2

Linguistic Levels in Aphasia

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The Need for Description

'Empirical work must come first'. It is discomfiting, but salutary, to begin with such a quotation — discomfiting, because it was a remark of Hughlings Jackson, made in the 1880s at a British Medical Association meeting, as apposite today as it was a century ago. Much has happened meanwhile. Yet there still remains a pressing need for a comprehensive and systematic description of the linguistic behaviour of aphasic patients, made at a level of detail that would be considered routine in, say, human anatomy or physiology. Compared with medical case studies, where are the published accounts of the *whole* of aphasic patients' linguistic behaviour, as manifest in a sample of their conversation? There are many partial studies and illustrations, of course, which give sample utterances, snippets of dialogue, test results, and linguistic observations. These help to build up a clinical character of the condition, and they provide input for formulating aphasia theories and therapies, but the goal of a comprehensive and precise description of a patient's linguistic strengths and weaknesses is still far from routine, and is usually missing from accounts of research investigations or of therapeutic practice.

Nevertheless, the demand for adequate descriptions continues. Some years ago, it was voiced primarily with reference to questions of diagnosis and assessment; more recently, with reference to procedures of treatment and rehabilitation; and more recently still, with reference to the problem of how to evaluate aphasia therapy. Indeed, these days the role of an initial linguistic description seems to take on the status of an axiom, in the accounts of many scholars. For example, in the introductory chapter of a recent volume on aphasia therapy (Code and Muller, 1983), the editors remark that

'a description of the patient's communicative abilities along linguistic parameters would appear to be essential before treatment can be planned', and in the concluding chapter to the same volume, Coltheart (1983) remarks that 'any study intending to obtain information about the efficacy of any form of treatment should begin with the assembling of a good description of the patient'. In another recent review, the author states: 'A detailed analysis of a patient's spontaneous speech is the first step in planning a treatment programme' (Ludlow, 1981). Such comments are widespread in the aphasia literature, making the almost complete absence of comprehensive descriptions all the more regrettable.

The need for detailed descriptions is not motivated solely by the demands of therapy, but also by the requirements of differential diagnosis. It is now something of a truism to point to the terminological uncertainty and the competing typologies that characterize the field of aphasiology. 'There is still no universally agreed definition of aphasia' complains Lesser (1978) on her opening page, and, after reviewing various syndromes, she concludes that 'it would be a mistake to give the impression that these syndromes are easily recognized in a clinical population'. Whurr (1982) begins similarly, with reference to typology: 'There is still no universally agreed classification. Terminological confusion exists, due, in part, to the multidisciplinary interest in the subject (clinical, physiological and behavioural), but also due to the diversity of philosophical and psychological theories on which much of the work has been based'. She concludes: 'In the absence of such descriptive statements, the traditional aphasiological foci of attention on matters of definition, diagnosis and classification seem positively misguided'. The role of accurate linguistic description of patient behaviour as a means of resolving these problems has long been appreciated: Jakobson, for instance, has argued the importance of the point for 30 years (*see*, for example, Jakobson, 1954). As recently as 1980, Jakobson still found it necessary to say: 'The further development of linguistic inquiry into aphasia demands a greater concentration on the description and classification of the purely verbal syndromes.' His own pioneering application of linguistic concepts to aphasia is rightly regarded as monumental, but his classifications remain extremely general, and have not, it seems, been followed by detailed subclassifications carried out at appropriate linguistic levels, or by applications relating his intentions to the specific demands of routine clinical practice.

The reasons for the lack of descriptive progress are not hard to find. The talk presupposes an adequate descriptive framework, and knowledge of how to use and apply it. In so far as linguistics is concerned with the provision of descriptive frameworks for language, it should be pointed out that reasonably comprehensive frameworks have only recently been devised, and there are still many gaps to be filled by pure research. Similarly, the training

of those people most involved in the study of aphasia has until recently lacked components in which such descriptive frameworks are routinely taught and practised. It is only as recently as 1974, after all, that a course on linguistic theory and description became an obligatory feature of speech therapy training in Britain; and many training courses in other parts of the world still lack this feature. Even in centres where the frameworks are available, and where the willingness to learn and use them is present, there are problems — primarily that of finding time and opportunity to carry out the descriptions of patient behaviour required before systematic advances in diagnosis and treatment can be made (*see further* Crystal, 1982b). Consequently there is a marked lack of publicly accessible data, and no guarantee that the data that are available have used the same descriptive framework, enabling comparative statements to be made clearly and consistently.

The theoretical framework required to solve the descriptive problem has been appreciated for a long time — a model of language which recognizes and interrelates a set of linguistic *levels*, or dimensions of linguistic analysis capable of independent study. The importance of this model is once again summarized by Jakobson (1980):

> 'The question of levels is relevant indeed. Too often, attempts to treat the linguistic aspect of aphasia suffer from inadequate delimitation of the linguistic levels. One could even say that today the most important task in linguistics is to learn how to delimit the levels . . . But in all linguistic questions and especially in the case of aphasia, it is important to approach language, and its disruption in the framework of a given level, while remembering at the same time that . . . the totality and the interrelation between the different parts of the totality have to be taken into account.'

Reference to at least the main levels of linguistic inquiry is now commonplace in aphasia studies. It is conventional to recognize the levels of phonology, grammar and semantics (Lesser, 1978; Albert *et al.*, 1981; Whurr, 1982). But this recognition of the theoretical importance of the model has not been accompanied by a corresponding readiness to provide descriptions in terms of the model. The idea of levels has proved its worth by providing a framework in which clinical observations can be placed somewhat more neatly than previously, and it has acted as a reminder to clinicians of the potential complexity of language; but in fact hardly any publications illustrate its systematic, detailed descriptive use, and there is a real danger of misleading conclusions being drawn about aphasia, when the limitations of the model fail to be understood, and the notion of level comes to be applied in an oversimplified way.

Some cautionary remarks are in order before proceeding to a descriptive approach. In particular, it must not be forgotten that the concept of 'level' is a linguistic fiction, with both the number of levels and the nature of their

boundaries being the outcome of specific linguistic theories. It is fashionable to search for neurological or psychological correlates of linguistic levels, but one does not need to commit oneself to a 'God's truth' view of these constructs in order to use them, and indeed there are interesting arguments against adopting such a view (*see further* Crystal, 1982a). The three-level approach, for example, is only one such possibility. There are two-level models (e.g. form v. meaning, structure v. use), four-level models (e.g. recognizing a separate level of phonetics alongside phonology, or morphology alongside syntax), five-level models (e.g. phonetics/phonology/morphology/syntax/semantics), etc. In some approaches, different kinds of levels are recognized, as in Halliday's notion of 'inter-levels' (of phonology and semantics) relating the primary levels of substance, form and context (Halliday, 1961). The linguistics literature has devoted much space to considering the question of how levels of analysis are motivated and applied, and it is generally recognized that levels ought not to be presented as if they had some kind of life of their own, but rather ought to be seen within a particular theoretical frame of reference. For instance, there is no single answer to the question: 'Is there a level of prosody?' Some approaches see prosody as a sub-level within phonology ('non-segmental' as opposed to 'segmental' phonology); some see it as separate from phonology (they would talk about a 'phonological and prosodic analysis', for example); others see it as best subsumed under the level of grammar; and there are other possible positions. To make a decision, one must first know something about the range of forms and functions that are designated by the term 'prosody' — the variations in pitch, loudness, speed and rhythm of speech — and reflect on the extent to which these variations operate in language as do the phonemes or distinctive features of phonology, or the syntactic rules of grammar. Only after one has made a judgement about their linguistic role and significance will one decide whether to 'promote' them to the status of a linguistic level, and give them some kind of autonomy in one's description (*see further* Crystal, 1969).

It must be remembered, too, that linguistics is concerned with the properties of language in general (not just English, or modern European languages), and that its models have to be tested against the variety of languages encountered in the world. It is not enough to devise a levels model that works quite well for English, and to assume its psycholinguistic or neurolinguistic reality, forgetting that the model may not work so well for structurally unrelated languages (whose speakers none the less have to be credited with isomorphic brains). Aphasia studies must also be generalizable in this way, and they usually are not. To take just one example, Lesser (1978) decides that in her book, 'as is more usual in aphasiology, the term *syntax* will be used to include morphology as well as sentence structure'. Now it is certainly possible to devise a theory in which a level of morphology has no

separate representation (generative grammar, for instance), and such a theory does not do too much harm to the facts of English, where inflectional endings are few, but it is most unlikely that such a theory would do justice to aphasic behaviour in, say, Turkish or Japanese (which are agglutinating languages, with complex word-structure), or Arabic or Greek (which are languages with a complex inflectional system). In such cases, the morphological component of the description would be so important that it would have to be recognized in one's general approach as a major level, and not be swallowed up as a junior aspect of the syntax. Similar issues arise in relation to any of the other linguistic levels.

A further cautionary observation relates to the notion of 'autonomy' of levels, referred to above. As Jakobson and many other theoreticians have emphasized: 'The various levels of language are autonomous. [But] Autonomy doesn't mean isolationism; all levels are interrelated' (Jakobson, 1980). Indeed, the convenience of a framework in which one is permitted to study a single aspect of linguistic form or function to the exclusion of others must not be allowed to obscure the artefactual nature of this manoeuvre, nor to minimize the importance of expounding the nature of the relationships which obtain between levels, and which define the language system as a whole. Points of contact between levels are frequently noticed in clinical investigation, e.g., the functional load of the phoneme /s/ at the grammatical level (where it realizes plurality, possession, 3rd person present, etc.), or the use of rising intonation as an alternative to syntactic forms of question, or the way in which lexical problems interfere with the construction of sentences (as in so-called 'word-finding' difficulties). What has to be appreciated is that these are not isolated topics: in principle, *all* descriptive statements made at a given level must be related to the corresponding statements made at other levels, the interactions noted, and some kind of integrated account arrived at. One should never take language apart without the intention of putting it back together again (*see further* Crystal, 1987).

The Importance of Transcription

An integrated description in terms of levels is an important goal of aphasia studies, but it cannot even begin to be achieved without a firm transcriptional foundation — and this is usually lacking. Whenever one obtains a sample of language from a patient (spontaneous speech, test results, reading aloud, or whatever), the first step should be to transcribe it; and the whole of one's analytic edifice depends on the accuracy of the transcription. If a transcription is unclear, partial or inconsistent, it becomes impossible to verify the analyst's descriptive claims. A good transcription, in essence, is an account of the sample which makes it unnecessary to refer back to the tape

from which it derived. It 'replaces' the tape, in the sense that any analyst trained in the conventions of the transcription can read it and 'hear' what was said as clearly as if he were listening to the tape itself. Few transcriptions ever reach this degree of autonomy, but all should strive to attain a reasonable level of accuracy and consistency. Unfortunately, transcriptions of aphasic speech are rarely complete and usually ambiguous.

The kind of transcription generally encountered in published work on aphasia can be illustrated by the following (taken from Goodglass, 1968):

> Yes .... ah .... Monday ... ah ... Dad and Peter Hogan, and Dad ... ah .... Hospital ... and ah ... Wednesday ... Wednesday, nine o'clock and ah Thursday ... ten o'clock ah doctors ... two ... two ... an doctors and ... ah ... teeth ... yah. And a doctor ... an girl ... and gums, and I.

It is impossible to derive from such a transcription a clear auditory impression of how the patient must have spoken this utterance. The punctuation is partly conventional (periods and commas), partly unconventional (the use of triple dots, but in two cases the use of quadruple dots). Are the dots intended to represent a *system* of pauses, in the sense that all triple dots are the same length? What exact value has the comma in relation to the other punctuation? What was it in the data that led the analyst to use a period after *yah* and not a comma or a triple dot? Or (to move to lexico-grammatical issues), what is the evidence to support the transcription of *an* in two places, instead of *and*? Does the fact that *Hospital* is written with a capital letter mean that the analyst is seeing this word as a proper noun, or as the beginning of a new sentence, or both? A transcription of this kind raises many such questions; none are trivial, for analytic decisions will later be made to depend on them. If one wishes to measure the length of this patient's sentences, for example, the decisions that led the transcriber to assign periods will be crucial.

There seems to have been no change in this kind of loose transcriptional practice since the 1960s. Ludlow (1981), for example, illustrates the following Broca's utterance:

> Me ... my wife ... went ... school, no, speech, speech, speech therapy. Oh, I don't know, I went ... and work, work.

The same problems recur. Why is there a comma after school, and not a period? What motivated the period after *therapy*? Why no period after *know*?

The use of punctuation supplemented by an arbitrary and idiosyncratic list of graphic devices seems to be standard practice in aphasia studies still, and it will not do. Such an approach leaves out far too much relevant information — information that is prerequisite for anyone wishing to sharpen their instruments for diagnosis and assessment, or to improve their

techniques of therapy. Most obviously, these transcriptions omit to tell us anything about the intonation, stress, rhythm and other prosodic and paralinguistic features of spoken language — features that are central to our understanding of the organization and progress of aphasic speech. Indeed, it is the particular combination of one of these features (stress) with certain word clusters which, in the view of Goodglass (1968), 'forms the essential feature of the agrammatism of Broca's aphasia' (see also the balanced comments in Lesser, 1978). If this is the case, one would at least expect aphasic transcriptions to contain stress marks to enable researchers to check the hypothesis — and this is not routinely done.

It is not simply a matter of stress. The multiple functions of intonation in the organization and processing of speech are also strongly implicated in the search for an explanation of aphasic disturbance. Is each word in a given sequence spoken with a separate intonation unit (a 'word-at-a-time' intonation) or do the words group themselves intonationally (and rhythmically) in certain ways? If the latter, the particular groupings can tell us a great deal about the way the patient is processing language, and where his difficulties lie. An example is the abnormal chunking introduced by prosody into one of Mr J's sentences (Crystal *et al.*, 1976). Mr J would say, at a certain stage in his treatment.

> the bòy is/ . èating a/ . àpple/

Later, he was able to say:

> the bòy/ is . èating/ a . àpple/

still somewhat hesitant, but at least now the main prosodic units correspond to the main grammatical elements of the sentence. To show this improvement, one requires a transcription in which at least tone unit boundaries, tonicity, and nuclear tone type are marked, along with stress and pause conventions, where needed.

The kind of transcription illustrated here is of course still only a crude level of phonological representation. A much more detailed level of transcription is required to capture the whole range of non-segmental phonological features available in a language, in which such variables as increases and decreases of tempo and loudness, alterations in the pitch range of stretches of utterance, rhythmical variations, and the many kinds of vocal paralinguistic effect (e.g. breathy, creaky, nasal, tense tones of voice) are taken into account. The level of detail of such a transcription has been illustrated elsewhere, for normal varieties of English, where it is possible to identify the salient phonological characteristics of, say, a sermon, or a sports commentary, or

1. / marks tone-unit boundaries; ò represents a falling tone; . represents a brief pause; all other syllables are unstressed. These conventions are taken from the transcriptional system presented in Crystal (1969), used in full in Crystal and Davy (1969), and in simplified form in Crystal, Fletcher and Garman (1976) and elsewhere.

everyday conversation, using such a combination of variables. It is my view that the nonsegmental variability of aphasic language is no less complex than that encountered in other varieties of English, and deserves a comparably serious treatment. This is most obviously the case for the more 'fluent' forms of aphasia, where variations in pitch range, loudness and speed are often important cues to our awareness of the patients' comprehension and control of what they say. Thus one patient (Mrs W) used to produce fairly well-formed sentences, consisting of main clause and subordinate clause as follows:

well I used to go down there whenever I could you see

which, lacking any prosodic transcription, tells us nothing about her problems of expression, and her listener's problems of comprehension. In fact, what Mrs W said was:

'well I/'used to/'go down thére/' 'when/ever I còuld you sée/'
'low, piano, allegro' *'ascending, crescendo, lento'*

where the inverted commas indicate that the first, main clause was spoken in a low-pitched, quiet and rapid tone of voice, and the second, subordinate clause was spoken with the voice level increasing and slowing. In short, the overall auditory effect was something like:

..... whenever I could you see.

This consistent obscuring of the main clauses in Mrs W's speech was an important feature of her assessment, and an early target for treatment. Similar forms of prosodic complexity can be demonstrated for other tyes of aphasia, e.g. the variations in the tempo of utterance of syllables and segments in 'non-fluent' speech.

It should be noted, at this point, that my requirement of a reasonably full prosodic and paralinguistic transcription of aphasic speech is not an abnormally strong one. It is no more than I would expect as a foundation for the description of any sample of spoken language, but in the case of aphasia the requirement has an added significance in that it is a prerequisite for an adequate symptomatology. I take it as axiomatic that an aim of aphasiology is a comprehensive statement of clinical symptoms. It is often said, impressionistically, that aphasic prosody is disturbed. But little effort has been made to build an appropriate bridge between these last two sentences. Thus, for example, in a recent synthesis representing the influential Boston approach, we have an account of Melodic Intonation Therapy (MIT), and an interesting case report, on the one hand (Albert *et al.* 1981); but on the other hand, the authors do not give any intonational transcription of their patient's speech, and in their introduction the section on 'linguistic aspects of dysphasia testing' makes no mention of intonation or prosody at all. There

are several valuable hypotheses about prosody in aphasia, and several experimental studies (cf. Lesser, 1978), but there is a remarkable lack of naturalistic empirical data on the point. We urgently need descriptions of patients' prosodic and paralinguistic features, both in a range of linguistic settings, and longitudinally; equally, we need similar transcriptions of the prosody and paralanguage of the patients' interlocutors, the prosodic character of whose stimuli exercises so much influence on the patients' response. Until a level of prosodic transcription becomes routine, the claims made about other levels of the patients' linguistic organization are inevitably to some extent arbitrary and uncertain.

Segmental phonological transcriptions of spontaneous or elicited speech samples (that is, of the vowel/consonant sequences that constitute the 'verbal' aspect of utterance), although somewhat more familiar than prosodic ones, are not made routinely. Here, too, we need an objective transcription, not simply to describe the patient's articulation problems (if any), but also to provide a data-base to verify grammatical and semantic hypotheses. Even the most experienced analysts have to be on their guard against reading grammatical or semantic information into what they hear on a tape. A phonetic sequence such as [an] could be a realization of *and, an, in, on*, or other words; and if contextual clues are ambiguous or absent, as is often the case in patients' conversations about themselves or their backgrounds, what justification has the analyst for assigning one rather than another of these interpretations to the sounds in question? In the transcript illustrated on page 28, for example, what grounds were there for a transcription of *an doctors* and *an girl*, as opposed to, say, *and doctors . . . and girl*? Was there something in the phonetics which motivated Goodglass' decision? If the phonetic evidence was [an], it would have been better to transcribe it thus, to enable other analysts to judge the matter for themselves, and perhaps argue for alternative grammatico-lexical interpretations. One of my own commonest problems, in this respect, is what to do with a final [s] following a noun, in non-fluent speech. A patient talks about a car and then says *brother*[*s*]: does he mean *brothers* (plural), *brother's* (possessive), *brothers'*, *brother's* (i.e. 'brother is' or 'brother has'), and so on? It is easy to underestimate the amount of analytical indeterminacy in the description of disordered speech. Indeed, it is only in recent years that the concept of phonetic indeterminacy has received investigation at all, in the attempts by various groups to set up new conventions for phonetic transcription, in which uncertainty is formally recognized (*see* Grunwell *et al.*, 1980).

The Primary Levels

On the basis of an adequate transcription, and bearing in mind the

Figure 1. Levels of Language Analysis, with examples of each category

artefactual nature of the exercise, it is usual to approach the description of aphasic disturbance using the three primary levels of *phonology*, *grammar* and *semantics*. These are three dimensions of the structural analysis of language — the 'structure' of language here being contrasted with the 'use' of language in social situations (which is sometimes loosely referred to as a *pragmatic* 'level'). These levels, with their main subdivisions (as most widely recognized) and some examples of the data which would be subsumed under each heading, are illustrated in *Figure 1*. A detailed discussion and clinical application of the theoretical issues relating to each level is presented in Crystal (1981). A complementary set of profiling procedures is given in Crystal (1982c). For present purposes, it will perhaps be most useful to focus on those issues that would seem to have particular relevance for aphasia studies, especially in so far as they relate to concepts that have been inadequately investigated.

The central question is to determine the depth of detail at which useful descriptive statements should be made. At one extreme, there are the maximally general characterizations of the disorder which ignore levels altogether (such as 'fluent' v. 'non-fluent'). At the other extreme, there are the maximally detailed specifications of all the linguistic variables encountered in a sample, as presented in a set of profiles (*see* Crystal 1982c). Between these two extremes, there are innumerable possibilities. Some scholars are satisfied with a classification of aphasic errors which recognizes only the three primary levels, with little or no further subclassification: 'phonological' or 'phonemic' errors are seen alongside 'grammatical' or 'syntactic' errors, and 'semantic' or 'lexical' errors. One often has to 'see through' traditional clinical terminology to establish that a levels approach is in use — for example, the notion of *paraphasia* at first glance seems to be defined in a way that cuts across the various levels e.g. 'the production of unintended syllables, words or phrases during the effort to speak' (Goodglass and Kaplan, 1972), but the real use of this notion recognizes them through its classification of *phonemic paraphasia* (phonological level), *verbal* and *neologistic paraphasias* (semantic level).

Some classifications collapse into a single category notions that belong to different levels; for example, Ludlow (1981, *Table 1*) has as two of his categories 'impaired articulation and melody' (which seems to bring together an aspect of phonetics and one of phonology) and 'impaired fluency and syntax' (an aspect of grammar plus an aspect of phonetics/phonology). Others operate neatly with binary classifications within levels, probably the most well-known one being the distinction between *agrammatic* and *paragrammatic* speech within the level of grammar (though the involvement of semantic factors in this distinction must not be ignored). A classification in terms of levels of use is routinely made in aphasia tests, recognizing such distinctions as mode of communication (speaking, listening comprehension,

reading, writing) and task (repetition, confrontation naming). Coltheart (1983), addressing the question of what counts as a useful descriptive level at which to work, considered the following specifications (among others) to be helpful; 'using function words in spontaneous speech', 'non-verbal behaviour assisting conversational speech', 'speech comprehension at the single-sentence level' and 'reading comprehension at the paragraph level'.

However, when one considers the properties of an 'ideal' aphasia theory, it is plain that the depth of descriptive detail presented by these approaches is still a long way from what is required. A theory of aphasia ought to be predictive, in the sense that from a precise specification of neurological damage it should be possible to derive predictions concerning the patient's linguistic behaviour at any point in time during the recovery process. Such a theory would also have to take into account the facilitating or hindering effects of formal interventions, in the course of therapy or rehabilitation. Now, despite the limited progress that has been made in this direction, everyday clinical work has no alternative but to proceed as if the theory existed. Clinicians will make assumptions to guide their therapy, on the basis of the medical case history and accompanying general observation, and their intention will be to change the patient's behaviour in a controlled manner, through the use of treatment hypotheses deriving from an ongoing analysis of their own stimuli and their patient's response. I see no point in an aphasia theory that is unable to make predictions about therapy, and it is in relation to therapy that the descriptive detail of the classification referred to above proves to be inadequate.

For, how would a clinician be able to interpret such notions as 'paraphasia' or 'word-finding problem' in order to carry out treatment? Even the more detailed specifications suggested by Coltheart are too general in this respect: a much more precise statement about such notions as 'function words', 'non-verbal behaviour' or 'single sentence' is required before a clinician could devise a treatment programme based on this rationale. Which function words are strong, which weak, and in which contexts? Which features of non-verbal behaviour are strong, which weak, and related to which aspects of conversation? Which kinds of single sentence? Which kinds of paragraph? Clinicians have to begin a session of treatment with a specific interaction, using specific sentences of a particular type, and they must monitor the patient's response, which also uses specific sentences (whether normal or abnormal) of a particular type. The treatment session does not deal with 'function words'. It deals with a particular function word, or set of words, in conditions that ought to be carefully specified. The goal is to establish the use of one or other of these words in the patient's behaviour, and it is by no means uncommon for whole sections of a session to be devoted to the eliciting and training of a single item. An assessment made at

the beginning and end of such a training period has therefore to be sufficiently detailed to capture the progress that may have been made, and to guide decisions as to how the next stage in therapy might proceed. At this level of concern, the task of description is inevitably an extremely detailed one, and the gap between it and the level of generality illustrated above is enormous.

It is not solely aphasia therapy that is undermined by the lack of appropriately detailed descriptions. Theoretical research into aphasia is being hindered by a reluctance to look beneath the general labels and to provide a more precise specification of the disorder. The point can be illustrated from one of the most frequently cited diagnostic criteria — *agrammatism* — which is often used as if it were a well-defined notion, but which is not the case. The imprecision hinges on the 'amount' of grammar that can be subsumed under the term. At one extreme, the term seems to refer to the whole of the grammatical level, as in the definition of Critchley (1970): 'An aphasic disorder which impairs syntax rather than vocabulary'. Most of grammar is implicated in Jakobson's account of agrammatism as a contiguity disorder: 'The syntactical rules organizing words into higher units are lost', and this 'causes the degeneration of the sentence into a mere "words heap"' ... 'Word order becomes chaotic; the ties of grammatical co-ordination and subordination ... are dissolved', 'words endowed with purely grammatical functions, like conjunctions, prepositions, pronouns, and articles, disappear first ...' and a 'typical feature ... is the abolition of inflection' (Jakobson, 1954).

At the other extreme, agrammatism is used to refer to just one aspect of grammatical analysis, the factor of so-called 'grammatical' or 'function' words (another example of the bias introduced by the English language, incidentally, for there are many languages to which this concept does not readily apply). For example, Eisenson (1973) says: 'Typically, agrammatism is characterized by the patient's errors or omissions in the use of functional words ... which serve to establish contextual relationships (grammatical context) of spoken and written content'. Albert *et al.* (1981) describe it as 'a near total absence of the "small grammatical words" of the language'. Some definitions stress the morphological aspect of the problem, by drawing attention to the loss of inflections (e.g. Albert *et al.* (1981)), others ignore morphology and give a definition solely in terms of syntax (e.g. Nicolosi, Harryman and Kreshek's 1978 definition as 'impairment of the ability to produce words in their correct sequence' — a definition they have based on Wood (1957)). Albert *et al.* (1981), begin with morphology, but end up with an account that implicates the whole of the system of grammatical relationships: 'Closer inspection of agrammatic speech suggests that this style has a more complex explanation than a mere dropping out of grammatical elements. In fact there appears to be a basic loss of the concept of words as

having a functional role in a sentence. The severe agrammatic uses words as disconnected, nominalized ideas, which can be placed contiguously without any expressed grammatical connection between them'.

Several problems present themselves, as one tries to make sense of such a range of definitions. To take the statement of Albert *et al.* — to what extent is this last characterization a matter of 'agrammatic speech' in general, or, as they say, 'severe' agrammatic speech in particular? And would they wish to maintain that, from the observation that there is no 'expressed' grammatical connection, there is no underlying grammatical connection made at all? Or, to take Eisenson's (1973) statement: 'In severe form, agrammatism may be expressed as *telegrammatism*. All functional words and grammatical markers may be omitted'. The *all* seems to be the point at issue, for he gives as a 'more typical' example of agrammatic production the sentence *I eggs and eat and drink coffee*. If this is typical, how does it square with the various accounts that mention the omission of pronouns and conjunctions in agrammatism? In fact, there is considerable uncertainty about the function words which are omitted in agrammatic speech. Albert *et al.* (1981) list them as 'the customary articles, pronouns, noun and verb inflections [sic], auxiliaries'; Goodglass (1976) says 'articles, connective words, auxiliaries, and inflections'; Eisenson (1973) says 'articles, prepositions and conjunctions'; Robbins (1951) says 'auxiliaries and relational words' in one definition, 'conjunctions and other subordinate [sic] words' in another, and adds that 'words are uttered in incorrect sequence, infinitives are misused'.

Rough characterizations of this kind may be generally satisfactory for impressionistic clinical purposes, but as soon as a more rigorous approach is required, a clearer and more comprehensive description becomes essential. Research studies in neurolinguistics and neuropsychology, for example, cannot afford to be loose in their handling of the notion of agrammatism, especially when statistical studies are involved, or in case studies where the meticulous analysis of lists of examples and counter-examples is routine. Yet, the looseness is universal. In a valuable review of deep dyslexia, for example, Coltheart (1980) asks whether such patients are agrammatic; points out that several of those studied in his paper were not; and concludes that 'agrammatism of speech is *not* one of the symptoms of deep dyslexia'. A little later in the same volume Morton begins his paper with the words, 'In spite of their trouble with reading, their agrammatism and non-fluency . . .', referring to his group of patients (1980), and Saffran *et al.* (1980) state that 'almost all of the patients would be classified as agrammatic'. What are the descriptive criteria used in this debate? Coltheart (1980) defines agrammatism as 'function words and inflections . . . selectively absent from speech which is still relatively meaningful and communicative'; Saffran *et al.* (1980) say that it 'consists mostly of concrete nouns . . . contains relatively few verb forms . . . and is notably lacking in functors'. Whatever the reality of the situation, it is

plain that with overlapping definitions of this kind, points of similarity and difference may be obscured. Unless everyone uses precisely the same set of descriptive criteria, comparisons can be weakened to the point of vacuity.

What must be appreciated is that there is no 'correct' definition of a notion such as 'function word', and it is certainly not possible to take it as self-evident. The distinction between 'content words' and 'function words' (or whatever terminology is used) is not clear-cut, as has long been recognized in the linguistics literature (*see*, for example, the special volume of *Lingua* (1966) devoted to the topic of word-classes). Function words are said to be empty of meaning, to have solely grammatical function. In fact, hardly any of the words considered functional have no referential meaning (the clearest cases are the infinitive particle *to*, and the 'empty' uses of *there* and *it* in *there's a horse in the street* and *it was yesterday I saw him* respectively). Most function words have some kind of referential meaning (consider all the prepositional or pronominal items, for example), and some lists of such words contain many items whose supposed grammatical status is open to question. In *Deep Dyslexia* (Coltheart, Patterson and Marshall, 1980), referred to above, there is an Appendix listing function word paralexias used by certain patients. They include items such as *had, was, to, the, not, or, am, are*; but they also include *on, down, most, while, where, just, neither, both, almost*, which seem to be semantically at a remove from the first set; And also *perhaps, sometimes, something, ever, generally, instead, never, seldom, therefore, usually* and *several*, which are really somewhat unexpected. After all, if such are included, where does one draw the line between function and content word? If *sometimes* and *seldom* are included, why not *often, frequently, regularly*, and thousands more of the adverbials available in English (*see* Quirk *et al.*, 1985)? A line may have to be drawn to enable research to proceed, but in our present state of knowledge of the areas of grammar involved it is going to be an arbitrary one. It certainly cannot be left to take care of itself.

Agrammatism is not an isolated example. A concept such as 'word-finding' is likewise implicated, in view of how this notion may be made to depend on a word classification principle similar to the above. Albert *et al.* (1981), for example, see word-finding as 'an estimate of the balance between contentive words and grammatical filler words', contentive words being 'nouns, principal verbs, adjectives and adverbs'. They would presumably class *sometimes, usually*, etc. as content words, compared with the approach cited in the previous paragraph. Most discussions of word-finding problems are not even so specific, most authors apparently seeing the concept of 'word-finding' as so self-evident that it does not require definition. Yet one has only to ask 'What is it that is to be found?' to see that the term hides a nest of methodological and theoretical problems. At one extreme, *all* the words in a language can be said to present difficulties of retrieval, including all classes

of 'content' words and all the 'grammatical' words containing some degree of specifiable meaning. At the other extreme, only one subclass of 'content' words is considered relevant, as when word-finding difficulties are cited only as part of the discussion of anomia (as in the Index to Eisenson (1973), for example). In some contexts, it would seem to be the word in a specific grammatical and phonological form which has to be found (*take, takes, took, taken, taking*). In other contexts, a more abstract sense of 'word' is clearly intended — the 'underlying form' of the various grammatical and phonological possibilities (the *lexical item*, or *lexeme* TAKE). A lexeme is the minimal unit of meaning in the semantic system of a language (*see* Lyons, 1977), and the notion has proved valuable in enabling the semantic analysis of vocabulary to proceed independently of the complications introduced by the constraints of grammatical form, although its potential as a means of refining and making precise the concept of 'word-finding problem' has yet to be appreciated.

We can see this if we look at just some of the possibilities that the notion of 'word-finding' can subsume. A particular form of lexeme may be 'lost', such as the noun *switch* as opposed to the verb *switch*, or the 3rd person form of the verb (*switches*), or the first part of a (multi-word) lexeme (saying *on* for *switch on*, for instance); or the whole of a lexeme may be 'lost', as when all forms of the lexeme, regardless of context, are unusable (*switch, switches, switching, switch on*, etc.); or again, a particular use of a lexeme may be lost (*switch* in the sense of 'electric switch', but not in the sense of 'change direction'), or a particular relationship between one lexeme and another (oppositeness, for example, *switch on* v. *switch off, big* v. *small*). The study of the way in which the lexemes of a language are organized into *semantic fields*, and are linked by specific *semantic* (or *sense*) *relations*, such as synonymy, oppositeness and hyponymy (the relationship of inclusion), constitutes one of the major themes of contemporary semantics, but it is an approach which has not been systematically applied to the analysis of aphasia. Aphasia tests often inquire after particular synonyms or antonyms, of course, but the tasks are always somewhat artificial, and do not take account of the range of contextual factors which constitute the real difficulty in handling a language's vocabulary. As an example of the 'decontextualized' approach, one might consider the kind of question put to patients in which they are asked (in so many words) for the opposite of, say, *run*. An inadequate response may well be due to the fact that there is no single 'correct' opposite for this lexeme: *run* has several opposites, depending on the context in which it is used, as the following examples illustrate:

> It's not enough to run round the track; you have to *jump* the hurdles as well.
> I *walked* towards the bus-stop; but when I saw the bus coming I started to run.

> The engine was running nicely, but then there was a sharp noise and it *stopped*.
> My horse isn't running; it's been *scratched*.
> The buses aren't running; they're *on strike*.
> The play's not running any more; it's been *taken off*.

Most lexemes in the language have many such 'opposites', and the commonest words have most of all. Without adequate contextual awareness, then, it is not possible to make sense of a patient's responses. Therapists may present a task in which they assume that the opposite of *run* is *walk*; the patient however may respond by saying *scratch*, which might easily be interpreted either as a comprehension difficulty with *run*, or a word-finding problem with *walk*, or both, unless one thought to check the horse-racing context. Similar problems arise when one considers the way in which patients might be using synonyms, or any other sense relation. The only solution, of course, is to ensure that the clinicians' approach to lexical assessment and remediation is given an adequate descriptive foundation: they must be aware, in principle, of the range and complexity of the semantic factors involved, and have available, as a matter of routine, a systematic description of the lexical possibilities being drawn upon by the patient. Primitive lexical descriptions, more than adequate for basic clinical needs, already exist: they are called dictionaries and thesauri, but are such books ever seen as being essential pieces of clinic equipment? Are they ever routinely consulted as a preliminary to condemning a patient's lexical response as 'random', or to constructing a lexical teaching programme?

The Tip of the Iceberg

The cases of agrammatism and word-finding are only two of the notions which have received inadequate description in terms of the main linguistic levels and their subdivisions. Agrammatism is primarily a grammatical notion, but it has been only partially explicated in its reliance on function words and morphological structure. It now needs to be investigated using a more abstract set of syntactic relations within the frame of reference of a reasonably comprehensive descriptive model, e.g. such relations as subject, object, complement, verb, used in association with the clause, phrase, and other aspects of grammatical hierarchy (*see further* Crystal, 1981). Word-finding is primarily a semantic notion, but it too has been only partially explicated, in terms of simple quantitative notions such as word frequency, word length, and word association forms (Lesser, 1978); it now needs to be investigated using a set of qualitative semantic relations, both syntagmatic and paradigmatic, so that lexical assessment and treatment can be seen within the frame of reference of an emerging system of structured semantic

fields (*see further* Crystal, 1981). The descriptive refinement of already available aphasiological notions is only the tip of the iceberg of linguistic enquiry into the disorder, using the model of levels. There remain wholly uncharted areas of aphasic linguistic behaviour —areas that are undoubtedly central to our understanding and treatment of the condition, but which have received little or no study because of the limited account that has been taken of theoretical linguistic insights in clinical training and practice. The point can be briefly illustrated from each of the main linguistic levels.

Within phonology, the neglect of non-segmental characteristics of language, especially of intonation, has already been pointed out in relation to the need for transcriptional accuracy. In the absence of non-segmental transcriptions, there will obviously be little precise study of the way in which patients control the forms and functions of intonation, stress, rhythm, pause, etc. in relation to the rest of their language, and to the kinds of task they are called upon to perform. Equally, the way in which clinicians make use of non-segmental variation in order to organize their stimuli, or to highlight a particular feature of language, has received little description. Recommendations about interaction remain controversial (e.g. whether one should increase or decrease the tempo of speech stimuli to facilitate the patient's response), and diagnostic characterizations remain vague (e.g. using general impressions about 'melody' or 'colour' of speech, and relying on a notion of 'dysprosody' whose phonetic or phonological status it is never possible to determine (*see* Crystal, 1981)).

The segmental (vowel, consonant, syllable) aspect of phonology is a more familiar area, but even here there are glaring gaps. To begin with, there is a marked bias towards the study of consonant errors, often to the exclusion of vowels. This is presumably a consequence of the tradition in articulation testing, where only consonants are investigated; but it cannot be justified in relation to aphasia, where errors of vowel length and quality are common. While consonant errors are of course the majority, it must not be forgotten that vowel values can play an essential part in the distinguishing of pairs of consonants — final [p] and [b], for instance, are primarily distinguished in terms of the length of the preceding vowel, as in *cap/cab*, etc. Secondly, there has been little sign of the importance of taking into account a sound's *distribution* in relation to larger linguistic units, such as syllable, word, tone unit, phrase. There is still a marked tendency to talk about sounds globally — a patient's 'difficulty with [l]', for example, instead of a 'difficulty with [l] in word-initial position'. Indeed, despite all the use made of the term *phoneme*, there is still a predominance in the aphasia literature to think of phonemes as sounds, as physical entities, instead of what they are — abstract classes of sounds, contrasting units within a sound system.

The almost universal focus on the phoneme as the key to the understanding of aphasic phonology is clear from a review such as that of

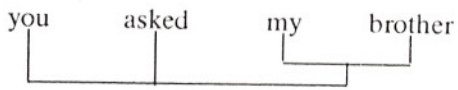
Lesser (1978), but this is by no means a satisfactory state of affairs. There are many other ways of studying phonological systems, and while some attention has been paid to the use of one of these (the distinctive feature frame of reference used in generative phonology), there are further approaches of considerable relevance to the analysis of aphasic errors, whose application has hardly begun. For example, one might examine those phonological processes that extend beyond the individual phoneme, and which apply to whole syllables, words or larger units — what have been variously referred to as 'prosodies' (Firth, 1948), or 'phonological processes' (Ingram, 1976). The idea that a single process can explain the selection of certain sounds made by a speaker at different points in an utterance has proved to be helpful in studies of normal language acquisition and of child language disability (Grunwell, 1981), and it seems likely that it would also be illuminating in the study of adult disorders. Several aphasiological notions seem tailor-made for analysis in terms of processes (e.g. 'perseveration'), and the approach might help to resolve some of the puzzles left by previous characterizations of disorders. Conventional accounts of apraxia, for example, refer to inconsistency of phonological errors (*see* Lesser, 1978). Yet is there really inconsistency, or is this the result of using only a phonemic model to investigate the disorder? Faced with a set of data where an item such as *pig* is recorded as [pig], [kig] and [sig], there seems to be inconsistency; but widening the scope of the enquiry may lead to explanations for the alternative forms. The /p/ may be realized as [k] under the influence of a following /k/, for example, as in *the pig is coming* (what is often referred to as an instance of 'consonant harmony'); the [s] may be the consequence of a preceding phoneme, as in *I see a pig*. We are not at the stage when it is possible to predict classes of error, or define the constraints on such processes as harmony; but there is a great deal to be gained by making use of the notion of process in analysing aphasic speech samples.

From the point of view of grammar and semantics, apart from the issues already noted, there is a considerable neglect of the hierarchical properties of sentence construction, especially the relationships between sentence and clause, and between clause and phrase (phrase and word, and word and morpheme, as we have seen, are routinely investigated). To illustrate the problem, first at the grammatical level, we may take the following sentence sequence:

You.
You asked.
You asked John.
You asked my brother.

Each sentence increases by one word, but there is a qualitatively different jump between the third and the fourth sentence. The fourth sentence is not

simply a linear string of four separate words: the relationship between *my* and *brother* is closer than that between *my* and *asked*, or *my* and *you*. This is conventionally illustrated in the form of a constituency diagram, such as:



(though this is only one way of representing the structural relationships involved). However we calculate the 'processing load' involved in these sentences, it should be evident that the jump from the third to the fourth sentence involves two extra factors — the extra word, and the extra level of sentence structure. It would not therefore follow that, because patients could handle some four-word sentences (such as *I saw John today*, where there is no hierarchical structure), they would be able to handle this one. They may be able to say (or comprehend) *you asked John* and *my brother* as separate utterances, but the conflating of the two might be beyond them. Moreover, it does not follow that because patients can handle hierarchy after the verb (as in *you asked my brother*), they can handle it before the verb (as in *my brother asked me*); indeed, differential ability in this respect is the norm for both adults and children (cf. Quirk *et. al.*, 1985). Also, the possibility of interference from other grammatical and semantic factors must be considered (in statement v. question, positive v. negative construction, using animate v. inanimate nouns, following static v. dynamic verbs (e.g. *see* v. *hit*), etc., as well as phonological factors, such as placement of nuclear tone). Whether one is studying comprehension or production, the relationship between clause and phrase elements always needs to be systematically taken into account. A similar set of factors needs to be borne in mind when one looks at more complex clauses, and the sequencing of clauses within sentences (*see* Crystal, 1981).

In recent years, some progress has been made in the analysis of aphasic speech using the concept of grammatical hierarchy, but the potentially more fruitful corresponding analysis in semantic terms has not been much invoked. The distinction between grammar and semantics here is best illustrated with a sentence, analysed from both points of view:

	John	kicked	the ball.
Grammar	Subject	Verb	Object
Semantics	Actor	Action	Goal

That the two levels are not the same notions masquerading under different labels can be shown by using other sentences:

	The ball	was kicked	by John.
Grammar	Subject	Verb	Adverbial
Semantics	Goal	Action	Actor

In the first sentence, the Subject is the semantic Actor; in the second, it is the semantic Goal of the Action. The clauses and clause elements of grammar play a number of semantic 'roles', which have been variously labelled by different scholars, and this constitutes an illuminating avenue of enquiry into the nature of aphasic disability. This is especially the case in relation to the more 'fluent' speech characteristic of Wernicke's aphasia, where a grammatical analysis is often unilluminating, as a wide range of sentence patterns is in use. Such speech is often said to be semantically 'empty', 'low in information', containing 'unnecessary words', 'circumlocutions' and various kinds of 'jargon'. On the other hand, there seems to have been little attempt to provide a qualitative analysis of these notions — to describe the kinds of circumlocution, to see whether certain semantic elements are more prone to circumlocution, and so on. Nor does anyone seem to have investigated these issues in relation to the semantic load carried by the therapists' verbal stimulus to the patient (though, for some programmatic suggestions, *see* Crystal, 1981). Yet this kind of information is surely central to any real understanding of the condition. Faced with a question such as *What is a key?*, patients may respond by keeping their meaning mainly constant, and varying their grammar (*A key opens a door, A door is opened by a key, It's a key to open a door*, etc.); or by keeping the grammar mainly constant, and varying the semantic content (*I open a door, You open cupboards, You lock a door*, etc.); or of course by some combination. Similarly, clinicians may vary the grammatical ways in which they ask the same question (*What can you do with a key?, What's a key for?*, etc.); or vary the meaning while maintaining the same grammatical form (*Do you eat things with it? Do you open things with it?*, etc.); or of course vary both factors at once.

Patients may be unable to process certain semantic elements, and have a facility in coping with others, e.g. they might be unable to handle lexemes when they have an Actor role to play in a sentence, but able to handle them when they function as Goal (*cat bite* vs. *bite cat*). They may have a preference for certain semantic roles, tending to focus on these first, to the neglect of other elements in the sentence; this may happen as part of comprehension or production. For example, one patient focused on any element that had a temporal role to play: in answer to a question such as *Where did you go yesterday?* he would focus on *yesterday* and talk about when it was, which day it was, etc.; in his own spontaneous speech, he would tend to begin a sentence with a temporal expression and use such expressions repeatedly in his speech (*well sometimes/ I like to quite often really/ — on Sundays/ I go you see/ often/* . . .). Rather than discount this kind of monologue as 'empty', 'stereotyped' or 'automatic', it makes more sense to investigate it systematically, and arrive at a description of the semantic roles and patterns that are being used and those being avoided. Only in this way can a norm be established for patients, which can act as a baseline for subsequent evaluation of their linguistic progress.

There are, then, several major areas within each of the linguistic levels which have yet to be applied in an appropriately detailed and systematic way to the description of aphasic language. The iceberg metaphor is currently an apt one. Far more remains to be described than has been described already. The next step is to generate sufficient motivation and resources to get the descriptive job done, so that linguistically more sophisticated experiments and therapeutic programmes may be carried out, and the foundations of a genuine theory of aphasia laid. It would be nice if the iceberg metaphor turned out to be archaic by the end of the century.

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