A GLOSSARY OF
CORPUS LINGUISTICS
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Introductory Notes

Website Addresses
We have tried to avoid referring to website addresses where possible, as we found that some of the websites we included at the start of writing this book were no longer in existence when we reached the final stages. We have included websites of some organisations, groups, corpora or software where we feel that the site is unlikely to close down or move. However, we cannot vouch for the longevity of all of the websites given here. If readers wish to follow up specific terms on the internet and are taken to a dead link, we suggest that they accept our apologies and then try a reputable search engine like www.google.com (assuming that Google still exists!).

List of Acronyms
Corpus linguistics is a discipline that has yielded a prolific number of acronyms. This presents a problem in terms of consistency: some terms are best known by their acronym, others are best known by their full-name. We want to make the ordering of dictionary entries consistent, yet we also want them to be easy to find. So, in ordering dictionary entries we have made the decision to spell out all acronyms as full words, while including a list of all of the acronyms at the beginning of the dictionary along with their full titles. Therefore, readers who want to use this dictionary to find out about the BNC can look up its full title in the acronym list at
the beginning of the book, and then go to the dictionary entry under **British National Corpus**.

ACASD (Automatic Content Analysis of Spoken Discourse)
  word sense tagging system
ACE (Australian Corpus of English)
ACH (Association for Computers and the Humanities)
ACL (Association for Computational Linguistics)
ACLDCI (Association for Computational Linguistics Data
  Collection Initiative)
AGTK (Annotation Graph Toolkit)
AHI (American Heritage Intermediate) Corpus
ALLC (Association for Literary and Linguistic Computing)
AMALGAM (Automatic Mapping Among Lexico-
  Grammatical Annotation Models) Tagger
ANC (American National Corpus)
ANLT (Alvey Natural Language Tools)
AP (Associated Press) Treebank
APHB (American Printing House for the Blind) Treebank
ARCHER (Representative Corpus of Historical English
  Registers) Corpus
ASCII (American Standard Code for Information Exchange)
ATC (Air Traffic Control) Corpus
AUTASYS (Automatic Text Annotation System) Tagger
BAS (Bavarian Archive for Speech Signals)
BASE (British Academic Spoken English) Corpus
BNC (British National Corpus)
BoE (Bank of English)
CALL (Computer Assisted Language Learning)
CAMET (Computer Archive of Modern English Texts)
CANCODE (Cambridge and Nottingham Corpus of Dis-
  course in English)
CEEC (Corpus of Early English Correspondence)
CEG (Cronfa Electroneg o Gymraeg)
CELEX (Centre for Lexical Information)
CES (Corpus Encoding Standard)
CETH (Centre for Electronic Texts in the Humanities)
CHAT (Codes for the Human Analysis of Transcripts) System
CHILDES (Child Language Data Exchange System)
CIDE (Collaborative International Dictionary of English)
CLAN (Computerized Language Analysis) System
CLAWS (Constituent Likelihood Automatic Word-tagging System)
CLEC (Chinese Learner English Corpus)
CLR (Consortium for Lexical Research)
CMU SLM (Carnegie Mellon University–Cambridge Statistical Language Modeling) Toolkit
Coconut (Cooperative, Coordinated Natural Language Utterances) Corpus
COLT (Bergen Corpus of London Teenage English)
CRATER (Corpus Resources and Terminology Extraction)
CSAE (Corpus of Spoken American English)
CSLU (Centre for Spoken Language Understanding) Speech Corpora
CSTR (Centre for Speech Technology Research)
CWBC (Corpus of Written British Creole)
DAT (Dialogue Annotation Tool)
DCPSE (Diachronic Corpus of Present-day Spoken English)
DTD (document type definition)
EACL (European Chapter of the Association for Computational Linguistics)
EAGLES (Expert Advisory Group on Language Engineering Standards)
ECI (European Corpus Initiative)
ELAN (Eudico Linguistic Annotator)
ELAN (European Language Activity Network)
ELDA (Evaluations and Language Resources Distribution Agency)
ELRA (European Language Resources Association)
ELSNET (European Network of Excellence in Human Language Technologies)
EMILLE (Enabling Minority Language Engineering) Corpus
ENGCG (Constraint Grammar Parser of English)
ESFSLD (European Science Foundation Second Language Databank)
FLOB (Freiburg–LOB Corpus of British English)
FRIDA (French Interlanguage Database)
FROWN (Freiburg–Brown Corpus of American English)
FTF (Fuzzy Tree Fragments)
GATE (General Architecture for Text Engineering)
GPEC (Guangzhou Petroleum English Corpus)
HCRC (Human Communication Research Centre)
HKUST (Hong Kong University Of Science And Technology) Corpus
HLT (human language technology)
HTML (Hypertext Markup Language)
ICAME (International Computer Archive of Modern and Medieval English)
ICE (International Corpus of English)
ICECUP (International Corpus of English Corpus Utility Program)
ICLE (International Corpus of Learner English)
IMS (Institut für Maschinelle Sprachverarbeitung)
ISLE (Interactive Spoken Language Education) Corpus
IviE (Intonational Variation in English) Corpus
KWIC (key word in context)
LCMC (Lancaster Corpus of Mandarin Chinese)
LCPW (Lancaster Corpus of Children’s Project Writing)
LDB (Linguistic DataBase)
LDC (Linguistic Data Consortium)
LeaP (Learning the Prosody of a Foreign Language) Corpus
Lindsei (Louvain International Database of Spoken English Interlanguage)
LLC (London–Lund Corpus)
LOB (Lancaster–Oslo/Bergen) Corpus
MARSEC (Machine-Readable Spoken English Corpus)
MBT (Memory Based Tagger)
METER (Measuring Text Reuse) Corpus
MICASE (Michigan Corpus of Academic Spoken English)
MTP (Münster Tagging Project)
MXPOST (Maximum Entropy Part-of-Speech Tagger)
NECTE (Newcastle Electronic Corpus of Tyneside English)
NEET (Network of Early Eighteenth Century English Texts)
NITCS (Northern Ireland Transcribed Corpus of Speech)
NLP (natural language processing)
OCP (Oxford Concordance Programme)
OCR (optical character recognition)
OLAC (Open Language Archives Community)
OTA (Oxford Text Archive)
POS (part-of-speech) tagging
POW (Polytechnic of Wales) corpus
SARA (SGML-Aware Retrieval Application)
ScoSE (Saarbrücken Corpus of Spoken English)
SEC (Lancaster/IBM Spoken English Corpus)
SEU (Survey of English Usage) Corpus
SGML (Standard Generalised Markup Language)
SPAAC (Speech Act Annotated Corpus for Dialogue Systems)
SUSANNE (Surface and Underlying Structural Analyses of Naturalistic English) Corpus
TEI (Text Encoding Initiative)
TELC (Thai English Learner Corpus)
TESS (Text Segmentation for Speech) Project
TLFi (Trésor de la Langue Française Informatisé)
TLG (Thesaurus Linguae Graecae)
TnT (Trigrams'n'Tags)
TOSCA (Tools for Syntactic Corpus Analysis) Corpus
T2K-SWAL (TOEFL 2000 Spoken and Written Academic Language Corpus)
UAM (Universidad Autónoma de Madrid) Spanish Treebank
UCREL (University Centre for Computer Corpus Research on Language)
USAS (UCREL Semantic Analysis System)
WBE (Wolverhampton Business English Corpus)
WSC (Wellington Corpus of Spoken New Zealand English)
WWC (Wellington Corpus of Written New Zealand English)
Xaira (XML Aware Indexing and Retrieval Architecture)
XML (Extensible Markup Language)
YCOE (York–Toronto–Helsinki Corpus of Old English Prose)
ZEN (Zürich English Newspaper Corpus)
accented characters  In order to ensure that the text within a corpus can be rendered in the same way across different platforms it is recommended that some form of recognised encoding system for accented characters is employed. The Text Encoding Initiative (TEI) guidelines suggests encoding accented characters as entities, using the characters & and ; to mark the beginning and end of the entity respectively. Table 1 shows a few accented characters and their corresponding encodings. A couple of examples of entity references for fractions and currency are also shown below. (See also punctuation marks.)

accuracy  A basic score for evaluating automatic annotation tools such as parsers or part-of-speech taggers. It is equal to the number of tokens correctly tagged, divided by the total number of tokens. This is usually expressed as a percentage. Typical accuracy rates for state-of-the-art English part-of-speech taggers are in range of 95 per cent to 97 per cent. (See also precision and recall.)

Acquilex Projects  The two Acquilex projects were funded by the European Commission and were based at Cambridge University. The first project explored the utility of constructing a multilingual lexical knowledge base from machine-readable versions of conventional dictionaries.
The second project explored the utility of machine-readable textual corpora as a source of lexical information not coded in conventional dictionaries, and looked at adding dictionary publishing partners to exploit the lexical database and corpus extraction software developed by the projects for conventional lexicography. See http://www.cl.cam.ac.uk/Research/NL/acquilex/acqhome.html.

Air Traffic Control (ATC) Corpus A corpus composed of recordings of conversations between air traffic controllers and airline pilots from Dallas Fort Worth, Logan International and Washington National airports. The corpus contains approximately seventy hours of such material. The original sound recordings are available and each conversation has been orthographically transcribed. The corpus is available from the Linguistic Data Consortium.

Alex Catalogue of Electronic Texts An archive of on-line,
freely available texts that are copyright free. The catalogue holds classics of British and American literature as well as some titles relating to Western philosophy. Alex has a rudimentary author/title search interface to assist users in finding texts to download. Alex currently contains approximately 600 texts.

**alignment** When working on a **parallel corpus**, it is useful to know exactly which parts of a text in language A correspond to the equivalent corresponding text in language B. The process of adding such information to parallel texts is called alignment. Alignment can be carried out at the **sentence level**, in which case each sentence is linked to the sentence it corresponds to in the other language(s). This is not straightforward, as the sentence breaks are not necessarily in the same place in a translation as they are in the original text.

Alternatively, alignment can be done at the **word level**, in which case each word must be linked to a word or words in the parallel text. This is much more complex, as a given word may correspond to one word, more than one word, or no word at all in the other language, and the word order may be different as well. For example, English *I saw it* would correspond to French *je l’ai vu*, where *I* = *je*, *saw* = *ai vu*, and *it* = *l’*. However, word alignment is also much more useful than sentence alignment, for example, for finding translation equivalents and compiling bilingual **lexicons**.

When a **spoken corpus** is released alongside the sound recordings from which it was created, the text may contain **markup** to show the point in time in the recording to which each chunk of text corresponds. This is also referred to as alignment (more specifically, **time-alignment** or **temporal alignment**). (See also **machine translation**.)
Alvey Natural Language Tools (ANLT) A set of tools for use in natural language processing research, created at the Universities of Cambridge, Edinburgh and Lancaster between the late 1980s and early 1990s. These include a morphological analyser, a grammar, two parsers and a lexicon containing 63,000 entries. They can be used independently or with a grammar development environment to form a complete system for the morphological, syntactic and semantic analysis of English. The tools are run on a Unix platform.

ambiguity In corpus annotation, in cases where there is a choice of two potential tags at one point in the text, it is not always possible to make a clear-cut decision. For example, in part-of-speech tagging, it is sometimes difficult to determine the grammatical categories of certain words as, for instance, in the following:

- I put it down. (Is put the past participle or past tense form?)
- Bill was married. (Is married an adjective or verb?)
- It’s broken. (Is ’s a contraction of has or is?)
- There is a question on gardening. (Is gardening a noun or verb?)

In some cases a portmanteau tag can be given in order to address the ambiguity. In others, examining more of the surrounding context may help to solve the problem. However, in extremely ambiguous cases, the corpus builder may have to make a decision one way or the other. If this approach is taken then the decision would need at least to be applied with consistency throughout the corpus. In general, decisions regarding ambiguous cases should be covered in the documentation that comes with a corpus.
American Heritage Intermediate (AHI) Corpus A commercial corpus of 5.09 million words based on a survey in 1969 of American schools, consisting of 10,043 samples of texts that were widely read among American children aged between seven and fifteen years. It was originally produced in order to provide a citation base for the American Heritage School Dictionary.

American National Corpus (ANC) A part-of-speech tagged corpus of American English, containing both written and spoken data, produced from 1990 onwards. Work on the corpus began in 1998 and is still in progress at the time of writing. It will contain a core of 100 million words, making it comparable to the British National Corpus (BNC). The genres in the ANC include newer types of language data that have become available since the latter part of the twentieth century, such as web-based diaries (blogs), web pages, chats, email, and rap music lyrics. Beyond this, it will include an additional component of several hundred million words. It is encoded in XML. See Reppen and Ide (2004).

American Printing House for the Blind (APHB) Treebank The APHB corpus was developed in a collaboration between Lancaster University (UK) and IBM T. J. Watson Research Center (USA). The corpus is composed of a number of works of fiction that had been converted to machine readable form by the APHB. The data was part-of-speech tagged using the CLAWS part-of-speech tagger. The output from CLAWS was corrected by hand. The corpus was then manually parsed using a skeleton parsing scheme (Eyes and Leech, 1993). Some 200,000 words were parsed to form the so-called APHB Treebank. The corpus has never been released into the public domain.
American Standard Code for Information Exchange (ASCII)

A character set based on the Roman writing script used in modern English and other Western European languages. It is a seven-bit code, meaning that each character is stored as seven binary digits. A binary digit can only be 0 or 1, meaning that only 128 characters can be encoded in ASCII. The first thirty-two codes (numbers 0–31 decimal) in ASCII are used as control characters (codes that control devices such as printers). Code 32 is a space character, while codes 33 to 126 are printable characters, consisting of the following letters, numbers, symbols and punctuation:

`!"#$%&'()*+,./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~`

The final code, 127, is a delete or rub-out character. ASCII is only suitable for encoding text that occurs in romanised scripts. An extended form of ASCII uses 8-bit character encodings, or 256 characters. This allows characters used in East European or Cyrillic languages to be encoded in the top half of the system. (See also Unicode.)

Anaphoric Treebank Developed in a collaboration between Lancaster University (UK) and IBM T. J. Watson Research Center (USA), the corpus was based upon newswire stories from the Associated Press (AP) news agency. The AP texts were part-of-speech tagged and manually parsed using a skeleton parsing scheme. Approximately 1 million words of AP newswire material was tagged and parsed in this manner. From this data, 100,000 words of the Treebank were annotated to show co-reference relationships in the text, using a scheme
devised by Fligelstone (1992). The corpus has never been released into the public domain.

**annotation** The process of applying additional information to corpus data. See encoding, tagging.

**Annotation Graph Toolkit (AGTK)** A suite of software which supports the application of annotation graphs to audio and video data. Using AGTK one can readily develop a tool which can aid in the process of the annotation of such data. See http://agtk.sourceforge.net/.

**anonymisation** As a point of ethics, corpus texts need to be made anonymous where necessary by removing personal names and other identifying details (or substituting them with codes, pseudonyms etc.). While there is no need to make published texts or transcriptions of radio or TV broadcasts anonymous, as their content is not confidential, unpublished writings or transcriptions of personal conversations should have the names removed so that the writers or speakers cannot be identified. Examples of corpora with anonymisation are the Cambridge Learner Corpus (written) or the spoken section of the BNC.

**AntConc** A freeware concordancer developed by Laurence Anthony which runs on the Linux operating system. AntConc offers a variety of basic corpus query tools including keyword extraction, KWIC concordancing and word list generation. See http://www.antlab.sci.waseda.ac.jp/.

**Apple Pie Parser** An automated parser developed as part of the Proteus project at New York University by Satoshi Sekine and Ralph Grishman (Sekine and Grishman, 1995). This is a probabilistic parser which was initially
trained on the **Penn Treebank**. The analyses produced by the parser follow the Penn Treebank parsing scheme prior to version II of the Penn Treebank. The system is available to run both on **Unix** and Windows machines. The system has a reported **accuracy** rate of 77.18 per cent at time of writing. It is available from http://nlp.cs.nyu.edu/app/.

**applications of corpus linguistics** Hunston (2002: 1) writes ‘It is no exaggeration to say that corpora, and the study of corpora, have revolutionised the study of language, and of the applications of language, over the last few decades.’ Since the 1980s corpus linguistics has been applied, among other ways, to dictionary creation (Clear et al. 1996), as an aid to interpretation of literary texts (Louw 1997), in forensic linguistics (Woolls and Coulthard 1998), language description (Sinclair 1999), in language **variation** studies (Biber 1988) and in the production of **language teaching** materials (Johns 1997). Corpus data has also informed studies of first and second language acquisition (see, for example, MacWhinney 1991, Granger 1998, Granger et al. 2002a). Other studies have shown how corpus analysis can uncover discourses and evidence for disadvantage (see Hunston 2002: 109–23 for a summary). **Multilingual corpora** are also useful in translation studies (e.g. Baker 1993). Finally, in psycholinguistics Garnham et al.’s (1981) study used the **London–Lund Corpus** to examine the occurrence of speech errors in natural conversational English.

**approximate string matching** In **information retrieval** when a **string** is being searched for in a collection of data that may contain errors. Given the case of a search for spelling errors, for example, we would like to find strings
that are almost the same as the search string, as well as strings that are exactly the same as the search string. For example, if we were searching for government but we would like to pick up spelling mistakes for government too (for example, governmant), this could be accomplished using approximate string matching.

archive Generally defined as being similar to a corpus, although with some significant differences. Geoffrey Leech (1991: 11) suggests that ‘the difference between an archive and a corpus must be that the latter is designed for a particular “representative” function’. An archive, on the other hand, is simply ‘a text repository, often huge and opportunistically collected, and normally not structured’ (Kennedy 1998: 4).

Asian Newspaper English An on-line concordance derived from a corpus of 114,502 words gathered from newspapers published in English in eighteen Asian countries. The system, developed at the University of Hong Kong, is no longer on-line.

Associated Press Treebank A skeleton-parsed 1-million-word corpus of American newswire reports. (See also treebank.)

Association for Computers and the Humanities (ACH) Along with the Association for Literary and Linguistic Computing (ALLC), the ACH is one of the two major international professional organisations in corpus-based studies of language and literature. Formed in the 1960s, the ACH publishes a journal, Computers in the Humanities and is concerned with the development and analysis of text databases as well as research in the humanities and social sciences. See www.ach.org.
Association for Computational Linguistics (ACL) An international scientific and professional society for people carrying out research on natural language and computation. The ACL publishes a quarterly journal *Computational Linguistics* and organises conferences. See www.aclweb.org.

Association for Computational Linguistics Data Collection Initiative (ACLDCI) The ACLDCI makes a number of texts available in Text Encoding Initiative (TEI)-conformant markup. These texts mainly consist of American English, including a selection of the *Wall Street Journal*, material from the *Penn Treebank* Project, the *Collins English Dictionary* (1979 edition) and transcripts of Canadian parliamentary proceedings (Hansard) in French and English aligned format. See Church and Liberman (1991).

Association for Literary and Linguistic Computing (ALLC) The ALLC is concerned with the application of computing in the study of language and literature. Formed in 1973, the ALLC’s membership is international, comprising students and researchers from across the humanities disciplines. The ALLC’s journal, *Literary and Linguistic Computing*, is published by Oxford University Press. It holds a joint annual conference with the Association for Computers and the Humanities (ACH), usually alternating between North America and Europe. See www.kcl.ac.uk/humanities/cch/allc/.

attested data Also *actual* or *authentic data*. This term denotes data that occur naturally and have been transcribed or recorded accordingly, without intervention from the researcher (Stubbs 2001: xiv). (See also *modified data* and *intuitive data*.)
Augustan Prose Sample An example of historical corpus data. The Augustan Prose Sample consists of extracts of writing by many English authors during the period 1678 to 1725. Milić (1990) gives details of the rationale behind this corpus and its later development. (See also the Century of Prose Corpus.)

Australian Corpus of English (ACE) The first systematically compiled heterogeneous corpus in Australia, consisting of 1 million words of Australian English based on 500 samples of text each consisting of 2,000 words. The ACE matches the Brown and Lancaster–Oslo/Bergen (LOB) corpora in most aspects of its structure, although it contains material from 1986. It was compiled at the department of Linguistics at Macquarie University NSW Australia. See Collins and Peters (1988).

authorship identification The field of text analysis which attempts to ascertain whether a given text was written by a particular author or not, usually by automatic and/or statistical methods. The use of a corpus is often essential to authorship identification as the text must be compared to a large number of other texts by the suspected author(s), and also a large number of texts not by the suspected author, to establish whether the statistical patterns found in the text are more like the former than the latter.

Automatic Content Analysis of Spoken Discourse (ACASD) word sense tagging system A form of semantic annotation which works on text that has been part-of-speech tagged using the CLAWS tagging system. See Wilson and Rayson (1993). (See also UCREL semantic analysis system (USAS).)
Automatic Mapping Among Lexico-Grammatical Annotation Models (AMALGAM) Tagger A project undertaken by a team led by Eric Atwell at the University of Leeds (UK) which sought to map correspondences between different part-of-speech tagsets and parsing schemes. As part of the project, a tagger was developed which could annotate a text with any one of up to eight different part-of-speech tagsets. The tagger is available via email, and there are plans to make this tagging service available via the web. See http://www.comp.leeds.ac.uk/amalgam/amalgam/amalghome.htm.

Automatic Text Annotation System (AUTASYS) Tagger A menu-driven MS-DOS based part-of-speech tagger for English developed by Alex Chengyu Fang (see Fang, 1996). It can tag words with one of three part-of-speech tagsets (the LOB, ICE and SKELETON tagsets). The system is generally available though users must pay a licence fee for the software. See http://www.phon.ucl.ac.uk/home/alex/project/tagging/tagging.htm.

balanced corpus A corpus that contains texts from a wide range of different language genres and text domains, so that, for example, it may include both spoken and written, and public and private texts. Balanced corpora are sometimes referred to as reference, general or core corpora.

Bank of English (BoE) The BoE is both a reference corpus and monitor corpus of general English launched in 1991 by COBUILD (a division of HarperCollins publishers) and The University of Birmingham. The BoE consisted of 525 million words of spoken and written language in
April 2005. The majority of texts reflect British English but some are from North American sources and other native varieties of English. See Jarvinen (1994).

**Baum–Welch algorithm** (or *Forward–Backwards algorithm*)
A technique for training a *part-of-speech tagger* based on *probabilistic disambiguation* on untagged data. Normally, the *tag transition probabilities* used in a *hidden Markov model* are calculated by looking at the frequency of each pair of tags in a tagged corpus. However, it is possible to take some initial estimates of the transition probabilities (which need not be very good) and use the Baum–Welch algorithm to apply these estimates to a corpus of untagged data, and thus compute *improved* estimates. The *Xerox tagger* can be trained in this way.

**Bavarian Archive for Speech Signals (BAS)** Hosted at the University of Munich, Germany, this *archive* seeks to make spoken German resources accessible to all. Some of the holdings in the archive are available for commercial as well as academic use. The archive is extensive and varied and includes *corpora*, speech databases, reports and software. While largely of interest to speech scientists, some of the material held in the archive is almost certainly of interest to the general linguist or scholar of German. For example, the Hempel’s Sofa Corpus contains a series of recorded spontaneous monologues produced in response to the question ‘What did you do within the last hour?’ See http://www.phonetik.uni-muenchen.de/Bas/BasHomeeng.html.

**Bellcore** The shortened name of the Bell Communications Research Corpus, collected in the USA, consisting of an *archive* of about 200 million words of newspaper wire
text and 50 million words of other journalistic writing along with other bodies of texts such as the Brown Corpus and some English dictionaries.

Bergen Corpus of London Teenage English (COLT)
A corpus of spontaneous speech gathered from London teenagers in the age range 13–17. The data was gathered in 1993. The project was led by Anna-Brita Stenström of the University of Bergen. Some of the COLT data appeared as part of the spoken section of the British National Corpus (BNC). The COLT corpus is notable, however, for having the original sound recordings as well as part-of-speech tagged orthographic transcriptions of the conversations available. The corpus is around 500,000 words in size. See http://torvald.aksis.uib.no/colt/ or Stenström et al. (2002) for further details.

bigram and trigram The two most common types of tag transition probabilities used in a probabilistic part-of-speech tagger. A bigram probability is the probability of a sequence of two tags: that is, the probability that tag B will occur, given that it comes directly after tag A. A trigram probability is the probability of a sequence of three tags: that is, the probability that tag C will occur, given that it comes directly after a sequence of tag A followed by tag B. The main difference between bigram and trigram taggers is the amount of tagging data required to train them: trigram taggers require a lot more because, for any given tagset, there are many more possible three-tag sequences than possible two-tag sequences. There is some debate as to whether trigram taggers work better than bigram taggers. In theory they should, as they take more context into account. It has been suggested, however, that, in practice, any improvement they offer is tiny compared to the extra effort required to train them.
More generally, the different types of transition probabilities can be referred to as \( N \)-grams (and the type of tagger that uses them can be called an \( N \)-gram tagger). Although other values of \( N \) are possible in theory, in practice \( N \) is nearly always 2 or 3.

**Birmingham Corpus** A synonym for the Bank of English (BoE).

**Birmingham Email Tagging Service** This part-of-speech tagging service is no longer available but is worthy of mention as it was the first email-based tagger to be made generally available. The system accepted text by email which was then part-of-speech tagged and returned to the sender. The system was developed by Oliver Mason and was based upon his Qtag system. For more information on the Qtag system, including a Java-based version of the program, which is freely available to download and use for academic research, see http://www.english.bham.ac.uk/staff/omason/software/qtag.html.

**BNCweb** A web-based tool used for searching and retrieving lexical, grammatical and textual data from the British National Corpus (BNC). BNCweb was developed at the University of Zürich and enables users to carry out searches, view, sort and thin concordances, calculate collocations using a range of statistical measures, specify tag-based searches, carry out distribution analyses and create sub-corpora. It can be used with any web-browser via the internet. See http://escorp.unizh.ch/.

**BNC Web Indexer** A web-based interface which allows one to explore the BNC using an alternative, genre-based
The categorisation of the BNC files provided by David Lee. The index covers twenty-four spoken and forty-six written genres. The web-based index is freely available via http://www.comp.lancs.ac.uk/computing/research/ucrel/bncindex/, though users must go through a registration process before accessing the index.

**body** The body of a corpus text is the part that follows the header. While the header contains information about the text (metadata), the body contains the text itself (the actual data) plus any markup the text has been given.

**boilerplate** A fixed block of text which can be used without alteration in many documents. Boilerplate is an important issue in corpus building that takes text from the World Wide Web, because most web sites add boilerplate text around the actual document a page contains, for instance a menu bar, advertisement, list of links, or copyright notice. To avoid duplicating this text in each corpus file, it is necessary to remove the boilerplate. However, the massive variations found in HTML across the Web mean that this can be difficult to do automatically, while removing it manually, on the other hand, is impractical for very large corpora.

**bootstrapping** Derived from the expression ‘to pull oneself up by one’s bootstraps’, this word describes a process often used in the development of corpus annotation tools, for example taggers. A tool is built quickly, with many weaknesses, and is used to analyse a corpus (perhaps with many mistakes). That corpus data is then used to improve the tool, perhaps by using it as training data. The improved tool is then used to analyse the corpus data again, this time with fewer errors. The sequence then repeats. Bootstrapping techniques allow
good corpus annotation tools to be developed without having to manually annotate a large training corpus in advance.

**Bow (aka libbow)** A library of text processing procedures written in the C **programming language** designed to assist with statistical textual analysis. Bow was developed by a team led by Andrew McCallum at Carnegie Mellon University, USA. Bow has three subsets of procedures – rainbow, arrow and crossbow. Rainbow focuses on document classification, arrow covers document retrieval while crossbow covers document **clustering**. Bow is available for both academic and commercial research purposes. For more information see http://www-2.cs.cmu.edu/~mccallum/bow/.

**Brill tagger** A trainable, rule-based **part-of-speech tagger** (named after its creator, Eric Brill) that was originally developed for the English language. The tagger was written in the LISP programming language and was initially trained on the **Brown Corpus**. The fact that the Brill tagger was made freely available to other researchers and was retrainable meant that the program has become widely used and has been retrained to cover a range of languages. The tagger is available for download from http://www.cs.jhu.edu/~brill/. (See also Brill (1992).)

**British Academic Spoken English (BASE) Corpus** Under development at the Universities of Warwick and Reading in the UK, the BASE corpus has been developed to complement the **MICASE (Michigan Corpus of Academic Spoken English)** corpus from the USA. It is **Text Encoding Initiative (TEI)** conformant and is composed largely of video recordings of lectures and seminars which are available both as sound files and
transcriptions. The corpus is structured within a sample frame covering four broad academic domains: Arts and Humanities, Social Studies and Sciences, Physical Sciences and Life and Medical Sciences. For details of the corpus see http://www.rdg.ac.uk/AcaDepts/ll/base_corpus/.

**British National Corpus (BNC)** An approximately 100-million-word corpus of written (90 per cent) and spoken (10 per cent) British English. The 4,124 texts mainly originate from the late 1980s and 1990s, although about 5.5 million words were first published between 1960 and 1984. The written texts consist of extracts from regional and national newspapers, specialist periodicals and journals for all ages and interests, academic books and popular fiction, published and unpublished letters and memoranda, school and university essays. The spoken part includes a large amount of unscripted informal conversation recorded by volunteers selected from different age, regional and social classes, together with language collected in different contexts ranging from formal business or government meetings to radio shows and phone-ins.

The corpus is part-of-speech tagged using the CLAWS C5 tagset. The project was carried out by a consortium led by Oxford University Press and includes academic research centres at Oxford and Lancaster University as well as the publishers Addison-Wesley Longman and Larousse Kingfisher Chambers. (See also BNCweb.)

**British National Corpus sampler** A subcorpus of the British National Corpus (BNC) consisting of about 2 million words or one-fiftieth of the whole corpus. The sampler corpus has been part-of-speech tagged using a more complex tagset than the rest of the corpus (the C7 tagset
which has 135 tags as opposed to the C5 tagset which has 61 tags). In addition the tagging of the sampler has been manually checked and hand corrected, so its accuracy is very close to 100 per cent. The sampler consists of 50 per cent written and 50 per cent spoken texts and maintains a wide and balanced sample of texts from across the BNC.

Brooklyn–Geneva–Amsterdam Parsed Corpus of Old English (aka the Brooklyn Corpus) A selection of texts from the Helsinki Corpus of English texts which have been parsed. Each Helsinki sample is from 5,000 to 10,000 words in length and the corpus consists of 106,210 words of annotated text. In addition to parsed data, the corpus also includes glosses to modern English and morphological tagging. The corpus is the result of an Anglo/Dutch/Swiss/US collaboration. While still available, the corpus has been superseded by the York–Toronto–Helsinki Corpus of Old English Prose (YCOE). See http://www-users.york.ac.uk/~sp20/corpus.html.

Brown Corpus A corpus of approximately 1 million words of written American English dating from 1961. It contains 500 samples of text, each of about 2,000 words. There are fifteen different genre categories: press reportage, press editorial, press reviews, religion, skills and hobbies, popular lore, belles lettres, miscellaneous, learned, general fiction, mystery and detective fiction, science fiction, adventure and western fiction, romance and love story and humour. It was created by Nelson Francis and Henry Kučera in the early 1960s and was one of the first machine-readable corpora ever built. Although it was undertaken during a climate of indifference and hostility towards corpus-based linguistic analysis, Francis and Kučera’s work proved to be ‘the
standard in setting the pattern for the preparation and presentation of further bodies of data in English or other languages’ as they hoped (1964: 2), inspiring the creation of other corpora. It is part of the International Computer Archive of Modern and Medieval English (ICAME) collection of corpora. (See also Lancaster–Oslo/Bergen (LOB), Freiburg–LOB Corpus of British English (FLOB) and the Freiburg–Brown Corpus of American English (FROWN).)

**BulTreebank** A corpus of Bulgarian parsed using a Head-Driven Phrase Structure Grammar (HPSG, see Gazdar et al., 1985) parsing scheme. The corpus is under development by a team including researchers from the Bulgarian Academy of Sciences. Kiril Simov is the leader of the project. In addition to parsing the corpus, the corpus is also being part-of-speech tagged. At the time of writing, 72 million words of Bulgarian has been collected for the project and the application of annotation to the data is an on-going task. For more details of the project see Simov et al. (2004a). To access resources produced by the BulTreebank project visit: http://www.bultreebank.org/.

**Business Letters Corpus** A corpus of business letters written by L2 American English speakers with a Japanese L1 background. The corpus was gathered by Yasumasa Someya of Aoyama Gakuin University, Japan. The corpus can be used via a web-based concordancer available at http://ysomeya.hp.infoseek.co.jp/. Via this interface a number of other corpora can be accessed, notably Someya’s Personal Letters Corpus. The corpus consists of 209,461 words contained in 1,464 letters.
C programming language This programming language has frequently been used to create powerful corpus annotation software and other applications in computational linguistics, particularly programs designed for a Unix environment. For example, many part-of-speech taggers have been written in C.

Cambridge and Nottingham Corpus of Discourse in English (CANCODE) A 5-million-word spontaneous spoken corpus of English collected by Cambridge University Press and the University of Nottingham between 1995 and 2000. The corpus includes casual conversations, discussion, people working together, shopping and finding out information. The recordings have been coded according to the relationship between the speakers: whether they are intimates (living together), casual acquaintances, colleagues at work, or strangers.

Cambridge–Cornell Corpus of Spoken North American English A 22-million-word spoken corpus of North American English collected jointly by Cambridge University Press and Cornell University in the United States.

Cambridge International Corpus A 700-million-word corpus of written and spoken English that includes the Cambridge and Nottingham Corpus of Discourse in English (CANCODE) the Cambridge–Cornell Corpus of Spoken North American English and the Cambridge Learner Corpus.

Cambridge Learner Corpus A 20-million-word (at the time of writing) corpus of English writing from learners of
English built by Cambridge University Press and Cambridge ESOL. The texts are taken from anonymised exam scripts from 50,000 students in over 150 countries. See learner corpus.

Canadian Hansard Treebank A skeleton-parsed corpus of proceedings in the Canadian Parliament consisting of 750,000 words.

Carnegie Mellon University–Cambridge Statistical Language Modeling (CMU SLM) Toolkit Unix-based software and tools designed to help researchers undertaking automated language processing. The tools are extensive and useful, and include packages that can generate word lists as well as bigram and trigram frequencies from corpus data. The toolkit is available for download, free of charge, from http://svr-www.eng.cam.ac.uk/~prc14/toolkit.html. (See also Clarkson and Rosenfeld (1997).)

CECIL A software package designed to assist in the analysis of speech data. The software was mainly of use for tone and stress analysis. The PC version of the program required specialist hardware to run. The software has been succeeded by the Speech Analysis Tools software package among others.

Centre for Lexical Information (CELEX) Relational Database A database of lexical data created in the 1990s developed by CELEX at the Max Planck Institute for Psycholinguistics. It contains data on the vocabulary of Dutch, English and German. Apart from orthographic features, the database comprises representations of the phonological, morphological, syntactic and frequency properties of lemmata.
Center for Electronic Texts in the Humanities (CETH) A centre established in 1991 by Princeton and Rutgers Universities in the United States as a North American focus for the acquisition and dissemination of electronic text files in the humanities. See http://www.ceth.rutgers.edu/.

Centre for Speech Technology Research (CSTR) A research unit specialising in speech science research at the University of Edinburgh, UK. CSTR produced the Eustace corpus. This speech corpus is mainly of interest to speech scientists, being composed of a pre-selected set of sentences spoken aloud by six speakers of English. The corpus contains 4,608 sentences. See http://www.cstr.ed.ac.uk/ for further details.

Center for Spoken Language Understanding (CSLU) Speech Corpora A range of speech corpora developed at the Center for Spoken Language Understanding, Oregon University of Health and Science, USA. The corpora cover a range of languages including Eastern Arabic, Cantonese, Czech, Farsi, French, German, Hindi, Hungarian, Japanese, Korean, Malay, Mandarin, Italian, Polish, Portuguese, Russian, Spanish, Swedish, Swahili, Tamil, Vietnamese and English. The corpora are largely of interest to speech scientists, as they typically are not of spontaneous conversations, being composed of material elicited with speech applications in mind (for example, people repeating a list of commands). Some of the corpora are available with a range of annotations. Access to the corpora is gained either by joining the Center or by licensing individual corpora from CSLU. See http://cslu.cse.ogi.edu/corpora/corpCurrent.html.

Century of Prose Corpus A diachronic corpus of literary and
non-literary English sampled from 120 authors between 1680 and 1780, including Burke, Swift and Gibbon. The corpus includes ten text categories and was compiled by Louis T. Milić. See Milić (1990) for more information. (See also the Augustan Prose Sample.)

Chadwyck-Healey Databases A number of databases of historical texts including The Chadwyck-Healey English Poetry Full Text Database, which contains most of the canon of English poetry from the Anglo-Saxon period to 1900 and contains over 4,500 volumes of poetry from 1,257 poets. The Chadwyck-Healey English Verse Drama Full-Text Database includes over 1,500 verse dramas by over 650 authors from the late thirteenth century to the late nineteenth century. Also included are The African–American Poetry Full-Text Database 1760–1900 and The American Poetry Full-Text Database.

character set A term used to describe the digital representation of text. This usually involves identifying a collection of characters and assigning a number or value to each of them. Connolly (1995) defines a coded character set as ‘A function whose domain is a subset of the integers, and whose range is a set of characters’, noting that discussion of character representation is complex and often subtly inconsistent. A distinction should be made between characters and glyphs: a glyph is the visual rendering of a character (which is a somewhat abstract concept). We could define fonts as being sets of glyphs. For example, a character could be identified as ‘Latin capital letter A’ but could be represented by a variety of glyphs: A, a, A or a.

Historically the American Standard Code for Information Exchange (ASCII) character set has been
used to represent modern English and other European languages. However, the Unicode Standard is a much larger character set that claims to cover writing systems for all of the world’s languages.

ChaSen  A morphological analyser for the Japanese language developed by the Computational Linguistics Laboratory, Graduate School of Information Science, Nara Institute of Science and Technology (NAIST). The system is available for downloading from: http://chasen.aist-nara.ac.jp/hiki/ChaSen/. The program runs on the Windows and Linux operating systems.

chi square A test for determining the significance of any numeric difference observed in data. The chi-squared test compares the difference between the observed values (e.g. the actual frequencies extracted from corpora) and the expected values (e.g. the frequencies that one would expect if no factor other than chance was affecting the frequencies). The greater the difference between the observed values and the expected values, the less likely it is that any difference is due to chance. Conversely, the closer the observed values are to the expected values, the more likely it is that the difference has arisen by chance. The chi-squared statistic is widely used, but is known to be unreliable when used with very low frequencies (frequencies less than 5, typically). Under such circumstances researchers have used the log-likelihood test. However even this statistic can be unreliable where low frequencies are concerned, so many researchers now use Fisher’s Exact Test under these circumstances instead. See Oakes (1998) for more details of chi squared.

Child Language Data Exchange System (CHILDES) CHILDES is a system that provides tools for studying
conversations, particularly those involving language acquisition. The system includes a database of transcript data from children and adults who are learning first and second languages, tools and guidelines for encoding and systems for linking transcripts to digitised audio and video. The data is transcribed in the Codes for the Human Analysis of Transcripts (CHAT) System. See http://childes.psy.cmu.edu/.

Chinese Learner English Corpus (CLEC) A corpus of L2 English produced by L1 Chinese speakers divided into five groups according to L2 English proficiency. The corpus was built by a team headed by Professor Gui Shichun at the Guangdong University of Foreign Studies, China. The corpus is approximately 1 million words in size and has been error tagged according to a scheme which classifies learner errors into sixty-one types. Both the corpus (on CD-ROM) and a description of the corpus (in Chinese) are available from the Shanghai Foreign Language Education Press. Email sflep@sflep.com.cn for details.

CHRISTINE Corpus Based upon a parsing scheme developed from the SUSANNE project and using data drawn from the spoken section of the BNC, the CHRISTINE corpus is a treebank of contemporary spoken British English. Comprehensive on-line documentation for the corpus is available at http://www.grsampson.net/ChrisDoc.html. The corpus can be downloaded, free of charge, for academic research from http://www.grsampson.net/Resources.html.

CLaRK An Extensible Markup Language (XML)-based system for corpora development created in a collaboration between the Seminar für Sprachwissenschaft,
Tübingen, Germany, and the Linguistic Modelling Laboratory, Bulgaria. The system is **Unicode** compliant and supports the manipulation and annotation of documents in the XML format. The system can be downloaded, free of charge, from http://www.bultreebank.org/clark/. More details of the system can be found in Simov et al. (2004b).

**clitic** A morpheme that has the syntactic characteristics of a word, but is phonologically and lexically bound to another word, for example *n’t* in the word *hasn’t*. Possessive forms can also be clitics, e.g. The dog’s dinner. When **part-of-speech tagging** is carried out on a corpus, clitics are often separated from the word they are joined to.

**closure** A term indicating that a particular feature in a variety of language is becoming finite. The more a corpus approaches closure, the more it approaches being completely representative of a language (or language variety). So, the more **representative** a corpus becomes, the lower the likelihood that new words, phrases or grammatical rules will be found. Lexical closure is defined as the point in a corpus beyond which the number of new lexical forms seen in every additional 1,000 tokens begins to level off at a rate lower than 10 per cent. See McEnery and Wilson (1996: 146–67) for studies of different types of closure in three corpora. Kovarik (2000), in his work on Chinese newspaper corpora, suggests that large corpora should be built incrementally by combining smaller representative samples of sub-languages. It is therefore not necessarily the size of the corpus that is paramount to closure, but the choice of texts within it.
cluster
1. A term used to describe any group of words in sequence (for example as used in WordSmith Tools). Also referred to as lexical bundles (Biber et al. 1999: 993–4).
2. A set of texts which statistically share similar linguistic features. See cluster analysis.

cluster analysis Clustering is the grouping of similar objects (Willett 1988) and a cluster analysis is a multivariate statistical technique that allows the production of categories by purely automatic means (Oakes 1998: 95). Clustering can therefore be used in order to calculate degrees of similarity or difference between multiple texts, based upon criteria set by the researcher. While clustering techniques have a useful application in document retrieval (van Rijsbergen 1979), Oakes (ibid.: 110) also notes that in corpus linguistics various identifiable features such as case, voice or choice of preposition within a text may be clustered in order to demonstrate how such features are used across different genres or by different authors.

CMU Pronouncing Dictionary A machine-readable pronouncing dictionary covering 125,000 words of American English. The resource is mainly of interest to researchers working in the areas of speech recognition and synthesis. See http://www.speech.cs.cmu.edu/cgi-bin/cmudict for details and to download the dictionary.

COALA A tool developed in the 1990s that is used for the ‘semi-automatic’ analysis of second language acquisition corpora. See Pienemann (1992).
COBUILD Corpus  See Bank of English. Also known as the Birmingham Corpus.

COCOA Reference  A form of text encoding consisting of a pair of angle brackets < > which contain a code standing for a particular type of information and the value assigned to the code. For example, when encoding speech a code such as <pause 2> could be used to show a pause which lasts for a duration of two seconds. COCOA was an early computer program used for extracting indices of words in context from machine-readable texts. Its conventions were carried forward into several other programs, notably the Oxford Concordance Program (OCP). The Longman–Lancaster corpus and the Helsinki Corpus have also used COCOA references. There is, however, no clear definition of the syntax of COCOA tagging. In Standard Generalised Markup Language (SGML) a slightly more complex version of COCOA references is defined in which the references are referred to as ‘elements’.

Codes for the Human Analysis of Transcripts (CHAT) System  An encoding system that has been developed to be compatible with the analysis program CLAN for use with the Child Language Data Exchange System (CHILDES) corpus.

cognates  Words in different languages that are similar, either in their orthographic or phonetic form, so that it is highly likely that one is a translation of the other. As Simard et al. (1992) have shown, cognates can be useful in aiding sentence alignment techniques when working with bilingual or multilingual corpora.

Collaborative International Dictionary of English (CIDE)  A
freely available dictionary based upon a combination of the 1913 Webster’s dictionary and definitions from Wordnet. This dictionary is being maintained and proof-read by volunteers from across the world. Different copies are held internationally and a number of interfaces are available to access the dictionary. GCIDE is one of these variants, being a version of CIDE available from the GNU project. See http://ftp.gnu.org/gnu/gcide/.

colligation A form of collocation which involves relationships at the grammatical rather than the lexical level. For example, nouns tend to colligate with adjectives while verbs tend to colligate with adverbs. We can also apply colligation to phrases or words. For example, as the examples in Table 2 show, a word like window tends to colligate with prepositions.

Table 2. Sample concordance of window

| colligating | prepositional phrase | word | prepositional phrase |
|-------------|----------------------|------|----------------------|
| with someone coming in through her | window | 
| The sun was shining through the window and illuminated them. | window | and looked down into the street. |
| I stood at the window and looked in the window at the menu, would be more likely to | window | |
| on got up and went over to the back window. | window | |
| She padded across to the window, drew back the curtains and looked in the window that he would otherwise | window | |
| at casual passers-by, looking in the window | window | |
| I can see him from the kitchen window you see. | window | |
| was a window and out through the window she could see down a long tunnel | window | |
| He found that it opened a window on the City that he would otherwise | window | |
| The World Outside My window encompasses an unusually broad ra | window | |

collocation Described by Firth (1957: 14) as ‘actual words in habitual company’, collocation is the phenomenon surrounding the fact that certain words are more likely to occur in combination with other words in certain contexts. A collocate is therefore a word which occurs
within the neighbourhood of another word. For example, within WordSmith users can specify a window within which collocational frequencies can be calculated. Table 3 shows the top ten collocates for the word time in the Brown Corpus, within a –5 to +5 span (the most common collocational position is emboldened for each word):

| Word | Total | Left | Right | L5 | L4 | L3 | L2 | L1 | R1 | R2 | R3 | R4 | R5 |
|------|-------|------|-------|----|----|----|----|----|----|----|----|----|----|
| the  | 1267  | 753  | 514   | 103| 80 | 60 | 254| 256| 47 | 146| 100| 111| 110|
| and  | 400   | 191  | 209   | 45 | 63 | 36 | 28 | 19 | 61 | 36 | 35 | 43 | 34 |
| for  | 287   | 185  | 102   | 24 | 28 | 85 | 48 | 0  | 35 | 23 | 13 | 16 | 15 |
| that | 219   | 130  | 89    | 13 | 15 | 25 | 9  | 68 | 27 | 12 | 10 | 19 | 21 |
| was  | 210   | 83   | 127   | 24 | 16 | 27 | 12 | 4  | 21 | 30 | 31 | 22 | 23 |
| this | 181   | 145  | 36    | 7  | 14 | 5  | 4  | 115| 6  | 10 | 8  | 8  | 4  |
| had  | 119   | 57   | 62    | 13 | 9  | 16 | 9  | 10 | 6  | 20 | 14 | 9  | 13 |
| his  | 107   | 47   | 60    | 16 | 7  | 4  | 8  | 12 | 2  | 18 | 11 | 16 | 13 |
| same | 103   | 100  | 3     | 1  | 0  | 3  | 1  | 95 | 0  | 0  | 0  | 1  | 2  |
| from | 96    | 78   | 18    | 2  | 5  | 25 | 19 | 27 | 2  | 4  | 2  | 6  | 4  |

Such tables tend to elicit high-frequency function words, which although useful, does not always show an exclusive relationship between two words. For example, the occurs as a collocate next to many other words, as well as time. We would perhaps find lower-frequency lexical words such as waste, devote, spend, spare and limit to be more illustrative collocates of time. Corpus linguistics techniques have therefore allowed researchers to demonstrate the frequency and exclusivity of particular collocates, using statistical methods such as mutual information, the Z-score (Berry-Rogghe 1973), MI3 (Oakes 1998: 171-2), log-log (Kilgarriff and Tugwell 2001) or log-likelihood (Dunning 1993) scores. Each method returns a value showing strength of collocation, but their criteria for assignation differ. For example, mutual information foregrounds the frequency with
which collocates occur together as opposed to their independent occurrence whereas it is more probable that log-likelihood will register strong collocation when the individual words are themselves frequent. So mutual information will give a high collocation score to relatively low-frequency word pairs like bits/bobs, whereas log-likelihood will give a higher score to higher-frequency pairs such as school/teacher.

Collocations can be useful in terms of language teaching – making students aware of low-frequency collocates that native speakers have internalised (e.g. Hoffman and Lehmann 2000). In addition, collocates can be useful for demonstrating the existence of bias or connotation in words. For example, the strongest collocate in the British National Corpus (BNC) of the word bystander is innocent, suggesting that even in cases where bystander occurs without this collocate, the concept of innocence could still be implied. (See also upward collocation, downward collocation, colligation.)

common core hypothesis The theory that all varieties of English have central fundamental properties in common with each other, which differ quantitatively rather than qualitatively (Quirk et al. 1985). McEnery and Wilson (1996: 109) suggest that such a theory can be tested using corpora and corpus techniques.

comparative linguistics Corpora have been used in comparative linguistics from as early as 1940 when Eaton carried out a study comparing the frequencies of word meanings in Dutch, French, German and Italian. (See also parallel corpus.)

competence–performance A dichotomy of language. Competence (or I-language) consists of our tacit internalised
knowledge of language, whereas performance (or E-language) is our behaviour in real life. Competence both explains and characterises a speaker’s knowledge of a language. Performance, however, is a poor mirror of competence. For example, factors diverse as short-term memory limitations or whether or not we have been drinking alcohol can alter how we speak on any particular occasion. Chomsky (1968: 88) argues that performance data is therefore degenerate. He also argues that corpus data (which is by nature performance data) is a poor guide to modelling linguistic competence. However, Labov (1969) offers a different view, claiming that ‘the great majority of utterances in all contexts are grammatical’. Corpus data may therefore not provide us with a perfect model of grammatical competence, but with that said it should also provide cases where performance is not ideal, helping to explain why the competence–performance dichotomy exists. (See also Ingram (1989: 223).)

**compilation**

‘Compiling a corpus means an endless series of compromises’ (Rissanen 1992: 188).

A number of stages go into the compilation of a corpus (as outlined by Kennedy 1998: 70–85). These include:

1. **Corpus design**: in general, compilers should assume that their corpus will be used for comparative purposes, although the design of the corpus will ultimately be dependent on the sorts of research questions that are being asked.

2. Planning a storage system and keeping records: particularly for spoken conversations it is important to note who was present, the relationships between participants, the topic and degree of formality.
3. Obtaining permission: copyright law and the rights of individuals to confidentiality must be observed.
4. Text capture: written text can be typed by hand, obtained in electronic form (for example via CD-ROM or website) or scanned. Spoken text normally must be transcribed by hand, using clear conventions to represent prosodic phenomena.
5. Markup: conventions for indicating text features such as line breaks, line numbers, chapters, paragraphs etc. can be encoded, preferably using a recognised standard such as the Text Encoding Initiative (TEI) which is an application of Standard Generalised Markup Language (SGML).

Compleat Lexical Tutor A data-driven learning, web-based program developed by Tom Cobb at the University of Montreal. It is designed to assist in L2 language acquisition. The site is of interest to L2 learners of English, French and Spanish. See http://132.208.224.131/.

Complete Corpus of Old English A corpus of 3,022 surviving Old English texts prepared at the University of Toronto and published in 1981. The corpus was used as the basis for the Dictionary of Old English.

compliant A corpus, text, tool or annotation scheme is compliant with a standard if it follows all the recommendations laid down in that standard. For example, if a text’s SGML/XML encoding fits with the rules of the Text Encoding Initiative (TEI), it may be described as TEI compliant. If a part-of-speech tagset adheres to the structure for tagsets recommended in the EAGLES Guidelines, it is EAGLES compliant.

compound noun A series of two or more nouns which gener-
ally function as a single noun. Compound nouns can be closed, when the words are melded together (e.g. *keyboard*), hyphenated (*sky-scraper*) or open (*mineral water*). Researchers have employed *corpus*-based analysis to identify compound nouns. See Kobayasi et al. (1994), Pustejovsky et al. (1993).

**computational linguistics** A field of linguistics which involves the scientific study of language from a computational perspective. This often involves the synthesis of computer science, artificial intelligence and linguistic theory. Computational models of linguistic phenomena are created by using knowledge-based or data-driven techniques and *corpora* have been particularly useful in enabling the creation of data-driven models. Computational linguists work on problems such as *machine translation*, *information retrieval*, speech recognition and synthesis, voice response systems, web search engines, text editors, language instruction manuals and automated content analysis.

**computer aided grammar instruction** An application for annotated *corpora*. Increasingly frequently, a computer program is used to teach grammatical analysis to students of languages and linguistics. Often, these programs exploit corpora with *part-of-speech tagging* or *parsing*. The computer offers the student a sentence, which they annotate; the student’s effort is then compared to the tagging in the corpus, and the student can receive instant feedback. The large size of many corpora means a very large number of sentences is available to the student to practise on. (See also *Computer Assisted Language Learning (CALL)*.)

**Computer Archive of Modern English Texts (CAMET)** An
organisation founded by Geoffrey Leech in 1970 at Lancaster University. CAMET was responsible for creating the Lancaster/Oslo–Bergen (LOB) corpus. In 1984, CAMET was transformed into UCREL.

**Computer Assisted Language Learning (CALL)** The use of computers to aid or support the learning of language (L1 or L2). Earlier examples of CALL included ‘drill master’ or ‘quiz master’ approaches to programmed instruction, while more recent techniques have favoured the use of concordances in the classroom where the student takes a more active role as a ‘language detective’ or researcher; see Tribble and Jones (1990) and Murison-Bowie (1993). (See also computer aided grammar instruction, data-driven learning, language teaching.)

**Computerized Language Analysis (CLAN) System** A set of thirty-eight computer programs designed to carry out data analyses, used with files from the Child Language Data Exchange System (CHILDES). It includes several searching tools as well as parsers in twelve languages.

**ConcApp** A freeware, Windows-based, concordance application (ConcApp) developed by Chris Greaves at the Polytechnic University of Hong Kong. The system is available for downloading from: http://www.edict.com.hk/PUB/concapp/. Version 4 of the program is Unicode compliant and can process most writing systems.

**concordance** Also referred to as key word in context (KWIC), a concordance is a list of all of the occurrences of a particular search term in a corpus, presented within
the context in which they occur – usually a few words to the left and right of the search term. A search term is often a single word although many concordance programs allow users to search on multiword phrases, words containing wildcards, tags or combinations of words and tags. Concordances can usually be sorted alphabetically on either the search term itself or to x places left or right of the search term, allowing linguistic patterns to be more easily observed by humans. As with collocations, concordances provide information about the ‘company that a word keeps’. For example, Table 4 shows a thinned concordance of the word *witnessed* sorted one place to the right (the sorted token is marked in bold print).

|   | Sample concordance of *witnessed* |
|---|----------------------------------|
| 1 | y told Tom Jones that he had never before witnessed a Cabinet scene like it.” All who were |
| 2 | the early decades of the twentieth century witnessed an increase in the power of medical m |
| 3 |uld be drawn up carefully and signed and witnessed in a particular way. If you write it |
| 4 | The first attitude has been witnessed in the 1930s and during our more rece |
| 5 | nk had recovered from the breakdown we witnessed in late 1986 and, despite the months al |
| 6 | fought essentially on national issues and it witnessed the return not only of a reforming Libe |
| 7 | The last year of Ayliffe’s Presidency witnessed the fulfilment of one of the BDDA’s ea |
| 8 | eneration after the coming of Cyrus which witnessed the most brilliant speculations of the “ |
| 9 | dirt, gloom and misery as I never before witnessed “. Queen Victoria had the curtains of h |
|10 |ood that this small Year Niner has been “ witnessed “ to and moves on to his next victim. |

Even in this small sample it is possible to note patterns – *witnessed* tends to precede an article or the preposition *in*. The concordance also shows different meanings of *witnessed*, from a legal usage in line 3 (*signed and witnessed*), to a meaning to do with noting a remarkable
event as in line 8 (*witnessed the most brilliant speculations*). The phrase *never before witnessed* occurs twice in the concordance (lines 1 and 9), also suggesting that *witnessed* is often used to denote a remarkable or unusual event.

As many concordance searches can produce hundreds or thousands of lines, Sinclair (1999) advocates selecting 30 random lines and noting patterns in them, then selecting a different 30, noting the new patterns, and so on until a further selection of 30 lines reveals nothing new.

**Concordance (R. J. C. Watt)** This Windows-based concordance program developed by R. J. C. Watt of Dundee University, UK, is available for purchase on the web. It includes a range of standard concordance functions. The program has the ability to work with a number of East Asian writing systems as well as those using the Roman alphabet, though the program is not currently Unicode compliant. See http://www.concordancesoftware.co.uk/.

**concordancer** A software tool that searches through a corpus for each instance of a given word, phrase or other element and the immediate context in which each instance occurs, to create a concordance.

**Concordancer/Le Concordanceur (D. W. Rand)** A freeware concordance program for the Macintosh computer, authored by D. W. Rand of the University of Montreal. The program offers basic concordancing features. See http://www.crm.umontreal.ca/~rand/CC_an.html.

**consistency** In corpus annotation consistency can be a problematic issue. Annotation is said to be consistent if the same phenomenon is always annotated in the same way
throughout the corpus. Unfortunately, there is sufficient ambiguity in language that there are often cases where more than one analysis is possible. For instance, in English the word *what* when occurring at the start of certain sorts of clauses can be considered to be *either* a conjunction *or* a pronoun (as for instance in *he asked me what I wanted*). If more than one person is involved in adding part-of-speech tags to a corpus there is a risk that they will make different decisions in borderline cases like this. This would result in inconsistent annotation. To avoid this, it is often necessary to compile a lengthy manual for any annotation scheme, recording and standardising all decisions made in the debatable cases. Even so, inconsistencies may remain. They can be uncovered using an inter-annotator consistency test, where different analysts annotate the same text independently, to check that they are annotating the text in the same way.

**Consortium for Lexical Research (CLR)** The CLR was established in 1991 under the Directorship of Yorick Wilks at the Computing Research Laboratory of New Mexico State University. The aim of the CLR was to develop an archive of sharable natural language resources. The consortium stopped accepting new members in the mid-1990s, at which time it also stopped accepting new resources for deposit. However, it did also then open up the majority of its existing holdings to non-members. These resources remain available to the research community. See http://clr.nmsu.edu/cgi-bin/Tools/CLR/clrcat for a catalogue of the material available from the CLR.

**Constituent Likelihood Automatic Word-tagging System (CLAWS)** CLAWS is a part-of-speech tagger developed by UCREL at Lancaster University. It was used to tag the
British National Corpus. The system has adopted an approach based on probabilistic disambiguation, rather than one based purely on grammatical rules. Such an approach requires prior processing from an existing tagged corpus in order to discover the statistical probabilities of the occurrence of different linguistic elements. CLAWS has consistently achieved 96–7 per cent accuracy (the precise degree of accuracy varying according to the type of text). Corpus-based tagging with CLAWS therefore consists of three stages: pre-edit, automatic tag assignment and manual post-edit. A number of tagsets have been used with CLAWS at different times – the C7 tagset consists of almost 140 tags, while the tagset used for the BNC, the C5 tagset, contains just over sixty tags. See Garside (1987, 1996) and Garside and Smith (1997). A web-based CLAWS trial-service is available from: http://www.comp.lancs.ac.uk/computing/research/ucrel/claws/.

Constraint Grammar Parser of English (ENGCG) A combined part-of-speech tagger and parser developed at the University of Helsinki. The part-of-speech tagging is used as the basis for parsing, with the entire process consisting of progressive rule-based disambiguation through a series of seven modules. The parser employs a dependency grammar analysis. The system works using the Constraint Grammar formalism and has been used to annotate the Bank of English. Karlsson (1994) reports an error rate of 0.3 per cent for word-class tagging of the 94–7 per cent of words that are given an unambiguous tag, whereas with parsing 3 per cent of the words are given an incorrect label and only 85 per cent are assigned a single tag. See Karlsson et al. (1995) for more details of this tagger. (See also http://www.lingsoft.fi/cgi-bin/engcg.)
content words A set of words in a language consisting of nouns, adjectives, main verbs and adverbs. When measures of lexical density are calculated on a text or corpus, sometimes only the content words are taken into account. (See also function words, lexical richness.)

conversation analysis Spoken corpora such as the London–Lund Corpus (LLC) of spoken English, the spoken section of the British National Corpus (BNC) and the Bergen Corpus of London Teenage Language (COLT) have been used in order to facilitate the analysis of conversations. Many of these studies are corpus-based rather than corpus-driven and have focused on words and phrases which are frequently found in spoken conversations. For example, Stenström (1984) correlated discourse items such as well, sort of and you know with pauses in speech and showed that such correlations related to whether or not the speaker expects a response from the addressee. Another study by Stenström (1987) examined ‘carry-on signals’ such as right, right-o and all right which were classified according to their various functions. Aijmer (2002) has also examined discourse particles such as now, just and actually in spoken corpora.

Cooperative, Coordinated Natural Language Utterances (Coconut) Corpus Developed by the Coconut project at the University of Pittsburgh, this corpus consists of a number of human–human computer mediated dialogues. Pairs of human participants were set the task of deciding what furniture to buy for a house. The resulting typed dialogue was recorded and it is these dialogues which make up the Coconut Corpus. The corpus is made up of twenty-four such dialogues, some of which include dialogue annotation. See Di Eugenio et al. (1998) for
more details of the corpus and annotation scheme. (See also http://www.pitt.edu/~coconut/coconut-corpus.html.)

copyright The right to publish and sell literary, musical or artistic work. Corpus compilers need to observe copyright law by ensuring that they seek permission from the relevant copyright holders to include particular texts. This can often be a difficult and time-consuming process as copyright ownership is not always clear – some texts are owned by the publisher, while others are owned by the author. If the corpus is likely to be made publicly available, copyright holders may require a fee for allowing their text(s) to be included, particularly if the corpus is believed to hold commercial value. Kennedy (1998: 77) notes that if permission is sought, many copyright holders are willing to facilitate genuine research by allowing their texts to appear in a corpus.

corpora see corpus

corpus The word corpus is Latin for body (plural corpora). In linguistics a corpus is a collection of texts (a ‘body’ of language) stored in an electronic database. Corpora are usually large bodies of machine-readable text containing thousands or millions of words. A corpus is different from an archive in that often (but not always) the texts have been selected so that they can be said to be representative of a particular language variety or genre, therefore acting as a standard reference. Corpora are often annotated with additional information such as part-of-speech tags or to denote prosodic features associated with speech. Individual texts within a corpus usually receive some form of meta-encoding in a header, giving information about their genre, the author, date
and place of publication etc. Types of corpora include specialised, reference, multilingual, parallel, learner, diachronic and monitor. Corpora can be used for both quantitative and qualitative analyses. Although a corpus does not contain new information about language, by using software packages which process data we can obtain a new perspective on the familiar (Hunston 2002: 2–3).

corpus-based Tognini-Bonelli (2001) makes a useful distinction between corpus-based and corpus-driven investigations. The former uses a corpus as a source of examples to check researcher intuition or to examine the frequency and/or plausibility of the language contained within a smaller data set. The researcher does not question pre-existing traditional descriptive units and categories. A corpus-driven analysis is a more inductive process: the corpus itself is the data and the patterns in it are noted as a way of expressing regularities (and exceptions) in language. A corpus-driven analysis tends to only use minimal theoretical presuppositions about grammatical structure.

Corpus del Español A 100-million-word corpus of Spanish created by Mark Davies of Brigham Young University, USA. The corpus is a diachronic collection of Spanish from the thirteenth century to the present day. The present-day material includes both written and spoken Spanish. The corpus has been part-of-speech tagged and can be queried on-line. See http://www.corpusdelespanol.org/ to access the corpus and see Davies (2000) for more details of the corpus.

corpus-driven see corpus-based
Corpus Encoding Standard (CES) Part of the Expert Advisory Group on Language Engineering (EAGLES) Guidelines. It sets out a system for the Standard Generalised Markup Language (SGML) encoding of corpus texts, and provides a document type definition (DTD) for encoding written corpora. This defines many of the SGML elements most commonly used in corpora, such as <p> for paragraph, <div> for division, and so on. The CES is closely compatible with the Text Encoding Initiative (TEI) recommendations. A version created in 2002, XCES, implements the Corpus Encoding Standard as an XML application. See http://www.cs.vassar.edu/CES/.

corpus linguistics A scholarly enterprise concerned with the compilation and analysis of corpora (Kennedy 1998: 1). According to McEnery and Wilson (1996: 1) it is the ‘study of language based on examples of “real life” language use’ and ‘a methodology rather than an aspect of language requiring explanation or description’. Stubbs (1996: 231), in noting the relative youth of corpus linguistics, argues that it ‘has as yet only very preliminary outlines of a theory which can relate individual texts to text corpora’. Early (pre-electronic) studies which used large bodies of text to analyse language included diary studies of child language (Preyer 1889, Stern 1924), research into language pedagogy (Fries and Traver 1940, Bongers 1947), spelling conventions (Käding 1897) and comparative linguistics (Eaton 1940). However, in a series of influential publications, Chomsky (1957, 1965) helped to change the direction of linguistics away from empiricism and towards rationalism. Although some corpus-based work was carried out in the 1960s (for instance Quirk’s work on the Survey of English Usage (1960) and Francis and
Kučera’s work on the Brown Corpus (1964), it was not until the 1980s, with advances in the availability of institutional and private computing facilities, that corpus linguistics began to grow and be accepted as a valid means of language enquiry. The main ways that corpus data can be manipulated via software packages, according to Hunston (2002: 3), are to show frequency, phrase structure and collocation.

**Corpus of Early American English** Designed as a supplement to the Helsinki Corpus of English Texts, the Corpus of Early American English represents the period from about 1620 to 1720 when the foundations of the first overseas variety of English were being laid down. See Kytö (1992).

**Corpus of Early English Correspondence (CEEC)** Approximately 2.7 million words of English taken from written correspondence of the period 1410–1681, produced by the historical sociolinguistics team at the Research Unit for Variation and Change in English at the University of Helsinki. The corpus contains around 6,000 letters written by 778 informants, roughly twenty per cent of whom were female. A subset of the corpus is also available. This sample corpus is 450,000 words in size, covering the period 1418–1680, and contains 1,147 letters from 194 informants. See Keränen (1998) for more details. (See also http://www.eng.helsinki.fi/varieng/team2/1_2_4_projects.htm.)

**Corpus of English-Canadian Writing** Created at Queens University in Kingston, Ontario, the Corpus of English-Canadian Writing contains the same written genre categories as the Brown family of corpora, with additional categories for feminism and computing. It is also
designed to be three times as large as the Brown Corpus (that is, to contain 3 million words of Canadian English).

Corpus of Late Eighteenth-Century Prose A corpus of around 300,000 words of English from the period 1761–1789 developed at the University of Manchester by a team led by David Denison. The documents included in the corpus are letters, mainly focused upon practical subjects. The corpus is marked up in a format identical to the Helsinki Corpus, though an HTML version of the corpus is also available. See Denison (1994) or http://www.art.man.ac.uk/english/staff/dd/lmodeprs.htm for further details.

Corpus of Middle English Prose and Verse A corpus of sixty-one Middle English texts developed by the Humanities Text Initiative, University of Michigan, USA. The corpus is marked up according to the Text Encoding Initiative (TEI) guidelines. It may be downloaded or can be searched via an on-line search facility. See http://www.hti.umich.edu/c/cme/.

Corpus Resources and Terminology Extraction (CRATER) CRATER is a parallel corpus consisting of documents in English, Spanish and French. The corpus contains a million words of text in each language (and more in English and French) from the International Telecommunications Union (ITU). The texts are lemmatised, part-of-speech tagged and aligned at the sentence level. The corpus is available at http://www.comp.lancs.ac.uk/linguistics/crater/corpus.html.

Corpus of Spoken American English (CSAE) Also referred to as the Santa Barbara Corpus of Spoken American English, the CSAE is the first large electronic corpus of
spoken American English as used by adults. It is based on hundreds of recordings of naturally occurring speech from across the United States representing a wide variety of people from different regions, social and ethnic backgrounds. See Chafe et al. (1991).

**Corpus of Spoken Professional American English** A corpus constructed from a selection of transcripts of interactions in professional settings, containing two main sub-corpora of 1 million words each. One sub-corpus consists mainly of academic discussions such as faculty council meetings and committee meetings related to testing. The second sub-corpus contains transcripts of White House press conferences, which are almost exclusively question-and-answer sessions (cf. Barlow 1998). The corpus is available with and without part-of-speech annotation for a modest fee. See http://www.athel.com/cspatg.html.

**Corpus of Written British Creole (CWBC)** A 12,000-word corpus containing written texts of English-lexicon Caribbean Creole (Patois/Patwa/Nation Language) consisting of poems, extracts from novels, plays, advertisements and graffiti. The corpus is annotated to show spelling, grammatical and discourse information.

corpus sampler Many large corpus-building projects also produce a smaller sample taken from the completed corpus, usually offered free of charge, to be used in situations in which millions of words of data are not required. The sampler can be used, for example, as a training corpus or as a comparative corpus when producing keywords.

**Corpus Wizard** A shareware concordance package by
Hamagushi Takahashi. The *concordancer* is written for the Windows and OS/2 operating systems. The program provides a range of basic concordancing functions. It is not *Unicode compliant*. For further details see http://www2d.biglobe.ne.jp/~htakashi/software/cw2e.htm.

**Cronfa Electroneg o Gymraeg (CEG)** A 1,079,032-word corpus of modern Welsh. The corpus loosely follows the *Brown Corpus* sampling frame, though the sampling period for the corpus was quite loose with many, but not all, texts sampled post-1970. More details of the corpus can be found at http://www.bangor.ac.uk/ar/cb/ceg/ceg_eng.html.

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**data** Information of any kind. Specifically, in *corpus linguistics*, *data* is the text contained in *corpora*, so we may speak of ‘a million words of spoken data’ etc. Data may also refer to statistics, *concordances* or *collocations* extracted from corpora.

*Natural language data* is text which has been produced in the ‘real world’. *Artificial data* is any language data which is not natural. (See also *attested data*, *modified data*, *intuitive data*.)

**data-driven learning** Sometimes also referred to as ‘discovery learning’, this is a technique devised by Tim Johns (1997), used in *language teaching* whereby the student takes a pro-active role in their own learning process by carrying out and analysing a series of *concordances* from a corpus. The advantage of data-driven learning is that it should help to increase student motivation, particularly when the search is prompted by their own questions.
Such activities can be directed by a teacher (who already knows what the results of the concordance analysis will bring), or can be carried out alone. However, as Hunston (2002: 171) points out, the former would require the teacher to carry out advance preparation while the latter may result in unpredictable outcomes. As Bernadini (2000) shows, data-driven learning is likely to be most useful to very advanced learners for filling in gaps in their knowledge.

**database** The term ‘database’ may be used to refer to a large collection of texts. Unlike corpora, databases are not made up of samples but instead constitute an entire population of data – for example, the complete works of Thomas Hardy, or all of the editions of the Guardian newspaper in a single year. Kennedy (1998: 4) notes that while many large databases are not subjected to corpus analysis, there is no reason why they should not be used for this purpose. Databases include the Oxford Text Archive (OTA), Acquilex, Bellcore, the CELEX Relational Database and CHILDES. (See also archive.)

**design** Design is the first of five stages in corpus compilation (the others being planning a storage system, obtaining permissions, text collection and encoding). The design of a corpus is dependent on the purposes for which it is going to be used, therefore careful thought should be given to the type, content, structure and size of the corpus. Such decisions as whether to include spoken and/or written texts, whether to build a diachronic or synchronic corpus, which genres to include and how large the corpus should be may all figure in the design process. Maintaining a sampled balance of texts in order to achieve an ideal representation of a language variety is desirable, although as many corpus compilers have
discovered, not always possible. In addition, texts do not always fit easily into previously created categories. Therefore, building a smaller pilot corpus is a useful way of resolving problematic cases at an early stage. Atkins et al. (1992: 7–9) list text origin, participants, medium, genre, style, setting, factuality, topic, date of publication, authorship, age and intended audience of readership as some of the most important extra-linguistic variables which should be taken into account when considering the content and structure of a corpus.

diachronic corpus A corpus that has been carefully built in order to be representative of a language or language variety over a particular period of time, so that it is possible for researchers to track linguistic changes within it. For example, the Helsinki Corpus of English Texts: Diachronic Part consists of 400 samples of texts covering the period from AD 750 to 1700 (Kytö and Rissanen 1992). (See also monitor corpus, synchronic corpus.)

Diachronic Corpus of Present-day Spoken English (DCPSE) A corpus being constructed at the Survey of English Usage, University College London by a team led by Bas Aarts. The corpus includes spoken corpus data drawn from both the London–Lund Corpus and the spoken section of the British International Corpus of English (ICE) corpus in order to develop a diachronic corpus of relatively contemporary spoken English covering a period of a quarter of a century or so from the 1960s and early 1990s. The corpus is available from http://www.ucl.ac.uk/english-usage/diachronic/.

dialect corpus A specialised spoken corpus (although written texts can also contain dialects), which is
compiled in order to carry out studies of regional variation. Speakers in the corpus may be categorised according to their dialect, and an encoding scheme which distinguishes between variant pronunciations is likely to be employed. (See also regional corpus, non-standard corpus.)

**Dialogue Annotation Tool (DAT)** Developed at the Department of Computer Science, University of Rochester, USA, this tool is designed to apply the DAMSL markup scheme to corpus texts. DAMSL (discourse act markup in several layers) allows for the annotation of multiple layers of information relevant to the understanding and analysis of spontaneous conversation. For more details of DAT, see http://www.cogsci.ed.ac.uk/~amyi/mate/dat.html. For information on DAMSL see http://www.cs.rochester.edu/research/cisd/resources/damsl/RevisedManual/RevisedManual.html.

**Dialogue Diversity Corpus** A corpus of fifty-four dialogues available free of charge for academic research developed by William C. Mann at the University of Southern California, USA. The dialogues are taken from a range of sources and represent a wide range of different interaction types, for example academic discussion, doctor–patient interaction, transaction. All of the dialogues are in English, with most being in American English, though the corpus contains examples of other English varieties also. To download the corpus and for more details see http://www-rcf.usc.edu/~billmann/diversity/DDivers-site.htm.

dictionaries There is a strong relationship between dictionaries and corpora. Many dictionaries are now created with the help of corpus data, for instance The Longman
Dictionary of Contemporary English (LDOCE) includes over a million examples of language use from corpus data and gives information about the top 3,000 words in spoken and written English. Dictionaries have also been published in electronic form – for example, the Oxford English Dictionary (second edition) on CD-ROM contains more than half a million entries and 2.4 million quotations. Dictionaries themselves have been used as specialised corpora, particularly for automatic sense disambiguation, while a number of lexical databases such as the MRC Psycholinguistic Database, the CELEX Relational Database and the Acquilex Project are recommended by Edwards (1993: 296) as being potentially useful for corpus linguistics research.

**disambiguation** Disambiguation is the resolution of ambiguity in language. Specifically, in the field of corpus annotation, disambiguation refers to a process where the correct annotation is chosen from a set of possible tags at a given point in the text. This may be done manually or automated. Many approaches to part-of-speech tagging are centred on disambiguation. First, each token in the corpus is assigned all the tags it can possibly have in any context, by looking it up in a tagging lexicon or using a morphological analyser. Then, disambiguation software uses the context to select the correct tag. Disambiguation is most often accomplished either by means of rule-based disambiguation or by a probabilistic approach, usually based on a hidden Markov model.

**discourse prosody** A term reported by Tognini-Bonelli (1996) and Stubbs (2001) relating to the way that words in a corpus can collocate with a related set of words or phrases, often revealing (hidden) attitudes. For example, in the British National Corpus (BNC) the word *happen*
has a discourse prosody for unpleasant things (see the sample *concordance* in Table 5).

**Table 5.** Concordance table showing discourse prosody of the word *happen*

| Example                                                                 | Discourse Prosody |
|------------------------------------------------------------------------|-------------------|
| le who foresee airplane disasters before they happen are said to have this gift.  |                  |
| experience very few genuine disasters ever happen in the school playground. |                  |
| It is a dreadful thing to happen .”                                      |                  |
| Luckily, it was the worst thing to happen to poor Sal all weekend.       |                  |
| And an accident can happen anywhere, at any time just when you least e  |                  |
| I don’t want that disaster to happen .”                                  |                  |
| Everything you feared might happen , did happen, only worse.             |                  |
| Did something terrible happen to those verbally adept young girls as they|                  |
| SIR – Drug poisoning can happen in unexpected ways.                      |                  |
| ever they lost their car keys, which seemed to happen quite frequently.  |                  |

Stubbs suggests that the difference between *semantic preference* and discourse prosody is not always clear cut; a deciding factor could be to do with how open-ended the list of possible collocates are. He also notes that discourse prosodies could be referred to as pragmatic prosodies. (See also *semantic prosody*.)

**dispersion** The rate of occurrence of a word or phrase across a particular file or corpus. Dispersion is normally calculated in mathematics using a descriptive statistic like the standard deviation, which gives a measure of the dispersion of a data set in relation to the mean value of the data. In *WordSmith*, a visual representation of the dispersion of a word or phrase can be obtained via a dispersion plot. This enables researchers to determine whether a term is equally spread throughout a text or
occurs as a central theme in one or more parts of the text. The following two dispersion plots are both from a small corpus of newsletters produced by a Catholic church. The two words (*joy* and *abortion*) have equal frequencies in the corpus, although the dispersion plots show that the term *joy* is more evenly dispersed throughout the speeches, whereas *abortion* occurs in fewer files and as a more focussed subject of discussion at various points:

![Fig. 1. Dispersion plot of joy](image1)

![Fig. 2. Dispersion plot of abortion](image2)

**distinctiveness coefficient** Any statistical method of identifying lexical items that are most commonly associated with a particular language variety. Johansson (1980) adopts a method of comparing linguistic differences between the Lancaster–Oslo/Bergen (LOB) and Brown corpora with the following calculation:
Another type of distinctiveness coefficient is the keyword function utilised by Scott (1999), which uses either log-likelihood or chi-squared statistical methods in order to derive lists of words that occur more often in one file or corpus when compared against another.

distribution A term with two distinct meanings in corpus linguistics:

1. Distribution is a factor in corpus design – ensuring that the files included in a corpus are drawn from a wide and representative range of text categories or genres. The size of a corpus needs to be offset against the diversity of sources in order to maintain representativeness (Kennedy 1998: 68). Biber’s (1990) distribution analysis concluded that the typical number of samples within each genre of the Lancaster–Oslo/Bergen (LOB) and London–Lund (LLC) corpora (between twenty to eighty texts) was adequate for correlation-based analyses of variation.

2. Linguistic distribution is one method of corpus analysis that is available to researchers (see also dispersion). For example, the written part of the British National Corpus (BNC) is subdivided into nine writing genres and it is therefore possible to compare frequencies across these genres. Distributions within spoken language can also be explored, using factors such as the sex, age and social class of speakers. Table 6 shows distributions (given as occurrences per million words) of the synonyms big and large in the different writing genres in the BNC. Big occurs more often in leisure and imaginative domains, whereas large is more typical of the sciences.
Table 6. Distribution (per million words of *big* and *large* in different genres in the British National Corpus)

| Genre                  | big    | large |
|------------------------|--------|-------|
| Leisure                | 395.8  | 406.8 |
| Imaginative            | 341.93 | 227.44|
| Arts                   | 284.64 | 310.86|
| Commerce and finance   | 275.85 | 476.06|
| Applied science        | 130.9  | 549.92|
| World affairs          | 115.81 | 370.36|
| Natural and pure sciences | 99.89  | 819.44|
| Belief and thought     | 94.44  | 244.41|
| Social science         | 92.69  | 338.12|
| **Total**              | **219.39** | **377.57** |

**ditto tags** A process, usually applied in part-of-speech tagging, whereby an idiom is given a single ‘tag’ spread over several words. For example, consider the sentence ‘It happened all of a sudden’. The phrase ‘all of a sudden’ could be said to function as an adverb. Rather than tagging this phrase with individual parts of speech (for example, all_DET of_PREP a_ART sudden_ADJ) the phrase is considered to be an adverb consisting of four parts and is given ditto tags accordingly: all_ADV41 of_ADV42 a_ADV43 sudden_ADV44. The first of the two numbers at the end of each tag denotes the number of words in the idiom (in this case 4), whereas the second number defines the position of each word in the idiom. Ditto tags are usually specified by rule-based disambiguation software. Decisions regarding what constitutes a ditto tag are somewhat subjective and need to be agreed on in advance of tagging and also included in the corpus documentation.

documentation A well-constructed corpus will usually be
released with accompanying documentation, explaining the design and encoding of the corpus. Information which one would usually expect to find in a corpus manual, as the documentation is often called, might include who built the corpus, and for what purpose, the size of the corpus, what texts it contains and how these were sampled. This last might describe the sources of the texts or their genres; for a spoken corpus, the way the recordings were made and transcribed would be specified. Good corpus documentation will also specify the character set used, the markup system and any analytic annotation that is used in the corpus (including how decisions were made about tagging ambiguities, ditto tags etc).

document type definition (DTD) In Standard Generalised Markup Language (SGML) and Extensible Markup Language (XML), a DTD is the set of statements that define what markup tags are allowed in a text file, what they can contain, and what attributes they can have. The DTD is usually stored in a separate file to the text, so that many text files can use the same DTD and be encoded uniformly.

Because of the great diversity in the structure and contents of corpus texts, the DTDs used in corpus linguistics are typically very complicated, for instance the Text Encoding Initiative’s TEI Lite DTD (see http://www.tei-c.org/Lite/DTD/).

downward collocation A form of collocation outlined by Sinclair (1991: 115–19) whereby the focus is upon semantic patterns surrounding a particular lexical item. Downward collocation occurs when one collocate occurs less frequently in a corpus or text than its collocational pair. Downward collocates tend to be content
words rather than function words. For example, downward collocates of the word bank (which occurs 17,596 times in the British National Corpus) are Jodrell (21 occurrences), Israeli-occupied (29), overdrafts (78), lending (1,307) and robber (189). These words suggest two unrelated semantic patterns of bank connected to either geographic locations or finance. (See also upward collocation, semantic preference.)

duplication In large corpora, which are often compiled by a team of several researchers, or even compiled automatically from sources such as the World Wide Web or daily newspaper text, there is a risk that some texts will be included twice or more in the corpus. That is, two texts with different labels will actually contain the exact same document. Duplication is, therefore, an important issue for corpus design.

Duplication is undesirable because it can distort the apparent frequency of very rare words or forms. If a duplicated text contains something that actually only occurs once in a 100-million-word corpus, then it will appear to occur, on average, once every 50 million words – a huge difference.

Sections of text can also be duplicated in a corpus. For instance, many web pages on news sites contain fixed text at the start and end (called boilerplate); if the pages are incorporated directly into a corpus, that boilerplate will be included in every document, and have the same distorting effect on statistics derived from the corpus.

dynamic corpus A dynamic corpus is one which is continually growing over time, as opposed to a static corpus, which does not change in size once it has been built. Dynamic corpora are useful in that they provide the means to monitor language change over time – for this
reason they are sometimes referred to as monitor corpora. Examples of dynamic corpora include the Longman Written American Corpus and the Bank of English (BoE). The American National Corpus (ANC) also has a dynamic component, consisting of texts added at regular intervals to the initial, basic corpus. (See also diachronic corpus.)

**embedded quotes** When a quotation contains a quotation, the inner quotation is said to be embedded. For instance, *The man told me, ‘my father said “never do that”, so I never have.’* The words *never do that* are an embedded quote. Often, when quotes are embedded, alternating double quotation marks (""") and single quotation marks (‘’) are used. Handling embedded quotes is not always straightforward for a computer as quotation marks are typically used to represent the start and end of a string.

**empiricism** An empirical approach to knowledge is based on the idea that knowledge comes from our experiences or from observation of the world. In linguistics, empiricism is the idea that the best way to find out about how language works is by analysing real examples of language as it is actually used. Corpus linguistics is therefore a strongly empirical methodology. An approach to knowledge which relies on introspection rather than observation is called rationalism, which in the field of linguistics is strongly associated with Noam Chomsky. (See also corpus linguistics.)

**Enabling Minority Language Engineering (EMILLE) Corpus** A corpus of South Asian languages constructed as part of a collaborative venture between Lancaster University
and the Central Institute of Indian Languages (CIIL), Mysore, India. EMILLE is distributed by ELRA. The corpus consists of three components: monolingual, parallel and annotated corpora. There are monolingual corpora for fourteen South Asian languages: Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Malayalam, Marathi, Oriya, Punjabi, Sinhala, Tamil, Telegu and Urdu. The EMILLE monolingual corpora contain 93 million words (including 2.6 million words of transcribed spoken data for Bengali, Gujarati, Hindi, Punjabi and Urdu). The parallel corpus consists of 200,000 words of text in English and accompanying translations in Bengali, Gujarati, Hindi, Punjabi and Urdu. The annotated component includes the Urdu corpora annotated for parts-of-speech, together with twenty written Hindi corpus files annotated to show the nature of demonstrative use. The corpus is encoded as Unicode with CES compliant SGML markup. See Baker et al. (2004).

**enclitic** A clitic that attaches to the end of the previous word. See proclitic.

**encoding** Encoding is usually the last of the five stages of corpus compilation, and is sometimes referred to as annotation, tagging or markup. Encoding is a way of representing elements in texts such as paragraph breaks, utterance boundaries etc. in a standardised way across a corpus, so that they can be more easily recognised by computer software and by corpus users.

A number of standardised text encoding schemes are in existence, including the Text Encoding Initiative (TEI) which makes use of the Standard Generalised Markup Language (SGML) and was used for encoding the British National Corpus (BNC). The Child Language Data
Exchange System (CHILDES) database of child language was created using an encoding scheme called Codes for the Human Analysis of Transcripts (CHAT) that is formulated for encoding the complexities of spoken data.

Annotation can also occur at the meta-linguistic level – for example, by adding information such as author, level of readership or date of publication to a text’s header – or it can encode an analysis of some feature at the discourse, semantic, grammatical, lexical, morphological or phonetic level. For example, automatic part-of-speech tagging can be carried out on a corpus, whereby every word within it is assigned a particular grammatical tag as shown in the following example below:

Anyway_AV0 ,_, I_PNP rented_VVD out_AVP a_AT0 few_DT0 horror_NN1 films_NN2 and_CJC am_VBB coming_VVG to_PRP the_AT0 conclusion_NN1 that_CJT horror_NN1 films_NN2 are_VBB all_DT0 about_PRP fears_NN2 of_PRF social_AJ0 class_NN1

English–Norwegian Parallel Corpus This parallel corpus is made up of original texts in either English or Norwegian together with their translations into the other language. There are thus four sections: original English, translated English, original Norwegian and translated Norwegian. It was designed for use in contrastive analysis and translation studies. It contains both fictional and non-fiction texts and is, in total, about 2.6 million words in size.

English Trigram Frequencies A list of letter trigrams derived from the Brown Corpus derived by John Cowan. The list is available at http://home.ccil.org/~cowan/trigrams.
ethics As with other forms of data collection for analysis, ethical considerations need to be taken into account for the compilation of a corpus. Specifically, permission must be obtained from the relevant bodies (usually the author and/or the publisher) for including a written text within a corpus. For spoken or recorded texts, participants must be made aware that they are being recorded in advance, be given the right to have their identities disguised if they wish, be able to give their informed, voluntary consent to being recorded and be allowed access to the recording in order to erase any parts with which they are uncomfortable. Furthermore, the researcher should not use his or her status in order to influence participants. For further information see Seiber (1992) or Homan (1991). The British Association for Applied Linguistics (BAAL) has information at their website entitled Recommendations on Good Practice in Applied Linguistics, see http://www.baal.org.uk/goodprac.htm.

Eudico Linguistic Annotator (ELAN) The tool was developed by a team at the Max Planck Institute for Psycholinguistics, Nijmegen specifically to handle multimodal corpora in which annotations coexist alongside other types of data such as transcriptions and video streams. The tool both supports the browsing of such corpora and their construction/annotation. The tool is freely available, with versions compliant to both Windows and Macintosh. For more details see http://www.mpi.nl/tools/elan.html.

Euralex The European Association for Lexicography (Euralex) was founded in 1983 with the aim of furthering the field of lexicography by promoting the exchange of ideas and information, often across discipline bound-
Corpus-based lexicography is prominent in the areas of interest explored by Euralex members. See http://www.ims.uni-stuttgart.de/euralex/ for more details of the association, including its conferences.

European Chapter of the Association for Computational Linguistics (EACL) The European wing of the ACL was founded in the early 1980s. It organises a conference every three years and is the primary professional organisation in Europe for computational linguistics. See http://www.eacl.org.

European Corpus Initiative (ECI) The European Corpus Initiative was founded to create a large multilingual corpus for scientific research. The corpus (ECI/MCI) has been available on CD-ROM since 1994. It contains texts in a range of languages including German, French, Spanish, Dutch, Albanian, Chinese, Czech and Malay as well as some parallel texts. The corpus is distributed by the European Network of Excellence in Human Language Technologies (ELSNET).

European Language Activity Network (ELAN) A project led by Laurent Romary that was designed to encourage the take-up of language resources, including corpora, by the users of such resources. This was achieved via the development of common standards for data interchange and engagement in a number of awareness-raising exercises to publicise the existence of language resources. See http://www.loria.fr/projets/MLIS/ELAN/.

European Language Resources Association (ELRA) The European organisation that promotes and oversees the production and distribution of language resources for use in natural language processing, and the evaluation
of NLP technologies. ELRA organises the LREC series of conferences every two years. Its operational body is the Evaluations and Language Resources Distribution Agency (ELDA).

**European Network of Excellence in Human Language Technologies (ELSNET)** A multidisciplinary grouping which seeks to bring together all those whose research touches upon natural language processing, including corpus linguists. The network has a number of special interest groups, with language resources as one of its six main focuses. In addition to providing an infrastructure to connect researchers across discipline boundaries, ELSNET also undertakes training via its summer schools and workshops. See http://www.elsnet.org/.

**European Science Foundation Second Language Databank (ESFSLD)** A corpus collected by research groups of the European Science Foundation project in France, Germany, Great Britain, the Netherlands and Sweden. The project concentrates on second language acquisition of immigrant workers living in Western Europe, and their communication with native speakers in their respective host countries.

**Eustace Corpus** see Centre for Speech Technology Research

**Evaluations and Language Resources Distribution Agency (ELDA)** The profit making, commercial counterpart of the European Language Resources Association (ELRA). ELDA works to identify, classify, collect, validate and produce language resources that are used by language technologists. This includes both producing and validating language corpora.
Expert Advisory Group on Language Engineering Standards (EAGLES) The EAGLES project ran from 1993 to 1996 under the auspices of the European Union. Its aim was to develop a set of standards (often referred to as the EAGLES Guidelines) in a number of areas of corpus linguistics and natural language processing. In most cases, the methods recommended by EAGLES were based on approaches and practices that had already developed in common use.

The EAGLES Guidelines cover a number of different aspects of corpus encoding and annotation. There are recommendations on: the classification of different types of corpora; the classification of texts in a corpus; the encoding of corpora (see Corpus Encoding Standard); the tagsets used to annotate corpora for part-of-speech or syntactic structure (see parsing); the grammatical information encoded in computational lexicons; the evaluation of NLP systems and formalisms for computer grammars. The guidelines are published at http://www.ilc.cnr.it/EAGLES96/browse.html.

Extensible Markup Language (XML) A markup language based on the Standard Generalised Markup Language (SGML) that is used for encoding electronic texts. In appearance it is very similar to SGML, being based on tags in angled brackets < > which may also contain attribute-value pairs, for instance <div type="chapter"> to indicate one type of text division. Also like SGML, XML defines the tags that can occur in a document, and the structure in which they occur, using a document type definition (DTD).

XML was developed in the 1990s as a more restricted markup language than SGML, offering fewer optional features. For example, using SGML it is possible to have tags with no end tag, such as <br> to indicate a line
break. In XML this is not allowed, so all tags must either come in pairs (<br></br>) or else as a special combined start-and-end tag (<br/>). These restrictions make XML easier to process.

XML is now widely used in corpus linguistics, and many of the main SGML applications used to encode corpora have been updated to use XML, for instance the Text Encoding Initiative and the Corpus Encoding Standard.

Fidditch Parser Developed by Donald Hindle, this is a computer-based tool which carries out automatic parsing of texts. It is a non-probabilistic parser, working via a series of grammatical rules.

first generation corpora This is a name given to a series of relatively small corpora that were created using a similar model. These include the Brown Corpus of American English (1961), the Lancaster–Oslo/Bergen (LOB) corpus of British English (1961), the Kolhapur Corpus of Indian English (1978), the Wellington Corpus of Written New Zealand English (1986) and the Australian Corpus of English (1986). Although these early corpora have been criticised in terms of their limited size and sampling (see Kennedy 1998: 30), they still continue to be important sources for analysis, as well as acting as models for the compilation of further corpora. (See also second generation corpora.)

Fisher’s Exact Test A test of statistical significance which is more reliable than either the chi-squared or log-likelihood statistics where the data set under investi-
gation includes low expected frequencies (less than 5). See McEnery, Xiao and Tono (2005).

Floresta Sintá(c)tica A joint Danish/Portuguese project which has produced two treebanks of Portuguese. The corpora were parsed using a parser called Palavras (Bick, 2000). The two corpora are called Bosque and Floresta Virgem. Bosque is a 174,856-word corpus containing 8,818 parsed sentences. The output of the parser used to annotate Bosque has been hand corrected. The second corpus, Floresta Virgem, is a 1,072,857-word corpus containing 41,406 sentences. This corpus, while parsed, has not been hand corrected. Both corpora have been built using subsections of previously created corpora of Portuguese. See http://acdc.linguateca.pt/treebank/info_floresta_English.html for further information, including details of how to access the corpora.

fnTBL A machine-learning toolkit geared towards natural language processing tasks such as part-of-speech tagging. The toolkit was developed at John Hopkins University, USA, by Radu Florian and Grace Ngai. The software is available to download, free of charge from http://nlp.cs.jhu.edu/~rflorian/fntbl/.

form-focused teaching Form-focused teaching is a method of language teaching whereby the teacher gives explicit form (or grammar) focused instruction as feedback in order to facilitate self-correction. Form-focused teaching may therefore arise in response to a mistake, or a question from a student. A corpus-based approach to form-focused teaching would involve the student and/or teacher using a corpus to investigate aspects of the student’s language use, informing instruction rather than determining it.
Forward–Backward algorithm  see Baum–Welch algorithm.

Framenet  A project based at the University of Berkeley, USA, which is seeking to produce a corpus-based lexicon with the needs of language learners, language teachers and lexicographers in mind. The basic ideas behind the project are derived from work in frame semantics (see Fillmore, 1985). For more information about Framenet see http://www.icsi.berkeley.edu/~framenet/.

Freiburg–Brown Corpus of American English (Frown) The Frown Corpus consists of 1 million words of written American English from the early 1990s. The text categories, the length of the samples and other details of the corpus design are an identical match to those of the Brown Corpus (hence Frown’s name), but it samples from a period thirty years later. It was compiled at the University of Freiburg and is available through the International Computer Archive of Modern and Medieval English (ICAME).

Freiburg–LOB Corpus of British English (FLOB) The FLOB Corpus is a 1-million-word corpus of written British English from the early 1990s, created by the same team that built the Frown Corpus at the University of Freiburg. Just as Frown is a match for the Brown Corpus but sampled from a period thirty years later, so FLOB is a thirty-year match for Lancaster–Oslo/Bergen (LOB) in terms of its sampling frame. Brown, LOB, Frown and FLOB form a ‘family’ of corpora that between them allow linguists to analyse differences between British and American English, and between the varieties of English used in different decades. All are available through the International Computer Archive of Modern and Medieval English (ICAME).
French Interlanguage Database (FRIDA) Under development at the Université Catholique de Louvain, this corpus, being built by a team headed by Sylviane Granger, is a learner corpus of L2 French. At the time of writing the corpus is 200,000 words in size. The goal is to build a corpus of 450,000 words. The data in the corpus has been produced by intermediate-level language learners, and each text is 100 to 1,000 words long. The corpus is being error-tagged according to a scheme developed at the Université Catholique de Louvain. The L1 backgrounds of the speakers in the corpus vary. See http://www.fltr.ucl.ac.be/fltr/germ/etan/cecl/Cecl-Projects/Frida/fridatext.htm.

frequency The concept of frequency underpins much of the analytical work that is carried out within the remit of corpus linguistics. Frequencies can be given as raw data, e.g. there are 58,860 occurrences of the word *man* in the British National Corpus (BNC); or (often more usefully) they can be given as percentages or proportions – *man* occurs 602.91 times per million words in the BNC – allowing comparisons between corpora of different sizes to be made.

Frequency analyses also allow comparisons to be made between different words in a corpus – for example *man* (602.91 per million) tends to occur more frequently than *woman* (225.43 per million), suggesting that *man* is the marked or ‘prototype’ term. On the other hand, *homosexual* (8.41 per million) occurs more than *heterosexual* (3.86 per million), which in this case is due to the term *homosexual* being marked because homosexuality has been considered problematical and non-standard by society in the past.

Frequency analyses can also be carried out on grammatical forms, for example to ascertain which past-tense
verb forms are more common than their corresponding present- or future-tense forms or to compare different genres of language – for example what are the most (and least) common words in written and spoken English, or how has use of modal verbs shifted over time. In addition, word lists, compiled by frequency counts of each word in a corpus can be used in order to derive keyword lists. Frequency counts are also used in the calculation of collocational and dispersion data as well as the type/token ratio of a corpus. However, care must be taken when using frequency counts. Frequencies do not explain themselves: concordance-based analyses are therefore required in order to explain why certain words are more frequent than others. It may also be necessary to take into account the frequencies of related terms, for example chap, fella, bloke, gent etc. as well as man.

**full text corpus** A corpus that contains all the texts from a particular population. In practice, however, many corpora are made of a sample of texts from a population. (See also sample text corpus.)

**function words** A set of words sometimes referred to as grammatical words, consisting of pronouns, prepositions, determiners, conjunctions, auxiliary and modal verbs. Function words are sometimes removed when calculating the lexical density of a text. (See also content words.)

**Fuzzy Tree Fragments (FTFs)** A system for describing a set of syntactic structures in a parsed corpus. Fuzzy Tree Fragments are the central search mechanism of the International Corpus of English Corpus Utility Program (ICECUP) tool. Each FTF is a non-specific grammatical tree structure that can be matched to a range of similar
parsing trees in the corpus. This process is similar to the way a regular expression can be used to match a range of different words in a corpus. However, FTFs match syntactic structures, not words. FTFs are represented visually, as graphical trees, and can be written by the ICECUP user or extracted from corpus data.

General Architecture for Text Engineering (GATE) GATE (Cunningham, 2002) is an architecture, development environment and framework for building systems that process human language. It has been in development at the University of Sheffield since 1995, and has been used for many R&D projects, including Information Extraction in multiple languages. The system allows for the processing and annotation of corpora. GATE is implemented in Java and is freely available from http://gate.ac.uk as open-source free software under the GNU library licence.

genre The word ‘genre’ comes from the French (and originally Latin) word for ‘class’. The term is used in linguistics to refer to a distinctive type of text. However, the classification taxonomy of texts into genres is not an objective procedure. It is therefore important that corpus designers provide accurate and complete descriptions of how genre categories were arrived at in the documentation which accompanies a corpus.

Common genres within a corpus may include categories such as press, religion, fiction, private letters and academic. However, genres may be categorised into sub-genres or super-genres; for example, fiction may be subclassified into mystery, science fiction, westerns,
romance and humour. The genre of a text is usually indicated in the corpus header, allowing comparisons between genres to be made as well as letting researchers focus on an analysis of one particular genre.

**GlossaNet** Hosted by the Centre for Natural Language Processing of the Université Catholique de Louvain, GlossaNet was originally developed by Cédrik Fairon of the University of Paris 7. GlossaNet allows users to generate concordances from daily editions of over 100 newspapers. Once saved, a query lodged with GlossaNet will result in a daily concordance of the news sources chosen. Concordances generated by the system are emailed to users. The newspapers cover twelve European languages, though the news sources used may be from beyond Europe. While one must register to use the site, registration and use is free. To use GlossaNet visit [http://glossa.fltr.ucl.ac.be/](http://glossa.fltr.ucl.ac.be/).

**gold standard** A gold standard dataset or corpus is one whose annotation has been checked and corrected. This is typically carried out in order to evaluate automatic annotation systems, for instance part-of-speech taggers. Different programs can be rated on how close to the gold standard their output is. (The term originally referred to an economic system where the value of gold is the standard of comparison for the value of money.)

**Gothenburg Corpus** A parsed corpus which has encoded both formal and functional properties of constituents, including some aspects of underlying structure. The corpus began as a subset of the Brown Corpus, which was manually analysed by researchers at Gothenburg University. (See also SUSANNE Corpus.)
grammar  As a central concept in linguistics, the word ‘grammar’ has many uses. Some of the uses relevant to corpus linguistics are discussed here.

A grammar is an explanation of how a particular language, or ‘language’ in general, works: what forms occur and what forms do not occur in that language. A descriptive grammar (or reference grammar) catalogues the facts of a language, whereas a theoretical grammar uses some theory about the nature of language to explain why the language contains certain forms and not others. Both these sorts of grammar may use corpus data as a basis for their claims.

Generative grammar is a formal theory of syntax associated with Noam Chomsky. It supposes that knowledge of language takes the form of innate, fixed rules (universal grammar) that generate the syntactic structure of each sentence. This approach to linguistics is generally opposed to the use of corpora for theoretical reasons (see also corpus linguistics, competence-performance). Other theories of grammar allow a greater role for empirical data, for example functional grammar.

In computational linguistics, a set of computer instructions that allow a program to analyse or handle language in some way may also be referred to as a grammar. In some cases these are related to one or another of the formalisms used in theoretical grammar. Some of these are hand-crafted grammars, based on rules designed by a linguist, for example the Constraint Grammar Parser of English (ENGCG). In other cases, the information is derived automatically from a corpus, and in this case may be a statistical or probabilistic grammar rather than consisting of absolute rules. A finite-state grammar is one that models language as a system that can be in one of a limited number of states at any one time; the operation of the grammar is then
described by the actions that cause the system to change from one state to another.

**granularity** Within an **annotation** scheme ‘granularity’ refers to how many categories the scheme distinguishes – that is, how subtle the differences are between the categories. A fine-grained annotation scheme is extremely precise and distinguishes many different categories. A coarse-grained annotation scheme is fairly rudimentary, distinguishing only a few categories that are obviously different from one another. For example, a **part-of-speech tagset** that only distinguished the major parts-of-speech (noun, verb, adjective, adverb etc.) would be very coarse grained. But a tagset that had categories for plural animate common noun, singular animate common noun, plural inanimate proper noun and so on, would be considered extremely fine-grained. Very fine-grained tagsets are often used for languages that mark lots of morphological distinctions on **content words**; see **morphological richness**.

**Gsearch** A system, developed at the University of Edinburgh, UK, that makes it possible to search **corpora** using syntactic queries even though the **corpus** does not contain any syntactic annotation. The system undertakes syntactic parsing using a chart parser to achieve this effect. The system runs under a number of operating systems and is available for use, free of charge, for academic research. For further details of the system and to download it see: http://www.hcrc.ed.ac.uk/gsearch/.

**Guangzhou Petroleum English Corpus (GPEC)** A specialised **corpus** containing 411,612 words of petroleum English from written British and American sources in the 1980s, compiled by the Chinese Petroleum University.
Guidelines for ToBI Labelling  An annotation scheme that provides a means of marking up the prosodic features of spoken English, including such features as intonation and stress. ToBI (Tones and Break Indices) are widely used both in phonetics and speech science. See http://www.ling.ohio-state.edu/research/phonetics/E_ToBI/ for guidelines to the application of the annotation scheme.

hapax legomenon  A Greek phrase (plural hapax legomena, usually abbreviated to hapax) meaning ‘once said’ and is used to describe a word that occurs only once in a text or set of texts. In corpus linguistics, a hapax is a word that occurs only once in a particular corpus. Hapaxes are very common (see Zipf’s law), and have important applications in corpus-based studies: for example, the relative frequency of hapaxes in a corpus or single text can, like the type/token ratio, be used to assess how varied the vocabulary is. The analysis of hapaxes can also be used in forensic linguistics, particularly in authorship attribution or cases of suspected plagiarism.

header  In most corpora, the corpus texts will utilise a header of some kind. This is a set of information about the text (often called metadata). This information is usually encoded in a specified format and occurs at the top of the file, before the text itself – thus the name.

Metadata can also be held separately, in corpus documentation or a database. But including it in a header can be very useful, because the header is usually structured so that it can be read and processed by a computer as well as by a human being. This has several advantages. For instance, if the categorisation scheme for the corpus
texts is expressed in the headers of the various texts, a corpus tool which can handle the markup will allow the user to interact with the categorisation scheme. For example, the user could restrict a concordance to just one genre of texts within the corpus, and the concordancer could carry this out by referring to the category information in the header.

The information in a header can vary greatly. It may include the language of the text (particularly if it is a multilingual corpus) and the type (spoken or written). The text’s category in the categorisation system used for texts in the corpus would also often be included. For a written text, the title, the author, the publisher, and the date and place of publication would normally be included. For a spoken text the header information would often include details of how, when and where the recording was made; whether the conversation was scripted (such as a speech) or spontaneous (like an everyday conversation); and information about the speakers, including their name (but see anonymisation), sex, age, job, what dialect they speak and their relationship to other speakers in the text. There may also be data related to the process of converting the document to a corpus file. The size of the corpus file and its last-modified date are also often given. There could also be some more general information about the corpus, its purpose, and who created and distributed it.

How exactly the information in a header is set out varies very greatly between different corpus encoding formats. In corpora encoded in Standard Generalised Markup Language (SGML) or Extensible Markup Language (XML), the document type definition (DTD) specifies which tags can occur in the header, just as they specify the tags for the text itself. Usually there will be a completely different set of elements defined for use in the
header. These create a structure for the header information not dissimilar to that found in a database. For example, the following is a basic Corpus Encoding Standard (CES) header:

```xml
<cesHeader version="2.0">
  <fileDesc>
    <titleStmt>
      <h.title>Gulliver’s Travels: an electronic sample</h.title>
    </titleStmt>
    <publicationStmt>
      <distributor>Really Big Corpus Project Team</distributor>
      <pubAddress>Linguistics Dept., Anytown University</pubAddress>
      <availability>Worldwide</availability>
      <pubDate>June 2005</pubDate>
    </publicationStmt>
    <sourceDesc>
      <biblStruct>
        <monogr>
          <h.title>Gulliver’s Travels</h.title>
          <h.author>Jonathan Swift</h.author>
          <imprint>
            <pubPlace>London and Dublin</pubPlace>
            <publisher>George Faulkner</publisher>
            <pubDate>1726</pubDate>
          </imprint>
        </monogr>
      </biblStruct>
    </sourceDesc>
  </fileDesc>
</cesHeader>
```

Particularly in SGML and XML corpora, there may be a single additional header for the corpus itself. This will provide information such as the title of the corpus, its size and the terms on which it is distributed.

**Helsinki Corpus of English Texts: Diachronic Part A**

A 1,572,800-word corpus of English covering Old, Middle and Early Modern English. The corpus was developed at the Department of English, University of Helsinki,
Finland by a team led by Matti Rissanen, Ossi Ihalainen and Merja Kytö (see Kytö (1991)). Texts are drawn from the period AD 750 to 1700. The Helsinki Corpus contains approximately 1.6 million words of English dating from the earliest Old English Period (before AD 850) to the end of the Early Modern English period (1710). It is divided into three main periods: Old English, Middle English and Early Modern English – and each period is subdivided into a number of 100-year subperiods (or seventy-year subperiods in some cases). The Helsinki Corpus is representative in that it covers a range of genres, regional varieties and sociolinguistic variables such as gender, age, education and social class. The Helsinki team have also produced ‘satellite’ corpora of early Scots and early American English. The corpus is encoded in COCOA format. For more details of the corpus see http://khnt.hit.uib.no/icame/manuals/HC/INDEX.HTM.

**Helsinki Corpus of Older Scots** A corpus of Scots texts gathered at the University of Helsinki, Finland. The corpus is composed of 830,000 words produced in the period 1450–1700, marked up in COCOA format. See http://khnt.hit.uib.no/icame/manuals/HC_OSCOT/BIBLIO.HTM for more details.

**hidden Markov model** A statistical tool that is used for modelling generative sequences. A Markov model calculates the most likely sequence of categories given a sentence. The model is referred to as ‘hidden’ because the actual categories are unknown: for any sequence of words, there are multiple possibilities in terms of the way that they could be encoded. The hidden Markov model has been used in corpus linguistics as a model for probabilistic disambiguation of corpus annotation, for
example, to carry out automatic part-of-speech tagging of corpora. (See also Baum–Welch algorithm, Maximum Likelihood principle, Viterbi algorithm.)

**historical corpus** A corpus consisting of texts from one or more periods in the past. Such a corpus might be used to investigate the language of an earlier period in the same variety of ways that can be employed to investigate contemporary language using corpora; however, an additional application of historical corpus data is in studying how language changes over time. Examples of historical corpora include the Lampeter Corpus of Early Modern English Tracts, the Helsinki Corpus of English Texts: Diachronic Part, the Newdigate Letters corpus, and the Representative Corpus of Historical English Registers (ARCHER).

While many historical corpora only include texts from a single time period (for example, the Newdigate Letters), one type of historical corpus (called a diachronic corpus) would include texts sampled from different times over a longer period of history. The Helsinki Corpus is an example of this type.

**homogeneity** When discussing corpus design, a corpus is said to be homogenous if the text it contains has been drawn from one source or a narrow range of sources. For instance, a corpus consisting of the novels of a single writer would be extremely homogenous. A corpus of articles drawn from different sections of a single daily newspaper over three years would be less homogenous; a corpus sampling from several different newspapers of different countries, would be less homogenous yet. The least homogeneous corpora are those that aim to be representative of the language in general, including a wide range of text types and possibly speech as well as
writing. For example, the Bank of English (BoE) is not very homogenous at all.

In most cases, there will be less variation in the language of a homogenous corpus than in a heterogeneous corpus. If the researcher’s goal is to study a particular, narrowly-defined variety of language, then a homogenous corpus would be useful. If the researcher is aiming to study how a given language works as a whole, then a general, broadly representative corpus would be more appropriate.

**homograph** An ambiguous word form: two lexemes, or two inflectional forms of a single lexeme, which have the same shape in the written language. For instance, *can* (‘be able to’) versus *can* (‘metal container’), or *read* (as in ‘I will read it’) versus *read* (as in ‘I have read it’). Homographs in a text or corpus can create problems when running a concordance search: researchers making investigations focused on the modal verb *can*, probably do not want to have to look at examples referring to metal containers. Resolving the ambiguity caused by homographs is one application of part-of-speech tagging and semantic tagging.

**Hong Kong University Of Science And Technology (HKUST) Corpus** The HKUST corpus is a 5-million-word learner corpus containing essays and exam papers written in English by Cantonese students. See Milton and Tong (1991).

**HTMASC** A tool that strips corpus texts of HTML encoding. The tool can be run across multiple files and is as useful on documents gathered from the web as it is on corpus texts. Available free of charge from http://www.bitenbyte.com/.
Human Communication Research Centre (HCRC) Map Task Corpus Developed by a team headed by Henry Thompson at the HCRC, University of Edinburgh, UK. The Human Communication Research Centre is an interdisciplinary research centre based at the Universities of Edinburgh and Glasgow, established in 1989 with funding from the UK Economic and Social Research Council (ESRC). It has produced the 1,470,000-word Map Task Corpus (Anderson et al. 1991), which consists of sixteen hours of unscripted speech from 128 conversations in an experimental setting. These were made available, along with the tasks used in the project as well as sound recordings of the original conversations, via the Linguistic Data Consortium.

Humanities Computing Yearbook A resource, published in 1991, which gives a survey of research in a range of fields connected to computing, for instance sources of corpora and centres for archives and research. See Lancashire (1991).

human language technology (HLT) see natural language processing

hybrid tagger An automatic tagger which uses a combination of probabilistic and rule-based disambiguation in order to making tagging decisions on a text. As Garside and Smith (1997: 102) argue, hybrid taggers are effective because they offer the best of both worlds.

Hyderabad Corpus A corpus of written British English collected by H.V. George and over 200 assistants from a range of sources (novels, plays, newspapers). The Hyderabad Corpus consists of about half a million words and was collected in India. George was one of the
pioneers of corpus-based research in the 1960s; one of his publications included a report on a verb-frequency count which was one of the earliest substantial studies to use corpus-based frequency data in grammatical description (George 1963).

**Hypertext Markup Language (HTML)** An application of Standard Generalised Markup Language (SGML) for encoding hypertext documents. Hypertext documents can contain links to other documents, creating a network of texts. HTML has become the foundation of the World Wide Web, although it was not originally designed for that purpose. A more recent language, XHTML, reproduces HTML as an Extensible Markup Language (XML) application; however, HTML is still widely used on the web and for other purposes.

Like HTML, most modern corpus markup schemes are based on SGML, making it possible to use HTML documents from the web as a source of texts for corpora. However, the complexity of the HTML codes used in many web pages means that converting an HTML document to a well-formed corpus text is rarely straightforward.

**IBM Manuals Treebank** A skeleton-parsed corpus of computer manuals consisting of about 800,000 words.

**ICAMET** A corpus of Middle English prose built at the Department of English, University of Innsbruck, Austria by a team led by Manfred Markus. Divided into three parts (the prose corpus, the letter corpus and the varia corpus) the corpus is available from the ICAME archive in CD-ROM. See [http://nora.hd.uib.no/icame/newcd.htm](http://nora.hd.uib.no/icame/newcd.htm).
imaginative prose Language consisting of texts (written and spoken) that generally fall under the remit of ‘fiction’. This would include literature and other forms of creative writing (novels, plays, poetry, songs). See informative prose.

Index Thomisticus A 10.5-million-word database compiled by Robert Busa from 1962 to 1966 and published in 1973. It contained almost forty volumes of the works of the philosopher and scholar Saint Thomas Aquinas (1225–1274). The database is a reference for medieval Latin.

indexer A program that creates an index for a corpus, so that it can be used with a concordancer that requires pre-indexing.

indexing Searching through millions and millions of words in a corpus for a concordance can be time-consuming even for a very fast computer. To speed this process up, some concordancers (for example WordCruncher, Xaira) use an index – a special file (or files) which gives the concordancer instructions on where to find all the instances of a particular word in the corpus. When a search is then run, the program looks up the target word in the index and goes straight to the examples in the corpus, rather than checking every word in every text from beginning to end. This makes searches much faster; the drawback is that the index must be created before the concordancer can analyse the text in the corpus, which can be a lengthy process.

information extraction The process whereby a computer program is used to isolate particular information from running text documents. The information, once found,
might be marked up in the text, or extracted and stored in a database. The techniques used for information extraction are often developed using corpora.

**information retrieval** The study and use of computers as a means to isolate particular information from a large amount of data, such as a corpus, a database, or a network of text such as the World Wide Web. A web search is an example of information retrieval. Corpora are often used in the development and testing of information retrieval techniques.

**informative prose** Language consisting of text (normally written) that is generally intended to provide information (rather than, say, entertainment). Informative prose could cover genres such as science, arts, commerce and finance. See imaginative prose.

Institut für Maschinelles Sprachverarbeitung (IMS) Corpus Work Bench Developed by IMS at the University of Stuttgart, Germany, this is a powerful concordance package that allows complex queries to be run on monolingual and parallel corpora. The corpus is markup aware and can read texts marked in Standard Generalised Markup Language (SGML). The concordancer is also able to handle large corpora (for instance 200 million words or more). The system runs on the Unix platform. It is not currently Unicode compatible, however. See Christ (1994) for more details of the concordancer. The concordancer is available as freeware; see http://www.ims.uni-stuttgart.de/projekte/CorpusWorkbench/.

Interactive Spoken Language Education (ISLE) Corpus A corpus of spoken L2 English produced by learners with
German and Italian L1 backgrounds. The corpus was developed at Leeds University, UK, by a team led by Eric Atwell and Clive Souter. The corpus contains transcriptions of the speakers’ responses to a number of tasks (e.g. reading simple sentences, giving answers to multiple choice questions). The corpus is composed of 11,484 transcribed utterances and the speech recordings from which the transcriptions were made. Much of the data has been annotated to mark various pronunciation errors. The corpus is available from ELRA. See Atwell et al. (2003) for further details.

interlanguage A term devised by Selinker in 1972, referring to the linguistic rules and patterns that learners of a second language build for themselves. Interlanguage is usually markedly different from a person’s first language and the target language. The study of interlanguage is one of the aims of building a learner corpus. See Selinker (1974), second language acquisition.

International Computer Archive of Modern and Medieval English (ICAME) An international organisation of linguists and information scientists working with English machine-readable texts. ICAME publishes a yearly journal and builds archives of English text corpora which are held at Bergen, Norway. The ICAME corpus collection consists of The Brown Family of written English corpora as well as a number of spoken corpora including the London–Lund Corpus, the Bergen Corpus of London Teenage English (COLT) Corpus and the Lancaster/IBM Spoken English Corpus. Since 1979 ICAME have held an annual conference, which usually occurs in May/June.
International Computer Archive of Modern and Medieval English (ICAME) Word Lists Four ready-made word lists are available for downloading from the International Computer Archive of Modern and Medieval English (ICAME) archive. There are word frequency lists for the Freiburg–LOB Corpus of British English (FLOB) and Freiburg–Brown Corpus of American English (Frown) corpora, as well as word frequency lists for the Lancaster–Oslo/Bergen (LOB) and Brown corpora. The wordlists for FLOB and Frown simply give the word frequency followed by the word in question, but the LOB and Brown wordlists give word frequency by word plus part-of-speech tag combination, hence the frequencies for brown as an adjective and as a proper noun are given separately. See http://khnt.hit.uib.no/icame/wordlist/ to download the wordlists.

International Corpus of English (ICE) The ICE project was initiated by Sidney Greenbaum in 1990 (Greenbaum, 1991). The goal of the project was to develop a series of comparable corpora of different Englishes. The hope was that by building corpora such as this it would be possible to compare and contrast a host of varieties of global English. In order to achieve this comparability, for each variety of English covered by the project the same sampling frame was adopted. Each corpus is constructed from 500 (300 spoken language and 200 written language) 2,000 word samples, 300 samples from spoken language and 200 from written language, to produce a 1,000,000 word corpus for each variety of English covered. At the time of writing, corpora for the following varieties of English are available via ICE: British, East African, Indian, New Zealand, Philipino and Singaporean English. Further corpora are planned, with corpora of American, Australian, Canadian, Hong
Kong, Irish, Jamaican, Malaysian, South African and Sri Lankan English under development. While the project is coordinated currently by Gerry Nelson at the Department of English Language and Literature, University College London, there are a range of teams directly involved with the construction of the corpora themselves. An example of research output based on the ICE project is Greenbaum (1996). To find out more about the project and corpora, see http://www.ucl.ac.uk/english-usage/ice/.

International Corpus of English Corpus Utility Program (ICECUP) A corpus analysis tool developed for use with the International Corpus of English. It is designed for the exploitation of syntactic structures in parsed text, such as the ICE corpora. ICECUP can perform a concordance using a Fuzzy Tree Fragment (FTF) as its search criterion, displaying syntactic information from the corpus parsing in the concordance lines. ICECUP can also display the grammatical trees in the corpus graphically, rather than just as text interspersed with syntactic tags. See http://www.ucl.ac.uk/english-usage/ice-gb/icecup.htm.

International Corpus of Learner English (ICLE) A learner corpus, consisting of 2.5 million words of English written by learners from different European mother-tongue backgrounds. The constituent parts of ICLE include the L1 English sub-corpus named LOCNESS, as well as a number of learner sub-corpora, among them Chinese, Czech, Dutch, Finnish, French, German, Japanese, Spanish, Swedish and Polish. Essays contained in ICLE are usually about 500–1,000 words in length and are on literary topics or those generating debate and argument.
They are by adult writers who are at least in their third year of English studies. See Granger et al. (2002b).

**International Journal of Corpus Linguistics** One of the most important journals in the field of corpus linguistics. It presents papers on many different applications of corpora, including lexicography, linguistic theory, and natural language processing (NLP). It is published by John Benjamins.

**Intonational Variation in English (IviE) Corpus** A corpus consisting of thirty-six hours of recordings of the speech of teenagers in the UK with associated prosodically annotated transcriptions for part of the corpus. The corpus was built at Oxford University, UK, by a team led by Esther Grabe and Francis Nolan. Nine urban varieties of modern English spoken in the British Isles are represented in the corpus with recordings being made in Belfast, Bradford, Cambridge, Cardiff, Dublin, Leeds, Liverpool, London and Newcastle. As well as recording monolingual English speakers, the corpus builders also recorded the speech of some bilinguals. The corpus data is composed largely of elicited rather than spontaneous speech. See Grabe and Post (2002) for more details. The corpus is available to download at http://www.phon.ox.ac.uk/~esther/ivyweb/.

**introspection** Introspective judgements about language arise from the linguist’s thought alone; they are not based on the observable, external facts of language. There is much disagreement on how great a role introspection and intuition should have in our study of language. Some schools of linguistic theory consider the linguist’s intuitions about what is grammatical and what is not to be the primary focus of what linguistics ought to be
explaining. On the other hand, some linguists (including some corpus linguists) reject any role for introspection at all, suggesting that work on language should be based solely on analysis of naturally occurring data. Yet another position (also held by many corpus linguists) is that introspection and intuition are valuable guides in telling us what to look for in empirical data, and how to interpret what we find – but the data itself is indispensable to make sure our ideas are grounded in reality. (See also empiricism, corpus linguistics, intuitive data.)

intuitive data Also introspective or invented data. Unlike attested or modified data which are based on real life examples, intuitive data are invented to illustrate a particular linguistic point (Stubbs 2001: xiv).

item A searchable term. Items can be single words, for example ‘dog’, but they can also consist of multi-word phrases ‘the dog’ or either/or constructions such as ‘dog/cat’ (dog or cat) ‘dog*’ (any word beginning with dog: dogs, dogged, doggy etc.). See wild card.

Java A computer programming language that is often used for corpus tools. A key feature of Java software is that it can run on many different computer systems, as long as those systems are running the Java Virtual Machine. Software written in other languages, such as the C programming language, can only be run on one type of system; the program must be recompiled to run on a different system.

Jiao Tong University Corpus for English in Science and Technology A specialised corpus containing approxi-
mately 1 million words of written English from the genres of science and technology organised into sub-genres including computers, metallurgy, machine building, chemical engineering etc. The corpus was compiled by Yang Huizhong at Jiao Tong University and was constructed in order to facilitate the lexical analysis of scientific registers of English.

**Journal of Quantitative Linguistics** The official journal of the International Quantitative Linguistics Association; the *Journal of Quantitative Linguistics* published by Routledge presents papers on mathematical and statistical approaches to the analysis of language. A great deal of the research published in the journal involves corpora in some way.

**JUMAN** A program which can analyse the morphology of Japanese corpus texts. The system is designed so that it can be extended by users. It was developed at the University of Kyoto, Japan, by a team led by Maokoto Nagao (Kurohashi and Nagao, 1998). The system is available to download for use free of charge, and to trial on-line at http://www.kc.t.u-tokyo.ac.jp/nl-resource/juman-e.html.

**keyboarding** One of the most basic (and slowest) ways of text capture (see compilation), keyboarding involves simply typing the contents of a text directly into a PC using word-processing software. Because it is non-automatic, and therefore expensive and time-consuming, keyboarding is normally only adopted in corpus building when no other option is available (as, for instance, when the texts cannot be scanned because the quality of the
original is too poor, or if the text is written using a character set that the scanner does not recognise – which is still unfortunately the case for some of the world’s writing systems). Additionally, spoken texts normally need to be keyboarded, particularly in cases involving accurate or detailed transcriptions of speech, although it is hoped that future generations of voice recognition software may help to quicken this procedure.

key keyword A potential issue with a keyword analysis is that a word may appear to be key simply because it occurs extremely frequently in a very small number of texts in a particular corpus. For example, if a corpus consists of 1,000 equal-sized files, and the word ironmonger only appears fifty-eight times in one single file called ‘The history of the ironmonger’, a keyword analysis may show this word to be key. In order to establish whether a word is key and representative of the corpus as a whole, a dispersion plot of the word across the corpus could be examined or a list of key keywords – words that are key in multiple texts in the corpus – could be calculated therefore allowing for the potentially skewing nature of disproportionate representation.

keyword

1. A word which appears in a text or corpus statistically significantly more frequently than would be expected by chance when compared to a corpus which is larger or of equal size. Usually log-likelihood or chi-squared tests are used to compare two word lists in order to derive keywords. Keywords can be calculated automatically using Scott’s WordSmith Tools program. Commonly found keywords include (1) proper nouns; (2) grammatical words that are often indicators of a particular stylistic profile; (3) lexical
words that give an indication of the ‘aboutness’ of a text. For example, the following is a list of keywords found when comparing a small corpus of essays written by learners of English with the 1-million-word Frown Corpus of L1 American English: my, I, very, nice, good, big, holiday, dog, hobby, lovely, tenis, beatiful, voleyball. This list reveals to us what is distinctive about the learner essays – for instance, significant spelling errors (tenis, beatiful, voleyball), over-reliance on a small set of simple adjectives (nice, good, lovely, big), the main essay topics (dog, holiday, hobby) and the fact that the essays are generally written as first person narratives (I, my). (See also key keywords.)

2. Any word that is considered ‘focal’ in a text, but not through statistical measures (see, for example, the discussion by Stubbs (1996: 166)).

3. A word which is made the subject of a concordance (see, for example, Kennedy 1998: 251).

key word in context (KWIC) see concordance

kfNgram A freeware Windows-based n-gram generator. The system allows users to generate a frequency list of all n-grams (either character or word n-grams) present in a corpus. See http://miniappolis.com/KWiCFinder/kfNgramHelp.html to download the program.

Kolhapur Corpus A first generation corpus which consists of approximately 1 million words of Indian English, drawn from materials after 1978. The texts are selected from fifteen categories, making it parallel to the Brown Corpus. It was developed by Geoffrey Leech with the financial assistance of Shivaji University and the University Grants Commission.
Korean Treebank  A treebank of the Korean language developed at the University of Pennsylvania, USA. The corpus consists of military training manuals that have been parsed using a scheme similar to that used for the Penn English Treebank. The corpus contains 54,366 words in 5,078 sentences. See http://www.cis.upenn.edu/~xtag/koreantag/ for more details.

Kučera and Francis Word List  A word list of American English, produced in printed form, based upon the Brown Corpus. See Kučera and Francis (1967).

KWICFinder  A web-based system (a personal internet search agent) developed by William H. Fletcher of the United States Naval Academy that allows one to conduct concordance searches across the World Wide Web. Using the web as a corpus enables users to access very large, unordered, text collections in a range of languages. The system is Windows based and requires the use of Internet Explorer. The service is available free of charge at http://www.kwicfinder.com.

L1  A person’s first language, normally the language that they learn as an infant and are most competent at using. See learner corpus, language teaching.

L2  A person’s second language, usually one that they will learn at school or as an adult. L2 is often influenced by L1, so that aspects of the L2 that are similar to L1 will be easier to learn than aspects that are different. Most people are not normally as proficient in their L2 as in their L1. See learner corpus, language teaching.
Lampeter Corpus of Early Modern English Tracts The Lampeter Corpus is a diachronic corpus of English, covering the period 1640–1740. The corpus samples texts from a range of genres (economy, law, miscellaneous, politics, religion and science) over this period, taking samples at time frames of roughly ten years. The corpus was constructed at the University of Chemnitz by a team led by Josef Schmied (see Schmied 1994), and has been used in the diachronic study of variation in English (see, for example, Claridge 1997). The corpus is around 1,100,000 words in size and is encoded with TEI markup. It is available from the International Computer Archive of Modern and Medieval English (ICAME) Archive.

Lancaster Corpus of Children’s Project Writing (LCPW) A corpus of project writing undertaken by British school children (Smith et al. 1998). The corpus is made up of the written project work produced by a class of thirty-seven school children in the UK. These projects were selected and researched independently by the same children over a period of three years. The LCPW is a computerised representation of the primary data and other related material. It attempts to capture as much useful information as possible about the original projects, such as their appearance, their textual content and grammatical characteristics, along with what the children and others said about them. To access the corpus visit http://bowland-files.lancs.ac.uk/lever/index.htm.

Lancaster Corpus of Mandarin Chinese (LCMC) A 1-million-word corpus of Mandarin Chinese created in the early 2000s using data sampled in the early 1990s, developed at the University Centre for Computer
Corpus Research on Language (UCREL), that has been part-of-speech tagged and is designed as a Chinese match to the Freiburg–LOB Corpus of British English (FLOB). The corpus is encoded in Unicode and marked up in Extensible Markup Language (XML).

Lancaster/IBM Spoken English Corpus (SEC) A corpus of approximately 52,000 words of contemporary spoken standard British English of adults sampled between 1984 and 1987 from categories including radio news, university lectures, religious broadcasts and poetry. The material is available in orthographic, phonetic and prosodic transcription (including features of stress, intonation and pauses) and in two versions with grammatical tagging. It is part of the International Computer Archive of Modern and Medieval English (ICAME) collection of corpora. See Knowles (1993).

Lancaster–Leeds Treebank A manually parsed sub-sample of the Lancaster–Oslo/Bergen (LOB) Corpus (about 45,000 words) showing the surface phrase structure of each sentence. The Treebank was manually parsed and prepared by Geoffrey Sampson.

Lancaster–Oslo/Bergen (LOB) Corpus A first generation corpus compiled by researchers in Lancaster, Oslo and Bergen. It consists of 1 million words of British English texts from 1961 derived from fifteen text categories. It is the British counterpart to the American Brown Corpus and is available through the International Computer Archive of Modern and Medieval English (ICAME).

Lancaster Parsed Corpus A parsed subset of the Lancaster–Oslo/Bergen (LOB) Corpus developed at Lancaster University, UK, by Geoffrey Leech, Roger
Garside and Tamas Varadi. The corpus has been manually skeleton parsed. Samples of text were parsed from each category of LOB, providing a corpus with a total of 11,827 parsed sentences (134,740 words). The corpus is available from the ICAME archive. See Leech and Garside (1991) for more details of the parsing process.

language engineering see natural language processing

language independent tagger A tagger that is not restricted to one particular language (although there are often some language restrictions, for example the tagger may only function with related writing systems). Some language-independent taggers require users to specify their own language-specific tagsets and also need pre-tagged sample texts in order to create rules or statistics. TreeTagger is an example of a language independent part-of-speech tagger developed at the Institute for Computational Linguistics at the University of Stuttgart.

language teaching Corpora can be used in order to aid language teaching in a range of ways. For example, concordancing packages can be employed in Computer-Assisted Language Learning (CALL) or data-driven learning exercises, whereby the student acts as a ‘language detective’, using inductive reasoning to make his or her own discoveries. Corpora can be used in order to improve curriculum design by examining which forms are more frequent (and therefore worth focusing on in more detail or earlier) and they can inform dictionary and grammar design by showing frequencies of different types of uses or revealing unexpected uses of words. Additionally, a learner corpus can be employed in order to build a profile of common earner errors and over-and under-uses of words and grammatical patterns.
See lexical syllabus, pedagogic corpus, while Hunston (2002: 170–216) and Kennedy (1998: 280–94) provide useful overviews.

learner corpus James (1992: 190) writes ‘The really authentic texts for foreign language learning are not those produced by native speakers for native speakers, but those produced by learners themselves.’ A learner corpus consists of language output produced by learners of a language. Most learner corpora consist of written essays using pre-set topics produced in language-teaching classrooms.

Learner corpora are useful in studies of second language acquisition as they help to build a profile of learner language, particularly in terms of error analysis or for ascertaining what words, phrases, parts-of-speech etc. are over- or under-used by learners, compared to native speakers. For example Gillard and Gadsby (1998) found that learners tend to overuse high-frequency adjectives like nice, happy and big whereas low-frequency adjectives like enormous, massive and huge occur less often when compared to native speakers. They also used the Longman Learner Corpus to create dictionary entries (in the Longman Essential Activator) containing additional help boxes for about 1,200 words that learners tended to find problematic, for instance ‘don’t say peoples, people is a plural noun’. For more information see Granger (1998) and Granger et al. (2002a).

Learning the Prosody of a Foreign Language (LeaP) Corpus
A phonetically annotated corpus of largely L2 speech produced by a team led by Ulrike Gut at the University of Bielefeld, Germany. The corpus contains a mix of elicited and spontaneous speech from L2 speakers of
German and English (131 speakers) and some L1 speakers of English and German (eighteen speakers). Twelve hours of recordings are present in the corpus in total. Thirty-two L1 backgrounds are represented in the L2 section of the corpus. The L2 speakers are of a range of levels of L2 proficiency. For further details see Milde and Gut (2002). The corpus is available from Ulrike Gut (ulrike.gut@anglistik.uni-freiburg.de).

Leeds Corpus of English Dialects A corpus based on recordings made of elderly dialect-speakers in rural England in the 1960s. These were transcribed and part-of-speech tagged in the late 1990s. The corpus is published by the University of Leeds.

**lemma** The canonical form of a word (the correct Greek plural is lemmata, although some people write the plural as lemmas and may consider lemmata to be somewhat pedantic). Francis and Kučera (1982: 1) define it as a ‘set of lexical forms having the same stem and belonging to the same major word class, differing only in inflection and/or spelling’. Lemmatised forms are sometimes written as small capitals, for example the verb lemma walk consists of the words walk, walked, walking and walks. In corpus studies, word frequencies are sometimes calculated on lemmata rather than types; words can also be given a form of annotation known as lemmatisation.

**lemmatisation** A form of automatic annotation that is closely allied to the identification of parts-of-speech and involves the reduction of the words in a corpus to their respective lexemes. Lemmatisation allows the researcher to extract and examine all the variants of a particular lexeme without having to input all the possible variants,
and to produce frequency and distribution information for the lexeme. In the following list the second column of words have been lemmatised. See Beale (1987).

He he
studied study
the the
problem problem
for for
a a
few few
seconds second
and and
thought think
of of
a a
means means
by by
which which
it it
might may
be be
solved solve

LEXA A corpus management and analysis tool, developed by Hickey (1993). LEXA is MS-DOS compliant and contains a suite of sixty interrelated programs for linguistic retrieval and analysis. LEXA allows the user to perform a number of (mainly non-parametric) statistical tests and can be used on any American Standard Code for Information Exchange (ASCII) formatted text. It also carries out lemmatisation and contains a tagger.

lexeme The base form of a word. For example, the forms kicks, kicked, kicks and kicking would all be reduced to
the lexeme *kick*. Together, these variants form the lemma *kick*.

**lexical density** Lexical density is a means of calculating the proportion of lexical words in a text or corpus, by expressing it as a percentage (Ure 1971). Unfortunately there are several interpretations of how lexical density is calculated and what exactly it measures. For example, it is sometimes calculated by dividing the number of lexical or content words (nouns, adjectives, adverbs and main verbs) in the text by the total number of words (or tokens) and then multiplying by 100 (Stubbs 1996: 71–3.). However, it can also be calculated by dividing the number of unique lexical words in the text by the total number of words and then multiplying by 100 (sometimes removing the function words first, sometimes not). Another strategy (Coulthard 1993) is to count the number of lexical words and then divide by the number of clauses. A fourth strategy is simply to divide the number of unique words by the total number of words (making lexical density the same as the type/token ratio).

Because of such conflicting accounts, it is good practice to state exactly which technique has been used in calculating lexical density.

Ure (1971) (using the first measure described) showed that written texts tend to have a lexical density of over 40 per cent, whereas spoken texts tend to be under 40 per cent. Spoken texts are predictable because they tend to focus on a person’s immediate physical environment and therefore contain more repetitions. Written texts are less restricted and are therefore less predictable. (See also lexical richness.)

**lexical grammar** The analysis of the behaviour of particular words in terms of their grammatical context. Corpus-
based analysis has supported the concept of a lexical grammar based on the view that it is difficult to make a strict distinction between lexicon and grammar. This is because lexical items must be characterised in terms of their distributions in grammatical patterns, most patterns occur with particular classes of lexical items, and many grammatical patterns are, as with lexical items, specific and therefore must be learned. See Hunston and Francis (1999).

**lexical richness** Sometimes used simply to refer to lexical density, lexical richness can also refer to a measure calculated by counting the number of lexical words in a text that occur only once (see *hapax legomenon*). See Woolls and Coulthard (1998).

**lexical syllabus** A syllabus for language teaching suggested by Sinclair and Renouf (1988) that can be built using frequency-based information derived from a corpus. A lexical syllabus is based on the argument that it makes sense to teach the most frequent words in a language first as these words tend to have a wide variety of uses. Therefore students will acquire a flexibility of language easily while also covering the main points of grammar in a language without needing to memorise a large vocabulary. Sinclair and Renouf suggest that high-frequency multi-functional words like *make* and *back* are therefore worth learning early.

**lexicography** An application of corpus linguistics that has aided the accuracy of dictionary citations. One of the earliest corpus-based dictionary projects was the *American Heritage Intermediate (AHI) Corpus* based on a 1969 survey of US schools. It was the forerunner for later projects in the 1980s such as the *Collins Cobuild*
English Language Dictionary. Corpus-based approaches can help dictionary creators to discover many more meanings and uses of lexical items. For example, the second edition of the Longman Dictionary of Contemporary English was written without reference to corpus data, while the third edition did use corpus data. The second edition gives twenty meanings of the word know, whereas the third edition has over forty meanings. In the 1987 edition, the phrase I know is described as occurring when people suddenly have an idea. But in the 1995 edition, there are other uses of I know, derived from the examination of corpora, for example to show agreement: ‘I’m tired’, ‘I know’. Many dictionaries are now created with the help of corpus-based analysis.

lexicon A list of words. In corpus linguistics, this usually refers to a list of words held on computer, sometimes with extra information about each word on the list. But one may also speak of ‘the lexicon of a language’. This refers to all the words that exist in that language – which cannot ever be fully listed in practice, since new words are being created all the time.

Lexicons are an important product of corpus linguistics: a word list from a corpus can be used as the basis for dictionary creation, for instance. But lexicons are also an important resource for automated corpus analysis. Part-of-speech-tagging and semantic tagging usually depend on extensive computer lexicons containing lists of word forms and the possible tags they can have. Using a lexicon means that the tagger’s less reliable ‘guesswork’ methods only need to be used for word forms that are not in the lexicon. These tagging lexicons may be ‘handcrafted’, that is, written by a linguist relying on their knowledge of the language. Alternatively, they may be ‘induced’ by automatically scanning a corpus for all
the word-and-tag combinations that it contains.

The ‘mental lexicon’ is a human being’s knowledge of the words in their language: their forms and pronunciation, their grammatical category, what they mean and how they are related to one another (for example by synonymy, antonymy, collocation, colligation and other links).

**Linguistic DataBase (LDB)** A database system developed by the Tools for Syntactic Corpus Analysis (TOSCA) group at Nijmegen University. It includes the Tools for Syntactic Corpus Analysis (TOSCA) Corpus and the Nijmegen Corpus. See van Halteren & van den Heuvel (1990). (See also treebank.)

**Linguistic Data Consortium (LDC)** An open consortium of universities, companies and government research laboratories, hosted at the University of Pennsylvania. It creates, collects and distributes speech and text databases, lexicons, and other resources for research and development purposes.

**Link Grammar Parser** Developed by a team at Carnegie Mellon University (Sleator and Temperley, 1991), the Link Grammar Parser is an automatic parser which is available free of charge for non-commercial research. See http://www.link.cs.cmu.edu/link/.

**log-likelihood** A test for statistical significance, similar to the chi-squared measure that is often used in corpus analysis, for example for collocation or keyword analysis. Log-likelihood is sometimes called $G$-square or $G$ score. Like chi squared, log-likelihood compares the observed and expected values for two datasets. However, it uses a different formula to compute the statistic that is used to
measure the difference. The following formula is used to calculate log-likelihood:

\[ G^2 = 2 \sum x_{ij} (\log_e x_{ij} - \log_e m_{ij}) \]

Where \( x_{ij} \) are the data cell frequencies, \( m_{ij} \) are the model cell frequencies, \( \log_e \) represents the logarithm to the base e, and the summation is carried out over all the squares in the table (Oakes 1998:42). (See also Dunning (1993).)

London–Lund Corpus (LLC) The LLC is derived from the Survey of English Usage (SEU) at University College London and the Survey of Spoken English (SSE) at Lund University. The LLC consists of 100 spoken texts of British speakers consisting of approximately 500,000 words. It was compiled by Jan Svartvik between 1975 and 1981 and between 1985 and 1988. It is part of the International Computer Archive of Modern and Medieval English (ICAME) collection of corpora. See Svartvik (1990a).

Longman Corpus Network A group of databases, including the Longman Learners’ Corpus, the Longman Written American Corpus, the Longman Spoken American Corpus, the Spoken British Corpus and the Longman/Lancaster Corpus.

Longman Learners’ Corpus Ten million words of written text produced by students learning English as a second or foreign language. It contains material produced by students from many different language backgrounds and at a variety of levels of skill. The corpus was compiled from essays and exam papers written by students and has been exploited to study the types of errors that
learners of English make. These results have been used by the publisher Longman to enhance their learner’s dictionary. (See also learner corpus, lexicography.)

Louvain International Database of Spoken English Interlanguage (Lindsei) A corpus of elicited L2 spoken English developed by an international team led by Sylviane Granger at the Université Catholique de Louvain. The data gathered in this way are available as original sound recordings and orthographic transcriptions. The aim of Lindsei is to represent as many L1 backgrounds of L2 English speakers as possible. The first corpus to be completed was a 100,000-word corpus of L1 French speakers of L2 English. Corpora covering German, Greek, Italian, Japanese, Polish and Spanish L1 speakers of L2 English are now also available. For an example of research based upon Lindsei see De Cock (2000).

LT Chunk Produced by the Language Technology Group, this software takes English part-of-speech tagged text and indicates where the major constituents (noun phrases and verb phrases) are in the sentences in the corpus. While limited (for example post-modifying prepositional phrases are excluded from the noun-phrase chunks) the software is nonetheless of use as a fairly reliable means of exploring the lexical constituents of noun and verb phrases. See http://www.ltg.ed.ac.uk/ for further details.

LT POS A part-of-speech tagger for English available from the Language Technology Group. This tagger can be run in combination with LT Chunk. Available free of charge for non-commercial research. See http://www.ltg.ed.ac.uk/ for further details.
LUCY  A parsed corpus of modern British English writing produced by a team led by Geoffrey Sampson at the University of Sussex, UK. The corpus is arranged into seven sections with two sections being composed of professionally authored and edited work (taken from the British National Corpus (BNC)), one section being composed of the writings of young adults and four sections consisting of the writing of children of different age groups (9-, 10-, 11- and 12-year olds). The corpus is 165,000 words in size. See Sampson (2003) for further details.

Machine-Readable Spoken English Corpus (MARSEC) A revised version of the Lancaster/IBM Spoken English Corpus. This version of the corpus contains the original recordings as well as time alignment information to link the transcriptions and recordings. See Roach et al. (1994).

Machinese Programmes (Connexor) A suite of annotation programs available from a Finnish company, Connexor. The team who created the software has also worked on the English Constraint Grammar Parser. The Connexor programs work on Danish, Dutch, English, Finnish, French, German, Italian, Norwegian, Spanish and Swedish. The available programs allow for part-of-speech tagging, dependency parsing, semantic analysis (English only) and name/term identification (English and Finnish only). See http://www.connexor.com/ for more details.

machine translation Machine translation is the study of computer programs that can translate a text automati-
cally into another language. As such it is an important field within computational linguistics. Machine translation is difficult to do well. It is not possible to translate a text simply by replacing each word with the corresponding word in the other language: a human translator uses a wide range of information including grammar, semantics, pragmatics and world knowledge. Some approaches to machine translation use examples from corpora (including parallel corpora) to simulate this knowledge-base. A more easily achievable goal than fully automated translation is machine-aided translation, in which the program assists a translator by carrying out the ‘easy’ bits of the translation, but leaves the difficult decisions to the human being. (See also alignment.)

Mann Whitney test  A non parametric test that is used to test for differences between the medians of two independent groups. It is sometimes known as the Wilcoxon rank sum test and is based on assigning values to observations, based on putting them in rank order. It is considered to be more robust than the t-test (which is its parametric equivalent), but also less powerful.

Map Task Corpus  see the Human Communication Research Centre

markup A term for the special codes used to annotate a corpus; or, the process of adding these codes to a text. See annotation, encoding, tagging.

Masterpiece library A database of 1,338 literary texts, including the Bible, the Koran, the works of Shakespeare and US government documents.
MATE workbench A program designed to assist in the process of building and using annotated speech corpora. The program was developed by a consortium of European researchers led by Laila Dybkjær at Odense University, Denmark. See Carletta and Isard (1999) for more details.

Maximum Entropy Part-of-Speech Tagger (MXPOST) A part-of-speech tagger for English, available for use free of charge for academic research developed by Adwait Ratnaparkhi at the University of Pennsylvania, USA. The tagger is based on a so-called maximum entropy model. See Ratnaparkhi (1999) for more details of the maximum entropy approach to natural language analysis.

Maximum Likelihood principle In part-of-speech taggers based on a hidden Markov model the Maximum Likelihood principle is one way of selecting a tag for an ambiguously-tagged word. The tag chosen is the one that is most probable, when the probabilities of all the possible sequences of tags, as calculated using the Markov model, are added together. This approach is in contrast to the Viterbi algorithm, where a probable sequence of tags is selected, rather than a probable tag for each word.

Measuring Text Reuse (METER) Corpus A corpus in which syndicated news stories produced by the Press Association in the UK are linked to a number of versions of that news story as printed in the British press. The newspapers represented in the corpus include the Daily Express, the Daily Mirror, the Daily Star, The Daily Telegraph, the Guardian, the Independent and The Times. The corpus allows users to explore how a news
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story is taken from a news source and edited for publication. The texts in the corpus were all taken from the period July 1999 to June 2000. The corpus contains 772 texts from the Press Association and 944 newspaper stories, amounting to 535,040 words and is available from the European Language Resources Association (ELRA). See Gaizauskas et al. (2001).

mega-corpora see second generation corpora

Memory Based Tagger (MBT) A package for creating part-of-speech taggers created by teams from the Universities of Antwerp and Tilburg, the Netherlands, utilising a memory-based learning approach to the task (Daelmans, 1995). See Daelmans (1996) for further details.

metadata The texts in a corpus are data, so information about the texts in a corpus is referred to as ‘metadata’ (data about data). This information may include the title, author, publisher and date of a written text, or details of the speakers in a spoken text. For a corpus it may include the purposes for which the corpus was constructed, the corpus size and the contact details of the distributor. The metadata for a corpus or for a text is often stored in its header. But it may also be stored separately to the actual text in the corpus documentation or in a database.

Michigan Corpus of Academic Spoken English (MICASE) Developed at the English Language Institute, University of Michigan, USA, the corpus is composed of academic speech sampled from a range of contexts at the University of Michigan. Some 190 hours of material were recorded and orthographically transcribed to construct the corpus. The corpus is marked up in Standard
Generalised Markup Language (SGML) and is currently 1.8 million words in size. The corpus is freely available for academic research. See http://www.lsa.umich.edu/eli/micase/index.htm for details of how to access the corpus.

**MicroConcord** An MS-DOS concordancer designed by Scott and Johns. The number of concordance lines that can be seen is limited to 1,500. Concordances can be saved as text files. MicroConcord offers a fast analysis and is relatively easy to learn how to use. See Murison-Bowie (1993).

**Minipar** A parser for English developed by Dekang Lin at the University of Alberta, Canada. The program can run on Linux and Windows platforms and is available free of charge for academic research. See http://www.cs.ualberta.ca/~lindek/minipar.htm to access the parser.

**modified data** Data that are based on attested data but have been modified in some way (for instance simplified) to exclude aspects which are extraneous (Stubbs 2001: xiv). (See also intuitive data.)

**monitor corpus** see dynamic corpus

**MonoConc** Developed by Michael Barlow of the University of Auckland, New Zealand, MonoConc is a Windows-based concordance program available in a basic (MonoConc) and advanced version (MonoConc Pro). MonoConc is designed for use with monolingual corpus material, with a sister program, ParaConc, being designed for use with data in a parallel corpus. The program is not Unicode compliant. See http://www.athel.com/ for details of how to purchase MonoConc.
morphological analyser  A computer program that analyses the form of a word to determine its morphological structure in terms of the root and affixes, compounding etc. This can be one of the steps in automated part-of-speech tagging, as particular affixes often indicate particular parts of speech (for instance in the word surrendered the -ed suffix indicates a verb or adjective). Morphological analysis is also important in lemmatisation, since the affixes must be identified if the word is to be reduced to its base form.

morphological richness  A reference to how many different inflectional forms the lexemes of a language have. A language like English, in which there are usually only two forms of each noun and four forms of each verb, is not very morphologically rich – although some languages, for example Chinese, are even less rich. Words in morphologically rich languages such as Arabic, Finnish or Latin have many inflectional forms for cases, tenses and other grammatical categories. A language’s morphological richness may affect how texts and corpora in that language are processed. For example, in part-of-speech tagging a morphologically rich language can often be tagged with less ambiguity than a morphologically poor language, since a particular affix or morphological form will indicate unambiguously that the word is a noun, or a verb or an adjective. (See also morphological analyser.)

Morphy  A freely available Windows-based morphological analyser and part-of-speech tagger for German. Morphy was developed by a team led by Manfred Wettler at the University of Paderborn, Germany. See Lezius (2000) for more details of the system. The system is available to download at http://www.lezius.de/wolfgang/morphy/.
MRC Psycholinguistic Database A machine-readable dictionary containing over 150,000 entries with up to twenty-six linguistic and psycholinguistic attributes for each (for example frequency, familiarity, concreteness, imageability and meaningfulness of words). This allows us to distinguish between a tangible word like house which can be more easily identified than an abstract word like choice. It was conceived by Max Coltheart in 1981 and was the basis for the Oxford Psycholinguistic Database created by Oxford University Press.

MULTEXT Tools The Multext project was led by Jean Véronis of the University of Provence, France. The project produced a series of tools designed to aid in the process of multilingual corpus building and use. The tools include support for working on a range of writing systems (Boualem et al. 1996) and aligning parallel corpora. While not Unicode compliant, the tools are still of great utility. See Ide and Véronis (1994) for more details of the Multext project.

Multiconcord A Windows-based concordance package designed by David Woolls. The program is designed to handle multilingual corpora, especially parallel corpora. The program can automatically align un-aligned parallel corpora and allows for parallel concordancing. The system is not Unicode compliant, however. For more details of the system see Woolls (2000).

multi-dimensional analysis A statistical, comparative approach to the analysis of different genres of speech and writing, advocated by Biber (1988, 1989). Biber used factor analysis to identify patterns of co-occurrence among sixty-seven linguistic features, in order to show the major dimensions on which texts could vary. The five
dimensions Biber identified were (1) involved vs informational production, (2) narrative vs non-narrative discourse, (3) elaborated vs situation-dependent reference, (4) overt expression of argumentation and (5) impersonal vs non-impersonal style. This type of analysis showed that variation involved degree on a linear scale, rather than being a case of simple binaries. Biber also argued that ‘genre distinctions do not adequately represent the underlying text types of English’ (1989: 6). For example, in terms of dimension (1) – involved vs informational – Biber found that personal letters had more in common with face-to-face spoken conversations than they did with official written documents. Therefore the distinction between written and spoken texts is not always clear-cut.

multifeature analysis  see multidimensional analysis

Multilingual Concordancer A Java-based basic concordancing package developed by Scott Piao at the University of Lancaster. The concordancer allows basic concordancing functions and incorporates some tools (for instance document similarity cluster analysis) not found in other concordancers. The concordancer supports Unicode. The system is free for use in academic research. See http://www.lancs.ac.uk/staff/piaosl/research/download/download.htm to download the system.

multilingual corpus A corpus that contains texts in more than one language. An example is the Enabling Minority Language Engineering (EMILLE) corpus. A parallel corpus is a specific type of multilingual corpus in which there is a defined relationship between the texts in the different languages (usually, the texts are direct translations of one another).
Münster Tagging Project (MTP) A project initiated at the University of Münster, Germany by Wolf Paprotté. The project developed part-of-speech tagsets for both English and German that were designed to be isomorphic. The tagsets were used to manually annotate corpora of English and German in order to produce training data for the development of an automatic tagger. The German tagset consists of a small (53 tags) and a large (138 tags) version. The English tagset also has a small (69 tags) and large (136 tags) version. Five-hundred-thousand words of German data and 40,000 words of English data have been annotated using the large tagsets. The German data is available from the European Language Resources Association (ELRA).

mutual information A statistical measure that compares the probability of finding two items together to the probabilities of finding each item on its own. In corpus linguistics it is often used as a measure of the strength of a collocation between two words.

named entity recognition One of the problems investigated in the field of information retrieval. For a computer program to assess what a text is ‘about’, it is useful for it to be able to identify (and tag) the names in the text: names of people, places, companies and other organisations. Doing this involves analysing the grammar and semantics of the text – for instance, the identification of proper nouns may involve part-of-speech tagging and other computational linguistics techniques.

national corpus Any large second-generation corpus that attempts to represent a range of the language used in a
particular national language community is often named after its home country and dubbed a ‘national corpus’. The earliest of these was the British National Corpus (BNC), but this has been followed by the American National Corpus (ANC), the Czech National Corpus, the Hungarian National Corpus, the Polish National Corpus and others.

**natural language processing (NLP)** A common term for the set of problems addressed by computational linguistics: getting computers to handle some aspect of language, to carry out automatically a job that a human analyst would otherwise have to do. Alignment, part-of-speech tagging, named entity recognition and machine translation are examples of applications in NLP. Many contemporary approaches to NLP make use of corpora: automatic analysis of a corpus is used to build up the base of knowledge about language that the NLP program uses to complete its task. The corpora used in NLP are often extremely large, measured in the hundreds of millions of words, and are also often relatively homogenous.

**neologisms** A new word or an existing word (or phrase) that has been given a new meaning. Neologisms are often used for naming inventions or new ideas. Corpus-based approaches are particularly helpful in identifying neologisms, for example Renouf (1993), using techniques which filtered out new word forms and the new contexts in which familiar words occur, analysed a 2.5-million-word corpus consisting of *The Times* newspaper and found 5,374 neologisms.

**Network of Early Eighteenth-Century English Texts (NEET)** Developed at the University of Northern Arizona, USA,
by a team led by Doug Biber, this is a 3-million-word corpus of a range of registers of eighteenth-century English. The corpus is not generally available.

**Newcastle Electronic Corpus of Tyneside English (NECTE)**

A corpus of English as spoken in the north east of England, developed by a team led by Karen Corrigan at the University of Newcastle. The corpus is composed of two distinct parts – one part based upon an earlier collection of spoken data made in the late 1960s by the Tyneside Linguistic Survey and a corpus of spoken data from the same area gathered in the early 1990s. The corpus from the 1960s is based upon approximately forty-three hours of data, while the corpus from the 1990s is based on roughly eighteen hours of data. For more details of the corpus see Beale and Corrigan (2000) and http://www.ncl.ac.uk/necte/.

**Newdigate Letters** A corpus of 2,100 letters written in the period 1673–1692. Most of the letters were addressed to Sir Richard Newdigate of Arbury, Warwickshire, UK. The corpus was produced by Philip Hines and totals 1,033,000 words. It is available from the International Computer Archive of Modern and Medieval English (ICAME). See Hines (1995) for further details.

**n-gram** A sequence of n letters from a given string after removing any spaces. For example, when n=3 the n-grams that can be generated from the phrase ‘how are you’ are ‘how’, ‘owa’, ‘war’, ‘are’, ‘rey’ and so on.

**N-gram statistics package** A freely available tool developed by Ted Pedersen of the University of Minnesota, USA. The program extracts significant multiword sequences from corpus data. The program offers a range of asso-
ciation tests (for example Fisher’s exact test, log-likelihood, chi square). See Banerjee and Pedersen (2003) for more details of the program.

Nijmegen Corpus A 130,000-word corpus of modern spoken and written British English with a full syntactic analysis of each utterance (see treebank).

Nijmegen Linguistic Database see Linguistic Database (LDB)

non-parametric test A statistical test that makes no assumptions about the population from which the data are drawn, unlike parametric tests which assume that the mode, median and mean are all the same and that the data follow a normal distribution. Although non-parametric tests are generally less powerful than their parametric counterparts, they are considered to be more appropriate for use on corpus data. They are also best used when a sample size is small. Commonly used non-parametric tests include the chi square test and the Mann Whitney test.

non-standard corpus A corpus containing non-standard language data, such as the Corpus of Written British Creole, the Freiburg Corpus of English Dialects (FRED) or the Leeds Corpus of English Dialects. See dialect corpus, regional corpus.

normal distribution In statistics the normal distribution is a probability distribution where there is a particular characteristic shape to the spread of the values in the data around the mean (average) value. Many quantitative phenomena in science and statistics are normally distributed. For this reason, the normal distribution is an important part of some of the statistical techniques used in corpus linguistics.
Northern Ireland Transcribed Corpus of Speech (NITCS) A corpus of approximately 230,000 words in size of English spoken in Northern Ireland. The corpus was built by a team led by John Kirk of Queen’s University, UK and consists of orthographically transcribed conversations with a fieldworker that occurred in the period 1973–1980. The corpus is freely available for academic research from the Oxford Text Archive. See Kirk (1992) for more details.

Nota Bene (nb) Discourse Annotation Tool A Windows-based discourse annotator developed by Giovanni Flammia at MIT, USA. The system is available for download and may be used free of charge for academic research. See http://www.sls.lcs.mit.edu/sls/publications/1998/nb.zip.

Notetab Light A Windows-based freeware program, this is an HTML aware text editor that may be of help to corpus builders needing such a tool. The program can be downloaded from http://www.notetab.com/ntl.php.

Nptool A program that can identify noun phrases in English texts. Developed by Atro Voutilainen. See Voutilainen (1993) for details of the system.

Ogden’s Basic English Word List Developed by Charles Ogden (1930) this list purports to be a list of so-called basic English terms – a list of 850 words that Ogden claimed could allow one to express some 90 per cent of all concepts in English. Available to download on-line at numerous web sites.
on-line corpus  A corpus that can be obtained over the internet. While many corpora can simply be downloaded straight from the internet onto a PC, an on-line corpus usually has a web-based search engine, allowing users to browse the corpus, specify their own restrictions on searches, carry out concordances or look up collocates. Examples of on-line corpora include the Michigan Corpus of Academic Spoken English (MICASE), BNCweb and CobluildDirect. Some on-line corpora providers charge a subscription fee for full access.

Open Language Archives Community (OLAC)  An attempt to create a virtual on-line library of language resources, including corpora. OLAC seeks to enable major language data archives, groups and individuals to harmonise their archiving practices so that the search for language resources worldwide can be facilitated via a standard interface. The interface is currently available for use at the Linguistic Data Consortium website.

optical character recognition (OCR)  see scanning

Oxford Concordance Program (OCP)  A batch program that can make word lists, concordances and indices from a corpus of raw text. The OCP is available from Oxford Computing Services. See Butler (1985), Lancashire (1991) and Davidson (1992).

Oxford Psycholinguistic Database  Formerly the MRC Psycholinguistic Database, the Oxford Psycholinguistic Database was updated in 1987 by Philip Quinlan at the University of York. It comprises 98,538 English words, giving information on a range of linguistic and psycholinguistic criteria (for example phonetics, syllable count,
familiarity, frequency etc.). The frequency data is taken from the Brown and London–Lund corpora.

Oxford Text Archive (OTA) The OTA consists of over 2,500 texts in more than twenty-five languages. Many of these texts have been marked up to Text Encoding Initiative (TEI) standard and can be downloaded from the internet as plain text files. The OTA is part of the Arts and Humanities Data Service (AHDS), which is funded by the Arts and Humanities Research Council (AHRC).

ParaConc Developed by Michael Barlow of the University of Auckland, New Zealand, ParaConc is a Windows-based concordance program specifically designed to facilitate working with parallel and multilingual corpora. The program can use pre-aligned corpus texts or can work interactively with a user to align unaligned data. The program is not Unicode compliant. See http://www.athel.com/ for details of how to purchase the program.

parallel corpus A parallel corpus consists of two or more corpora that have been sampled in the same way from different languages. The prototypical parallel corpus consists of the same documents in a number of languages, that is a set of texts and their translations. Since official documents (technical manuals, government information leaflets, parliamentary proceedings etc.) are frequently translated, these types of text are often found in parallel corpora. The Corpus Resources and Terminology Extraction (CRATER) corpus is an example of this type of corpus.

However, another type of parallel corpus (sometimes
called a ‘comparable corpus’) consists of different texts in each language: it is merely the sampling method that is the same. For instance, the corpus might contain 100,000 words of fiction published in a given timeframe for each language.

The applications of parallel corpora include comparing the lexis or grammar of different languages (see comparative linguistics), looking at the linguistic features of translated texts, and work on machine translation. For many of these purposes, an important first step in processing the parallel corpus is alignment.

Although the term ‘parallel corpus’ usually refers to corpora in different languages, corpora in different regional dialects of the same language (for example, the Brown and Lancaster–Oslo/Bergen (LOB) corpora) or in the same language variety at different times (for example, the LOB and Freiburg–LOB Corpus of British English (FLOB) corpora) can also be considered to be ‘parallel’ in a similar sense.

**parser** A computer program that adds parsing tags to a text automatically: examples include Minipar and the Link Grammar Parser.

**parsing** When a text is parsed, tags are added to it in order to indicate its syntactic structure. For instance, the start and end points of units such as noun phrases, verb phrases, and clauses would be indicated by parsing tags. The parse might also add information about how the syntactic units relate to one another. Examples of parsed corpora include the Lancaster–Leeds Treebank, the Penn Treebank, the Gothenburg Corpus and the CHRISTINE Corpus. (See also phrase structure, treebank, skeleton parsing.)
part-of-speech tagging (POS) A type of annotation or tagging whereby grammatical categories are assigned to words (or in some cases morphemes or phrases), usually via an automatic tagger although human post-editing may take place as a final stage. A number of POS taggers are in existence, for example, the CLAWS taggers, the LT POS tagger, Trigrams’n’Tags, TAGGIT, Text Segmentation for Speech (TESS), and the Constraint Grammar Parser of English (ENGCG) tagger.

Patrologia Latina Database An electronic version of the first edition of Jacques-Paul Migne’s Patrologia Latina, published between 1844 and 1855, and the four volumes of indices published between 1862 and 1865. It comprises the works of the Church Fathers from Tertullian in AD 200 to the death of Pope Innocent III in 1216. It is available as a CD-ROM and as an on-line corpus.

pattern see regular expression

pedagogic corpus A corpus used for language teaching that simply consists of all of the language to which a learner has been exposed in the classroom; for example, the texts and exercises that the teacher has used. The advantage of using a pedagogic corpus is that when a language item is met in one text, the teacher can refer back to examples from previous texts to show students how to draw conclusions from additional evidence. Also, the examples will be familiar to the students, and a concordance-based analysis of a pedagogic corpus will be more predictable than analyses of a general corpus. See Willis and Willis (1996).

Penn Chinese Treebank A project on-going since 1998 at the University of Pennsylvania, USA to provide a large treebanked corpus of Mandarin Chinese. The project has, to
date, produced four versions of their corpus, with version 4.0 being current at the time of writing. The corpus is composed of text drawn from three newswire services (Xinhua, the Information Services Department of Hong Kong Special Autonomous Region and Sinorama) in the period 1994–2001. The corpus currently consists of 404,156 words, though the project aims eventually to provide a 500,000-word corpus. Details of the corpus, including annotation schemes and standards are available on-line at http://www.cis.upenn.edu/%7Echinese/. The corpus is available from the Linguistic Data Consortium.

Penn–Helsinki Parsed Corpus of Middle English This historical corpus consists of over a million words of Middle English text. Its annotation includes part-of-speech tagging and parsing. It was developed at the University of Pennsylvania, USA, alongside another historical corpus, the Penn–Helsinki Parsed Corpus of Early Modern English.

Penn Treebank A collection of corpora which have been annotated with brackets indicating where syntactic phrases begin and end in the texts, and how the phrases are nested in the structure of the sentence. Constructed at the University of Pennsylvania, USA, it includes – among other text collections – versions of the Brown Corpus and the Switchboard Corpus annotated with Penn Treebank syntactic tags. Two versions of these tags exist: Penn Treebank I bracketing and Penn Treebank II bracketing. (See also parsing, treebank.)

Perl A programming language often used to create programs for text-manipulation and searching. Programs in Perl are often referred to as ‘scripts’. 
Personal Letters Corpus  A corpus of personal letters written by L2 American English speakers with a Japanese L1 background. The corpus was gathered by Yasumasa Someya of Aoyama Gakuin University, Japan. The corpus consists of 1,037 letters amounting to 141,608 words. It can be used via a web-based concordancer available at http://ysomeya.hp.infoseek.co.jp/.

phrase structure  An important aspect of grammar. When we analyse phrase structure, we identify the start and end points of major syntactic units such as sentences, noun phrases, verb phrases and so on, and identify how they are ‘nested’, that is which phrases are part of which other phrases. For instance, in one common approach to analysing phrase structure, the sentence *The cat sat on the mat* would be analysed as follows:

\[
[S \ [NP \text{The cat NP}] \ [VP \text{sat [PP on [NP the mat NP] PP] VP}] \ S]
\]

Where:
[S Sentence S]
[NP Noun Phrase NP]
[VP Verb Phrase VP]
[PP Prepositional Phrase PP]

In parsing, these phrase structures are marked onto a corpus text, often using some kind of bracketing, as above (although the structure can also be represented visually as a tree: see treebank). However, parsing does not necessarily just mean phrase structure analysis, as other syntactic analysis, such as the grammatical functions of words and phrases (for example subject, object) or dependencies between words and phrases (for example a subject noun phrase is dependent on its verb) may be marked up in a parsed text.
plain text  A text or corpus that does not contain any markup (whether Standard Generalised Markup Language (SGML), Extensible Markup Language (XML) or other), or any added analysis such as part-of-speech tags and contains only the actual words of the original document, is said to be plain text. ‘Plain text’ normally also implies the use of a standard character encoding such as American Standard Code for Information Exchange (ASCII) or Unicode. (See also raw corpus.)

Polytechnic of Wales (POW) corpus  A corpus consisting of about 65,000 words of naturally-occurring language data spoken by 120 children aged between six and twelve years in South Wales. It has been grammatically parsed in terms of systematic functional grammar and is available through the International Computer Archive of Modern and Medieval English (ICAME).

portmanteau tag  A solution to the issue of problematic disambiguation. When probabilistic taggers are unable to select a single tag for a word or phrase they may sometimes use a portmanteau tag, indicating that a firm decision could not be made but that the correct tag is likely to be one of a range of two (or more) possible outcomes. Portmanteau tags are often indicated by using a hyphen, for instance within the CLAWS C5 tag set, used to tag the British National Corpus (BNC), the tag NN1-AJ0 is a portmanteau tag consisting of ‘singular common noun or adjective’. In general, the more likely possibility is given as the first half of the pair.

post-editing  Most automatic taggers tend not to be 100 per cent accurate, for example, Smith (1997) notes a 3–5 per cent error rate for the automatic part-of-speech tagging of English texts. In order to improve accuracy towards
100 per cent, human editors are sometimes employed to correct tagging errors by hand. Such measures often improve accuracy, for example Baker (1997) found a mean accuracy of 99.11 per cent between four human post-editors (an improvement of 1.9 per cent compared to the computer tagger). However, as well as accuracy of post-editors, consistency (both inter-rater and intra-rater) also needs to be taken into account, particularly in cases where a word’s part-of-speech is potentially ambiguous. Factors such as the prior experience of post-editors, amount of training given, the amount of communication between different post-editors and the size and complexity of the tagset are all likely to have an impact on overall accuracy and consistency.

postmodification A study of postmodification by de Haan (1989), using the Nijmegen Corpus, found that almost 98 per cent of postmodifying clauses had simpler clause patterns, compared to 92 per cent of non-postmodifying clauses. Biber et al. (1994) used part of the Lancaster–Oslo/Bergen (LOB), corpus, finding that post-nominal modification by prepositional phrases is more frequent than full, finite relative clauses.

post-processing The process of running a text that has been manipulated by a computational tool through an additional program. Typically, a post-process would affect the encoding format of the text, and might be applied to the text output by an annotation tool such as a part-of-speech tagger. It is common for taggers and similar programs to output text in a specific, non-standard format. Post-processing is then needed to convert the tagged text to Standard Generalised Markup Language (SGML), XML or another standardised format for use in concordancers. Post-processing is an entirely automatic
process that does not affect the actual tags; as such, it should not be confused with post-editing.

**Prague Dependency Treebank** A parsed corpus of Czech, consisting of texts drawn from the Czech National Corpus with part-of-speech and syntactic annotation. See http://ufal.ms.mff.cuni.cz/pdt.

**precision and recall** Precision and recall are a pair of measures, taken from the field of information retrieval, that can be used to measure how successful an automated tagger is. The performance of a tagger that only assigns one tag to each token can be measured with just a single score, accuracy or ‘correctness’, which is the percentage of tokens that have the correct tag. But many taggers can assign more than one tag to each token, so a single measure of correctness will not suffice: precision and recall are often used instead.

*Recall* measures, roughly speaking, how many correct tags have been assigned by the tagger. It is equal to the number of tokens tagged correctly divided by the total number of tokens tagged. *Precision* measures how many unwanted tags the tagger has removed from the text. It is equal to the number of tags correctly assigned in the text, divided by the total number of tags assigned. Both precision and recall are expressed as percentages, with scores closer to 100 being better in both cases (see also van Halteren (1999)).

In information retrieval, recall measures how much of the desired information has been retrieved, and precision measures how much undesired information has been retrieved along with it.

**pre-electronic corpus** Corpus-based research that occurred
before the 1960s is generally categorised as pre-electronic and consisted of work in five main areas: biblical and literary studies, **lexicography**, dialect studies, language education studies and grammatical studies (Kennedy 1998: 13). Such research was often painstakingly carried out, using index cards and human labour to calculate **frequencies** by counting. See, for example, Thorndike and Lorge’s frequency lists (1944) and Fries’ studies of grammar (1940, 1952). (See also **corpus linguistics**.)

**probabilistic disambiguation** A set of methods for choosing the correct tag in automatic corpus **annotation** that rely on **probability** or statistics to make a good guess at what the correct tag is likely to be. These statistics are **frequencies**, and are often derived from previously annotated **corpora** in order to perform a subsequent analysis on untagged texts. See Garside et al. (1987). (See also **hidden Markov model**, **rule-based disambiguation**.)

**probability** A goal of **corpus linguistics** is to account for language in terms of whether something is possible and/or probable (Kennedy 1998: 270). Using **frequency** data derived from **corpora**, coupled with statistical tests, we can go beyond measures of whether a particular linguistic feature is possible, but say the extent to which it is probable in actual language use. Probability therefore allows for a more gradated account of language use.

**problem-oriented tagging** The phenomenon (as described by de Haan (1984)) whereby users will take a **corpus**, either already **annotated** or unannotated, and add to it their own form of annotation, oriented particularly towards their own research goal. It is not an exhaustive process, so not every word or sentence needs to be tagged, only
those which are directly relevant to the research questions being asked. In addition, annotation schemes are selected with these research questions in mind.

**proclitic** A proclitic is a clitic which attaches to the beginning of the following word. See *enclitic*.

**Project Gutenberg** A massive internet archive of over 16,000 copyright-free books stored as machine-readable text. It is accessible at http://www.gutenberg.org. Additional texts are continually being added to the collection; books are distributed as plain text.

**proofreading** One of the final processes of text capture involving corpus building, particularly when texts have been keyboarded or electronically scanned. An automatic spell-check is rarely 100 per cent accurate at targeting errors, so additional human checking is required.

**PROSICE Corpus** This corpus consists of a set of spoken texts from the British section of the International Corpus of English (ICE) with time-alignment and syntactic annotation. It was created for the study of English prosody.

**prosody**

1. Prosodic features of spoken language (such as speed, volume and pitch) can be annotated in a corpus, allowing for a more sophisticated analysis.
2. Prosody also refers to patterns in language that are revealed via corpus analysis (often via looking at concordances or collocations). See semantic prosody, discourse prosody, semantic pattern.
punctuation marks Along with accented characters, punctuation marks can sometimes be rendered differently on different platforms, particularly those that occur outside the American Standard Code for Information Exchange (ASCII). It is therefore suggested that corpus builders represent punctuation marks as entities, delimited by the & and ; characters. Table 7 gives examples of the standard entity references for punctuation.

Table 7. Some standard entity references for punctuation

| entity reference | punctuation                  | punctuation mark |
|------------------|------------------------------|------------------|
| &ldquo;           | left double quotation mark   | “                |
| &rdquo;           | right double quotation mark  | ”                |
| &mdash;           | one-em dash                  | -                |
| &hellip;          | horizontal ellipsis          | …                |
| &rsquo;           | right single quote           | ’                |
| &lsquo;           | left single quote            | ’                |
| &lsqb;            | left square bracket          | [                |
| &rsqb;            | right square bracket         | ]                |
| &verbar;          | vertical bar                 | |                |
| &lcb;             | left curly bracket           | {                |
| &rcb;             | right curly bracket          | }                |

rank ordering

1. A common way of presenting frequency information in word lists is to present them in rank order, for example the most frequent word is given first. This is opposed to, say, presenting the list alphabetically.
2. A technique used in some non-parametric statistical tests, for instance the Wilcoxon test or the Mann-
**Whitney test**, that involves carrying out the test using ranked values of raw frequency data, rather than using actual frequencies.

**raw corpus**  A corpus that has not been processed in any way. Particularly, it is a corpus to which no analytic annotation (such as parsing) has been applied. (See also plain text.)

**Reading Academic Text Corpus**  A corpus constructed to study the use of English in an academic context; it consists of research articles and Ph.D. theses written by staff and students at Reading University. See http://www.rdg.ac.uk/AcaDepts/cl/slals/corpus.htm.

**Reading/Leeds Emotion in Speech Corpus**  A spoken corpus constructed with the aim of investigating how properties of speech such as intonation relate to the emotions that human beings perceive as being expressed in speech. As such its text is annotated for intonation and for emotional content. See http://www.rdg.ac.uk/AcaDepts/lil/speechlab/emotion/.

**recall**  see precision and recall

**reference corpus**  When using frequency-based techniques to analyse a text or set of texts, it is necessary to have something with which to compare them. This is necessary, for instance, if we wish to establish that some word or form is more common in a particular text than is normally expected. The basis for the comparison is often a larger set of texts drawn from a wider range of genres and/or sources. This larger dataset is often called a reference corpus.

Typically, for English, a reference corpus would be
one from the **Brown** family of corpora or one or more sections of the **British National Corpus (BNC)**. The term ‘reference corpus’ may also be used to describe any corpus that, like these corpora, is not a sample of any particular language variety, domain or text type, but is instead an attempt to represent the general nature of the language through a wide-sampling corpus **design**.

**regional corpus** A **corpus** consisting of language from a particular region, which is often compiled in order to investigate regional or sociolinguistic variation. (See also **dialect corpus**, **non-standard corpus**.)

**regular expression** A type of **string** that may include special characters (sometimes called ‘**wild cards’**) that mean the regular expression as a whole will match with more than one string. For instance, the full stop . as a special character in a regular expression can represent any single letter. If so, the regular expression $b.d$ would match with the strings $bad$, $bd$, $bcd$, $bdd$, $bed$ etc. Regular expressions, sometimes known as **patterns**, are often used when searching a **corpus**. It is often easier to define a regular expression that matches the set of words in a search, than to search for each word individually and combine the results. For example, for an investigation into compound words of which the second element is -house (for instance, **greenhouse**, **hothouse**) a search could be made for $.^*house$. The precise rules of what the special characters in regular expressions are and how they work may vary in different **tools**.

**relational database** A **database** that stores **data** in a number of separate data tables, that are linked by means of **keys** that identify particular records. A record in table A can be linked to a record in table B if one of the fields (or
columns) in table A contains the key of the record in table B. In corpus linguistics, relational databases are sometimes used to store corpora, as an alternative to storing them as marked-up text files.

For example, one table might contain the words in the corpus, with each record containing a single word, together with other fields to indicate where that word occurs in the corpus, what part-of-speech tag it has and so on. These fields would link the record to other tables; for example, the part-of-speech tag might link to a table listing all the part-of-speech tags and containing information about the category that the part-of-speech tag indicates. Storing a corpus in a relational database allows the corpus to be searched using database queries, rather than requiring software designed specifically for corpus analysis.

Representative Corpus of Historical English Registers (ARCHER) Corpus A corpus covering ten registers of English, both British and North American, over a period of 340 years (1650–1990). The corpus contains 1,037 texts, amounting to 1.7 million words. It covers both written (letters for example) and so-called speech-based (for instance drama) genres. The corpus is not generally available and is held at the University of Arizona. See Biber et al. (1994) for a fuller description.

representativeness One of the key claims it should be possible to make of a corpus is that it is a representative sample of a particular language variety. There are many safeguards that may be applied in sampling to ensure maximum representativeness in corpus design. Random sampling techniques are standard to many areas of science and social science, and these same techniques are also used in corpus building. Biber (1993) emphasises
that the limits of the population that is being studied must be defined as clearly as possible before sampling procedures are designed. One way to do this is to use a comprehensive bibliographical index – this was the approach taken by the Lancaster–Oslo/Bergen (LOB) Corpus builders who used the British National Bibliography and Willing’s Press Guide as their indices. Another approach could be to define the sampling frame as being all the books and periodicals in a particular library that refer to a particular area of interest. This approach is one that was used in building the Brown Corpus. Biber also points out the advantage of determining beforehand the hierarchical structure (or strata) of the population. This refers to defining the different genres or channels etc. of which it is composed. Stratificational sampling is never less representative than pure probabilistic sampling, and is often more representative, as it allows each individual stratum to be subjected to probabilistic sampling. However, these strata (like corpus annotation) are an act of interpretation on the part of the corpus builder and others may argue that genres are not naturally inherent within a language. See sample text corpus, validity.

**robust** A robust program or method is one that does not stop working, or produce nonsense results, if applied to poorly formed input. In computational linguistics, a robust tool is one that can deal at least in part with the ‘messiness’ of actual language in use. This messiness includes things such as sentence fragments, grammatical errors, lists, acronyms, formulas, plus (in spoken data) slips of the tongue, false starts, hesitations, filler noises and so on. So, for instance, a robust part-of-speech tagger or parser could be used on text containing these messy elements, and the messy elements would still be
analysed and tagged/parsed. In general, robustness is a desirable trait for corpus analysis tools.

**rule-based disambiguation**  A technique in tagging that uses rules rather than probabilities to determine which is the correct tag for a given linguistic item in a corpus. For example, if a word that might be a noun or a verb is preceded by an adjective and followed by a verb, then it should be tagged as a noun.

**Saarbrücken Corpus of Spoken English (ScoSE)**  A spoken corpus of North American English, consisting of transcriptions of conversations, interviews, stories and jokes. See http://www.uni-saarland.de/fak4/norrick/scose.htm.

**sample corpus**  Many corpora are not freely available to all, either because the texts in the corpus are subject to copyright restrictions, or because the corpus builders need to recoup the costs of creating the corpus by charging researchers for access to it. Often, in this case, a subset of the texts in the corpus will be released for free or at a very low price: this is usually called a sample corpus. Many of the large second generation corpora such as the British National Corpus (BNC) have associated sample corpora (see British National Corpus sampler), usually making up somewhere between 1 per cent and 10 per cent of the entire corpus.

A small section of a corpus that has been constructed or annotated for demonstration purposes, before the full corpus exists or has been annotated, may also be referred to as a sample corpus.
sample text corpus A corpus that is designed in order to be representative of a particular language variety (not necessarily language as a whole). It may consist of complete texts or samples taken from parts of texts. In general, the more specialised the language variety, the smaller the sample needs to be. However, Kennedy (1998: 21) warns that some corpora are not suitable for certain types of research: samples of texts may not be appropriate for carrying out stylistic or discourse studies, where we would expect to find different types of linguistic features at different points in a text.

scanning An increasingly popular technique of text capture when the original text only exists in paper form. Scanning involves the use of a scanner (which resembles a small photocopier or fax machine) and optical character recognition (OCR) software which converts the text on paper to electronic form. Scanning is not 100 per cent error-free and factors such as typeface used, presence of tables, footnotes and layout of text as well as the colour and quality of the paper can all have an impact on accuracy.

second generation corpora A term referring to corpora created during or after the 1990s. Such corpora are sometimes referred to as mega-corpora because of their large size (for example 100 million words or more). Examples of second generation corpora include the British National Corpus (BNC), the Bank of English (BoE) and the Longman Corpus Network. (See also first generation corpus.)

second language acquisition A popular application of corpus linguistics is in studies of second language acquisition, and a number of corpora have been assembled for
this purpose. These include learner corpora such as the Longman Learner Corpus or the International Corpus of Learner’s English which are designed to reveal profiles of learner language or interlanguage. Native speaker/writer corpora, such as the British National Corpus (BNC) can also be used in order to help learners to obtain a better understanding of the norms of the target language as well as the contexts in which certain words or phrases are best used. For example, Johns (1997) outlines data-driven learning, which involves learners carrying out concordances in order to explore naturally-occurring language phenomena. Additionally, a pedagogic corpus (Willis & Willis 1996), consisting of all the language that a learner has been exposed to in the classroom (texts and exercises) can be used so that teachers can refer back to examples from previous texts when a new language item is encountered. The examples are likely to be familiar to students, so the concordances will be more predictable than when looking at a general corpus. Other types of corpus-based studies can aid curriculum design, for instance Mindt’s (1996) comparison of the use of modal verbs in German text books for teaching English with a corpus of spoken English: he found that native speakers commonly tend to use ‘will’ when they want to talk about future time reference. However, in German textbooks, ‘will’ tended to be introduced to the students about halfway through the second year, whereas less frequent modal verbs were covered much earlier by the textbooks. (See also language teaching.)

**segmentation** The process of splitting up running text into smaller units such as sentences or words (or even morphemes). Segmentation is usually done automatically by specially designed software.

Splitting a text into words, which is usually called
tokenisation, is commonly referred to as segmentation if
the writing system of the language in question does not
use spaces between words (for instance, Chinese). For
languages such as this, word segmentation is not a trivial
task.

semantic preference A term similar to Louw’s (1993)
concept of semantic prosody. Semantic preference is,
according to Stubbs (2001: 65), ‘the relation, not
between individual words, but between a lemma or
word-form and a set of semantically related words’. For
example, in the British National Corpus (BNC) the
word rising tends to co-occur with words relating to
work and money: incomes, prices, wages, earnings,
unemployment etc. Semantic preference also occurs with
phrases. For example, the phrase glass of co-occurs with
a lexical set of words that could be categorised as
‘drinks’: e.g. sherry, lemonade, water, champagne, milk
etc. Semantic preference is therefore related to the
concepts of collocation and colligation, but focuses on a
lexical set of semantic categories rather than a single
word or a related set of grammatical words.

Semantic preference is related to the concept of
discourse prosody, although the difference between the
two is not always clear-cut. Stubbs (2001: 65) says it is
partly a question of how open-ended the list of collocates
is. So it may be possible to list all of the words for
‘drinks’, indicating a semantic preference, but a more
open-ended category such as ‘unpleasant things’ might
be seen as a discourse prosody. Stubbs (2001: 88) later
notes that even a category of semantic preference will
be open-ended, but will contain frequent and typical
members.

In addition, semantic preference denotes aspects of
meaning that are independent of speakers, whereas
discourse prosody focuses on the relationship of a word to speakers and hearers, and is therefore concerned with attitudes. Semantic preference is therefore more likely to occur in cases where attitudes are not expressed.

**semantic prosody** A term popularised by Louw (1993) and also used by Sinclair (1996), referring to the idea that words collocate in language use with specific semantic groups as well as with individual words. For example, the word *hair* may collocate with semantic groups such as length (*long, short*) and colour (*red, blonde, black*). Examination of concordances generally helps to reveal the existence of semantic prosodies. The concept is also referred to as a *semantic pattern* or *semantic preference* by others, for instance Stubbs (2001). (See also discourse prosody.)

**semantic tagger** A piece of software that attaches codes to words based upon their semantic function. An example of a semantic tagger would be the **UCREL Semantic Analysis System (USAS)** (Wilson and Thomas 1997).

**SGML-Aware Retrieval Application (SARA)** A software package designed specifically for use with the **British National Corpus (BNC)**. It enables users to search rapidly through the BNC, displaying *frequencies* and *concordances* of specific words, phrases, patterns of words etc. It is compatible with **Standard Generalised Markup Language (SGML)** and aware of the annotations in the BNC, allowing searches to be performed on combinations of words and grammatical tags. Searches can be limited to particular SGML contexts (for example, within a particular kind of element such as the title of a book or a spoken utterance), or to particular kinds of text (such as newspaper texts only or the speech
One of the most common questions concerning corpus building is ‘how large should a corpus be?’ In addition to the size of the corpus, the sizes of samples of texts within a corpus also need to be considered. Ultimately, size depends on a number of factors. For example, how restricted is the genre of language to be gathered? Shalom’s (1997) study of personal adverts used a corpus of only 766 adverts (about 20,000 words), whereas the British National Corpus (BNC), which contains written and spoken language from a variety of genres and time periods, contains 100 million words. However, smaller corpora (for instance those of one million words) that are typical of one variety of language, for example British English, Indian English, collected in a relatively short time period, are still viewed as adequate for comparative work (Leech’s (2002) study of modal verbs across the Brown family of corpora, for example). Additionally, what is the purpose of building the corpus? For collocations or to derive word meanings from concordances, say. Kennedy (1998: 68) suggests that for the study of prosody 100,000 words of spontaneous speech is adequate, whereas an analysis of verb-form morphology would require half a million words. For lexicography, a million words is unlikely to be large enough, as up to half the words will only occur once (and many of these may be polysemous). However, Biber (1993) suggests that a million words would be enough for grammatical studies. Finally, corpus-based analyses do not always need to be carried out on corpora: Stubbs (1996: 81–100) carried out a comparative corpus-based analysis on two speeches by Baden-Powell, consisting of under 1,000 words of data in total. Although this was a
small amount of data, he was still able to indicate significant differences in usage between the two speeches, based on concordances and collocations of various key lexis.

**skeleton parsing** A set of procedures for simplified parsing of sentences, developed by Leech and Garside (1991). Skeleton parsing is carried out manually, using software to speed up data entry.

**specialised corpus** A corpus which has been designed for a particular research project, for example, lexicography for dictionary compilation, or to study particular specialist genres of language: child language, English for Academic Purposes etc. (See also learner corpus, dialect corpus, non-standard corpus and regional corpus.)

**Speech Act Annotated Corpus for Dialogue Systems (SPAAC)** This spoken corpus contains annotations particular to spoken text: the corpus is marked up in Extensible Markup Language (XML) format for the speech acts of the individual utterances within the corpus, which were applied partly manually and partly automatically.

**Speech Analysis Tools** A software suite that provides the ability to view and to add annotation to speech waveforms. Available for free from http://www.sil.org/computing/catalog/show_software.asp?id=59.

**speech corpus** This term is sometimes used to refer to a specialised form of corpus, not to be confused with a spoken corpus. A speech corpus consists not of transcriptions, but of recordings, usually made in a studio, that are used to study pronunciation and other aspects
of phonetics and phonology in depth. In some cases, a speech corpus may not consist of natural data – the participants may be reading out words or sentences set by the researcher. An example is the **TIMIT Corpus**.

**Speech, Thought and Writing Presentation Corpus** A corpus developed at Lancaster University to investigate the different ways in which reported language is presented in texts, an important issue in stylistics. The corpus is *annotated* to indicate different types of presentation, for instance, direct reported language versus indirect reported language. See [http://www.ling.lancs.ac.uk/stwp](http://www.ling.lancs.ac.uk/stwp).

**spoken corpus** A corpus consisting entirely of transcribed speech. This could be from a range of sources: spontaneous informal conversations, radio phone-ins, meetings, debates, classroom situations etc. Spoken corpora can present problems to traditional *taggers* due to repetitions, false starts, hesitations, vocalisations and interruptions that occur in spontaneous speech. Compared to *written corpora*, spoken corpora tend to have a higher proportion of pronouns (particularly first and second person) and discourse markers. However, Biber (1998) has shown that some spoken and written *genres* are remarkably similar to each other (for example personal letters and face-to-face conversations) in terms of frequencies of certain linguistic phenomena.

**SRI American Express travel agent dialogue corpus** This is a large spoken corpus made up of transcribed telephone conversations between travel agents and customers. The corpus texts are on-line at [http://www.ai.sri.com/~communic/amex/amex.html](http://www.ai.sri.com/~communic/amex/amex.html).
Standard Generalised Markup Language (SGML) A standard way, created in the 1980s, of encoding electronic texts by using tags (developed from a system known as COCOA references) to define typeface, page layout etc. In general, the codes are enclosed between less than and greater than symbols: < >. These codes are often referred to as ‘elements’. So for example the code <p> is used to indicate the start of a new paragraph. However, many codes also have a corresponding closing or end tag, which is demonstrated by the use of a forward slash / sign after the less than symbol. So the end of a paragraph would be encoded as </p>.

Elements may also contain what are called ‘attributes’. For example, the code <pause dur=4> could be used in a spoken transcription to indicate the occurrence of a pause during speech, the duration being 4 seconds. Here, the attribute is dur (duration) and its value is 4 (seconds).

Different forms of SGML have been employed for a range of purposes. So HTML (Hyper Text Markup Language) uses a predefined set of codes based around the general SGML rules. For example, bold print is specified in HTML with the code pair <b> and </b>. See Bryan (1988) and Goldfarb (1990) for more information about SGML. (See also Text Encoding Initiative (TEI).)

standardisation When comparing frequencies across or within corpora, it is often useful to standardise the results in order to take into account the fact that files or corpora may be of different sizes. This can be achieved by expressing frequencies as a percentage or as occurrences per x words. Table 8 shows frequencies for the six age groupings in the British National Corpus (BNC) for the word cheerio.
Table 8. Frequencies for cheerio in six age groupings

| Age category | Total number of words spoken in category | Frequency of cheerio | Frequency of cheerio per million words |
|--------------|------------------------------------------|----------------------|---------------------------------------|
| 0–14         | 383,233                                  | 2                    | 5.22                                  |
| 15–24        | 590,264                                  | 8                    | 13.55                                 |
| 25–34        | 1,111,255                                | 9                    | 8.1                                   |
| 35–44        | 1,067,047                                | 12                   | 11.25                                 |
| 45–59        | 1,624,720                                | 27                   | 16.62                                 |
| 60+          | 1,129,298                                | 66                   | 58.44                                 |
| Total        | 5,905,817                                | 124                  | 21                                    |

Although the word cheerio appears more often in the 35–44 age range than the 15–24 range, because the 35–44 section of the corpus is almost twice as large as the 15–24 section, the word occurs proportionally more often in the 15–24 age range.

**standardised type/token ratio** One problem when calculating the **type/token ratio** in a corpus is that the larger the corpus, the lower the type/token ratio is likely to be. This is because high **frequency** words like the tend to be repeated whereas the probability of new types of words appearing will always decrease, the larger the corpus size. Therefore, the type/token ratio tends to reveal more about corpus size than lexical repetition or uniqueness.

For example, the Freiburg–LOB Corpus of British English (FLOB) Corpus is made up of fifteen files of different sizes. From Table 9, it can be seen that the larger the file, the smaller the type/token ratio tends to be.
### Table 9. Type Token Ratios of the 15 texts

| File name | Size (words) | Type token ratio |
|-----------|--------------|------------------|
| M         | 12,208       | 28.20            |
| R         | 18,313       | 24.97            |
| D         | 34,618       | 17.12            |
| C         | 34,744       | 23.90            |
| L         | 48,466       | 13.77            |
| B         | 55,001       | 16.05            |
| P         | 58,627       | 12.71            |
| K         | 58,759       | 14.23            |
| N         | 58,846       | 14.73            |
| H         | 61,597       | 10.92            |
| E         | 77,717       | 15.16            |
| F         | 89,864       | 13.25            |
| A         | 90,204       | 13.50            |
| G         | 156,909      | 11.26            |
| J         | 164,714      | 9.16             |
| **Total FLOB** | **1,020,623** | **4.56** |

A solution to the skewing effect of corpus size is to calculate a standardised type/token ratio (sometimes referred to as the ‘mean type/token ratio’). This is achieved by obtaining the type/token ratio for, say, the first 2,000 words in the corpus (or however many words are specified), then the next 2,000 words, then the next and so on. The standardised type/token ratio is calculated by working out the average of all of these separate type/token ratios, providing a more representative figure. Using this technique, the standardised type/token ratio of FLOB therefore works out at 46.03.
static corpus  A sample text corpus that is intended to be of a particular size – once that target is reached, no more texts are included in it. Most corpora are static, providing a ‘snapshot’ of a particular language variety at a given time. (See also dynamic corpus, monitor corpus.)

stem  The part of a word to which inflectional affixes are added; conversely, it is the part that remains when affixes are removed. For instance, walk is the stem of walks, walked and walking. Isolating the stem of a word is important for lemmatisation, and is often done by a morphological analyser. (See also lemma.)

stochastic tagging  see probabilistic disambiguation

string  A sequence of letters, numbers or other symbols, usually relatively short. The term comes from computer science; on a computer, each symbol is encoded as a number (referred to as a ‘character’) and an adjacent set of characters in a computer’s memory is called a ‘string’. The term ‘search string’ refers to a string that a program looks for as it goes through a text or corpus, for example when creating a concordance.

Surface and Underlying Structural Analyses of Naturalistic English (SUSANNE) Corpus  A corpus created with the purpose of developing a taxonomy and annotation scheme for the grammar of English for natural language processing. It consists of about 128,000 words of the Brown Corpus annotated using the SUSANNE scheme, each word being tagged via six fields covering (1) reference and (2) status (both of which show whether the word is an abbreviation or symbol), (3) word-tag (showing part-of-speech category), (4) the word itself, (5) its lemma and (6) how it is parsed in the context of the sentence it appears in. See Sampson (1995).
Survey of English Usage (SEU) Corpus Founded in 1959 by Randolph Quirk in order to provide an account of spoken and written British English, with both genres being represented about equally. It contained 200 text samples of about 5,000 words each, collected between 1953 and 1987. It was a pre-electronic corpus, consisting of a paper slip for each word token in the corpus. Each slip contained seventeen lines of text and was marked as a case of one of sixty-five possible grammatical features and 400 function words or phrases. It provided the basis for a complete description of English grammar (see Quirk et al. 1985). The spoken section was eventually published in electronic form as the London–Lund Corpus.

Switchboard Corpus A large American English spoken corpus. It consists of transcribed recordings of telephone conversations from the early 1990s. It is around 3 million words in size, and is made up of over 2,000 conversations lasting more than 240 hours. See http://www.cavs.msstate.edu/hse/ies/projects/switchboard/index.html.

synchronic corpus A corpus in which all of the texts have been collected from roughly the same time period, allowing a ‘snapshot’ of language use at a particular point in time. (See also diachronic corpus.)

tagger Software which automatically carries out tagging on a corpus. See also annotation, post-editing, hybrid tagger, part-of-speech tagging, semantic tagger, template tagger, training corpus.
tagging  A more informal term for the act of applying additional levels of **annotation** to corpus **data**. A tag usually consists of a code, which can be attached to a phoneme, morpheme, word, phrase or longer stretch of text in a number of ways, for example, using **Standard Generalised Markup Language** (SGML) elements, or by using an underscore character between a word and its tag (for example cat_NN1 is the word *cat* tagged as a singular common noun using the CLAWS C7 tagset). Tagging is often carried out automatically using software (see **tagger**). However, human **post-editing** is also often required as a final stage. (See also **ditto tags**, **part-of-speech tags**, **portmanteau tag**, **problem-oriented tagging**, **stochastic tagging**, **tagging errors**, **tagset**, **tag stripping**.)

**tagging errors** Automatic **taggers** are not usually 100 per cent accurate, hence the need for human **post-editing**. In general, texts that contain rare words (which are likely to be unfamiliar to the **tagger**), foreign words (which may not work well with the tagger’s morphological rules), specific **genres** that use language in an unpredictable, playful or creative way (for instance jokes, poems) or genres which do not conform to standard grammatical rules (for example informal spoken conversations) are likely to contain higher numbers of tagging errors than texts that are more predictable and typical of a standard language variety. The application of **portmanteau tags** is one way in which errors can be minimised. (See also **robust**.)

**TAGGIT** An early **part-of-speech tagger** developed by Greene and Rubin (1971) that was used to tag the **Brown Corpus**. Its **tagset** contained eighty-seven tags, including major word classes and their inflectional variants, function words and other important lexemes
such as *not*. It assigned the correct tag 77 per cent of the time to the Brown Corpus and despite its relatively low accuracy rate, provided a basis for more advanced taggers that were to follow.

tagset A collection of tags (or codes) that occur in an encoding or tagging scheme used to annotate corpora in order to facilitate a more sophisticated analysis. A tagset usually adheres to a particular descriptive or theoretical stance of language. Tagsets are often based around grammatical (part-of-speech) categories or semantic categories.

tag stripping Tags provide additional levels of information within a corpus, although they can make the corpus difficult for humans to read (and can also sometimes interfere with lexical analysis). As Leech (1997: 6) notes, one aspect of good practice for corpus annotation is that it should be possible and easy to dispense with the annotations, reverting back to the untagged corpus. Some corpus analysis software, for example WordSmith, allow the user to specify which tags they would like to ignore, a default case being anything that occurs within Standard Generalised Markup Language (SGML) bracketing `<...>`. See Greenbaum (1996) for a description of tag-stripping facilities with the Corpus of English (ICE) corpus.

tag transition probabilities The probability of some particular part-of-speech tag being followed by another specified tag in running text is a ‘transition probability’. These are usually determined by statistical analysis of tagged corpora. For instance, if there are 50,000 tokens tagged NN1 in a corpus, and 30,000 of them are followed by tokens tagged VVZ, then the tag transition probability
for NN1→VVZ is 60 per cent. In many probabilistic taggers, a hidden Markov model is used to combine tag transition probabilities to work out the likelihood of each of the potential tags for a given token being the correct tag. The process whereby tag transition probabilities are calculated for use in a tagger is called ‘training’ the tagger. (See also bigram and trigram.)

template tagger A piece of software that automatically patches (that is, corrects) tagging errors in a corpus. A template tagger was used in the final stages of tagging the British National Corpus (BNC), using a set of sophisticated rules in part derived by semi-automatic procedures from a sample set of texts which had previously been manually disambiguated.

term bank A special type of computer lexicon, containing a list of words that are technical terms in some particular field or domain. Term banks are often created from corpora by means of automated terminology extraction. Many term banks are bilingual or multilingual, making them of particular use in translation (including machine translation), because a word used as a technical term will often have a different translation to the same word used in normal non-technical language. An example of a multilingual term bank available on the Web is Eurodicautom (see http://europa.eu.int/eurodicautom/Controller).

terminology extraction Terminology extraction, also sometimes called ‘terminology acquisition’, is a type of information extraction. Terminology extraction software is designed to identify and create a list of words in a text or corpus that are likely to be technical terms, in order to create a term bank.
text archive  see archive

text capture  The process of gathering the texts that will comprise a corpus, text capture is one of a number of stages in corpus compilation. Text capture can involve the scanning or keyboarding of written texts, as well as proof reading to ensure that errors are removed. Spoken recordings need to be transcribed using an annotation scheme to represent particular features of conversation: speaker identification, prosody, fillers, overlap etc. Text capture should also involve the systematic backing up of data.

Text Encoding Initiative (TEI)  Launched in 1987, the TEI is an international and interdisciplinary standard for representing texts electronically. It is hosted by the Universities of Oxford, Bergen and Virginia and Brown University and is sponsored by a number of bodies including the Association for Computers and the Humanities (ACH), the Association for Computational Linguistics (ACL) and the Association for Literary and Linguistic Computing (ALLC). Its guidelines for text encoding can be applied to any text, regardless of language, date of production or genre. It uses a large tagset that is based on both Standard Generalised Markup Language (SGML) and Extensible Markup Language (XML). It provides an environment for creating customised document type definitions (DTDs). Projects that use TEI tagging include the British National Corpus (BNC), the Wittgenstein Archive, the Women Writers’ Project and Perseus. See Sperberg-McQueen and Burnard (2002).

Text Segmentation for Speech (TESS) Project  The project aimed to develop predictive theories about English
intonation in order to make automated text-to-speech systems sound more natural. It explored grammatical, prosodic and lexical aspects of spoken English using the London–Lund Corpus. See Svartvik (1990a).

**Text Segmentation for Speech (TESS) tagger** A probabilistic tagger developed at Lund University that was designed to facilitate the syntactic analysis of spoken texts on the Text Segmentation for Speech (TESS) Project. It had an error rate of between 3 to 6 per cent, using 200 tags. See Svartvik (1990b).

text type see genre

**Thai English Learner Corpus (TELC)** A learner corpus consisting of over a million words of essays and exam papers produced by native speakers of Thai learning English.

**Thesaurus Linguae Graecae (TLG)** An on-line archive of texts written in ancient, classical and medieval Greek. The term also refers to the research centre that constructs and maintains the TLG. The archive contains more than 90 million words, representing nearly all the surviving literature in Greek prior to AD 1453. See http://www.tlg.uci.edu.

**thinning** A method of reducing the amount of information in a concordance so that it can be more easily analysed. For example, the word *basic* occurs 10,988 times in the British National Corpus (BNC), so it would take an extremely long time to examine each instance of *basic* in the context in which it occurs. The concordance can be thinned to a more manageable level by programming the concordancer to present the user with, say, 100 random concordance lines.
TIGER Corpus A large German treebank, consisting of around 700,000 words of newspaper text. It is annotated for part-of-speech as a part of its parsing markup. It is available on the Web at http://www.ims.uni-stuttgart.de/projekte/TIGER/TIGERCorpus/.

TIMIT Acoustic–Phonetic Continuous Speech Corpus A spoken corpus consisting of recordings and transcriptions of ten specially-designed sentences being read by several hundred speakers.

TIPSTER Corpus A large collection of American English texts constructed for use in information retrieval and information extraction. It consists of approximately 500 million words of text from newspapers and government documents. Its markup is based on the Corpus Encoding Standard (CES).

TOEFL 2000 Spoken and Written Academic Language Corpus (T2K-SWAL) A corpus of English from academic contexts, developed at Northern Arizona University. It is around 2.8 million words in size and is notable for containing spoken academic language, for example transcribed speech from the classroom, as well as academic writing such as textbooks.

token A single linguistic unit, most often a word, although depending on the encoding system being used, a single word can be split into more than one token, for example he’s (he + ’s). (See also tokenisation, type, type/token ratio.)

tokenisation The automatic process of converting all of a text into separate tokens, for example, by splitting conjoined words like he’s, separating punctuation (such
as commas and full stops) from words and removing capitalisation. Tokenisation is usually the first stage in lemmatisation or part-of-speech tagging.

tool A term given to any piece of software that can automatically manipulate electronic (usually textual) data. Some tools can be used in the compilation of corpora, for example, by collecting files from the internet. Other tools are used to encode corpus data, such as part-of-speech taggers, while other tools carry out analysis on the data, generating frequency information, concordances, keywords, collocations or carrying out statistical tests.

Tools for Syntactic Corpus Analysis (TOSCA) Corpus The TOSCA Corpus contains 1.5 million words of English, stored in the Nijmegen Linguistic Database (see Oostdijk 1991).

training corpus A collection of text (often a smaller, representative sample taken from a larger corpus) that has been annotated and can be used to ‘train’ an automatic tagger or parser to apply that same annotation to other texts. The tagger is then tested by using it to tag a blank version of (part of) the training corpus, which is then analysed for errors. This provides feedback that is used to refine and improve the accuracy of the tagger.

TRAINS Dialogue Corpus A spoken corpus created in the early 1990s from recordings of dialogues produced by pairs of participants in problem-solving interactions. The texts are available at http://www.cs.rochester.edu/research/cisd/resources/trains.html.

treebank A corpus that has been grammatically annotated
in order to identify and label different constituent structures or phrases. Because of the system of labelling (Figure 3 shows a visual representation), such structures are sometimes referred to as ‘trees’.

![Diagram of a treebank](image)

**Fig. 3.** Visual representation of a treebank:
DE = Determiner, P = Preposition

**TreeTagger** A part-of-speech tagger developed at the University of Stuttgart. While it is based on probabilistic disambiguation, unlike most probabilistic taggers it does not use a hidden Markov model. Instead, the likeliest tag is selected using a ‘decision tree’. The TreeTagger is language-independent and has been trained to tag a number of different languages, including German, English, French and Spanish. It also provides lemmatisation in its output. See [http://www.ims.uni-stuttgart.de/projekte/corplex/TreeTagger/DecisionTreeTagger.html](http://www.ims.uni-stuttgart.de/projekte/corplex/TreeTagger/DecisionTreeTagger.html).

**Trésor de la Langue Française Informatisé (TLFi)** A database consisting of 170 million words of written French from the seventeenth century to the present, from about
2,600 texts. Genres include novels, verse, journalism, essays, correspondence and treatises. Standard scholarly editions were used to convert the text into machine-readable form.

**trigram** see bigram and trigram

Trigrams’n’Tags (TnT) A part-of-speech tagger created by Thosten Brants at the Universität des Saarlandes, Germany. It is a language independent tagger and can be used with any tagset. It is optimised for speed and for training on a large variety of corpora.

**type** While the number of tokens in a corpus refers to the total number of words, the number of types refers to the total number of unique words. For example, the word *ship* may occur 177 times in a corpus, but it only counts as one type of word. Types are used in calculating the **type/token ratio** (a measure of lexical repetition) of a text or corpus.

**type/token ratio** The number of types (unique words) in a text, divided by the number of tokens (total number of words) and expressed as a percentage. A high type/token ratio suggests that a text is lexically diverse, whereas a low type/token ratio suggests that there is a lot of repetition of lexical items in a file.

The type/token ratio tends to use all of the words in a text, unlike measures of lexical density which can remove the function words. However, the larger the corpus or file is, the lower the type/token ratio will be, due to the repetitive nature of function words. One solution is therefore to calculate a **standardised type/token ratio**.
UCREL Semantic Analysis System (USAS) A semantic tagger, that is to say a software system for undertaking the automatic semantic analysis of text. The semantic tagset used by USAS was originally loosely based on Tom McArthur’s *Longman Lexicon of Contemporary English* (McArthur, 1981). It has a multi-tier structure with twenty-one major discourse fields, subdivided, and with the possibility of further fine-grained subdivision in certain cases. For example, the code T3 refers to ‘Time: Old, new and young; age’, so the word *kids* is assigned T3- placing it at one end of a linear scale, whereas a word like *pensioner* would receive T3+. In addition, when words can fit into more than one semantic category, they may receive more than one semantic tag, shown by a forward slash sign. So *kids* is tagged as T3-/S2mf which also places it in the category of ‘People’. See the University Centre for Computer Corpus Research on Language (UCREL).

Unicode Unicode is a large character set covering most of the world’s writing systems, offering a way of standardising the hundreds of different encoding systems for rendering electronic text in different languages, which were often conflicting. Older character sets such as the American Standard Code for Information Exchange (ASCII) used 8-bit encoding (meaning that they can only represent 256 characters) so no single system was adequate for all the letters, punctuation and other symbols in common use. Therefore, character sets based around different languages would be incompatible with one another – a character rendered as ā in one character set could appear as something completely different in another, and mixing writing systems in a single character
set would be impossible. Unicode, on the other hand, uses a 16-bit or 32-bit encoding system, allowing for thousands of unique characters. Many modern corpora are encoded in Unicode (for instance the Enabling Minority Language Engineering (EMILLE) Corpus and the Lancaster Corpus of Mandarin Chinese (LCMC)).

Universidad Autónoma de Madrid (UAM) Spanish Treebank
A parsed corpus (or treebank) of 1,500 sentences in Spanish. (See also http://www.lllf.uam.es/~sandoval/UAMTreebank.html.)

University Centre for Computer Corpus Research on Language (UCREL) A research centre at Lancaster University that focuses on corpus building and exploitation of Modern English, Early Modern English, modern foreign languages, minority, endangered and ancient languages. UCREL holds a conference every two years and has been involved in the creation and annotation of corpora such as the British National Corpus (BNC), the Enabling Minority Language Engineering Corpus (EMILLE) and the Lancaster Corpus of Mandarin Chinese (LCMC). UCREL also developed the CLAWS part-of-speech tagger, the UCREL semantic analysis system (USAS) and the Automatic Content Analysis of Spoken Discourse (ACASD) word sense tagging system.

UNIX A computer operating system. Many corpus analysis tools have been designed to run on mainframe computers in a Unix environment, which users might access via a network. This is because, until the mid to late 1980s, the large size of many corpora meant that a very fast, powerful computer was required to process them in a reasonable length of time. However, as desktop computers become more powerful, tools designed to run
on common PC operating systems such as Windows or Linux are capable of processing larger and larger corpora with ease.

**unrestricted text** In computational linguistics, a common goal is to develop methods and tools that will work on unrestricted text, that is, any text at all in a given language. Many part-of-speech taggers, for instance, can process unrestricted text (albeit with some errors). If the text to be analysed is restricted – that is, drawn from a defined type of text whose language does not vary a great deal, for example computer manuals or recipe books – it is often easier to develop tools, but the tools are obviously of much wider use if they can handle unrestricted text.

**upward collocation** A form of collocation outlined by Sinclair (1991: 115–19) whereby the focus is upon grammatical patterns surrounding a particular lexical item. Upward collocation occurs when one collocate occurs more frequently in a corpus or text than its collocational pair. Upward collocates tend to be function words rather than content words. For example, upward collocates of the word bachelor (which occurs 1,135 times in the British National Corpus (BNC)) are who (200,991 occurrences in the BNC), a (21,69,250), his (409,826) and into (157,875). (See also colligation, downward collocation.)

**validity** A variable or measure is valid if its values are close to the true values of the thing that the variable or measure represents. Validity is therefore an important
aspect of corpus design, related to the concept of representativeness.

Varbrul programs The name given to a group of analysis tools including GoldVarb and Varbrul for MS-DOS. These programs are used to conduct a type of statistical analysis called a ‘variable rule analysis or multivariate analysis’ on corpus data or other large quantity of language data. This analysis tries to identify whether different linguistic variables in the data are related to one another, that is if changes in one variable coincide with or correspond to changes in another variable.

variation Many studies using corpora have focused on variation by comparing two or more dialects, channels, genres, languages or varieties of language in order to uncover the main differences and similarities between them (see also multi-dimensional analysis (Biber 1988, 1989)). Other studies of note include Altenberg’s (1994) comparison of spoken and written English, Leech and Fallon’s (1992) study of British and American English, Rissanen’s (1992) diachronic comparison of the Helsinki Corpus texts and Gillard and Gadsby’s (1998) comparison of learner English and native speaker English.

Viterbi algorithm A technique for probabilistic disambiguation using a hidden Markov model. One problem with using a Markov model for part-of-speech tagging is that it can need a lot of computer power. For example, if we have a sequence of five tokens, each with five potential tags, then the number of possible sequences is $5 \times 5 \times 5 \times 5 \times 5 = 3,125$. Calculating the probability of each of these sequences requires lots of memory and computing. If the Viterbi algorithm is used to process the Markov model, however, unlikely sequences are dropped from
consideration as the program goes along, and the computer only has to take a small number of good possibilities into account at any one time. The VOLSUNGA tagger is based on this type of Markov model system.

VocabProfile An MS-DOS-based tool which compares vocabulary overlap between different texts. It also compares texts to a pre-specified frequency list and calculates the proportion of the text that is made from the words in the list. It can be useful in determining whether a text contains language that is representative of a particular genre. See Laufer and Nation (1995).

VOLSUNGA A probabilistic tagger created by De Rose (1988). It has ninety-seven tags and achieved 96 per cent accuracy when tagging the Brown Corpus. Its method of tagging involves using dynamic programming (Dano 1975) to choose an optimal path – one whose component collocations multiplied out to the highest probability. (See also Viterbi algorithm.)

Web as corpus see World Wide Web

Wellington Corpus of Spoken New Zealand English (WSC) A corpus consisting of a million words of spoken New Zealand English that was collected between 1988 and 1994 by the Victoria University of Wellington. It contains 2,000 word extracts, consisting of 75 per cent informal speech, 12 per cent formal and 12 per cent semi-formal speech) as well as monologues and dialogues. See Holmes et al. (1998).

Wellington Corpus of Written New Zealand English (WWC)
A corpus consisting of a million words of written New Zealand English collected from writings published in the years 1986 to 1990. Its structure mirrors the categories in the Brown Corpus, containing 2,000 word excerpts of a range of texts. See Bauer (1993).

**wild card** A character that can stand for any other character in a regular expression. Wild cards allow more sophisticated searches in corpora to be carried out. For example, a concordance program could specify that the * character acted as a wild card, standing in for a string of any characters of any length. It would be possible to search for any word that begins with the word look (for example looked, looking, looker) by carrying out a search on the string look*. Other types of wild cards can represent any single character – the full stop character can often function this way in search syntax, for example h.t will find hat, hit, hot and hut. Different concordance tools may use different (or no) wildcards in their search facilities.

**Wmatrix** An analysis system for English texts and corpora developed by Paul Rayson at Lancaster University. It is accessed using a web-based interface. As well as tagging text using the CLAWS part-of-speech tagger and the UCREL Semantic Analysis System (USAS) semantic tagger, Wmatrix functions as a concordancer. It can also calculate keywords, key part of speech tags, and key semantic categories in a text.

**Wolverhampton Business English Corpus (WBE)** A corpus of 10 million words of English texts drawn from the World Wide Web, and consisting entirely of documents from the domain of business.
**word list** A list of all of the words that appear in a text or corpus, often useful for dictionary creation. Word lists often give the frequencies of each word (or token) in the corpus. Words are most usually ordered alphabetically, or in terms of frequency, either with a raw frequency count and/or the percentage that the word contributes towards the whole text. Additionally, word lists can be lemmatised or annotated with part-of-speech or semantic information (including probabilities – for example, the word *house* occurs as a noun about 99 per cent of the time and as a verb 1 per cent of the time). Word lists are needed when calculating key words and key key words. (See also lexicon.)

**WordCruncher** A corpus tool that provides text indexing and retrieval software for text analysis created by Brigham Young University. It includes two separate and distinct programs, WCView and WCIndex. WCIndex indexes texts to be studied with WCView; WCView analyses and retrieves texts prepared with WCIndex. Users may catalogue and alphabetically sort each word in a text, written in English or other languages, into a WordCruncher Index. They can also analyse and manipulate data from a textbase in any number of ways, carrying out searches on words, phrases, regular expressions etc. WordCruncher also allows analysis of frequency distributions and can create word lists, collocations and concordances. It is available from Johnston and Company, Electronic Publishers, Indiana.

**WordSmith Tools** A software package for analysing the lexis of texts and corpora, developed by Mike Scott. It can be used to produce frequency lists, to run concordance searches and calculate collocations for particular words, and to find keywords in a text and examine their dis-
tribution. It can be used with both plain text and text with markup tags (for instance Standard Generalised Markup Language). Unlike some other analysis packages (for example SARA, WordCruncher) WordSmith does not require the corpus to be indexed in advance. (See also www.lexically.net/wordsmith.)

World Wide Web More commonly WWW or simply ‘the Web’, this is a global network of interlinked hypertext documents that can be read using a browser program and an Internet connection. At the beginning of the twenty-first century it has become the main way of accessing resources on the Internet. The explosive growth of the Web in the last years of the twentieth century means that it is now an immense mass of text, numbering in the billions of documents, and greater in size than even the largest corpus by a factor of thousands. This being the case, researchers such as Kilgarriff and Grefenstette (2003) have investigated the possibility of using the web as a corpus. This is particularly useful for lexicography, since most words occur only rarely (see Zipf’s Law); a huge dataset is needed to get a reasonable set of examples of such words.

At a basic level, frequency counts for words on the Web can be obtained using a commercial search engine such as Google (www.google.com). At a more sophisticated level, software has been developed to make using the Web as a corpus more like using a ‘normal’ corpus: for example, the WebCorp concordancer (http://www.webcorp.org.uk), WebCONC (http://www.niederlandistik.fu-berlin.de/cgi-bin/web-conc.cgi), or WebKWiC (http://miniappolis.com/WebKWiC/WebKWiCHome.html). Quite apart from using the whole Web as a corpus, the Web has frequently been employed as an inexpensive and convenient
method to gather documents for inclusion in a corpus. Some corpora can also be obtained and/or analysed via a Web interface; see BNCweb, on-line corpora.

While the Web’s size is its great strength as a corpus, its great drawback is the low level of control that researchers have over its contents. So, if representativeness or a careful corpus design are important for a particular corpus-based study, the Web would not be the best corpus to use.

**written corpus** A corpus that only contains texts that have been produced or published in written format. This could include traditional books, novels, textbooks, newspapers, magazines or unpublished letters and diaries. It could also include written texts that were produced electronically; for example, emails, bulletin board contributions and websites. The criteria for what exactly constitutes a written text can have grey areas – for example, prepared speeches or television/film/radio scripts are probably better considered as written-to-be-spoken texts. In the absence of a pre-existing electronic version, written texts need to be scanned or keyboarded. Because written texts tend to be grammatically predictable, many taggers usually perform with a higher accuracy on written texts than spoken texts (particularly spontaneous conversations). Written corpora generally tend to contain a higher number of conjunctions and prepositions than spoken data, suggesting longer, more complex sentences.

**Xerox tagger** A probabilistic part-of-speech tagger based on a hidden Markov model. It can be trained on untagged data using the Baum–Welch algorithm. It was originally
trained to tag English, but as it is language-independent, it has also been retrained for other languages, for instance Spanish. See Cutting et al. (1992).

**XHTML** A form of HTML which complies with the rules of XML, rather than the rules of SGML, the basis for HTML. XHTML was designed in the early years of the twenty-first century as a successor to HTML.

**Xkwic** A search and retrieval tool, also called CQp, that was developed at the University of Stuttgart. It is capable of rapid, complex searches on very large corpora and can also carry out frequency distributions and calculate collocates based on part-of-speech tagged corpora. It is free and runs on Unix, Linux and Java platforms. See Christ et al. (1999).

**XML Aware Indexing and Retrieval Architecture (Xaira)** A software package descended from SARA, and with many of the same capabilities, for example running queries for words, markup, or word tags to produce concordances. But while SARA was designed specifically for use with the British National Corpus (BNC), Xaira can be used with any text or corpus that is encoded in XML. Xaira has full Unicode support, allowing it to be used with corpora in any language and any writing system. Like SARA, Xaira searches large corpora quickly by looking through an index, which must be set up in advance for each corpus. See http://www.xaira.org.

**York–Toronto–Helsinki Corpus of Old English Prose (YCOE)** This historical corpus contains 1.5 million
words of text from the Anglo-Saxon period. It has been syntactically annotated (see parsing), with an annotation scheme which is the same as that of the Penn–Helsinki Parsed Corpus of Middle English. It was developed alongside a corpus of poetry from the same period, the York–Helsinki Parsed Corpus of Old English Poetry. Together with the Penn–Helsinki corpora, these form a family of parsed historical corpora.

**Zipf's law** The mathematical formula that describes the frequency patterns found for words in corpora. In any corpus (and in language as a whole), there are a small number of words that occur very frequently: for instance, *of, the, or it*. But there are many, many words that occur very infrequently: for example *destructiveness, elephantine, pseudonymous*. If word frequency is plotted on a graph against the number of words in the corpus that occur with that frequency, the points form a characteristic curve whose shape is described by Zipf’s law. This is an interesting finding, because Zipf’s law also describes the distribution of many things other than words. For example, it has been found that the popularity of websites follows the same pattern (a very few are very popular, and an immensely greater number are viewed by hardly anyone at all). (See also hapax legomena.)

**Zürich English Newspaper Corpus (ZEN)** This historical corpus consists of early English newspapers from the period 1671 to 1791, and contains more than 1 million words of text in Standard Generalised Markup Language (SGML) format.
Z-score  A statistical measure of the degree of relatedness of two elements: it expresses how unlikely it is that the two words are unrelated. In corpus linguistics, it is often used as a measure of the strength of a collocation between two words.
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