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Redundancy in Language Design

ONE of the striking facts about spoken or written language is that you do not have to listen to or read every word to get the intended message. Psychologists have devised quite convincing tests which show this to be true, and the phenomenon known as evesdropping, often successfully accomplished under very adverse listening conditions, also can be used as evidence for it.

There are various reasons why this may be so. For one, the message may be familiar already, as when the reading from the Bible is from a well-known passage; or the message may be prescribed by the social situation (in which case what is said hardly counts as a message); or you may know the mind of the one speaking so well that you can anticipate the message, as when the vacuum cleaner is being used in your vicinity and you are waiting for the word to lift your feet. Of course anticipating what someone

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is going to say can lead to trouble because you may only "hear" what you expect to hear while what was said might have been quite different. We can probably all cite examples of this from our own experience. Generally, however, our expectations of what may be said to us serve us well in many situations and it is worth the risk of an occasional misunderstanding or embarrassment to make use of them.

Indeed part of the problem with learning a new language is that we have no expectations, and we have to listen very carefully, even when someone is only saying "hello" to us or is simply commenting on the weather. It wouldn't hurt you to acquire some of the stock expressions of Language X very early in the game. Being able to understand "Hello, how are you?" without thinking about it frees your mind and ears for the more difficult task of listening carefully to someone with a real message.

But even in the absence of expectations about what you may hear, expectations based on the situation in which the utterance is spoken, it is still not necessary to listen to every sound segment in order to get the message.

Linguists say that language is redundant. A simple illustration will

help to indicate what is meant by this. Suppose you were reading along in a book and you came across a sentence starting with the words "I just caught a glimpse of the..." but the last word is partially smudged so that you can't make out the second letter, but you can still manage to tell that the rest of the word is "q-een". No doubt you could predict, knowing the rest of the letters that the missing letter is "u", since in ordinary written English a "q" is always followed by a "u", and you know furthermore that when you put the "u" back in the word, it spells "queen", and that makes sense in the whole sentence.

Suppose the "i" of "glimpse" were smudged: still you could mentally fill it in, since there is no word in English with any other letter in that position—there is no word "glumpse" or "glympse" or "glampse". Furthermore, you could obscure the "e", the "p" and the "l", too; just having "g--m-s-" uniquely specifies the word "glimpse" in English spelling and no other word! For that matter in the context of the rest of the sentence, if the whole word were smudged, you could probably figure out what was intended, especially if you knew that the sentence was a statement made by someone watching a beauty parade, and who was straining his eyes to pick out the winner in the midst of a throng of photographers.

Context in spoken language

Now consider the same phenomenon in spoken rather than in written language. Suppose you were standing next to this person in the actual situation in which he made the utterance, and just as he uttered the word "glimpse" a baby cried out. What you actually hear is "I just caught a WAAH! of the queen." Once again you could mentally fill in the word "glimpse", or perhaps a synonym, such as "view." In this situation, you can get the intended message without hearing the words; it's not just a matter of simple expectation due to the situation, as in the cases we have already considered (the vacuum cleaner, or the "hello, how are you" cases), but an expectation that the structure of the English language itself leads us to entertain.

Linguists are very keen to study such language-dependent expectations, and they have shown that there are many, many such expectations that one can discover in human languages, and they are of all kinds, too. There are expectations having to do with the patterning of the sounds of language, for example we may expect vowels to follow consonants or groups of consonants, and vice-versa. There are expectations about words which may occur together, for example, "Dogs bark" but "Cats miaow;" and there are expectations about words which occur together because of grammar alone, such as the "more... than" of "Jacob had more faith than Esau." There are subtler kinds of expectations, too, but let us withhold discussion of them until we have finished with a brief outline of the types just mentioned above.

First let's consider expectations about the sound pattern of languages. These can be divided into several sub-types. The first that we may

consider has to do with individual sounds themselves, for example the expectation we have in English that vowels are spoken with a "voicing" vibration of the vocal cords or that consonants with velar point of articulation are not fricatives (i. e., that English has no sound like German "ch"), or that the American English "r" is not trilled. These, believe it or not, are very useful expectations to have, and having them we can perceive and comprehend without listening as intently as we should have to without them.

The next subtype is very similar, it has to do with features of pronunciation that are conditioned by the neighboring sounds. You are perhaps familiar with the fact that voiceless stops in English ("p," "t," "k") are aspirated unless they follow [s], thus [p^{h}in] but [spin], and so forth. Similarly within words, if a nasal consonant precedes a stop or affricate it is pronounced with the same point of articulation as the following consonant, as in the words "pump, punt punch, punk".

I cannot stress enough the usefulness that knowledge of these expectations have for perception; thus as you learn Language X, the effort you put in to the actual study of expectations concerning pronunciation in that language will be rewarded by quicker ability on your part to perceive and discriminate among the words and phrases of that language. Conversely, failure to notice them will put you in a disadvantageous position. Unfortunately, native speakers may not be consciously aware of the phonetic expectations

they have about their own language, and your teachers, no matter how competent otherwise, may be unable at first to help you in this area. This may be a case where you will have to play Socrates and draw this information out of them to teach you.

A third type of phonetic expectation is a sort of a converse of the preceding one: certain combinations of sounds may be impossible in a particular language. One might indeed say that most combinations are disallowed; phonological patterning can be compared to a sieve which strains out most sound combinations and leaves only a few. Many unpermitted combinations have to do with difficulty of pronunciation, thus one can not have too many consonants or vowels in a row; while others seem more arbitrary, for example the fact that English words do not start off with "dl" or "tl", although "pl", "kl", "bl", and "sl" are all permitted at the beginning of English words. As I indicated in the last article, it is often useful and always instructive to contemplate the patterns which don't occur in human language. When you get a genuine feel for what language isn't, or at least what English or Language X isn't, you have by the same token improved your understanding of what they are.

A fourth expectation about the sound structure of language has to do with something like chance, or perhaps historical accident. There is no word in English pronounced [bley], although phonologically there is no reason for its absence from the dictionary. It is perfectly pronounceable, and is analogous in form to

normal English words like "bray", "play" and "pray". These *accidental gaps,* as linguists call such absences as [bley] in English, are different from the *systematic gaps* considered previously, and are of least importance to the language learner, although fluent listeners doubtless make use of them, especially in the perception of long words. To perceive that a given word is, say, "counterrevolutionary," a fluent listener of English probably only has to actually notice a few of the consonants and vowels in order to recognize it, simply because there are no words in English which sound very much like "counterrevolutionary" (unless there may also be a word "counterresolutionary" in somebody's speech.)

Expectations from word choice

Now let's look at the expectations we can have as a result of the way sentences are constructed in human languages. We already noticed that there are restrictions on the choice of subject and verb in English which lead us to expect that "Dogs bark" and "Cats miaow", but not that "Dogs miaow" and "Cats bark". Indeed, the verbs "bark" and "miaow" tend to be used only with canine and feline subject nouns respectively, so that if by chance you happened to miss the subject of a sentence in which either verb is used, you can probably make an accurate guess as to what the subject actually was.

The verbs "bark" and "miaow" are perhaps extreme cases in English, but it is still nevertheless true that practically every verb has some set of expectations associated with it concerning the range of possibilities for its subject. Similarly, there are expectations which hold between a transitive verb and its object. Many times these expectations can be related to the meaning of the verb. The fact, for example, that you expect the subject and object of the verb "marry" to be of opposite sexes has something to do with the meaning of that verb in English. The detailed study of the expectations that hold between subjects, verbs and objects in English sentences, and between these and instruments, "with a knife," locatives, "in the room;" agents, "by the man," and other possible constituents of sentences is a task which will probably never be fully completed, even by generations of capable scholars working full time on it, and I can only begin to touch on it here.

But even if scholars cannot explicitly state the mutual sets of expectations which hold among the constituents of sentences, we all know what they are implicitly, and we all most certainly make use of them in both speaking and listening.

It might be thought that these expectations reduce the expressive power of language, that our view of the way things are is limited by what our language imposes on us. But actually quite the opposite is true. The fact that these expectations exist and are so pervasively a part of languages, frees our mind to pick up and to express subtle shades of meaning. Furthermore these expectations are exactly that—expectations — not hard and fast rules which cannot be broken by their human users; and when they are broken they jolt us

like any unexpected noise into a higher level of awareness. With skill, the systematic breaking of expectations can be used to create a most dramatic effect, both in speaking and in writing. So, far from chaining our thoughts and imagination, the expectations which hold among the constituents of sentences can be viewed as a tool for making our expressions of thought both precise and colorful.

Expectations from grammar

Returning to the topic of discussion, let us now consider those expectations which follow from the more or less mechanical rules of grammar of syntax of which every language has its share. In the first article, we said something of what goes into the formation of questions in English. The presence of an interrogative word or the changes in word order that we noted can be viewed as "signals" that the sentence is interrogative. When both signals occur, they reinforce each other and serve as a double cue that the sentence is interrogative; we can miss one cue and still get the "message" from the other. When you look closely at English sentences, you begin to notice that there are often multiple clues for a single structure in a given sentence. One often is given a second chance to hear something, as it were. In the first article, when we considered the vulgar English sentence

I don't want no help from you.

we saw that the word "no" reinforces the sentence-negation and thus we see that it acts as a second clue to the negative status of the sentence. But notice that the counterpart to

this sentence in "proper" English has "any" where this sentence has "no"

I don't want any help from you.

and this "any" also serves to reinforce the negation of the entire sentence. Why? Because in an affirmative sentence, the word "some" would appear there

I want some help from you.

In grammatical jargon, we call these words "some", "any" and "no" indefinite quantifiers. They tell us that there is an unspecified amount (or no amount) of whatever noun they modify under consideration. In English, generally, the indefinite quantifier is used only in affirmative declarative sentences, while "any" and "no" are used under certain condition in negative and interrogative sentences; notice that we generally say:

Do you want any help from me?

rather than

Do you want some help from me?

although the second of these is also all right. In the first sentence the choice of "any" reinforces the interrogation.

I have spent time in this article on these rather detailed considerations of English sentences to point out to you the wealth of clues that simple little old sentences contain which point to their grammatical structure. To the learner of a new language, he needs all the help he can get from the language to tell him what the structure of what he is hearing and trying to say has. Grammatical expectations, such as the kind I have been talking about, supply exactly the kind of help he needs,

provided he is aware of their existence.

This is all I have to say on the subject of expectations that we can have about the phonetic and grammatical character of the words and sentences of language. You will recall that at the beginning of this article I said that there are subtler kinds of expectations in language, too, and that I would defer discussion of these for a time.

Relation of sound and grammar

The first of my observations is that the phonetic and grammatical sides of language are not unrelated, but rather that they are very closely and intimately related, and that there are many expectations about pronunciation which one can obtain from observations about grammar. These expectations differ from language to language, but all languages have them, and some of them do carry over from one language to another.

Let us take an example from English. There are many pairs of words in English, one being a verb, and the other a noun.

Often the noun is indicated by a suffix of some sort. Thus:

hate, v.	hatred, n.
conquer, v.	conquest, n.
give, v.	gift, n.
invest, v.	investment, n.
collect, v.	collection, n.
deny, v.	denial, n.
defy, v.	defiance, n.
complain, v.	complaint, n.
inquire, v.	inquiry, n.

Sometimes the verb and noun are identical:

love, v.	love, n.
draft, v.	draft, n.
cover, v.	cover, n.
control, v.	control, n.

In certain cases, the verb and noun differ only in stress pattern (and perhaps stress-related vowel change):

rebel, v.	rebel, n.
torment, v.	torment, n.
permit, v.	permit, n.
contest, v.	contest, n.
address, v.	address, n.

And in other cases they differ in that the verb ends in a voiced fricative [v, d, z] while the noun ends in a voiceless one [f, ø, s]; there may also be a vowel and/or stress change:

strive, v.	strife, n.
believe, v.	belief, n.
live, v.	life, n.
prove, v.	proof, n.
breathe, v.	breath, n.
mouthe, v.	mouth, n.
bathe, v.	bath, n.
use, v.	use, n.
house, v.	house, n.
refuse, v.	refuse, n.
merchandise, v.	merchandise, n.

The point of all these examples is this. The pattern of English noun-derivation or verb-derivation is quite complex, and difficult for foreigners to learn; but in some cases, at least, the pattern is strictly a matter of phonetics, and a regular one at that. If you know that nouns and verbs differ in stress pattern they always differ in the same way; if they differ in voicing of a final fricative, again they differ in the same way each time.

The significance of phonetic cues for grammatical identification can be best appreciated, if we realize that when we speak we do not usually announce the part of speech of each word. But we can often infer the part of speech from pronunciation; we can identify suffixes or prefixes

which tell us this, or the kinds of phonetic signals we've just considered — voicing of final fricatives or stress patterning. In a nutshell, details of pronunciation can and often do relate to grammar, and when they do they almost invariably do so consistently.

Let's take another case in which English stress relates to grammar. When we put two nouns together to form a compound noun, the first noun generally has greater stress:

> 'life ‚boat
> 'table ‚spoon
> 'potato ‚masher

When an adjective modifies a noun, then the noun, which is second, has greater stress:

> ‚red 'brick
> ‚common com'plaint
> ‚Turkish 'towel

It is often the case, however, that a given adjective-noun combination has the same words comprising it as a compound noun. But we can always distinguish the compound from the adjective-noun construction by the stress pattern. Thus, people grow plants in a 'green ‚house, but they may live in a ‚green 'house. The first is a compound, the second an adjective-noun. Likewise, a 'light ‚ship (compound) is a special kind of ship, but a ‚light 'ship (adjective-noun) is a ship which is not heavy. 'White ‚wash (compound) makes walls white, but a ‚white 'wash (adjective-noun) is the laundry. It is clear that the pronunciation is a useful clue for the grammatical construction.

About complex sentences

My second and final not-so-subtle subtle observation has to do with the structure of complex sentences. You are familiar from school-days with the notion that complex sentences are made up of a main clause and one or more subordinate clauses, and compound sentences have several main clauses hooked together by conjunctions. Such sentences are indeed found in all languages, and in all of them it can be maintained that each clause of a complex or compound sentence is itself a close relative of an independent simple sentence. Thus we may say that all languages have a way of making big sentences out of little ones. Often, to figure out the meaning of a complex sentence, it is necessary to first reduce it to its simple components. This is also a useful practice in translating from one language to another.

Let me conclude this article by reviewing its main points. We maintained that language is redundant, first when viewed in its social and cultural setting, and second and perhaps more importantly within itself. There are redundancies at all levels of language. Within its system of pronunciation, we distinguished four kinds: (i) expectations about the pronunciation of sounds derived from the sounds themselves, and their place within the phonetic pattern of the language, (ii) similar expectations as a result of the phonetic environments in which they occur, (iii) systematic gaps in the inventory of words and (iv) accidental gaps in the inventory of words. The

structure of the patterning of words and phrases generally is governed by the meaning of the elements involved and by mechanical rules of grammar. These rules of grammar often assist us in identifying the message since they may result in a multitude of clues scattered about. Similarly, the structure of complex sentences relates by means of rules to the structure of the simple sentences which comprise it. In addition we also observed that pronunciation and grammar are not unrelated and that clues for the grammatical structure of utterances can be found in the manner in which they are pronounced. It is this multiplicity of clues for the same feature that we speak of as "redundancy" in language design.