2.1 INGO PLAG

Productivity and the Mental Lexicon*

Introduction to Reading 2.1

The excerpt that constitutes Reading 2.1 is the first quarter of a chapter from a book on English morphology. Morphology is the study of how words are formed out of meaningful parts. For example the adjective *unhappy* is {un-} plus {happy} and it means 'not happy'; and *admissible* is {admit} plus {-able} and means 'can be allowed in', with *admit*[a] having a special form {admiss} here; and *-able* being conventionally spelt *-ible* in this word.

The rules of morphology cover meaning, sound, spelling and syntax (*admit* is a verb, but the suffix in *admissible* marks it as an adjective). Some word-formation rules are more productive than others. I imagine that whichever science fiction writer first wanted to write about the condition of floating free of gravity might have had to think a moment for the word *weight*, but from there to *weightless* and thence *weightlessness* would have taken only instants, because suffixation with {-less} and {-ness} are both very productive processes. And, because use of these particular suffixes is so productive, readers would instantly have understood the new word *weightlessness*. A productive morphological rule is one that can freely be used to create new words. You'd've understood *moneylessness* the first time you heard it, wouldn't you?

Plag next discusses psycholinguistic questions of how we store words in our minds – as wholes (*weightlessness*) or parts (*weight+less+ness*), or perhaps as both wholes and parts – and how we find them when they are needed to express our meanings, or for understanding what other people say or write. (Part 4 of this reader has more articles on psycholinguistics.)

OUTLINE

In this chapter we will look at the mechanisms that are responsible for the fact that some affixes can easily be used to coin new words while other affixes cannot. First, the notions of 'possible word' and 'actual word' are explored, which leads to the discussion of how complex words are stored and accessed in the mental lexicon. This turns out to be of crucial importance for the understanding of productivity. [. . .]

* 2003, excerpt reprinted with permission from *Word-Formation in English*. Cambridge: Cambridge University Press, 44–51.

[a] Should we say that *admit* is *ad-* plus *mit*? Maybe in Latin, but in English today this *mit* does not have a meaning of its own that is obvious to users of the language.

1 Introduction: what is productivity?

We [. . .] can distinguish[b] between redundancy rules that describe the relationship between existing words and word-formation rules that can in addition be used to create new words. Any theory of word-formation would therefore ideally not only describe existing complex words but also determine which kinds of derivative could be formed by the speakers according to the regularities and conditions of the rules of their language. In other words, any word-formation theory should make predictions about which words are possible in a language and which words are not.

Some affixes are often used to create new words, whereas others are less often used, or not used at all, for this purpose. The property of an affix to be used to coin new complex words is referred to as the **productivity** of that affix. Not all affixes possess this property to the same degree; some affixes do not possess it at all. For example, [. . .] nominal *-th* (as in *length*) can only attach to a small number of specified words, but cannot attach to any other words beyond that set. This suffix can therefore be considered unproductive. Even among affixes that can in principle be used to coin new words, there seem to be some that are more productive than others. For example, the suffix *-ness* (as in *cuteness*) gives rise to many more new words than, for example, the suffix *-ish* (as in *apish*). The obvious question now is which mechanisms are responsible for the productivity of a word-formation rule. This is the question we want to address in this chapter. What makes some affixes productive and others unproductive?

2 Possible and actual words

A notorious problem in the description of [. . .] speakers' morphological competence is that there are quite often unclear restrictions on the possibility of forming (and understanding) new complex words [. . .] for example, [. . .] *un-* can be freely attached to most adjectives, but not to all, [. . .] *un-* occurs with nouns, but only with very few, and [. . .] *un-* can occur with verbs, but by no means with all verbs. [W]e could establish some restrictions, but other restrictions remain [. . .] mysterious. The challenge for the analyst, however, is to propose a word-formation rule that yields (only) the correct set of complex words. Often, word-formation rules that look straightforward and adequate at first sight turn out to be problematic upon closer inspection. A famous example of this kind (see, for example, Aronoff 1976) is the attachment of the nominalizing suffix *-ity* to adjectival bases ending in *-ous*, which is attested with forms such as *curious–curiosity*, *capacious–capacity*, *monstrous–monstrosity*. However, *-ity* cannot be attached to all bases of this type,

[b] Two ways of thinking about rules of morphology are distinguished here. They could merely save redundant repetition when we are listing words that already exist in a language. For example, most existing words ending with the suffix {-less} are paired with existing words having the further addition of the suffix {-ness}: *mindless, mindlessness; guileless, guilessness*, etc. So someone compiling a dictionary could save space by stating that Noun+*less* words imply the existence of corresponding Noun+*lessness* words. (It might not be true, because there are perhaps a few Noun+*less* words that have not yet prompted anyone to add {-ness} to talk about the state of affairs described, which is to say that the word ending *-lessness* might not yet exist.) On the other hand, regarding a morphological rule as a word-formation rule treats it as making predictions: if a new Noun+*less* word came into being, then proficient users of English would accept the corresponding Noun+*lessness* word.

as evidenced by the impossibility of *glorious–*gloriosity* or *furious–*furiosity*.[c] What is responsible for this limitation on the productivity of *-ity*?

Another typical problem with many postulated word-formation rules is that they are often formulated in such a way that they prohibit formations that are nevertheless attested. For example, it is often assumed that person nouns ending in *-ee* (such as *employee*, *nominee*) can only be formed with verbs that take an object ('employ someone', 'nominate someone'), so-called transitive verbs. Such *-ee* derivatives denote the object of the base verb, i.e. an employee is 'someone who is employed', a nominee is 'someone who is nominated'. However, sometimes, though rarely, even intransitive verbs take *-ee* (e.g. *escape-escapee*, *stand-standee*), or even nouns (*festschrift-festschriftee* 'someone to whom a *Festschrift* is dedicated'). Ideally, one would find an explanation for these apparently strange conditions on the productivity of these affixes.

A further problem that we would like to solve is why some affixes occur with a large number of words, whereas others are only attested with a small number of derivatives. What conditions these differences in proliferance? Intuitively, the notion of productivity must make reference to the speaker's ability to form new words and to the conditions the language system imposes on new words. This brings us to a central distinction in morphology, the one between **possible** (or 'potential') and **actual words**.

A possible, or potential, word can be defined as a word whose semantic, morphological or phonological structure is in accordance with the rules and regularities of the language. It is obvious that before one can assign the status of 'possible word' to a given form, these rules and regularities need to be stated as clearly as possible. It is equally clear that very often the status of a word as possible is uncontroversial. For example, it seems that all transitive verbs can be turned into adjectives by the attachment of *-able*. Thus, *affordable*, *readable*, *manageable* are all possible words. Notably, these forms are also semantically transparent, i.e. their meaning is predictable on the basis of the word-formation rule according to which they have been formed. Predictability of meaning is therefore another property of potential words.

In the case of the potential words *affordable*, *readable*, *manageable*, these words are also actual words, because they have already been coined and used by speakers. But not all possible words are existing words, because, to use again the example of *-able*, the speakers of English have not coined *-able* derivatives on the basis of each and every transitive verb of English. For instance, neither the *OED* nor any other source I consulted lists *cannibalizable*. Hence this word is not an existing word, in the sense that it is used by the speakers of English. However, it is a possible word of English because it is in accordance with the rules of English word-formation, and if speakers had a practical application for it they could happily use it.

Having clarified the notion of a possible word, we can turn to the question of what an actual (or existing) word is. A loose definition would simply say that actual words are those words that are in use. However, when can we consider a word as being 'in use'? Does it mean that some speaker has observed it being used somewhere? Or that the majority of the speech community is familiar with it? Or that it is listed in dictionaries? The problem is that there is variation between individual speakers. Not all words one speaker knows are

[c] Linguists put an initial asterisk on to expressions that are not in the language.

also known by other speakers, i.e. the mental lexicon of one speaker is never completely identical to any other speaker's mental lexicon. Furthermore, it is even not completely clear when we can say that a given word is 'known' by a speaker, or 'listed' in her/his mental lexicon. For example, we know that the more frequent a word is the more easily we can memorize it and retrieve it later from our lexicon. This entails, however, that 'knowledge of a word' is a gradual notion, and that we know some words better than others. Note that this is also the underlying assumption in foreign language learning where there is often a distinction made between the so-called 'active' and 'passive' vocabulary. The active vocabulary obviously consists of words that we know 'better' than those that constitute our passive vocabulary. The same distinction holds for native speakers, who also actively use only a subset of the words that they are familiar with. Another instance of graded knowledge of words is the fact that, even as native speakers, we often only know that we have heard or read a certain word before, but do not know what it means.

Coming back to the individual differences between speakers and the idea of 'actual words', it seems nevertheless clear that there is a large overlap between the vocabularies of the individual native speakers of a language. It is this overlap that makes it possible to speak of 'the vocabulary of the English language', although, strictly speaking, this is an abstraction from the mental lexicons of the speakers. To come down to a manageable definition of 'actual word' we can state that if we find a word attested in a text, or used by a speaker in a conversation, and if there are other speakers of the language that can understand this word, we can say with some confidence that it is an actual word. The class of actual words contains of course both morphologically simplex and complex words, and among the complex words we find many that do behave according to the present-day rules of English word-formation. However, we also find many actual words that do not behave according to these rules. For example, *affordable* ('can be afforded'), *readable* ('can be (easily) read'), and *manageable* ('can be managed') are all actual words in accordance with the word-formation rule for *-able* words, which states that *-able* derivatives have the meaning 'can be Xed', whereas *knowledgeable* (*'can be knowledged') or *probable* (*'can be probed') are actual words which do not behave according to the word-formation rule for *-able*. The crucial difference between actual and possible words is then that only actual words may be idiosyncratic, i.e. not in accordance with the word-formation rules of English, whereas possible words are never idiosyncratic.

We have explored the difference between actual and possible words and may now turn to the mechanisms that allow speakers to form new possible words. We have already briefly touched upon the question of how words are stored in the mental lexicon. In the following section, we will discuss this issue in more detail, because it has important repercussions on the nature of word-formation rules and their productivity.

3 Complex words in the lexicon

Idiosyncratic complex words must be stored in the mental lexicon, because they cannot be derived on the basis of rules. But what about complex words that are completely regular, i.e. words that are in complete accordance with the word-formation rule on the basis of which they are formed? There are different models of the mental lexicon conceivable. In some approaches to morphology the lexicon is seen 'like a prison – it contains only the lawless' (Di Sciullo and Williams 1987: 3). In this view the lexicon would contain only

information which is not predictable, which means that in this type of lexicon only simplex words, roots, and affixes would have a place, but no regular complex words. This is also the principle that is applied to regular dictionaries, which, for example, do not list regular past-tense forms of verbs, because these can be generated by rule and need not be listed. The question is, however, whether our brain really follows the organizational principles established by dictionary makers. There is growing psycholinguistic evidence that it does not and that both simplex and complex words, regular and idiosyncratic, can be listed in the lexicon (in addition to the word-formation rules and redundancy rules that relate words to one another).

But why would one want to bar complex words from being listed in the lexicon in the first place? The main argument for excluding these forms from the lexicon is economy of storage. According to this argument, the lexicon should be minimally **redundant**, i.e. no information should be listed more than once in the mental lexicon, and everything that is predictable by rule need not be listed. This would be the most economical way of storing lexical items. Although non-redundancy is theoretically elegant and economical, there is a lot of evidence that the human brain does not strictly avoid redundancy in the representation of lexical items, and that the way words are stored in the human brain is not totally economical. The reason for this lack of economy of storage is that apart from storage, the brain must also be optimized with regard to the processing of words. What does 'processing' mean in this context?

In normal speech, speakers utter about three words per second, and given that this includes also the planning and articulation of the message to be conveyed, speakers and hearers must be able to access and retrieve words from the mental lexicon within fragments of seconds. As we will shortly see, sometimes this necessity of quick access may be in conflict with the necessity of economical storage, because faster processing may involve more storage and this potential conflict is often solved in favor of faster processing.

For illustration, consider the two possible ways of representing the complex adjective *affordable* in our mental lexicon. One possibility is that this word is decomposed in[to] its two constituent morphemes *afford* and *-able* and that the whole word is not stored at all. This would be extremely economical in terms of storage, since the verb *afford* and the suffix *-able* are stored anyway, and the properties of the word *affordable* are entirely predictable on the basis of the properties of the verb *afford* and the properties of the suffix *-able*. However, this kind of storage would involve rather high processing costs, because each time a speaker wanted to say or understand the word *affordable*, her/his language processor would have to look up both morphemes, put them together (or decompose them) and compute the meaning of the derivative on the basis of the constituent morphemes. An alternative way of storage would be to store the word *affordable* without decomposition, i.e. as a whole. Since the verb *afford* and the suffix *-able* and its word-formation rule are also stored, whole-word storage of *affordable* would certainly be more costly in terms of storage, but it would have a clear advantage in processing: whenever the word *affordable* needs to be used, only one item has to be retrieved from the lexicon, and no rule has to be applied. This example shows how economy of storage and economy of processing must be counter-balanced to achieve maximum functionality. But how does that work in detail? Which model of storage is correct? Surprisingly, there is evidence for both kinds of storage, whole-word and decomposed, with frequency of occurrence playing an important role.

In most current models of morphological processing access to morphologically complex words in the mental lexicon works in two ways: by direct access to the whole-word representation (the so-called **whole-word route**) or by access to the decomposed elements (the so-called **decomposition route**). This means that each incoming complex word is simultaneously processed in parallel in two ways. On the decomposition route it is decomposed in[to] its parts and the parts are [. . .] looked up individually; on the whole-word route the word is looked up as a whole in the mental lexicon. The faster route wins the race and the item is retrieved in that way. The two routes are schematically shown in Figure 2.1.1.

How does frequency come in here? As mentioned above, there is a strong tendency that more frequent words are more easily stored and accessed than less frequent words. Psycholinguists have created the metaphor of **resting activation** to account for this phenomenon (and other phenomena). The idea is that words are sitting in the lexicon, waiting to be called up or 'activated' when the speaker wants to use them in speech production or perception. If such a word is retrieved at relatively short intervals, it is thought that its activation never completely drops down to zero in between. The remaining activation is called 'resting activation', and this becomes higher the more often the word is retrieved. Thus, in psycholinguistic experiments it can be observed that more frequent words are more easily activated by speakers, such words are therefore said to have a higher resting activation. Less frequent words have a lower resting activation.

Other experiments have also shown that when speakers search for a word in their mental lexicon, not only the target word is activated but also semantically and phonologically similar words. Thus lexical search can be modeled as activation spreading through the lexicon. Usually only the target item is (successfully) retrieved, which means that the activation of the target must have been strongest.

Now assume that a low-frequency complex word enters the speech-processing system of the hearer. Given that low-frequency items have a low resting activation, access to the whole-word representation of this word (if there is a whole-word representation available at all) will be rather slow, so that the decomposition route will win the race. If there is no whole-word representation available, for example in the case of newly coined words, decomposition is the only way to process the word. If, however, the complex word is extremely frequent, it will have a high resting activation, will be retrieved very fast and can win the race, even if decomposition is also in principle possible.

Let us look at some complex words and their frequencies for illustration. The first problem we face is to determine how frequently speakers use a certain word. This methodological problem can be solved with the help of large electronic text collections, so-called 'corpora'. Such corpora are huge collections of spoken and written texts which

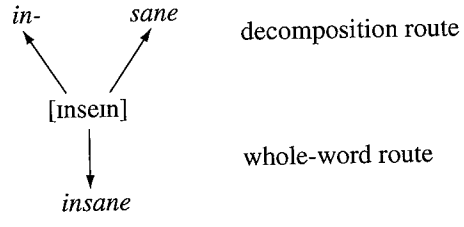

Figure 2.1.1 [Two routes for morphological processing]

can be used for studies of vocabulary, syntax, semantics, etc., or for making dictionaries. In our case, we will make use of the **British National Corpus (BNC)**. This is a very large representative collection of texts and conversations from all kinds of sources, which is available on the internet. The corpus amounts to about 100 million words, c. 90 million of which are taken from written sources, c. 10 million of which represent spoken language. For reasons of clarity we have to distinguish between the number of different words (the so-called **types**)[d] and the overall number of words in a corpus (the so-called **tokens**). The 100 million words of the BNC are tokens, which represent about 940,000 types. We can look up the frequency of words in the BNC by checking the word-frequency list provided by the corpus compilers. The two most frequent words in English, for example, are the definite article *the* (which occurs about 6.1 million times in the BNC), followed by the verb BE, which (counting all its different forms *am*, *are*, *be*, *been*, *being*, *is*, *was*, *were*) has a frequency of c. 4.2 million, meaning that it occurs 4.2 million times in the corpus.

For illustrating the frequencies of derived words in a large corpus let us look at the frequencies of some of the words with the suffix *-able* as they occur in the BNC. In Table 2.1.1, I give the first twenty *-able* derivatives (in alphabetical order) from the word list for the written part of the BNC corpus. Note that the inclusion of the form *affable* in this list of *-able* derivatives may be controversial [. . .].

There are huge differences observable between the different *-able* derivatives. While *acceptable* has a frequency of 3416 occurrences, *absorbable*, *abusable*, *accruable*, *acid-extractable*, *actable*, and *actualizable* occur only once among the 90 million words of [the written] sub-corpus. For the reasons outlined above, high-frequency words such as *acceptable* are highly likely to have a whole-word representation in the mental lexicon although they are perfectly regular.

Table 2.1.1 Frequencies of *-able* derivatives in the BNC (written corpus)

-able derivative	*frequency*	*-able derivative*	*frequency*
abominable	84	actionable	87
absorbable	1	actualizable	1
abstractable	2	adaptable	230
abusable	1	addressable	12
acceptable	3416	adjustable	369
accountable	611	admirable	468
accruable	1	admissable	2
achievable	176	adorable	66
acid-extractable	1	advisable	516
actable	1	affable	111

[d] The distinction between *type* and *token* is explained in introductions to corpus linguistics; or see Unit 5 of Bloomer, Griffiths and Merrison (2005).

To summarize, it was shown that frequency of occurrence plays an important role in the storage, access, and retrieval of both simplex and complex words. Infrequent complex words have a strong tendency to be decomposed. By contrast, highly frequent forms, be they completely regular or not, tend to be stored as whole words in the lexicon. On the basis of these psycholinguistic arguments, the notion of a non-redundant lexicon should be rejected.

But what has all this to do with productivity? [In the next section, not reproduced in this excerpt, Plag argues that] productive processes are characterized by a high proportion of low-frequency words.

NOW, THINK, DO!

2.1.1 Why is *affable* a 'controversial' item to have in Table 2.1.1? (See Plag's note where he introduces this table.) Does *abominable* fit the relevant rule?

2.1.2 Table 2.1.1 lists *admissable* as occurring twice in the British National Corpus's 90 million words of written text. Look it up in the frequency list held on a computer at Lancaster University (ucrel.lancs.ac.uk//bncfreq/flists.html) and, in the same list, look up the frequency of occurrence of *admissible* (the conventional spelling). Did Plag mis-spell the word *admissible* in his table or did he give us only the frequency of the unusual spelling *admissable*?

2.1.3 Write an explanation, with examples, of Plag's assertion that 'only actual words may be idiosyncratic, i.e. not in accordance with the word-formation rules of English, whereas possible words are never idiosyncratic'. An example that you could start with is the idiosyncrasy illustrated by a common use of *breathable*. According to the rule given in Reading 2.1 it should mean that 'can be breathed (like air)', but in connection with water-resistant fabrics it means 'air can get through (to stop the wearer from feeling sweaty)'.

FURTHER READING

Read the rest of Plag's (2003) Chapter 3 for more about the notion of productivity in morphology. Or, for much more detail, consult the book by Bauer, Anderson and Bresnan (2001).

In Section 3 of the reading, Plag says that 'growing psycholinguistic evidence' supports the view that the mental lexicon is not maximally economical: we store as prefabricated wholes some words that could be assembled from parts each time they are needed. Marslen-Wilson (2007) provides a balanced and comprehensive survey of relevant psycholinguistic evidence.

The British National Corpus, at Oxford University, has an interesting website. It includes a short statement on what corpora can be used for.

Reading 3.7 (McEnery) is based on the study of a corpus.

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2.2 ARTHUR HUGHES, PETER TRUDGILL and DOMINIC WATT

Regional Accent Variation*

Introduction to Reading 2.2

In this reading, Hughes, Trudgill and Watt offer a thumbnail sketch of many of the major phonetic differences in the more widely recognised accents in the British Isles. They assume that the reader will be sufficiently familiar with the alphabet of the International Phonetic Association (IPA). If you are not that familiar, consult Unit 8 of Bloomer, Griffiths and Merrison (2005) or the IPA chart on page 384 at the back of this book. Even if you still do not grasp phonetic transcription symbols, you should be able to glean a reasonable understanding so long as you work on the basic IPA premise that every symbol represents a discrete and identifiably different sound.

REGIONAL ACCENT VARIATION

[The] accent of British English which has been most fully described, and which is usually taught to foreign learners, is the accent known as RP.

In this chapter we first give a brief outline of the main regional differences to be found in accents of British English other than RP, and then compare them with RP. We do not, however, attempt to give a detailed account of all the regional and social differences in pronunciation to be found in British Isles English. In particular, we do not attempt at all to describe accents associated with traditional dialects, spoken by older people in rural areas (for these, see Wakelin 1977). We concentrate instead on urban and other regional accents of the sort most widely heard around Britain and Ireland, and which are most likely to be encountered by visitors from overseas. [. . .] Intonation is also dealt with briefly in cases where it deviates markedly from the general RP-like pattern.

Regional accent differences

The vowel /ʌ/

(a) One of the best-known differences between English accents is one of phoneme inventory – that is, the presence or absence of particular phonemes [. . .]. Typically, the vowel /ʌ/ does not occur in the accents of the north and midlands of England, and in some accents of the Republic of Ireland. In these accents, /ʊ/ is to be found in those words that elsewhere have /ʌ/. The vowel /ʌ/ is relatively recent in the history of English, having developed

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* 2005, reprinted with permission from *English Accents and Dialects: an Introduction to Social and Regional Varieties of English in the British Isles* (4th edn). London: Hodder Arnold, Chapter 4, 59–71.