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The Learner's Dictionary and the Sciences: Mismatch or no match?

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Learner's dictionaries are at the forefront of lexicographical practice; it is through them that corpora have become standard practice, through them that the most dynamic electronic dictionaries have come onto the market. The market for such dictionaries is enormous with the big five working hard to keep and increase their share of the market. However, it may well be that they are failing to take into account the needs of a particularly user group; the ESP/EAP learner. This communications looks at how scientific usage is shown in three major learner's dictionaries and proposes a corpus-based solution using prototype theory.

1. Introduction

« In praise of dictionaries » was the title of John Sinclair's 2004 Euralex plenary (Sinclair 2004). As he pointed out, there is much to be praised. Dictionaries have evolved over centuries to become the major reference works that we rely on today. In the second half of the 20th century, computer technology ensured a revolution in the publishing world in general, but in the world of lexicography in particular by opening up new systems for the analysis and management of data, but above all new sources. The world of electronic resources was opened in the late fifties and sixties with projects such as Frantext, the Brown and the OSTI corpora, but the great revolution came about in the eighties with the COBUILD project in Birmingham and the development of a brand new advanced learner' dictionary (Sinclair 1987).

Learner's dictionaries are at the forefront of lexicographical practice; it is through them that corpora have become standard practice, through them that the most dynamic electronic dictionaries have come onto the market. The market for such dictionaries is enormous with the big five working hard to keep and increase their share of the market. However, it may well be that they are failing to take into account the needs of a particularly user group; the ESP/EAP learner.

All depends on the definition one gives to learner. In France, at least, this is often restricted to those studying English as a language; at least as far as dictionary acquisition is concerned. Students in ESP/EAP tend to rely heavily on bilingual dictionaries and often have poor dictionary skills. However, some of these students go on to become fully fledged research scientist, for whom publication in English is a necessity, but whose dictionary skills will still be minimal. In ESP/EAP lexical acquisition has tended towards the terminology that a specialist must master, but, as a discipline, terminology has only recently moved towards

consideration of collocational and sociolinguistic context (L'Homme 2003, Temmerman 2000) and the job of a terminologist is not to help with language production; that is the role of the lexicographer.

This text then looks at two aspects of special language lexicography: the use of a corpus to adapt learner's dictionaries to the needs of the non-language specialist and the possibility of going beyond the general learner's dictionary to a corpus-based dictionary of subject specialists.

2. From general word list to the Oxford 3000

The OALD is the father of learner's dictionaries having grown out of the pioneering work of Palmer and Hornby in the 1920's and 30's. Palmer was concerned with the teaching of English as a foreign language. His work in applied linguistics was central in the definition of a basic vocabulary for learners (Palmer 1930, 1931, Palmer & West 1936), work which ultimately lead to the "General Service List" (West 1953) which provided the underpinning of most post-war language teaching methods. Palmer was not just concerned with words as isolated items as it was he who first introduced the notion of collocation into English language teaching in a revolutionary document that, unfortunately, is still not widely available (Palmer 1933). It is but a small step from a contextualized list to a true learner's dictionary. Palmer's collaboration with Hornby led to new lexicographical practices, and, in 1948, to the publication of Hornby's "Advanced Learner's Dictionary". The latter became the "Oxford Advanced Learner's Dictionary" (OALD), the father of the now vibrant and dynamic world of learners' dictionaries for English.

Writing a dictionary requires the establishing of a list of headwords and also of a defining vocabulary in that the words used to define should not, in theory, be more complicated than those that are being defined. Such lists are accumulative and were not seriously challenged until the COBUILD revolution in the nineteen eighties that brought corpora into the dictionary making picture (Sinclair, ed. 1987). The most recent version of the OALD makes use of corpora, but also the knowledge of ELT research to set out a basic vocabulary for the use of Advanced Learners: the Oxford 3000. This list has been established taking into account the frequency factor, but also those of range and familiarity (OALD 7th edition R99). In addition to this list, Oxford also has a list of specialist words in fields such as the sciences; it is this last list that is the start point for the current research.

3. The Oxford Scientific

The Oxford Scientific list consists of 250 headwords; in fact 265 word-forms once spelling variations are taken into account. The aim of this list, according to the blurb is to "help you understand texts about these subjects more easily" (OALD 7, R115). The question as to who is concerned by "you" is not addressed. Are these general readers who wish to read more widely or ESP science students? The answer can only lie in a very broad definition of the language learner at upper school and university levels as much depends on the attitude of the teaching to the use of dictionaries. The issue that is addressed here is not so much of the general language user, but that of the non-English specialists. In other words, do the scientific 250, and by extension the other specialized word lists, address the needs of these specific

learners, or simply widen the vocabulary available to a more general audience. Part of the answer will be found in looking at these words in the OALD.

To carry out this study, the list has been analyzed to address a number of factors. Are all these words headwords within the dictionary? Are they signaled as being scientific by a general or domain-specific label? Is the scientific aspect explicit or implicit in the definition and the example? Which words have a label and which do not? Finally, the presence of this specialized vocabulary has been checked against a very specialized corpus – the Parasitic Plant Corpus (Williams 1998) – to see whether this language could represent a very widely available core of scientific usage.

The findings of the study reveal a remarkable degree of inconsistency with some other words being clearly signaled with subject field labels, whilst in others the ‘scientific’ aspect is simply implicit in the definition or example. In some cases there is no indication of any specialized usage whatsoever.

One word ‘rat’ has an unclear status. It could be the fact that this mammal is used in experiments, although ‘mouse’ is what most people would associate with laboratory work, and also in computing. The dictionary does not show any particular scientific status which may mean that a typographical error has given ‘rat’ rather than the noun ‘rate’. In only one case is the word-form actually missing from the dictionary, this is ‘cloning’ which is present in the list as being a derived form from ‘clone’. The adjectival form is not given even in the examples, which makes its presence in a list of knowable forms surprising given that in the BNC it is present 143 times for 45 texts, whereas ‘cloned’ is more frequent (174 for 39), but not in the list. Another surprising feature is to be found in the names of disciplines that the learner should ‘know’. ‘Geology’ needs to be listed, but ‘biology’, ‘chemistry’ and ‘physics’ do not. The derived adjective ‘biological’ is listed, but not ‘chemical’. The reasoning behind the choice of derived forms selected is far from clear. All of this is, however, relatively anecdotal, what is more important is the presentation of words from the list in dictionary entries.

The dictionary uses a series of labels to designate more specialized usage. These range from the very general, such as *technical*, to specific disciplines as in *biology*, *physics*, *computing*. In fact, only 25% of the words from the list carry a usage label. In this case the usage label will be between brackets and may be found in single sense entries, as for ‘chromosome’, or to differentiate between several senses as with the verb ‘evolve’.

- chromosome
- (biology) one of the very small structures like threads in the nuclei (= central parts) of animal and plant cells, that carry the genes
- evolve
- 2 evolve (from sth) (biology) (of plants, animals, etc.) to develop over time, often many generations, into forms that are better adapted to survive changes in their environment:
 - The three species evolved from a single ancestor.
 - The dolphin has evolved a highly developed jaw.

If the scientific aspect is not given in the label, the learner has to rely on the definition or example in order to see why they need to 'know' these words as can be seen with the 'activate' where the terms 'chemical process' and 'germ' show the scientific aspect.

- ac-ti-vate [vn] to make sth such as a device or chemical process start working:
 - The burglar alarm is activated by movement.
 - The gene is activated by a specific protein.

In 30% of the cases there is nothing in the definition to show a scientific aspect. In 60%, it is the example that implicitly shows some specialized usage, although in 18 cases this example follows a definition that has no specialized aspect. This is the case for 'undertake' which is implicitly shown to collocate with 'research'.

- 1[vn] to make yourself responsible for sth and start doing it: *to undertake a task / project - University professors both teach and undertake research. - The company has announced that it will undertake a full investigation into the accident.*

In 45 cases (17%) there is a scientifically-oriented definition, but no example, which implies that the user is expected to need assistance with decoding, but not be expected to encode. 'Chromosome' (above) is a good example of such a practice and corpus evidence confirms that such words often form complex terminological groups that are beyond the needs of the general user.

In other cases the reader is left to his or her own devices to find the scientific aspect

- assess 1. sb/sth (as sth) to make a judgement about the nature or quality of sb/sth:[vn] It's difficult to assess the effects of these changes. - *to assess a patient's needs - The young men were assessed as either safe or unsafe drivers. - I'd assess your chances as low. - [v wh-] - The committee assesses whether a building is worth preserving. - We are trying to assess how well the system works.*
- as-sess-ment
- 1[C] an opinion or a judgement about sb/sth that has been thought about very carefully SYN evaluation: *a detailed assessment of the risks involved - his assessment of the situation*

All in all it remains difficult to see who exactly is being addressed. Definitions should help with decoding, but when they are missing what status does the word have? When examples are present, they may help with either encoding or decoding, but only in very general usage as a learner's dictionary cannot be expected to cater for the needs of the scientific research article.

4. From corpus to corpus: a question of readership

In order to look at the question of readership the next stage has been to look at how the dictionary meanings compare to those found in a specialized corpus. The dictionary has been built using a corpus, but a general reference corpus rather than its specialized subdivisions. It is most probable that the more general meanings have been privileged rather than those found in more specialized sub-corpora. This is perfectly normal as a reference corpus as a whole is representative of a language, whilst the degree of true representativity lessens with the

subcorpora which are present to demonstrate a generic tendency, but not necessarily a sub-field. On the other hand, a specialized corpus based on research articles demonstrates a type of lexical usage and a terminological density that is way beyond the needs of a general language user. However, it is worthwhile looking at more specialized corpora for three reasons: to see to what extent the words in this vocabulary list are to be found in all scientific texts, and to see whether it is possible to improve the dictionary to demonstrate general scientific usage, or to use the dictionary as a model to build a tool for use within a more specialized environment. Two corpora have been used: the scientific section of the British National Corpus (BNC) to look at general scientific usage and a highly specialized one on parasitic plant biology (Williams 1998). If a majority of words from the Oxford 250 list are present in the specialized corpus one of two conclusions may be reached; the list gives a very good coverage of scientific specificities, or these are very general words.

A close study of these specialized contexts has shown while that many of the Oxford 250 scientific words are present, their nature is not necessarily even semi-technical. Some 76% of the words are present; of these a mixed bag of 48 entries includes adverbs, adjectives and 1 abbreviation. The adverbs such as ‘consequently’ and ‘furthermore’ are used in scientific texts, but can also be used to organize any text. The only scientific adverb is ‘genetically’ which brings us back to the question posed earlier as to why certain derived forms have been selected and not others. Most of the adverbs can be seen as having a specific scientific usage, but this is hardly true of ‘respective’, ‘subsequent’ and ‘widespread’. The one word marked as being an abbreviation ‘et al.’ is not specific to science. Other abbreviations are included in the list, but these are classed as being nouns, as in ‘DNA’ and ‘PC’.

5. Dictionary tweaking

It is all too easy to criticize, it is better to attempt a solution. The following stage in this research is to look at closely at the words in the context of a specialized corpus to see what sort of changes would be necessary to improve coverage. For this, corpus-driven studies on a wide variety of specialized corpora are necessary so as to help fill in the gaps and enable adjustments in the definitions. The current research is far too limited, but does allow an insight into what might be done. The aim is simply to use corpus data to slightly alter the dictionary definition in order to improve or adapt its scientific coverage. This is illustrated below with examples of what might be proposed

In the list, 128 a nominal form and 30 entries have a verbal form. We shall first look at two of the verb forms that also occur in the parasitic plant corpus; probe and differ. The two former are classed as being verbs first, nouns after. In the corpus it is the noun form that dominates in both cases. If we look at the entry for the verb form for ‘probe’ in the dictionary we find:

2[vn] to touch, examine or look for sth, especially with a long thin instrument:
The doctor probed the wound for signs of infection. Searchlights probed the night sky.

The nouns form of ‘probe’ is neatly introduced by repeating the definitional statement of ‘long thin instrument’. The corpus examples do not necessarily show the use of a probe as can be seen in the following examples taken from the BNC and the PPC corpora

Electrochemistry is also being used to probe the electronic structure of the fullerenes.

By observation we can probe this world and attempt to discern the laws which regulate it.

BNC

the subclones were labelled with 32P and used to probe gel blots of *Conopholis* total cellular RNA

coding region of tobacco ABP1, was used to probe a Southern blot of tobacco genomic DNA (Figure 5)

PPC

This is allowed for in the OALD definition, the problem is more with the examples in this case which both give an active use. In the PPC the verb is mostly used in the infinitive, a choice confirmed by the natural and pure sciences section of the BNC where for 67 concordancer lines for the lemma 'probe', 27 (40%) use the infinitive. It would take just a small change to make the text scientist-friendly.

In the case of differ the situation is different. This word is to be found in the science list, but in the dictionary neither the definition nor the examples show any particular scientific usage, unless of course if 'medical opinion' can be considered relevant.

- 1A and B ~ (from each other) | A ~s from B to be different from sb/sth: *They hold differing views. - French differs from English in this respect. - French and English differ in this respect. - Ideas on childcare may differ considerably between the parents.*
- 2differ (with sb) (about / on / over sth) to disagree with sb: *I have to differ with you on that. - Medical opinion differs as to how to treat the disease.*

'Differ' is a relatively frequent verb in the PPC occurring 132 times (0.03%). In all cases the sense used is that 'A' differs from 'B', the first sense in the OALD. Examples from the BNC and PPC show the following:

Spines differ from spine-like setae in being produced by undifferentiated epidermal cells.

Their methods differed accordingly [Shonfield, 1965].

BNC

These invertases differ in pH and tempera optima.

The tRNA^{Leu/2} gene from maize (20) differs from the bean tRNA^{Leu/2}.

The two biotypes differed in both the amount and depth of rhizome production.

PPC

In this case, the examples given with sense 1 of the OALD confirm the usage found on the corpora. In the BNC, we also find the second sense which does collocate with 'opinion', but not prototypically with 'medical'. This shows thus a predominance of the first sense, but whilst a scientist might appreciate a more specific example, but it is hard to see how the word can really be considered 'scientific'.

If we now turn to semi-technical and 'lightly' technical words as 'control', we find that the dictionary entries give little help as to encoding.

- IN EXPERIMENT

- 5[C] (technical) a person, thing or group used as a standard of comparison for checking the results of a scientific experiment; an experiment whose result is known, used for checking working methods: *One group was treated with the new drug, and the control group was given a sugar pill.*

This is quite adequate for general uses, but a detailed study of the PPC corpus has shown that, in practice, the word enters into a number of relationships. This is illustrated in appendix 1, which will be discussed in more detail later

Sometimes it may be necessary to widen slightly the prototype on which the word is based. This will be illustrated with a word that is not on the list, but which does have a particular scientific usage – bank.

6. Adapting the prototype: Bank

Improving coverage does not necessarily mean changing the content in the general language learner’s dictionary, but widening the reference of the underlying definitional prototypes. The notion of corpus-driven prototypes has been introduced by Hanks (1994, 2000) in order to overcome the problem of polysemy in corpus data. In Hanks (2000), the theory is developed with a prototype for “bank” which is deemed to have the following characteristics:

- is an institution
- is a large building
- for storage
- for safekeeping
- of finance/money
- carries out transactions
- consists of a staff of people

This covers the many meanings of bank and allows for meaning extension through the characteristic of storing and safeguarding for future use. An extended meaning can be seen with the blood and sperm banks mentioned in the OALD.

- STH COLLECTED / STORED
- 3an amount of sth that is collected; a place where sth is stored ready for use: *a bank of knowledge - a blood / sperm bank—see also databank*

A close look at the PPC data shows (appendix 1.) a further use, that of clone bank and seed bank. Whilst the former enters into the same group as sperm bank, the latter is more problematic in that a seed bank is not voluntarily stored but something that accumulates naturally. In this case the data in the parasitic plant corpus shows that the prototype needs enlarging to enlarging to take into account the notion of non man-made reserve of something necessary to understand the notion of “seed bank”. Again, this is not a radical change, just a small updating to take into account more specialized usage.

7. Not ‘learner’, but ‘user’

Throughout, we have insisted on that fact that close study might show inconsistencies in the OALD as concerns its scientific list, but that overall the remedy is only a slight alteration of the content to make it useful to a much wider audience. A learner’s dictionary is not the place for specialized terminology, but in so far as the dictionary successfully enables advanced learners to improve encoding skills, could the same model not be adapted for a specialized learner’s dictionary?

Widening the reference of definitional prototypes would clear the way for the creation of special language production dictionaries that would go beyond the needs of the ‘advanced learner’ to become tools in the production of publishable scientific papers. Such dictionaries would be aimed at scientists, who would benefit from the clarity of learner’s dictionaries, but who do not necessarily see themselves as learners, but as specialized users. This population knows its terminology in English but requires help in production. This is what is amply provided in the learner dictionary model with its emphasis on clear example and information on collocation and syntactic patterns; what is needed is to apply this model to material drawn from a special language corpus as, for example, in the dictionary proposed in Williams (2002).

The Parasitic Plant Dictionary is purely experimental and designed to show what can be done using a specialized corpus and a model based on a learner’s dictionary. The dictionary is corpus-based and is being developed using the Tshwanelex¹ database system. The dictionary could be printed, but the amount of data makes a hyper text format preferable. The type of entry foreseen can be illustrated with two examples: ‘control’ and ‘haustorium’ (appendices 2 and 3). The former is simply a detailed analysis of a semi-technical word in a specialized context; the latter is a domain specific word. What is being built is a dictionary, not a terminology. The difference is crucial the aim is to empower the user, not to standardize. The example is a case in point as the *haustorium* is the defining element of parasitic plants. However, the scientific community involved does not agree on the exact terminological definition, much argument turns around prepositions. The definition seeks thus to summarize the corpus data and show how the word is used. No attempt is made to formalize a concept as this would be presumptuous on the part of the lexicographer.

8. Conclusion

This article has set out to show that whilst a learner’s dictionary such as the OALD does not apparently set out to deal with the needs of the ESP user that it could be adapted to such use. It also shows that in looking at specialized corpora it will be possible to remove some of the inconsistencies found in the dictionary and especially in its specialized word lists. The examples given do not take away from the value of the dictionary, but do aim to show that some adjustments are necessary to adapt them to the needs of the EAP/EAP user in scientific studies. By adapting a dictionary the path is opening to dictionaries for specialized users.

To achieve such dictionaries two strategies are possible: entirely reinventing the wheel by creating a dictionary from zero or adapting and adding to an existing dictionary. The former

¹ <http://tshwanedje.com>

will require a great deal of works hardly feasible as the work load and technical needs go beyond the scope of the corpus linguist and dictionary analyst; their role is to propose solutions and demonstrate what can be done. The second is the ideal solution, but this requires collaboration in building a broad based corpus, or corpora in specialized usage, and a desire on the behalf of the major publishing houses to open towards the market of the ESP/EAP user.

This study has concentrated on the OALD because it supplies a clear list of scientific words. This is just a beginning as further research is looking at the other major learners' dictionaries and also studying their CD-ROMS to see how complex searches can show scientific data in the dictionary.

This is a very rapid overview of a much larger research project into dictionary, as opposed to terminology, creation for ESP/EAP users. What it reveals however is that scientific usage is handled in a very inconsistent manner in the learner's dictionaries, but that in many cases a very small modification of the definitional prototype would render them usable in specialist contents. It also reveals that the well tested format used in learner's dictionaries could be easily adapted to corpus-based specialized dictionaries, provided the big dictionary houses agree to collaborate in what could be a very fruitful partnership for them.

References

- Hanks P. 2000. 'Do word meanings exist?'. In Kilgarriff & Palmer (eds) 2000. *Sensival: Evaluating Word Sense Disambiguation Programmes. Computers and the Humanities*. 34/1-2. 205-215.
- Hanks, P. 1994. 'Linguistic Norms and Pragmatic Exploitations or, Why Lexicographers Need Prototype Theory, and Vice Verse.' *Papers in Computational Lexicography: Complex 94*. 89-113.
- L'Homme, M-C. 2003. 'Les combinaisons lexicales spécialisée (CLS : Description lexicographique et intégration aux banques de terminologie. In Grossman, F., Tutin, A. 2003. *Les Collocations: Analyse et traitement*. Travaux et Recherches en Linguistique Appliquée. Amsterdam: Editions De Werelt. 89-104.
- Palmer H.E. (1930), *IRET First interim report on vocabulary selection*, Tokyo, IRET.
- Palmer H.E. (1931), *Second interim report on vocabulary selection*, Tokyo, IRET.
- Palmer H.E. 1933. *Second Interim Report on English Collocations*. Tokyo: Kaitakusha
- Palmer H.E., West M.P., Faucett, L. (1936), *Interim report on vocabulary selection for the teaching of English as a foreign language*, London, P.S King & Son.
- Sinclair, J McH, (ed) 1987. *Looking Up: an account of the COBUILD Project in Lexical Computing*. London: Collins
- Sinclair, J McH, 2004. 'In praise of the dictionary'. In Williams, G and Vessier, S. (eds) 2004. *Proceedings of the Eleventh EURALEX International Congress*. 1-12.
- Temmerman, R. 2000. *Towards New Ways of Terminology Description: The Sociocognitive approach*, Amsterdam: John Benjamin's.
- West M.P., (1953), *A general service list of English words, with semantic frequencies and a supplementary word-list for the writing of popular science and technology*, London, Longman, Green.
- Williams G. (1998). 'Collocational Networks : Interlocking Patterns of Lexis in a Corpus of Plant Biology Research Articles'. *International Journal of Corpus Linguistics*. Vol. 3/1. pp. 151-171.
- Williams, G. (2006). 'Advanced ESP and the Learner's Dictionary: Tools for the non-language specialist'. *Proceedings of the Twelfth EURALEX International Congress*, Turin 6th-9th September 2006.

Williams, G. 2002. 'Corpus-Driven Lexicography and the Specialised Dictionary: Headword Extraction for the Parasitic Plant Research Dictionary.' In Braasch & Povlsen (eds) 2002. Proceedings of the Tenth EURALEX International Congress. 859-864.

Dictionaries consulted

OALD - Oxford Advanced Learner's Dictionary. 7th Edition 2005.

Appendix 1. Concordance for ‘bank’

</P><P>A data	bank	search revealed no significant similarit
imilarities between that region and data	bank	sequences, suggests a different evolutio
ain degree of similarity with other data	bank	sequences.
d the <TERM TYPE="pp">Striga</TERM> seed	bank	while improving grain yield (Fig 2).
d the <TERM TYPE="pp">Striga</TERM> seed	bank	by about 30% annually through inducing i
d the <TERM TYPE="pp">Striga</TERM> seed	bank	by 300% on average.
e the <TERM TYPE="pp">Striga</TERM> seed	bank	significantly (Table 2).
e the <TERM TYPE="pp">Striga</TERM> seed	bank	in the soil and to assess the suitability
e the <TERM TYPE="pp">Striga</TERM> seed	bank	, no single methodology will be complete
f the <TERM TYPE="pp">Striga</TERM> seed	bank	in the soil is reduced.
n the <TERM TYPE="pp">Striga</TERM> seed	bank	(!
both <TERM TYPE="pp">Striga</TERM> seed	bank	reduction and enhanced host productivity
scussed in terms of controlling the seed	bank	of <TERM TYPE="pp">Striga</TERM> in the
varying management practices on the seed	bank	of land that was heavily infested with <
been aimed at reducing the parasite seed	bank	in the soil of infested fields and have
as a trap crop helps to reduce soil seed	bank	and increases soil fertility.
bioherbicides could reduce the soil seed	bank	of this noxious parasitic weed.
nd one picture illustrates the soil seed	bank	.
flowering, then certainly the soil seed	bank	would be completely depleted over severa
ome and the availability of a ctDNA gene	bank	in <REG ORIG="S.
A clone	bank	of EcoRI-digested light band DNA was est

ents in mind we have established a clone	bank	and show the construction of the physica
ailability of a physical map and a clone	bank	of potato ctDNA in conjunction with chlo
gest of potato ctDNA to generate a clone	bank	, since the number of different fragment
was established with the help of a clone	bank	and molecular hybridization to <TERM TYP
</P><P>Using a clone	bank	of twelve restriction fragments covering
"><HEAD>Hybridizations </HEAD><P>A clone	bank	of the entire <TERM TYPE="hp"> tobacco <
ell as the availability of a ctDNA clone	bank	.

Appendix 2. Provisional entry for 'control' (output TshwaneLex)

Forms: **control**¹ (= **controls, controlling, controlled**) (*verb transitive*) **1** To limit. To control something is to restrain or limit the capacity of something to act. In the case of parasitic plant biology it means to limit the spread or degree of infestation of the parasites. : *Most farmers in Gambia control Striga by weeding.* Other example. : *The tree canopy completely controlled Striga infestation.* Other example. : *Orobanche aegyptiaca was controlled by all chemigated treatments.* **a** MODAL VERBS. The verb is often modified by a modal verb such as can or may to show possibility or probability. : *Pot experiments had shown that chlorosulphuron can control Broomrape in tomato.* Other example. : *Ethylene may control the growth of dodder.* **b** PHRASAL PATTERNS. The present participle "controlling" is often used in the pattern of adjective/noun + in + controlling + noun or noun + for + controlling + noun. : *The herbicide was found effective in controlling the parasite.* Other example. : *The semi-arid zone of West Africa holds a great potential in controlling Striga hermonthica.* Other example. : *They could provide a potential for controlling parasites.* Collocate Infestation, Treatment, Dodder, See control², Compare Striga **2** To manage. to control is to manage something. : *Ethylene negatively controls the growth of dodder.*

Forms: **control**² (*noun*) **1** A control is a comparative sample used in an experiment. , It consists of an uncontaminated sample or population used as a standard against which the infected sample can be compared. : *A set of uncovered plants was used as a control.* **a** Collocation: The noun control is frequently found in the singular, where it is referred to as "a control" (general) or "the control" (specific). The singular form may be used as a modifier as in "control plants" or be modified as in the "untreated control". The plural form cannot modify another noun, but can be modified as in "uninfected controls". **i** Control can modify nouns. **control lane, control plant, control tissue** Equivalence Control lane, Control plant, Control tissue **ii** Control can be modified by adjectives. : *negative control.* Other example. : *positive control* Other example. : *Susceptible control.* Other example. : *untreated control.* Other example. : *uninfected control* Collocate susceptible, uninfected, untreated **b** PHRASAL PATTERNS. Control is often used in comparative phrases. Different patterns

require different prepositions. : *Height was lower than that of control plants.* Other example. : *Dry mass was slightly modified in comparison with the control.* Other example. : *The number of striga plants was significantly lower than in the control.* Other example. : *A higher number of Striga plants compared to the control.* See compare 2
 Restraint or limitation, generally used in the singular. , Control in this sense is the action taken to prevent spreading or propagation of a parasite as opposed to its elimination. Control in this case concerns parasitic plants as weeds rather than botanical specimens. 3
 Management., Control in this sense is the action of managing something. It is often expressed using the pattern "to be under the control of something or someone".

Forms: **Control lane** (*noun*)

Forms: **controlled** (*adjective*) Controlled refers to the fact that the noun object is limited or restrained in some way. : *The experiments were carried out under controlled conditions.* See control¹:1

Forms: **controlling** (*adjective*) Controlling refers to something that controls or limits the capacity of something else. : *This could be the controlling factor.* See control¹:1

Forms: **Control plant** (*noun*) Plant or plants used as a standard group for comparison with the plants under study. Equivalence control²:1

Forms: **Control tissue** (*noun*)

Appendix 3. Provisonal entry for 'haustorium' (output TshwaneLex)

Forms: **haustorium (=haustoria)** (*noun*) 1 A parasite attaches itself to a host plant by means of a haustorium which penetrates the host conductive tissues. The haustorium forms a physiological bridge through which nutrients pass from the host to the parasite. It is the defining feature of parasitic plants. Haustoria may be either a primary or a secondary haustorium. : *The sieve tube connection from the haustorium of the holoparasite.* Other example. : *This paper discusses the mechanisms of haustorium penetration.* Other example. : *Evidence of pectinase activity released by Orobanche haustorium in host tissues.* Other example. : *The intrusion of the haustorium inside host tissues.* Other example. : *Haustorium development is also under control of biological molecular signals.*

Primary haustorium The primary haustorium develops at the apex of the young root that emerges from the parasite seed. It attaches itself to the host root before penetrating the host tissues and seeking the conductive elements located inside the host root . : *Striga penetrates the host tissue by developing primary and secondary haustoria.* , **Secondary haustorium** Secondary haustoria may develop laterally from the primary root system of the parasite or on adventitious roots developing from parasite shoots. These provide further contact between the host roots, or branches in the case of aerial parasites such as mistletoe, and the parasite. This is particularly true in facultative parasites that do not have a primary haustorium. In some cases secondary haustoria allow the parasite to be attached to more than one host. : *Secondary haustoria develop from the primary root system of the parasite* Other example. : *The secondary haustoria are borne on the adventitious root system of Alectra vogelli.* a

Collocations: Haustorium occurs with a variety of other words. i Haustorium may be used to modify another noun. **Haustorium development.**, **Haustorium penetration.**, **Haustorium size.** ii Haustorium is often modified by another word. : *Resistance occurred during the establishment of a functional haustorium.* Other example. : *Secretion was found along the*

abortive haustorium Other example. : *The transformation of a young haustorium into a functional haustorium* Other example. : *The mature haustorium of Scleropyrum.* iii
Haustorium is often associated with certain verbs. : *The haustorium develops when intrusive cells of the parasite penetrate host tissues.* Other example. : *The germ tube develops and forms a haustorium.* Other example. : *The changes in cell wall composition persist long after the haustorium has penetrated.* Other example. : *Haustoria penetrate host tissues.* Other example. : *The host stem where the dodder haustoria are attached.*