

# Speech errors: old data in search of new theories\*

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## *Abstract*

*Recent theories of speech production have sought to explain speech errors in terms of the permutation or decay of intended elements. More venerable accounts — Freud, Meringer and Mayer — on the other hand, acknowledged the influence of unintended elements on the occurrence and nature of errors, and offered data whose most plausible explanation seemed to be in terms of the effects of unintended material. In this paper, I re-examine the claims made by these authors, along with modern attempts to explain away their problematic data. Recent theories are also committed to a strict sequence of processing stages, but a closer examination of both modern and older corpora reveals an improbable proportion of errors caused, apparently, by the malfunction of two or more theoretically independent stages.*

*There seems to be no way of naturally extending strictly sequential models to accommodate these data, and the sketch of an alternative is proposed in which strict sequence is replaced by parallel processes with checking.*

## **1. The sources of error**

In the seminal work on speech errors, *Versprechen und Verlesen*, Rudolf Meringer and Karl Mayer proposed three distinct sources of error:

(i) interference from intended elements of the utterance (what I shall call PLAN INTERNAL ERRORS);

(ii) interference from an alternative formulation of the intended thought (ALTERNATIVE PLAN ERRORS);

(iii) interference from an unintended thought (COMPETING PLAN ERRORS).

Of course, both alternative and competing plan errors can be thought of as involving competition, but at different levels or stages of production. Informally, alternative plan errors involve competition between ways of

expressing or formulating an intended message; whereas, competing plan errors involve competition between separate messages, intended or unintended. Baars (1980) has recently proposed 'competing plans' as the 'trigger' for erroneous output, but for him both type (ii) and type (iii) errors fall under this rubric. Most other modern authors assign nearly all errors to category (i); Freud, on the other hand, wanted to assign all errors to category (iii), in fact, to a special subcategory of (iii) which will be discussed below. I shall argue that modern theories are based almost entirely on errors assigned to the plan internal category, are designed therefore just to account for this type, and cannot be extended in a natural and consistent way to deal with alternative plan errors (except for two subcategories of these) and thus have to ignore these venerable but inconvenient data.

Two authors have proposed fairly detailed models that attempt to trace the entire route from thought to articulate speech using speech error data, Fromkin (1971: 1973) and Garrett (1975; 1976; 1980a; 1980b). Both models are well-known and widely cited, and both provide adequate treatments for large and varied corpora of error data. There have been admirable attempts to treat particular aspects of errors; for example, Shattuck-Hufnagel (1980; Shattuck-Hufnagel and Klatt, 1979) has provided a very detailed treatment of segmental movement errors; Fay and Cutler (1977) offer an interesting account of a certain kind of word substitution error. However, Fromkin and Garrett have tried to provide a comprehensive framework for treating classes of errors from lexical, intonational and syntactic errors to phonetic feature movements and articulatory errors. Since, as will be seen, error categories (i)–(iii) cut across linguistic levels, my essay will concentrate on these two models.

*Plan internal errors.* It is assumed by all writers that the generation of an utterance involves the translation or transduction of an intended thought into articulate speech via a hierarchy of levels of linguistic description — roughly, syntactic structures, intonational patterns, words (or morphemes), sequences of items representing sounds, sequences of motor commands, etc. Authors disagree about the number of levels, the precise nature of descriptions at each level and the ordering of levels. Generally, it is held that at a given linguistic level there will be a (not necessarily complete) representation of the intended elements. So at a level where words (or morphemes) are represented, errors can lead to the anticipation, perseveration or transposition of these elements.

- (1) a. Die Milo von Venus  
       Target: 'Die Venus von Milo' (Meringer and Mayer, 1895).

- b. There you go again powdering *mich* (me) with *deiner* (your) puff.  
Target: 'There you go again powdering *dich* (yourself) with *meiner* (my) puff' (Freud, 1924).
- c. in the phonology of theory  
Target: 'in the theory of phonology' (Fromkin, 1971).
- d. although murder is a form of suicide  
Target: 'although suicide is a form of murder' (Garrett, 1975).

At a presumably later level, where the sounds of words are represented, interfering elements need not be whole words but individual sound segments:

- (2) a. Eine Sorte von Tacher  
Target: 'Eine Torte von Sacher' (Meringer and Mayer, 1895).
- b. ...durch die Ase natmen  
Target: 'durch die Nase atmen' (Freud, 1924).
- c. the nipper is zarrow  
Target: 'the zipper is narrow' (Fromkin, 1971).
- d. the little burst of beaden  
Target: 'the little beast of burden' (Garrett, 1975).

Of course, not all errors yield the complete transposition of elements: there are, probably, at least as many errors of anticipation and perseveration of elements. We also find examples of the substitution of an unintended element for an intended element. Thus at the word level, whole word substitutions are widely observed.

- (3) a. Ich gebe die Preparate in den Briefkasten (letter box).  
Target: '...in den Brütkasten' (incubator) (Meringer and Mayer, 1895: 74).
- b. ...they are certainly unusual people, they all possess *Geiz*<sup>1</sup> (greed) — I meant to say *Geist* (cleverness) (Freud, 1924).
- c. I really like to — hate to get up in the morning (Fromkin, 1971).<sup>2</sup>
- d. At low speeds it's too light.  
Target: '...heavy' (Garrett, 1975).

Notice that in (3a) and (3b) the substituted word is similar in sound but different in meaning from the intended word; whereas in (3c) and (3d) the substituted word is similar in meaning but different in sound. All corpora report both kinds. Either kind of word substitution of course constitutes a *prima facie* problem for a plan internal explanation. A variety of solutions are possible and have been proposed. All require the postulation of

abstract elements which do not and cannot by their nature show up directly in the final utterance. Fromkin (1971) thus postulates abstract semantic features to explain (3c):

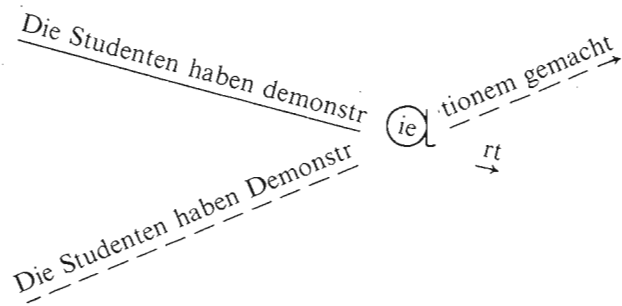
The error cited in (3c) might then occur in the following way: the speaker wishes to say (at least on a conscious level — we leave the unconscious motivations to be explained by others) *I really hate to get up in the morning*. At the point in the generation of the utterance prior to the selection of the words, in the 'slot' representing *hate*, the features [+verb, -desire ...] occur and an address for a word is sought from the semantic class which includes [ $\pm$ desire]. But either because of unconscious wishes or due to a random error, the address for a verb with the feature [+desire] rather than one specified as [-desire] is selected, and the item at that address called forth with its accompanying phonological features turns out as [lajk] rather than [hejt].

A possible scenario for sound related substitutions could be something like this: the abstract element, the ADDRESS of the phonological item, undergoes some random mutation such that an item at a similar address is selected. This will result in a similar sounding word provided that such items are organised (addressed) on a phonological basis, e.g. all one-syllabled words beginning with /g/ are grouped together (have similar addresses), all three-syllabled words beginning with /b/ are grouped together, and so on. (Fay and Cutler, 1977, have proposed just such an account.)

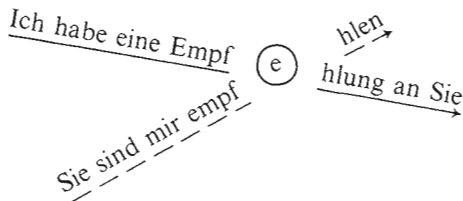
The claim that errors (1), (2), and (3) are all plan internal rests on the assumption that one need look no further than the complex of intended elements to explain the errors. Why the error should take place at all, why elements should interfere with each other, is unspecified. Fromkin and Garrett seem to put it down to some kind of random, temporary, 'mechanical' fault. Of course, the types of errors will not be random, they will show regularities determined by the kinds of representation and the kinds of processes hypothesised in the thought to speech translation. Although the types won't be random, their occurrence presumably will be.

*Alternative plan errors.* An intended thought might not have a unique linguistic expression, and thus the translation may lead to two, or more, alternative and equally appropriate plans for linguistic expression. This shows up in the blending of the alternatives. Meringer and Mayer have some examples of this, and a neat way of diagramming the interference of the unspoken on the spoken alternative:

- (4) a. Die Studenten haben demonstrart.  
 Target: Die Studenten haben demonstriert  
 or Die Studenten haben Demonstrationem gemacht



- b. Ich habe eine Empfehlung an Sie.  
 Target: Ich habe eine Empfehlung an Sie  
 or Sie sind mir empfohlen



Fromkin and Garrett offer examples of word-blends, where either word would seem to be an equally appropriate expression of the intended thought.

- (4) c. My data consists [mæunli:j]–[me:jstli:j]  
 (mainly/mostly)  
 d. She's a real [swɪp] chick  
 (swinging/hip. Fromkin, 1971).  
 e. At the end of today's [lekʃən]  
 (lecture/lesson. Garrett, 1975).

Many other modern authors, e.g. Hockett (1967) and Laver (1969), agree that a number of suitable words may be activated or partly activated by higher levels of planning. But, as Meringer and Mayer have suggested, if alternative words may be activated, then why not alternative syntax, or indeed, whole alternative clauses?

*Competing plan errors.* And if alternatives representing the same thought, why not alternatives representing quite different thoughts?

- (5) a. Ru. was speaking of occurrences which, within himself, he pronounced to be *Schweinereien* ('disgusting', literally, 'piggish'). He tried, however, to express himself mildly, and began: "But then facts came to *Vorschwein...*" Mayer and I were present and Ru. confirmed his

having thought *Schweinereien*. The fact of this word which he thought being betrayed in 'Vorschwein' and suddenly becoming operative is sufficiently explained by the similarity of the words. (Meringer and Mayer, 1895: 62).

- b. Here is another case. I asked R. von Schid. how his sick horse was getting on. He replied: "Ja, das *draut* .... dauert vielleicht noch einen Monat". I could not understand the *draut*, with an *r*, for the *r* in *dauert* could not possibly have had this result. So I drew his attention to it, whereupon he explained that his thought had been: "das ist eine *traurige* Geschichte ('it's a *sad* story')". Thus the speaker had two answers in his mind and they had been inter-mixed. (Meringer and Mayer, 1895: 97).

In these examples, nothing apparently mysterious is occurring, since the speaker is well aware of the competing thought which is the source of the error. Freud distinguishes this class from errors in which the speaker is unaware of the competing thought, and claims that these show the 'effect of words outside the intended sentence whose excitation would not otherwise have been revealed' (1924: 101–102). Thus (3b) is, for him, not a substitution due to a random mechanical fault. Freud suspected the speaker of having been ashamed of her family and having reproached her father with something not yet uncovered. She claimed to remember no such reproach, but it turned out, apparently, that it was indeed her father's greed which she was ashamed of and with which she reproached him. Here are further examples: the first is a substitution, the second two result in blends:

- (6) a. In the case of the female genitals, in spite of many *Versuchungen* (temptations) — I beg your pardon, *Versuche* (experiments).
- b. A young man said to his sister: "I've completely fallen out with the D.'s now. We're not on speaking terms any longer." "Yes indeed!" she answered, "they're a fine *Lippschaft*". She meant to say *Sippschaft* ('lot, crew'), but in the slip she compressed the two ideas: viz. that her brother had himself once begun a flirtation with the daughter of this family, and that this daughter was said to have recently become involved in a serious and irregular *Liebschaft* ('love-affair').
- c. A young man addressed a lady in the street in the following words: "If you will permit me, madam, I should like to *begleit-digen* you". It was obvious what his thoughts were: he would like to *begleiten* ('accompany') her, but was afraid his offer would *beleidigen* ('insult') her. That these two conflicting

emotional impulses found expression in one word — in the slip of the tongue, in fact — indicates that the young man's real intentions were at any rate not of the purest, and were bound to seem, even to himself, insulting to the lady. But while he attempted to conceal this from her, his unconscious played a trick on him by betraying his real intentions. But on the other hand he in this way, as it were, anticipated the lady's conventional retort: "Really! What do you take me for? How dare you *insult* me" (reported by O. Rank). (Freud, 1924)

Freud's distinct theoretical contribution is to emphasise that the competing plans may be unconscious, indeed, his proposal may be construed as claiming that unconscious plans are precisely the kind that are likely to interfere, perhaps because so much psychic energy is engaged in their activation and repression.<sup>3</sup>

If we take examples (5) and (6) at their face value, and assume they really are caused by competing plans, will they create serious difficulties for modern theories? At least one author (Ellis, 1980) has tried to explain away Freud's corpus by reinterpreting the errors as plan internal, or word-blends of the most commonly reported types. Nevertheless, Ellis concludes, rather curiously, that although Freud's data are generally amenable to modern explanations, and his theory is untestable, it 'can be translated into modern speech production models without excessive difficulty ... the cognitive system ... should be capable of processing two rival messages simultaneously'.

However, in her Introduction to the standard collection of readings on errors, Fromkin (1973) does not discuss Freud's corpus once, even though his is the first and longest paper in it. And we find no attempt in Garrett's papers to take the apparently simple step Ellis recommends in order to account for Freud's materials.

We now turn to a more detailed consideration of Fromkin's and Garrett's models, and ask whether they can indeed be straightforwardly extended to deal with alternative and competing plans.

## 2. Linguistics meets errors: Fromkin

Fromkin was not the first to see errors as providing evidence for testing linguistic theories. Meringer, himself a philologist, had deployed it; he demonstrated, for example, the reality of phonetic segments, phonetic features, the syllabic unit and showed that clusters were sequences of segments not single segments (see Cutler and Fay, 1978). His successors have used error data in a piecemeal manner to evaluate aspects of

linguistic — especially phonological and phonetic — theory (Hockett, 1967; Fry, 1969; etc.). But Fromkin (1971) was the first to make the much bolder step of trying to relate errors in a systematic way to an integrated linguistic theory (generative grammar, with emendations) ranging from syntax and lexical selection to phonetic features, and to sketch a performance model — ‘utterance generator’ — to collate the linguistic levels into a single, psychologically plausible system.

Essentially, she sets out to demonstrate that the UNITS, and, to a lesser extent, the PROCESSES proposed by theory, are psychologically real. Theory claims that speech continua realise a string of discrete segments, thus one should be able to observe errors in which segments shift location in the string; and Fromkin, like others, documents a very large number of such errors (see (2a–d) above). Theory further claims that segments are complexes of features; by parity of argument, errors of feature movement should also be observed. Here a feature movement will yield a segment not in the intended elements:

- (7) Cedars of Lemadon [lemədan]  
Target: ‘Cedars of Lebanon’.

(7) can be interpreted as the transposition of the STOP and NASAL features on the intended segments /b/ and /n/, giving the unintended bilabial nasal segment /m/ and the alveolar stop segment /d/.

Although the classical generative position (Chomsky and Halle, 1968) does not use the syllabic unit, Fromkin, like many other linguists, does. To show the reality of this unit she employs the same kind of argument: syllables move as whole units:

- (8) Morton and Broadpoint...  
Target: ‘Morton and Broadbent point...’.

She also uses another kind of argument. She points out that in segment movements and feature movements syllable structure CONDITIONS the loci of the movements: segments and features transpose only with their counterparts in homologous syllable positions. Thus in (2c) segments transpose from syllable initial positions:

- (2) c. the nipper is zarrow  
Target: ‘the zipper is narrow’.

The logic of this interpretive principle has been made explicit by Garrett (see below, 3), but in Fromkin is appealed to implicitly. In her interpretation of word exchange errors (1a–d), she notes that they typically involve words of the same syntactic class. Thus, she claims, syntactic categorisation of lexical items must be represented in the system.



Establishing the reality of linguistic PROCESSES, as contrasted with units, depends on a third interpretative principle. Theory claims that, for a given language, not all possible sequences of segments are allowable. In English, for example, words can't start /#tl-/. Theory further claims that some segmental elements will 'accommodate' to their segmental environments. Thus the affixal /s/ becomes [s,z,] or [əz] according to the kind of segment it follows. If such an accommodation process is involved in utterance generation, then the misplacement of /s/, or of its environment, will in suitable cases result in different phonetic realisations of it. In (9) /b/ and /p/ transpose, and theory postulates [z] after [b] but [s] after [p]. The intended utterance contained [s], but the error showed the appropriate accommodation changing [s] to [z] in the presence of the transposed [b]:

- (9) tap stobs [tæp stɒbz]  
 Target: 'tab stops' [tæb stɒps]

So Fromkin can argue that the processes of morphophonemic alternation which determine this accommodation operate in the system and, by invoking a further implicit interpretative principle, operate on segment strings representing selected lexical items. This is a strong argument for a hierarchy of levels: morphophonemic processes can only apply AFTER certain lexical and syntactic decisions have been made.

She summarises her conclusions in the model of utterance generation given in Figure 1.

Rectangular boxes stand for representations at the various linguistic levels, diamonds for PROCESSES translating one level of representation into another, and the big rectangular box 'Lexicon', stands for a complex process of lexical selection.

Let us consider certain quite general features of the model, and see whether it can be naturally extended to treat alternative plan errors and competing plan errors, along the lines suggested by Ellis (1980) or in some other way.

Fromkin commits herself to three properties of the model. First, 'levels' are 'stages' in the generation of the utterance, so that boxes and diamonds in diagram operate in a strict top-down sequence; a typical consequence is that lexical items can be selected only after the syntactic (-semantic) structure has been determined. Second, only one clause is processed at a time; and presumably this entails that, third, only one 'meaning' can enter the system at a time. This is a 'top-down' (or 'straight-through') system where the input to a process (a diamond) is no more and no less than the information in the representation (box) dominating it (connected to it by an input arrow). Thus, the action of, say, the 'intonation-contour generator' is conditioned solely by the 'syntactic-semantic structure' it

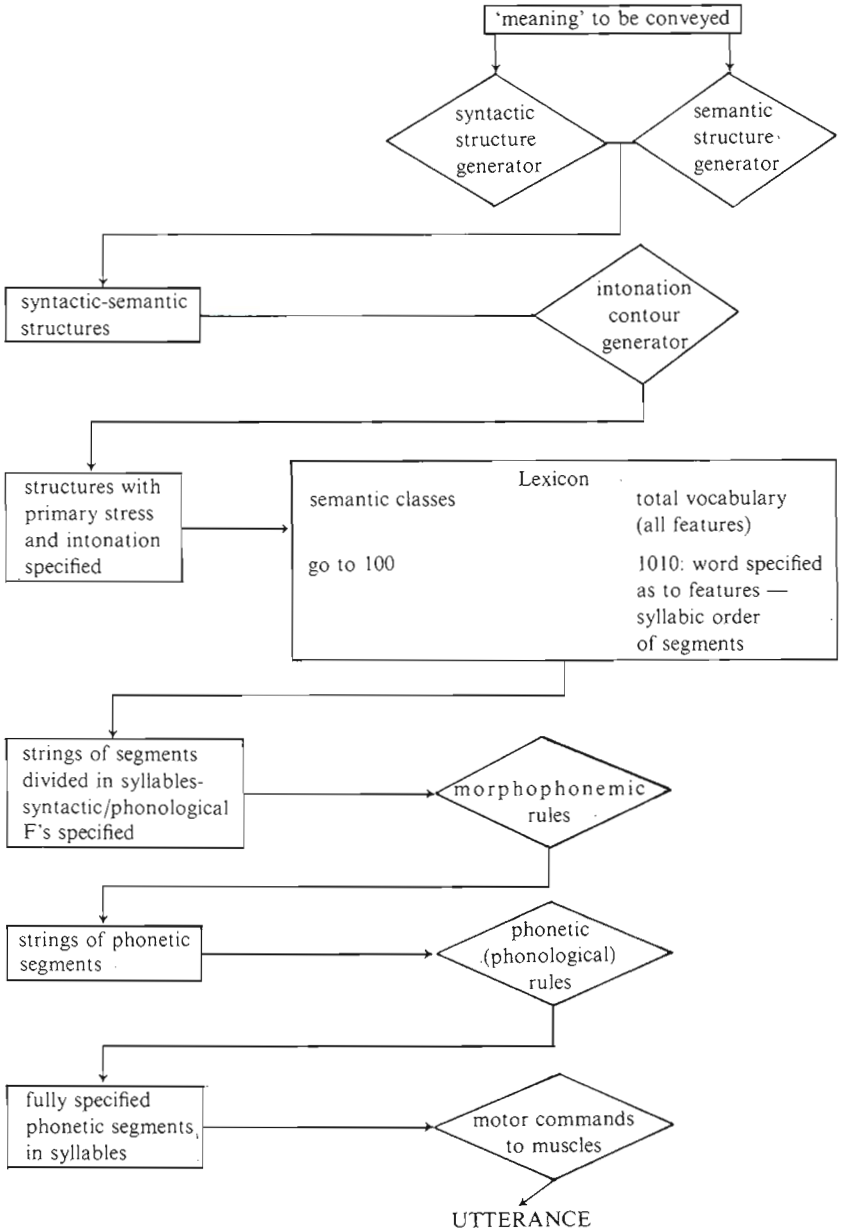


Figure 1. Fromkin's 'Utterance generator'. From Fromkin (1971)

takes as input. It has no access to higher levels — the ‘message’ — directly, and no access to lower levels — the phonological form of the lexical items, for instance. This contrasts with heterarchical models where lower-level information may influence higher-level decisions, (Turvey, Shaw and Mace, 1978, for a discussion of model types and Arbib and Caplan, 1980, for application of heterarchical models to language processing).

STAGE 2. The ‘idea’ or ‘meaning’ is structured syntactically, with semantic features associated with parts of the syntactic structure. For example, if a speaker wishes to convey the fact that ‘a ball’ rather than ‘a bat’ was thrown by a boy, the utterance *A ball was thrown* or alternately *He threw a ball* is structured at this stage. If he uses the second structure, part of the features specified for the final nouns must include [+emphasis] together with the features selected for ‘ball’, i.e. [-animate, -human, +count, +round, +used in games etc.]. This suggests that the STRUCTURE itself is put into buffer storage prior to actual articulation of the utterance; this would account for the switching of noun for noun, verb for verb etc., when such transpositions occur. (1971: 49)

The ‘intonation-contour generator’ takes this representation and decides the kind and location of at least the main sentence accent: this augmented representation then determines the lexical items required, using the semantic features [-animate, etc.] to locate an entry in the ‘lexicon’, and incorporates them into the syntactic structure. And so on down to the motor commands to the muscles.

On the face of it, this model cannot deal with alternative or competing plan errors at all. However several crucial properties are left un- or under-specified and judicious choice of appropriate specifications may turn out to provide the required flexibility. The most important gaps concern the ‘dominance parameters’ — the nature of the determination of a given level over its immediate successor, and the ‘real-time parameters’ — the nature of the real-time relations between one stage and the next. That is, will a given representation — box — completely determine the operation of the next process — diamond — or can the diamond generate two or more alternative translations of that representation? And, can a process begin operation before the prior process has completed generation of its representation (as has been suggested by Fry, 1969)?

Fromkin maintains that at the level of lexical selection, dominance is not complete and alternative lexical items may be selected. This results in word-blends — e.g. (4c–e). If alternatives can be generated at the lexical level, why not at other levels? In which case, it would seem a straightforward matter to account for the blending of alternative clause structure plans.

However, it is not straightforward. To begin with, the temporal

relationship between alternative plans must be specified. One way is to allow alternative clause structures, like alternative specifications of lexical items, to be generated simultaneously and stored together in a buffer. If this is the case, consequences develop which seem inconsistent with the model and inconsistent with a more detailed analysis of the data.

First, if alternative clause structures can be generated and stored, the generation of complete alternatives — ultimately with full phonetic specification — will proliferate down through the system. Two alternative structures may give rise to two alternative lexical items each, and so on. Since blending alternatives can happen at each stage, a host of errors unpredicted by Fromkin would result. Consider, for example, the consequences of the simultaneous complete representations of the two sentences possible underlying example (3c) — see Note 1.

(3c) I really hate to get up in the morning.

(3c)'' I really like to stay in bed in the morning.

Suppose that (3c)'' is inhibited and reveals itself just through the kinds of mechanisms that Fromkin allows, e.g. word movements and segment movements and under just those structural constraints required for plan-internal errors. The following errors could then arise:

Word anticipation: ... really *stay* to get up...  
 ... have to *stay* (up)...  
 ... get up in the *bed*...

(N.B. all honour grammatical category constraints)

Segment movement: ... *state* to get up...  
 ... hate to *bet* up...  
 ... to get *bup*...

(N.B. all honour syllable position constraints.)

In each case, the error source is the unspoken clause. If such errors do occur, then the model will have to be radically modified and the loci of alternative elements specified. For example, it appears to be the case that segment movements rarely cross clause boundaries and span very few elements (Garrett, 1980a). To preserve this constraint, it must be assumed that the representation of (3c)' and (3c)'' is quite different from the arrangement of two sentences intended to be spoken successively.

Second, if errors are caused by representational similarity at a given level, then blends at the clause structure level should occur between similar structural elements in the two alternative clause structures. Garrett has observed that when elements exchange between ADJACENT clauses, they serve very similar grammatical roles ((12) below), and these data may be

invoked to support the principle for the alternative clause cases. However, closer examination of alternative plan errors (4a, b, c) and (e) reveals that BLENDING errors are conditioned by phonetic similarity,<sup>4</sup> and in (4a, b) a structural similarity constraint is violated and nouns blend with verbs: *demonstriert* (Vb) blends with *Demonstrationen* (N) to give *demonstrart*; *Empfehlung* (N) blends with *empfohlen* (Vb) to give *Emphfohlung*. Notice that these blends follow the usual principles for word blends by honouring syllable structure — homologous part exchange, stressed syllable element exchanging with stressed syllable element, etc. So, either the blend occurs very late in the system, implying the full phonetic specification of both alternatives and hence the difficulties mentioned above, or, that higher level blending is sensitive to low-level descriptions of phonetic form, and this implies that the strictly top-down character of the model has to be abandoned.

On the other hand, if alternative clauses are represented successively, then the second would have to catch up with the first in a race down the system in order to interfere with it. To allow this would also require importing a new set of principles to preserve the regularity of observed errors. In particular, it would show why construction of *Sie sind mir empfohlen* catches *Ich habe eine Empfehlung an Sie* just at the point where both clauses have the common phonetic form [empf-].

Competing plan errors require, of course, that the two 'meanings' are processed by the system together. This will result normally in an even greater proliferation of representations down the system, since two plans are entered even earlier in the hierarchy of stages. And scrutiny of these errors reveals just the same kind of phonetic constraint on blending as alternative plan errors. Thus in (5a) the word *Vorschein* ('came to light') blends with *Schweinereien* ('piggish') to yield *Vorschwein* — a nonword; and in (5b) *dauert* ('last', Vb.) blends with *traurige* ('sad', Adj.) to yield *draut* — a nonword. Similarly, in (6b) *Sippschaft* ('crew') blends with *Liebshaft* ('love-affair') to give *Lippschaft*, also a nonword. There is a clear phonetic similarity between the blended words, and the precise form of the blend follows the regularities seen in the plan internal blends and segment movements. So we see word-initial obstruent /l/ replacing word-initial /s/ in very similar syllabic contexts. Of course, we don't know whether it's an anticipation, a perseveration or a spoonerism! *Vorschwein* is a fairly common cluster addition error; compare the following examples from Fromkin ((1973): 245, 255), the first two are blends, the third an anticipation:

- (10) a. book return shlute  
Target: 'slot' or 'chute'.

- b. shlug of whiskey  
Target: 'slug' or 'shot'.
- c. shmut his mouth  
Target: 'shut his mouth'.

And in general, competing and alternative plan blends seem to obey the same rules as plan-internal segmental errors. This would be expected if two plans achieve full phonetic status, since the phonetic system(s) operate in ignorance of higher level constraints, witness the appearance of nonwords in plan internal errors indicating that the phonetic system does not check its output for lexical status.

In any event, Fromkin's model cannot be readily adapted to handle alternative plan and competing plan errors: there will be an enormous proliferation of representations at lower levels which requires the postulation of new mechanisms to sort them out in an appropriate way, or else strict top-down processing will have to be abandoned, and it's not clear what that would mean for the model.

### 3. Psychology meets errors: Garrett

The only other model of comparable scope was proposed by Garrett in 1975 and elaborated in a number of subsequent papers (1976, 1980a, 1980b). Garrett's model is similar in many ways to Fromkin's, but the interpretative principles used to construct it are made explicit and this turns out to force certain differences.

Garrett's principle (A) is one that Fromkin uses implicitly all the time, and she uses (B) on occasion, as for instance, with errors conditioned by syllable structure.

(A) When elements of a sentence interact in an error (e.g. exchange position), they must be elements of the same processing type.

(B) The structural constraints for a given error type must be of a single processing type (that is, operate at a single level in Figure 2).

The conjunction of principles (A) and (B) permits the differentiation of levels. Consider the following examples:

- (11) a. I went to get a cash checked.  
Target: '... check cashed'.
- b. Even the best teams losts [tim lasts]  
Target: '... best teams lost [timz last]'.

The exchange of *cash* and *check* entails, by (A), that free morphemes are elements of the same processing type. Since grammatical category constraints are not honoured — (11a): noun and verb exchange; (11b): affix

moves from a verb to a noun — we can infer that grammatical class is not information available to the processes shifting the elements about.<sup>5</sup>

Consider the interpretation of morphonemic alternation. Suppose *I wanted to eat my beans first* was intended, but underwent a morpheme exchange error involving *want* and *eat*. If the result is *...eated to want ...* the grammatical morphemes will be added AFTER lexical selection and in ignorance of the lexical status of *eated*. However, if the result is the irregular, lexically-conditioned *... ate to want*, the process of adding grammatical affixes has access to lexical information and the place of the process in the hierarchy becomes problematical. Garrett (1980b) claims that errors of the *eated* type occur if rarely; but Fromkin (1971) argues that morphophonemic processes are entirely post-lexical in spite of reporting perhaps the most celebrated example of the irregular form in a morpheme movement: *Rosa always date shrinks* (target: 'Rosa always dated shrinks'). Here, she maintains, the past-tense morpheme shifted from *date* to *shrink*.

Using (B), Garrett can take advantage of observed regularities in error distribution. Since whole word exchanges are predominantly between items of the same grammatical class, and dramatically so in cross clause exchanges, he can postulate a level of organisation which handles both 'grammatical relations' and lexical selection — his 'functional level'; and he can differentiate this level from the level where 'morpheme stranding errors' like (11a,b) occur and which do not typically involve elements of the same grammatical category. He calls this the 'positional level'. Notice that (11b) can be interpreted not as a segment that moves (or exchanges with a null element), but as something more abstract, like a plural morpheme. Generally, in segment movements, the segment doesn't alter according to its new environment (though arguments to that effect have been advanced, e.g. Hill, 1972; Hockett, 1967). Segment interactions are assigned to the 'positional level' where phonemic information is represented, including abstract phonemes like plural /s/. Accommodations and certain other sound errors are assigned to the later 'sound level representation'. His model is summarised in Figure 2.

This is broadly comparable to Fromkin's model. 'Message Level' is similar to Fromkin's 'meanings'. 'Functional Level Representations' combine the outputs of her 'syntactic structure' and 'semantic feature' generators. 'Positional Level Representations' combine a 'syntactic structure' with a phonemic realisation of lexical selections. 'Sound Level Representation' is equivalent to her 'fully specified phonetic segments in syllables', but she separates morphophonemic rules from phonological rules. Thus from the Positional Level she has two transformations to Garrett's one.

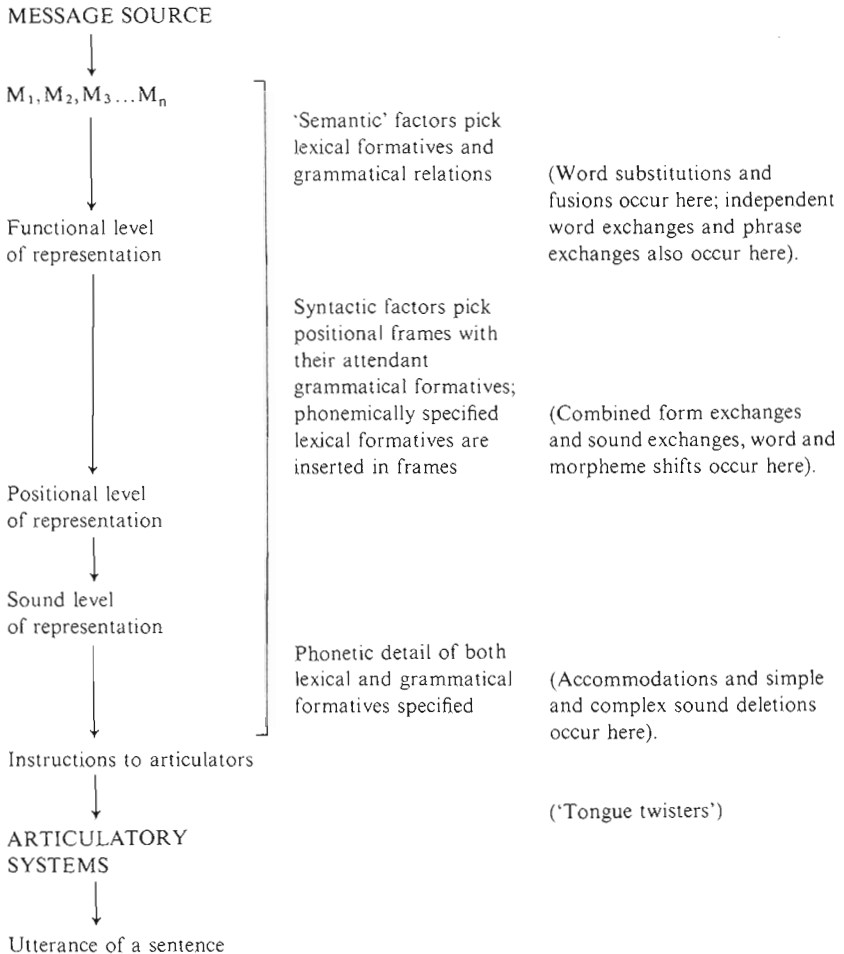


Figure 2. Garrett's model of sentence production. From Garrett (1975)

But these are minor differences. Essentially, both models are strictly top-down, with each level dominating the next one down. Garrett does not, however, commit himself to one clause, or indeed to one 'message' at a time, but it is not made clear how elements in different clauses interact and some get eliminated. He does note that in word exchanges errors across clauses (12a, b) show 'a striking structural parallelism' between exchanged elements.

- (12) a. ... read the newspapers, watch the radio, and listen to TV.  
 Target: '... listen to the radio, and watch TV'.



- b. Every time I put one of these buttons off, another come on.  
Target: '... buttons on, another comes off'.

Not only do the exchanged words belong to the same grammatical category, they also serve the same grammatical role, e.g. direct object (NP dominated by VP). But some sound exchange errors between clauses show no such parallelism:

- (13) Helf, helf, the wolp is after me.  
Target: 'Help, help, the wolf is after me'.

One interesting feature of the examples Garrett (1980a) cites is that there is arguably both structural and sound parallelism:

- (14) a. I bess I getter go.  
Target: 'I guess I better go'.  
b. I never know you nuticed [nutɪst].  
Target: 'I never knew you noticed'.

Phonologically, the two initial consonant-vowel portions of *guess* and *better*, are parallel constructions of voiced stops followed by /e/, both syllables being stressed. In (14b) the exchange is between verbs, both with initial stressed syllable beginning /n/ and a back vowel, and thus comparable to within-clause sound exchanges. As with Fromkin's model, there is no way in which an error can be conditioned both syntactically and phonetically, since syntactic processes occur at the level at which phonetic information is not represented — the 'Functional Level'; conversely, as we have seen, phonetic errors are conditioned by factors like the phonetic similarity of interacting segments and their syllable position, but not by syntactic factors. Garrett (1980a) reports that only 39% of sound exchanges involve words of the same grammatical category, as compared with 85% of word exchanges. What is a little strange is that syntactic information is represented at the level where sound exchanges are held to take place — the 'Positional Level', even though this information does not constrain the processes responsible for the errors at this level.

Garrett, unlike most modern authors, is aware that some error types pose problems for a simple 'top-down' model.

[Word] blends are something of a puzzle. They do not fit straightforwardly into the outline we have been constructing, for their antecedents are 'early' and their apparent error locus late ... one might ... argue for a routine parallelism in sentence construction (1980a: 211).

Garrett suggests that two alternative 'planning frames' — into which morphemes are slotted — could be formulated, at the Functional Level,

which are then 'carried down through the processing to the (by hypothesis) late stage of editorial selection in which competing formulations are weeded out' (1980a: 211). However, this is not discussed in any more detail, and it is unclear how the model is to be amended to accomplish both parallel planning and late editing.

Let us consider whether 'routine parallelism' and 'late editing' can be accomplished in an extension of Garrett's model.

Alternative 'Planning Frames' will be constructed at the Functional Level, using the same mechanism and stored in the same buffer — if separate buffers, there is no reason to expect any interaction at all. Similarly, alternative Planning Frames will occasionally be constructed for each of the two competing messages and stored in the same buffer. This, of course, will lead to proliferation as in Fromkin's model, but let us suppose for the moment that editing stops this getting out of hand. Interaction between frames may occur at each level: so blending between syntactic and semantic elements under comparable descriptions will occur at the Functional level, and blending between morphologically or phonologically similar items will occur at the Positional Level. What would Functional Level blends and substitutions look like?

One might expect descriptions of grammatical roles in the two clauses to interact. If only grammatical frames are produced at this level, then syntactically correct but inappropriate structures will result. However, syntactic errors relevant to this haven't been systematically studied so far. In the case of words, semantic specification of lexical items — perhaps in a featural format, as suggested by Fromkin — would interact such that the new combination of features specifies an item inappropriate for either clause. Notice that there is no requirement that the erroneous items sound like intended items. The only classes of substitutions regularly reported show either semantic or phonological similarity to the intended item. One class of interactions at this level extensively studied by Garrett concerns word EXCHANGES: within- and between-clause exchanges, consequent upon the exchange of word descriptions, yield grammatical sentences, as in (1a–d), since a condition on exchange is that items are of the same grammatical category. Interactions at this level occur between highly abstract elements, and hence the operation of lower level systems will typically ensure the lexical status of elements. An erroneous word description will still pick out a whole word or word-stem: the lexicon doesn't consist of stray bits of words. Thus interaction of Functional Level word-descriptions cannot be sufficient for word-blends.

Blending at the Positional Level alone will not ensure the semantic and syntactic constraints observed by Fromkin and Garrett (4c–d). However, competing plan blends are not, of course conditioned by semantic

similarity, but often honour grammatical category constraints: in (5a), two nouns, *Vorschein* and *Schweinereien*, blend (in (5b), *dauert* (Vb.) and *traurige* (Adj.) constitute an exception), in (6b) two nouns, *Sippschaft* and *Liebschaft* and in (6c) two verbs, *begleiten* and *beleidigen*. Some alternative plan errors seem to depend on semantic but not syntactic equivalence: thus in (4a) *demonstriert* ('demonstrate'), verb, and *Demonstrationen* ('demonstration'), noun, interact, and in (4b) *Empfehlung* ('recommendation'), noun, and *empfohlen* ('recommended'), verb, interact.

Interestingly, in Fromkin's collection of 'normal' blends (1973: 260, 261) where entries are (definitionally?) similar semantically and equivalent syntactically, a surprising number seem to be phonetically similar as well. It's not clear what the best measure of similarity is, and I offer several. All point to the same conclusion.

- (15) a. Of the two presumed words involved in the blends, half or more of the segments found in one are also found in the other.  
 e.g. trying/striving → strying: /t,r,ai,ɪŋ/  
 tummy/stomach → stummy: /t,ʌ,m/  
 blisters/splinters → splisters: /l,ɪ,t,z/  
 29 out of 65 errors.
- b. Same syllable pattern  
 e.g. draft/breeze → dreeze  
 velars/dentals → dentars  
 terrible/horrible → herrible  
 40 out of 65 errors (including those also satisfying criterion a).
- c. Same initial phoneme  
 e.g. what/which → watch  
 grizzly/ghastly → grastly  
 21 out of 65 errors (including those also satisfying criteria a and b).
- d. Same initial phoneme PLUS 50% of segments  
 e.g. pollution/population → population: /p,ɑ,l,u,f,ə,n/  
 slick/slippery → slickery: /s,l,ɪ/  
 19 out of 65.
- e. Same stress pattern, same initial phoneme, 50% of segments.  
 e.g. transcribed/transposed → transpired  
 omnipotent/omniscient → omnipotent  
 mainly/mostly → /meistli/  
 8 out of 65.

On the other hand, only 14 out of 65 errors involve a pair of presumed words which differ on all of the three criteria (15a, b) and (c).

- (16) minor/trivial → minal (/məɪnəl/)  
 edited/annotated → editated

instantaneous/momentary → momentaneous  
 corollary/parallel → corallel

And one may feel that even in (16) some sound similarity may be found in some of the examples.

No reliable figures exist, to my knowledge, describing the distribution by type or token of stress patterns, initial phonemes or segmental similarity between arbitrary words but I think it would be hard to maintain the null hypothesis that the data for (15a) could have arisen by chance. If not by chance, then it's hard to see how a top-down model could account for it.

#### 4. Is there really anything to explain?

One way out of this difficulty is to discount or discard the problematic data. Ellis (1980), for example, goes through the whole of Freud's corpus in the 'Slips of the Tongue' chapter of the *Psychopathology of Everyday Life*, and tries to show that these errors can be reclassified into theoretically less problematic categories. He notes that 51 out of 85 errors drawn from spontaneous speech are cases of lexical substitution. Almost all of the substituted words are related to the intended item semantically, phonologically or both. 'Thus, the lexical substitution errors which Freud adduces in support of his theory of conflicting intentions do not differ on formal or structural grounds from the errors analyzed by psycholinguists'. Unfortunately, Ellis failed to see the problem created by substitution where both semantic and phonological relatedness is involved. His treatment of word blends is (even) more sketchy. He offers an alternative plan internal explanation for one claimed blend, and permits us to infer that such explanation would be available for other examples. And finally, he allows that a 'disturbing word had been "spoken" subvocally, so that the intended word could have blended with a lingering phonemic trace of the disturbing word'. But the status of such a trace in a speech production model and how it can interact with other plans is exactly what is problematical.

The most thoroughgoing attempt to reclassify the Freudian corpus was undertaken by the Italian textual critic Sebastiano Timpanaro (1976).

Psychoanalysts and textual critics have to a large extent studied the same phenomena — though their methods and purposes in doing so have been very different. The task of the textual critic is to inquire into the origin of alterations undergone by a text in the course of its successive transcriptions, so as to be able to correct those errors persuasively or to establish which of two or more variants deriving from different sources is the original, or approximates most closely to it.

Among the various types of errors of transcription, there are at least two which have nothing to do with a 'slip of the pen'. On the one hand, there are those mistakes which are inaccurately termed 'palaeographic'; these consist of misunderstandings of signs in the written text which the copyist had before him — for every kind of writing, ancient or modern, contains signs that resemble each other and are therefore liable to confusion. On the other hand, there are those alterations which have been *consciously* made in the transmitted text...

But it has long been realized that the majority of mistakes in transcription and quotation do not belong to either of the two categories just mentioned. They are, on the contrary, 'errors due to distraction' (let us adopt, for the moment, this extremely imprecise formula), to which anyone transcribing or citing a text may be subject — whether scholar or lay man, mediaeval monk or modern typist or student...

It has long been established that a copyist, whether ancient or modern, does not as a rule transcribe a text word for word, still less letter for letter (at least not unless he is transcribing a text written in a language or a script of which he is wholly ignorant), but reads a more or less lengthy section of it and then, without looking back at the original at each point, writes it down 'from memory'. He is therefore liable, if only in the brief interval between the reading, or, as the case may be, the dictation, and the actual transcription of the passage, to commit errors which are not substantially different from those examined by Freud and (though with other methods) by psychologists who were his predecessors and contemporaries...

Furthermore, a textual critic often has to deal with what is called an indirect tradition — that is, with quotations, often from memory, of complete texts by other authors. Quintilian frequently commits such errors in quoting Virgil; Francesco De Sanctis in citing Dante or Petrarch, Leopardi or Berchet. Finally, he must consider oversights which are much more likely to be those of the author himself than of his copyists. Thus Cicero in a moment of distraction once wrote, instead of the name of Aristophanes, that of Eupolis — another great Athenian writer of comedies; on another occasion he confused the name of Ulysses' nurse, Euriclea, with that of his mother, Anticlea. Here we are manifestly concerned with 'slips of the pen' analogous to those studied by Freud. (1976: 19–23).

Timpanaro analyses numerous parapraxes from the *Psychopathology of Everyday Life* — and not just 'Slips of the Tongue' and 'Slips of the Pen' — and tries to show that these errors can be accounted for by principles familiar to textual critics who have no access to, and evidently no use for, psychoanalytic information about the author, copyist or typesetter. The most powerful of such principles is BANALIZATION, which is best explained with reference to an example of Freud's that Timpanaro discusses in great detail.

A young Austrian Jew, with whom Freud strikes up a conversation while travelling, bemoans the position of inferiority in which Jews are held in Austria-

Hungary. His generation, he says, is 'destined to grow crippled, not being able to develop its talents nor gratify its desires'. He becomes heated in discussing this problem, and tries to conclude his 'passionately felt speech' (as Freud, with a pinch of good-natured irony, calls it) with the line that Virgil puts in the mouth of Dido abandoned by Aeneas and on the point of suicide:

- [17] *Exoriare aliquis nostris ex ossibus ultor* (*Aeneid*, IV 625).  
 ('Let someone arise from my bones as an Avenger'  
 or 'Arise from my bones, o Avenger, whoever you may be'.)

But his memory is imperfect, and all he succeeds in saying is

- [18] *Exoriare ex nostris ossibus ultor*: i.e. he omits *aliquis* and inverts the words *nostris ex*.

What is the explanation for this double error? The most mediocre of philologists would have no difficulty in giving one. As we have already mentioned, anyone who has anything to do with the written or oral transmission of texts (including quotations learnt by heart) knows that they are exposed to the constant danger of banalization. Forms which have a more archaic, more high-flown, more unusual stylistic expression, and which are therefore more removed from the cultural-linguistic heritage of the person who is transcribing or reciting, tend to be replaced by forms in more common use. This process of banalization can affect many aspects of a word. For instance, it can affect its spelling: forms like *studj*, *havere* easily turn into *studi* and *avere* in texts transcribed today or even so in quotations written down from memory. It can affect its phonetic character: one so often reads or hears someone recite the famous line from Ariosto: 'O gran bontà de' cavalieri antiqui!' with the *antiqui* replaced by *antichi*, even though the rhyme between the third and fifth lines of that octet favours the more archaic form. It can affect its morphology: 'enno dannati i peccatori carnali', wrote Dante, *Inferno*, V 38; but in various manuscripts of the *Commedia* one finds *sono* or *eran*, or some similar banalization (see Petrocchi's critical edition). It can affect its lexical character: again in Dante the archaic form *aguglia* was nearly always replaced by the more usual *aquila* in certain manuscripts — and still is today in quotations loosely made by modern authors. Finally, it can affect its syntactic or stylistic-syntactic character: in the sub-title to Ruggiero Bonghi's *Lette critiche, Perché la letteratura italiana non sia popolare in Italia* ('Why Italian literature is not popular in Italy'), the subjunctive *sia* is itself not popular enough in Italy, so that when the sub-title is quoted from memory one frequently finds it replaced by the indicative mood *è*. (1976: 29–30)

Now, (17) cannot be translated directly because *aliquis*, the indefinite pronoun, is difficult to render into German with the second person singular verb *exoriare*.

- (17) *Exoriare aliquis nostris ex ossibus ultor*.

(The error form:

## (18) Exoriare ex nostris ossibus ultor.)

Something has to be sacrificed: either one wishes to bring out the character of a mysteriously indeterminate augury, which means rendering *exoriare* by the third person singular rather than the second person ('... let some Avenger arise'); or one prefers to conserve the immediacy and directly evocative power of the second person singular, which means modifying somewhat, if not suppressing outright, the *aliquis* ('Arise, o Avenger, whoever you may be...'; 'Arise, unknown Avenger...'). (1976: 33–34)

Distinguished German translators have in fact opted for one of these simplifications, and Schiller loses both the invocation of the Avenger and the character of augury: 'Ein Rächer wird uns meinem Staub erstehn'. Thus some reasonable approximation to the meaning can be achieved by the deliberate suppression of *aliquis*, but other words cannot be suppressed without making a nonsense of the whole. So *aliquis* is the word most prone to loss.

The principle of banalization can now operate on the residue to regularise highly irregular syntax:

The young Austrian, as we saw, also made another mistake: he quoted *ex nostris ossibus* instead of *nostris ex ossibus*. This too is a banalization. It is a banalization in terms of Latin usage, since the word-order adjective–preposition–noun, although occurring frequently in Latin, was nevertheless not so common as the order preposition–adjective–noun (or preposition–noun–adjective), and was particularly rare in prose. It is also a banalization with respect to the German word-order, in which, in a phrase corresponding to *nostris ex ossibus*, the attachment of the proposition in front of the whole complement it governs is precisely the rule. However, as Freud himself remarks ('he attempted to conceal the open gap in his memory by transposing the words'), this second error could have been a consequence of the first, viz. the forgetting of *aliquis*. Since this case concerns a young man who had been to school in Austria, it seems unlikely that he would have had a good recollection of elementary Latin prosody and metre, and would have kept up the habit of reading and reciting Latin hexameters according to the so-called *ictus* (rhythmic stresses) rather than the grammatical accents on individual words (had he gone to school in Italy, this would have been less probable). He would therefore have noticed, in a more conscious fashion, that the string of words *exoriare nostris ex ossibus ultor* could never be found in a hexameter, while this could well be the case for *exoriare ex nostris ossibus ultor*. (1976: 39–40)

Banalization is, of course, well-known to psychologists in another garb: Bartlett's 'conventionalization' (1932: 268ff): 'When cultural material is introduced into a group from the outside it suffers change... (a) by

assimilation to existing cultural forms within the receptive group; (b) by simplification, or the dropping out of elements peculiar to the group from which the culture comes'.

Freud has a quite different explanation of the transformation of (17) into (18) involving the deeply repressed competing thought of the unwanted pregnancy of the speaker's girl friend in Naples, and revealed through successive associations from the omitted word *aliquis*. This explanation has no account for the word inversion in (18).

Now omissions, though common, are not discussed in much detail by modern students of errors; however, word-substitutions are, and we turn now to Timpanaro's treatment of these.

Textual criticism teaches us that one of the most frequent category of errors is a confusion between words of an equal number of syllables which are also connected by a marked phonic similarity, or even better, by assonance or rhyme. The great majority of errors are not derived from misunderstandings of the signs used in the text to be copied: many of the letters that compose the respective words have a different form, and cannot be confused in any type of script. Rather, they are cases of faulty memory, and usually not so much visual in nature as auditory. (1976: 64)

Cicero called Ulysees's nurse *Anticlea* instead of *Euryclea*: 'here is the equal number of syllables, the rhyme... the affinity of role between the two characters — the one the mother, the other the nurse of the same Homeric hero — are more than sufficient to account for the "slip"' (1976: 65). Heine cites *Kätchen* instead of *Gretchen* as the heroine of *Faust*: 'they are two of the most prevalent feminine diminutives, ... and they are both names found in Goethe, and even belong to persons in his *life*'.

Neither of these are banalizations, indeed they may involve deciding upon a *lectio difficilior*. Such 'disimprovements' happen when, due to an inability to localise the fault, the correction goes astray. Thus in successive codices, Cicero's citation of the name of a locality in Cisalpine Gaul, *Litana*, becomes banalized to the clearly inappropriate *Latina*. A later emendator 'realized that *Latina* was inadmissible, but did not succeed in restoring ... the difficult *Litana*; and since he saw that the *Lucani* are named a little further on, it occurred to him to introduce the name of another Latin people, the *Hirpini*'.

Timpanaro used these methods to elucidate Freud's celebrated *Boltraffio* error. Freud was trying to find the name of the Italian painter *Signorelli*, but the only name that came to mind was *Botticelli*, a banalization that he realised was incorrect. *Bo-* may then have been disimproved to give *Boltraffio* — a little known painter of Leonardo's school.



Unfortunately, Timpanaro does not deal with the interesting word blend cases which we've discussed above (5, 6); but in the Boltraffio substitution example we notice again how it seems that for an error to occur, both semantic and phonological relatedness are involved.

Moreover, Timpanaro acknowledges that some errors may be genuinely 'Freudian', and proposes two criteria by which an error should be admitted.

- (I) Psychological processes of a relatively 'superficial' character, which regularly give rise to 'slips' [i.e. like those discussed by Fromkin and Garrett, and Banalizations] and instances of forgetting, are not sufficient to explain it.
- (II) The 'Freudian' explanation does not rely on associations or symbolic connexions that are so forced as to make it wholly arbitrary and unverifiable. (1976: 125)

Freud reports a delegate in the Reichstag, Lattmann, appealing for support for the Emperor in the following words:

It is our belief that the united thoughts and wishes of the German people are bent on achieving a united demonstration in this matter as well, and if we can do so in a form that takes the Emperor's feelings fully into account, then we should do so *spinelessly* [rückgratlos] as well ... (laughter) ... Gentleman, I should have said not *rückgratlos* but *rückhaltlos* [unreservedly].

He glosses this slip with a quotation from a Social-Democratic paper, which points out that the anti-Semitic Lattmann involuntarily accused himself and the parliamentary majority by slipping 'into an admission that he and his friends wished to express their opinion to the Emperor *spinelessly*'.

Timpanaro accepts this case as 'genuinely Freudian'. The erroneous substitution was not a banalization, since *rückgratlos* is a much less frequent word in the language, and there is no reason to suppose it's more frequent in Lattmann's idiolect. And there is nothing in the context conducive to a *lectio difficilior*. So Criterion (I) is satisfied.

So too is the second — the 'troubled conscience' which induced the hypocritical politician to give voice to the unfortunate adjective is all too obvious. We need have recourse neither to the existence of improved connexions ... nor to symbolisms that adapt to all eventualities in order to expose it. (1976: 125–126)

Timpanaro goes on to cite other examples satisfying his two criteria.

Thus, even a rigorous critic of Freud acknowledges competing plan errors and provides useful criteria for distinguishing them from Freudian

overinterpretations. In addition, his own textual examples reinforce the argument against top-down models by showing how errors are conditioned by sound and meaning.

Finally, both Hill (1972) and Garrett (1980a) produce examples of competing plan errors, in which the competing thought can easily be traced to its source, and which Garrett calls 'environmental contaminant'.

- (19) a. Target: 'Are you trying to send me a message, Dog?'  
 Situation: Speaker is addressing Dog; Dog is standing by front door looking woebegone. Immediately beside speaker at eye level on a shelf, is a novel with the cover blurb: 'A novel of intrigue and menace'. Speaker has idly read this while approaching the dog and preparing to speak.  
 Output: Are you trying to send me a menace, Dog?
- b. Target: 'People should take off their old bumper stickers'.  
 Situation: Speaker is looking at a car bumper with two-year-old sticker reading, 'Dukakis should be governor'.  
 Output: People should take off their old governor stickers. (Garrett, 1980a)

Of course, Garrett's examples do not support Freud's principal contention that competing plans are often, even typically, repressed into the unconscious; and Timpanaro's Criterion (II) will probably exclude, in practice, those slips Freud found particularly revealing. Nevertheless, the basic psycholinguistic datum of competing plans, from whatever source, seems well established.

### **Attempts at a (re)solution**

I think it should now be fairly clear that alternative and competing plan errors exist and pose problems for recent information-processing models of speech production based on error data.

The crucial point that emerges is that in a large class of competing and alternative plan word-substitution and blend errors, at least, two levels of representation seem to be simultaneously implicated. These data can be summarised in Table 1.

At the error locus, both sound representation and at least one higher level representation is involved. Strict top-down models cannot allow this, and would have to resort to coincidence to explain the similarity in sound between interacting items.

Freud's account of competing plan errors is a modification of Wundt's (1900) proposal, and he cites the following passage from Wundt with approval:

Table 1. *Critical errors*

	Sound level Relatedness	Syntactic Relatedness	Semantic Relatedness	Competing Message	Source
1. 'Normal' blends <i>omnipicent (omnipotent/ omniscient)</i>	✓	✓	✓		Fromkin, 1973
2. Alternative plan blends <i>demonstrart (Demonstriert/ Demonstrationen)</i>	✓		✓		Meringer and Mayer, 1895
3. Substitutions I. <i>Kätchen (Gretchen)</i>	✓	✓	✓		Timpanaro, 1976
4. Substitutions II. <i>rückgratlos (rückhaltlos)</i>	✓	✓		✓	Freud, 1924
5. Competing plan blends <i>Vorschwein (Vorschein/ Schweineereien)</i>	✓	✓		✓	Meringer and Mayer, 1895

"First of all they [errors] have a positive determinant in the form of the uninhibited stream of *sound-associations* and *word-associations* evoked by the spoken sounds. In addition there is a negative factor in the form of the suppression or relaxation of the inhibitory effects of the will on this current, and of the attention which is also active here as a function of the will. Whether this play of association manifests itself by a coming sound being anticipated, or by the preceding sounds being reproduced, or by a habitually practised sound being intercalated between others, or finally by quite different words, which stand in an associative relation to the sounds that are spoken, having an effect upon them — all these indicate only differences in the direction and at the most in the scope of the associations taking place, and not differences in their general nature. In some cases, too, it may be doubtful to which form a certain disturbance is to be assigned, or whether it would not be more justifiable, in accordance *with the principle of the complication of causes*, to trace it back to a concurrence of several motive forces."

I consider these observations of Wundt's fully justified and very instructive. Perhaps it would be possible to emphasize more definitely than Wundt does that the positive factor favouring the slip of the tongue (the uninhibited stream of associations) and the negative factor (the relaxation of the inhibiting attention) invariably achieve their effect in combination, so that the two factors become merely different ways of regarding the same process. What happens is that, with the relaxation of the inhibiting attention — in still plainer terms, AS A RESULT OF this relaxation — the uninhibited stream of associations comes into action.

But he is aware that Wundt's account can deal only with alternative plan errors, whereas his corpus is concerned with competing plan errors.

Among the slips of the tongue that I have collected myself, I can find hardly one in which I should be obliged to trace the disturbance of speech simply and solely to what Wundt calls the 'contact effect of sounds'. I almost invariably discover a disturbing influence in addition which comes from something OUTSIDE the intended utterance: and the disturbing element is either a single thought that has remained unconscious, which manifests itself in the slip of the tongue and which can often be brought to consciousness only by means of searching analysis, or it is a more general psychological motive force which is directed against the entire utterance.

Now Wundt's treatment can be grafted on to a modified model of the Fromkin-Garrett type. What is required is a model of the lexicon in which activation of the intended item spreads, or concurrently activates other items, in two ways: semantically related or associated items (Wundt's 'word associations'). Morton's Logogen model would be a candidate for the lexical processes required in a top-down model, (Morton, 1970 etc.). In Morton's model, the semantic specification of an intended word simultaneously activates, to a greater or lesser extent, semantically associated

items — 'logogens'. If an intended item is activated sufficiently, its phonetic shape becomes available as a response. If this phonetic information is recirculated so that it activates items of similar phonetic character, then both semantic and phonetic information will combine to activate a second logogen, similar semantically and phonetically to the intended logogen. On occasion the intended logogen, though available as a response, may not be produced as a response, but held in a buffer awaiting output and will be joined there by the unintended item. These two items may then, by some process as yet mysterious, fuse together to create a 'normal blend'. In this way, Wundt's 'complication of causes' could be achieved. The simpler, and perhaps, commoner cases of 'word-associations' substituting for the intended word could also be handled straightforwardly within this framework, but 'sound-associations' could not. Semantic input would activate one (or more) logogens similar in meaning, but potentially quite different in sound. Recirculation of phonetic information would not (could not) activate a semantically unrelated word to threshold.

Competing plan data, as Freud remarked, cannot be handled by this scheme, since semantically unrelated words would not be word-associations of the intended item. Freud also points out that if, as Wundt has suggested, two parallel speech streams, one suppressed, are generated at least to the level of phonological representation, the 'contact effect' of sounds cannot be the only mechanism for their interaction, since although many competing plan errors do show interaction just at the point where the hypothesised suppressed stream is phonologically most similar to the intended stream, there are many competing plan substitutions, for example (3c, d), which show no such phonological similarity.

Freud and Wundt both seem to require competing or alternative plans to explain errors. Thus they must postulate a quite different explanation of the errors assigned to the plan internal category. And Freud himself, as Fromkin has pointed out, includes in his corpus no errors standardly assigned to the plan-internal category — like spoonerisms. The radical step of abolishing the plan internal category requires a return to the old collection methodology of recording not just the error, but the context of the error and a report of, at least, the speaker's introspections about the cause of the error. It may turn out that even if the whole category isn't abandoned, many segmental errors will turn out to be blends and be re-assigned to the alternative plan category (cp. Aitchison and Todd, 1979; Baars, 1980).

*An alternative approach*

The theories discussed above fail, in the proposed amendments, to handle what I shall call (1) 'the proliferation problem', and (2) 'the simultaneous conditions problem'.

*The proliferation problem* can arise when a model is extended to provide two (or more) low-level representations where one is intended — for example, two phonological representations of words competing to fill one location in the current utterance, as in blend errors. In order to make this provision, strict top-down models must postulate two (or more) higher-level representations. In Fromkin's model, alternative and competing plan errors require the postulation of two 'syntactic-semantic structures', and, without an 'editor', each successive stage will have to compute two (or more) 'structures with primary stress and intonation specified', two (or more) sets of lexical choices (possibly overlapping), two 'strings of segments divided in syllables' etc. Garrett hints that there might indeed be 'routine parallelism'.

There is thus a dilemma for such models between, on the one hand, undergenerating representations and hence not explaining alternative and competing plan errors, and overgenerating representations rendering the models devoid of empirical content with regard to the occurrence and distribution of error types. I have tried to show that there is no way out of this dilemma for strict top-down models.

The problem is one of control structure (Butterworth, 1980), and the solution will lie in designing a model whose control structure allows multiplication of representations for just those kinds of representations implicated in the error. That is to say, the model must allow high-level inputs ('message level' for Garrett, 'meaning' for Fromkin) to access lower level processes directly and independently. So, for example, the process which will construct two alternative (or competing) syntactic structures will affect the processes which select an intonation contour or select lexical items. These three processes must, in other words, operate in parallel, and their outputs merge later in a final common path. In this way, lexical blends, say, will be explicable just in terms of overgeneration by lexical processes, and other processes can be assumed to be operating correctly.

A model along these lines has been proposed by Butterworth (1980) (see Figure 3).

*The simultaneous conditions problem* - substitution and blend errors appear conditioned by both meaning and sound. The alternative and competing plan errors cited above involve lexical items and seem expli-

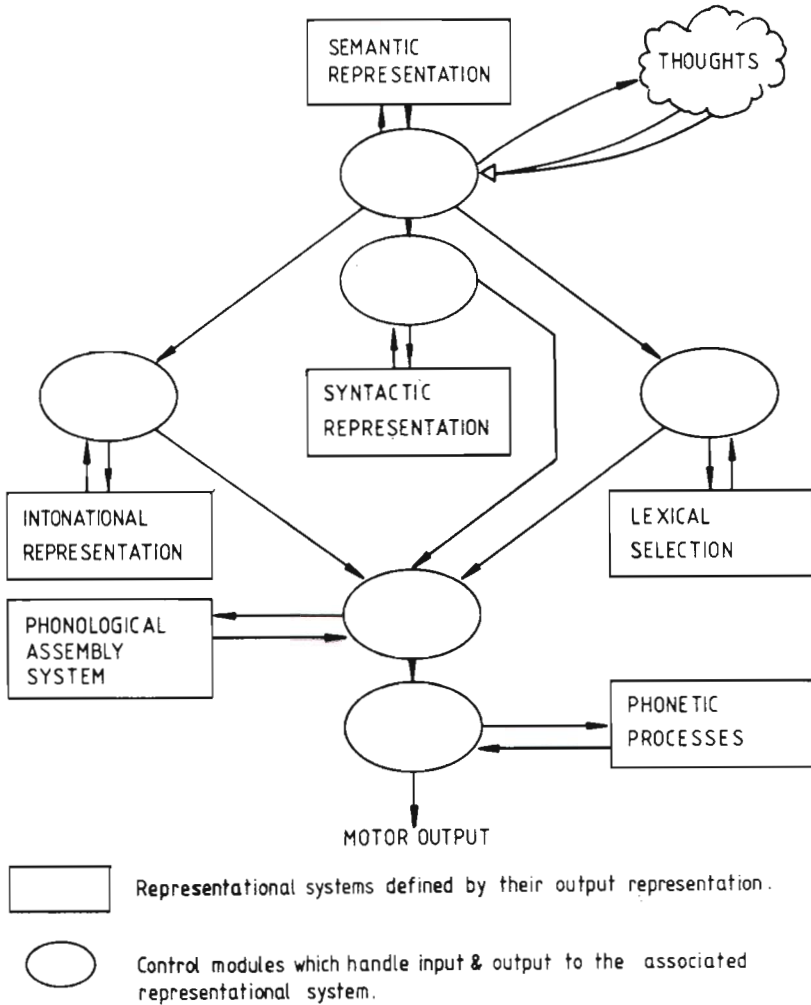
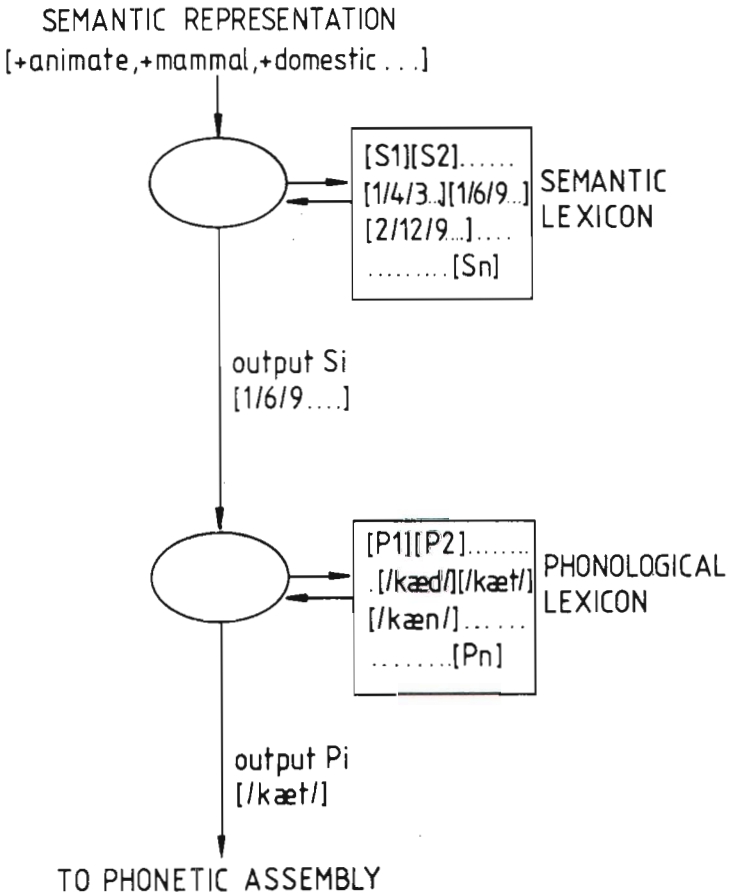


Figure 3. Butterworth's model of speech production. Adapted from Butterworth (1980)

cable without consideration of syntactic and intonational processes, though the model would allow for syntactic blend errors, or the substitution of an unintended syntactic structure, or selection of an unintended intonational contour (see Cutler and Isard, 1980; Butterworth, 1980). Lexical errors also constitute the most difficult case for this model, since word selection in it is guided solely by the intended meaning. Indeed, more detailed consideration of lexical selection makes the solution of the simultaneous conditions appear even more difficult.

Lexical selection is held to take place in two stages (see Figure 4). At stage 1, a semantic representation accesses, via a content address ([+animate, +mammal, +domestic ...] in Figure 4), an item in the 'Semantic Lexicon' (S.L.) This item is simply an address to an item in the 'Phonological Lexicon' (P.L.) At stage 2, this address ([1/6/9 ...]) is used to access an item in the Phonological Lexicon. This item is a phoneme string corresponding to a word ([/kæt/]), or perhaps a word stem. Accessing is under the control of a 'control module' which regulates input



[1/4/3...] represents the address code [1 syllable/begins/d-/ /vowel/ɒ/...] (dog)  
 [1/6/9...] represents the address code [1 syllable/begins/k-/ /vowel/æ/...] (cat)  
 [2/12/9...] represents the address code [2 syllables/begins/h-/ /first vowel/æ/...] (hamster)

Figure 4. Two stages of lexical selection from Butterworth's model (from Butterworth, 1980)



and output, and can carry out checks on the appropriateness of the output; (oval boxes in Figure 4).

There are three ways in which unintended or erroneous output from S.L. can arise:

1. Two competing semantic representations may be input, yielding either the competing (unintended) output or both unintended and intended.

2. Two alternative semantic representations may be input, yielding either the alternative output or both.

3. Addressing error: since items in S.L. are held to be arranged according to their meanings, hence content addressing, an addressing error will yield a near neighbour close in meaning but not necessarily close in sound.

There are two ways in which an error output from P.L. can occur:

1. Two addresses can be forwarded from S.L. (i.e. competing or alternative items) yielding two outputs instead of the intended one from P.L.

2. Addressing error: since items in P.L. are held to be arranged according to their sound (phonological structure), an addressing error will yield a near neighbour close in sound, but not necessarily close in meaning.

These error processes straightforwardly account for the following error types: word substitutions connected in meaning but dissimilar in sound (competing plan errors are held to be connected in meaning since they satisfy the meaning specification of the competing plans, but are not similar in meaning); word substitutions similar in sound but dissimilar in meaning (Fay and Cutler's (1977) 'malapropisms'). Word blends will be the result of two addresses output from S.L. accessing two words in P.L. which are then output.

Nothing in this account makes it intrinsically more likely for words similar in both meaning and sound to be the result of selection malfunction. To achieve the desired match with observations, it is necessary to postulate a checking mechanism.

Let us assume that there is a small probability that a word connected in meaning to the target is also similar in sound. This must be the case, or else errors connected in meaning and similar in sound couldn't ever arise. A check which filtered out items DISSIMILAR IN SOUND from the target would leave only those which were similar in sound. Since errors which are dissimilar in sound though connected in meaning do occur, this check cannot be 100% effective. Either it operates only some of the time, or its criteria shift, say, with utterance context.

For this mechanism to provide a match to the observed distributions,

either the probability of words which are connected in meaning and similar in sound must be far more common than one might guess, or it must be that errors in S.L. are far more common than errors in P.L. Since three error sources are postulated for S.L. errors, this seems not unlikely.

A plausible mechanism for checking would be simply to run the selection twice, for each word, and compare outputs. If they are similar, continue; if not, start again. This mechanism has the added advantage of making two outputs, in any case necessary for blends, a regular feature of the process.

A plausible locus for the check is on the outputs from S.L. First, addresses — not completely specified phoneme strings — are compared, giving perhaps the right degree of approximateness to the whole process, and also it would suggest that the involvement of longer words with longer or less precise addresses<sup>6</sup> would be more likely to yield observed errors. Second, if S.L. errors are much more frequent, this would be the sensible place to try and weed them out.

For the appropriate values for the parameters of error probability of the three types in S.L., of the two types in P.L., and the effectiveness of the checking procedure, better estimates are needed of the actual probabilities of error types than are currently available. In particular, meaning-connected errors may not have the same detectability as similar sounding errors.

Without a large tape-recorded corpus of errors from which to compute the probabilities of error types, these proposals must remain highly speculative. But they do seem to offer a way of treating alternative plan and competing plan errors in the model framework that one might postulate for plan internal errors and normal error-free speech production.

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## Notes

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1. This illustrates a major problem in speech error analysis: the possibility of alternative interpretations of the error source. In this case, as Anne Cutler has pointed out to me, the error could be a phoneme reversal of /s,t/ — /gaist, gaits/. But errors of this type within a consonant cluster are rare, and even rarer, I imagine, are those which result in a real word.
2. Another illustration. The target may have been 'I really like to stay in bed in the morning', and hence the error would be categorised as having its source in an alternative plan.
3. Evidence from reading suggests that words that the reader is conscious of have an inhibitory effect on other words with different meanings but excitatory effects on words of similar meanings whereas words that the reader is not conscious of (when pattern-masked, for example) have only an excitatory effect (on words of similar meaning) (Marcel, in press).
4. Garrett (personal communication) suggests that phonetic similarity here may be a consequence of similar semantic specification giving rise to morphologically related items. However, this explanation accounts for very few of the documented examples.
5. Morpheme-stranding errors, positional-level events, are similarly unconstrained by syntactic information: only 43% involve items of the same grammatical category (Garrett, 1980a).
6. Assume that words are located in a multidimensional phonemic space, with number of syllables, stress pattern, initial phoneme, initial phoneme of subsequent syllables etc. etc. as dimensions. As the words get longer, the space becomes less crowded — i.e. there are more one-syllabled words beginning /#k-/ than four-syllabled words beginning /#k-/ to address. If the address of /kæt/ is imprecise, i.e. just locates a region in the space, there will be many neighbours differing in just a phoneme /kɔt, kɪt, kɔ:t, tæt, bæt, sæt .../ which would have a high probability of selection. If the address of /kɔn vɔ:lʊʃən/ is imprecise, there will not be any similarly near neighbours to be selected. So addresses for long words don't need to be precise. Or, even if they are fully precise, they won't (usually) need to be checked as closely. Or, even if they are checked as closely, there is more chance of making an error.

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