combinations which the individual has previously experienced and learned though his or her apprenticeship in the meaning-making practices of the culture. They are a model in the brain of the kinds of discourse contexts which the individuals in some "ensemble" jointly enact and participate in. The notion of syntagmatic relations does not refer to the actual context in which the individual finds him- or herself on some concrete occasion of *parole*.

Rather, it refers to a mental model of the kinds of structured discursive activities that the individuals in a community participate in.

The term 'effective' refers, then, to the fact that what is 'imprinted' and 'stored' in the brain as a syntagm is not a specific or actual discourse context, but a model or schematic categorisation of a given context-type. A syntagm is, then, a template or a schema of some discursive procedure that language users can 'effect' or execute in some context. The ability to effect a particular discursive capacity in a given context means that the brain recalls or evokes in short-term memory appropriate schematic representations or categorisations of the syntagmatic contexts in which the required ability was first experienced or developed. This is achieved on the basis of neural maps that group patterned associations of meanings in a variety of possible ways on the basis of the individual's participation in the meaning-making practices of the society — through the "practices of *parole*", as Saussure puts it. Saussure's notion of associative relation shares many suggestive affinities with the notion of neural map in modern neuropsychology (Edelman 1989). What is essential here is that while associative relations group together elements on the basis of some feature which is common to all the elements in a given series (*CLG:* 173), there is no single criterion whereby a given element is grouped with some other. That is, an element may belong to a variety of mnemonic series on the basis of different common factors that link the elements in any given series. Further, and in ways strikingly similar to Wittgenstein's notion of 'family resemblances', or to the logic of fuzzy sets, Saussure speaks of an "associative family":

Whereas a syntagm immediately calls up the idea of a sequential order and a determinate number of elements, the terms of an associative family are presented neither as definite number nor in a determinate order. If désir-eux ('desirous'), chal-eux ('warm'), peur-eux ('fearful'), etc., are associated,

it could not be said in advance what will be the number of words suggested by memory, nor in which order they will appear. A given term is like the centre of a constellation, the point at which other co-ordinated terms converge, the sum of which is indefinite […].
(CLG: 174)

As we shall see in the following section, Saussure's theory of syntagmatic and associative relations converges in significant ways with recent developments in the theory of connectionism in cognitive science. These developments provide a powerful alternative to the ontology of discrete, context-independent linguistic rules.

The Ontology of Linguistic Rules: Saussure's Alternative

Chomsky (1965: 7-8) has criticised Saussure for failing to formulate a system of explicit and well-defined rules that assign structural descriptions to sentences. However, this represents a misunderstanding of Saussure's notion of *langue*. Rather than postulating an innate language acquisition device or a competence whereby the 'rules' of the language are induced by speakers and then explicitly stored in memory, Saussure's notion of associative relationships show how linguistic regularities are built up from repertoires of patterned connections among the terms (phonic and conceptual) in *langue* through the speaking subject's participation in the practices of *parole*. Rather than a black box of linguistic rules or cognitive competences 'in the brain' of the individual, Saussure's account of the way *langue* is 'imprinted' in the brain of the individual suggests that the way meaning shapes brain function is directly linked to the individual's participation in social-semiological relations and practices in *parole*.

In the theoretical language of connectionism, the "connection strengths" among the units in some network of relations are adjusted on the basis of information which is locally available at the connection (McClelland et al 1986: 32). A given linguistic regularity is not stored as an explicit and context-independent rule which can be 'accessed' and 'retrieved' when necessary. Instead, the speaker's knowledge of the linguistic regularity, or pattern, and its use is distributed over the connections in some associative relationship. In the language of connectionism, such knowledge is not localised and stored as discrete, formal rules, but is distributed over the connections among a large number of units in some network of relations (Smolensky 1988: 13).

I shall discuss below how these units correspond to the conceptual and phonic terms on which Saussure, with remarkable foresight, founds his theory of *langue.* In connectionist networks, the emphasis is on the patterns of activation over units and on the learning mechanisms "whose explicit purpose is to learn the right connection strengths to allow the right patterns of activation to become activated under the right circumstances" (McClelland et al 1986: 33). That is, both the learning mechanism and the patterns of activation are context-dependent.

Paul Smolensky, who is a leading contemporary theorist of connectionism in cognitive science, has commented on McClelland and Rumelhart's (1986) model of the U-shaped curve for past-tense production in children in exactly these terms. Commenting on the child's inconsistent use of past tense forms (e.g., *goed, wented*), Smolensky argues against the need for formal, context-independent rules of the type "the past tense of *go* is *went*":

Informally we can say that the connections producing went do so in the context of the other vocabulary items that are also stored in the same connections. There is no guarantee that these connections will

produce went in the context of a different vocabulary. As the child acquires different vocabulary items, most of which are regular, the context radically changes. Connections that were, so to speak, perfectly adequate for creating went in the old context now have to work in a context where very strong connections are trying to create forms ending in -ed; the old connections are not up to the new task. Only through extensive experience of trying to produce went in the new context of many regular verbs can the old connections be modified to work in the new context. In particular, strong new connections must be added that, when the input pattern encodes go, cancel the -ed in the output; these were not needed before. (Smolensky 1988: 14)

The relations between the terms in some "associative family" are neither fixed nor determinate. Like all natural language categories, they are best described according to the logic of fuzzy sets, rather than as fixed type-categories. In this way, the complex gradings and subtle semantic clines between categories are more adequately and realistically handled. A given term, seen as the "centre of a constellation" in some associative series, suggestively echoes Aristotle's notion of mnemonic "loci". It also ties in with the recent work on both neural networks in neuropsychology as well as the social aspects of memory construction in some recent developments of social psychology. The networks referred to here do not originate as fixed informational stimuli that are found in the physical environment (Edelman 1989), or as a uniquely 'inner' process of the individual (Bartlett 1932; Shotter 1990).

Phonic and Conceptual Terms: A Bridge Between Social-Semiological Processes and the Brain-Body Complex

The individual and social dimensions of *langue* suggest a 'fruitful duality' of interpretation of the "two forms of our mental activity activity" that Saussure proposes. That is, syntagmatic and associative relations may provide a theoretical bridge between social-semiological processes and the brain processes in and through which the former are realised (Lecture 6, Section 5). This does not mean that Saussure's two forms of mental activity are to be identified with the neural level per se and he says nothing that suggests that they are. Indeed, it is important to distinguish these two levels. A possible solution to this problem lies in the fact that both syntagmatic and associative relations are based, in the first instance, on terms (phonic or conceptual), rather than on already given phonological or lexicogrammatical units (see section 7 below). This insight is a remarkable breakthrough on Saussure's part. The scalar difference between the terms, on the one hand, and the sign-relations these enter into, on the other, represent a scalar, or dimensional, shift (see also Smolensky 1988: 11). The phonic terms, for example, occur on a lower scalar level than that of phonemes. Whereas the symbolic program in AI inspired models relies on programs, subprograms, etc. on the same scale, Saussure shows how higher-level linguistic forms (signs) emerge from more fundamental lower-level processes through the cross-coupling of terms from the two orders of difference in *langue* (*CLG:* 166-7). There are no recursive rules which are derived post hoc from these forms, but vectors which specify which values are activated by a given pattern of activation.

Phonic and conceptual terms are the cornerstone of Saussure's theory of *langue*. The terms from the two orders of difference are continuous analogue values that can be equated with neither the level of language form (the sign) nor with the neural level of brain processes. They are intermediate between the two. The implications of this will now be discussed in relation to connectionist cognitive models.

Connectionist cognitive models seek alternative explanations to those of the 'symbolic' paradigm which has dominated in the AI programs based on explicit rule following in cognitive science (Smolensky 1988: 5). The symbolic paradigm, as Smolensky points out, "gets its power by allowing highly complex, essentially arbitrary, operations on symbols with conceptual-level semantics" (1988: 6). The connectionist's alternative to this conceptual level of modelling is what Smolensky calls the "sub-conceptual" level. In the symbolic paradigm, writes Smolensky,:

… cognitive descriptions are built of entities that are symbols both in the semantic sense of referring to external objects and in the syntactic sense of being operated on by symbolic manipulation. These manipulations model fundamental psychological processes in this approach to cognitive modelling.

The name "sub-symbolic paradigm" is intended to suggest cognitive descriptions built upon entities that correspond to constituents of the symbols used in the symbolic paradigm: these fine-grained constituents could be called sub-symbols, and they are the activities of individual processing units in connectionist networks.
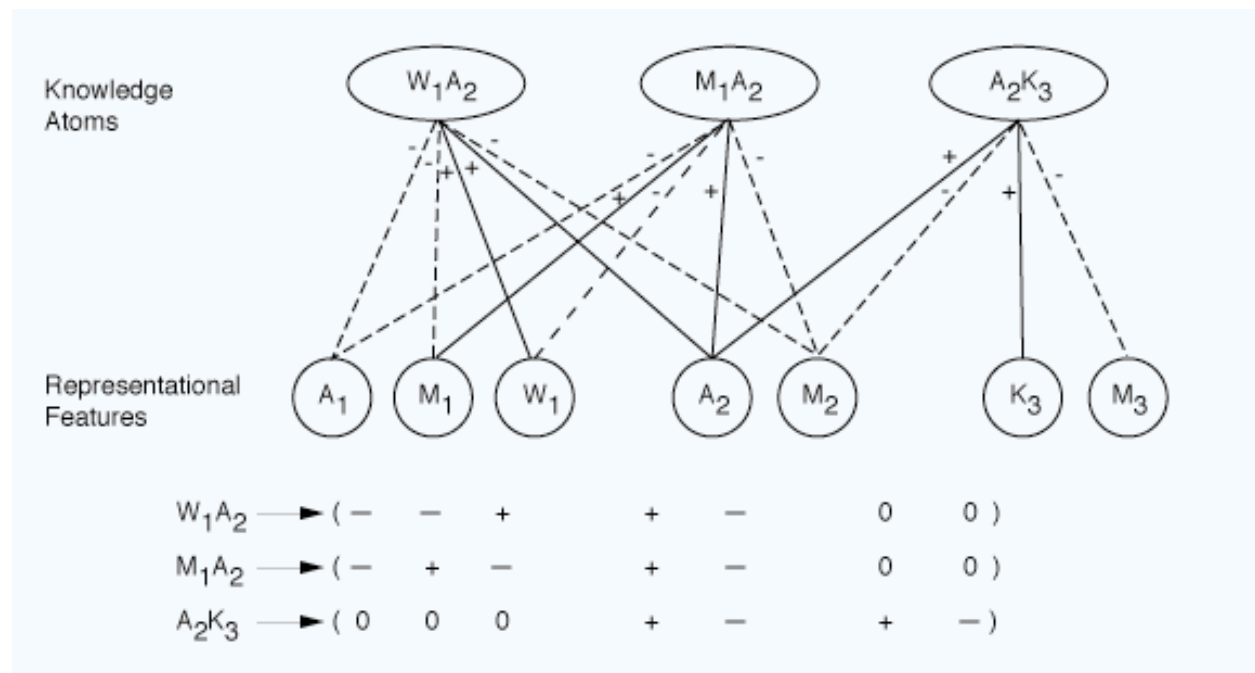*(Smolensky 1988: 3)*

Smolensky's "subconceptual level" is remarkably similar to Saussure's notion of phonic and conceptual terms, and in ways that suggest how the gap between sensori-motor processes and social-semiological ones can be bridged in a conceptually unified way.

Smolensky's subconceptual level is based on elementary constituents, which he calls "knowledge atoms" (1986b: 202). The cognitive system activates coherent assemblies of knowledge atoms into context-sensitive schemata. In Saussurean terms, this process of activation may be said to

take place through the meaning-making practices of *parole*. Smolensky formalises the notion of coherency or consistency in these patterns of activation under the rubric of harmony theory (Smolensky 1986b: 202-3). A schemata may be a grammatical unit such as a word, a clause, or a discourse-level unit and so on. Knowledge atoms, in Smolensky's account, are explainable in terms of both a micro- and a macro- level of description. The microtheory "prescribes the nature of the atoms, their interaction, and their development through experience", whereas the macrotheory "describes schemata, their interaction, and their development through experience" (Smolensky 1986b: 204). The microlevel is constituted by the phonic and conceptual terms — the sub-features — that are dynamically assembled as stable or coherent patterns on the basis of the co-operation among very many microlevel units. What is important here are the intrinsic dynamics of the system and how these alter in interaction with contextual factors. This is based on the reentrant mappings of potentially very many different systems all interacting together in the real-time of the event (see Lecture 6, Section 5). Thus, repeated experiences of vocal tract activity in interaction with others sets up attractors that contain expectations about that event, its perception and execution, as it is shaped and guided by the individual's co-participation in and experience of many similar if not identical events involving diverse speakers and situations who belong to the same socio-cultural group. It is this constant and repeated participation in such practices that sets up attractors which entrain and influence perceptions and understandings of future events in spite of the many specific physical-material differences between one utterance of, say, a given phonological category and another. Rather than an intrinsic competence which governs and regulates this process from the outset, we might say that intrinsic biological dynamics represent formal causes which are, however, guided by external events along a trajectory. As newly emergent attractor basins form on the basis of repeated experience,

learning takes place as the attractor assimilates to itself the detail of more and more specific articulatory events.

Smolensky illustrates how knowledge atoms are assembled from sub-conceptual units in the following example of how words are assembled from lower-level grapheme units:

Smolensky comments as follows on this figure:

Figure 4 shows the basic structure of harmony models. There are atoms of knowledge, represented by nodes in an upper layer, and a lower layer of nodes that comprises a representation of the state of the perceptual or problem domain with which the system deals. Each node is a feature in the representation of the domain. We can now view "atoms of knowledge" like W1 and A2 in several ways. Mathematically, each atom is simply a vector of +, -, and 0 values, one for each node in the lower, representation layer. This pattern can also be viewed as a fragment of a percept: The 0 values mark those features omitted in the fragment. This fragment can in turn be interpreted as a trace left behind in memory by perceptual experience.
(Smolensky 1986b: 205)

It is not difficult to see in Smolensky's discussion and accompanying figure the striking parallels with Saussure's discussion of phonological types and the phonic terms that constitute these (see Lectures 3 and 4). Thus, Smolensky's "knowledge atoms" are parallel to phonemes and his "representational features" to the phonic terms which configure in the topological space of the vocal tract and which differentiate one phoneme from another. The two levels are mutually constraining: each acts on and constrains the other. The model which connectionists draw on to explain the two-way and mutually constraining nature of these processes is known as parallel distributed processing, or PDP, for short (McClelland et al, 1986: 10):

These models assume that information processing takes place through the interactions of a large number of simple processing elements called units, each sending excitatory and inhibitory signals to other units. In some cases, the units stand for possible hypotheses about such things as the letters in a particular display or the syntactic roles of the words in a particular sentence.
(McClelland et al 1986: 10)

A phoneme, in Saussure's theory, is a vector of + and − elements (terms) that are activated in a topological space. The phoneme is a phonological schemata, or type-category, which is dynamically assembled by the probabilistic skewing or weighting of the relations among the phonic terms in the global analogue continuum of the vocal apparatus, represented as a topological space. The question of which phoneme category is assembled is a question of which phonic terms are dynamically activated as a vector in this topological space. Each of the phonic terms which is activated carries a quantum of statistical information (e.g., [+ nasality], and so on) about the articulatory environment. The point of Saussure's analysis is to show that phonic terms, not phonemes, are the basis on which schemata are activated, or computed. We shall see below that this same basic argument also applies to the conceptual level of the sign relation (the signified).

The phonic terms constitute the phonological system's representation of the possible states of the environment with which it is concerned. In the case of speech sounds, these are concerned with specifying, in the informational sense, the vocal apparatus as a series of topologically defined regions and subregions. A vector of phonic terms, thought of as a configuration of binary values, is activated by a given activity vector (see below). Saussure's arguments are strikingly similar to those advanced by Smolensky in his explanation of the relationship between lower-level representational features and higher-level knowledge atoms:

*The representational features serve as the blackboard on which the cognitive system carries out its computations. The knowledge that guides these computations is associated with the second set of entities, the knowledge atoms. Each such atom à is characterised by a knowledge vector **kà**, which is a list of +1, -1, and 0 values, one for each representation variable ri. This list encodes a piece of knowledge that specifies what value each ri should have: +1, -1, or unspecified (0).*

*Associated with knowledge atom à is its activation variable, **aà**. This variable will also be taken to be binary: 1 will denote active; 0, inactive. Because harmony theory is probabilistic, degrees of activation are represented by varying probability of being active rather than varying values for the activation variable.*

*[…] The list of {0, 1} values for the activations {aà} comprises the activation vector **a.***

*Knowledge atoms encode subpatterns of feature values that occur in the environment. The different frequencies with which various such patterns occur is encoded in the set of strengths, {**kà**}, of the atoms.*
(Smolensky 1986b: 215)

The 'blackboard' may be likened to the topological space of the vocal apparatus before it is semiotically formed as a given phonic substance in and through the categorial differences recognised by the phonology of a given *langue*. Smolensky's 'blackboard' is analogous to Saussure's analog domain of 'sound' (cf. also Hjelmslev's expression purport). Likewise, the 'cognitive system' is analogous to the phonological categories of a given language system that operate on this and construe it as a specific phonic substance. Thus, the phonological categories act as an attractor basin in relation to which patterns of association among phonic terms are activated. The stratified nature of these networks illustrates the principle of PDP. Knowledge of the phoneme is not localised in an explicit and retrievable formal rule, but is distributed over the connections among many phonic terms, all of which, when activated as a particular vector, serve to activate a given phoneme category.

The Dynamic Configuring of Syntagms from Patterned Associations of Terms in Memory

Phonic and conceptual terms are, then, comparable to Smolensky's subsymbolic level, which lies somewhere between the neural and conceptual levels (Smolensky 1988: 9). This brings us back to the question of the relationship between language form (the sign), phonic and conceptual terms, and the neural level. Smolensky (1986b: 201) raises some interesting problems in connection with Schank's (1980) script theory of stereotypical situation-types that are relevant to our argument.

Suppose, Smolensky argues, that one gets a headache while eating in a restaurant. Rather than drawing on and combining two separate 'restaurant' and 'headache' scripts in order to plan and execute an appropriate course of action such as asking the waitress for an aspirin, Smolensky argues that "the knowledge base of the system does not consist of a set of scripts" (1986b: 201). Instead, it is "a set of knowledge atoms that configure themselves dynamically in each context to form tailor-made scripts" (1986b: 202). That is, tailor-made may be taken to mean 'occasion-specific'. Scripts are regular syntagmatic templates of activity-structure types that are recognised and deployed in a given cultural system. However, rather than saying that ready-made scripts are stored in memory and accessed when required, Smolensky's claim is that these are dynamically assembled in context from the lower-level "knowledge atoms" on the subsymbolic level. Latent syntagmatic types or schemas are then attractor which serve to activate patterns of association as a particular vector. We may see here how Aristotle's notion of a movement which occurs in the mind when a memory is activated is a suggestive precursor notion of the present concept of vector (section 2 above). Patterns of interconnections are built up between the units on the sub-symbolic level, and in ways that give rise to large-scale activity patterns on the conscious level (Smolensky 1988:

13). Further, different patterns of associations can be built up from the same set of interconnections, depending on the specific learning mechanisms that are experienced (McClelland et al 1986: 37). Different patterns of association weight the connection strengths between the nodes in ways that are appropriate to the specific higher-level activities that are stabilised in the learning process.

Now, Saussure argues that associative relations, which are 'outside of discourse' and in long-term memory in *langue*, constitute the particular form in which *langue* is 'stored' in the brain of the individual as phonic and conceptual terms (*CLG:* 171). Syntagmatic relations, as we have seen, must have some form of spatio-temporal support if they are to be manifested in discourse. The point I wish to emphasise here is that Saussure evidently does not consider memory to be based on a stock of ready-made syntagms. That is why Saussure says associative relations are 'virtual' whereas syntagmatic relations are 'effective' (see above). His point is that the syntagms which are enacted in any given discursive context are dynamically assembled from different possible patterns of associations among the terms in the system. There are, to be sure, stabilised and typical patternings of associative groups and syntagmatic relations in the language system, but the 'virtual' nature of these relations also means that they are always dynamically assembled according to specific contextual contingencies. There may be more or less typical mappings of associative relations onto syntagms, but this is never a rigidly mechanical process. There is always a degree of flexibility according to specific contextual requirements and contingencies.

Saussure illustrates the distinction between syntagmatic and associative relations with a first pedagogical example, as follows:

In this dual point of view, a linguistic unit is comparable to a determinate part of a building, a column, for example; this is, on the one hand, in a certain relationship with the architrave which supports it; this construction comprising two units equally present in space brings to mind the syntagmatic relationship; on the other hand, if this column is of the Doric order, it evokes mental comparison with the other orders (Ionic, Corinthian, etc.), which are elements which are not spatially present: the relationship is associative.
(CLG: 171)

The syntagm, in this first example, is the spatial configuration 'COLUMN + ARCHITRAVE'. At the same time, any given syntagm activates different possible patterns of associations among the terms in some still wider associative group. For example, the choice of 'Doric' may, as Saussure puts it, "evoke mental comparison with other orders (Ionic, Corinthian, etc.)". A given choice is always related to a still wider network of possible associations, as illustrated in Figure 1.
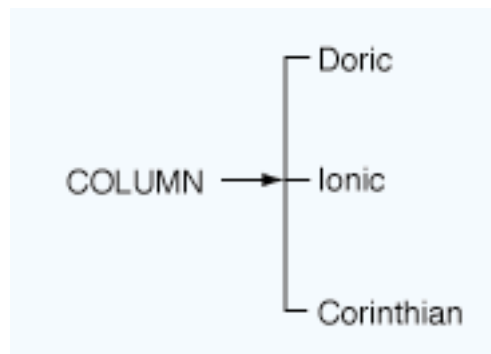
Figure 1: Associative group, showing possible associative relations in architectural COLUMN series.

Although 'absent' in the syntagm, the virtual character of these associations means that they can be 'evoked' or 'connoted' according to specific contextual requirements.

In ways that strikingly foreshadow the connectionist's claims about the dynamic assembling of scripts from microlevel "knowledge atoms", Saussure goes on to point out that syntagms are not based on the positive plans, choices, or intentions of speakers, but are dynamically configured from the terms from the various associative groups that are intersected to produce the syntagm:

Our memory holds in reserve all types of more or less complex syntagms, no matter of what kind or duration, and at the moment of using them, we bring in associative groups in order to fix our choice. When someone says marchons! ('let's walk!'), he unconsciously thinks of diverse associative groups at the intersection of which is found the syntagm marchons!. This figures as a part in the series marche! ('walk!'– 2nd Person Singular), marchez! ('walk!'–2nd person Plural), and it is the opposition of marchons! with these forms which determines the choice; on the other hand, marchons! evokes the series montons! ('let's go up'), mangeons! ('let's eat!'), etc., within which it is chosen by the same procedure; in each series one knows what has to be varied in order to obtain the differentiation which is appropriate to the unit which is required. If the idea to be expressed is changed, other oppositions will be necessary in order to bring about another value; one will say, for example, marchez!, or else montons!
(CLG: 179)

Saussure makes an important distinction in this passage between the "types of syntagms" that are held in memory and "the moment of using them" in order to obtain a specific unit. Thus, a "unit" means for Saussure a syntagm which is instantiated in *parole*. Syntagms *qua* types, on the other hand, are purely schematic categories in *langue*. They do not correspond to actual contextual uses of syntagms in discourse. Saussure points out that when a given syntagmatic type is actually instantiated it is contextualised by its connections with a number of associative groups. Thus, the selection from a given series of a particular term "fixes that choice". The syntagm that is chosen, so to speak, is not therefore already represented in memory. Instead, the syntagm emerges as the result of the global connections among the terms from associative networks that are relevant. This occurs not on the basis of pre-stored syntagmatic types but on the basis of the connections that are excited and inhibited across the whole network in relation to the attractor basin of some context. Emergent global patterns of association among terms redound with and specify relevant contextual parameters. This means that specific associative patterns are evoked from the virtual associative series that constitute "an entire latent system" in response to specific contextual contingencies. That is, the justification for a given choice is not made on the basis of ready-made and consciously retrievable plans, intentions, etc., but on the basis of the operations performed on a whole "latent" system of terms in order to constitute a particular linguistic choice. Thus, the 'fixing' of a given choice is really a question of how the patterns of interconnections among the terms in the various associative series and syntagmatic types are stabilised and 'weighted' according to specific contextual factors. Differentiation is the principle which underlies this process.

Saussure's analysis of the French first person plural imperative form *marchons!* shows that this form is related to and belongs to a number of associative groups. It does not, therefore, have a ready made meaning.

Rather, it is assignable to a number of associative series on the basis of the relations of similarity and difference among the terms in these series. The syntagmatic unit *marchons* is an emergent set of properties resulting from the distribution over the constituent parts of this syntagm of a number of terms that derive from various associative series in French. Saussure suggests two such possible series in the case of *marchons!.* The first includes *marchons!, marche!, marchez!,* and so on. In this case, the common factor which relates each term is the base morpheme *march-* of the verb stem, and the distinguishing factor is the morphemic suffix *-ons, -e, -ez,* etc., which realises both Person and Number. Another possible series is *marchons!, montons!, mangeons!,* and so on. In this second case, the common factor is the morphemic suffix *-ons,* which intersects the conceptual terms or values [SECOND PERSON], [PLURAL] and [IMPERATIVE], all of which derive from specific associative groups in the grammar of French. The differentiating factor in each case is the base morpheme which distinguishes the lexical meaning of each of the verbs in question. The associative series which intersect to produce the syntagm *marchons!* are presented in Figure 2.
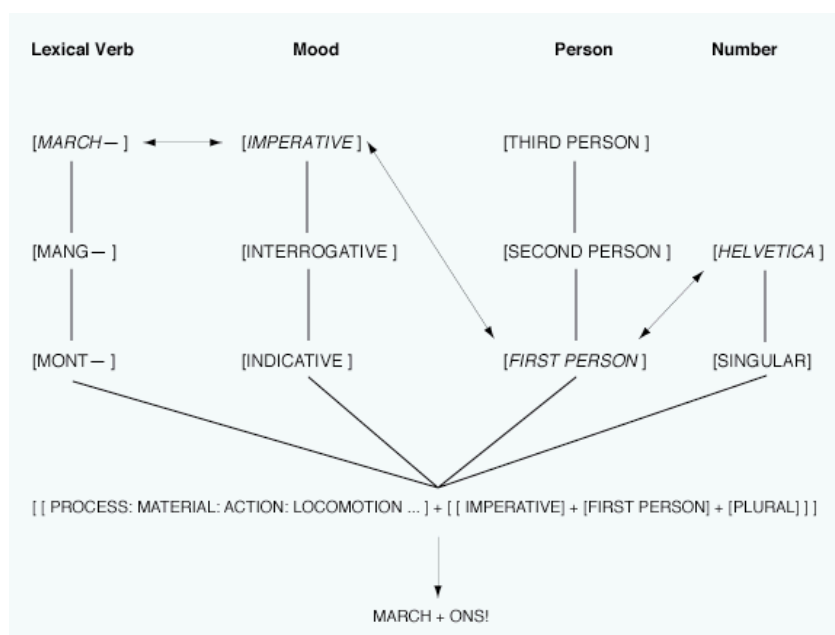

Lexical Verb	Mood	Person	Number
[MARCH—] ←→	[IMPERATIVE]	[THIRD PERSON]	
[MANG—]	[INTERROGATIVE]	[SECOND PERSON]	[HELVETICA]
[MONT—]	[INDICATIVE]	[FIRST PERSON]	[SINGULAR]

[[PROCESS: MATERIAL: ACTION: LOCOMOTION ...] + [[IMPERATIVE] + [FIRST PERSON] + [PLURAL]]]

MARCH + ONS!

Figure 2: Intersection of associative series to produce the syntagm *marchons,* showing weighted connections between terms in relation to the latent syntagmatic type or schema of which the given unit *marchons!* is an instance.

Figure 2 shows the intersection of terms from the four associative series Lexical Verb, Mood, Person, and Number to produce the linguistic unit *marchons!.* The use of square brackets and upper case letters indicates that the items in each series are abstract conceptual terms, which belong to virtual associative series, rather than to syntagms. The italicised term in each of the four series indicates the specific term which is activated in each group to produce the syntagm *marchons!.* The doubled-headed arrows linking the italicised terms are meant to suggest the weighted connections that give rise to the syntagm in question. The lines without arrows show the links between the terms in each of the associative series which is involved.

Memory is not replicative in Saussure's account. The virtual associative groups that are 'stored' in long-term memory depend on more or less stable patterns of association. These constitute the individual's ability to 're-categorise', in Edelman's (1989: 101) sense, newly contingent contexts on the basis of previously 'imprinted' and 'stored' patterns of association. However, associative groups are never simply replicated in the present, but are dynamically reassembled in order to construct syntagms which meet the changing requirements of specific contextual demands. Associative series are not then fixed and unchanging categories. The very basis of an "associative family" is a principle of schematisation combined with flexibility. The dialectic between the typical and the innovatory, on the one hand, and the usual and the unexpected, on the other, which occurs in *parole* means

that categorisation must be dynamic and adaptive rather than fixed and unchanging. Rather than the mere replication of syntagms as they occurred in past contexts, the associative nature of the connections means that particular sets of these are activated in response to contextually specific features, and in ways that can re-categorise the past associations. It is in this way that individuals in the secondary structure elaborate and re-contextualise in memory their position in the social-semiological system in the pursuit of their projects. This implicates, of course, that their *langue interieure* is constantly re-elaborated along an individuating trajectory-in-time.

Edelman's own theory of the 'recategorical' nature of memory is explicitly concerned with the neural level in a way that Saussure is not. However, the "fruitful ambiguity of interpretation" of which I have already spoken suggests how Saussure's notion of associative memory goes hand-in-hand with the emergence of higher-order consciousness, whereby the organism is freed from the immediate perceptual experience of the present (Edelman 1989: 190; Halliday 1994). Edelman argues that higher-order consciousness can only emerge when the organism is biologically equipped with "structures that allow a symbolic modelling of the self-nonself distinction" (1989: 186). Edelman further comments:

… the development of such a language is itself absolutely predicated on the existence of consciousness–first, primary consciousness, and then the emerging ability to relate various systems of memory to a symbolic representation of the self acting on the environment and vice versa. This representation is the essential element in freeing an animal from slavery to present time and its 'neural image'.
(Edelman 1989: 187)

It is no accident that the child first learns the imperative mood before the declarative. Mead (1934) drew attention to the ways in which language allows for the incorporation into the individual of social attitudes and viewpoints of the group. Thus, the imperative clause *Give me a drink!* implicates both a subjective orientation to the speech act and an awareness of the ends towards which it is directed. The emergence of the imperative in infants points to an emerging higher-order consciousness which recognises (1) the 'I' as a point of action from which acts may flow in a field of social relations; (2) an awareness of the object of the act — the desired change in the material world; (3) the 'you' as one who responds (complies, refuses, etc.) the act; (4) a subjective orientation to the act and the desired result, viz. 'I lack but want; you get it for me'; and (5) the ability to account for the act in terms of the interpersonal moral order of the group in terms of normative statements of authority, legitimacy, and so on.

The Unconscious Modelling of Associative Connections and the Conscious Execution of Linguistic Units

Saussure's discussion of *marchons!* reveals a further suggestive parallel with connectionist thinking on the relation between "conscious rule application" and "intuition" (Smolensky 1988: 12). "In the subsymbolic paradigm," Smolensky writes, "conscious rule application can be formalized in the conceptual level but intuition must be formalized at the subconceptual level" (1988: 12). In Saussure's account, the execution or the saying of the syntagm *marchons!* is a conscious act, but the speaker in order to do so "thinks unconsciously of diverse associative groups at whose intersection the syntagm *marchons!* occurs" (*CLG:* 179; my emphasis). That is, the execution of the linguistic unit is "unconsciously" modelled by the connections among the various associative groups that dynamically

configure to produce the given unit. The patterned associations among terms in the various associative groups are what is stored in memory. Rather than discrete syntagms which are stored, ready made, in memory and retrieved when required, what is stored in memory are weighted patterns of associations among terms that can be activated when required in a given context. In other words, the patterns of associations are contextually skewed or probabilistic. I shall discuss below how these patterns are contextually learned through the speaking subject's participation in the practices of *parole*.

As Saussure points out, one need only vary the connections among the terms "in order to obtain the differentiation appropriate to the required unit". All that is required to activate the required pattern in some context is, as Smolensky puts it, "the reinstantiation in memory of the entire pattern representing the production" (1988: 12). In line with connectionist thinking, Saussure shows that there are two stages to this process: (1) the activation in memory of the entire pattern of associations that configure to produce a given syntagm; and (2) the 'interpretation' of this pattern as the instantiation of a given syntagmatic type. In the connectionist terms argued by Smolensky, (1) is the subconceptual level of 'intuitive' (unconscious) processes where linguistic structures are 'represented' and 'processed' (1988: 12). Memories are 'stored' in patterned associations of terms. It is on account of such memory capabilities of connectionist systems, Smolensky (1988: 12) points out, that "sequential rule interpretation can be implemented", as in (2) above.

Now, the fact that, as Saussure points out, one unconsciously knows how to vary the terms in any given series in order to obtain the required linguistic unit demonstrates his awareness of the weighted, or probabilistic, nature of the patterned associations among the terms. In Figure 2, a specific weighting of connections, as indicated by the italicised term in each

of the four associative groups that are relevant here, produces the syntagm *marchons!*. Another weighting of the connections among these groups would produce a different syntagm, say, *marchez!* or *marche!*.

As I pointed out above, Saussure acknowledges both the conscious and the unconscious aspects of the execution of linguistic units. Smolensky (1988: 13) points out that only the most global or large-scale patterns of activity that are "extended over spatially large regions of the [connectionist, PJT] network and that are stable for relatively long periods of time" are conscious. This accords with the way in which Saussure formulates the relationship between associative and syntagmatic relationships. Both of these forms of mental activity belong to *langue* (see above). The syntagm corresponds to a global pattern of activity over a diverse number of associative groups. The syntagm is what is consciously accessible on account of its global character. On the other hand, the conceptual (and phonic or graphic terms) that are so activated belong to the unconscious domain at the lower levels of this mental activity. An 'effective' syntagmatic type is, then, a global pattern of such connections which has been stabilised in time through the individual's apprenticeship in the practices of *parole*.

Learning the Pattern: An Alternative to Rules

How does such a stabilised pattern come to be learned by the speaker if not by explicit and formal rules which are stored and retrieved when required? Rather than say, for example, that the second person plural imperative of regular -ER verbs in French is formed by an explicit rule of the type: to the morphemic base or verb stem (e.g., MARCH-) add the morphemic suffix -ONS, Saussure's account of the relations between

associative and syntagmatic relations in *langue* proposes an alternative. Rules of the kind suggested here represent discrete operations that are applied serially in a context-independent way. This explains their *post hoc* character. Rules of this kind bear an odd resemblance to traditional pedagogical grammars. These have their use, but it is a mistake to transform their normative value or pedagogical into an ontological or causal-deductive/explanatory one. Saussure's alternative shows, on the other hand, that: (1) there is constant communication between the associative and syntagmatic dimensions; and (2) a given pattern of associations among the terms in their respective series is a context-sensitive activity vector which alters when the context itself alters. That is, the pattern of connections among the terms is internally related to the structure of the linguistic unit that is executed.

The notion of an 'effective' syntagmatic type in Saussure's account does not, therefore, refer to the pre-programmed procedures or rules which exist in the genetic structure of the individual after the fashion of the Turing machine. Instead, the open, dynamic and historical properties of both the associations in the individual's memory and of the ecosocial environment of the individual mean that no such set of rules or procedures can be so modelled or are necessary in the form of, say, a genetic program or sub-personal (language) module in the brain.

The alternative to hard rules that are discretely stored in memory is founded on Saussure's claim that a "whole latent system" is involved in the constitution of the linguistic unit. This means that a given unit is realised on the basis of the weighted connections that are activated among the terms in the various associative groups and latent syntagmatic. Figure 3 takes Saussure's analysis of *marchons!,* etc. a step further by showing the entire associative group of the French imperative as a single interrelated network

of possible connections which are then specified as possible realisation at the right of the network.
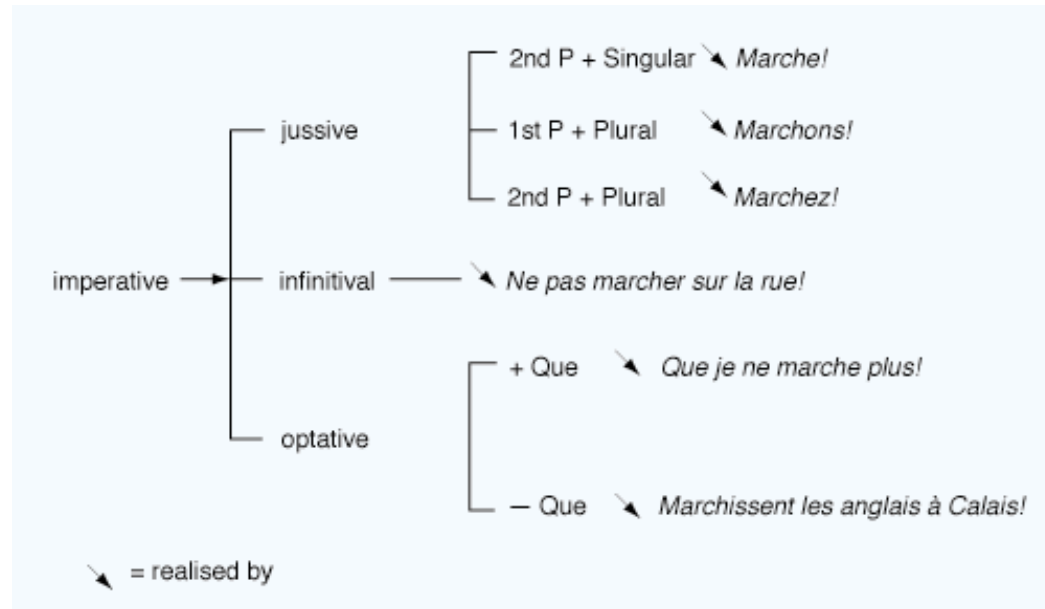

Figure 3. Associative group; imperative Mood in French; = realised by.

Figure 3 shows how the linguistic unit *marchons!* results from the dynamic configuring of a number of terms, which may be gathered together and specified as follows: [IMPERATIVE: JUSSIVE; 1st PERSON; PLURAL]. The "latent system" that Saussure refers to is a continuous, analogue domain of conceptual and phonic terms in *langue*. The dynamic configuring

of terms in a context-dependent activity vector does not require the application of discrete rules which are stored in and retrieved from memory in order to perform a single operation, such as the execution of *marchons!.* Instead, the execution of a given unit means that higher-level properties of the unit do not emerge on the basis of *post hoc* rules applied discretely and serially on the basis of contextual factors that do or do not apply. Rather, it emerges on the basis of the constraints that operate on an "entire latent system" of potential connections. That is, discrete higher-order properties of the unit emerge from the operations performed on the analogue domain of the conceptual and phonic terms that are associated in memory. We shall see in section 11 below that the emergence of such properties refers to the lexicogrammatical level.

Connectionists remain wedded to the idea of learning mechanisms based on the notion of 'experience'. Alternatively, I would rather say the system of potential connections is learned in and through the patterns of social-semiological action–the practices of *parole*–that speaking subjects enact in regular and predictable ways. That is, there are regular deployments of the social-semiological resources of *langue* in some social groups and into which subjects are recruited, co-opted, etc.. It is through these social practices along a trajectory, rather than an empiricist notion of experience, that the associative patterns are learned, 'imprinted' and 'stored'. Connectionists have understood the global and co-operative nature of the patterned connections that give rise to perception, action, and meaning. However, their notion of experience places little emphasis on the self-organising properties of such networks which enable the brain to creatively and flexibly respond to novelty and individual variation.

A given linguistic form may occur in a range of different contexts. The various "associative families" of terms that potentially intersect in a given syntagm share a number of similarities and differences. Take, for example,

the adjective *little* in English. This single morpheme word has more than one potential meaning. This is so in the sense that it may activate different alternative conceptual terms in different syntagmatic contexts. The word *little* belongs to the grammatical class adjective. It may activate a conceptual term of [PHYSICAL SIZE], as in *Pluto is a little planet.* Or it may activate a conceptual term of [AGE + COMPARISON OF AGE], as in *Linda is my little* (= younger) *sister.* A third possibility is a conceptual term of [LOW DEGREE], as in *John's a little* (= not very much) *ill.* The linguistic unit *little* may activate any one (or more) of these three associative series, depending on the context. None of the three series proposed is necessarily mutually exclusive. Rather, the varying contexts in which *little* occurs may change the connection weights among the terms in these series. In each case, however, the important factor is that the internal structure of the unit is altered by the particular weighted connections that are activated.

I do not accept that lexicogrammatical forms have a fixed literal meaning which is primary and even prior to other secondary meanings. For example, Kirsner argues that the "Saussurean orientation [of the Columbia school, PJT] leads to the working hypothesis that the basic units of language will not be rules but signs: invariant signals of invariant meaning used by intelligent speakers and hearers to hint at and to infer messages" (1993: 85). Saussure, on the other hand, started from the premise that the basic units of language are not signs but the phonic and conceptual terms that are selectively combined to form signs (*CLG:* 166-7). Signs in this definition are not "invariant signals of invariant meaning". Rather, their meaning potential is constrained both by the networks of patterned associations and syntagmatic types that give rise to them in *langue* and by the context-specific uses in *parole.* I do not doubt that linguistic forms provide clues to speakers and hearers as to how to construe them. However, such clues are not in the signs per se, but rather in the patterned relations between these

and other features of the overall situation or the social practices in which the sign is embedded.

Only the taxonomic rather than full semantic meaning of, say, *little* is 'fixed' in the sense that in stands in a relationship of antonymy with *big* in possibly all of the contexts in which it occurs. However, the full semantic meaning of *little* will vary in relation to a number of different intertextual semantic patterns in and through which this word is assigned its meanings according to the contexts in which it is used. Thus, the networks of associations that the word *little* evokes may vary according to the specific social situation or the social practices in which it is used.

The Brain-Body Complex in Social Semiosis

The analysis of *little* in the previous section is a concrete illustration of the problem which Saussure discusses in the following passage:

To associate two forms is not only to feel that they have something in common, it is also to distinguish the nature of the relations which regulate the association. Thus subjects are aware that the relation which unites enseigner ('to teach') to enseignement ('teaching') or juger (to judge') to jugement ('judgement') is not the same as that which holds between enseignement and jugement […]. It is in this way that the system of associations connects with the grammatical system. It may be said that the sum of the conscious and methodological classifications made by the grammarian who studies a state of the language system [état de langue] without letting history intervene must coincide with the sum of associations, unconscious or not, put in play in parole. It is these which fix in our mind word families, inflexional paradigms, formative elements: roots,

suffixes, endings, etc.
(CLG: 189)

In this passage, Saussure identifies three critically important theoretical concepts: (1) the system of associative relations; (2) the grammatical system; (3) how the notions referred to in (1) and (2) are put into play in *parole*; and (4) an incipient observer perspective in which the grammarian's categories are built around those of the speaker in *parole*. In *parole*, (1) to (3), require the material support of a sensible unit, as discussed in the paragraphs which follow the one quoted here (see section x). But Saussure also goes to some trouble to stress that their materiality is not the basis of the syntagm's existence:

A material unit only exists in and through the sense [le sens], the function with which it is endowed; this principle is particularly important for the recognition of restricted units, because one is tempted to think that they exist in virtue of their pure materiality, that for example aimer ('to like', 'to love') owes its existence entirely to the sounds that make it up. Conversely,—as we have just seen—a sense, a function only exist on account of the support of some material form; if this principle has been formulated in relation to more extended syntagms or syntactic types, it is because one is led to see in them immaterial abstractions floating above the terms of the sentence. These two principles, in complementing each other, agree with our claims relative to the delimitation of units (see p. 145).
(CLG: 191-2)

In addition to the four theoretical constituents introduced in the previous paragraph, Saussure adds, in the passage I have just quoted, two more. These are: (1) the physical-material form or substrate; and (2) the "sense" or the "function" with which this is endowed relative to an appropriate delimitation of units on the basis of the global distribution of values across

the resulting syntagm. If (1) depends on the sensori-motor activities of the brain-body complex, then (2) depends on the psychic process of 'associating' a sequence of speech sounds with their concepts in the speech circuit. The relative smallness of a unit such as *aimer* may suggest that it consists of an unanalysable sound which is associated with a single, unanalysable concept, whereas, in actual fact, it is a composite unit on both levels of its organisation in the sense that a number of phonic and conceptual terms from diverse associative series are distributed across this unit.

There is a close connection among all five constituents in Saussure's argument. The unifying principle is that of syntagmatic and associative relations, seen as two forms of mental activity in the brain of the individual. It is on account of the relations between these two forms of mental activity, on the one hand, and "the delimitation of units", on the other, that we can understand how, in Saussure's perspective, the concepts and acoustic images which are stored in memory come to be associated so as to give rise to signs in the speech circuit.

There are no pre-established rules or algorithms in Saussure's explanation. How, then, are sequences of units assembled to produce signs in the brain? Broca's areas and Wernicke's area are concerned, respectively, with the production and comprehension of sequences of speech sounds. The phonological sequences so generated in memory are then 'associated' with concepts. In Edelman's explanation, "this conceptual basis is provided by the categorization of global mappings in frontal, temporal and parietal areas" (1989: 177) of the brain. In other words, the stratification of the sign also corresponds to a stratified hierarchy of brain functions (Peng 1994: 124-5). It is the stratified nature of these relations which enables associative values stored in long-term memory to be mapped onto sequences of speech sounds. In the process, the conceptual and

phonological strata of the sign relation are integrated as a sign-form through the intermediate stratum of the lexicogrammar. The key brain functions are those performed by Broca's and Wernicke's areas. These areas provide "a special set of recategorical memories related to the means for production and recognition of coarticulated speech sounds" (Edelman 1989: 178). These sequences of sensori-motor activity involved in the production and recognition of speech sounds are then associated with conceptual categories in the way mentioned above. The point is that it is in virtue of the sensori-motor activities which produce and recognise a given "series of material elements" that lexicogrammar emerges as a level of pure form between the phonological and conceptual levels. In this way, material units are "delimited" as units of "sense" or "function". Saussure puts it like this:

No grammatical abstraction is possible without a series of material elements which serves as it substrate, and one must always refer to these elements in the final analysis.
(CLG: 190)

On the following page he further develops this argument:

But if the order of words is incontestably an abstract entity, it is no less true that it owes its existence to the concrete units which contain it and which flow in a single direction. It would be a mistake to believe that there is an incorporeal syntax outside of these material units distributed in space.
(CLG: 191)

There is no such thing as an incorporeal or disembodied syntax not only because grammatical relations require a material support involving temporal succession or spatial organisation in, respectively, speech and writing, but also because the ability to produce and recognise sequences

of, say, articulate speech sounds itself provides the sensori-motor basis on which grammatical function, associative values, and so are "delimited". That is, the ability to produce and comprehend temporally co-ordinated sequences of speech sounds in virtue of Broca's and Wernicke's areas is also the basis on which the conceptual and lexicogrammatical strata are integrated with the phonological stratum in the making of a stratified unit of language form, which is precisely what Saussure intended with the notion of the sign (see also Edelman 1989: 179).

There are no separate grammar or meaning modules in Saussure's account. Grammar and meaning are dynamically assembled from the associative relations that are stored in long-term memory in the psychic process of construing a given sound sequence as a "delimited" series of units which have their grammatical "sense" or "function" in relation to the whole. Saussure's term concept does not refer to a separate level of 'semantics' or 'meaning'. In the sign, both signifier and signified contribute to the overall process of meaning-making. Lexicogrammar emerges from the stratal integration of phonic and conceptual terms from the two orders of difference in the making of a sign. This suggests that the association of acoustic image and concept in the brain involves massive patterns of global neural activity the permit the emergence of lexicogrammar as a self-organising interface between the two levels. Thus, a given sound sequence does not directly construe the conceptual layer of organisation. If it did, then the association of these two variables would not have the potential to be de-coupled and re-coupled in new possible associations as would be the case in the simple coupling of phonology and semantics (Halliday 1994: 56). When a full-fledged lexicogrammar mediates between the two, then the meaning-making potential of the system is massively expanded. Saussure did not extensively develop the implications of this last point though his analyses of the internal grammatical structure of words like *defaire* and others clearly demonstrates that his theory was developing

in this direction. The dialectical duality of syntagmatic and associative relations in the instantiating of linguistic units as the analysis of *marchons!* shows is concerned with (1) the internal stratification of language as phonology/graphology, lexicogrammar, and semantics; and (2) the mapping of a diversity of functional regions onto the same linguistic form. In the case of (2), the linguistic unit *marchons!* exhibits the simultaneous mapping of the interpersonal semantic resources of mood as a resource for exchanging goods-&-services [imperative mood], the experiential semantic resources of the verb process [material: action: locomotion: …] which construe the goods-&-services to be exchanged, and the speech roles of the interactants in the exchange [first person plural 'nous']. Thus, the potential simultaneously to enact interpersonal relations and to construe experience as linguistic information which is not dependent on the here-and-now of the immediate spatio-temporal purview of the interactants is very much at one with Edelman's theory of the emergence of linguistically based higher-order consciousness. The semiotic potential which lexicogrammar affords its users to construe, name and categorise external reality means that the world outside the self — the non-self — is no longer seen as primarily having to do with the biological maintenance of the organism. As Prodi (1983: 26), the world is seen as 'other', objectified, rather than something to be immediately incorporated by the subject. This detachment from the world through language also leads to the realisation that the self is a part of a wider network of relations. In this way, the world can be elaborated as meanings and values. The semiotic construal of the object as a name through the resources of the nominal group creates a moment of suspension between organism and object on the basis of an originary distinction between 'in here' and 'out there'. The latter is no longer than which is simply assimilated to the biological requirements of the organism. Further, that which is construed as exchangeable between social agents means that the 'in here' is standardised and normalised in lexicogrammatical form at the same time that the act of exchange situates

the 'I' in a world of other 'I's' on the basis of relations of contiguity and similarity with others (Prodi 1983: 32).

Grammar and the associative values on which this is founded are globally distributed across many levels in the brain (Edelman 1989: 179; Peng 1994: 124). There is no pre-assembled grammar as such because the grammar is an emergent property of the interstratal process of signification which takes place in relation to context. That is, grammar emerges through a process of "semantic-bootstrapping" (Edelman 1989: 176) or 'upgrading' (Peng 1994: 120, 125) when a particular sound sequence which is assembled by the speaking subject is stratally integrated with the conceptual level in relation to specific contextual requirements. For this reason, neither phonic nor conceptual values values nor grammar are localised in any specific brain function. On the other hand, both the faculty of articulate speech production (c.f. Broca's area) and the faculty of speech recognition (c.f Wernicke's area), which materially support and enable the former are, as shown in Figure 4.
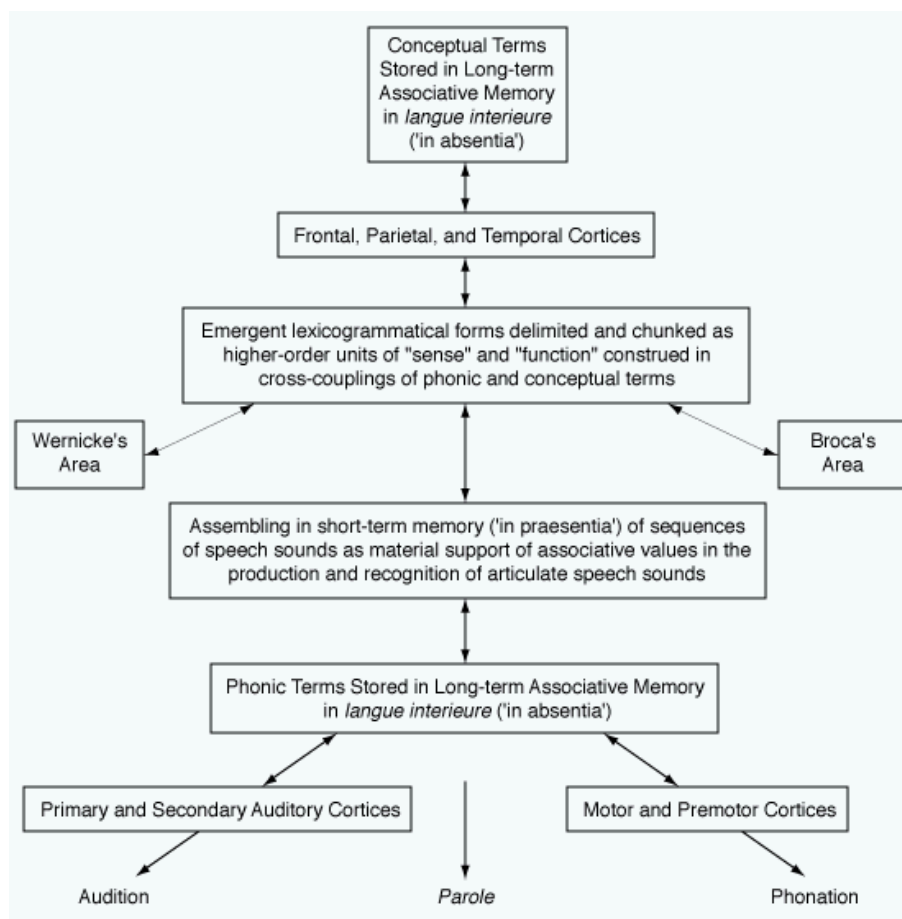
Figure 4: Stratification of language in brain in relation to the two forms of mental activity (partially re-worked from Edelman 1989: 177).

Phonic and Conceptual Terms, Language Form, and Context

Now, the specification of the associative series that intersect to produce a given syntagm remains an extensional description. Lists of the conceptual or phonic terms that intersect to produce a given syntagm do not in themselves tell us how the syntagm functions in discourse. This is, of course, a consequence of Saussure's *langue*-based perspective. But what remains unanswered is the question as to the relationships between the internal, *langue*-based description and (1) the contexts in which linguistic units have their meanings and (2) the intentions, goals, and purposes of language users. In order to be meaningful, these internal states must also be intentionally (psychically) directed. It is often assumed that in Saussure's theory there is no ontological commitment to what lies 'outside' the system of *langue*. This results from the mistaken assumption that *langue* and *parole* are necessarily and ontologically separated. Consequently, 'referring', in this interpretation of the relation between *langue* and *parole* is, as Lee argues, "the speaker's utilization of a system which is itself not determined by reference or denotation" (1985: 110). Certainly, Saussure eschews any commitment to naively denotational or referential theories of language, as his critique of language as nomenclature clearly demonstrates. But I think there is a better solution to this problem. This lies in Saussure's understanding of the psychically directed character of social-semiological processes in the speech circuit (see Lecture 5).

In the speech circuit, the combinations of conceptual terms which intersect in some syntagm are re-construed as higher-order concepts in the sign. This occurs in relation to (1) the ecosocial environment of the speech circuit; and (2) the goals and intentions of the participants in the circuit. It must be borne in mind here that the associative terms that intersect in the syntagm are themselves context-sensitive. Saussure's psychic perspective combines points (1) and (2) by showing how speaking subjects deploy the resources of *langue* to re-construe perceptual information which is picked up in the environment in and through the categories that are internal to a given social-semiological system. At the same time, they use these categories both to orient to each other and to the environment in socially significant ways. The environment, it is important to add, is to be understood in social-semiological terms. It is not simply a reductively bio-physical one that impinges on the sensori-motor systems of the individual (see also Harré and Gillett 1994: 69). The individual — the self–is always located within a system of interpretation. Its encounters with the world — the non-self — is always mediated by this system of interpretation. In the process of encountering the world, the individual learns about the world by virtue of the signs it is required to interpret. In this way, the individual discovers and develops a system of interpretation which enables and extends its possibilities of interaction with the world. That is, the process of encountering and interpreting signs in its interactions with the non-self is the means whereby the system of interpretation itself develops.

The stratal nature of the sign suggests how this happens along two dimensions, as shown in Figure 5:
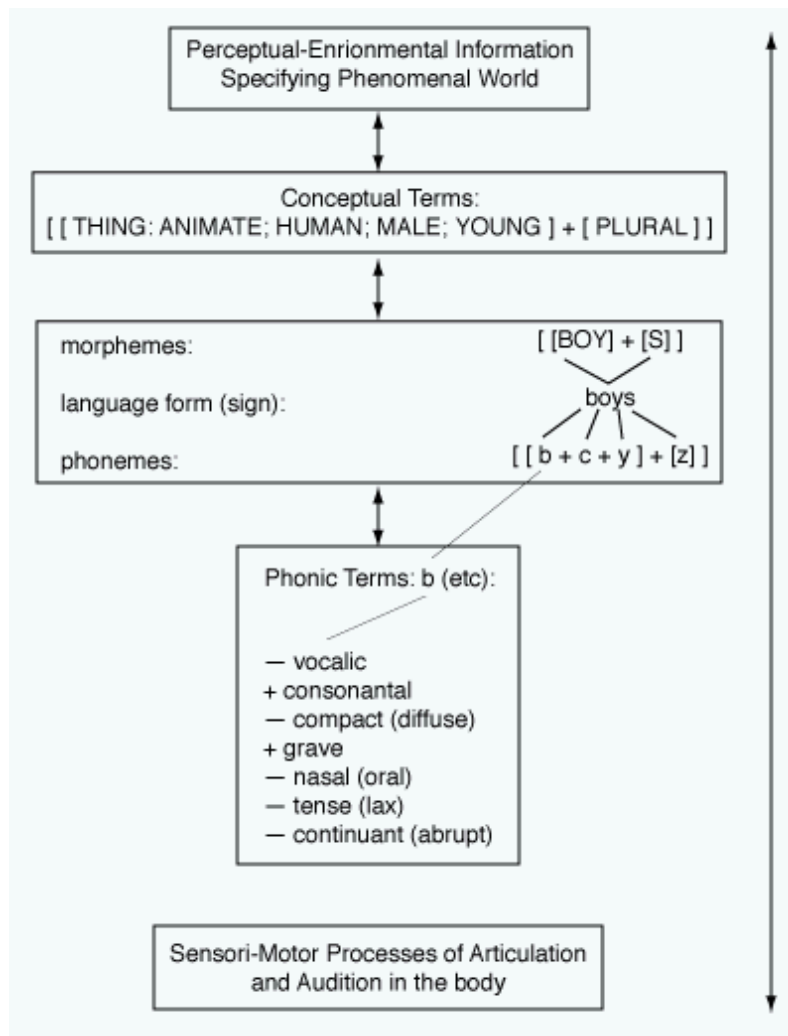
Figure 5: Stratifying the single morpheme word boy; semantic, lexicogrammatical and phonological strata in the making of the sign in relation to the analogue domains of 'thought' and 'sound'.

In line with the connectionist thesis, both conceptual and phonic terms are somewhere between the level of language form and the neural level. There is no pre-linguistic concept or thought 'boy' which stands behind the linguistic form and which is represented by the latter as a fixed schema in memory. Instead, dynamically assembled patterns of association from the conceptual and phonic domains are globally distributed over very many terms at increasingly more fine-grained levels of description. These may

not be available to conscious awareness and correspond to cross-modal associations of articulatory and auditory information (phonic terms) as well as perceptual, cultural, physical and other features of boys. There is no fixed relationship with the neural level. Rather, groups of neurons which are stimulated by either peripheral sensori-motor activity or by internal stimulus information self-organise in global patterns which store information about past associations as well as respond and adapt to future ones. Figure 5 suggests that three levels of associative patterns may be postulated. These are: (1) the global patterns of activity whereby groups of nerve cells which are excited or inhibited self-assemble into global networks of associations; (2) the distribution of patterns of association of phonic and conceptual terms that correspond to features of either the articulatory and acoustic properties or the conceptual properties and features of boys; (3) the dialectical interplay of syntagmatic and associative relations in and through which a specific linguistic unit emerges in either inner or outer speech; and (4) the meaning relations and value orientations that the individual constructs between this particular use of some form in this text or occasion of discourse and the wider patterns of intertextual relations in a community in relation to which any given instance is always interpreted (Lemke 1983; Thibault 1986). Each of these four levels of networks of associations is globally distributed and operates in parallel with respect to the others in the individual's brain. This also highlights an interesting ambiguity in Saussure's term 'thought'. It may designate both the analogue realm of mental activity in the central nervous system before it is integrated with language and the stimulus information which the individual picks up through his or her peripheral samplings of the environment. In both cases, thought is intentionally directed to objects — real or imaginary — which can be further elaborated through their integration into a higher-order social-semiological system of interpretation such as *langue*.

For example, the word *boy* construes certain instances of human beings in the environment (real, imagined, etc.) as instantiations of the features that are specified by the conceptual terms that intersect in this linguistic form. In so doing, it cross-couples the linguistic form to the environment in socially relevant ways. In this way, the form enables its users to selectively attend to, act on, and co-ordinate their orientations to the phenomena of experience in their ecosocial environment.

The conceptual terms on the semantic stratum are the minimal features (c.f. sememes) which configure to produce the single morpheme word *boy.* The stratification of lexical meaning in this way is necessary in order to show what conceptual terms differentiate the meaning of one morpheme, word, etc. from another.

For example, the single morpheme word *girl* is differentiated from *boy* from the conceptual point of view by the fact that the former has the conceptual term [FEMALE] whereas the latter has the conceptual term [MALE]. This is the principle of differentiation that Saussure discusses in the quotation discussed in section 7 above. These two terms differentiate *girl* from *boy.* The lexical item *boy* is a single morpheme word. There is no conceptual term [BOY] in English. Rather, the single morpheme word *boy* is the lexicogrammatical realisation of the specific bundle or configuration of conceptual terms shown in Figure 5. In this case, it is the stratification of the grammar and semantics of the word *boy* which shows this. In specifying "subpatterns of feature values of the environment", as Smolensky (1986b: 215) puts it, Saussure's conceptual and phonic terms provide, in my view, a means of bridging between the organisation of the material-phenomenal world of experience that we pick up and sample through our sensori-motor systems, and so on, on the one hand, and their construal as culturally salient things, objects, processes by linguistic and other semiotic forms, on the other.

But there is a further, much less neglected dimension of this process. This is the stratum of the acoustic or graphic image. In this case, phonic or graphic terms serve as the link between the information which specifies the articulatory or tracing activities of the speaker or writer and language form. From the point of view of this stratum, the form serves to orient the participants in the circuit to shared corporeal-temporal or corporeal-spatial gestural schemas whereby embodied social beings mutually orient to each other in their ecosocial environments. In this perspective, the sign is not only cross-coupled with patterns of social activity in meaningful ways, but also with the bodies of the participants who orient to each other in the ecosocial space-time of the speech circuit.

Phonic and conceptual terms belong to *langue*. In the first instance, that which is 'imprinted' and 'stored' in the brain are interconnected networks of associative values based on these two orders of difference. Once these values are internalised in this way, as part of a global system of interconnections, they function to discriminate or weight the speaking subject's responses to sensori-motor stimulus information, and in ways that categorially construe these phenomena of experience as instances of particular conceptual and phonological categories in a given system of *langue*. That is, a particular activity vector of values is selectively amplified as a co-ordinated and contextually specific semiotic response to some aspects of the material-phenomenal world.

Networks of conceptual terms serve as the link between the stimulus information which specifies the environment, in Gibson's (1986 [1979]) sense, and lexicogrammatical form. Clearly, no two individuals will have exactly the same networks of associations for even a deceptively simple item such as *boy.* The individual's *langue interieure* is built up and elaborated on the basis of a potentially very large number of experiences of how the word is used and encountered in many different contexts, personal

experiences, and so on. All of the information which is picked up will be integrated into the network of associations and in ways which dynamically alter the previous weightings among the terms in the network. Moreover, the patterns of association among the terms and their distributions are not neutral. The patterns of association in, for example, the 'boy' network are also shaped and guided by the systems of values in operation in the social practices of a given community. If all terms interacted with all other terms in the network with equal probability, then there would be no discernible pattern or order for all possible combinations would occur. This raises an important question concerning the relationship between the patterns of association in the individual's brain and the communities of which the individual is a member. If everyone simply carried round their own personal network of associations, then on what basis could individuals engage in jointly enacted meaning-making practices which require a socially shared system of interpretation. Where, then, does meaning reside? In the brain? In the society? Saussure argued that *langue* in the individual has only a virtual existence; it is not complete in the individual. The richly interconnected and forever changing patterns of association that constitute the individual's *langue* interieure have a purely virtual existence as a meaning potential until this is activated in and through interaction with other individuals in the practices of *parole* (see also Gee 1992: 47 for a similar view). A number of implications may be derived from this. First, the process of activating these patterns of association that are stored in the individual as linguistically realised meanings depends on the dialectical interplay of a *langue*-based system of syntagmatic and associative relations whereby this meaning potential is assimilated to the categories of a higher system of interpretation. Secondly, this process further requires that values are mapped onto perceptible physical-material units which constitute the means whereby they are enacted and stored in space and time. It is in virtue of this principle of material embodiment that meaning-making agents can project their meanings into the ecosocial environment and interact with

it. 'Inner speech' is no exception to this as it, too, is a specialised form of linguistic activity which is embodied by underlying neurophysiological processes in the central nervous system. Thirdly, the virtual nature of the networks of associations that the individual has built up cannot, logically speaking, be considered as a definition of meaning as such. As Saussure himself realised, individuals must be apprenticed in the meaning-making practices of the culture (see also Gee 1992: 48; Kaye 1982: chap. 4; Lave 1997). The patterns of associations stored in the individual's brain are a form of proto-meaning which is further elaborated and developed by its integration into the social practices of a given community (Lecture 8, Section x). The associations stored in a given individual's head are entrained and directed by the cultural practices of the community so that he or she will learn to recognise and use the culturally salient patterns and to ignore those that have no meaning or use in that community. Meaning only arises when we activate and constrain the meaning potential of the system through the systems of practices, the genre conventions, the semiotic forms — linguistic, visual, gestural, musical, and so on–that are the resources for making meanings in that community.

Associative Relations and Memory

Associative relations function in ways that closely parallel the notion of the cognitive mediational memory system (hereafter CMM) which has been proposed by neuropsychologists Warrington and Weiskrantz 1982; see also McCarthy and Warrington 1990: 325-7). This notion was developed on the basis of research conducted by these neuropsychologists on the amnesic syndrome. The CMM implies a system in which "memoranda could be manipulated, inter-related and stored in a continually changing record of events" (Warrington and Weiskrantz, 1992: 242). According to

neuropsychologists McCarthy and Warrington, the system is absent in amnesic patients. They report a number of controlled experiments conducted with both amnesic and normal subjects:

Baddeley and Warrington (1973) manipulated different encoding strategies in a verbal free-recall task. In one condition subjects were instructed to form a visual image (e.g., the dog chased the thief through the street in the village). Whereas the control subjects showed substantial gains when they were instructed to form a visual image, the amnesic patients did not […]. In a second experiment using a somewhat different technique, Warrington (1982b) found that amnesic patients failed to benefit from meaningful relationships between words in a retention-with-distraction task […]. Random noun-verb-adjective combinations (e.g., pipe-cold-frighten; walk-shiny-pools) were contrasted with word triplets linked by their meaning (e.g., crack-nut-hard; birds-south-fly). The amnesics and controls performed at identical levels with the random words, however on meaningful triplets the amnesic patients failed to show the gain which was observed in all controls.

The third experiment was one of learning to make associations between pairs of words presented in a list (paired-associate learning) (Warrington & Weiskrantz, 1982). There were three conditions, rhyme pairs (ring-sing), semantic category pairs (bird-owl) and meaningful noun-verb pairs (floor-wash). Both controls and amnesics scored at the same level on the rhymes condition (40% correct). However, the amnesics were much worse than controls on the semantic category and the noun-verb conditions […]. (McCarthy and Warrington 1990: 325-6)

The second experiment referred to here is based on syntagmatic criteria; the third on associative relations in precisely Saussure's sense. Furthermore, the fact that associations can be made on the basis of

phonological, grammatical, and semantic criteria is precisely borne out by Saussure's claim that associative relations may be established on the basis of shared criteria pertaining to either "sense" or to "form" (*CLG:* 174). The notion of the CMM supports Saussure's own views on associative relations. Mental activity is not based on criteria of input–storage–output, as in many earlier theories of memory. Rather, the flexible, open-ended and selective nature of associative relationships means that the individual has a dynamic resource which can be adapted according to constantly changing contextual requirements.

The brain does not store a closed and fixed inventory of properties which may be 'accessed' and 'retrieved' when required. Instead, it selectively activates particular connections in the neural networks according to the demands of specific contexts. In this view, the brain does not have at its disposal already given discursive strategies and procedures which are stored, ready to use in a given context. The point is quite another. That is, new connections, procedures and categorizations are created as the brain adapts to and modifies the contexts in which it functions. The brain, in this view, works on the basis of schematic generalisations and prototypical categorisations, rather than fixed images in memory. It learns to generalise and schematise on the basis of its participation in the social-semiological practices of *parole*. It constructs contextual models which can be reconstructed and manipulated according to new contextual contingencies. In this way, the "virtual mnemonic series" which are constructed by associative relationships or families of connections between nodes are ways of organising meaning relations, and in ways which connect past to present to future in the construction of new contextual relations. This takes place in and through the "effective series" that model the syntagmatic contexts in and through which acts of speaking and understanding in *parole* are functionally interpreted and integrated in discourse.

How Do Individuals Know Language?: An Alternative to the Impasse Between Natural Kinds and Social Conventions

Rather than an abstract and intrinsic knowledge of language, this suggests a very different way of conceptualising how individuals know a language. Trevor Pateman (1983) argues the case for two discontinuous orders of language study, viz. (social) beliefs about language and abstract knowledge of language, where it is assumed that languages "exist as natural and cultural kinds, but cultural kinds of languages are discontinuous with or additional to their natural reality (there is no one-to-one relationship)" (1983: 123). Thus, languages as natural kinds have an "abstract mode of existence" in the brain of the individual at some deeply unconscious level along the lines postulated by Chomsky. They are psychologically real mental representations of rules or grammars — cf. intrinsic competence–though not available to introspection (Pateman: 1983: 119). In Pateman's view, the naturalistic argument is supported by the claim that:

the child abduced its rules not from the rules held in common by its interlocutors, but from the output of these rules. It made no use of their common knowledge character, and could have succeeded just as well had its linguistic input been derived from the output of a regular rather than a rule-governed device: there would be no outward criteria to show the difference in the underlying generative mechanism, about which the child has no need to speculate.

More radically still, it seems quite well established that children do not simply abduce or reinvent existing rules in the process of their linguistic

development; they quite clearly invent new rules, the output of which becomes input to the speech of the community to which they belong. Though the outward criteria for ascription of rules is present, the collectively-shared character of these rules is missing: if they are shared at all, it is distributively (in virtue of a shared nature) rather than collectively (in virtue of shared membership of as linguistic community).
(Pateman: 1983: 115-6)

Pateman then cites evidence from the work of Bickerton (1981) on first-generation creolisation of pidgin languages and the work of Feldman et al (1978) on the spontaneous development of signing systems in isolated deaf children as a means for communicating with their hearing interactants in support of his view of language as natural kind. First, Bickerton, who attributes to the child an innate biopgram which allows him or her "to go beyond not merely the information given, but the range of socially available rules" (Pateman 1983: 116):

… the vast mass of human children are not growing up in even a partial linguistic vacuum. There will be a ready-made language which their elders will be determined that they should learn. Thus, almost (but not quite) from the earliest stage, the evolving bioprogram [for language] will interact with the target language. Sometimes features in the bioprogram will be very similar to features in the target language, in which case we will find extremely rapid, early, and apparently effortless learning. Sometimes the target language will have evolved away from the bioprogram, to a greater or lesser extent, and in these cases we will expect to find common or even 'systematic' errors which, in orthodox learning theory, will be attributed to 'incorrect hypotheses' formed by the child, but which, I shall claim, are simply the result of the child's ignoring (because he is not ready for it) the data presented by speakers of the target language and following out the

instructions of his biogram.
(Bickerton 1981: 135; quoted in Pateman 1983: 116)

Next, Feldman et al (1978):

All of the subjects we studied developed the ability to communicate with manual gestures. All began, like hearing children, simply by pointing to the people and things around them, engaging their listeners by eye contact (that is, they did not point if no one else was looking). These points continued to bear a heavy burden in the subjects' communications throughout our observation. In comparison, gesturing tends to decline for hearing children as speech emerges. As our subjects grew older, two striking changes in their communicative attempts took place. They began to use the points in combination, in ways that seemed clearly intended to convey semantic relations between the referents of the points. And they began to invent motor-iconic gestures that seemed to specify predicates of various kinds. These gestures, which we have called characterizing signs, soon came to be used in combination with the points in structured ways. Such extensive elaboration of the gestural mode is not typical for hearing children. As observers, we came inescapably to understand these signs and sign combinations as communicative acts —as comments about the world, queries, requests, and demands addressed to the listener. All in all, it is impossible to observe these subjects and deny seriously that they achieved considerable communicative skill in a gestural mode: each subject must be credited with an idiosyncratic "home sign" system that puts him into mental contact with those around him.
(Feldman et al 1978: 375; quoted in Pateman 1983: 117)

Both Pateman's argument and the evidence he cites in support of it from the studies of Bickerton and Feldman et al invoke some innate bio-program or mentally represented grammar as the cause of the observed 'output'.

The isolated deaf children of hearing parents who spontaneously develop signing systems as studied by Feldman et al are cited is evidence as to the falsifiability of common knowledge conventions. Pateman's argument is based on a sharp distinction between naturalistic and sociologistic definitions of language — intrinsic competence vs. common shared conventions to be learned — that is in my view irrelevant. There is not some innate bio-program which causes the development of signing systems in the absence of speech input. I would rather say that the signing activity of these children or, indeed, the invention of new syntactic and other rules by first generation creoles is the result of the way a system — the individual signer–with particular intrinsic dynamic properties behaves in a particular context. What makes this type of signing activity or the rules of this or that creole come to the fore in the activities of the children concerned is determined by the specific activities they engage in. This leads to the creation of attractors through the systems ongoing ability to self-organise in real-time through increases in the coupling strengths of the various reentrant systems that are mapped onto the brain and which are in turn responsible for the further development of the brain itself.

Knowledge of language does not then reside in some pristine context-independent causal realm in the individual's head. Knowledge as such does not exist in the head from the start. Rather, the infant has intrinsic dynamics which interact with the outside world in the dynamic process of assembling knowledge in relation to context-specific activities. The child's intrinsic dynamics mean that manual-brachial gestures are every bit a part of the system's potential as are vocal tract gestures. However, specific contexts — e.g. deaf infants with hearing parents — may mean that some patterns of spontaneous signing activity occur that **appear** to be independent of the ways in which intrinsic dynamics interact with specific contextual parameters. In actual fact, this is an artifact of the system of observation adopted by the analyst. The emphasis on individuals as

processors of input (Bickerton) or as seeking "mental contact with those around him" (Feldman et al) itself places the emphasis squarely on the individual Leibnizian monad who look out on the world through their own little peep holes. Thus, in the system of interpretation adopted by these analysts only individuals and lower-scalar subsystems of these come into view thereby blocking any theoretical possibility of bringing the higher-scalar levels into view. What their explanations cry out for yet completely fail to see is that the activities of the individuals described are precipitated and only come into view on account of the observational standpoint (the theory) interacting with a higher-scalar trajectory which enables individuals to come into view.

A further problem resides in Pateman's naturalistic assumption that all of the information — the intrinsic competence — is stored in the organism from the outset. Thus, in abducing rules from the linguistic output of others, individuals self-reproduce in virtue of in-built genetic programs operating as formal causes. This view fails to see that higher-scalar levels above the individual always contain stored information which is necessary for the development of the individual and which the individual accesses and integrates into its own structure and dynamics as it progresses along a trajectory-in-time. As Salthe points out, "as a system accesses a new developmental stage, it is contributing to the build up of meaning in its trajectory" (1993: 219).

A further problem with the notion of intrinsic programs which causally generate linguistic behaviour is that this leaves no room for the ways in which historical contingencies increasingly distinguish an individual trajectory from others of the same type. This is so because individual trajectories are marked by unique experiences on account of their particular histories. No two histories are exactly alike. Therefore, the deaf children or the first generation creoles mentioned above can be see as specific cases

of historical emergence. The individuating trajectories of the deaf children in their particular situation means that they encounter historical contingencies along their trajectory which contribute to the emergence of a unique individual with properties that differentiate it from the type. On the basis of the description above, these children appear able to accommodate and assimilate particular historical contingencies along their trajectories without compromising their integrity as systems. In this way, these contingencies constitute information which is integrated into the system as it trajectory unfolds and which modify the individuating behaviour of the system. The historical information accumulated by the deaf children is different from that of hearing children and this means that differences can emerge along a trajectory. The bio-program postulated by Feldman et al does not determine how the trajectory unfolds. It exists at a lower-scalar level whereas the interactions between the deaf children and hearing adults are informed by higher-scalar boundary conditions at the social level. The bio-gram is not then the generator of the signing activity. Rather, it provides lower-scalar level stability which buttresses the organism against catastrophic historical perturbations (Salthe 1993: 202). Instead, these children-in-interaction are events whose behaviour along their trajectory is generated by the way their intrinsic dynamics interact with the non-self.

On the basis of the description cited above, it is, moreover clear that the deaf childrens' signing activity is an attempt to zoom in on to a point of convergence with the speech activities of their hearing parents. It is the higher-order boundary conditions in operation which pull their activity along in this direction in virtue of the constraints operating at the higher-scalar levels. This is clearly indicated by their initial efforts to engage the attention of others by pointing and eye contact. Thus, this spontaneous signing activity is not outside the available systems of interpretation at the higher levels. On the contrary, it represents an attempt to construct a bridge towards the meaning system of the speaking adults. For this reason, it

must assume as intrinsic to its own dynamics some common interpretative ground with the adult's system.

Both cases discussed by Pateman assume an agentive viewpoint which can assimilate external contingencies to its own developing system of interpretance and its categories, in the process creatively adapting and modifying them. This shows that the ability to create new rules and new forms of meaning-making activity ties in with self-organisation along a trajectory. The increasingly more complex gestures which the deaf children create and the "new rules of syntax" of the first generation creoles leads to the auto-collection of these same products as the results of its own cascading activities. This leads to the further elaboration and integration of the individual in relation to an ecosocial environment which is itself changing as a result of these same cascading/collecting activities.

We are now better placed to consider the role of signifying activity as the interface between individual and ecosocial environment. Information stimuli such as articulate speech sounds or graphic traces on a treated surface are picked up as indexes of external events in the stimulus flux of the ambient array. The correspondences that Gibson (1986 [1979]) notes between stimulus information in the array and the material event that caused this is a necessary or indexical one. That is, the stimulus information in, for example, the acoustic array corresponds to necessary features of the vocal tract activity which produced the sounds heard. Therefore, the information in the array may be said to constitute an environmental record of the sensori-motor activity that produced the sounds. However, this indexical information concerning a mechanical event is internalised by the perceiver and transduced by the stored patterns of association in the central nervous system into symbolic possibilities. The stored patterns of association in the central nervous system are internal models of possible ways of projecting meaningful activity beyond the individual into the environment. The

transduction of indexical information about an external environmental event into symbolic possibilities severs the necessary connection between external stimulus and internal activity. This is so because the interfacing of a lexicogrammatical system between external stimulus and internal activity means that the necessary link between the two is broken. In doing so, the possibility of creatively adapting to and modifying the relation between self and non-self is massively expanded.

The expression stratum of semiosis in actual fact contains both indexical necessities and symbolic possibilities. Thus, the expression stratum of speech has both topological-dynamic (indexical) and typological-categorical (symbolic) properties. The former directly index bodily states of the speaker in the real-time of the speech event. In so doing, they ground the speech event at a particular embodied individual. The latter refer to the phonological and, hence, linguistic features of speech sounds in sensu strictu. These generate a different kind of possibility: their re-construal as the symbolic possibilities of lexicogrammar and its semantics on the content stratum of semiosis. Both articulate speech sounds and graphic tracings on a surface are environmental traces relative to a point of observation. Speech sounds constitute a progressive record in time of the vocal tract activity during the act of articulation. Written symbols are a progressive record of the muscular and hand-arm-joint movements involved in the act of tracing on a surface. As traces in an ecosocial environment, both selectively attend to some features of the original material event relative to the purposes of the producers and receivers of such traces.

Yet another difficulty lies iin Pateman's defence of language as natural kind is the assumption of language as formal, abstract, autonomous and therefore monomodal. This flies in the face of the fact that language both co-evolved with and is co-deployed with other semiotic resource systems

which interact with and influence the intrinsic properties and dynamics of language itself. Given that the case for language-specific and genetically programmed modules in the brain is largely discredited in modern biology, we need to re-consider this question more seriously with respect to brain function. My starting point is the earlier observation that the virtual character of the individual's *langue interieure* is a richly interconnected set of patterns of association which are no more than a meaning potential until activated in and through the meaning-making practices of the community. Now, given that the patterns of association that are stored and elaborated in the brain are reentrantly mapped onto groups of neurons from many cross-modal sources, it follows that such patterns of association in the brain are themselves cross-modal in character. This means that information derived from proprioception, exteroception, diverse semiotic resource systems, and social practices is cross-modally associated as networks of connections in the brain. The example of *little* discussed above already begins to show this in its own modest way. All of the observations made above lead me to re-consider the status of the general sign-constituting faculty that Saussure postulated (see Lecture 6, Section 1). I shall now discuss this.

Saussure made the point that this faculty regulates the making of linguistic signs of all kinds — spoken, written, signed (*CLG:* 26-7; Lecture 8, Section 1). This suggests that various semiotic modalities may be dissociated and re-combined in new ways on the basis of the cross-modal character of the networks of associations stored in the brain. Thus, the semantics and lexicogrammar of language may be de-coupled from speaking, gesturing, and so on and re-coupled to the writing, spatial layout, and so on. Articulate sounds may be coupled with either the linguistic semiotic in speaking or with a musical one, as in song. Manual-brachial movements may be coupled to either sign or to the spontaneous gesture which accompanies speech.

Even this way of expressing the problem seems somewhat awkward and suggests that we need to shift our definition away from notions such as the spoken language and the written language to notions such as **speaking** and **writing.** The former assumes a narrow definition of what is linguistic as distinct from what is para- or non-linguistic. In my view, the notion of speaking as a multimodal semiotic performance gets much nearer to the embodied nature of the intrinsic dynamics which characterise speaking as a time-bound contextual activity. Thus speaking (not spoken language) forms cross-coupling patterns between vocal tract and pulmonic activity, facial movement, gaze, eye contact, head movements, hand-arm movements, and body movements as well as with selected aspects of the material world. Further, these peripheral bodily activities variably couple, de-couple and re-couple in the real-time of the activity of speaking with the lexicogrammatical and semantic resources of the language system in sensu strictu. Given that multimodality is a fundamental design principle of all acts of meaning-making, it follows that different semiotic performances and the texts that derive from these (e.g. speaking, writing, signing, depicting, and so on) co-deploy selective cross-couplings of semiotic resources in relation to cross-modal patterns of association that are stored in the brain as a **multimodal** meaning-making potential. In this way, the brain is integrated with multimodal semiotic performances and texts — material actions, speaking, writing, visual images, movement, sound, etc. Thus, peripherally focussed sensori-motor activities are (1) the means for transducing stored patterns of cross-modal patterns of association in the brain into meaningful activity and (2) projecting this into the ecosocial environment with which the individual interacts. The transduction of cross-modally stored patterns of association (proto-meanings) in the central nervous system as contextualised meaning-making activity thus functions (1) to synchronise and selectively focus the orientation of the interactants with respect to the meanings and practices that are relevant as well as to each other; (2) to selectively attend both to the internal states of

participants as well as to their ecosocial environment; and (3) to organise the space-time of the interaction in terms of felt rhythms, tempo and duration.

Saussure's Social Psychology and the Institutional Amnesia of Linguistics

The *langue interieure* which is stored in the individual's brain constitutes a meaning potential which is distributed across some social ensemble of individuals. This does not mean that all individuals have exactly the same patterns of associations 'imprinted' in their brains. Saussure used the word "approximately" (*CLG:* 29) to indicate the fact that the patterns of associations stored in the individual's brain are entrained through their participation in the practices of *parole* to converge in ways that make shared meaning-making possible. Thus, the individual's repertoire of associative patterns reflects patterns which both are typical of the cultural groups that he or she participates in as well as exhibiting individuating tendencies. Saussure also says that these strategies are both "virtual" and "incomplete in any one individual" (*CLG:* 30) in the sense that meaning-making does not occur inside lone individuals but in and through their participation in social meaning-making practices. Ax I shall argue in Lecture 8, inner speech is no exception to this.

It would, of course, be too easy to think that all of this is some sort of 'inner' process that goes on 'in' the head of the individual as some sort of individual cognitive competence or mental representation. This is a good moment to reflect on Saussure's use of the term 'social psychology' (*CLG:* 33) in connection with his social-semiological theory of language. *langue*, it should be borne in mind once again, is dually social

and individual in character. From the point of view of the primary structure, typical patterns of discursive structures and strategies (syntagms) and the means of manipulating and adapting these to changing contextual requirements (associative relationships) are located at each of the individuals in a given social ensemble. Thus, the social is 'in' the individual. This means that the individual has the social-semiological resources for entering into specific kinds of discursive relations with others in a given social-semiological system. *langue* is a transindivual system. Therefore, and by definition, it cannot be other than 'virtual' and hence 'incomplete' in any given individual. It is for this reason that *langue* is both social and individual: it provides the resources for integrating the individual qua body-brain complex into the social-semiological system as a recognisable social type in a given historically specific culture. In this connection, it must also be remembered that, in Saussure's account, the individual is defined as both a unique historical-biographical individual in *parole*, and as a social type in *langue* (Thibault 1997: chap. 5).

I do not believe that Saussure intended the two forms of "mental activity" that he proposes in any sort of individualistic sense as something that goes on inside the head of the individual per se. He says variously that these relations, from the point of view of the individual, are without pre-meditation, 'virtual', 'incomplete' (*CLG:* 30) and 'unconscious' (*CLG:* 171). That is, syntagmatic and associative relationships, which belong to the system of contextualising relations in *langue*, are always implicit in the material-semiotic cross-couplings that are entailed in acts of *parole*. Generally speaking, they are implicit and beyond the conscious awareness of the individuals who participate in *parole* at the same time that they provide higher-order, *langue*-based meta-rules of interpretation of these same practices.

For Saussure, the individual is biologically equipped to develop and act as a social being. The 'faculty of articulate speech' which Saussure, following the anatomical research of Paul Broca, locates in the third frontal convolution of the left lobe of the brain (*CLG:* 26-7; Saussure 1993: 277), and the existence of the vocal apparatus are cited as evidence for the existence of a universal biological faculty in this sense. But what interests Saussure is the way that this pre-disposes the individual to be integrated as a fully social being into a given social-semiological system. Saussure does not privilege the individual organism. This is just one level or organisation in a still wider system of organised complexity. The 'imprinting' and 'storing' of the social-semiological system of *langue* in the brains of individual organisms raises the fundamental question as to how social-semiological structures and processes regulate and entrain the individual to become a fully social member of a given social-semiological system. Saussure does not directly engage with this question. Nevertheless, he saw the issues in the context of contemporary developments in language studies, evolutionary theory, psychology, and neuroanatomy with uncommon acumen and theoretical foresight. Saussure has understood, like the pioneering neurologist, J. H. Jackson (1969), that language cannot be localised in any one area in the brain. Rather, Broca's 'faculty of articulate speech' is just one of a number of different brain functions, all of which work in parallel. Saussure shows, with his idea of the 'general language faculty', that the global criterion which integrates these as one dynamically functioning system is that of meaning.

It was only the collective amnesia of the institutionalised discipline of linguistics, along with the other human and social science disciplines, that quickly forgot these fundamental insights. This collective amnesia effectively deferred, to the point of losing sight of, the creation of a genuine dialogue of the kind Saussure initiated between the human and social sciences, on the one hand, and the life sciences, on the other.

Subsequently, the very possibility of such a dialogue has been forgotten and removed from the political and ideological agendas of these disciplines in the name of the individual as the privileged locus of theoretical analysis.

In Lecture 8 I shall further explore these insights in relation to the dialectic of collecting/collecting whereby individuals are integrated into the higher-scalar orders of the social-semiological system in the forging of an individuating trajectory-in-time.

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