To Siobhan (again) and my famous mother
“It is nothing other than words which has made us human”

(Pavlov, 1927/1960)
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Preface to the Second Edition

I welcome this opportunity to write a second edition of *The Psychology of Language*, and I would like to thank Mike Forster of Psychology Press for giving it to me.

As I remarked in the preface to the first edition, although language might not be all that makes us human, it is hard to imagine being human without it. Given the importance of language in our behaviour, it is perhaps surprising that until not so long ago, relatively scant attention was paid to it in undergraduate courses. Often at best it was studied as part of a general course on cognitive psychology. That situation has changed. Furthermore, the research field of psycholinguistics is blossoming, as evinced by the growth in the number of papers on the subject, and indeed, in the number of journals dedicated to it. With this growth and this level of interest, it is perhaps surprising that there are still relatively few textbooks devoted to psycholinguistics. I hope this book will fill this gap. It is aimed at intermediate and advanced-level undergraduates, although new postgraduates might also find it useful, and I would be delighted if it found other readers.

I have tried to make as many of the references as possible point towards easily obtainable material. I have therefore avoided citing unpublished papers, doctoral theses, and conference papers. New papers are coming out all the time, and if I were to make this book completely up-to-date, I would never stop. Therefore I have decided to call a halt, with a very few exceptions, at material published in 2000. Of course, given current publication lags, much of this material would actually have been written some years before, and the current state of people's thinking and work, as discussed in conferences and seminars, might be very different from the positions attributed in this book. This is most unfortunate, but unavoidable.

It is now impossible to appreciate psycholinguistics without some understanding of connectionism. Unfortunately, this is a topic that many people find difficult. The formal details of connectionist models are given here in an Appendix: I hope this does not mean that it will not be read. I toyed with a structure where the technical details were given when the class of model was first introduced, but a more general treatment seemed more appropriate. I was swayed by Alan Kennedy in making this decision.

I have been very gratified by the positive feedback I have received on the first edition of this book, and the number of suggestions and comments people have made. I have tried to take these into account in this revision. "Taking into account" does not mean "agreeing to everything"; after consideration, there are some suggestions that I decided against. One of these was numbering sections, which I find aesthetically displeasing. I take the general point that there are a lot of cross-references, but I regard this as a positive aspect: we should try to foster as many connections between parts of the subject as possible. I have also found that it is impossible to please everybody. Indeed, people's suggestions are often contradictory. In such
cases I can only rely on my own inclinations. One example of this is the material on the Sapir-Whorf hypothesis: some people have suggested deleting it, whereas others have found it one of the most useful sections, and wanted more information on it. Almost everyone wanted more material on their particular speciality, and in this respect probably everyone is going to be disappointed to some extent. Nevertheless, the book is quite long enough as it is.

This new edition is much more than just a "maintenance release". I have—on some people's advice and against others'—rearranged the order of the chapters. This has created room for some of the other changes and for inclusion of more recent material. In particular, I have moved to the beginning the material on language acquisition that many students new to psycholinguistics find most interesting. The most significant alteration to the content is that I have changed the treatment of syntax and parsing. Linguistic approaches to syntax now form part of an introductory chapter, and the psycholinguistic material on parsing that was in Chapters 5 and 9 in the old edition is now in a completely new Chapter 9. This was originally suggested by Gerry Altmann; he was right. Don Mitchell and Martin Pickering also encouraged me to write more on syntax. The material on lexical ambiguity is now in the chapter on word recognition. I have added more on morphology, bilingualism, the biological basis of language, and developmental dyslexia. There is now a glossary, and at the end of each chapter some "questions to think about". There is also a new bulleted summary at the end of each chapter. I have updated material and suggestions for further reading everywhere; there are numerous new subsections. One significant advance since the first edition has been the impact of connectionism on our understanding of semantic memory and the neuropsychology of semantics. I have also toned down my stance on cognitive neuropsychology, and talked more about the relationship between language and the brain. I am still sceptical about what it tells us beyond where things happen, but the book is more comprehensive as a result of this change. Where it is sensible to do so, I have tried to be more true to the title in emphasizing data and phenomena before I discuss the appropriate theories. This doesn't always work, of course, particularly when experiments are driven by theories. It wouldn't make sense to discuss the sentence verification task and results from it before describing semantic networks.

There are, I think, only two instances where the preponderance of evidence has led to a conclusion that is significantly different from that proposed in the first edition. The more substantive of these is the presence—or absence—of feedback connections in a model of speech production. Whereas I think the evidence still suggests that speech production is an interactive process, we can accommodate this interaction without rather implausible feedback connections. The second reversal of opinion concerns the existence of types of automatic non-associative semantic priming.

Students often find the study of the psychology of language rather dry and technical, and many find it difficult. In addition to making this edition as comprehensible as possible, I have also tried to make it fun and to emphasize applications of research. The American Psychological Association now recommends the use of the word "participants" instead of "subjects". I have followed this recommendation, although personally I find the usage rather jarring. Finally, I have taken this opportunity to make a few minor corrections, and to put right a few omissions.

There is a web site associated with this book. It contains links to other pages, details of important recent work, questions and answers, and a "hot link" to contact me. It is to be found at: http://www.dundee.ac.uk/psychology/language. I still welcome any corrections, suggestions for the next edition, or discussion on any topic, but please note that I have moved since the first edition, and that my email address is now: t.a.harley@dundee.ac.uk. Suggestions on topics I have omitted or under-represented would be particularly welcome. The hardest part of writing this book has been deciding what to leave out. I am sure that people running other courses will cover some material in much more detail than it has been possible to provide here. However, I would be interested to hear of any major differences of emphasis. If the new edition is as
successful as the first, I will be looking forward (in a strange sort of way) to producing the third edition in five years’ time.

I would like to thank all those who have made suggestions about both editions, particularly Jeanette Altarriba, Gerry Altmann, Elizabeth Bates, Helen Bown, Paul Bloom, Gordon Brown, Hugh Buckingham, Lynne Duncan, the Dundee Psycholinguistics Discussion Group, Andy Ellis, Gerry Griffin, Zenzi Griffin, Francois Grosjean, Evan Heit, Lauraq Hunter, Lesley Jessiman, Barbara Kaup, Alan Kennedy, Kathryn Kohnert, Siobhan MacAndrew, Nadine Martin, Randi Martin, Elizabeth Maylor, Don Mitchell, Wayne Murray, Lyndsey Nickels, Jane Oakhill, Padraig O’Seaghdha, Martin Pickering, Julian Pine, Ursula Pool, Eleanor Saffran, Roger van Gompel, Alan Wilkes, Suzanne Zeedyk, and Picnic Zwitserlood. Numerous people pointed out minor errors and asked questions: I thank them all. George Dunbar created the sound spectrogram for Figure 2.1 using MacSpeechLab. Katie Edwards and Denise Jackson helped me to obtain a great deal of material, often at very short notice. This book would not be what it is without the help of all these people. I am of course responsible for any errors or omissions that remain. If there is anyone else I have forgotten, please accept my apologies.

I would also like to thank Psychology Press for all their help and enthusiasm for this project, particularly Rachel Brazil, Paul Dukes, Caroline Osborne, and Tanya Sagoo. Jenny Millington did a wonderful job copy-editing the text. Tanya Sagoo helped immensely with the preparation of the graphic material. Most of all, Caroline Osborne has been a real treasure, wielding just the right amounts of carrot and stick. Finally, I would like to thank Brian Butterworth, who supervised my PhD in the “good old days”. He probably doesn’t realize how much I appreciated his help; without him, this book might never have existed.

Finally, perhaps I should state my bias about some of the more controversial points of psycholinguistics: I think language processing is massively interactive, I think connectionist modelling has contributed enormously to our understanding and is the most profitable direction in which to go in the near future, and I think that the study of the neuropsychology of language is fundamental to our understanding. Writing this edition has fostered and reinforced these beliefs. I realize that many will disagree with me, and I have tried to be as fair as possible. I hope that any bias there is in this book will appear to be the consequence of the consideration of evidence rather than of prejudice.

Trevor A. Harley
How to Use This Book

This book is intended to be a stand-alone introduction to the psychology of language. It is my hope that anyone could pick it up and gain a rich understanding of how humans use language. Nevertheless, it would probably be advantageous to have some knowledge of basic cognitive psychology. (Some suggestions for books to read are given in the “Further reading” section at the end of Chapter 1.) For example, you should be aware that psychologists have distinguished between short-term memory (which has limited capacity and can store material for only short durations) and long-term memory (which is virtually unlimited). I have tried to assume that the reader has no knowledge of linguistics, although I hope that most readers will be familiar with such concepts as nouns and verbs. The psychology of language is quite a technical area full of rather daunting terminology. I have defined technical terms and italicized them when they first appear. There is also a glossary with short definitions of the technical terms.

Connectionist modelling is now central to modern cognitive psychology. Unfortunately, it is also a topic that most people find extremely difficult to follow. It is impossible to understand the details of connectionism without some mathematical sophistication. I have provided an Appendix that covers the basics of connectionism in more mathematical detail than is generally necessary to understand the main text. However, the general principles of connectionism can probably be appreciated without this extra depth, although it is probably a good idea at least to look at the Appendix.

In my opinion and experience, the material in some chapters is more difficult than others. I do not think there is anything much that can be done about this, except to persevere. Sometimes comprehension might be assisted by later material, and sometimes a number of readings might be necessary to comprehend the material fully. Fortunately the study of the psychology of language gives us clues about how to facilitate understanding. Chapters 7 and 11 will be particularly useful in this respect. It should also be remembered that in some areas researchers do not agree on the conclusions or on what should be the appropriate method to investigate a problem. Therefore it is sometimes difficult to say what the “right answer”, or the correct explanation of a phenomenon, might be. In this respect the psychology of language is still a very young subject.

The book is divided into sections, each covering an important aspect of language. Section A is an introduction. It describes what language is, and provides essential background for describing language. It should not be skipped. Section B is about the biological basis of language, the relationship of language to other cognitive processes, and language development. Section C is about how we recognize words. Section D is about comprehension: how we understand sentences and discourse. Section E is about language production, and also about how language interacts with memory. It also examines the grand design
or architecture of the language system. The section concludes with a brief look at some possible new
directions in the psychology of language.

Each chapter begins with an introduction outlining what the chapter is about and the main problems faced
in each area. Each introduction ends with a summary of what you should know by the end of the chapter.
Each chapter concludes with a list of bullet points that give a one-sentence summary of each part of that
chapter. This is followed by questions that you can think about, either to test your understanding of the
material or to go beyond what is covered, usually with an emphasis on applying the material. If you want to
follow up a topic in more detail than is covered in the text (which I think is quite richly referenced, and so
the References should be the first place to look), then there are suggestions for further reading at the very
end of each chapter.

One way of reading this book is to treat it like a novel: start here and go to the end. Section A should
certainly be read before the others because it introduces many important terms without which later sections
would be very hard going. However, after that, other orders are possible. I have tried to make each chapter
as self-contained as possible, so there is no reason why the chapters cannot be read in a different order.
Similarly, you might choose to omit some chapters altogether. In each case you may find you have to refer
to the glossary more often than if you just begin at the beginning. Unless you are interested in just a few
topics, however, I advise reading the whole book through at least once.

OVERVIEW OF THIS BOOK

Chapter 1 tells you about the subject of the psychology of language, and covers its history and methods.
Chapter 2 provides some important background on language, telling you how we can describe sounds and
the structure of sentences. In essence it is a primer on phonology and syntax.

Chapter 3 is about how language is related to biological and cognitive processes. It looks at the extent to
which language depends on the presence and operation of certain biological, cognitive, and social
precursors in order to be able to develop normally. We will also discuss whether animals use language, or
whether they can be taught to do so. This will also help to clarify what we mean by language. We will examine
how language is founded in the brain, and how damage to the brain can lead to distinct types of impairment
in language. We will look in detail at the more general role of language, by examining the relation between
language and thought. We will also discuss what can be learned from language acquisition in exceptional
circumstances, including the effects of linguistic deprivation.

Chapter 4 examines how children acquire language, and how language develops throughout childhood.
Chapter 5 examines how bilingual children learn to use two languages.

We will then look at what appear to be the simplest or lowest-level processes, and work towards more
complex ones. Hence we will first examine how we recognize and understand single words. Although these
chapters are largely about recognizing words in isolation, in the sense that in most of the experiments we
discuss only one word is present at a time, the influence of the context in which they are found is an
important consideration, and we will look at this as well.

Chapter 6 addresses how we recognize words and how we access their meanings. Although the emphasis
is on visually presented word recognition, many of the findings described in this chapter are applicable to
recognizing spoken words as well. Chapter 7 examines how we read and pronounce words, and looks at
disorders of reading (the dyslexias). It also looks at how we learn to read. Chapter 8 looks at the speech
system and how we process speech and identify spoken words.

We then move on to how words are ordered to form sentences. Chapter 9 looks at how we make use of
word order information in understanding sentences. These are issues to do with syntax and parsing.
Chapter 10 examines how we represent the meaning of words. Chapter 11 examines how we comprehend and represent beyond the sentence level; these are the larger units of discourse or text. In particular, how do we integrate new information with old to create a coherent representation? How do we store what we have heard and read?

In Chapter 12 we consider the process in reverse, and examine language production and its disorders. By this stage you should have an understanding of the processes involved in understanding language, and these processes must be looked at in a wider context.

In Chapter 13 we will look at the structure of the language system as a whole, and the relation between the parts. Finally, Chapter 14 examines some possible new directions in psycholinguistics.

Remember, you can contact me through the web site for this book, at http://www.dundee.ac.uk/psychology/language.
This section describes what the rest of the book is about, discusses some important themes in the psychology of language, and provides a means of describing language. You should read this section before the others.

**Chapter 1, The Study of Language**, looks at the functions of language and how the study of language plays a major role in helping to understand human behaviour. We go back to basics and ask what language is, where it came from, and what it is for. After a brief look at the history and methods of psycholinguistics, the chapter covers some current themes and controversies in modern psycholinguistics, including modularity, innateness, and the usefulness of studies involving people with brain damage.

**Chapter 2, Describing Language**, looks at the building blocks of language—sounds, words, and sentences. The chapter then examines Chomsky’s approaches to syntax and how these have evolved over the years.