

The Linguistics Encyclopedia

Third Edition

Edited by
Kirsten Malmkjær

THE ROUTLEDGE LINGUISTICS ENCYCLOPEDIA

The Routledge Linguistics Encyclopedia is a single-volume encyclopedia covering all major and subsidiary areas of linguistics and applied linguistics. The seventy nine entries provide in-depth coverage of the topics and sub-topics of the field. Entries are alphabetically arranged and extensively cross-referenced so the reader can see how areas interrelate. Including a substantial introduction which provides a potted history of linguistics and suggestions for further reading, this is an indispensable reference tool for specialists and non-specialists alike.

This third edition has been thoroughly revised and updated, with new entries on:

- Attitudes to Language
- Conversation Analysis
- English Language Teaching
- Gesture and Language
- Idioms
- Language and Advertising
- Language and New Technologies
- Linguistics in Schools

- Optimality Theory
- Research Methods in Linguistics
- Slang

The following entries have been recommissioned or substantially revised:

Animals and Language, Artificial Languages, Computational Linguistics to Language Engineering, Contrastive Analysis/Contrastive Linguistics, Corpus Linguistics, Critical Discourse Analysis, Dialectology, Discourse Analysis, Dyslexia, Genre Analysis, Historical Linguistics, Intonation, Language and Education, Language, Gender and Sexuality, Language Origins, Language Surveys, Language Universals, Linguistic Typology, Metaphor, Pragmatics, Rhetoric, Semantics, Semiotics, Sociolinguistics, Stylistics, Systemic-Functional Grammar, Writing Systems.

Kirsten Malmkjær is Professor of Translation Studies and Literary Translation at Middlesex University, UK.

THE ROUTLEDGE LINGUISTICS ENCYCLOPEDIA

THIRD EDITION

Edited by
Kirsten Malmkjær

First published 1995, second edition 2002
Third edition 2010
by Routledge
2 Park Square, Milton Park, Abingdon, OX14 4RN

Simultaneously published in the USA and Canada
by Routledge
270 Madison Ave, New York, NY 10016

Routledge is an imprint of the Taylor & Francis Group, an informa business

This edition published in the Taylor & Francis e-Library, 2009.

To purchase your own copy of this or any of Taylor & Francis or Routledge's
collection of thousands of eBooks please go to www.eBookstore.tandf.co.uk.

© 1995, 2002, 2010 Kirsten Malmkjær

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any
form or by any electronic, mechanical, or other means, now known or hereafter invented,
including photocopying and recording, or in any information storage or retrieval system,
without permission in writing from the publishers.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data

A catalog record for this book has been requested

ISBN 0-203-87495-1 Master e-book ISBN

ISBN13: 978-0-415-42104-1 (hbk)

ISBN13: 978-0-203-87495-0 (ebk)

Contents

List of entries	vi
Key to contributors	viii
Notes on contributors	ix
Preface	xix
Acknowledgements	xx
Introduction	xxiii
Entry A–Z	1
Bibliography	562
Index	651

List of entries

Acoustic phonetics	Generative semantics
Animals and language	Genre analysis
Aphasia	Gesture and language
Applied linguistics	Glossematics
Articulatory phonetics	
Artificial languages	Historical linguistics
Attitudes to language: past, present and future	History of grammar
Auditory phonetics	
	Idioms
Behaviourist linguistics	The International Phonetic Alphabet
Bilingualism and multilingualism	Interpretive semantics
	Intonation
Cognitive linguistics	
From computational linguistics to natural language engineering	Language acquisition
Contrastive analysis/contrastive linguistics	Language and advertising
Conversation analysis	Language and education
Corpus linguistics	Language and new technologies
Creoles and pidgins	Language, gender and sexuality
Critical discourse analysis	Language origins
	Language pathology and neurolinguistics
Dialectology	Language surveys
Discourse analysis	Language universals
Distinctive features	Lexicography
Dyslexia	Lexis and lexicology
	Linguistic relativity
English Language Teaching	Linguistic typology
	Linguistics in schools
Forensic linguistics	
Formal grammar	Metaphor
Formal logic and modal logic	Morphology
Formal semantics	
Functional phonology	Non-transformational grammar
Functionalist linguistics	
	Optimality theory
Generative grammar	
Generative phonology	Philosophy of language
	Phonemics

Port-Royal Grammar

Pragmatics

Prosodic phonology

Psycholinguistics

Research methods in linguistics

Rhetoric

Semantics

Semiotics

Sign language

Slang

Sociolinguistics

Speech-act theory

Speech and language therapy

Stratificational linguistics

Stylistics

Systemic-functional grammar

Text linguistics

Tone languages

Writing systems

Key to contributors

A.B.	Aileen Bloomer	J.P.B.	James P. Blevins
A.d.V.	Antonio de Velasco	J.P.L.	James P. Lantolf
A.F.	Anthony Fox	J.R.	Jonnie Robinson
A.G.	Angela Goddard	J.S.	Jakob Steensig
A.M.R.	Allan M. Ramsay	K.H.	Ken Hyland
A.P.G.	Andrew Peter Goatly	K.M.	Kirsten Malmkjær
A.P.R.H.	Tony Howatt	K.O'H.	Kieran O'Halloran
B.A.	Barbara Abbott	L.J.R.	Louise J. Ravelli
B.C.	Billy Clark	L.P.	Lucy Pickering
B.D.J.	Brian D. Joseph	L.T.D.-R.	Lynne T. Diaz-Rico
C.B.	Colin Baker	M.A.G.	Michael A. Garman
C.H.	Christopher Hookway	M.B.	Michael Burke
C.L.	Carmen Llamas	M.C.	Malcolm Coulthard
C.M.	Cornelia Müller	M.J.M.	Michael J. McCarthy
C.-W.K.	Chin-W. Kim	M.K.C.M	Michael K.C. MacMahon
D.B.	David Britain	M.L.	Michael Leff
D.G.C.	Daniel Glen Chandler	M.L.J.	Mary Lee Jensvold
D.G.L.	David G. Lockwood	M.M.	Molly Mack
E.F.-J.	Eli Fischer-Jørgensen	M.T.	Maggie Tallerman
E.K.B.	Keith Brown	N.B.	Nicola Brunswick
F.J.N.	Frederick J. Newmeyer	P.S.	Philippe Schlenker
G.C.	Guy Cook	R.A.C.	Ronald A. Carter
G.N.L.	Geoffrey N. Leech	R.D.	René Dirven
G.P.	Gill Philip	R.F.I.	Robert F. Ilson
H.C.D.	Hope C. Dawson	R.K.	Richard Kennaway
H.G.	Howard Giles	S.C.	Sonia Cristofaro
H.H.	Hilde Hasselgård	S.Ed.	Susan Edwards
H.R.	Henry Rogers	S.Eh.	Susan Ehrlich
J.B.	Jacques Bourquin	S.S.	Stef Slembrouck
J.E.	John Edwards	T.A.	Tsutomu Akamatsu
J.F.	John Field	T.P.	Teresa Parodi
J.J.S.	Jae Jung Song	T.T.	Tony Thorne
J.M.A.	James M. Anderson	V.S.-L	Vieri Samek-Lodovici
J.N.W.	John N. Williams	W.S.-Y.W.	William S.-Y. Wang

Notes on contributors

Barbara Abbott taught linguistics and philosophy at Michigan State University from 1976 to 2006. Her main areas of specialisation fall within semantics, pragmatics and philosophy of language. Specific topics of interest include definiteness and indefiniteness, referential opacity, presuppositions, natural kind terms and conditionals. Among her published articles are 'Nondescriptionality and Natural Kind Terms', 'Models, Truth, and Semantics', 'Water = H₂O', 'Presuppositions As Nonassertions', 'Donkey Demonstratives', and 'Conditionals in English and First Order Predicate Logic'.

Tsutomu Akamatsu studied Modern Languages at Tokyo University of Foreign Studies, Phonetics at the University of London and General Linguistics at the University of Paris. He earned his Ph.D. from the University of Leeds, where he was a lecturer in the Department of Linguistics and Phonetics. He is a member of the Société Internationale de Linguistique Fonctionnelle (SILF) and has published more than 100 articles in linguistics journals. His other publications include *The Theory of Neutralization and the Archiphoneme in Functional Phonology* (1988), *Essentials of Functional Phonology* (1992), *Japanese Phonetics: Theory and Practice* (1997) and *Japanese Phonology: A Functional Approach* (2000).

Colin Baker is Professor of Education at the University of Wales, Bangor. He is the author of fifteen books and over fifty articles on bilingualism and bilingual education. His *Foundations of Bilingual Education and Bilingualism* (2006, 4th edn) has sold over 50,000 copies and has been translated into Japanese, Spanish, Latvian, Greek, Vietnamese and Mandarin. His *Encyclopedia of Bilingualism and Bilingual Education* (with S.P. Jones) won the British Association for Applied Linguistics Book Prize Award for 1999. He is Editor of the *International Journal of Bilingualism and Bilingual Education* and also edits two Book Series for Multilingual Matters. In

addition to academic activities, Colin Baker has held two government appointments as a member of the Assessment and Curriculum Council and the Welsh Language Board.

James P. Blevins received his Ph.D. from the University of Massachusetts, Amherst, Mass., in 1990. He currently teaches in the Research Centre for English and Applied Linguistics at the University of Cambridge. His research interests include syntax, morphosyntax, computational linguistics and the history of linguistics.

Aileen Bloomer was Principal Lecturer at York St John University having previously worked in Warwick, Sweden, Germany, Vietnam and China.

Jacques Bourquin, Docteur ès sciences, Docteur ès lettres, is Professor of French Linguistics at the University of Franche-Comté, Besançon, France. He has written a thesis entitled 'La Dérivation suffixale (théorie et enseignement) au XIXe siècle', plus several articles on the problem of reading and on the epistemology of linguistics.

David Britain is Professor of Modern English Linguistics at the University of Bern in Switzerland, having previously worked in the Department of Linguistics at Victoria University of Wellington in New Zealand (1991–93) and in the Department of Language and Linguistics at the University of Essex in England (1993–2009). He has edited *Language in the British Isles* (2007, Cambridge University Press) and, with Jenny Cheshire, *Social Dialectology* (2003, Benjamins), as well as co-authored *Linguistics: An Introduction* (2009, 2nd edn, Cambridge University Press) with his former colleagues Andrew Radford, Martin Atkinson, Harald Clahsen and Andrew Spencer. He is currently an Associate Editor of the *Journal of Sociolinguistics*. His research interests lie in

dialect contact, the dialectology of East Anglia and the anglophone Southern Hemisphere, and the human geography-sociolinguistics interface.

E. Keith Brown received his Ph.D. from the University of Edinburgh in 1972. He has lectured in Ghana, Edinburgh, Essex (where he was Research Professor in Linguistics) and Cambridge. He has held visiting appointments in Toronto, Stirling, Heidelberg, Vienna and Düsseldorf, and his lecture tours have taken him to Germany, Poland, Bulgaria, Iran and Japan. His major publications include *Linguistics Today* (1984) and (with J.E. Miller) *Syntax: A Linguistic Introduction to Sentence Structure* (1980), *Syntax: Generative Grammar* (1982), *A Concise Encyclopedia of Syntactic Theories* (1996) and *A Concise Encyclopedia of Grammatical Categories* (1999). He is Editor in Chief of Elsevier's *Encyclopedia of Language and Linguistics* (14 vols) (2006).

Nicola Brunswick is Senior Lecturer in Psychology at Middlesex University. She studied for her Ph.D. in the psychophysiology of dyslexia at the University of Warwick and completed her post-doctoral training with Professors Chris and Uta Frith at the Wellcome Department of Imaging Neuroscience and the MRC Cognitive Development Unit, London. She researches in the areas of normal reading development and developmental dyslexia, and her research has appeared in the journals *Brain*, *Nature Neuroscience* and *Science*. She is a trustee of the British Dyslexia Association.

Michael Burke is Associate Professor in Rhetoric, English and Pedagogy and Head of the Academic Core Department at Roosevelt Academy Middelburg, an honours college of Utrecht University. He received his Ph.D. from Amsterdam University for his work 'The Oceanic Mind' on literary discourse processing. He currently teaches courses in stylistics, cognitive stylistics, rhetoric, creative writing, critical discourse analysis and persuasion in social discourses. He has published several articles and books in all these areas.

Ronald A. Carter is Professor of Modern English Language in the School of English Studies at the University of Nottingham. His publications include *Language and Literature: A Reader in Stylistics* (1982), *The Web of Words* (with teacher's book, 1987), *Vocabulary: Applied Linguistic Perspectives* (1987, 2nd edn, 1998), *Vocabulary and Language Teaching* (with M. McCarthy, 1988), *Seeing Through Language* (with Walter Nash, 1990), *Exploring Spoken English* (with M. McCarthy, 1997), *The Routledge History of Literature in English:*

Britain and Ireland (with John McRae, 1997, 2nd edn 2001), *Investigating English Discourse* (1997), *Exploring Grammar in Context* (with Rebecca Hughes and Michael McCarthy, 2000), *Standard Spoken English: Common Language, Creative Discourse* (2001), *The Cambridge Grammar of English* (with Michael McCarthy, 2002), as well as a number of edited volumes and numerous research papers. He is the editor of six book series, and his research activities range from empirical classroom investigations of the relationship between language awareness and language teaching to a multi-million-word, corpus-based analysis of spoken English. Professor Carter was awarded an MBE for services to local and national higher education in the 2009 New Year's Honours List.

Daniel Glen Chandler is a lecturer in the Department of Theatre, Film and Television Studies at the University of Wales, Aberystwyth. He is the author of *Semiotics: The Basics* (2002 and 2007).

Billy Clark is Senior Lecturer in English Language at Middlesex University. His research interests centre mainly on linguistic meaning (semantics and pragmatics). Recent work has focused on intonational meaning, pragmatic stylistics and the inferential processes involved in writing. He was Section Editor and contributor for the section on 'Foundations of Linguistics' in the *Elsevier Encyclopedia of Language and Linguistics*, edited by E. Keith Brown in 2006. He has worked on a number of committees concerned with the links between linguistics and education, including a group working towards the development of an A Level in Linguistics. His book on Relevance Theory will be published by Cambridge University Press.

Guy Cook is Professor of Language and Education at the Open University in England. He was formerly head of TESOL at the London University Institute of Education (1991–8), and Professor of Applied Linguistics at the University of Reading (1998–2004). He has published extensively on applied linguistics, discourse analysis, English-language teaching, literary stylistics, advertising, and the language of public debates about food. His books include *The Language of Advertising* (2008), *Genetically Modified Language* (2004), *Applied Linguistics* (2003), *The Discourse of Advertising* (2001), *Language Play, Language Learning* (2000), *Discourse and Literature* (1994) and *Discourse* (1989). He is co-editor of the journal *Applied Linguistics*, and an Academician of the Academy of Learned Societies for the Social Sciences.

Malcolm Coulthard is Professor of Forensic Linguistics at Aston University, Emeritus Professor of English Language and Linguistics at the University of Birmingham and Honorary Professor at Cardiff University. He is best known for his work on discourse analysis, published in *Towards an Analysis of Discourse* (1975), *An Introduction to Discourse Analysis*, (1977, 1985) and *Texts and Practices* (1996). In the late 1980s, he became involved in the emergent field of forensic linguistics. He was elected founding President of the International Association of Forensic Linguists and was the founding editor of the journal *Forensic Linguistics: The International Journal of Speech, Language and the Law*. He has been consulted as an expert witness in over 180 cases, including the high-profile Birmingham Six, Derek Bentley and Bridgewater Four appeals. *An Introduction to Forensic Linguistics: Language in Evidence*, jointly authored with Alison Johnson, appeared in 2007.

Sonia Cristofaro is Associate Professor of Linguistics at the University of Pavia, Italy. Her research interests focus on typology, cognitive linguistics and historical linguistics. Her publications include two books, *Subordination* (2003) and *Aspetti sintattici e semantici delle frasi complete in greco antico* (The Syntax and Semantics of Complement Sentences in Ancient Greek) (1996), as well as various scholarly articles which have appeared in international journals and edited volumes.

Hope C. Dawson received her Ph.D. in Linguistics in 2005 from The Ohio State University, writing her dissertation on morphological variation and change in Vedic Sanskrit. Since then, she has been the Teaching Associate Coordinator and Lecturer in Linguistics and Sanskrit for the Department of Linguistics at Ohio State. Her research interests include historical and Indo-European linguistics, language contact and sociolinguistics, Sanskrit and the history of American linguistics.

Lynne T. Diaz-Rico is Professor of Education at California State University, San Bernardino, where she coordinates the MA in Education, Teaching English to Speakers of Other Languages programme. Her books, *A Course For Teaching English Learners* and *The Crosscultural, Language, and Academic Development Handbook* (now in its fourth edition) are widely used in programmes of teacher education to prepare teachers for multiethnic and linguistically diverse classrooms, and her book *Strategies for Teaching English Learners* is a comprehensive textbook for TESOL master's programs. Her research interests

are in classroom discourse and innovative English-language-acquisition pedagogy.

René Dirven studied Germanic Philology at the Catholic University of Leuven from 1952 to 1956, and taught in the secondary-school sector until 1958, when he became a lecturer in two Brussels training colleges. In 1965, he was appointed to a lectureship in the Higher Institute for Translators and Interpreters Marie Haps in Brussels. He obtained his Ph.D. in Germanic Philology in 1971 and was appointed Professor in English Linguistics at the University of Trier, Germany, in 1972. Here he set up the Linguistic Agency University Trier (LAUD), organising annual linguistic symposia and publishing linguistic preprints. In 1985 he was offered a full professorship at the University of Duisburg, Germany, where he stayed until 1995, when he retired from teaching. As Professor Emeritus, he continues his research and work in international projects and organisations such as LAUD, LICCA (Languages in Contact and Conflict in Africa) and ICLA (International Association of Cognitive Linguists), of which he was President from 1995 to 1997. The group project EURO-PILL, which aims at producing introductions to language and linguistics in the most important European languages, was completed in 2000, and a Cognitive English Grammar and a project in electronic bibliographies, E-Bib, was begun. René Dirven's publications include (with Wolf Paprotté) *The Ubiquity of Metaphor: Metaphor in Language and Thought* (1985), (with V. Fried) *Functionalism in Linguistics* (1987) and *Fillmore's Case Grammar: A Reader* (1987), (ed.) *A User's Grammar of English: Word, Sentence, Text, Interaction* (1989), *Metonymy and Metaphor: Different Mental Strategies of Conceptualisation* (1993), *Metaphor and Nation: Metaphors Afrikaners Live by* (1994), (with Johan Vanprys) *Current Approaches to the Lexicon* (1995) and (with Marjolijn Verspoor) *Cognitive Exploration of Language and Linguistics* (1998).

John Edwards was born in England, educated there and in Canada, and received a Ph.D. (in psychology) from McGill University in 1974. After working as a Research Fellow at the Educational Research Centre, St Patrick's College, Dublin, he moved to Nova Scotia, where he is now Professor of Psychology at St Francis Xavier University. His research interests are in language, identity and the many ramifications of their relationship. He is on the editorial boards of a dozen language journals and is the editor of the *Journal of Multilingual and Multicultural Development*; he also edits a companion series of books. Professor Edwards' own books

include *Language in Canada* (1998), *Multilingualism* (1995), *Language, Society and Identity* (1985) and *The Irish Language* (1983). He is also the author of about 200 articles, chapters and reviews. Professor Edwards is a member of several psychological and linguistic societies, as well as scholarly organisations for the study of ethnicity and nationalism. He is a fellow of the British Psychological Society, the Canadian Psychological Association and the Royal Society of Canada.

Susan Edwards is Professor of Clinical Linguistics in the School of Psychology and Clinical Language Sciences at the University of Reading. She is also a qualified speech and language therapist whose expertise is focused on aphasia. She has worked with both children and adults. Her publications cover a variety of topics in language pathology, including many on aphasia. She has written over fifty papers on speech and language impairment in children and adults and two books, *Fluent Aphasia* (2005), and (with Rondall), *Language in Mental Retardation* (1997). She has co-authored two language tests, one for use with children – The Reynell Developmental Language Scales (1997), with Fletcher, Garman, Hughes, Letts and Sinka – and one (with Bastiaanse) that is used in aphasia treatment and research, The Verb and Sentence Test (2002). She is on the editorial board of *Aphasiology*, the *Asia Pacific Journal of Speech Language and Hearing* and the *Journal of Language and Mind*.

Susan Ehrlich is a professor of linguistics in the Department of Languages, Literatures and Linguistics at York University, Toronto. Her areas of research include discourse analysis, language and gender and language and the law and her work has appeared in journals such as *Discourse and Society*, *Language in Society*, *Journal of Sociolinguistics* and the *International Journal of Speech, Language and the Law*. Recent books include: *Representing Rape: Language and Sexual Consent* (2001), *Language and Gender* (a four-volume edited edition, 2008) and the forthcoming *'Why Do You Ask?': The Function of Questions in Institutional Discourse* (edited with Alice Freed, Oxford University Press).

John Field is a member of the Applied Linguistics department at the University of Reading, where he lectures on psycholinguistics, child language, grammar for language learning and second-language processes. He also teaches cognitive approaches to second language acquisition at the Faculty of Education, Cambridge University. Before becoming an academic, he was active in ELT as a

materials writer, designing courses for Saudi Arabia, Hong Kong and Mainland China and programmes for BBC English by Radio. He worked as a teacher trainer in many parts of the world and was an inspector of British language schools. His principal research interest lies in second language listening, on which he has published widely. His comprehensive account of the skill, *Listening in the Language Classroom* was published in 2008.

Eli Fischer-Jørgensen was Professor of Phonetics at the University of Copenhagen from 1966 to 1981, and was appointed Professor Emeritus on her retirement. In addition to about seventy article publications on phonological problems, and several Danish language volumes, her publications include *Trends in Phonological Theory* (1975) and *25 Years' Phonological Comments* (1979). She was Chair of the Linguistics Circle of Copenhagen, 1968–72, and has served on the editorial boards of several journals devoted to phonetics. In 1979 she presided over the Ninth International Congress of the Phonetic Sciences, held in Copenhagen. She received honorary doctorates from the Universities of Åhus and Lund in 1978.

Anthony Fox holds a Ph.D. from the University of Edinburgh. He taught in the Department of Linguistics and Phonetics at the University of Leeds, where he was Head of Department from 1989 until his retirement in 2003. He has published four books: *German Intonation* (1984), *The Structure of German* (1990), *Linguistic Reconstruction* (1995) and *Prosodic Features and Prosodic Structure* (2000). His research and publications have been mainly devoted to intonation and other suprasegmental features, especially from a typological point of view.

Michael A. Garman is a lecturer in the Department of Linguistic Science at the University of Reading.

Howard Giles was awarded his Ph.D. in 1971 and a D.Sc. in 1996, by the University of Bristol, where he became Chair of Social Psychology and, thereafter, Head of Psychology. He emigrated to California in 1989 and is Professor (past-Chair) of Communication at the University of California, Santa Barbara. Founding Editor of the *Journal of Language and Social Psychology* and the *Journal of Asian Pacific Communication*, elected Editor of *Human Communication Research*, and Editor of eight Book Series, Giles has researched different areas of inter-group communication, been on the Editorial Boards

of over forty journals, elected Fellow in gerontology, psychology, intercultural relations and communication Societies, and received many distinguished honours (e.g., the International Communication Association's inaugural Career Productivity and their Aubrey Fisher Mentor Awards). He has been Past President of this Association and the International Association of Language and Social Psychology. Furthering one of his inter-group research interests, Giles is a reserve lieutenant in the Santa Barbara Police Department and on call twenty-four/seven for their Crisis Negotiation Response Team.

Andrew Peter Goatly studied with Randolph Quirk for his Ph.D. at University College London and subsequently taught in colleges and universities in the UK, Thailand and Singapore. He is at present Professor in the Department of English at Lingnan University, Hong Kong. He has published the following books: *The Language of Metaphors* (1997), *Critical Reading and Writing* (2000), *Washing the Brain: Metaphor and Hidden Ideology* (2007), and *Explorations in Stylistics* (2008). He is also the chief investigator of a cross-linguistic study of metaphors in the lexicons of English and Chinese, which led to the interactive website Metalude.

Angela Goddard is Professor of English Language and Head of Subject for Languages and Linguistics at York St John University. She is also Chair of Examiners for English Language A Level at a national examination board. In 2008, she was awarded a National Teaching Fellowship by the Higher Education Academy, for her innovative English-language curriculum work. She co-edits the Routledge Intertext series, which currently features a core book, *Working with Texts*, in its third edition, and twenty-two further topic titles. She wrote *The Language of Advertising* and (with L. Méan) *Language and Gender*, in the same series. Her Ph.D. research focused on the language of chatrooms, and she has since expanded her interest to include all the ways in which language users express their identities in new communication contexts.

Hilde Hasselgård is Professor of English Language at the Department of Literature, Area Studies and European Languages at the University of Oslo, Norway. She holds a Ph.D. from the same university. Most of her research is within contrastive linguistics and corpus linguistics, using both monolingual and multilingual corpora. Other research interests include text analysis (within a systemic-functional framework) and the language of

learners of English. She has co-authored an English–Norwegian dictionary as well as two grammar books for university students of English and textbooks for the Norwegian upper secondary school.

Christopher Hookway has been Professor of Philosophy at the University of Sheffield, UK, since 1995, having previously taught at the University of Birmingham. His publications include *Peirce* (1985), *Quine: Language, Experience and Reality* (1988), *Scepticism* (1990) and *Truth, Rationality, and Pragmatism* (2000). He has edited *Minds, Machines and Evolution* (1984) and, with Donald Peterson, *Philosophy and Cognitive Science* (1993). His research interests are epistemology, American pragmatism and the philosophy of language.

Tony Howatt was born in Sheffield and educated in Yorkshire and Scotland, graduating with an MA (Edinburgh) in 1958. He taught English as a Foreign Language in Spain and Germany and, after gaining a distinction in the Diploma in Applied Linguistics (also Edinburgh) in 1962–3, he took up a research and development post with Kursverksamheten vid Stockholms Universitet. He returned to a lectureship in applied linguistics at Edinburgh in 1965, becoming a senior lecturer in the early 1980s. He retired in 1999, but continues to serve as Honorary Fellow. His early publications were teaching materials for English as a foreign language, including *Weltsprache Englisch* (with Hans G. Hoffmann, 1962) and *A Modern Course in Business English* (with John Webb and Michael Knight, 1966), but his best-known work is *A History of English Language Teaching* (1984). He has also made contributions to journals, encyclopedias, etc., mainly in the field of historical studies in language teaching and applied linguistics.

Ken Hyland is Professor of Education and Director of the Centre for Academic and Professional Literacies at the Institute of Education. Before moving to London in 2003, he worked overseas for twenty-six years, mainly in Asia and Australasia. He has published over 120 articles and twelve books on language education and academic writing, most recently *Disciplinary Discourses* (2000, 2004), *Teaching and Researching Writing* (2002), *Second Language Writing* (2003), *Genre and Second Language Writing* (2004), *Metadiscourse* (2005), *EAP* (2006) and *Feedback in Second Language Writing* (edited with Fiona Hyland, 2006). He is co-editor of the *Journal of English for Academic Purposes*.

Robert F. Ilson is an Honorary Research Fellow of University College London and sometime

Associate Director of the Survey of English Usage which is based there. He has been Editor of the *International Journal of Lexicography* and the *Bulletin of the European Association for Lexicography*. He has been convenor of the Commission on Lexicography and Lexicology of the International Association for Applied Linguistics.

Mary Lee Jensvold is Assistant Professor of Anthropology and Associate Director of the Chimpanzee and Human Communication Institute at Central Washington University in Ellensburg, Wash. She has numerous publications covering topics in chimpanzee use of American Sign Language and captive chimpanzee care.

Brian D. Joseph is Distinguished University Professor of Linguistics and the Kenneth E. Naylor Professor of South Slavic Linguistics at the Ohio State University, where he has taught since 1979. He received his Ph.D. from Harvard University in 1978. His dissertation was a study of syntactic change between medieval and modern Greek. Dr Joseph specialises in historical linguistics, Greek linguistics and Balkan linguistics and has published extensively in these areas. He served as Editor of *Diachronica* from 1999 to 2001 and as Editor of *Language* from 2002 to 2008.

Richard Kennaway studied mathematics at Edinburgh and Oxford and has been engaged in computer-science research at the University of East Anglia since 1981, in the areas of programming language theory and design, virtual reality, control theory, robotics and biocomputing. Between 1997 and 2003 he also maintained one of the most widely referenced online inventories of resources relating to constructed languages.

Chin-W. Kim received his Ph.D. in Linguistics from the University of California, Los Angeles, Calif., in 1966. He is Professor and Head of Linguistics, Speech and Hearing Sciences, and English as an International Language at the University of Illinois at Urbana-Champaign, Ill. He authored a paper entitled 'A Theory of Aspiration' in *Phonetica* in 1970 and contributed the entries 'Experimental phonetics', in W.O. Dingwall's *Survey of Linguistic Science* (1978), and 'Representation and derivation of tone' in D.L. Goyvaerts' *Phonology in the 80s* (1981). His fields of specialisation are phonetics, phonology and Korean linguistics.

James P. Lantolf is the Greer Professor in Language Acquisition and Applied Linguistics in the

Department of Applied Linguistics at The Pennsylvania State University. He is also Director of the Center for Language Acquisition, and co-Director of CALPER (Center for Advanced Language Proficiency Education and Research) at Penn State. He was president of the American Association for Applied Linguistics (2004–05) and co-editor of *Applied Linguistics* (1995–2000). He has published numerous articles, book chapters, and book reviews on sociocultural theory and second language learning and teaching. He is co-editor of *Vygotskian Approaches to Second Language Research* (with G. Appel), Ablex 1994; editor of *Sociocultural Theory and Second Language Learning*, Oxford University Press 2000; and co-editor of *Sociocultural Theory and the Teaching of Second Languages* (with M. Poehner), Equinox 2008. He is co-author (with S. Thorne) of *Sociocultural theory and the genesis of second language development*, Oxford University Press 2006.

Geoffrey N. Leech is Research Professor of English Linguistics at Lancaster University. He is co-author of *A Comprehensive Grammar of the English Language* (1985), based on the Survey of English Usage based at University College London. He has also written books and articles in the areas of stylistics, semantics and pragmatics, notably, *A Linguistic Guide to English Poetry* (1969), *Semantics: The Study of Meaning* (2nd edn 1981) and *Principles of Pragmatics* (1983). In recent years, his research interests have focused on the computational analysis of English, using computer corpora. He was a member of the groups that compiled and annotated the Lancaster–Oslo–Bergen Corpus (LOB) and the British National Corpus (BNC). He is co-author of a large-scale corpus-based grammar of English: D. Biber et al., *The Longman Grammar of Spoken and Written English* (1999).

Michael Leff is Professor and Chair of the Department of Communication at the University of Memphis. Prior to coming to Memphis in 2003, he held appointments at the University of California-Davis, the University of Wisconsin, and Northwestern University. He has published widely in the research areas of the history of rhetoric, rhetorical criticism and argumentation, has won numerous awards for his scholarship and has been designated as a distinguished scholar by the National Communication Association and the International Society for the Study of Argumentation. He is the former editor of *Rhetorica*, the Journal of the International Society for the History of Rhetoric, and is the current President of the Rhetoric Society of America.

Carmen Llamas lectures in sociolinguistics at the University of York. Her research interests are in phonological variation and change, with a main focus on diffusion and levelling in the north-east of England. She is particularly interested in the identity-making and -marking functions of language and in sociolinguistic fieldwork methods. Her publications include *The Routledge Companion to Sociolinguistics*, edited with Louise Mullany and Peter Stockwell.

David G. Lockwood received his Ph.D. from the University of Michigan, Ann Arbor, Mich., in 1966. He has taught at Michigan State University since then, and has been a professor there since 1975. In addition to numerous articles, his publications include *Introduction to Stratificational Linguistics* (1972), *Readings in Stratificational Linguistics* (which he co-edited, 1973) and *Morphological Analysis and Description: A Realizational Approach* (1993). His teaching specialities are stratificational grammar and phonology, problem-oriented courses in phonology, morphology, syntax and historical linguistics, structure of Russian and comparative Slavic linguistics. David G. Lockwood died on September 26, 2007.

Michael J. McCarthy is Emeritus Professor of Applied Linguistics at the University of Nottingham. He has published widely in the field of English language teaching, co-authoring *Vocabulary and Language Teaching* (with Ronald A. Carter, 1988). *Vocabulary* was published in 1990, *Discourse Analysis for Language Teachers* in 1991 and *Spoken Language and Applied Linguistics* in 1998. He holds a Ph.D. (Cantab.) in Spanish, and his current research interests are in corpora of spoken language, discourse analysis and vocabulary.

Michael K.C. MacMahon is Emeritus Professor of Phonetics in the Department of English Language at the University of Glasgow. He holds a Ph.D. on British neurolinguistics in the nineteenth century, and his publications have dealt with aspects of phonetics, dialectology and neurolinguistics.

Molly Mack received her Ph.D. in Linguistics from Brown University, Providence, RI. She is an associate professor in the Department of Linguistics at the University of Illinois at Urbana-Champaign, Ill. Her research interests are in speech perception and production, the psycholinguistic and neurolinguistic aspects of bilingualism, and age-related effects upon the acquisition of dual-language phonetic systems in bilinguals. As Resident Associate in

the Center for Advanced Study at the University of Illinois, she has co-organised and led an interdisciplinary faculty seminar and national conference on the topic of the relationship between the mind, brain and language. Her publications include 'From the Ancients to Axial Slices: a Historical Perspective on the Role of Neuroscience in Linguistic Science' (2001) and the co-edited volume (with Marie T. Banich, 2001), *Mind, Brain and Language: Multidisciplinary Perspectives*. Molly Mack died on December 10, 2008.

Kirsten Malmkjær was lecturer in Modern English Language and MA course tutor at the University of Birmingham from 1985 until 1989, when she moved to the Research Centre for English and Applied Linguistics, the University of Cambridge. She directed the Centre's M.Phil. in English and Applied Linguistics until April 1999, when she was appointed Professor of Translation Studies and Head of the Centre for Research in Translation at Middlesex University. Since August 2007 she has been Head of the Department of English, Languages and Philosophy in the School of Arts and Education at Middlesex. She is the author of a number of books and articles on translation studies.

Frederick J. Newmeyer received a Ph.D. from the University of Illinois in 1969. He is Professor Emeritus in the Department of Linguistics at the University of Washington, Seattle, Wash., and Adjunct Professor at the University of British Columbia and Simon Fraser University, Canada. He is Editor-in-Chief of *Linguistics: The Cambridge Survey* (1988), and author of *English Aspectual Verbs* (1975), *Linguistic Theory in America* (1980), *Grammatical Theory: Its Limits and its Possibilities* (1983), *Politics of Linguistics* (1986), *Language Form and Language Function* (1998) and *Possible and Probable Languages* (2005). His interests are syntactic theory and the history of linguistics.

Kieran O'Halloran is a senior lecturer in linguistics in the Centre for Language and Communication at the Open University. He is interested in the application of corpus linguistics to discourse analysis – specifically to critical discourse analysis, stylistics, argumentation – as well as cognitive issues in critical discourse analysis. Publications include *Critical Discourse Analysis and Language Cognition* (2003), *Applying English Grammar: Functional and Corpus Approaches* (2004 with Coffin and Hewings) and *The Art of English: Literary Creativity* (2006 with Goodman).

Cornelia Müller is Professor of Applied Linguistics at European University Viadrina in Frankfurt (Oder). She is the author of *Redebegleitende Gesten: Kulturgeschichte, Theorie, Sprachvergleich (Gestures: Cultural History–Theory–Cross-linguistic Comparison)* and of *Metaphors – Dead and Alive, Sleeping and Waking: A Dynamic View*. She is the co-editor of the journal *Gesture* and its accompanying book series and has co-edited the volumes *The Semantics and Pragmatics of Everyday Gestures*, *Gestural Communication in Human and Nonhuman Primates*, and *Metaphor and Gesture*.

Teresa Parodi holds a Ph.D. from the University of Düsseldorf (Germany). She is Assistant Director of Research in the University of Cambridge, Research Centre for English and Applied Linguistics. Her research interests focus on first- and second-language acquisition of syntax and morphology. Her publications include *Der Erwerb funktionaler Kategorien im Deutschen (The Acquisition of Functional Categories in German)* (1998) and *Models of Inflection* (co-edited with R. Fabri and A. Ortmann, 1998).

Gill Philip has taught English language at CILTA (the Centro Interfacoltà di Linguistica Teorica e Applicata L. Heilmann) (L. Heilmann Inter-faculty Centre for Applied and Theoretical Linguistics) University of Bologna, since 1997. Her principal research interests centre on the relation between phraseology and meaning, especially the effects of variation and creativity on 'fixed' phrases, in the language of both natives and learners. Her Ph.D. thesis, based on English and Italian corpus data, investigated the factors that cause connotative meanings to be activated in text. More recent studies include a series of articles examining features of learners' written production of metaphor and figurative language, and analyses of the use of metaphor by Italian politicians.

Lucy Pickering is an Associate Professor in the Department of Applied Linguistics and ESL at Georgia State University, Atlanta, Ga. She received her Ph.D. from the University of Florida in 1999. Her research interests include intonation in discourse and the cross-linguistic transfer of prosodic features.

Allan M. Ramsay is Professor of Formal Linguistics in the Department of Computation at UMIST (University of Manchester Institute of Science and Technology), UK. He previously held a Chair in Artificial Intelligence (AI) at University College Dublin, and before that was a lecturer in AI at the

University of Sussex. He is the author of *Formal Methods in AI* (1991) and *The Logical Structure of English* (1990). His research interests include the application of reasoning and planning techniques within language processing and the development of algorithms for dealing with languages with free word order.

Louise J. Ravelli is Associate Professor of Communication and Journalism in the School of English, Media and Performing Arts at the University of New South Wales. Her research interest is communication in professional contexts, using social semiotic approaches, including systemic-functional linguistics and multi-modal discourse analysis, to enhance communication outcomes. Key areas of application include museum communication and academic literacy. Recent books include *Museum Texts: Communication Frameworks* (2006) and *Analysing Academic Writing* (2004, with Robert A. Ellis).

Jonnie Robinson spent several years teaching German at secondary schools before working on the Survey of English Dialects 'Incidental Material' at the Leeds Archive of Vernacular Culture, the University of Leeds. In 2003 he joined the British Library Sound Archive as Curator of English Accents and Dialects, where he developed the Library's online dialect archive, *The Way We Speak*; an interactive website on regional speech in the UK, *Sounds Familiar*; and assisted with the BBC Voices audio project. In 2007 he was appointed Lead Content Specialist for Sociolinguistics and Education at the British Library Social Sciences Collections and Research.

Henry Rogers is Professor Emeritus in Linguistics at the University of Toronto, having taught there since 1967. He received his BA, MA and Ph.D. from Yale University. His Ph.D. thesis was on Sherbro, a language spoken in Sierra Leone, West Africa. Later he worked on Scots Gaelic, spending a year on the island of Eriskay in the Outer Hebrides of Scotland. He has taught in most areas of linguistics, but generally phonetics and writing systems. His most recent research has been on the sociophonetic aspects of gay and lesbian speech. He has written two books on phonetics and one on writing systems.

Vieri Samek-Lodovici is Reader in Theoretical Linguistics at University College, London. Optimality theory has always been at the centre of his work. His research in this area has examined both the fundamental properties and theoretical architecture

of optimality theory as well as its applications to syntax and to the syntax-phonology interface. His academic curriculum includes a BA in Computer Science (Milan), an MA in Linguistics (Brandeis University, Waltham, Mass.) and a Ph.D. in Theoretical Linguistics (Rutgers University, New Brunswick, NJ).

Philippe Schlenker (Ph.D., Linguistics, Massachusetts Institute of Technology; Ph.D., Philosophy) is a senior researcher at Institut Jean-Nicod (CNRS [School of Advanced Studies in Social Sciences], Paris) and a global distinguished professor at New York University. He has published research on formal semantics, pragmatics, the philosophy of language and philosophical logic. Previously he held positions at the University of Southern California and UCLA (University of California at Los Angeles), and he was the recipient of an ‘Euryi’ award of the European Science Foundation.

Stef Slembrouck is Professor of English Linguistics and Discourse Analysis at Ghent University (Belgium). He has published mainly on the role of language use, communication and discursive processes in the construction of institutional identities (public administration, child protection and health), including the impact of migration-connected multilingualism. Publications include *Language, Bureaucracy and Social Control* (with S. Sarangi, 1996), *Language Practices in Social Work. Categorisation and Accountability in Child Welfare* (with C. Hall and S. Sarangi, 2006) and *Globalization and Languages in Contact: Scale, Migration and Communicative Practices* (with J. Collins and M. Baynham, 2009).

Jae Jung Song is Associate Professor of Linguistics at the University of Otago (Dunedin, New Zealand). He has contributed to international linguistics journals, including *Lingua*, *Linguistics*, *Journal of Pragmatics*, *Australian Journal of Linguistics*, *Oceanic Linguistics* and *Language Sciences*. He is the author of *Causatives and Causation: A Universal-Typological Perspective* (1996), *Linguistic Typology: Morphology and Syntax* (2001), and *The Korean Language: Structure, Use and Context* (2005). He is the co-editor, with Anna Siewierska, of *Case, Typology and Grammar* (1998), and also the sole editor of *Frontiers of Korean Language Acquisition* (2006) and *The Oxford Handbook of Linguistic Typology* (forthcoming).

Jakob Steensig is Associate Professor at the Department of Linguistics, University of Aarhus, Denmark. His Ph.D. was about interactional linguistics. He has further published on turn

construction in Danish and Turkish, on bilingual interaction, and on the interactional functions of specific syntactic and lexical constructions in Danish. Presently, his research focus is on how interactional practices reflect and constitute social norms, involving issues of interactional affiliation/disaffiliation and the distribution of and rights to knowledge.

Maggie Tallerman is Professor of Linguistics at Newcastle University. She has spent her professional life working in north-east England, first at Durham and then Newcastle. Her current research interests fall into two quite distinct categories: the origins and evolution of language, particularly syntax, morphology and the mental lexicon; and the syntax and morphosyntax of Brythonic Celtic, particularly modern Welsh. She is the author of *Understanding Syntax* (2nd edn, 2005), editor of *Language Origins: Perspectives on Evolution* (2005), co-author of *The Syntax of Welsh* (2007, with Robert Borsley and David Willis), and the *OUP Handbook of Language Evolution* (with Kathleen Gibson).

Tony Thorne became Director of the Language Centre at King’s College, University of London, in 1991, having previously worked as language teacher, translator, professional communication trainer and lexicographer. Since 2006 he has been Language and Innovation Consultant at King’s and responsible for the King’s Archive of Slang and New Language which can be accessed at <http://www.kcl.ac.uk/schools/humanities/depts/elc/resources/slangresearch.html>. He is the author of a number of reference works and cultural history titles.

Antonio de Velasco is an assistant professor of rhetoric in the Department of Communication at the University of Memphis. His research draws on the traditions of rhetoric and social theory to address questions about politics in the USA. He teaches graduate and undergraduate courses in rhetorical theory and criticism and is currently completing a book on centrist political rhetoric.

William S.-Y. Wang received his Ph.D. from the University of Michigan, Ann Arbor, Mich., in 1960. From 1966 to 1994 he was Professor of Linguistics at the University of California at Berkeley, Calif., and Director of the Project on Linguistic Analysis. Since 1973, he has been editor of the *Journal of Chinese Linguistics*. He is an Academian of Academia Sinica in Taiwan, and the founding

president of the International Association of Chinese Linguistics. Currently he is Research Professor at the Department of Electronic Engineering at the Chinese University of Hong Kong.

John N. Williams graduated in psychology at the University of Durham in 1981 and went on to do doctoral research at the Medical Research Council Applied Psychology Unit, Cambridge. His Ph.D. in psychology, which concerned semantic processing during spoken language comprehension, was awarded by the University of Cambridge in 1985.

He spent two years as a post-doctoral researcher at the University of Padova, Italy, examining semantic processing and word recognition. He worked as an English language assistant at the University of Florence for one year before taking up his post as Assistant Director of Research at the Research Centre for English and Applied Linguistics, University of Cambridge, where he teaches courses on psycholinguistics and language learning. His research interests include the cognitive mechanisms of second language learning, and syntactic processing in the second language.

Preface

You are reading something, or listening to a lecture, or taking part in a conversation about language. You notice an unfamiliar term, or realise that you don't know enough about what is being said to understand. At this point, you should seek out this encyclopedia. Strategies for the use of encyclopedias differ, but this one is designed to allow you to proceed in one of three ways:

- You can consult the index at the back of the book, where you will find the term or subject in question appearing in its alphabetically determined place, with a page reference, or several, which will tell you where in the main body of the work it is defined, described and/or discussed.
- If you are looking for a major field of linguistic study, you can consult the List of Entries immediately before this Preface.
- You can simply dive into the body of the work.

The entries are designed to be informative and easy to access. They do not provide as much information as you will find in a full book on any given topic, but they contain sufficient information to enable you to understand the basics and to decide whether you need more. Each entry ends by listing some suggestions for further reading and draws on many more works than those listed as further reading. These are mentioned in the text by author and year of publication, and a full reference can be found in the Bibliography at the

end of the book. Almost all the entries contain cross-references to other entries.

The first edition of this book was published in 1991 and the second, revised and updated edition, some ten years later. The changes to the present, third edition reflect the rapid expansion and developments that have taken place in linguistics and language studies in the current millennium; many entries are new, and many have been recommissioned and substantially updated.

This volume demonstrates the many facets of linguistics, and the Introduction provides a view of its history. But it is likely that people have taken a theoretical interest in language for much longer than the time span covered there. Having language is probably concomitant with wondering about language, and so – if there is one thing that sets linguistics apart from other disciplines – it is the fact that its subject matter must be used in the description. There is no metalanguage for language that is not translatable into language, and a metalanguage is, in any case, also a language. According to one view, language creates reality for us. According to another, it reflects, more or less adequately, what there is. Probably both are true. At least it seems certain that we use our language prolifically to create and change our momentary values, and that, in seeking to understand language, we are seeking to understand the cornerstone of human cognition.

Kirsten Malmkjær
Cambridge, 2009

Acknowledgements

The great majority of the work involved in the first edition of this encyclopedia took place when I was employed in the School of English at the University of Birmingham. My colleagues there, the late David Brazil, Deirdre Burton, Malcolm Coulthard, Florence Davies, Tony Dudley-Evans, Harold Fish, Ann and Martin Hewings, Michael Hoey, Diane Houghton, Tim Johns, Chris Kennedy, Philip King, Murray Knowles, Paul Lennon, Mike McCarthy, Charles Owen and John Sinclair, were a constant source of inspiration, support and encouragement. By the time the first edition saw the light of day, I had moved on to the Research Centre for English and Applied Linguistics at the University of Cambridge. My colleagues there, Jim Blevins, Gillian and Keith Brown, Teresa Parodi, Sue Sentance, Ianthi Tsimpli and John Williams, helped me to discover new perspectives on a number of topics. I was fortunate, once more, to find myself in a supportive and inspiring working environment.

All of the editing for the second edition as well as for this third edition has taken place after my move to Middlesex University. I am extremely grateful to the three Deans of School with whom I have worked at Middlesex, Gabrielle Parker, Richard Tufnell and Edward Esche, for their support and for the support of so many other colleagues, particularly Billy Clark and Nicola Brunswick who are among the new contributors to this volume, but also all my colleagues in the Department of English, Languages and Philosophy and in the School of Arts and Education more widely. I cannot mention them all, but particular thanks have to go to those with whom I worked most closely in Translation Studies over the years, Christina Delistathi,

newly Yulia Knottenbelt, Abele Longo, until recently Emily Salines, Moritz Schaeffer and Claire Shih.

A number of students and staff at Birmingham, Cambridge and Middlesex have been exposed in one way or another to versions or drafts of some of the entries. I should like to thank them all for their patience and reactions; in particular, I am grateful to Deborah Anderson, Moritz Schaeffer, Martha Shiro and Amy Tsui for their helpful comments.

It goes without saying that I am very grateful indeed to the contributors themselves, all of whom had busy schedules, but who were, in spite of this, always ready to read and reread their entries during the editing stage. I should particularly like to thank Tsutomu Akamatsu, who worked tirelessly and with great kindness to help me from the planning stage and throughout the editing process of the first edition. Tsutomu Akamatsu, James Anderson, Gillian Brown, Eve Clark, David Crystal, Janet Dean Fodor, Michael Garman, Tim Johns, Chin-W. Kim, George Lakoff, Bertil Malmberg, Keith Mitchell, Maggie-Jo St John, Bertil Sonesson, Peter Trudgill and George Yule provided valuable guidance in the choice of contributors.

I am grateful to the anonymous readers who gave advice on how the second edition could be made an improvement on the first, and the third on the second. I hope they and the contributors like this latest outcome of our joint efforts, even though I have not been able to incorporate every one of the readers' suggestions. Of course, the faults that remain are my sole responsibility.

This encyclopedia was the brainchild of Wendy Morris, then Linguistics Editor at Routledge.

Without her encouragement and guidance, I could not have contemplated taking on such a major commitment at a very early stage in my career. I am grateful to her, and to Steve, Poul and Stuart, who also believed the book would see the light one day, and to Jonathan Price of Routledge for his help in the later stages of editing the first edition. The second edition was greatly speeded on its way by the help and encouragement of Louisa Semlyen, Ruth Bourne and Katharine Jacobson at Routledge. Louisa once again took a leading hand in the production of the third edition, and I have also been tremendously supported in this endeavour by Ursula Mallows, Samantha Vale Noya, Stephen Thompson and Paola Celli.

David, Tomas, Amy and Nils have lived with this project through all our life together. The three, so young when the first edition was published, are now in various stages of settling into their adult lives, watched with delight by the two of us. It was and remains a lovely journey, and I can still say most sincerely: I could not wish for a better context.

Permissions

In the entry on ACOUSTIC PHONETICS, Figures 9 and 14 are reprinted with permission of the publishers from *A Course in Phonetics* 2nd Edition, by Peter Ladeford @ 1982 Harcourt Brace Jovanovich, Inc. Figure 10 in the same entry is based on Figure 8.9 in the same work.

In the entry on the INTERNATIONAL PHONETIC ALPHABET, the three versions of the alphabet are reproduced with permission from the International Phonetic Association. (<http://www.arts.gla.ac.uk/IPA/ipa.html>)

We are grateful to Michael Halliday and Christian Matthiessen for permission to reproduce the following in the article on SYSTEMIC-FUNCTION GRAMMAR: Figure 2, from Halliday and Matthiessen (2004) Figure 1.9, p. 23; Table 1, from Halliday and Matthiessen (2004) Table 5 (12), p. 216; Table 3, based on Halliday and Matthiessen (2004) Figure 4.1, p. 107.

Every effort has been made to contact copyright holders. If any have been inadvertently overlooked the publishers will be pleased to make the necessary arrangements at the first opportunity.

K.M.

Introduction

As the present encyclopedia shows, linguistics today encompasses a wide range of component disciplines and associated activities, all of which use the name to announce their commitment to the serious study of language and languages. This (relatively recent) expansion of linguistics means we need to focus on the core of the subject and how it emerged from its nineteenth-century origins as ‘the science of language’, a phrase which is still taken as a gloss on modern linguistics though not all linguists find it equally congenial.

The roots of linguistics

While the nineteenth century is a reasonably well motivated starting point for modern linguistics, the roots of serious language study lie deep in the past. The development of fully linguistic (i.e. post-pictographic) writing systems entailed not only a conscious awareness of linguistic processes but also an account of how they worked. Only in this way could the knowledge have been preserved and passed on to succeeding generations. This would locate the source of linguistic studies in the literate civilisations of antiquity – Mesopotamia, north India and China, Egypt, etc. – and it was in India that one of the earliest of the great traditions of linguistic scholarship was founded leading to **Panini’s grammar of Sanskrit** in the first millennium BC (see Cardona 1990/1994). At much the same time, the Greeks embarked on the codification of their language in a long series of works culminating in the **Technē grammatikē of Dionysius Thrax** (c. 100 BC) (see Matthews 1990/1994).

The full story of ‘grammar’ would take too long to tell, but in its Latin guise it was the bedrock of Western schooling until the secularisation of education in the eighteenth-century Enlightenment encouraged the creation of vernacular grammars, providing for the needs of an increasingly literate society. Latin grammars had been designed to teach the subject as a foreign language and they therefore adopted a highly normative approach. The unthinking transfer of this prescriptivism to the teaching of the mother tongue resulted in a species of simplistic, Latin-based ‘school grammars’, which tended to tarnish the reputation of traditional grammar as a whole.

The need to improve language pedagogy was one motivation for the reorientation of linguistic studies in Europe in the early nineteenth century, but so too was the renewal of contact with other traditions, most importantly that of the **Sanskrit** scholars whose objectivity and sharpness of focus on the linguistic (rather than literary) aspects of the subject seemed to accord with contemporary intellectual trends influenced by the methods and procedures of the natural sciences. The example of the Swedish botanist **Carl Linnaeus** (1707–78) in classifying the plant world had greatly impressed the eighteenth century, and geology was another science that seemed to offer language an appropriate model, particularly as it had a historical dimension that suited the intellectual climate of the time (e.g., Whitney 1875: 195). In fact the nineteenth century represented a synthesis between a sober demand for meticulous scientific research and a romantic desire to ‘return to national roots’ fired by revolutions in America and France and by

the disintegration of the classical tradition in the arts and sciences.

A commitment to rigour was at the heart of the new linguistic sciences, including the close observation and careful collection of the ‘facts’, meticulous record-keeping and the exercise of objective judgement in the processes of classification, accountability to the wider scientific community through the dissemination of findings, etc. More significant, however, was the intellectual conviction that language was subject to the kind of ‘general laws’ that were the hallmark of the natural sciences. Arguments such as these increased as the young science (still known as ‘philology’ – ‘linguistics’ came later) moved decisively into comparative studies from the early 1820s onwards, applying notions such as sound change in the investigation of, for example, ‘language families’, a line of research influenced by the interest in the biological sciences kindled *inter alia* by the appearance of Charles Darwin’s *The Origin of Species* in 1859.

Then quite suddenly in the 1870s the argument turned much sharper. A group of young German scholars in Leipzig – the so-called **Junggrammatiker** (Neogrammarians, initially a term of abuse) – challenged the contemporary establishment by announcing that their scientific claims convinced nobody. In particular, the sound-change laws were not scientific in any serious sense unless they aimed at generalisations that were watertight and exceptionless. In addition, linguistic evidence should be derived from spoken language sources, not merely written inscriptions, and suitable informants could be found among the speakers of non-standard dialects whose speech had not been ‘corrupted’ by education in the standard language. There was a hint of romanticism in this suggestion, but it was also noted positively by **Ferdinand de Saussure** (1857–1913), a young student at Leipzig at the height of the Junggrammatiker furor, and repeated in the opening chapter of his posthumous *Cours de linguistique générale* (1916), namely that a language should not be seen ‘as an organism developing of its own accord but ... as a product of the collective mind of a linguistic community’ (Saussure 1916/1983: 5).

In 1876, Saussure (who had moved into philological studies from physics and chemistry) was poised to become the most highly respected

philological scholar of his time. In 1906–7, with a major academic career behind him and still only fifty years of age, he gave a series of lectures in his home university of Geneva, to which he had returned in 1891 after ten years as a professor in Paris. He repeated the course twice more, ending in 1911. In their eventual published form these lectures effectively transformed nineteenth-century **historical and comparative philology** into the twentieth-century discipline of contemporary linguistics. They were to be Saussure’s last academic achievement – two years later he died of cancer aged fifty-six, leaving no manuscript or lecture notes. His Geneva colleagues and students collaborated in a complex editorial project to bring his work to the outside world with the publication of the *Cours* in Paris in 1916. Through this extraordinary chain of events, Saussure became known as the ‘founding father’ of modern linguistics. We shall look at his ideas again below.

Three phases of development in twentieth-century linguistics

Twentieth-century linguistics can be divided into two main phases: a phase of emergence lasting until the late 1920s or early 1930s, and a later phase of expansion and diversification triggered by the general expansion of higher education after 1960. Between them was a period of transition, which affected the subject differently in Europe and America (see Figure 1).

Phase 1: The emergence of modern linguistics (1911–33)

As we have seen, modern linguistics was founded by the leading philologist of his day towards the end of his academic career. Saussure was no young Turk setting out to break the mould; he was the recognised elder statesman whose greatness lay in his ability to identify and preserve what his profession had achieved in the nineteenth century while at the same time setting it on a completely new course for the future. He did not get everything right (perhaps this explains his decision to scrap his lecture notes), but after Saussure linguistics could never be the same. We shall look at his specific proposals later. First we need to summarise the basic

Phase 1: The emergence of modern linguistics (1911–33)

- 1911 Saussure's third (final) lecture series in Geneva
Boas's 'Introduction' to *Handbook of American Indian Languages*
- 1912 Daniel Jones becomes Head of Department of Phonetics, University of London
- 1913 Death of Saussure (1857–1913)
- 1914 Bloomfield's *Introduction to the Study of Language*
- 1916 Saussure's *Cours de linguistique générale*
- 1921 Sapir's *Language*
- 1924 Linguistic Society of America founded
- 1925 First volume of the journal, *Language*
- 1928 First International Congress of Linguists (The Hague)
- 1932 First International Congress of Phonetic Sciences (Amsterdam)
- 1933 Bloomfield's *Language*

Phase 2: A time of transition (c. 1925–60)

- 1923 Malinowski's 'The problem of meaning in primitive languages'
- 1926 Linguistic Circle of Prague founded
- 1938 Death of Trubetzkoy (1890–1938)
- 1939 Trubetzkoy's *Grundzüge der Phonologie*
Death of Sapir (1884–1939)
- 1941 Death of Whorf (1897–1941)
- 1942 Death of Boas (1858–1942)
- 1944 J.R. Firth becomes Professor of General Linguistics, University of London
- 1949 Death of Bloomfield (1887–1949)
- 1951 Harris's *Methods in Structural Linguistics*
- 1953 Weinreich's *Languages in Contact*
- 1956 Jakobson and Halle's *Fundamentals of Language*
- 1957 Chomsky's *Syntactic Structures*

Phase 3: The expansion and diversification of linguistics (since 1960)

- 1961 Halliday's 'Categories of the theory of grammar'
- 1963 Greenberg's *Universals of Language*
- 1965 Chomsky's *Aspects of the Theory of Syntax*
- 1966 Labov's *The Social Stratification of English in New York City*
- 1973 Halliday's *Explorations in the Functions of Language*
- 1978 Halliday's *Language as Social Semiotic*
- 1981 Chomsky's *Lectures on Government and Binding*
- 1985 Halliday's *Introduction to Functional Grammar*
- 1986 Chomsky's *Knowledge of Language*
- 1995 Chomsky's *The Minimalist Program*

Figure 1 Three phases of development in twentieth-century linguistics: a chronology.

principles behind his transformation of 'philology' into 'linguistics'.

Linguistics is the scientific study of language for its own sake.

The stress on science was not new, though its interpretation varied with time and context.

What was important for Saussure was the focus on language for its own sake (philology never really gave up its links with the study of texts).

Linguistics is not prescriptive.

For Saussure, this was an obvious preliminary to a definition of linguistic science. It was perhaps

more central to American linguistics, with its more practical orientation.

Spoken language is the primary object of study.

The spoken language principle was already strongly held in phonetic and (some) philological circles, but Saussure's emphasis on it is quite explicit 'the spoken word alone constitutes [the object of study in linguistics]' (Saussure 1916/1983: 24). However, he was also prepared to be practical – written texts might be the only materials available.

Linguistics is an autonomous discipline.

As a new science, linguistics had to fight off the claims of other more powerful disciplines, such as psychology, philosophy and anthropology. The first principle (the study of language 'for its own sake') was very significant in this context – as was the last, the synchronic principle.

Synchronic studies of language at a specific point in time take precedence over diachronic (historical) studies.

For Saussure this was the principle that revolutionised linguistics – 'it is absolute and admits no compromise' (Saussure 1916/1983: 83). It was, so to speak, the Rubicon philology could not cross. It also opened the way to the central (structural) point of his theory; namely, that 'the linguist must take the study of linguistic structure as his primary concern, and relate all other manifestations of language to it' (Saussure 1916/1983: 9). We shall discuss what he meant by 'linguistic structure' later.

The beginnings of American linguistics

By a curious coincidence of timing modern linguistics can be said to have emerged in the same year on both sides of the Atlantic. The year 1911 was not only the year of Saussure's final lecture series at Geneva; it was also the year in which the first part of the official *Handbook of American Indian Languages* was published in Washington. The Introduction by **Franz Boas** (1858–1942) came to be seen as a major milestone for the subject in the USA.

Unlike European linguistics, with its emphasis on theory, American priorities were firmly practical. The Amerindian project was a large-scale

study designed to cover the whole field before too many of the languages involved became extinct, and it was led by an anthropologist who could claim expertise in the new linguistic sciences. The basic message of his famous Introduction was: respect for the data and the generalisations that could be drawn from it, provided the proper procedures were followed in a disciplined manner.

The project became a kind of rite of passage for all the major linguists of the time, and it also provided a clear perimeter fence that distinguished the **linguist** from the **philologist** – though there were significant individuals such as **Leonard Bloomfield** (1887–1949) who were equally at home in both environments. In his first book (Bloomfield 1914), published after a study visit to Germany, his philological interests were still strong, though he called his subject 'linguistics', a term which (following Whitney 1875) the Americans (unlike the British; cf. Bolting 1929) accepted without difficulty. Although Boas and Bloomfield published their early work before Saussure, their general approach, following consciously in the footsteps of Whitney (1867, 1875), was consistent with the five principles listed above. In the context of the autonomy issue, Bloomfield's prefatory note is particularly instructive: 'I hope that this essay may help to introduce students of philosophy, psychology, ethnology, philology and other related subjects to a juster acquaintance with matters of language' (Bloomfield 1914/1983: vi).

The other young scholar of importance in America was **Edward Sapir** (1884–1939) who, like Boas, was an anthropologist with a consuming interest in language. In *Language*, published in 1921 and written in typically elegant prose, Sapir made the most extensive statement yet on the new approach to language study, introducing for the first time notions such as the significance of formal linguistic patterning which were to become increasingly influential. He also emphasised the independence of form and function: 'we cannot but conclude that linguistic form may and should be studied as types of patterning, apart from the associated functions' (Sapir 1921: 60).

Soon there were the first signs of successful institutionalisation. The Linguistic Society of America (LSA) was inaugurated in December

1924, with its 'house journal' *Language* appearing the following year (though it was a long time before articles on linguistics formed more than a minority of the contents [Matthews 1993: 10–11]). Back in Europe, a group of followers of Saussure established the Prague Linguistic Circle in 1926, the membership of which eventually included major figures in the subsequent history of the subject: Roman Jakobson, for instance, and Prince Nikolai Trubetzkoy. In 1928 the first International Congress of Linguists was held in The Hague, and the first in the Phonetic Sciences in Amsterdam in 1932. Finally, with the appearance of Bloomfield's massive second book, also called *Language* (1933), there could no longer be any doubt: linguistics had arrived, though it comes as a bit of a shock to note that, among the 264 founder members of the LSA in 1924, only two could claim to hold an academic post explicitly linked to the subject (one being Bloomfield).

Before moving to Phase 2, we should take a brief look at linguistics in Britain. For centuries the English have always been good at the same two linguistic things: phonetics and lexicography, and both were riding high in the late nineteenth century. It was not difficult, for instance, to claim scientific status for **phonetics** and it also had considerable potential for practical application: in language pedagogy, for instance, medicine, or the new technology of sound recording (Thomas Edison's phonograph appeared in 1877). **Lexicography** benefited from the nineteenth-century obsession with history, which provided the basis for the huge project that dominated England as the American Indian project dominated America; namely the *Oxford English Dictionary*. While phonetics counted as part of linguistics in the broad sense, the dictionary project is much more doubtful. It was essentially an exercise in philology. Where the new linguistic sciences had some influence was in the interest in **dialectology**, which was given plenty of houseroom in the *Transactions of the Philological Society* from the 1840s onwards. But there was no British equivalent of W.D. Whitney to lead the transition from **philology** to modern **linguistics**. The leadership role in England fell to **phonetics** (see Firth 1946/1957a) and therefore to **Henry Sweet** (1845–1912) – the man who 'taught phonetics to Europe' (Onions 1921: 519), but who was also very protective of

traditional philological studies in which he had a formidable (and enduring) reputation. He passed the phonetics torch to **Daniel Jones** (1881–1967) and the subject was accorded the status of an academic department at London University as early as 1912. By 1921 there was a Chair, with Jones as the obvious appointee; general linguistics had to wait another twenty-three years for a similar honour.

The history of the term, '**linguistics**', in Britain is instructive in this context. Sweet avoided it, preferring his homemade term '**living philology**' (e.g., Sweet 1884: 593, 1899: 1). Jones had little need for it, since most of his work was closely tied to phonetic data, and general 'linguistic' matters were not seen as pressing, though his language teaching colleague Harold Palmer used it as the title of a course he gave at the School of Oriental Studies (Smith 1999: 62). Oxbridge preferred not to recognise its existence at all: C.K. Ogden, for instance, possibly the nearest Oxbridge had to a linguist before 1945, only used the word in *The Meaning of Meaning* (with I.A. Richards, 1923) when translating from other languages (even using 'linguistic' as a noun on two occasions) or when introducing Malinowski, who contributed a famous Supplement. Bolling tells us that the British establishment tried (unsuccessfully) to persuade the Americans that 'philology' was the right label (Bolling 1929). Whitney's early groundwork in the USA had borne fruit.

Phase 2: A time of transition (c. 1925–60)

Modern linguistics emerged at much the same time in Europe and the USA, and the post-war revival started around 1960 for both, but the intervening years were very different in the two continents. In America, structural linguistics, or descriptive linguistics as it came to be known, grew in size and extent throughout the inter-war period until it suddenly and unexpectedly lost its leadership in the 1940s, initiating a period of transition before Chomsky's 'generative enterprise' took centre stage in the 1960s. Saussurean linguistics, on the other hand, had no leader and change began as soon as the ideas had been assimilated in Europe after the First World War.

As it stood, Saussure's *Cours* had little to say about the practical description of particular

languages, and it was partly to fill this gap that the **Linguistic Circle of Prague** was founded in 1926. Phonology was the first – but not the only – focus of the Circle’s work, which rapidly developed a personality of its own, adopting a strongly functional interpretation of linguistics.

Functionalism was also the mark of André Martinet in Paris in the late 1930s before internment during the war and ten years in America, and, in a rather different sense, function was a central component of Louis Hjelmslev’s theory of **glossematics** published in Copenhagen in 1943, though it was little known until an English translation appeared in 1953. Finally, there was London, where linguistics (as distinct from phonetics) began in a small way with a contribution by the anthropologist Bronislaw Malinowski in 1923. Although superficially reminiscent of the role of Boas and Sapir in America, Malinowski’s work led the subject in an entirely different direction – away from the structural properties of sentences and their parts, and towards the functional values of texts (especially spoken texts) and their role in social life. London under J.R. Firth in the 1940s and 1950s effected a new synthesis that combined the ‘micro’ traditions of English phonetics/phonology with the textual traditions of Malinowski and later also Prague, within Malinowski’s anthropological framework known as ‘the context of situation’. It might have been a rather mixed assortment, but under the influence of Firth’s student, M.A.K. Halliday, it was forged into a powerful model that genuinely sought to establish a fertile union between form and function within a general theory of language in a social context (‘social semiotic’, to use Halliday’s phrase [1978]). With Halliday, the long transition from Saussurean structuralism was complete.

The American story is more traumatic. After a long period of growth between the wars, structural-descriptive linguistics was deprived of all its leading founder members within a few years. Sapir died from a heart condition in 1939 aged fifty-five; Whorf from cancer in 1941 aged only forty-four; Boas in 1942 (he was already an elderly man); and Bloomfield himself through a stroke, which effectively removed him from the profession in 1947 at the age of sixty (he died in 1949). The next generation, delayed somewhat by the war anyway, was not ready to take over,

and Bloomfield’s colleagues and followers, who had not expected the role of leadership to be thrust upon them, understandably held back from any overt move to step into his shoes. Under such circumstances, new initiatives were bound to come from the edges rather than the mainstream, and one of the successful new departures of the 1950s was **applied linguistics** in both language pedagogy (Charles C. Fries) and mission work (e.g., Eugene Nida and Kenneth Pike of the **Summer Institutes**).

The linguists left behind in 1950 (Bernard Bloch, for instance, George L. Trager, Charles F. Hockett and Zellig S. Harris) have since become known collectively as ‘**post-Bloomfieldians**’ in acknowledgement of their decision to carry on with the work Bloomfield had initiated, but the practical effect (see Matthews 1993 for details) was inevitably to extend the technicalities of structural analysis rather than rethink the approach. However, Harris, in some ways the most influential of the group, produced the idea that brought this unsought-for and somewhat unhappy transitional interlude to an end: **transformational grammar**. By the 1960s, in the hands of Harris’s former student Noam Chomsky, it had become **transformational-generative grammar (TG)** and was well on the way to recreating the energies of the inter-war years.

Phase 3: the expansion and diversification of linguistics (since 1960)

From around 1960, linguistics in both Europe and the USA began to benefit from the expansion of higher education following the post-war economic recovery: new departments were opened, research programmes initiated, posts created, and so on. It was a lively time, and the subject itself attracted a large number of young people, including those at the top with the new ideas – scholars like Noam Chomsky in the USA and M.A.K. Halliday in Britain (later Australia).

The chronology in Figure 1 offers only a short list of texts under the present heading, but this does not reflect a lack of activity (rather, the reverse). So much was being done that only a very few publications stood out as marking a major new departure. In addition, all the important works since 1960 are listed under individual entries elsewhere in this encyclopedia.

The unifying theme of structuralism which had maintained a broad transatlantic consensus before the war evaporated fast in the early 1960s, and by 1970 it had vanished, leaving two contrasting approaches to the subject, both descended from different branches of the structuralist 'family tree'. One (Chomskyan generativism) was fathered directly by American structuralism, and the other (functionalism) had more complex parental origins, but there was no doubt that the line went back to Saussure in the end.

The details of this contrast will emerge later, but some of the key features can be sketched quickly here. Generativism typically idealises the data and employs it in the pursuit of an increasingly powerful theory of language acquisition and its role in understanding the human mind. There is no interest in the 'real world' here; language is the realm of (largely silent) cognition. For many people, however, this is a world of great allure that affords the kind of excitement that 'frontiers of knowledge' have always generated. The functionalist alternative refuses to idealise language; it is located in a world of real events affecting the lives of everybody in one way or another. This has a special attraction for those who are concerned to understand, and perhaps influence – even control – the power that language has in the conduct of everyday life. It is an approach that places a high value on respect for authentic language data and in recent years it has been able to match the technological gloss that used to be a generativist preserve by developing massive computer-based corpora on the basis of which to judge the status of linguistic generalisations. The functionalists use words like 'scientific', 'individual' and 'cognitive' less often than their generativist rivals, and words like 'human', 'social' and 'relationship' more frequently. For the time being, we must accept that there is no easy way in which the two approaches can be effectively unified into an integrated model, but eventually a synthesis will emerge since both sets of perceptions inhabit the same world.

Rivalries between approaches should not be allowed to mask the fact that modern linguistics is not defined solely by its 'mainstreams' but also by its breadth of coverage. Three initiatives, also dating from the 1960s, deserve particular prominence (and are dealt with in their own

right in the encyclopedia) but there are, no doubt, many more.

The **descriptivist tradition** – the respect for language diversity, the meticulous collection and classification of appropriate data, and the commitment to language in the real world – lost its mainstream status in the 1960s, but it lived on, for instance, in the research, associated with figures like Joseph Greenberg (e.g., Greenberg 1963), that focuses on patterns of similarity among apparently diverse languages, associations in the data that would lend support to a theory of universals, not in the sense that 'all languages have such-and-such-a-feature', but that the spread of variation is narrower than it may appear to be. Greenberg's results continue to excite useful controversy.

A second major development in America was a direct challenge to the emergence of mainstream generativism. Known from the 1950s as **sociolinguistics**, it gathered considerable momentum in the 1960s, building to some extent on the past work of Sapir and Uriel Weinreich (1953), but also introducing a wholly new range of concerns into modern linguistic studies: the processes of language change, for instance, and language variation have been important themes, along with the linguistic consequences of human communication. It is impossible to identify specific 'leaders', but important contributors would have to include William Labov, John Gumperz, Dell Hymes and Joshua Fishman.

If sociolinguistics can be said to enrich the appeal of functionalism over its generativist rival, then by the same token modern **psycholinguistics**, the third major development of post-1960 linguistics, might be seen as an elaboration of aspects of generativism which focus on relationships between language and the human mind lying outside the domain of most functionalist analyses. While we should not press symmetries of this kind too far, they help to illuminate the contrasts they relate to. For instance, in its earlier behaviourist guise in the 1930s and 1940s, psycholinguistics, using the more tentative label of 'linguistic psychology', underpinned Bloomfieldian structuralism (Bloomfield 1935: 32) while, in its later cognitive manifestation, it became so enmeshed with the theoretical concerns of generativism that Chomsky famously defined linguistics itself as 'a subfield' of cognitive

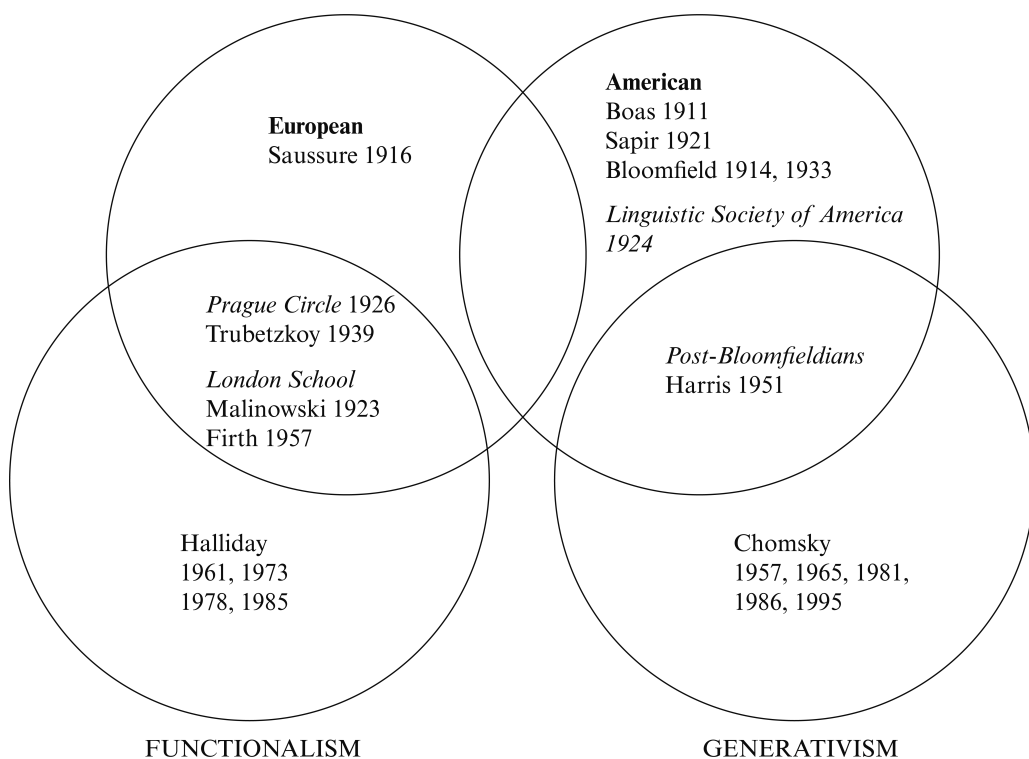


Figure 2 Trends in modern linguistics: a 'map of the world'.

psychology (e.g., Chomsky 1991: 5). In fact, for many of its adherents, the principal attraction of modern psycholinguistics lies in its links with the new cognitive sciences.

Trends in modern linguistics: a 'map of the world'

Figure 2 shows the three 'mainstream' approaches to linguistics in the twentieth century that have emerged from our discussion so far: structuralism, functionalism and generativism. However, it does not show instances of what might be called 'crossover' relationships, nor does it include sub-disciplines such as sociolinguistics or psycholinguistics despite the links with mainstream ideas that we have just noted above. Before continuing with the main text a brief comment on these omissions might be helpful.

First, as we shall see, functionalism and generativism represent such different perceptions of the linguistic world that 'crossover concepts' are

rare. One well-known example, however, might be the notion of 'communicative competence' which, in the sense of this rather over-worked term identified by Hymes (1972), would qualify as an attempt to draw on ideas originating in both schools of thought.

Second, so far as sociolinguistics and psycholinguistics are concerned, their acceptance as unified subject matters is reflected in the use of one-word labels (even the earlier hyphens *socio-* and *psycho-* have disappeared). However, when these expressions are 'opened up' so to speak, their surface symmetry dissolves altogether. The infinitely diverse nature of 'language in use' as the raw material of sociolinguistics for instance has resulted in an umbrella term covering a wide variety of largely independent fields of investigation typically referred to by descriptive phrases such as *text linguistics*, *discourse analysis*, *conversation analysis*, *speech-act theory*, *genre analysis* and so on. Psycholinguistics by contrast has remained a more conceptually unified and sharply focused

field of enquiry into a subject that is deemed to have universal status, namely the workings of language in ‘the human mind/brain’. While this topic, like any other complex subject matter, can be broken down into interrelated components, it remains a unitary study that does not encourage ‘loose affiliations’. These contrasting approaches are reflected in the design of the present volume.

Structuralism

Structuralism in linguistics has two interpretations: one derived from Saussure, and the other from the American school founded by Boas.

The Saussurean model

In his *Cours de linguistique générale* Saussure famously compared language to chess, pointing out that the design of the pieces and their names are structurally irrelevant: they can take any form agreed between the participants provided only that each side starts with sixteen pieces divided into six contrasting categories, with the correct number of units in each category. The game may then proceed according to a system of agreed rules known to each player. This analogy demonstrates clearly the distinction between the surface phenomenon of ‘a game’ and the underlying system of categories and the rules for their deployment which together constitute ‘chess’. Perhaps the most important point Saussure wanted to make is that each component of the system is defined by reference to its distinctive place in the system: change one element and the entire system is affected. Removing the bishop, for instance, would destroy ‘chess’, but a different game might emerge if the new bishopless system were agreed by all participants. Similarly, language is an arbitrary system of rules and categories that works by virtue of a ‘social contract’ tacitly accepted by all speakers, a socially sustained agreement to call a rose ‘a rose’.

Given the chess analogy, we can understand why Saussure’s first step towards a theory of language is to draw a basic distinction between instances of language in use (*parole*) and the underlying language system (*langue*) (the French terms have no exact equivalents in English and typically remain untranslated in accounts of Saussure’s work). Linguistic structure lies at the heart

of *langue* and is the primary concern of linguistics (cf. Saussure 1916/1974/1983: chapter 3).

Saussure goes on to characterise *langue* as a ‘social fact’, that is a socially sanctioned system of signs each of which represents a conventionalised (‘arbitrary’) fusion of sound (the **signifier**) and meaning (the **signified**). Since the significance of a sign derives from its relationships with other signs in the system, it has no meaning ‘on its own’. The meaning of the signifier *house* in English, for instance, is that it contrasts with *flat*, *tower block*, etc., and each language determines its system of contrasts in a different way. The same is true *mutatis mutandis* for sounds: /p/ is a significant sound in English because it contrasts with /b/, /f/, etc. What is important is the total system, not the component ‘bits’.

Langue is not, however, merely a bundle of signs; it is a structured system of relations organised in terms of two contrasting axes. The first is a ‘horizontal’ (**syntagmatic**) axis along which signs are combined into sequences. Saussure declined to call these sequences ‘sentences’, since for him a sentence was an instance of *parole* (a unit that would probably be called an ‘utterance’ today). In addition, each point in the sequence represents a (more or less tightly constrained) choice of alternatives on a ‘vertical’ (**associative**) axis. This two-dimensional framework became a central feature of structural linguistics (with **paradigmatic** replacing the term ‘associative’).

The final point of importance in this thumbnail sketch of a complex work is Saussure’s emphatic rejection of the notion that language is a nomenclature, i.e. a set of labels for pre-existing categories ‘in the real world’. Quite the opposite – linguistic systems impose their structures on the world and each language ‘sees the outside world’ in a unique way. This does not mean that speakers are ‘prisoners’ of their linguistic categories, but it does mean that all languages are different (a cardinal principle of structuralism) and a special effort is needed to understand the categories of a new one. The *Cours* itself provides an excellent example in the resistance of *langue* and *parole* to translation into English.

The lack of a translation for many years meant that the reception of Saussure’s work in the anglophone world was rather slow, though Bloomfield himself was an early reviewer in

America (Bloomfield 1923), acknowledging that Saussure had 'given us the theoretical basis for a science of human speech', but noting also that he differed from Saussure 'chiefly in basing my analysis on the sentence rather than on the word' (Bloomfield 1923: 319). This was to become a major point of difference between Saussurean and American linguistics, including Chomsky's (1964: 23ff.).

American structuralism

In writing his Introduction to the *Handbook of American Indian Languages*, **Franz Boas** aimed to produce a scientific study as free from prejudice and preconception as possible and dedicated to an objective and positive approach to the practical work in hand.

Being an anthropologist, Boas began with a warning against simplistic notions purporting to link language, race and culture, each of which must be studied independently before connections are proposed. From there he turned to language and the first instance of the most emblematic of structuralist themes: respect the data and let it speak for itself. He answered the contemporary prejudice that 'primitive peoples don't pronounce accurately' by pointing out that listeners impose their own sound system on others and then complain they cannot understand. The first task of linguistics was to provide objectively accurate phonetic descriptions on the principle that 'every single language has a definite and limited group of sounds' (1911: 12). Later this was to become **the phoneme principle**.

Other basic principles included:

- All languages are different: 'in a discussion of the characteristics of various languages, different fundamental categories will be found' (Boas 1911: 39). Boas provides a memorable set of examples which must have come as a shock to readers used only to the predictabilities of a few Indo-European languages.
- 'Give each language its proper place' (Boas 1911: 39), i.e. do not impose preconceived categories on the data – including categories derived from other Indian languages.
- The sentence is the basic unit of language: 'since all speech is intended to serve for the

communication of ideas, the natural unit of expression is the sentence' (Boas 1911: 23).

Already the positivist, data-led ground rules of American structuralism had been laid; much later Bloomfield picked up the same themes in a famous structuralist dictum, 'the only useful generalisations about language are inductive generalisations' (Bloomfield 1935: 20).

The next significant step came in **Sapir's *Language*** (1921), where for the first time the discussion is couched in structural terms and Sapir introduces the concept of formal patterning, a notion he went on to explore in more detail in his later work.

Sapir's (1921) wholly integrated approach to language, culture and social life was later somewhat modified by the ideas of Benjamin Lee Whorf (1897–1941) – in the so-called '**Sapir-Whorf Hypothesis**'. In an extreme form the hypothesis claimed that the human mind could not escape from the cognitive constraints of specific linguistic systems, but there were weaker and perhaps more convincing versions. What the idea really needed was a long-term research programme, but the early deaths of both Sapir (1939) and Whorf (1941) left a legacy of unfinished business (see Lee 1996 for a comment).

Finally came Bloomfield's ***Language*** (1933), probably the major classic of the period, yet difficult to assess because it plays more than one tune. As Matthews puts it: 'one of the marvellous things about Bloomfield's *Language* is the way in which it reconciled so much that was the established wisdom in the discipline ... with so much that was strikingly new' (Matthews 1993: 11).

This was the book that taught linguistics to America. It marked a crucial watershed: before *Language*, linguistics might have been absorbed into traditional academia once the Amerindian project was completed; after it, however, this could not have happened. The subject had earned and deserved its autonomy.

Language is no descriptivist manual (Bloomfield wrote one later [see Bloomfield 1942]). It is a hugely well-informed and detailed account of the whole field of linguistics, traditional and modern, but it is better known now for what its later opponents have criticised rather than for what it set out to do in its own day. This is particularly true of its approach to **meaning**.

As is well known, Bloomfield accepted the arguments of behaviourism, including the principle that scientific enquiry required overt, observable evidence. This committed him to a situational theory of meaning ('we have defined the meaning of a linguistic form as the situation in which the speaker utters it and the response which it calls forth in the hearer' [Bloomfield 1935: 139]), which he illustrated in a lengthy anecdote about 'Jack and Jill' (1935: chapter 2). In summary form, Jack gets Jill an apple off a tree as the (apparent) consequence of Jill speaking to him (presumably she asked for it). This approach to meaning proved very influential in foreign-language pedagogy for a long time, but as a serious contribution to linguistic theory it will not do. Even in the – heavily manipulated – Jack and Jill story, which puts the situational approach in the best possible light, it is still impossible to know what Jill actually said. Bloomfield's need for scientific consistency had led him up an intellectual cul-de-sac, and he tried a different tack. This time he maintained that the only way of reaching a scientific definition of meaning was to obtain the relevant scientific knowledge (e.g., defining salt in terms of chemistry [Bloomfield 1935: 139]). Finally, he gave up – 'any utterance can be fully described in terms of lexical and grammatical forms; we must remember only that the meaning cannot be defined in terms of our science' (Bloomfield 1935: 167) – and continued with his book. Unfortunately, the long-term effect of this weakness made his followers nervous of the topic, encouraging the belief that meaning had to be 'kept out' of scientific linguistic procedures.

It is interesting to speculate whether Bloomfield would have modified his 'mechanistic' views on meaning if he had not died prematurely in 1949 (it is not impossible: he had changed his mind before). What happened in practice, however, was an even more determined effort by his successors (the 'post-Bloomfieldians') to extend the practical analytic procedures of descriptive linguistics (for details see Matthews 1993). Bloomfield's teachings stressed the importance of formal features and mechanical (i.e. 'objective') techniques. The outcome was an approach known as 'distributional analysis', in which categories were established by systematically testing the data in all possible structural environments

(its distribution) through techniques like substitution. Using meaning and 'mixing levels of analysis' were forbidden. This 'bottom-up' approach had its strengths, but eventually it could go no further. Higher-level grammatical units could never be 'discovered' in this way, as the post-war generation (particularly Noam Chomsky, b. 1928) argued.

Generativism

Generativism is associated so closely with **Noam Chomsky** that it is often referred to (despite his disapproval) as '**the Chomskyan revolution**'. However, as Lyons (1991: 162 ff.) and others have stressed, it is important to draw a distinction between transformational-generative grammar and the broader views and beliefs that characterise the so-called 'generative enterprise'. Acceptance of the former does not necessarily entail commitment to the latter.

Transformational grammar (TG) first emerged in the early 1950s in the work of the leading 'post-Bloomfieldian', Zellig S. Harris, Chomsky's supervisor at Pennsylvania, and was the central focus of his Ph.D. (1955), entitled 'Transformational Analysis'. The basic notion was that sentence types, e.g., actives and passives, were systematically related to each other. This was a commonplace of traditional grammar but rejected by structuralism because of the dependence on meaning. From these beginnings Chomsky devised a theory of so-called **kernel sentences** (sentences without transformations [active, declarative, etc.]), which could be described in terms of a set of **phrase-structure rules**, plus a set of **transformation rules**, in order to '**generate**' – i.e. provide structural descriptions for – the non-kernel derivatives (passive, interrogative, etc.). This model was the basis for his first major publication, **Syntactic Structures** (1957).

Chomsky's revival of the concept of rules was predictably controversial. In their attack on traditional grammar, the structuralists had made a special point of replacing 'rules' with 'patterns' and 'structures' that emerged from close involvement with the data. The term 'rules' may have reminded people of old school grammars, but there is nothing prescriptive about saying, for instance, that sentences in English consist of a

noun phrase followed by a verb phrase (e.g., *the dog* followed by *chased the cat*). The rule, which Chomsky formalised to look something like $S \rightarrow NP VP$, is in effect a theory of English sentence structure which can be challenged empirically. More generally, Chomsky maintained that scientific linguistics had to start from theory, like any other science and the procedures for handling data offered by the structuralists would not do. Nor were these procedures as modestly practical as they appeared to be. Their ultimate aim was to ‘discover’ the grammar of the language under analysis – an aim which Chomsky dismissed as an impossible dream. Linguistic theory in his view should adopt a more limited and conventional goal; namely, to provide ways of choosing between alternative descriptions (e.g., between three possible candidate analyses of our example sentence: *the dog/chased the cat* or *the dog chased/the cat* or *the dog/chased/the cat*).

In 1957, Chomsky’s linguistic and psychological views were kept separate, but in 1959 there was more than a hint of what was to come when he published a fiercely hostile review of *Verbal Behavior* by the leading behaviourist psychologist of the day B.F. Skinner, the subtext of which was a further criticism of the methods and procedures of structural linguistics which, as we have seen, had been heavily influenced by behaviourist thinking – particularly in the crucial area of meaning.

In 1965 Chomsky dropped the ‘kernel sentence’ notion in a major reworking of his model, which introduced a revolutionary new concept to the theory of syntax: a distinction between underlying (**deep**) structure and **surface structure**, the two interrelated by **transformations**, allowing active and passive sentences, for example, to have the same deep structure but two different transformational histories producing two different surface structures. Published as *Aspects of the Theory of Syntax*, this became known as the **standard theory**. In practice, however, the model soon showed itself to be cumbersome and insufficiently sensitive to the needs of languages other than English. Chomsky and his colleagues made substantial revisions during the 1970s to create the **extended standard theory**. The old phrase-structure rules were largely replaced by a more flexible syntactic process known as **X-bar theory**. The deep/

surface distinction was preserved along with transformations, but in a heavily modified form, and there were also new features, all tending towards greater simplicity. The revised model (called **Government and Binding [GB]**, later **Principles and Parameters [P&P]**) appeared in 1981 and gave the whole ‘generativist enterprise’ a new lease of life. Since then there have been further simplifying changes resulting in **The Minimalist Program** of the 1990s.

Chomsky’s work has always been motivated by a single goal: to explain human **language acquisition**. Many of the changes mentioned above were expressly designed to help account for the acquisition process by offering simpler procedures in tune with the innate capacities of the acquirer. The reintroduction of **innate ideas** has been Chomsky’s most far-reaching and controversial proposition. The key notion is that human language acquisition cannot be explained by any theory of social learning. It is too powerful and universal for that: there are no exceptions and no unexplained failures. Chomsky’s response has been to postulate the existence in each human of what he calls **universal grammar (UG)**, a set of genetically determined principles that define the nature of language and determine the course of acquisition. It has nothing to do with the specifics of particular languages, which are acquired through contact with data in the environment.

The final outcome of the acquisition process is a system of (tacit) knowledge (**‘competence’** is Chomsky’s term) that can be put to use in social communication, private thought, expression, and so on, activities that Chomsky categorises as ‘language **performance**’. The competence/performance distinction (first put forward in *Aspects* in 1965) is reminiscent of Saussure’s **langue/parole** contrast, but the choice of terms is psychological, not linguistic. ‘Competence’ seems an odd synonym for ‘knowledge’ (Chomsky himself has agreed), but ‘performance’ is an effective label, though typically described in rather negative terms, as the source of memory limitations, distractions, shifts of attention and errors of various kinds that prevent the true reflection of underlying competence. Like *langue* for Saussure, competence is the ultimate focus of linguistic theory, which is defined by Chomsky in his most famous quotation as being ‘concerned

primarily with an ideal speaker-listener, in a completely homogenous speech-community, who knows its language perfectly and is unaffected by [performance limitations]' (1965: 3). How the ideal speaker-listener interacts with the actual language acquirer has been at the heart of the Chomskyan research programme since 1965.

Functionalism

While generativism reformulated structuralism without changing fundamentals such as the centrality of the sentence, functionalism transformed it by restoring an aspect of linguistic organisation that had been set on one side by the emphasis on form. Form and function (in at least one of its many guises) have long been traditional partners in the business of accounting for language and its use, form being concerned with the establishment of categories and function with the relations between them. In an English sentence like *The cat caught the mouse*, for example, *the cat* and *the mouse* have the same form (noun phrases) – but different functions: *The cat* functions as the subject of the sentence and *the mouse* as the object of the verb. **'Function'** can be extended to cover notional distinctions: the cat, being animate, functions as the **agent** of the catching, while the mouse as the one affected by the catching functions as the **'patient'**.

Functionalism is, however, even broader than this and it can be said to have had two god-parents, both European: (i) the **Linguistic Circle of Prague** (1926–39), including Vilém Mathesius (1882–1945), Roman Jakobson (1896–1982) and Prince Nikolai S. Trubetzkoy (1890–1938), and (ii) the linguists of the so-called **'London School'**, beginning with Bronislaw Malinowski (1884–1942) in 1923.

The Linguistic Circle of Prague (1926–39)

The principal aim of the linguists of the Prague Circle was to explore Saussurean structuralism and make proposals for its extension. Their best-known work is Trubetzkoy's *Grundzüge der Phonologie* (*Principles of Phonology*), an account of phonology published posthumously in Prague through the good offices of Jakobson in 1939. Following Saussure, Trubetzkoy was the first to distinguish systematically between

phonetics (*parole*) and **phonology** (*langue*), placing the distinction in a functional context: 'phonology of necessity is concerned with the linguistic function of the sounds of language, while phonetics deals with their phenomenological aspect without regard to function' (Trubetzkoy 1939/1969: 12), the best-known instance of this principle being the phoneme and its contrastive function in distinguishing between different words, e.g., *pin* and *tin* in English. The characterisation of the phoneme itself as a 'bundle of distinctive features' also derived from Prague and was taken to America by Jakobson in 1942 and incorporated in publications with Morris Halle and others, including *Fundamentals of Language* (1956).

At the other end of the scale so to speak was the functional approach to text introduced by Karl Bühler (a philosopher colleague of Trubetzkoy's at Vienna University), who proposed a threefold classification which distinguished between a central **'representational' function** concerned with the content of the text, together with a contrasting pair of functions: **'expressive'** relating to the speaker/writer and **'conative'** to the listener/reader. Bühler's was the first of many such schemes which later influenced both Jakobson and Halliday. In the former case, Bühler's framework turned up in a much-extended form in Jakobson's famous contribution to a conference on stylistics in the late 1950s (Jakobson 1960).

Somewhere between the micro-functions of sentence components and the macro-functions of textual design, the Prague School (particularly Mathesius himself) founded an important line of research which came to be known as **'functional sentence perspective' (FSP)**, aimed at identifying systematic relationships between linguistic units and features of text structure. It was specifically concerned with the way in which successive sentences in texts are constructed in order to reflect the developing pattern of information: what is **'new information' (rheme)** in one sentence, for instance, becomes **'given information' (theme)** in a later one and each language has its own way of signalling these relationships.

Functional linguistics in Britain

As we have already seen, the main British contribution to scientific language study focused on

phonetics, a success that was recognised institutionally at University College London (UCL) in 1912. The founding of the School of Oriental Studies (SOS) in 1916 expanded the range of expertise in the linguistic sciences considerably and it was intended that the School should do for the languages of the British Empire what the Americans were doing for Amerindian languages, and this was the case to some extent. In addition, Bronislaw Malinowski, an anthropologist with an interest in language from the London School of Economics, established a working relationship with J.R. Firth (1890–1960), a senior member of staff at the School from the late 1920s and (from 1944) the first Professor of General Linguistics in the UK.

Malinowski's work in the Trobriand Islands led him to develop a functional repertoire of text types, with special reference to spoken language in pre-literate societies (Malinowski 1923). His principal theoretical contribution to the subject was a notion that became closely associated with London linguistics: the context of situation, without knowledge of which he argued no coherent account of the meaning of spoken utterances was possible. In a detailed example based on a narrative describing the return home of a canoe, a key phrase literally translatable as 'we paddle in place' could only be understood properly as 'we arrived' if you knew that paddles replaced oars in the shallow water near the shore, i.e. the context of situation imposed a meaning on the text that in isolation it did not possess. For Malinowski – and for Firthians in general – this interdependence between contextual meaning and linguistic form was crucial.

Writing in 1950, Firth expanded the notion of 'context of situation' into a schematic construct, as he called it (Firth 1950/1957b), and one of the major themes that he drew from it was the importance of language variation in context, an idea that later became known as 'register'. In fact the investigation of 'meaning' in all its manifestations is at the heart of Firth's work, but it was only with Halliday (from 1961 onwards) that the crucial interrelationship between meaning and its linguistic realisation began to find a systematic foundation.

Halliday's contribution to late twentieth-century linguistics is immensely generous. His publications range over the entire field of language

study from formal syntax to the teaching of reading in the most versatile display of talent and inspiration the subject has yet encountered. As a consequence, it is impossible to summarise his contribution with any justice, except perhaps to emphasise one or two major themes. The first is his insistence, following Firth, that language must be studied in an integrated, unified manner without the intervention of a **langue/parole distinction** (cf. Firth 1950/1957b: 180–1). Instead, linguistics must study language as 'part of the social process' (Firth 1950/1957b: 181) or as '**social semiotic**' (Halliday 1978). More specifically, the linguist must attempt to make explicit and systematic statements on the choices people make within the linguistic systems at their disposal ('**textual function**') in response to their social ('**interpersonal function**') and cognitive ('**ideational function**') needs. The three functions (or '**metafunctions**') provide the basic architecture of the approach within which the key concept is the network (or system) of choices. Taken together, these features explain the use of '**systemic-functional linguistics**' as the name for his approach.

As Halliday says in his *Introduction to Functional Grammar* (1985/1994: xvi–xvii), his early work concentrated on the importance of meaning in language, since he believed the current stress on formal syntax was undervaluing it, but later his emphasis shifted as he felt that the formal properties of language were being neglected in a rush for meaning. The interdependence between the two is the bedrock principle of his work. Of particular importance in this context is his joint publication with Hasan, *Cohesion in English* (1976), and his support for the tradition of discourse analysis associated with J.M. Sinclair and M. Coulthard. The details of functionalist linguistics are covered elsewhere in the encyclopedia.

Two macro-themes

Two themes have played a powerful role in the history of linguistics over the past 150 or so years. Both have to do with the implications of major methodological decisions and their theoretical implications.

The first of these themes relates to the imposition of a basic distinction between linguistic systems and language-in-use: Saussure's **langue/**

parole distinction is the original one, but Chomsky's **competence/performance** contrast is drawn in much the same place on the map. It could also be said that Bloomfeldian structuralism tacitly operated a **system/use distinction** in the search for 'patterns'. At the outset, it seems a convenient way of coping with the scope of the material, if nothing more. However, before long the theory-laden abstract 'sister' (langue, competence, system, etc.) has moved centre stage and her ordinary, everyday, 'real-world' sibling is marginalised. In 1875, Whitney said something rather powerful that may well still be relevant: 'not one item of any existing tongue is ever uttered except by the will of the utterer; not one is produced, not one that has been produced or acquired is changed, except by causes residing in the human will, consisting in human needs and preferences and economies' (Whitney 1875). Where has this gone? (cf. Joseph 1994).

Finally, it is appropriate to finish with a restatement of Saussure's basic aims for linguistics which reflect the second macro-theme of recent linguistic history: the contrast between **diversity** and **universality**. This was recognised by Sapir in 1921: 'There is no more striking general fact about language than its universality' and 'scarcely less impressive than the universality of speech is its almost incredible diversity' (1921: 22–3); and by Saussure in 1916, in a statement of basic aims which is out of date on specifics, but entirely relevant in its general thrust:

The aims of linguistics will be:

1. to describe all known languages and record their history (this involves tracing the history of language families and, as far as possible, reconstructing the parent languages of each family);
2. to determine the forces operating permanently and universally in all languages, and to formulate general laws which account for all particular linguistic phenomena historically attested;
3. to delimit and define linguistics itself.

(Saussure 1916/1983: 6)

A. P. R. H.

Suggestions for further reading

- Joseph, J.E. (1994) 'Twentieth-Century Linguistics: Overview of Trends', in R.E. Asher (Editor-in-Chief), *The Encyclopedia of Language and Linguistics*, vol. IX, Oxford: Pergamon.
- Matthews, P.H. (1993) *Grammatical Theory in the United States from Bloomfield to Chomsky* (Cambridge Studies in Linguistics, no. 67), Cambridge: Cambridge University Press.
- Morpurgo Davies, A. (1998) *History of Linguistics*, Vol. IV, edited by G. Lepschy, London: Longman.

A

Acoustic phonetics

Acoustic phonetics deals with the properties of sound as represented in variations of air pressure. A sound, whether its source is articulation of a word or an exploding cannon ball, disturbs the surrounding air molecules at equilibrium, much as a shove by a person in a crowded bus disturbs the standing passengers. The sensation of these air pressure variations as picked up by our hearing mechanisms and decoded in the brain constitutes what we call **sound** [*see also* AUDITORY PHONETICS]. The question whether there was a sound when a tree fell in a jungle is therefore a moot one; there definitely were air-molecule variations generated by the fall of the tree but, unless there was an ear to register them, there was no sound.

The analogy between air molecules and bus passengers above is rather misleading, though, since the movements of the molecules are rapid and regular: rapid in the sense that they oscillate at the rate of hundreds and thousands of times per second, and regular in the sense that the oscillation takes the form of a swing or a pendulum. That is, a disturbed air molecule oscillates much as a pushed pendulum swings back and forth.

Let us now compare air molecules to a pendulum. Due to gravity, a pushed pendulum will stop after travelling a certain distance, depending on the force of the push; it will then begin to return to the original rest position, but, instead of stopping at this position, it will pass it to the opposite direction due to inertia; it will stop after travelling about the same distance as the initial displacement; it will again try to return to the

initial rest position; but it will again pass this point to the other direction, etc., until the original energy completely dissipates and the pendulum comes to a full stop.

Imagine now that attached at the end of the pendulum is a pencil and that a strip of paper in contact with the pencil is being pulled at a uniform speed. One can imagine that the pendulum will draw a wavy line on the paper, a line that is very regular in its ups and downs. If we disregard for the moment the effect of gravity, each cycle, one complete back-and-forth movement of the pendulum, would be exactly the same as the next cycle. Now if we plot the position of the pendulum, the distance of displacement from the original rest position, against time, then we will have Figure 1, in which the y-ordinate represents the distance of displacement and the x-abcissa the time, both units representing arbitrary units. Since a wave form such as the one given in Figure 1 is generatable with the sine function in trigonometry, it is called a **sine wave** or a **sinusoidal wave**. Such a wave can tell us several things.

First, the shorter the duration of a cycle, the greater (the more frequent) the number of such cycles in a given unit of time. For example, a cycle having the duration of one hundredth of a second would have a frequency of 100 cycles per second (**cps**). This unit is now represented as **Hz** (named after a German physicist, Heinrich Hertz, 1857–94). A male speaking voice has on average 100–50 Hz, while a woman's voice is twice as high. The note A above middle C is fixed at 440 Hz.

Second, since the y-axis represents the distance of displacement of a pendulum from the

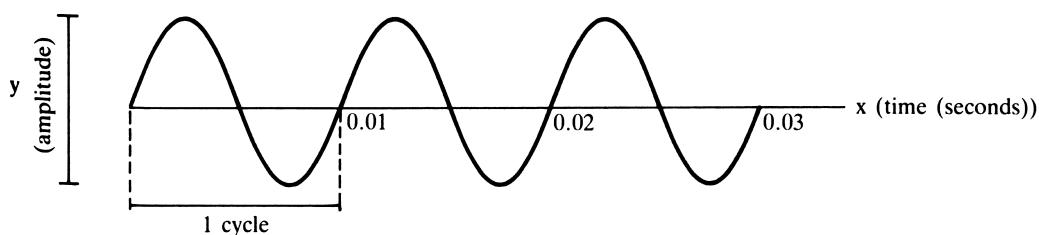


Figure 1 A sine wave whose cycle is one-hundredth of a second, thus having the frequency of 100 Hz.

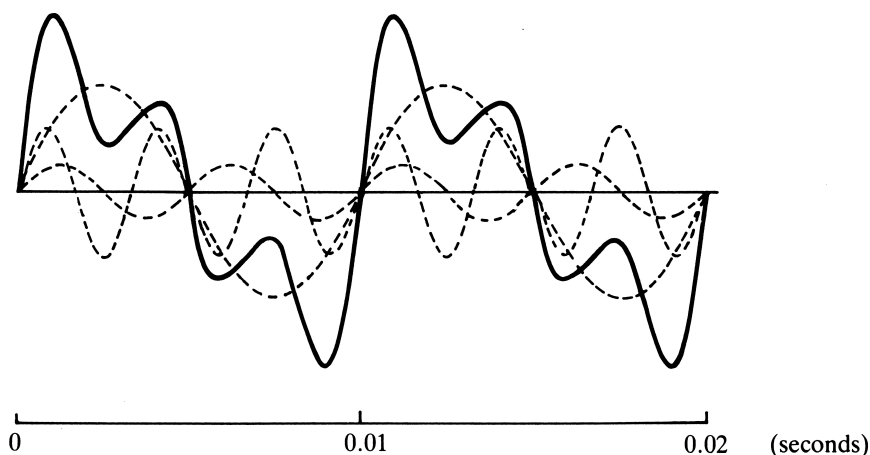


Figure 2 A complex wave formed with a combination of 100 Hz, 200 Hz and 300 Hz component waves.

rest position, the higher the peak of the wave, the greater the displacement. This is called **amplitude**, and translates into the degree of loudness of a sound. The unit here is **dB** (decibel, in honour of Alexander Graham Bell, 1847–1922). A normal conversation has a value of 50–60 dB, a whisper half this value, and rock music about twice the value (110–20 dB). However, since the dB scale is logarithmic, doubling a dB value represents sound intensity which is ten times greater.

In nature, sounds that generate sinusoidal waves are not common. Well-designed tuning forks, whistles, and sirens are some examples. Most sounds in nature have complex wave forms. This can be illustrated in the following way. Suppose that we add three waves together having the frequencies of 100 Hz, 200 Hz and 300 Hz, with the amplitude of x , y and z , respectively, as in Figure 2. What would be the resulting wave form? If we liken the situation to three people pushing a pendulum in the same

direction, the first person pushing it with the force z at every beat, the second person with the force y at every second beat, and the third person with the force x at every third beat, then the position of the pendulum at any given moment would be equal to the displacement, which is the sum of the forces x , y and z . This is also what happens when the simultaneous wave forms having different frequencies and amplitudes are added together. In Figure 2, the dark unbroken line is the resulting complex wave.

Again, there are a few things to be noted here. First, note that the recurrence of the complex wave is at the same frequency as the highest common factor of the component frequencies, i.e. 100 Hz. This is called **fundamental frequency**. Note, second, that the frequencies of the component waves are whole-number multiples of the fundamental frequency. They are called **harmonics** or **overtones**. An **octave** is a relation between two harmonics whose frequencies are either twice or one half of the other.

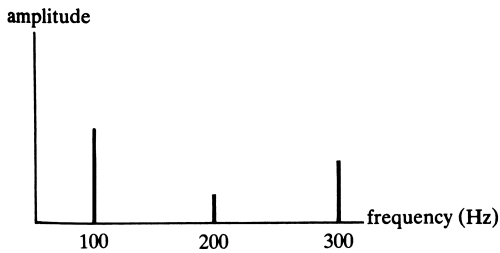


Figure 3 A line spectrum.

There is another way to represent the frequency and amplitude of the component waves, more succinct and legible than Figure 2; namely by transposing them into a graph as in Figure 3. Since the component waves are represented in terms of lines, a graph like Figure 3 is called **line spectrum**.

Recall that the frequencies of the component waves in Figure 2 are all whole-number multiples of the lowest frequency. What if the component waves do not have such a property; that is, what if the frequencies are closer to one another, say, 90 Hz, 100 Hz and 110 Hz? The complex wave that these component waves generate is shown in Figure 4.

Compared to Figure 2, the amplitude of the complex wave of Figure 4 decays rapidly. This is called **damping**. It turns out that the more the number of component waves whose frequencies are close to one another, the more rapid the rate of damping. Try now to represent such a wave in a line spectrum, a wave whose component waves have frequencies, say 91 Hz, 92 Hz, 93 Hz, etc. to 110 Hz. We can do this as in Figure 5.

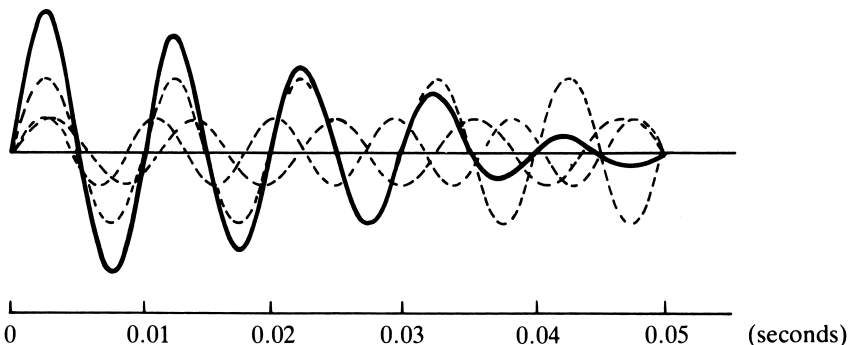


Figure 4 A 'decaying' complex wave formed with a combination of 90 Hz, 100 Hz and 110 Hz component waves.

What if we add more component waves between any two lines in Figure 5, say ten or twenty more? Try as we might by sharpening our pencils, it would be impossible to draw in all the components. It would be unnecessary also if we take the 'roof' formed by the lines as the envelope of the amplitude under which there is a component wave at that frequency with that amplitude, as in Figure 6. To contrast with the line spectrum in Figure 3, the spectrum in Figure 6b is called **envelope spectrum** or simply **spectrum**.

What is the significance of the difference in the two kinds of spectrum, Figure 3 and Figure 6b? It turns out that, if we divide sound into two kinds, **melody** and **noise**, melody has regular, recurrent wave forms, while noise has irregular non-recurrent wave forms.

Before turning to speech acoustics, it is worth noting that every object, when struck, vibrates at a certain 'built-in' frequency. This frequency, called **natural resonance frequency**, is dependent upon the object's size, density, material, etc. But in general, the larger the size, the lower the frequency (compare a tuba with a trumpet, a bass cello with a violin, or longer piano strings with shorter ones) and the more tense or compact the material, the higher the frequency (compare glass with carpet, and consider how one tunes a guitar or a violin).

Acoustics of speech

Vowels

A pair of vocal folds can be likened to a pair of hands or wood blocks clapping each other. As

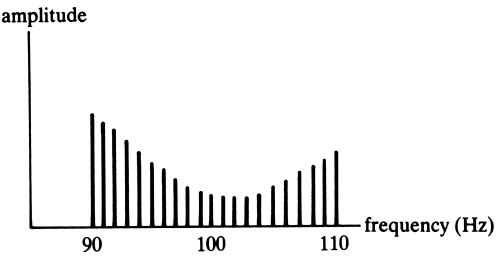


Figure 5 A line spectrum showing relative amplitudes and frequencies from 90, 91, 92 ... to 110 Hz of the component waves.

such, the sound it generates is, strictly speaking, a noise. This noise, however, is modified as it travels through the pharyngeal and oral (sometimes nasal) cavities, much as the sound generated by a vibrating reed in an oboe or a clarinet is modified. Thus what comes out of the mouth is not the same as the pure unmodified vocal tone. And, to extend the analogy, just as the pitch of a wind instrument is regulated by changing the effective length or size of the resonating tube with various stops, the quality of sounds passing through the supraglottal cavities is

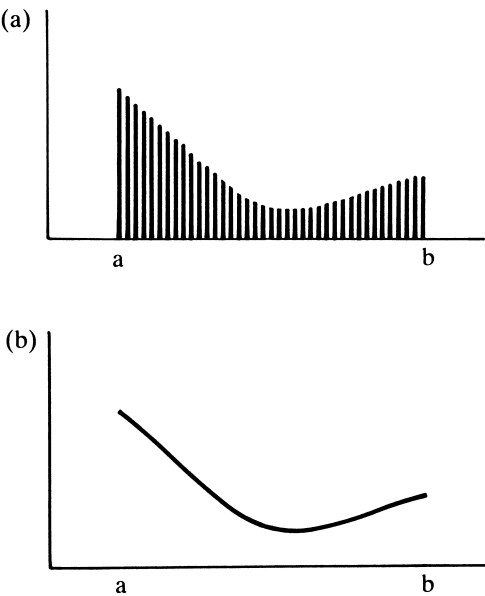


Figure 6 (a) A line spectrum with an infinite number of component waves whose frequencies range from a to b. (b) An envelope spectrum which is an equivalent of the line spectrum in Figure 6a.

regulated by changing the cavity sizes with such 'stops' as the tongue, the velum and the lips. It is immediately obvious that one cannot articulate the vowels [i], [a] and [u] without varying the size of the oral cavity [see also ARTICULATORY PHONETICS]. What does this mean acoustically?

For the sake of illustration, let us assume that a tube consisting of the joined oral and pharyngeal cavities is a resonating acoustic tube, much like an organ pipe. The most uniform 'pipe' or tube one can assume is the one formed when producing the neutral vowel [ə] (see Figure 7).

Without going into much detail, the natural resonance frequency of such a tube can be calculated with the following formula:

$$f = (2n - 1) \frac{v}{4l}$$

where f = frequency, v = velocity of sound and l = length of the vocal tract.

Since v is 340 m per second, and l is 17 centimetres in an average male, f is about 500 Hz when $n = 1$, 1500 Hz when $n = 2$, 2500 Hz when $n = 3$, etc. What this means is that, given a vocal tract which is about 17 centimetres long, forming the most neutral tract shape usually assumed for the schwa vowel [ə], the **white noise** (the vocal-fold excitation) at one end will be modified in such a way that there will be resonance peaks at every 1000 Hz, beginning at

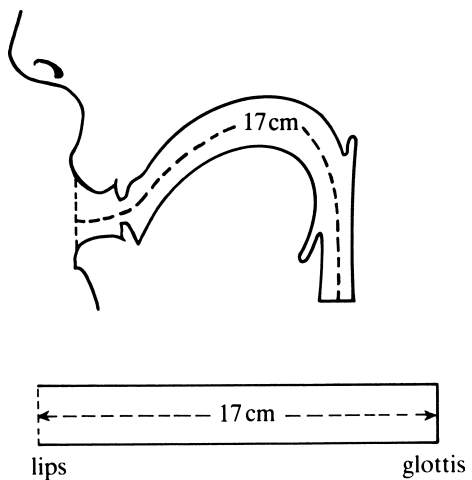


Figure 7 The vocal-tract shape and an idealised tube model of the tract for the most neutral vowel.

500 Hz. These resonance peaks are called **formants**.

It is easy to imagine that a change in the size and shape of a resonating acoustic tube results in the change of resonance frequencies of the tube. For the purpose of speech acoustics, it is convenient to regard the vocal tract as consisting of two connected tubes, one front and the other back, with the velic area as the joint. Viewed in this way, vowel [i] has the narrow front (oral) tube and the wide back tube, while [a] is its mirror image, i.e. [a] has the wide front tube but the narrow back tube. On the other hand, [u] has the narrow area ('the bottle neck') in the middle (at the joint) and, with lip rounding, at the very front as well. The vocal-tract shapes, the idealised tube shapes and the resulting acoustic spectrum of these three vowels are illustrated in Figure 8.

The formant frequencies of all other vowels would fall somewhere between or inside an approximate triangle formed by the three 'extreme' vowels. The frequencies of the first three formants of eight American English vowels are given in Table 1.

Table 1 can be graphically represented as Figure 9 (adapted from Ladefoged 2006: 185).

A few things may be observed from this figure:

- F1 rises progressively from [i] to [a], then drops to [u].
- F2 decreases progressively from [i] to [u].
- In general, F3 hovers around 2500 Hz.

From this it is tempting to speculate that F1 is inversely correlated with the tongue height, or the size of the oral cavity, and that F2 is correlated with the tongue advancement, or the size

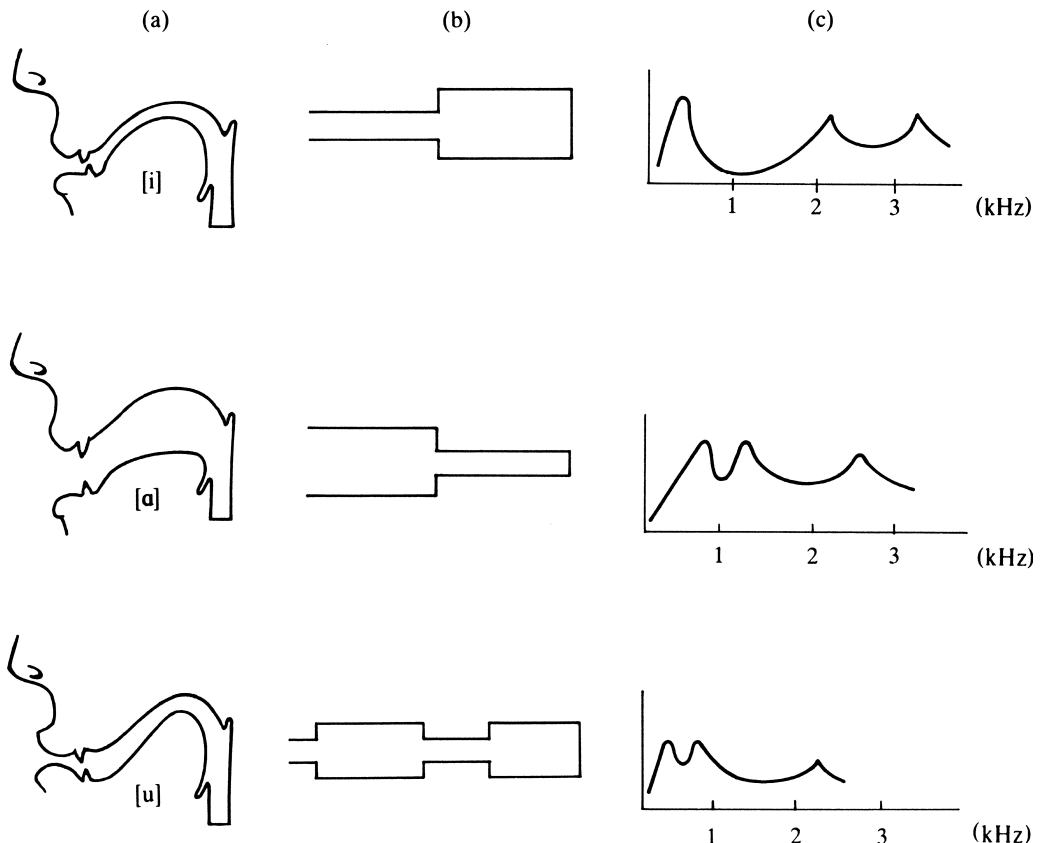


Figure 8 The vocal-tract shapes (a), their idealised tube shapes (b), and the spectra (c) of the three vowels [i], [a] and [u].

Table 1 The frequencies of the first three formants in eight American English vowels

	[i]	[ɪ]	[ɛ]	[æ]	[ɑ]	[ɔ]	[ʊ]	[u]
F1	280	400	550	690	710	590	450	310
F2	2250	1920	1770	1660	1100	880	1030	870
F3	2890	2560	2490	2490	2540	2540	2380	2250

of the pharyngeal cavity. While this is roughly true, Ladefoged feels that there is a better correlation between the degree of backness and the distance between the first two formants (i.e. F2–F1), since in this way there is a better match between the traditional articulatory vowel chart and the formant chart with F1 plotted against F2, as shown in Figure 10 (from Ladefoged 2006: 183).

Consonants

The acoustics of consonants is much more complicated than that of vowels, and here one can talk only in terms of generalities.

It is customary to divide consonants into **sonorants** (nasals, liquids, glides) and **obstruents** (plosives, fricatives, affricates). The former are characterised by vowel-like acoustic qualities by virtue of the fact that they have an unbroken and fairly unconstricted resonating tube. The vocal tract for nasals, for example, can be

schematically represented as a reversed letter F, shown in Figure 11.

The open nasal tract, functioning as a resonating acoustic tube, generates its own resonance frequencies, known as **nasal formants**, which are in general discontinuous with vowel formants. Different lengths of the middle tube, i.e. the oral tract, would be responsible for different nasals.

The acoustic structure of **obstruents** is radically different, for obstruents are characterised by either the complete obstruction of the airflow in the vocal tract or a narrow constriction impeding the airflow. The former creates a silence and the latter a turbulent airstream (a hissing noise). Silence means no sound. Then how is silence heard at all and, furthermore, how are different silences, e.g., [p], [t], [k], distinguished from each other? The answer is that silence is heard and distinguished by its effect on the adjacent vowel, as illustrated in the following.

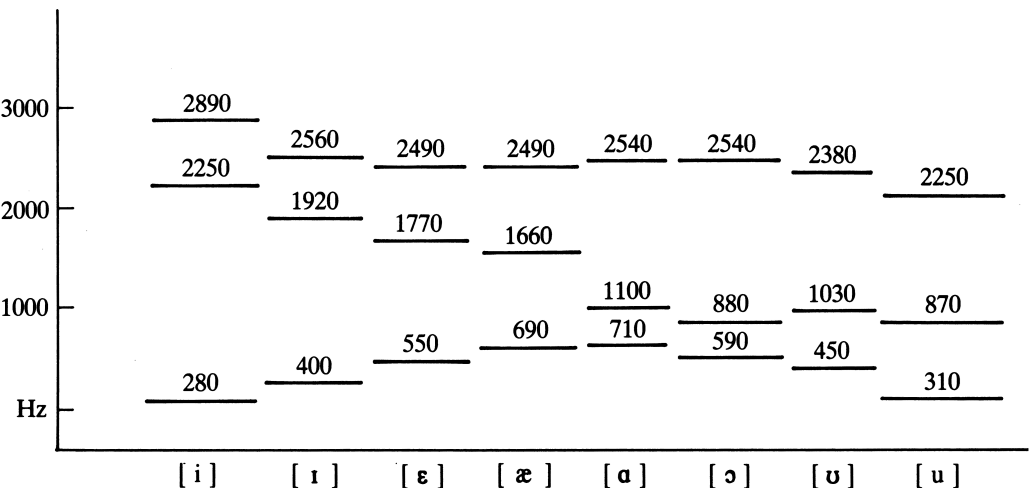


Figure 9 The frequencies of the first three formants in eight American English vowels.

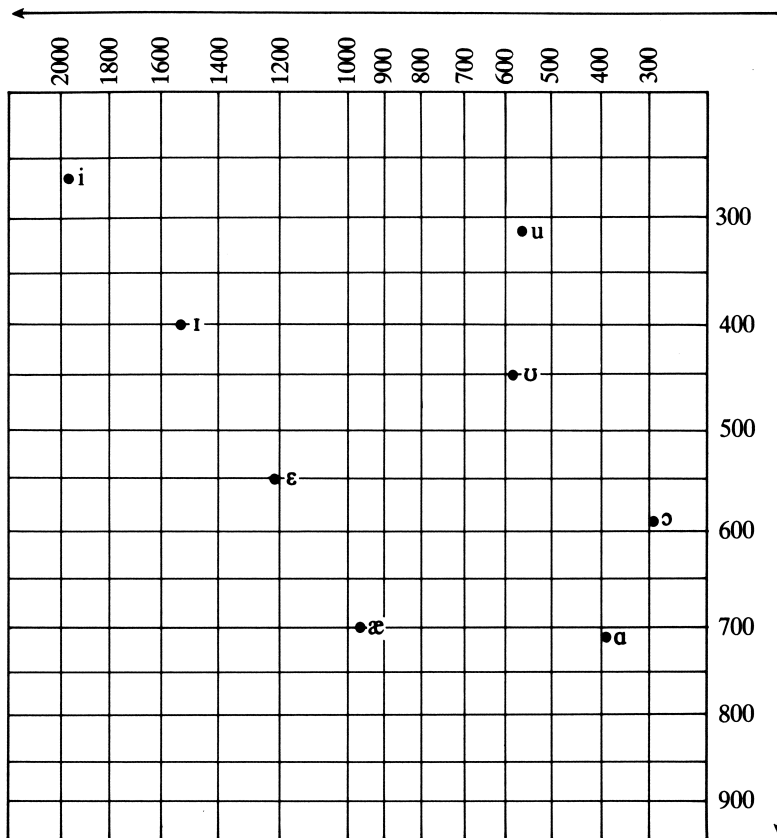


Figure 10 A formant chart showing the frequency of the first formant on the vertical axis plotted against the distance between the frequencies of the first and second formants on the horizontal axis for the eight American English vowels in Figure 9.

Assume a sequence [apa], and examine the behaviour of the lips. They are wide open for both [a]s, but completely closed for [p]. Though rapid, both the opening and closing of the lips is a time-taking process and, if we slow it down, one can imagine the process shown in Figure 12.

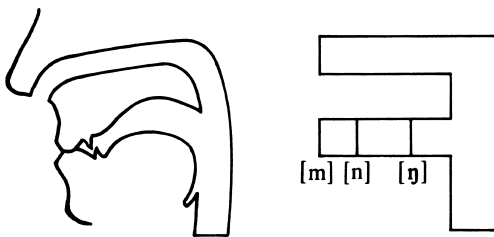


Figure 11 The vocal-tract shape and the idealised tube shape for nasal consonants [m], [n] and [ŋ].

Now, as we have seen, vowels have their own resonance frequencies, called formants. A closed tube, such as the one that a plosive assumes, can also be said to have its own resonance frequency, although it is inaudible because no energy escapes from the closed tube (for what it is worth, it is $\frac{v}{2l}$). If we take the resonance frequency (i.e. formant) of the vowel to be x , and the resonance frequency of the plosive to be y , then the closing and opening of the lips can be seen to be, acoustically speaking, a transition from x to y and then from y to x . It is this formant transition towards and from the assumed value of the consonant's resonance frequency that is responsible for the perception of plosives. This imagined place of origin of formant transitions is called **locus**. As for different places of plosives, the lengths of a closed tube for [p],

[t] and [k] are different from each other; so would be the loci of these plosives; and so would be the transitional patterns. They are shown schematically in Figure 13.

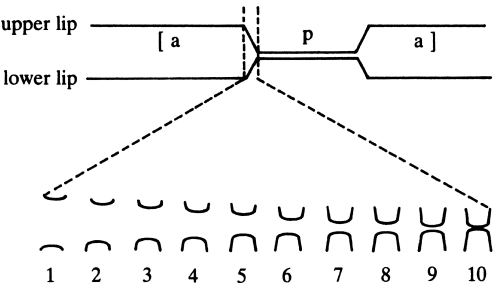


Figure 12 A schematic diagram of the closing of lips in [apa], its progression slowed down in ten steps.

It can be seen that all formants rise rapidly from plosive to vowel in [pa], while higher formants fall in [ta], but converge in [ka].

A machine designed to analyse/decompose sound into its acoustic parameters, much as a prism splits light into its colour spectrum, is called a **spectrograph**, and its product is a **spectrogram**. A normal spectrogram shows frequency (ordinate) against time (abscissa), with relative intensity indicated by degrees of darkness of spectrogram. A spectrogram of English words *bab*, *dad* and *gag* is shown in Figure 14 (adapted from Ladefoged 2006: 192). Compare this with the schematic spectrogram of Figure 13.

In addition to the formant transitions, a noise in the spectrum generated by a turbulent air-stream characterises fricatives and affricates. This noise may vary in its frequency range,

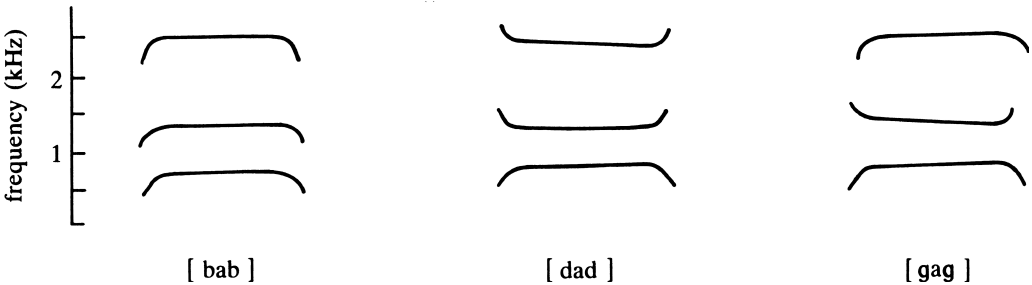


Figure 13 A schematic spectrogram of the words [bab], [dad] and [gag], showing different patterns of transitions of upper formants for different places of articulation. Compare this with the real spectrogram in Figure 14.

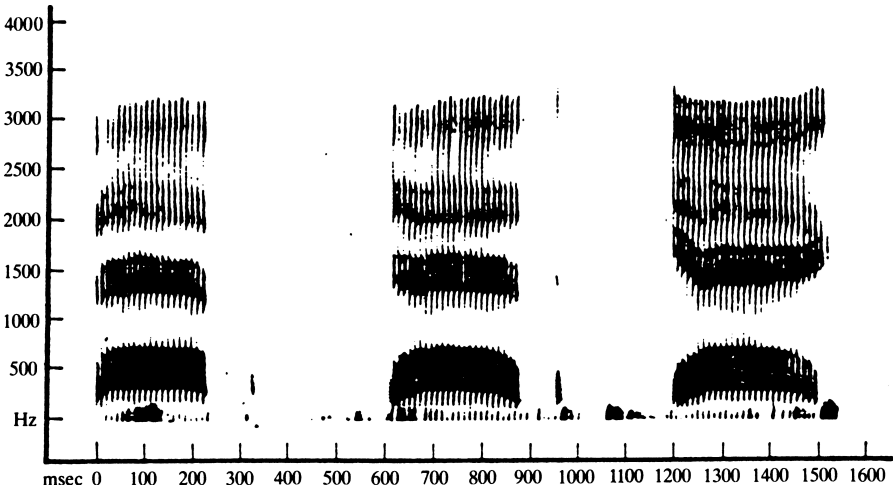


Figure 14 A spectrogram of the words [bab], [dad] and [gag]. Compare with Figure 13.

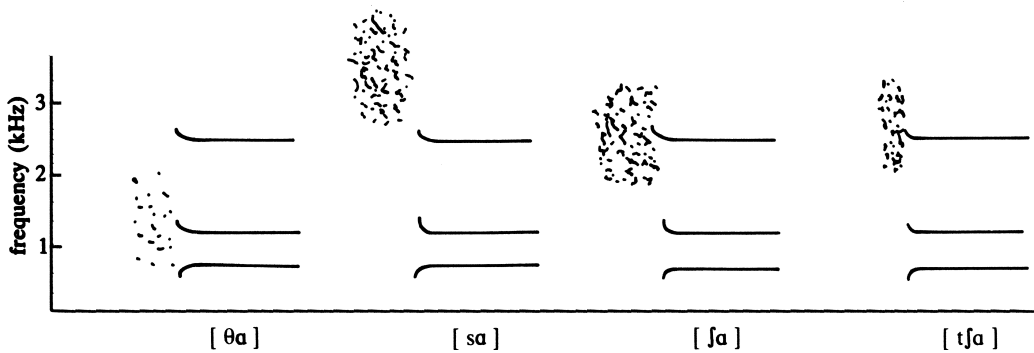


Figure 15 A schematic spectrogram showing different fricatives. Note that the difference between [s] and sibilants is in the noise intensity; in the noise frequency between [s] and [ʃ]; and in the noise duration between [ʃ] and [tʃ].

intensity and duration depending upon the location and manner of the oral constriction. In general, sibilants are stronger in noise intensity than non-sibilants ([f], [θ], [h] – [h] being the weakest); affricates have a shorter noise duration than fricatives; and [s] is higher in its frequency range than [ʃ]. See the schematic spectrograms in Figure 15.

Acoustic phonetics developed in the 1940s with the advent of the age of electronics and provided a foundation for the theory of distinctive features of Jakobson and Halle (Jakobson et al. 1951) [see DISTINCTIVE FEATURES], which in turn formed the basis of generative phonology in the 1950s and 1960s [see GENERATIVE PHONOLOGY]. Although this framework was overhauled by Chomsky and Halle (1968: especially Chapter 7), acoustic phonetics is still an indispensable tool both in instrumental phonetic research and in validation of aspects of phonological theories.

C.-W. K.

Suggestions for further reading

- Carrè, R. (2004) 'From an Acoustic Tube to Speech Production', *Speech Communication*, 42 (2): 227–40.
- Fry, D.B. (1979) *The Physics of Speech*, Cambridge: Cambridge University Press.
- Ladefoged, P. (1962/1996) *Elements of Acoustic Phonetics*, 2nd edn, Chicago, Ill.: University of Chicago Press.
- (1975/2006) *A Course in Phonetics*, 5th edn, Boston, Mass.: Thomson Wadsworth.

Animals and language

All species on this planet procreate. For most to do that they must encounter another individual. To do that they must exchange information; they must communicate. Communication occurs chemically through scent, vibrationally through sound, visually with light, and tactilely through contact. Many taxa use a combination of these and for each there is a unique system. Each system accommodates the organism in its particular social and ecological environment. For example elephant groups are spread out over large distances. Their seismic communication travels over long distances and their large feet are adapted to detect these vibrations as well as support their massive bodies! In contrast many birds live in trees where foliage blocks the view. Their high pitch vocalisations travel easily over short distances. Cetacean communication is well designed to work where they live, in water. The human system is based largely on speech and visual communication. The visual component includes facial expressions, postures, and gestures and overlaps with the communication system of non-human primates.

A description of each system is beyond the scope of this article, and it will concentrate on examples of communication systems used by species of bees, birds, whales, elephants and non-human primates, including human systems, both artificial and natural, that are utilised by non-human animals.

The dance of the honey bee

Von Frisch (1967), an Austrian ethologist, provided much of our knowledge of the honey bee dance. Bees dance on the hive, which indicates the location of rich food sources. Other bees follow the dancer and then go out to the food source themselves. One type of dance, the **round dance**, is used for nearby items. The bee circles alternately clockwise and counter-clockwise, much like a figure eight. A second dance, the **waggle dance**, is used for distant food sources and contains information about the location and distance of the food source. The dancer waggles along a straight line then circles back and repeats. The speed and duration of the waggle portion indicate the distance to the food; the slower the dance, the longer the distance. The direction of the waggle indicates the location of the food. Usually the hive is in a dark location perpendicular to the ground. In this case the waggle line uses the direction of gravity as a reference point. The angle of the waggle line relative to the direction of gravity correlates to the angle of the line between the hive and the food to the line between the hive and the sun. If the waggle line is straight up, the bees should fly straight towards the sun to reach the food. If the waggle line is straight down, the bees should fly straight away from the sun to reach the food. If the waggle line is 40 degrees to the left of the direction of gravity, the bees should fly 40 degrees to the left of the sun. This symbolic system communicates information about something not present in the hive, which is displaced information.

Bird vocalisations

Birds communicate with vocalisations, plumage, drumming, tapping, postures, and other methods, although this section will focus only on bird vocalisations. There are many species of birds representing much diversity, so generalisations are difficult to make. Birds rely heavily on vocalisations; many species recognise conspecifics by voice. In fact, deafened turkeys will attack their own young. Bird calls are usually short bursts of sound or simple patterns of notes. There are many types: alarm calls, feeding calls, threats, begging, and social calls to maintain cohesion in the flock. Some distinct calls carry specific

meaning. For example, alarm calls for flying predators sound different from alarm calls for ground predators and the birds give appropriate responses to each one. In the **playback technique**, a recording of a call is played to the birds in the absence of the predator to test the birds' response. When an aerial predator alarm call was played to laboratory chickens, they crouched down and looked up. In response to the ground predator alarm call, they ran for cover or strutted and called in a threatening way. This shows that the alarm call carries referential meaning (Evans and Marler 1993).

Much of what is known about bird vocalisation focuses on birdsong, its qualities, and acquisition. Bird songs are usually longer than calls and have elaborate patterns of pitches. Of all the types of birds, passerines (songbirds), a very diverse group including finches, scrub birds, swallows, crows, starlings, and warblers groups, most commonly sing songs. Birdsong is a male behavior and functions in breeding to attract females and stimulate hormones, and in territory marking to repulse other males. Songs may be strings of units which may be recombined in new ways.

Birdsong is learned behaviour, as evinced by Thorpe's (1961) early research. He showed that the songs of adult chaffinches raised in sound-proof isolation were very different from the songs of their wild counterparts, yet they maintained the pitch, length, and subdivision of songs. But if the isolates heard tape recordings of adult male songs during rearing, their adult songs sounded like those of their wild counterparts. This is also true for sparrows. In contrast, finches did not learn from recordings, they required interaction to learn, even if it was simply turning on the recorder. A songbird also relies on hearing himself to properly develop the adult song; if deafened the songbird's songs are very abnormal. Most songbirds are genetically predisposed to learn species-specific songs. At five weeks the young chaffinch begins singing long sequences of notes called sub-songs. This develops into songs that more closely resemble the parents', and at this phase are called plastic songs. In the winter the chaffinch ceases its singing, and then in the spring it sings the sub-song blended with the plastic song. A month later this emerges into the full song. The plastic song has

more syllables than the full song; thus each generation is producing more material than is necessary. This pattern of development is common to sparrows, cardinals and buntings. Neural development parallels the pattern of song development; after a period of intense branching and growth, there is a pruning of neural connections.

Chaffinches only require adult exposure in the first few weeks of life to develop the adult song. This period of time when adult exposure is required is known as a critical period. Kroodsma (1978) reports on an experiment in which long-billed marsh wrens were systematically exposed to songs during development. They learned the most songs from twenty-five to fifty-five days of age and by the eightieth day they learned no more. The critical period for birdsong varies for different species of birds. There are similar critical periods in the development of other systems in biology, including the development of binocular vision and human speech. Once the adult chaffinch develops its song, it never changes it. Other species have variation over time, for example canary songs change every season.

Some species of songbirds show geographic variations in their songs, called regional dialects. In the Bay Area of California one can tell where a bird lives to within a few kilometres by listening to the song and identifying the dialect (Marler and Tamura 1964). Usually songs vary in relation to the distance, so birds located more closely to each other sound more alike and vice versa. Different species of birds reproduce the adult song with more or less accuracy, which also produces temporal dialects. White-crowned sparrows copy the previous generation very exactly while indigo buntings introduce slight change with each generation. Chaffinches copy with 85 per cent accuracy and some species only copy part of the previous generation's song. Variation is created by either the introduction of errors, introduction of new syllables, or recombinations of syllables.

Cetacean communication

Within the order Cetacea there are two sub-orders. Mysticeti are baleen **whales** – large filter feeders including humpback, minke, fin, right, blue, and gray whales. Odontoceti are toothed whales generally less than 10 metres in

length including beaked, sperm and beluga whales, narwhals, porpoises and dolphins.

Baleen whales use low frequency moans, groans and thumps to communicate. Some sounds are infrasonic which is below the human range of hearing. Generally these whales travel alone or in small groups, and many are migratory. The nature of the low frequency sounds allows the sounds to travel long distances up to thousands of miles. This is underscored when the sound waves hit pressure gradients and physical features of the ocean floor, which directs the sound waves and allows them to travel further. Thus whales communicate with others hundreds of miles away. This is quite adaptive for taxa like baleen whales that are spread out over large distances.

At the breeding grounds, Baja Mexico and Hawaii for Pacific humpbacks, the males sing. Payne (1995) recorded and analysed hours of humpback songs. He noted that songs were made up of units, which were much like musical notes. These were combined and repeated into phrases. Groups of similar phrases were combined into themes. Many themes were combined and repeated into songs and songs were repeated in song sessions, which could last for hours. Songs within a geographic area were continually changing and all the individuals in the population sang the current song. Thus Pacific humpback songs were different from Atlantic humpback songs, but the rules for creating new songs were the same in both groups. Near Bermuda, humpback songs had eight to ten themes while near Hawaii songs had four to five themes. But for both groups songs could change by dropping a theme while maintaining the order of the remaining themes. Song changes happened rather rapidly; for example over two months the song could be completely different. Between breeding seasons, when humpbacks were not at the breeding area, the songs did not change. At the beginning of the next season the songs picked up where they left off in terms of change.

The toothed whales have specialised structures in the head to produce and detect sounds. They produce a large variety of high frequency pulsed sounds which are used for echolocation, navigation, hunting and social interaction. The sounds include squawks, burps, squeaks, clicks and chirps, and some are ultrasonic which is

above the human range of hearing. When sounds are combined they sound to humans like hinges or machines. Bottlenose dolphins and harbour porpoises produce pulsed yelps in courtship, squawks in distress and buzzes in aggression.

Some species of toothed whales produce unpulsed, pure tones called whistles as well as clicks. **Whistlers** include oceanic dolphins, which tend to live in large foraging groups numbering well over 100 in oceans. Whistles carry well over long distances and carry information such as predator type (Janik et al. 1994). Whistlers' clicks are acoustically different from the clicks of non-whistlers. Whistlers' clicks tend to be short and broad bandwidth while non-whistlers' clicks are long with a narrow bandwidth. Non-whistlers include many river dolphins; they tend to live in smaller groups inshore and their clicks are well adapted for this murky type of environment (Bright 1984).

Signature whistles identify individuals (Caldwell and Caldwell 1965). Male dolphins copy their mothers' signature whistle, while females do not. Males then leave the natal group, which avoids any potential confusion with the mother's whistle. The toothed orca whales live in pods, each of which has its own dialect. For example, Orcas near Vancouver, British Columbia have dialects different from those of transient pods that pass through the area (Ford and Fisher 1983).

Noise pollution in the sea produced by motors of boats may be affecting cetacean communication. There is much we do not understand or know about cetacean communication due to the difficulty of observing them in their underwater environment.

Elephants

Elephants are social, long-lived mammals that produce a variety of sounds (Moss 1988). They produce a constant low rumble that sounds like a purr or gargle to humans. This sound stops in the presence of danger and alerts others in the group. They produce infrasonic calls that can be heard by other elephants up to 10 kilometres away. These sounds are associated with danger, greeting, excitement and fear. They allow elephants to keep in contact with others from a distance, which is useful in times of limited resources. For example, should the elephants

encounter a limited water supply, these far-ranging sounds can help coordinate with others so too many do not arrive at one time. Also these sounds allow males to locate fertile females, and mothers to track their calves.

Elephant infrasonic vocalisations travel through the air while their seismic vocalisations travel through the ground (O'Connell 2007). Seismic vibrations can travel 16 to 32 kilometres. Elephant feet are specially designed to be sensitive to vibration with layers of gel substances and vibration sensors.

Non-human primates

Monkeys, apes and humans communicate visually using various gestures, postures, and facial expressions in their interactions with conspecific. Additionally they all use vocalisations. Study of monkey vocalisations began with vervet monkeys. They produce acoustically distinct alarm calls for three different predators. One call is for eagles, another is for snakes, and another for leopards, and the monkeys make appropriate responses. For the snake alarm call they stand bipedally and look around. For the eagle alarm call they look up and run for cover. For the leopard alarm call they run up a tree if on the ground. Cheney and Seyfarth (1990) played recordings of an alarm call to the monkeys in the absence of the predator. The monkeys responded appropriately to the recording indicating the calls are referential. Additionally, calls are not made by individuals who are alone which means the call is more than a reflection of an internal state.

Young vervets begin to produce the alarm calls at about three months of age. Acoustically, the calls are in the adult form yet they are elicited by a broader class of animals. For example, alarm calls are elicited by numerous types of non-raptors while adults usually respond to raptors. In human language development, early language learners also give a response to a wider range of referents. For example the word 'dog' might be elicited by dogs, horses, cows and cats. Humans eventually limit the referents for the word 'dog' as do vervets with their calls. The young vervet's responses to the alarm calls are shaped by adults. At three to four months vervets most often run to mother. At four to five

months they run to mother less often and instead make inappropriate responses, ones that make them more likely to be killed. But by six to seven months all vervets are making appropriate responses. Thus production and response to calls are learned behaviours.

Vervets produce a variety of grunts that sound similar to the human ear, but which spectrograms reveal to be distinct. Four types identified by Cheney and Seyfarth (1990) include grunts to a dominant, grunts to a subordinate, grunts to an animal moving into the open, and grunts to another group. Playbacks of recordings of grunts elicit different responses. Grunts to a dominant elicited looks towards the speaker. Grunts to another group elicited looks out towards the horizon. When new males moved into a vervet group they initially produced grunts to another group in encounters with their new group members. With time, the new arrivals produced grunts to a dominant or grunts to a subordinate to group members, whichever was appropriate. The original group members also gave these intra-group grunts to the new arrivals after a time.

Other species of primates such as Diana and Campbells monkeys, tamarins and lemurs also produce referential alarm calls. Diana and Campbells monkeys share the Tai Forest in Ivory Coast. Diana monkeys respond appropriately to the calls of the Campbells monkeys. When faced with uncertain danger, for example when the predator is far away, Campbells monkeys emit a 'boom' before the alarm call. In playback experiments while the Diana monkeys responded with evasive action to the boomless calls, they did not respond to the boom calls (Zuberbühler 2002). Thus 'boom' modifies the meaning of the alarm call.

Chimpanzees, bonobos, orangutans and gorillas use gestures in free-living and captive settings. They combine these into sequences and use them appropriately based on the attentional state of the partner. When partners have their backs turned, gesturers are more likely to use an auditory or tactile gesture. If partners have visual contact, the gestures are more likely to be visual (Call and Tomasello 2007).

Chimpanzees, bonobos and orangutans in different regions use different gestures. For example, during grooming chimpanzees at

Gombe Stream Reserve in Tanzania grasp an overhead branch, while just south in the Mahale Mountains the chimpanzees grasp each others' hands and hold them overhead. Researchers working at nine different long-term chimpanzee field sites collaborated and developed a list of sixty-five behaviour patterns (Whiten et al. 1999). The behaviours were classified in terms of their local frequency of occurrence. There were thirty-nine behaviours including gestures that the researchers determined were cultural variants since they were absent in some communities and customary or habitual in others. This same analysis was used to determine learned variation in gestures of bonobos (Hohmann and Fruth 2003) and orangutans. For example, orangutans in one location place a kiss squeak on a leaf while in another location they place a kiss squeak on the back of the hand (Van Schaik 2004).

Chimpanzee communities also have local variation in the form of the same gesture. This is well documented in the overhand handclasp gesture used during grooming. At Mahale, Tanzania, in the K group, partners' arms are fully extended and held palm to palm while in the M group one chimpanzee grasps the other's wrist and the arms are not fully extended. The individual who supports the wrist is always lower in dominance rank (McGrew 2004).

Human-influenced communication

Ethologists use the procedure called **cross-fostering** to study the interaction between environmental and genetic factors by having parents of one species rear the young of a different species. Primate cross-fostering projects date to the 1930s, when Kellogg and Kellogg (Kellogg 1968) raised the infant chimpanzee **Gua** for a period of nine months with their son. In the 1950s, Hayes and Hayes (Hayes and Nissen 1971) cross-fostered the chimpanzee **Viki** while attempting to teach her to talk. After four years she was able to say four words, 'mama', 'papa', 'cup', and 'up'. This research demonstrated that chimpanzees cannot speak, leading to the search for other means of testing the language and other cognitive abilities of apes.

Gardner and Gardner (Gardner et al. 1986) cross-fostered the infant chimpanzee **Washoe**

and immersed her in American Sign Language (ASL). In teaching ASL to Washoe, caregivers imitated human parents teaching human children in human homes. For example, they called attention to objects, expanded on fragmentary utterances, and moulded Washoe's hands into the shape of new signs. In a second project, the Gardners cross-fostered four more chimpanzees, **Moja**, **Pili**, **Tatu** and **Dar**. All of these cross-fosterlings acquired and used signs in ways that paralleled human children. The size of their vocabularies, appropriate use of sentence constituents, number of utterances, proportion of phrases, and inflection all grew robustly throughout the five-year cross-fostering process.

In 1979 at the University of Oklahoma Washoe adopted a ten-month-old chimpanzee son, **Loulis**. Human signing was restricted in Loulis' presence to test whether he could learn ASL from other chimpanzees rather than from humans. Loulis began to sign in one week, and at seventy-three months of age had a vocabulary of fifty-one signs. Washoe, Loulis, Tatu and Dar now live together at The Chimpanzee and Human Communication Institute (CHCI) at Central Washington University in Ellensburg, Wash. Current research shows they sign to each other and to themselves (Bodamer et al. 1994). The chimpanzees initiate conversations (Bodamer and Gardner 2002) and maintain topics. When human interlocutors feign a misunderstanding, the chimpanzees adjust their responses appropriately (Jensvold and Gardner 2000). The chimpanzees' patterns of conversation with human caregivers resemble patterns of conversation found in similar studies of human children.

In 1979 Terrace (Terrace et al. 1979) claimed to have replicated the Gardners' cross-fostering project with a chimpanzee named **Nim**. The young chimpanzee spent six hours each day in a classroom while a string of teachers drilled him with questions and demands for signing. If he wanted something, the teachers withheld it until he named it. Terrace found that Nim made few spontaneous utterances and often interrupted his teachers. This procedure differed greatly from the Gardners' cross-fostering project, in which the young chimpanzees were treated like human children. Terrace's failure to create a comparable environment for language acquisition led to

Nim's failures. Later studies showed Nim made more spontaneous utterances and interrupted less in a conversational setting than in a drill setting (O'Sullivan and Yeager 1989).

In 1972 Patterson began teaching signs to an infant gorilla, **Koko**, and later **Michael**. The gorillas acquired many signs and used them in all of their interactions with their caregivers (Patterson and Gordon 1993). In 1978, at the University of Tennessee at Chattanooga, Lyn Miles taught signs to a young orangutan, **Chantek**. He produced signs spontaneously and combined them into phrases (Miles 1990). At the time of this writing Chantek lives at Zoo Atlanta in Georgia and the project continues on a modified basis.

Also in the 1970s the Gardners' research sparked research using artificial systems to examine grammatical skills in chimpanzees. Premack used plastic tokens which varied in shape and colour to represent words. **Sarah** learned rules for their order and used them to answer simple questions about attributes of objects (Premack and Premack 1983).

Rumbaugh tested a chimpanzee's grammatical ability using **Yerkish**, a system of individual symbols (known as **lexigrams**) each standing for a word, and rules for their ordering. **Lana** used lexigrams to generate sentences to ask for goods and services. Later Savage-Rumbaugh attempted to train a bonobo, **Matata**, to use lexigrams. While Matata failed to use the lexigrams, her infant son, **Kanzi**, who was present during training, did use them (Hillix and Rumbaugh 2004). Devoid of face-to-face interaction, these artificial systems reveal little about conversational behaviour, but they do demonstrate apes' capacities to use syntax.

Herman (1986) used intensive training to demonstrate dolphin comprehension of artificial symbols. The dolphin **Akeakamai** learned to respond to human hand gestures and **Phoenix** learned to respond to underwater whistle-like sounds. They both learned vocabularies of about thirty-five gestural or auditory symbols representing objects and actions. In tests of comprehension, Herman combined the symbols to create commands such as 'Frisbee fetch', and overall the dolphins responded correctly 75 per cent of the time. The symbols could be recombined to produce novel combinations and

included up to five units. Additionally the symbols could be reversed to change the meaning of the command and the dolphins' responses showed they were sensitive to these differences.

M. L. J.

Suggestions for further reading

- Bright, M. (1984) *Animal Language*, New Haven, Conn.: Cornell University Press.
 Rogers, L. and Kaplan, G. (2000) *Songs, Roars, and Rituals*, Cambridge, Mass.: Harvard University Press.

Aphasia

Aphasia is an **acquired language disorder** arising from brain damage. 'Acquired' signifies that language was previously intact in the speaker. 'Language' conveys that both understanding and production are involved and that written as well as spoken language is impaired. Although impaired written language is considered part of aphasia, two separate terms are used for impairments with written language, **dyslexia**, which is an acquired difficulty with reading [see DYSLEXIA], and **dysgraphia**, an acquired difficulty with writing. Dysgraphia denotes a problem in conveying words and sentences in the written form rather than a motoric difficulty because of hemiparesis or hemiparalysis of the arm or hand. 'Brain damage' informs us that there is a physiological cause of the condition and neurological investigations can now routinely reveal site and extent of the brain damage. The terms, '**aphasia**' and '**dysphasia**' are synonymous as total absence of language (the strict interpretation of 'aphasia') is extremely unusual. The term 'dysphasia' is still used by some clinicians in the UK but 'aphasia' is the preferred term in the international research literature. The term 'aphasia' may, controversially, be applied to language associated with language impairment in some types of dementia as the manifestations of the language breakdown are similar in the two conditions. Historically, it has also been used to signify severe developmental language impairment in children. 'Aphasia' is the appropriate term for acquired language impairment in children. It is

no longer considered appropriate for another group of children who fail to develop language along the expected lines. This developmental condition is more accurately referred to as **specific language impairment**. Although aphasia can be acquired in children and young adults, it is more often associated with the elderly.

Impairments in aphasia may affect one or more components of language: the phonological form of words, the selection of words and/or the grammatical structures used. Further, understanding of language is usually impaired to some degree. The severity of impairment varies from mild, barely discernable problems to severe cases when the individual is unable to use language to communicate and cannot understand spoken language. As well as varying in overall severity, impairment may be more severe in one domain of language and here a distinction has traditionally been drawn between impairments in lexico-semantic domains and impairments within the grammar. Within these two domains, further distinctions can be observed. First, access to lexical meaning may be disturbed or the aphasic speaker's ability to convey meaning may be reduced. Second, the form of a word, that is production or processing of individual speech sounds, may be impaired and/or the accessing or processing the meaning of words may be impaired. At the level of individual speech sounds, a distinction is made between errors that are described as phonological or phonemic and assumed to be part of the mental representation of words, and errors that arise because of poor muscular control. Speech errors that are a consequence of impaired muscle control or reduced muscle strength are not considered to be part of aphasia but belong to a separate group of disorders, the **dysarthrias**. In practice, it may be difficult to distinguish between speech errors arising from dysarthria and aphasia especially immediately following brain damage. However, most aphasic speakers do not have trouble with controlling speech musculature but have problems in the production of words with the correct form and meaning and/or comprehension of the meaning of words. Many also have problems with the production of grammatical sentences and using grammatical markings for tense. Understanding of language may break down because of limited access to lexical and sentential

meaning. Thus we see that language can be impaired within the phonological, semantic, syntactic and morphological domains, in all domains, some or one. Teasing apart the strands of language impairment and building theoretical accounts of the deficits observed in one or more individual with aphasia has proved to be a rich field of research.

The most common cause of aphasia is a cerebral vascular accident (CVA), in lay terms, a stroke, affecting the dominant, in most people, the left side of the cerebral hemisphere. As the term implies, a CVA arises from problems in the blood supply to the brain, commonly from a blockage (a thrombosis or embolism) in a blood vessel. If brain cells are deprived of the oxygen and nutrients brought by the blood, they quickly die. Haemorrhages and tumours also cause brain damage by compression and, in the case of some tumours, invasion of cells. Aphasia may arise from accidental or deliberate head injuries (for example, in the case of war) but outside war zones, the most frequent cause is some type of stroke. Cerebral damage usually has to involve the left cerebral hemisphere (in right handed people) to cause aphasia although right sided damage may, exceptionally, result in aphasia. This condition is known as **crossed aphasia**.

Stroke is the most common cause of long-term disabilities in Europe. The Stroke Association estimates that every year approximately 150,000 people in the UK have a stroke. Approximately two-thirds of all stroke victims survive and of these, between one-third and a half will have aphasia. Life expectancy following stroke is increasing in the UK so it follows that a large number of people will survive with some degree of aphasia. In some cases, the condition will resolve in the first months following stroke, but for the majority, aphasia is a chronic condition. There are no reliable figures of the number of people with aphasia alive in the UK.

Aphasia is manifested in a number of ways. In some cases, comprehension seems to be intact but the ability to express thoughts and feeling is severely limited. The speaker is unable to produce more than a few words at a time, cannot formulate sentences but may be able to communicate in a limited way through short phrases. For other aphasic speakers, understanding of

language is impaired and although language is produced fluently with normal intonation, meaning of what is said is compromised. When comprehension is limited, the aphasic speaker may not be able to monitor their output and may not realise that their speech is not making sense. Aphasic speakers find it difficult to retrieve appropriate words and this interferes with sentence structure as well as conveying meaning. Word retrieval is problematic for all aphasic speakers but not all word classes are equally affected across all types of aphasia. For some, word retrieval is particularly problematic for free grammatical morphemes (classified by some as 'closed class' words) while for other speakers the major grammatical classes of nouns and verbs ('open class' words) present the major difficulty. And there are further distinctions. Some aphasic speakers have more difficulty with nouns compared with verbs and for others, the reverse is true. Certain psycholinguistic variables of vocabulary are thought to play a part in word retrieval. These include frequency, familiarity, imageability and name agreement (that is the degree in which non-aphasic speakers agree on the label attached to a word, usually a verb).

Fortunately for the clinician and researcher, this wide range of possible aphasic features do not occur randomly. They tend to cluster together, and there is some relationship between site of brain lesion and aphasic features. This is by no means an isomorphic relationship and the nature of relationship continues to be debated more than one hundred years after two major types of language difficulties and site of lesion were observed by Paul Pierre Broca (1824–80) (in France) and Carl Wernicke (1848–1905) (in Germany). Despite individual differences and variation in aphasic profiles, certain patterns of language impairment are recognised. These are referred to as syndromes and are identified by bundles of characteristics that tend to co-occur. Lack of obligatory defining characteristics, characteristics that occur in more than one syndrome and the observation that one syndrome may evolve into another have led some aphasiologists to abandon the framework of syndromes when talking about aphasia. However, many aphasiologists find syndromes useful shorthand and they are widely used by physicians and within the international research community.

The symptoms, or characteristics, are not necessarily obvious on a casual bed-side examination and diagnosis is usually dependent on a psycholinguistic assessment in which both production and comprehension of spoken and written language is explored. In addition, there is increasing use of instrumental procedures such as **computerised tomography (CAT)**, (**functional**) **magnetic resonance imaging (fMRI)** and **MRI**) and **electroencephalography (EEG)** in clinical practice as well as aphasia research.

Diagnosis of syndrome is largely dependent on observed language behaviour but there are some weak (or disputed) associations with area of cortical damage. The following brief descriptions outline the main types, or syndromes of aphasia listing classical assumed lesion sites as well as language characteristics. In all cases, the assumption is that cortical damage is on the left side of the brain.

The most severe form of aphasia is **global aphasia** which arises from diffuse damage typically involving frontal, parietal and temporal cortical lobes. Production and understanding of language are impaired to the extent that production may be limited to a very few words or even one or two meaningless utterances. This condition may be present in the acute stage and slowly resolve to resemble one of the less severe syndromes. In contrast, **anomic aphasia** is a mild form of aphasia. Anomia is present in all other types of aphasia but is used as a syndrome label only when the most obvious impairment is word retrieval. Open class words especially nouns are affected. Where there is good recovery, syndromes may resolve and anomia remain as the last persisting symptom of aphasia.

Broca's aphasia is associated with lesions in the lower frontal lobe anterior to the (central) Rolandic fissure. Clinically it is recognised by slow effortful speech production, reduction of closed class words and verbs and hence production of grammatical utterances, especially complex sentences, is severely reduced. There is difficulty in retrieving nouns but this tends to be superior to verb retrieval. Comprehension of conversational speech appears intact although the aphasic listener may be slower to respond than s/he was pre-morbidly. However, research over the last thirty years or so has revealed that this type of aphasia is associated with difficulty

with parsing certain types of grammatical structures. Complex sentences containing passives, object cleft, object relatives and certain wh-questions are especially problematic. The well-described comprehension deficit plus reduced spoken output is associated with a subgroup of Broca's aphasia, **agrammatism** although some writers, confusingly, use the terms as synonymous.

Wernicke's aphasia, like Broca's aphasia, is a major category of aphasia and in many ways stands in contrast. Lesions associated with this type of aphasia are associated with lesions in the temporal lobe, posterior to the Rolandic fissure and encroach upon the parietal lobe. Spoken language is fluent with normal prosody but contains many sound substitutions (phonemic paraphasias), word substitutions (lexical paraphasias), non-words (neologisms) and grammatical errors (paragrammatisms). Grammatical errors are less marked than in Broca's aphasia. Speech is referentially vague and meaning is thus reduced. Comprehension of language is reduced as is the ability to self-monitor and thus communication is severely reduced in this condition. Word-finding difficulties typically affect nouns but recent research suggests that verbs are also implicated in this condition.

Speech in **conduction aphasia** is also fluent with phonemic and lexical substitutions. Comprehension is less affected than in Wernicke's aphasia: repetition is impaired. It can be viewed as a mild form of Wernicke's aphasia and Wernicke's aphasia that diminishes matches the profile of conduction aphasia. There is some debate about the site of lesion associated with this condition, which is classically described as sub-cortical, involving fibres that connect Broca's and Wernicke's aphasia, the arcuate fasciculus. The supramarginal gyrus and angular gyrus are also implicated.

Two other types of aphasia, **transcortical motor aphasia** and **transcortical sensory aphasia** are found within the traditional battery of syndromes. These conditions resemble mild forms of Broca's (transcortical motor) and Wernicke's aphasia (transcortical sensory) but all symptoms are less severe. Additionally they are the only two syndromes where repetition is well preserved. In transcortical motor aphasia, there is difficulty in initiating speech, word retrieval problems and reduced utterances as in Broca's aphasia. In transcortical sensory aphasia there is

a marked semantic deficit, fluent speech, much of it meaningless. It is thought to resemble speech found in Alzheimer's disease and thus the two conditions may be confused.

During the second part of the twentieth century, psycholinguistics had an increasing influence within aphasiology that continues into our century. Models of language processing were applied to aphasic language as well as non-aphasic language in an effort to tease apart stages of language processing and to test the independence of these assumed levels. Early simplified versions of single word processing models have been embraced by some clinicians and are used as a basis of assessment and to motivate treatment. Experiments using aphasic speakers have also been designed to test theories of the relative input of syntax and non-linguistic cognitive operations. Linguistic influences have been strong in a relatively small, although very influential area of aphasia research, that of comprehension deficits in agrammatism, a well-defined subgroup of Broca's aphasia. A number of researchers have based their theoretical assumptions about the nature of comprehension loss in agrammatism on various versions of transformational grammar, and latterly, to versions of minimalism. Research arising from different backgrounds has helped fuel the debate about the nature of aphasia. Is aphasia a deficit of language representation (and in particular, of certain syntactic structures or operations) or is it more usefully viewed as a deficit of language processing? Most researchers would support the latter view although there are cogent and vigorous arguments supporting the representational view.

However, as there is now increasing evidence that, given the correct diagnosis and access to appropriate treatment, language can improve even several years post-onset of aphasia, it is difficult to argue for loss of representation. Increasingly sophisticated neural imaging studies show that, contrary to traditional ideas about the inability of cortical matter to regenerate, neural activity can change following treatment. Treatment studies that focus on specific linguistic structures suggest that even long-term language disability may be reduced if appropriate linguistically motivated treatment is given.

S. Ed.

Suggestions for further reading

- Basso, A. (2003) *Aphasia and Its Therapy*, Oxford: Oxford University Press.
- Edwards, S. (2005) *Fluent Aphasia*, Cambridge: Cambridge University Press.
- Goodglass, H. (1993) *Understanding Aphasia*, San Diego, Calif.: Academic Press.
- Goodglass, H., Kaplan, E. and Barresi, B. (2001) *The Assessment of Aphasia and Related Disorders*, Philadelphia, Pa.: Lippincott, Williams and Wilkins.
- Grodzinsky, Y. (2000) 'The Neurology of Syntax: Language Use Without Broca's Area', *Behavioral and Brain Sciences*, 23 (1): 1–71.
- Grodzinsky, Y., Swinney, D. and Shapiro, L. (eds) (2000) *Language and the Brain*, London: Academic Press.

Applied linguistics

Perhaps no other field in either the humanities or the social sciences has experienced as much debate and discussion in coming to terms with its self-image as has applied linguistics. The term, 'applied linguistics', was used at least as far back as the 1920s (see Coleman 1929) to refer to a linguistics-based approach to language instruction. In North America, especially during the Second World War, this approach was understood as the application of the findings of structural linguistics research to the teaching of the grammar and phonology of languages deemed important for the US war effort. Shortly after the end of the war, the first journal to include 'applied linguistics' in its title, *Language Learning*, was founded at the University of Michigan in 1948. In 1956, the University of Edinburgh established the School of Applied Linguistics under the direction of J.C. Catford, and in 1957 the Center for Applied Linguistics was founded in Washington, DC, under the direction of Charles Ferguson (Stevens 1992: 14). While the two organisations differed in scope, both shared the general aim of promoting and enhancing the teaching of the English language around the world. Despite the shift in focus towards English, the North American applied-linguistics scene did not lose its interest in languages other than English. For example, Lado's (1957) classic monograph, *Linguistics Across Cultures: Applied Linguistics for Language Teachers*, made extensive use of

illustrations from Spanish, Portuguese, Korean, Russian, Chinese and Arabic.

Over the course of its relatively brief history, applied linguistics has expanded well beyond the domain of language teaching to include such areas as second language learning, language rights and identity, multilingualism and multilingual education, literacy, language policy and planning, language dispora, translation and interpreting, speech therapy and forensic linguistics, among others. Some would even include stylistics, genre studies, discourse analysis, sociolinguistics, language socialisation and conversational analysis within its scope of (see Kaplan and Grabe 2000).

The field counts a number of internationally recognised journals among its publishing organs, including *Applied Linguistics*, the *Annual Review of Applied Linguistics*, the *International Review of Applied Linguistics*, the *International Journal of Applied Linguistics*, and the *Journal of Applied Linguistics*. These journals espouse editorial policies that have paralleled the expansion of the field and regularly publish articles in many of the areas listed above. Other journals, such as *Language Learning*, *Studies in Second Language Acquisition*, *Second Language Research* and *The Modern Language Journal*, have maintained their focus on empirical and, to a lesser extent, theoretical studies, relating to the acquisition and teaching of languages beyond the first. At least two journals focus primarily on the teaching and learning of English: *TESOL Quarterly* and the *English Language Teaching Journal*. Still others are concerned with specific sub-domains, such as *Language Testing* and *The Journal of Second Language Writing*.

In addition to the number of journals, another indication of the robustness of the field is the increasing number of monograph and book-length volumes published by important academic and commercial presses, including Oxford University Press, Cambridge University Press, Blackwell, Routledge, Erlbaum, Edward Arnold, Pearson, John Benjamins, Kluwer, Multilingual Matters, Springer, Elsevier and Equinox. Attendance at conferences such as those sponsored by the American, British, German and Spanish Associations for Applied Linguistics as well as the International Association of Applied Linguistics continues to increase. There has also been remarkable growth in the number of

universities around the world offering graduate degrees in applied linguistics.

Ironically, despite its prosperity, the field continues to experience an identity crisis in the sense that there is a lack of agreement on the precise nature of what it is and what applied linguists do that make them applied linguists. According to Davies and Elder (2004), the field still is uncertain as to whether it is a subject, a discipline, a profession or a vocation. Moreover, it continues to debate the precise nature of the distinction between conceptualising itself as an extension of general linguistics (i.e. linguistics applied) or as a completely separate field (i.e. applied linguistics). If the former, it seems clear that what gets applied is linguistics, but if the latter, things become a bit murkier with regard to what, if anything, gets applied.

The early Edinburgh School considered applied linguists to be consumers of linguistic theory where the task was to interpret the findings of linguistic research on how languages are learned and used in order to inform language teaching (Corder 1973: 10). In arguing for an expanded understanding of the domain of applied linguistics to include not just language teaching but also stylistics, language disabilities and translation, Crystal (1981a) proposed that not only could the findings of linguistic research be made relevant to these areas but so could its theories and research methods as well.

As applied linguistics expanded its interests beyond the domain of language teaching, it became apparent that disciplines other than linguistics would need to be drawn on in order to develop in-depth understandings and solutions to real-world language problems. Eventually, Widdowson, a disciple of the Edinburgh School, proposed a distinction between *applied linguistics* and **linguistics applied**. The latter concept is closer to the original understanding of the term applied linguistics; that is, it assumes that language-based real-world problems can be solved exclusively through the application of linguistic theory, methods and findings (Widdowson 1980). The former term recognises that while linguistics offers important insights and solutions to language problems, and continues to form the core of applied linguistics, research from other disciplines, such as psychology, anthropology, sociology and perhaps even

philosophy and literary research can also be profitably brought to bear on these problems. According to Widdowson (2000a, 2000b), there is good reason to reject the understanding of applied linguistics as linguistics applied, since most language-based problems cannot reasonably be solved through the application of linguistic principles alone. In Widdowson's view, the applied linguist serves as a mediator between linguistics and language teaching in order to convert the abstract findings of linguistics research into knowledge that is useful for pedagogical practices (Widdowson 2000a: 28). This perspective, then, seems to mirror the earlier 'applied linguistics as consumer' interpretation proposed by Corder. Unlike Corder, however, Widdowson recognises the necessity of applied linguistics to draw on disciplines outside of linguistics in order to develop its insights and recommendations.

One reason for drawing a distinction between applied linguistics and linguistics applied is the worry that as linguistics itself expands the domain of its own research interests beyond theorising about autonomous and abstract grammatical systems to recognition of the relevance of context for language use and language learning, the narrow interpretation of applied linguistics as linguistics applied could well make redundant the work of applied linguists (Widdowson 2000a). Furthermore, the need for applied linguistics to draw on disciplines outside of linguistics means that, unlike linguistics proper, it is a genuinely interdisciplinary field. Spolsky (1980: 73) argues that a more appropriate way to mark the distinction between applied linguistics and linguistics proper is to recognise that the former is a 'relevant linguistics' while the latter believes there is merit in the autonomous study of language as an object in itself divorced from any real-world use.

Another matter of some controversy is which brand of linguistics should inform the work of applied linguists. Widdowson (2000a: 29–30), for example, argues that generative theory is relevant to language teaching, but it is not the task of the theoretician to demonstrate its relevance. The applied linguist, as the mediator between theory and practice, is charged with the responsibility of realising this task. Widdowson contends, for example, that Chomsky's rejection

of language learning as habit formation and recognition that acquisition is a 'cognitive and creative process' in which learners infer possible grammars on the basis of input and biologically determined constraints, has had a major impact on language teaching practice. While learners most certainly draw inferences based on what they hear and see in their linguistic surrounding, it is not at all clear, despite a good deal of research, that their inferences are constrained in the ways predicted by generative theory. What is more, Chomsky's understanding of 'creativity' is quite technical in nature and does not reflect the kind of creativity that others, such as Bakhtin (1981), Harris (1981), Vygotsky (1987), or Kramsch (1995) recognise as genuine linguistic creativity (i.e. the ability to create new meanings and forms, especially in the domain of metaphor), and it is this latter kind of creativity that might in the long run be more relevant to the language learning process.

Grabe (1992) proposes that in addition to generative research, applied linguists draw upon work in three other lines of linguistic research: functional and typological theories as seen in the work of Halliday, Chafe, Givon, Comrie and Greenberg; anthropological and sociolinguistics represented in the research of Labov, Hymes, Ochs, Gumperz, Fishman and the Milroys, and research which results in probabilistic grammars based on corpus linguistic analyses [*see* CORPUS LINGUISTICS]. Interestingly, this latter type of research is criticised by Widdowson (2000a: 24) as too narrow in scope because its focus is on what is done rather than on what is known – although it has to be added that Widdowson sees some relevance for corpus linguistics, since it is able to at least reflect a partial reality of how language is deployed in the real world.

What agreement has been achieved seems to point to applied linguistics as a field whose scope of interest is the development of solutions to language-based problems in the real world. To realise its goal, it draws on theoretical, methodological and empirical research from a wide array of disciplines, including, but not limited to linguistics. One problem with this perspective, however, is that it is not clear that all of the work that refers to itself as applied linguistics can legitimately be seen as entailing solutions to real-world problems. For instance, some of the

leading journals in applied linguistics publish articles on genre studies, discourse analysis and sociolinguistics that are potentially of interest to applied linguists, but in and of themselves do not purport to solve real-world language problems. The argument could be made, of course, that while not really applied in nature, this type of research is at least relevant to applied linguistics, and therefore could be included within its domain. But this same argument can be made for work in linguistics proper; yet it is not likely that such research would find its way into the field's journals or conferences. Where then are we to draw the line? If we draw it too broadly, everything could be included within applied linguistics; if we draw it too narrowly, some of the areas that have been traditionally included under the umbrella of applied linguistics would be left out. If applied linguistics does not stay focused on solving real-world language-based problems, then it might eventually be taken over by linguistics itself as the so-called 'parent discipline' becomes no longer content with analysis of language as an autonomous object but becomes increasingly interested in contextualised language learning and use (Widdowson 2000a). Yet, if the problem-solving focus is to be the distinguishing feature of applied linguistics, we might even question whether an area such as second language acquisition (SLA) research should be legitimately included in applied linguistics. Some SLA researchers, especially those working within the framework of universal grammar, have in fact claimed that their project is not about solving real-world problems and might better be situated within the domain of theoretical linguistics (see Gregg 1996). This argument is not without merit as such research can be construed as an attempt to explore whether or not the same constraints that operate in first-language acquisition also hold for languages acquired later in life. This is not to suggest that SLA research is not relevant to applied linguistics, but it does point out the complexities entailed in deciding whether a particular research programme meets the criteria for inclusion within applied linguistics.

In laying the foundation for linguistics as the science of languages, Saussure proposed that if linguistics was to operate as a legitimate scientific enterprise it would be necessary to overlook how

people actually use and learn languages in their life world. He thus created the illusion of language as an autonomous object, akin to the objects of the physical universe, so it could then be studied in accordance with the principals of scientific inquiry (see Crowley 1996). This viewpoint has dominated much of the research in linguistics to the present day. Kaplan (1980: 64) believes, however, that despite an assumption that applied linguistic research adheres to the principles of scientific investigation, applied linguists might, on occasion, have to sacrifice allegiance to these principles in their commitment to find solutions to language-based human problems. Kaplan (1980: 63) contends that for this reason applied linguists are 'the most humanistic breed of linguists'. Perhaps, then, applied linguistics would be more appropriately situated alongside literary, historical and even some branches of psychological research as a human, rather than social sciences (see Polkinghorne 1988).

In concluding this exposition, I would like to suggest that applied linguists need no longer worry about what gets applied and whether or not it is a discipline, subject, profession or vocation. What matters is its activity. If, indeed, as is claimed in most definitions, this activity is the solving real (i.e. social) world language-based problems, then applied linguistics is a truly scientific linguistics, because it is a linguistics of praxis. Praxis is the uniquely human activity whereby theory and practice are integrated into a dialectical unity with the purpose of transforming the material circumstances in which humans live (Sanchez Vazquez 1977: 188). It dissolves the chasm between theory and so-called basic research and practice that has worried many researchers in applied linguistics. Gass and Mackey (2007: 190), for example, note that SLA researchers have been 'cautious about making direct connections between theory, research, and teaching practice'. In praxis, theory guides practice but at the same time practice, as the site where the theory is genuinely tested, informs and, if necessary, reshapes theory. According to Vygotsky (2004: 304), in dualistic orientations to science, practice is conceived of as

the colony of theory, dependent in all its aspects on the metropolis. Theory was in no way dependent on practice. Practice

was the conclusion, the application, and excursion beyond the boundaries of science, an operation which lay outside science and came after science, which began after the scientific operation was considered completed.

Importantly, whether or not the application of the theory, in Vygotsky's case, psychological theory, succeeded or failed, 'had practically no effect on the fate of the theory' (2004: 304). In a praxis orientation, however, 'practice pervades the deepest foundations of the scientific operation and reforms it from beginning to end. Practice sets the tasks and serves as the supreme judge of the theory, as its truth criterion. It dictates how to construct the concepts and how to formulate the laws' (2004: 304). Applied linguistics as praxis then distinguishes itself from all other approaches to the scientific study of language as the one discipline which does not restrict itself to the mere contemplation of language but which in fact develops a true understanding of its object of study by engaging in linguistically grounded transformative activity.

J. P. L.

Suggestions for further reading

- Annual Review of Applied Linguistics* (2000) vol. XX.
 Davis, A. and Elder, C. (eds) (2004) *The Handbook of Applied Linguistics*, Oxford: Blackwell.
 Grabe, W. and Kaplan, R. (eds) (1992) *Introduction to Applied Linguistics*, Reading, Mass.: Addison-Wesley.
 Rampton, B. (1995) 'Politics and Change in Research in Applied Linguistics', *Applied Linguistics*, 16 (2): 231–56.
 Vygotsky, L.S. (2004) 'The Historical Meaning of the Crisis in Psychology: a Methodological Investigation', in R.W. Rieber and D.K. Robinson (eds), *The Essential Vygotsky*, New York: Kluwer/Plenum, pp. 227–344.
 Widdowson, H. (2000) 'On the Limitation of Linguistics Applied', *Applied Linguistics*, 21 (1): 2–25.

Articulatory phonetics

Articulatory phonetics, sometimes alternatively called **physiological phonetics**, is a

sub-branch of phonetics concerned with the study of the articulation of speech sounds. **Speech sounds** are produced through various interactions of **speech organs** acting on either an **egressive** (i.e. outgoing) or an **ingressive** (i.e. incoming) airstream. Such articulation of speech sounds is unique to human beings (*homo loquens*, 'speaking human').

The term **articulation** refers to the division of an egressive or ingressive airstream, with or without vocal vibration, into distinct sound entities through the above-mentioned interaction of speech organs. The concept of articulation in phonetics has evolved in such a way that present-day phoneticians use expressions like 'articulating/the articulation of such-and-such a speech sound' as practically equivalent to 'pronouncing/the pronunciation of a speech sound as a distinct entity' and the term 'articulation' will be used in this technical sense in what follows.

In articulatory phonetics a speech sound is primarily considered and presented as a discrete entity so that the replacement of one speech sound by another in an identical phonetic context is regarded as possible, at least in theory. However, phoneticians are also well aware that, in the vast majority of cases, speech sounds occur in sequential combination in connected speech, with the result that they partially blend into each other in such a way that the conception of speech sounds as discrete entities is unsatisfactory. Consequently, in articulatory phonetics, speech sounds are normally first presented as discrete entities showing how they are each articulated, and then as less than discrete entities showing how they articulatorily affect each other in the speech chain.

The human physiological organs which are employed for the articulation of speech sounds and which are hence called **speech organs** or **vocal organs** all have a more basically biological function than that of allowing for verbal communication by means of speech. Thus the teeth are used for chewing food; the tongue serves to push food around during chewing and then to carry it towards the food-passage into which it is swallowed; the lungs are used for breathing; the vocal folds function as a valve to prevent the accidental entry of foreign bodies into the windpipe; if foreign bodies are about to enter the wind-pipe, the vocal folds quickly close

before being pushed open again by an egressive airstream which at the same time blows the foreign bodies upwards; in other words, what happens in this case is a cough. The vocal folds also assist muscular effort of the arms and the abdomen; the vocal folds close to create a hermetic air-filled chamber below them, and this helps the muscles of the arms or the abdomen to be made rigid. The use of these biological organs for the purpose of articulating speech sounds is another property unique to human beings.

In the articulation of speech sounds, the speech organs function as follows. A well-coordinated action of the **diaphragm** (the muscle separating the lungs from the stomach) and of the **intercostal muscles** situated between the ribs causes air to be drawn into or be pushed out of the **lungs** through the **trachea** or **windpipe**, which is a tube consisting of cartilaginous rings, the top of which forms the base of the larynx.

The **larynx**, the front of which is indirectly observable from outside and is popularly known as the Adam's apple, houses the two **vocal folds**, also known as **vocal lips**, **vocal bands**, or **vocal c(h)ords**. The whole of the larynx can be moved upward – in pronouncing an **ejective** sound like [p'] – or downward – in pronouncing an implosive sound like [ɓ] – [see THE INTERNATIONAL PHONETIC ALPHABET for information on phonetic symbols].

The vocal folds are fixed on the front–back axis in a horizontal direction, hinged together at the front end while being mobile sideways in two opposite directions at the back end where they are mounted on the **arytenoid cartilages**, which are also mobile. The vocal folds can thus be brought close together in such a way that their inner edges, which lightly touch each other, are set into vibration by an egressive or ingressive airstream as it rushes through between them. There is then said to be **vocal vibration** or **glottal vibration** or simply **voice**, and speech sounds articulated with vocal vibration are said to be **voiced** (e.g. [b z v]). The vocal folds can be made to approach each other in such a way that air passing through them causes **friction** without, however, causing vocal vibration; this happens in the case of [h]. Also, the vocal folds can be kept wide apart from each other (as in quiet breathing) so that air passes

freely between them in either direction, causing neither glottal friction nor vocal vibration; speech sounds articulated with the vocal folds thus wide apart are said to be **voiceless** (e.g. [p s f]). Furthermore, the vocal folds can be brought tightly together to form a firm contact so that no air can pass through them either inwards or outwards: the only speech sound produced when this posture of the vocal folds is assumed and then released is the **glottal plosive**, also popularly known as the **glottal stop**, i.e. [ʔ]. The space between the vocal folds is known as the **glottis**, so that the above-mentioned four different postures of the vocal folds may be viewed as representing four different states of the glottis; they are among the most important in normal speech, though other states of the glottis are possible, including those for breathy or murmured speech and creaky or laryngealised speech.

The area in which the speech organs above the larynx are situated is generally referred to as the **vocal tract**. It consists of three cavities: **pharyngeal** or **pharyngeal**, **nasal**, and **oral**. The pharyngeal cavity is also known as the **pharynx**. These three cavities function as **resonators** in that a tiny voiced sound originating from the vocal folds is amplified while passing through them. The shapes of the pharyngeal and oral cavities are variously changeable, while that of the nasal cavity is unalterable.

The pharyngeal cavity is bounded by the larynx at the bottom, by the pharyngeal wall at the back, by the root of the tongue at the front, and by the area of bifurcation into the nasal and oral cavities at the top. Apart from functioning as a resonator, the pharynx is responsible for producing **pharyngeal sounds** – to be exact, **pharyngeal fricatives** – with or without vocal vibration, i.e. [ʕ] or [ħ], in the articulation of which the root of the tongue is drawn backwards to narrow the pharynx.

The nasal cavity, which is larger than the pharyngeal or oral cavity, extends from the nostrils backwards and downwards to where the nasal cavity and the oral cavity meet. The nasal cavity can be closed off from the two other cavities or can remain open to them, depending on whether the movable **soft palate** or **velum** (see below) is raised, in which case there is said to be a **velic closure**, or lowered, in which case

there is said to be a **velic opening**. Any speech sound articulated in such a way that the egressive airstream issues outwards through the nasal cavity is a **nasal sound** or a **nasalised sound**, as the case may be. On the one hand, a **nasal consonant** is produced if the air meets total obstruction at a given point in the oral cavity (e.g. [n]), or between the lips ([m]). On the other hand, a **nasalised vowel** such as [õ] is produced if the air is at the same time allowed to issue out freely through the oral cavity as well.

The oral cavity extends from where the front teeth lie to the end of the roof of the mouth at the top, and the end of the tongue at the bottom. The lips form the orifice to the oral cavity. It is in the oral cavity that further speech organs are situated, which will be examined below. Various interactions between these speech organs in the oral cavity, with or without the involvement of the lips, and with or without vocal vibration, and with or without the involvement of the nasal cavity, give rise to a number of different **manners** and **places of articulation** which are associated with a number of different speech sounds, oral or nasal, or nasalised.

Figure 1 shows the different speech organs found in the oral cavity, and the lips. The **lips** are obviously the easiest to observe from outside. They can be brought together to form a firm contact, or well separated from each other, or made to touch or approach each other lightly in such a way that audible friction may or may not occur as air passes between them. They can also be spread, or can assume a neutral unrounded posture, or can be rounded.

The teeth are next easiest to observe, particularly the upper and lower front teeth. There are of course other teeth further towards the back, including the molars, which are also important in articulating some speech sounds.

What is sometimes called the **roof of the mouth** is what phoneticians refer to as the **teeth-ridge** and the **palate**. It consists of the following:

1. the front end (convex to the tongue) which is known as the **teeth-ridge** or the **alveolar ridge**;
2. the hard (concave) immovable part which is known as the **hard palate**;

3. the soft (also concave) mucous part capable of up-and-down movement known as the **soft palate** or **velum**;
4. the pendent fleshy tip at the end of the soft palate, which is known as the **uvula**.

The **tongue** plays a prominent role in the articulation of speech sounds in the oral cavity. It is particularly versatile in the movements it is capable of making, in the speed with which it can move, and the shapes it is capable of assuming. For the purpose of describing various speech sounds articulated in the oral cavity, phoneticians conveniently divide the tongue into various parts in such a way that there is some correlation between the division of the tongue and that of the roof of the mouth. Thus, as well as (1) the **tip** or **apex** of the tongue, we have (2) the **blade**, i.e. that part of the tongue which, when the tongue is lying at rest (this state of the tongue also applies to (3) and (4) below), faces the upper teeth-ridge, (3) the **front**, i.e. that part of the tongue which faces the hard palate, and (4) the **back**, i.e. that part of the tongue which faces the soft palate. Notice that the above-mentioned division of the tongue does not include what one might call the middle or the centre of the tongue which corresponds to the area consisting of the posterior part of the front of the tongue and the anterior part of the back of the tongue and whose recognition is implied in phoneticians' general practice of talking about central vowels or centralisation of certain vowels.

Before speech sounds are articulated through the intervention of various speech organs such as have been mentioned above, movement of an airstream is required; this airstream is then variously modified by speech organs into speech sounds.

There are three types of airstream mechanism. First, there is the **pulmonic airstream mechanism**. This is initiated by the lungs, and in normal speech the airstream is egressive, that is, the air is pushed out from the lungs. **Vowels** and many of the **consonants** require this type of airstream mechanism. Second, there is the **velaric airstream mechanism**. This is initiated by **velar closure**, i.e. the closure between the back part of the tongue and the soft palate, and the airstream is always ingressive. **Clicks** require this type of airstream mechanism. Third,

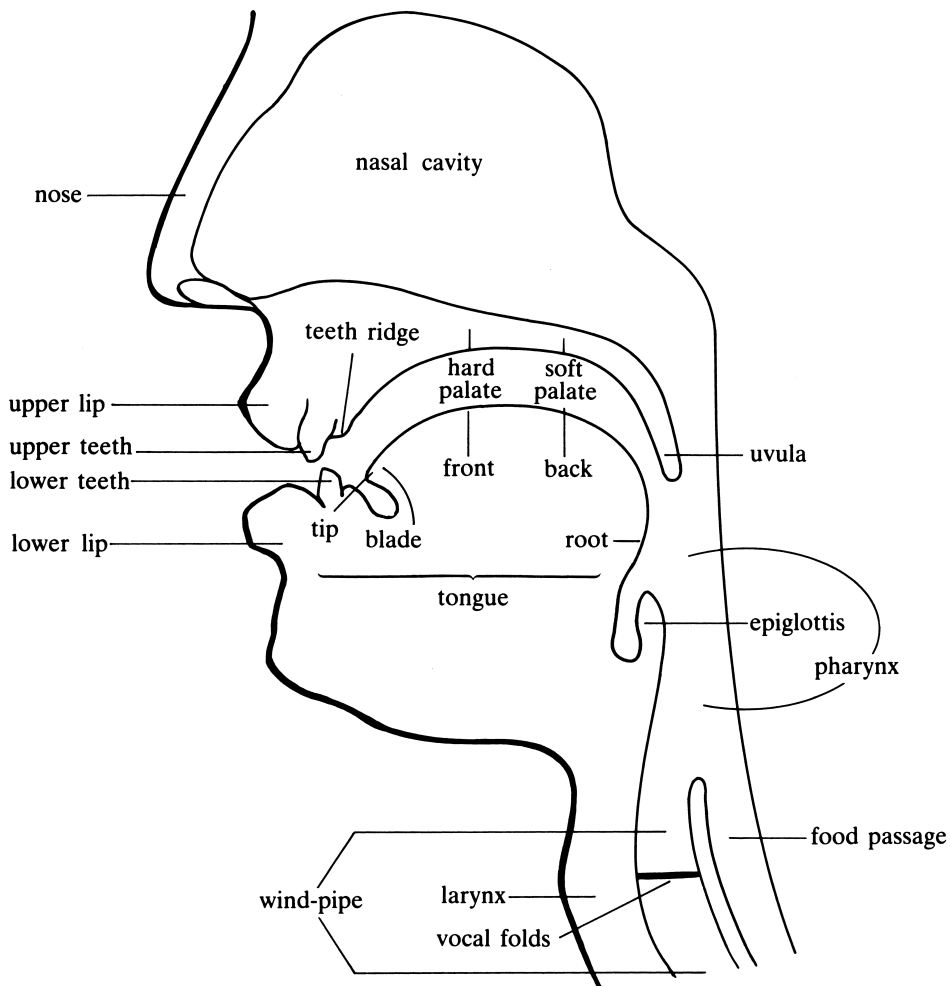


Figure 1 Speech organs.

there is the **glottalic airstream mechanism**. This is initiated by the glottis, which may be firmly or loosely closed, and the airstream is either egressive or ingressive. **Ejectives** (egressive) and **implosives** (ingressive) require this type of airstream mechanism, the firmly closed glottis for the former and the loosely closed glottis for the latter. Certain combinations of two of these types of airstream mechanism also occur.

In classifying speech sounds from the articulatory point of view, phoneticians frequently operate with the division between vowels and consonants. The so-called **semivowels**, e.g. [j w ɥ], are, articulatorily speaking, vowels.

Vowels are speech sounds in whose articulation (1) the highest part of the tongue which varies is located within a certain zone in the oral cavity which may be described as the **vowel area** (cf. the cardinal vowels discussed below) and (2) the egressive airstream from the lungs issues into the open air without meeting any closure or such constriction as would cause audible friction in the oral cavity or the pharyngeal cavity. Note that the occurrence of audible friction between the vocal folds, i.e. voice or vocal vibration, does not disqualify sounds as vowels provided there occurs at the same time no closure or constriction in any of the above-mentioned

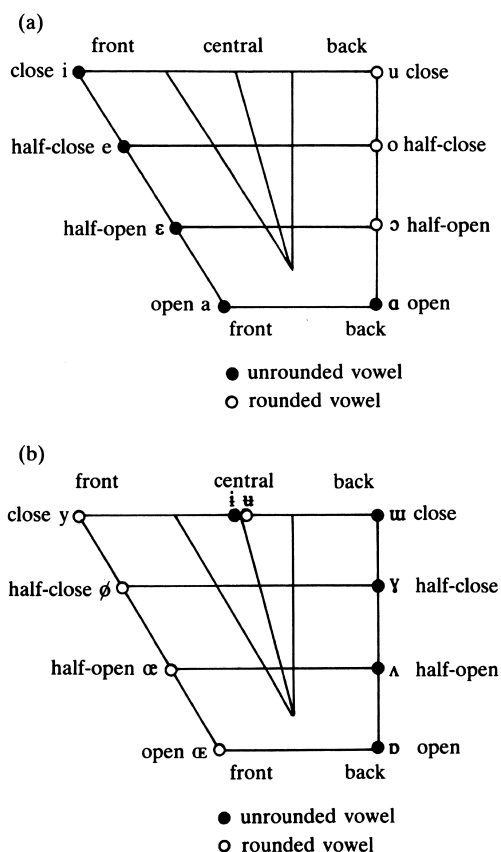


Figure 2 (a) Primary cardinal vowels (b) Secondary cardinal vowels.

cavities. Many phoneticians assume a vowel to be voiced by definition; others consider that some languages have **voiceless vowels** – indeed it is possible to argue that [h] in English is a voiceless vowel. The soft palate, when raised (cf. velic closure), prevents the airstream from entering the nasal cavity, and oral vowels are produced, e.g. [i]; but when lowered, the soft palate allows the airstream to enter the nasal cavity as well as the oral cavity, and nasalised vowels result, e.g. [ɪ̃].

In describing a vowel from the point of view of articulatory phonetics, many phoneticians customarily make use of a certain auditory-articulatory reference system in terms of which any vowel of any language may be identified. The auditory-articulatory reference system in question is the **cardinal vowel system** devised by the

English phonetician, **Daniel Jones** (1881–1967). The cardinal vowel system consists, as shown in Figure 2, of eight **primary** cardinal vowels, numbered from 1 to 8, and ten **secondary** cardinal vowels, numbered from 9 to 18; all of these eighteen cardinal vowels are oral vowels.

The primary cardinal vowels are posited in such a way that no. 1, [i], is articulated with the front of the tongue as high and front as possible consistent with its being a vowel – i.e. without becoming a consonant by producing audible friction; no. 5, [a], is articulated with the back of the tongue as low and back as possible consistent with its being a vowel; nos. 2, 3, and 4, [e ε a], are so articulated as to form an auditory equidistance between each two adjacent vowels from no. 1 to no. 5; nos. 6, 7 and 8, [ɔ o u], are so articulated as to continue the auditory equidistance, with no. 8 being articulated with the back of the tongue as high and back as possible consistent with its being a vowel. Nos. 1, 2, 3, 4 and 5 are articulated with the lips unrounded, and nos. 6, 7 and 8 with the lips rounded.

The secondary cardinal vowels are posited in such a way that nos. 9 to 16 [y ø œ ɐ̃ ɐ̃ ʏ ʘ], correspond to the same points as nos. 1 to 8, respectively, except for the posture of the lips in terms of rounded and unrounded, which is reversed. Nos. 17 and 18, [ɪ̃ ʊ̃], are articulated with the central part of the tongue as high as possible, consistent with their being vowels; the former is unrounded and the latter rounded. Thus, by connecting the highest points of the tongue in the articulation of all the cardinal vowels, we can conceive of what may be referred to as the **vowel area**.

Use of the cardinal vowel system enables phoneticians to specify a vowel of any given language with regard to the following: (1) the height of the part of the tongue that is the closest to the palate, the reference points being close, half-close, half-open, open; (2) the part of the tongue on the front-back axis that is the closest to the palate, the reference points being front, central, back; and (3) the posture of the lips, rounded or unrounded. In addition, phoneticians specify the posture, raised or lowered, of the soft palate, that is, whether the vowel is oral or nasalised.

Monophthongs are vowels in the articulation of which the tongue all but maintains its

posture and position, thereby maintaining practically the same vowel quality throughout, e.g. the vowels in the English words *raw*, *too*, etc. On the other hand, **diphthongs** are vowels in the articulation of which the tongue starts with the position for one vowel quality and moves towards the position for another vowel within one syllable, e.g. the vowels in the English words *no*, *buy*, etc.

Consonants are speech sounds in the articulation of which the egressive or ingressive airstream encounters either a closure or a constriction which may or may not cause audible friction. Consonants may be classified according to the **manner of articulation** on the one hand and according to the **place of articulation** on the other. According to the various manners of articulation, consonants are classified into (1) plosives, (2) fricatives, (3) affricates, (4) approximants, (5) nasals, (6) rolls, (7) flaps, (8) ejectives, (9) implosives, and (10) clicks. Note that this classification is only one of different possible ones current among phoneticians.

1. A **plosive** is a sound in whose articulation the airstream meets a closure made by a firm contact between two speech organs, which prevents the airstream from issuing beyond the point of the closure. The closure is then quickly released, but since a complete, if brief, stopping of the airstream has taken place, the sound is considered to be **non-continuant**. Some examples of plosives are [p d t]. The release of a plosive may be incomplete in certain sequences of plosives or of plosives followed by homorganic affricates (see below). In English, for example, [k] in *actor* is incompletely released, while in French [k] in *acteur* is completely released; similarly, [t] in *what change* in English and the second [t] in *toute table* in French are not released.
2. A **fricative** is a sound in whose articulation the airstream meets a narrowing between two speech organs and causes audible friction as it passes through this narrowing – a **close approximation** – in the vocal tract. Some examples of fricatives are [f z h] which are **central fricatives**, and [ʃ] which is a **lateral fricative**. In the articulation of a central fricative, the egressive air issues out along

the median line in the oral cavity, while in that of a lateral fricative it issues out from one or both sides of the tongue.

3. An **affricate** is a sound in whose articulation the closure made by two speech organs for a plosive is slowly and partially released with the result that what is known in phonetics as a **homorganic fricative** immediately follows. In this sense, an affricate combines the characteristic of a plosive and that of a fricative; the term **homorganic** is used in phonetics to indicate that a certain consonant is articulated in the same place in the vocal tract as another consonant articulated in a different manner. Some examples of affricates are [tʃ dʒ ʃ ʒ], which are sequences of homorganically pronounced plosives and fricatives.
4. An **approximant** is a sound in whose articulation the airstream flows continuously, while two speech organs approach each other without touching, that is, the two speech organs are in **open approximation**. Consequently, there is no audible friction – the sound is **frictionless**. Approximants, which correspond to what the IPA [see THE INTERNATIONAL PHONETIC ALPHABET] formerly called **frictionless continuants** and **semivowels**, are by definition any speech sounds so articulated as to be just below **friction limit**, that is, just short of producing audible friction between two speech organs. Approximants are subdivided into **lateral approximants** and **median approximants**. Examples of lateral approximants include [l ʎ ʎ], in the case of which the two speech organs which are said to approach each other are the side(s) of the tongue and the side(s) of the teeth-ridge. Some examples of median approximants are [ʋ ɹ j w ʁ].

One particular type of speech sound which the IPA only partially recognises but which should be fully recognised as median approximants are the speech sounds to which some refer as **spirants** and which are quite distinct from fricatives. The sounds correspond to the letters *b*, *d*, and *g* in, e.g., *haber*, *nada*, and *agua* in Spanish, in the articulation of which, in normal allegro speech, there occurs no audible friction. These

spirants are often symbolised by **ɸ**, **ɸ̥** and **ɸ̥**, respectively, although these symbols are not recognised by the IPA. Note also that any close and ‘closish’ vowels, situated along or near the axis between the cardinal vowels nos. 1 and 8 or nos. 9 and 16 may justifiably be said to be approximants when they function as the so-called semivowels. Approximants thus make up a category of heterogeneous speech sounds, including as they do certain of the vowels. There are divergent identifications of some approximants on the part of individual phoneticians.

5. A **nasal** is a sound in whose articulation the egressive airstream meets obstruction at a given point in the oral cavity and is channelled into the nasal cavity – the soft palate being lowered – through which it issues out. Some examples of nasals are [m n ŋ].
6. A **roll** or **trill** is a sound in whose articulation one speech organ strikes several times against the other rapidly, e.g. [r].
7. A **flap** or **tap** is a sound in whose articulation one speech organ strikes against the other just once, i.e. [ɾ].
8. An **ejective** is a sound in whose articulation a contact or constriction made by two speech organs at a given point in the oral cavity is released as the closed glottis is suddenly raised and pushes the compressed air in the mouth outwards, e.g., [p’ s’ ts’], and the air issues out as the oral closure is suddenly released. An ejective can thus be a plosive, a fricative or an affricate.
9. An **implosive** is a sound in whose articulation a contact made by two speech organs in the oral cavity is released as air rushes in from outside. This is made possible by a sudden lowering of the loosely closed glottis, e.g. [ɓ], and the air then rushes further inwards as the oral closure is released. An implosive is thus a plosive as well.
10. A **click** is a sound in whose articulation a contact between two speech organs is made at a relatively forward part in the oral cavity at the same time as the closure made between the back of the tongue and the soft palate – velar closure – is released. As a result air rushes in as the back of the tongue slides backwards on the soft palate, e.g. [ǀ]. A click is a plosive or a lateral as well.

Consonants may also be classified according to various **places of articulation**. The major places of articulation are as follows:

1. **bilabial**, i.e. both lips, as in [p];
2. **labio-dental**, i.e. the lower lip and the upper front teeth, as in [f];
3. **apico-dental**, i.e. the tip of the tongue and the upper front teeth, or the tip of the tongue placed between the upper and lower front teeth, as in [θ];
4. **apico-alveolar**, i.e. the tip of the tongue and the teeth-ridge, as in [t];
5. **blade-alveolar**, i.e. the blade of the tongue and the teeth-ridge, as in [s];
6. **apico-post-alveolar**, i.e. the tip of the tongue and the back part of the teeth-ridge, as in [ʃ];
7. **palatal**, i.e. the front of the tongue and the hard palate, as in [ç];
8. **alveolo-palatal**, i.e. the front of the tongue, the hard palate, and the teeth-ridge, as in [tʃ];
9. **palato-alveolar**, i.e. the tip and blade of the tongue, the back part of the teeth-ridge, and the hard palate, as in [ʃ];
10. **retroflex**, i.e. the curled-up tip of the tongue and the hard palate, as in [ɻ];
11. **velar**, i.e. the back of the tongue and the soft palate, as in [k];
12. **uvular**, i.e. the uvula and the back of the tongue, as in [q];
13. **pharyngeal**, i.e. the root of the tongue and the pharyngeal wall, as in [ʕ];
14. **glottal**, i.e. the vocal folds, as in [h].

Thus, for example, [p] is described as the voiceless bilabial plosive, [z] as the voiced blade-alveolar fricative, [tʃ] as the voiceless palato-alveolar affricate, [ŋ] as the voiced velar nasal, [ʌ] as the voiced palatal lateral approximant, [v] as the voiced labio-dental approximant, [ɾ] as the voiced alveolar flap or tap, [r] as the voiced alveolar roll or trill, [p’] as the voiceless bilabial ejective, [ɓ] as the voiced bilabial implosive, and [ǀ] as the voiceless dental click.

Assimilation

It was mentioned above that speech sounds, when occurring in connected speech, partially

blend into each other. Some phoneticians talk about **combinatory phonetics** in this connection. There are a number of such combinatory articulatory phenomena, but we shall concentrate on just one such phenomenon known as **assimilation**. Assimilation is said to occur when a speech sound undergoes a change in articulation in connected speech, becoming more like another immediately or otherwise adjacent sound. In English, for example, when [m] is replaced by [ŋ] before [f] or [v], as in *comfort* or *circumvent*, in an allegro pronunciation, its bilabiality changes into labio-dentality, and the pronunciation becomes [ˈkʌmfət] or [ˈsɜːkənˈvɛnt]. In French, the voicelessness of [s] as in the word *tasse* is changed into voicedness, thus [s̥] (the diacritic mark ̥ signifies voicing), in normal pronunciation of e.g., *tasse de thé*, without [s̥] being identical to [z] all the same: [tʰɑ̃dɛt] ≠ [tʰɑ̃ dɛ tɛ]. In English, the voice of [m] in e.g. *mall* is either partially or completely lost in e.g. *small* under the influence of the voicelessness of [s] preceding it, producing [smɔːl] (the diacritic mark ̥ signifies devoicing).

An assimilation in which a sound affects the preceding sound, as in *comfort*, *circumvent*, *tasse de thé* is said to be regressive in nature and is therefore called **regressive assimilation**; an assimilation in which a sound affects the following sound, as in *small*, is said to be progressive in nature and is therefore called **progressive assimilation**. Assimilation of these kinds relates to the question of what is called an **allophone** of a **phoneme** [see PHONEMICS] and to the question of a realisation of a phoneme or an **archiphoneme** [see FUNCTIONAL PHONOLOGY].

Segmentals and suprasegmentals

What we have seen above concerns speech sounds to which phoneticians often refer as **segmental units** or **segmentals** for short, since they are phonetic units which occur sequentially. In languages there are also what phoneticians refer to as **suprasegmental units** or **suprasegmentals** which are associated in their occurrence with stretches of segmentals and therefore are coterminous with them. They may be in other cases associated in their occurrence with single segments but ultimately have implications on multiple segments.

Intonation and **stress** are among the better known suprasegmentals [see INTONATION]; another well-known segmental is **duration**: a segmental may be relatively long, i.e. a long sound (e.g., [i:] in *beet* [bi:t] in English; [tɪ] in *itta* [ita] ‘he/she/it/they went’ in Japanese), or relatively short, i.e. a short sound (e.g., [ɪ] in *bit* [bɪt] in English; [t] in *ita* [ita] ‘he/she/it/they was/were (here, there, etc.)’ in Japanese).

Finally, **tones** which characterise **tone languages** are, physically speaking, comparable to intonation but are assigned ultimately to **morphemes**, i.e. to the smallest linguistic units endowed with meaning [see TONE LANGUAGES]. Therefore, tones are, linguistically, comparable to phonemes and archiphonemes [see FUNCTIONAL PHONOLOGY], whose function it is to distinguish between morphemes, rather than to intonation. However, every language, be it tonal or not, has intonation.

T. A.

Suggestions for further reading

- Abercrombie, D. (1967) *Elements of General Phonetics*, Edinburgh: Edinburgh University Press, Chapters 2, 4, 8, 9 and 10.
- O'Connor, J.D. (1973) *Phonetics*, Harmondsworth: Penguin, Chapter 2.
- Ladefoged, P. (2001) *A Course in Phonetics*, 4th edn, Boston, Mass.: Heinle and Heinle, Chapters 1, 6, 7, 9 and 10.

Artificial languages

Artificial languages are languages which were deliberately constructed, rather than developing in a linguistic community. In this article we discuss both invented languages intended for people to speak to each other, and programming languages intended for people to instruct machines. The latter and their relation to language in general will be discussed in their place below.

Artificial languages for people to speak are also known as constructed languages, or conlangs. There have been a surprisingly large number of these. Richard Harrison's bibliography of the more accessible written sources

(Harrison 2002) provides information on about 100. More comprehensive is (Dulichenko 1990, in Russian), referencing printed materials for more than 900 international language projects, and there are nearly 2,000 constructed languages in Jeffrey Henning's online collection (Henning 2007).

These languages are rarely studied by linguists, because with the exception of the very few that have achieved a substantial following and first-language speakers, they are artificial creations that do not necessarily reveal anything of the innate mechanisms of language. However, whether or not they are 'language', they form part of the history of ideas about language.

The perfect language

It is possible that all languages evolved from a single original, but whatever the truth of that hypothesis [see LANGUAGE ORIGINS], the idea that they did so goes back as far as the story in Genesis. Mythologically, this original language has generally been imagined to have also been a perfect language, a mirror of reality which gave to all things their true names. The idea of actually constructing such a language came to prominence in the seventeenth century, for several reasons. Latin had long been the common written language for scholarly works in Europe, but with increasing general literacy and dissemination of printed books, it was yielding to the vernaculars. Besides the linguistic divisions that this created, the vernaculars were thought unsuited to deal with the explosion of scientific knowledge from all over the world, which required new vocabulary to classify and describe it. Missionaries abroad had to preach to people who knew no European languages. Reports of the Chinese language and Egyptian hieroglyphics stimulated the idea of a 'real character', whose symbols would directly and unambiguously represent things, as those systems were believed to do, allowing all people to communicate with a common writing.

One of the first attempts to create a common language was that of Francis Lodwick (or Lodowick) (Salmon 1972). In 1647 he published a universal writing, and in 1652 a proposal for a new language whose vocabulary would order things in accordance with their natures, and therefore

be more suitable for the conduct of science. The work drew some attention but did not progress beyond a description of the grammar and the principles on which its vocabulary might be built.

George Dalgarno was the first to take such a project to completion. As with Lodwick, Dalgarno's first idea was of a universal writing, developing into the idea of a new language. His *Ars Signorum*, published in 1661, proposed a vocabulary based on a classification of things into about 20 genera, with around 1,000 basic words, to be combined as necessary to express all concepts.

The third major effort of that time was John Wilkins' *Essay Towards a Real Character and a Philosophical Language* of 1668. The greater part of the Essay is taken up with his classificatory tables, which are much more detailed than Dalgarno's, and amount to a survey of human knowledge.

A basic flaw in the idea of a universal writing was already pointed out by Descartes in a letter to Mersenne of 1629 (reprinted in Yaguello 1991). A universal writing amounts to a new language, and the burden of learning it is at least equal to that of learning an existing language; but the latter already has speakers that one can learn from.

Leibniz had a lifelong interest in a universal language, and first wrote on the subject in his *Dissertatio de Arte Combinatoria* in 1666. This is mostly concerned with a part of mathematics now known as combinatory analysis, but also contains his ideas for a philosophical language based on logic. His fundamental idea was that 'a kind of alphabet of human thought can be worked out and that everything can be discovered and judged by a combination of the letters of this alphabet and an analysis of the words made from them' (Leibniz, translated in Maat 2004: 293–4). The philosophical language that he desired would be above all an instrument of reason, 'for nothing greater can happen to men than the perfection of their mental functions' (Maat 2004: 301). He looked forward to people being able to resolve all arguments by calculating. Although he worked on the project all his life, he never completed more than a sketch of an actual language, and regretted that the construction would be beyond the capacity of one person.

Although none of the philosophical languages ever came into use, the idea persisted. In 1852 Roget credited Wilkins as an influence in the preface to his *Thesaurus*, and regarded a work such as his own as a prerequisite for constructing such a language.

The next step towards creating a philosophical language came with the development in the nineteenth century of mathematical logic. George Boole (1815–64) was the first to establish a system of logic in which one could truly carry out argument by calculation (Boole 1854). Mathematical logic was developed further, notably by Gottlob Frege and Bertrand Russell, and in 1910–13, Russell and A.N. Whitehead published their *Principia Mathematica*, which was a demonstration by example that all mathematical knowledge of the time could be expressed and proved within a quite minimal logical system.

Mathematical logic, and specifically the first-order predicate calculus, is now in principle the generally accepted universal language of mathematics [see FORMAL LOGIC AND MODAL LOGIC]. What Leibniz strove for has in this specialised field been attained: all mathematicians can agree precisely on what is a correct proof and what is not. However, mathematical arguments are never written out in full formality, except when the act of doing so is itself the purpose, for it is very tedious. *Principia Mathematica* only covered the basics of mathematics, and took three weighty volumes to do so. (The theorem that $1+1=2$ takes more than 350 pages to reach.) In practice, it is enough to learn how to express oneself in the perfect language. Thereafter one need not trouble to do so, except when a difference over some difficult technical point requires the parties, as Leibniz envisaged, to sit down and calculate.

Now that there are computers to assist, there have been attempts to actually express all mathematical knowledge in logic, with automatically checked proofs. There are two substantial projects with this aim: Automath, initiated by N. de Bruijn in the late 1960s (Nederpelt 1994), and Mizar, begun in 1973 by Andrzej Trybulec. An entire mathematical textbook, Landau's *Grundlagen der Analysis*, has been translated into Automath, while Mizar has amassed a corpus of some 40,000 theorems. The Mizar formalism is designed to be as readable as a mathematician's

verbal proof, but without any loss of rigor. It remains the case, however, that these systems are used to demonstrate that it can be done, rather than as a practical medium for mathematicians to write in.

The idea of logic as the foundation for a *human* language finally bore fruit in an actual construction in 1960, when James Cooke Brown presented his language Loglan (Brown 1989). The Loglan community later split, and a revised version based on the same principles appeared, called Lojban (Cowan 1997), but for present purposes the differences between them are slight. There is a closed class of grammatical particles for various purposes, the rest of the vocabulary being a single open class, the predicates. These perform the functions of nouns, verbs, adjectives, most adverbs, and many prepositions of natural languages. Each predicate expresses a relation between a fixed number of arguments. Grammatical particles transform predicates into the equivalent of noun phrases, that is, things that can be arguments of these relations. Other particles act as logical connectives, quantifiers, and variables, thus giving a speakable version of first-order predicate calculus. There are further particles for adverbial modifiers, conjunctions, and emotional attitudes. The grammar is formally defined and can be easily parsed by machine.

While the grammar is based on logic, the vocabulary is based on existing languages. The basic concepts (about 1,000 in Loglan and 1,400 in Lojban) are chosen so as to cover the range of everyday needs, rather than on the basis of any classification scheme. The words to denote them were constructed algorithmically from the words in the most widely spoken natural languages. (It must be admitted that the primitive predicates, which are of a rigid CVCVV or CCVCV form, generally bear little resemblance to the originals from which they were built.) Primitives can be combined to express new concepts, and combinations contracted into new words. This allows the vocabulary to expand as required for any domain of discourse. Both Loglan and Lojban are still developed and practised by their enthusiasts.

The mathematician Hans Freudenthal proposed logic as a language for communicating with aliens, should we ever discover any. In his

book (Freudenthal 1960) he gave a detailed account of how, communicating through radio and sending nothing but sequences of beeps, one might convey the basics of logic and mathematics, and work up to concepts of time, behaviour, social interaction and physical objects. He chose logic and mathematics as the starting point, since their truths are universal, and must be recognisable by anyone who has developed the technology to receive radio signals.

An international language

The eighteenth century saw the ascendance of French as the European language of the educated, and the demand for a new language faded. By the later nineteenth century, the topic was again in the air, and there arose many artificial languages of a new type, motivated purely by the goal of international communication. For the sake of easy learnability, they based their vocabularies not on any scheme of classification, as the philosophical languages had done, but by borrowing or modifying words from existing European languages sufficient to meet everyday needs. Their grammars were simplified versions of those languages.

The first such language that had any popular success was Volapük, published by Johann Martin Schleyer in 1880. Its vocabulary was largely (but distantly) based on English, with some admixture of other European languages. The craze for Volapük reached its peak with its third congress in 1889, but rapidly declined soon after.

In 1887, Ludwig L. Zamenhof published Esperanto. It draws its vocabulary mainly from the Romance languages, with some borrowings from German and a few from other languages. A few words – the correlatives – are systematically constructed *a priori*. The grammar relies on word order with few inflections. Zamenhof summarised it in a set of sixteen rules, although those rules presuppose his audience's familiarity with some European language, and a full reference grammar would be much larger. The original vocabulary contained about 900 root words, but by the use of some two or three dozen affixes they can produce many more. Thus the word for 'hospital' is *malsanulejo*, which analyses as *mal-san-ul-ej-o*, based on the root *sana*,

'healthy', and literally means 'place for sick people'. The language has grown since its creation and dictionaries now contain upwards of 15,000 root words, allowing some hundreds of thousands of derivatives.

Despite persecution under Hitler and Stalin in the twentieth century, Esperanto has survived to become the most well known and best established of all the artificial languages. It has somewhere between a few hundred thousand and 2 million second-language speakers worldwide (accurate estimates are difficult to make), and a small number of first-language speakers. It has been the medium not only for translations but also for works of original literature. Within the Esperanto movement, the original goal of becoming a universal second language for all mankind has been supplemented, and for some superceded, by a view of Esperanto as a minority language with a community and culture valuable in themselves.

In 1951 the International Auxiliary Language Association (IALA) published Interlingua, following their study of several contemporary artificial languages. For some decades, several scientific journals published abstracts in Interlingua. The IALA ceased activity in the 1950s, but several successor organisations have continued to promote the language.

One of the problems besetting all artificial international languages is the creation of offshoots, by those wishing to change the language to be more to their liking. Arguments within the Esperanto community led to the splitting off of Ido in 1907, and Volapük was reformed into Idiom Neutral in 1902. (Yaguello 1991: Appendix 2) lists many more such offshoots, which are now all but forgotten.

All of these languages based their vocabulary on a mixture of European languages, designed to be easily learnable, or even readable at sight, by people speaking those languages. Some other projects were based on a single natural language. Basic English, devised by C.K. Ogden (Ogden 1930), was simply English reduced to 850 words, plus their inflections. However, the count is misleading evidence of its learnability, as many of its words have multiple meanings, and also form a large number of phrasal verbs whose meanings must be learned separately. Latino sine Flexione was devised by the mathematician Guiseppe

Peano in 1903, and is a version of Latin, simplified by omitting most of the inflections. (The language has also been known as Interlingua, but is distinct from the IALA language.) (Libert 2004) lists fourteen other Latin-derived artificial languages.

A few international languages have a completely *a priori* vocabulary, that is, not built from the words in any existing language. No such language has met with any success.

Another use for international languages has been as an *interlingua*, an intermediate language for use in computer translation. (Neither of the artificial languages known as Interlingua is used as an interlingua in this sense.) Esperanto has been used as an interlingua, and one language, UTL (Universal Translation Language) was specifically designed for the purpose. It remains to be seen whether interlinguas can compete against either abstract representations of meaning based on linguistic theory, or the more recent statistically based methods of automatic translation currently used by services such as Google.

Despite the measure of success that Esperanto has achieved, the overwhelming trend of history since its creation has been for English to become the international language in all areas of discourse and all walks of life. This is unlikely to change in the foreseeable future.

Fiction

Many artificial languages have been invented as parts of fictional worlds. Three in particular are well known to the general public: Klingon, J.R.R. Tolkien's Elvish languages and George Orwell's Newspeak.

Klingon is the language of the warlike race of that name in the Star Trek universe. It was commissioned for the third Star Trek film and created by the linguist Marc Okrand. There have appeared a dictionary, books of grammar and cultural background, and many other materials. Okrand gave Klingon several features rare or absent in human languages, such as OVS word order, an unusual set of basic colour categories, and some properties of the phoneme inventory. The language is designed for barking out orders in the heat of battle and is devoid of all pleasantries.

J.R.R. Tolkien invented the Elvish languages Sindarin and Quenya, whose sounds are reminiscent of Welsh and Finnish, respectively. They form part of the background to *The Hobbit* and *Lord of the Rings*, although Tolkien himself wrote that he created the languages first as an aesthetic hobby, and the stories grew from them (Tolkien 1997).

George Orwell's novel *1984* describes the language Newspeak, developed by the ruling class in his dystopia as a deliberately impoverished language. Its vocabulary is designed to fit the rulers' political viewpoint, and exclude all others, to make even the thought of revolt impossible. Newspeak was also intended as a satire on Esperanto and Basic English.

The role ascribed to Newspeak presumes a strong form of the Sapir-Whorf hypothesis, that language limits thought (Whorf 1956). Whether that is true or not, the idea has played a major part in several other novels of speculative fiction.

Jack Vance's *The Languages of Pao* is a novel about the Sapir-Whorf hypothesis in its strongest and, one might say, most naive form. It describes a backward and static world whose language, Paonese, embodies passivity. The world is invaded and its conquerors impose three new languages, the better to train up three social classes which Pao lacks: Valiant for soldiers, Technicant for engineers, and Cogitant for scientists. Each language was designed to mould its speakers' thoughts into the forms appropriate for each class. (Vance gives a few illustrative examples, but he did not construct complete languages.) The people eventually combine against their oppressors, and the linguistic divisions are healed by merging the four languages into a new language that overcomes the limitations of each one.

Láadan was invented by the linguist Suzette Haden Elgin for her novel *Native Tongue* and its sequels. The language is intended to more easily lexicalise certain perceptions of women which, according to Elgin, can be talked about only with difficulty in existing languages. Its vocabulary includes words such as *widazhad* – to be pregnant late in term and eager for the end; *radúidin* – a supposed holiday that is actually a burden because of work and preparations; *honáal* – the hours between midnight and dawn. There are words for five types of friendliness and

thirteen types of love, and a range of affixes and particles to indicate speech act type, evidentiality, and the speaker's state of consciousness.

Elgin intended the language not only as background to the novel, but as an experiment in the real world. She wished to test the hypothesis that such a women's language would be taken up by women, and that its influence on thought would bring about social consequences. As it turned out, Láadan has not been taken up by significant numbers, leaving it undecided what would happen if it was.

These are of course fictions. While the strong form of the Sapir–Whorf hypothesis makes for more interesting stories, actual studies suggest that there is at most a much weaker influence of language upon thought [*see* LINGUISTIC RELATIVITY; PSYCHOLINGUISTICS].

Recreation

Many of the languages indexed by Henning are intended as international auxiliary languages, but the majority are projects of recreation. In the past, such languages might never become known to anyone but their creator, but with the spread of the Internet there has arisen a whole community of conlang enthusiasts sharing their creations with each other. As well as languages, some have created automated tools to assist in the construction of a language, for example by generating vocabularies of words from a set of phonological rules. In contrast to the negative view of the activity implied by the title of Yaguello (1991), *Lunatic Lovers of Language: Imaginary Languages and Their Inventors*; Sarah Higley acknowledges it as a worthwhile creative and artistic enterprise (Higley 2000).

A few examples from Henning's list will illustrate the range of these projects. Brithenig is an exercise in alternate linguistic history, the Romance language that might have evolved if Latin had survived in Britain and been influenced by the Celtic languages. There has been more than one attempt to construct a modern descendant of Gothic, together with an alternate history of how it survived to the present. AllNoun is an experiment in syntactic form: it contains only nouns. Solresol (a nineteenth-century project that achieved some renown in its time) is a language of musical sounds. Tsolyani forms part

of the background to a fantasy novel and a role-playing game. Toki Pona is a language exploring the Sapir–Whorf hypothesis, designed to encourage positive thoughts. Ithkuil is a philosophical language, striving for compactness, logicity, and accuracy – but not practical usability, its own creator disavowing being able to speak it.

Programming languages

Programming languages and the computers that they instruct are, in a perfectly literal sense, technological embodiments of mathematical logic. Their ancestry reaches back to Leibniz's idea of a *calculus ratiocinator*, in the senses both of a machine to perform reasoning, and a language with which a person may express its operation.

A basic lesson learned by the novice programmer, and never ignored by the seasoned professional, is that a prerequisite for making a machine perform a complex task is to first think clearly about the task it is to perform. Programming languages exist to enable that clarity of thought: *a programming language is a tool for thinking about computation*.

Whatever may be the relationship between natural languages and thought, it is generally held in the computing profession that programming languages do have a profound effect on how one thinks about computation. Because the semantics of these languages is defined by what a machine does with them, the programmer cannot take Humpty Dumpty's attitude, and alter the language to fit his thoughts. He must fit his thoughts to the language. Of the language Lisp, the academic scientist E.W. Dijkstra wrote 'Lisp ... has assisted a number of our most gifted fellow humans in thinking previously impossible thoughts' (Dijkstra 1982), and a similar thought from the practical end of the profession is expressed by E.S. Raymond in his essay, 'How To Become A Hacker': 'Lisp is worth learning for ... the profound enlightenment experience you will have when you finally get it. That experience will make you a better programmer for the rest of your days, even if you never actually use Lisp itself a lot'. Lisp – the second-oldest programming language still in wide use – was based on the lambda calculus, a mathematical notation that came out of mathematical logic in the early twentieth century.

Every programming language embodies concepts of computation, and these can differ radically from one language to another. Most programming languages describe a computation as a sequence of operations, but in some others, a program is a mathematical expression which the machine is called on to evaluate, without any sequence being specified. In yet others, a program is a set of logical axioms, together with a proposition to be proved from those axioms. Many other conceptual variations exist within these three classes. While all programming languages are 'universal', in the sense of being able to express any computation, there has never been a language that is universally used for all applications, since some problems can be expressed more easily in the concepts of one language than another. Whenever a new field of computational applications develops – for example, creating web pages – new languages are soon created to deal with them.

The later 1990s and early 2000s have seen the development of a class of computer languages to describe things outside computing, using the 'Extensible Metalanguage' XML. XML is a language for defining languages, called XML application languages. An XML application language defines the possible structure of some class of documents, specifying all the different components that may occur in the document, in what order and in what combinations. What these components mean may or may not be defined in computational terms. For example, XML languages have been standardised for describing such things as line drawings, web pages, and business forms. XML languages are constructed to fit their subject matter, and by their standardisation to serve as common languages with which diverse software systems may exchange data. XML itself is intended to be a language fit for describing these languages.

Some applications of XML have particular relevance to the original motivation for constructing artificial languages: the perfection of human communication. There have been several attempts, of varying degrees of elaboration, to develop XML languages for representing emotional states and gestures accompanying text, marking up an utterance to be a joke, or to be spoken in a happy or sad way, etc. This can be either to overcome the limitations of written text

as a medium of communication, or to specify the behaviour of animated avatars in virtual worlds. No such proposal has yet been brought to fruition.

The most recent elaboration of the idea of a computer-mediated universal language is the Semantic Web. At present, the World Wide Web contains information that is meaningful to the people who access it but not to the machines which store it. The Semantic Web is a large-scale project to create explicit representations of more and more of the meaning of the content of web pages, in a form amenable to universal mechanical understanding. It is too early to predict how much of this promise will be realised.

R. K.

Suggestions for further reading

- Blanke, D. (1985) *Internationale Plansprachen: Eine Einführung*, Berlin: Akademie-Verlag.
- Harrison, R.K. (2002) *Bibliography of Planned Languages (excluding Esperanto)*, <http://www.rickharrison.com/language/bibliography.html> (accessed 2009).
- Henning, J. (2007) *Langmaker*, <http://www.langmaker.com> (accessed 2007).
- Knowlson, J. (1975) *Universal Language Schemes in England and France 1600–1800*, Toronto: University of Toronto Press.
- Large, A. (1985) *The Artificial Language Movement*, Oxford: Blackwell.
- Maat, J. (2004) *Philosophical Languages in the Seventeenth Century: Dalgarno, Wilkins, Leibnitz*, Dordrecht: Kluwer Academic.
- Slaughter, M.M. (1982) *Universal Languages and Scientific Taxonomy in the 17th Century*, Cambridge: Cambridge University Press.
- Yaguello, M. (1991) *Lunatic Lovers of Language: Imaginary Languages and Their Inventors*, London: Athlone Press.

Attitudes to language: past, present and future

Introduction

Our views of others – our sense of their beliefs, preferences, capabilities, social attributes and so on – are influenced by our perceptions of their language and speech. It follows that our interactions with them can be mediated by these attitudes – and, as well, that these may influence

our *self*-presentations. It is hardly surprising, then, that the study of language attitudes has been integral to the sociolinguistic description of many speech communities, and that it has contributed to exercises in language planning and policy-making (Ryan and Giles 1982; Garrett et al. 2003).

Since the pioneering work of Lambert and his colleagues in the 1960s, there has been a great deal of attention given to language attitudes and their ramifications (for review, see Giles and Billings 2004). Among a number of methodological approaches, procedures that examine how listeners react to supposedly different speakers reading the same neutral passage of prose have proved particularly useful: attitudes towards speakers are measured on rating scales that typically reflect the evaluative dimensions of **competence**, **solidarity** and **dynamism**. This **matched-guise procedure** (see Lambert 1967) – employing **stimulus speakers** who can assume authentic versions of languages, dialects, accents or other speech variables – has the advantage of experimental control, since all extraneous variables are obviously constant across ‘guises’. In some studies (where children’s voices are to be investigated, for example), more direct methods may be required, since we cannot expect speakers to adopt more than one ‘guise’. The necessity for such **verbal-guise approaches**, in which different speakers are used for each variety of interest, implies greater caution in the interpretation of results.

A fairly consistent finding across many contexts is that **standard dialect** or **prestige varieties** elicit favourable reactions to speakers. They are stereotyped as more competent and confident than their less prestigious-sounding counterparts, and what they say is given greater weight. It is interesting to note here that the listener-judges in such studies are often willing to record their language attitudes after only the briefest exposure to the stimulus voices. Such attitudes appear to be socialised in complex ways early in childhood and to persist into later life (Giles et al. 1992). Another generality is that, as the ‘target’ variety becomes farther removed from the prestige form, evaluations of speaker competence typically become less favourable. Speakers of **low-status varieties** can, however, possess a **covert prestige**, reflected in

favourable assessments on dimensions like integrity, social attractiveness and dynamism (see Marlow and Giles 2008); this typically arises because of (middle-class) attributions of directness, ‘toughness’ and masculinity to non-standard varieties (see Edwards 1989).

The history and social connotations of some standard varieties – such as **RP (Received Pronunciation)** English – can give rise to a status that crosses national borders, while non-standard varieties are typically hierarchically organised within cultural boundaries. Across studies, the effects of many speaker and listener characteristics have been studied and, although there are demographic and contextual factors whose presence or degree influence evaluative reactions, their general patterns are remarkably stable and alterations in the socio-political fabric usually have to be quite pronounced before they give rise to significant changes in those evaluations.

When we focus on vocal features other than strictly dialectal ones, **context** has particularly powerful effects. For instance, a positive linear relationship has repeatedly been found between **speech rate** and **perceived competence**, but this may disappear when evaluative exercises are more fully contextualised; thus, Brown et al. (1985) found that when listeners were informed that a male speaker had been recorded while helping audience members with an unfamiliar topic, he was seen as just as intelligent and competent when he talked slowly as when he spoke quickly. Other features – including **lexical diversity**, **pausing**, **self-disclosure** and **pitch** – have also been manipulated, both independently and in conjunction with other **speaker attributes** (e.g., socio-economic status). Findings suggest that such variables often interact in important ways; in one example, the least favourable judgements were evoked when non-standard accent, low lexical diversity and working-class background were the interacting variables (Giles et al. 1981).

As suggested at the beginning of this section, studies have also shown a direct correspondence between reported language attitudes and actual behavioural responses to members of dialect groups, across a number of applied domains (Purnell et al. 1999; Wated and Sanchez 2006). In Britain, for example, when Dixon et al. (2002) asked for evaluations of an audio-taped police

interrogation of a suspect who was pleading his innocence, they found that a speaker with a Birmingham accent was rated significantly more guilty than was an RP speaker; this effect was magnified when the crime was the 'blue-collar' one of armed robbery.

The bases of attitudinal judgement

Setting aside dictionary definitions of dialect and accent that have typically helped to sustain the view that non-standard usage is less correct usage, it is necessary to consider the possible bases upon which **language attitudes** might rest. Three broad possibilities suggest themselves. The first is that evaluations could reflect intrinsic linguistic differences. Although this is a view that has had considerable historical support, and while it remains common at a popular level in virtually all linguistically stratified societies, linguists have convincingly demonstrated that to see languages or dialects in terms of innate superiority or inferiority is to profoundly misunderstand the nature of human language itself. A good demonstration of this was provided by Labov (1976a). He studied **Black English** (in the USA), which made an excellent test case for establishing the general linguistic validity of all dialects, since it had for so long been rejected by the white middle class, and since its speakers were victims of a prejudice that went well beyond language alone. If it could be shown that Black English was not, after all, some debased variety, this would go some way towards establishing linguistic integrity for all dialect varieties.

There were three strands to Labov's work. First, he justly criticised earlier studies whose data were flawed because they had been elicited from youngsters in unfamiliar and intimidating circumstances. Second, Labov reminded us of what casual observers had known for a very long time – the Black community is verbally rich and, like other **oral cultures** worldwide, supports and rewards those who are particularly linguistically gifted. Third, and most important of all, Labov demonstrated the rule-governed nature of Black English. The import of this sort of work is clear: there are no **sub-standard language varieties**. There are **standard dialects** (roughly, those spoken by educated people and used in formal writing) in many languages, and

so it logically follows that all others must be non-standard – but this latter term is not pejorative in any technical linguistic sense. Neither Black English nor, by extension, any other non-standard dialect can be characterised as some 'approximation' to 'proper' language.

Another possibility might be that **language varieties** – although not to be seen (grammatically or 'logically') in terms of better or worse – possess different aesthetic qualities. Perhaps, then, more favourable attitudes attach to those varieties that sound better, or more mellifluous, or more musical. Many years ago, for instance, **standard English** was defended as 'one of the most subtle and most beautiful of all expressions of the human spirit' (Chapman 1932: 562). Such sentiments remain quite common and are not restricted to those speaking about English. But is it possible to put them to the test? Revealing studies have compared an **inherent value hypothesis** here with an **imposed norm hypothesis**. The former term suggests, as Wyld (1934) did, that aesthetic qualities are intrinsic, while the latter holds that they are imposed by the listener who, in hearing a standard (for instance), considers it cultured and pleasing because of the status of its speakers. In one investigation, Welsh adults listened to European French, educated Canadian French and working-class Canadian French voices (Giles et al. 1979). Asked to rate the pleasantness and prestige of the voices, the judges – who were virtually ignorant of French – did not single out any of the three varieties. Earlier studies had shown, however, a clear aesthetic preference among French speakers for European French.

Important in these demonstrations is that judges were unaware of the social connotations possessed by the different varieties in their own speech communities. The implication is that, if one removes (experimentally) the social stereotypes usually associated with given varieties, aesthetic judgements will not be made that favour the high-status standards. Anyone who watches a film or a play in which (for example) a woman dressed as a duchess speaks with a Cockney accent can appreciate the point here: someone in the audience who had an understanding of English, but not of more subtle intralinguistic variation and convention, would miss a great deal of the comedic effect. The

norms here are ‘imposed’ by those in the know, and the stereotypes which link beauty, or harshness, or comedy to a particular set of sounds are unavailable to others.

Having eliminated two possibilities, we arrive at the most likely basis of **attitudinal judgement**: the variant evaluations found in the social laboratory and on the street reflect, above all, listeners’ perceptions of the *speakers* of given varieties. The variety itself is a trigger or stimulus that evokes attitudes (or prejudices, or stereotypes) about the community to which the speaker is thought to belong.

Attitudes in context

It is impossible here to go into any detail about the many contexts in which attitudes assume importance, but we should at least mention the home, school and language-learning settings.

There is a strong tendency for speakers of non-standard varieties to accept the unfavourable evaluations of others (the so-called ‘minority-group reaction’ is an example here; see Lambert 1967). While the sense that one’s own speech is not very good may be a common phenomenon, it is nonetheless a disturbing one. Halliday (1968: 165) noted that ‘a speaker who is made ashamed of his own language habits suffers a basic injury as a human being’. One might ask, as did Ryan (1979), why do **low-status speech varieties** continue to exist? If they are generally considered inferior, why do speakers not try to eradicate them, why is language or dialect shift not a more popular option? Non-standard speakers are hardly without adequate models for language alteration, after all – the ubiquity of the broadcast media today means that virtually everybody has at least a passive awareness of standard forms, and it is not difficult, in theory, for this to be translated into something more active (Edwards 1989). We must remind ourselves here that the solidarity function of any variety can be powerful, and even one of low status can act as a bonding agent, reinforcing group identity (see Ryan 1979). Besides, attempts to alter speech styles may be risky, and failure may lead to social marginalisation. Indeed, even success may prove too costly: a Mexican American who has ‘migrated’ to English might be labelled a *vendido*, a ‘sell-out’; and a

French Canadian, a *vendu*. It is obvious that attitudes and perceptions are of considerable importance in such social dynamics.

In the classroom, too, language attitudes figure prominently. Almost four decades ago, Gumperz and Hernández-Chavez (1972) reflected upon the important ramifications of teachers’ attitudes towards what they often thought of as the ‘deviant’ speech styles of their pupils. Trudgill (1975: 63) noted, too, that teachers were not averse to telling (some of) their pupils that their speech was ‘wrong ... bad ... careless ... sloppy ... slovenly ... vulgar ... gibberish’. The findings of Edwards and McKinnon (1987: 335) demonstrated that such perceptions have survived linguistic insights: teachers reported, for example, that the speech of poor children revealed an inability to articulate their thoughts, and that Black pupils ‘have a slang language all their own – they will not use proper English when the opportunity arises’. It is a cruel irony that socially disadvantaged children, who clearly struggle under all sorts of very real burdens, should be weighed down still more by inaccurate attitudinal evaluations of their language.

In language-learning settings, attitudes have a more interesting role to play than might first be imagined. While variations in the context and the perceived functions of a new language are obviously important, the received wisdom has been that positive attitudes facilitate acquisition; there is a large literature on **attitude and motivation in language learning** (see Dörnyei 2003, for a recent overview). Macnamara (1973), however, appeared to take an opposing view, arguing that attitudes were of little importance here. He suggested that necessity typically overpowered attitude – and this is clearly true, since large-scale language shifts are rarely accompanied by favourable attitudes. Most historical changes in language use owe much more to socio-economic and political pressures than they do to attitudes per se. But perhaps attitudes of a sort – instrumental attitudes – *do* play a part in language shift. A mid-nineteenth-century Irishman may have hated English and what it represented, for example, while still acknowledging the necessity and long-term usefulness of the language. A pragmatic or **instrumental motivation**, then, need not imply the deeper and more **integrative motives** so dear to the