

Introduction

Donald G. MacKay

Jarvella and Deutsch (Chap 3) note that psycholinguistic research has tended to concentrate on perception, rather than on production, or on relations between perception and production, so that neither the similarities nor the asymmetries between speaking and listening processes have attracted much attention (see also Fodor, Bever and Garrett, 1974). When theoreticians have taken note of the fact that at higher levels, language perception and production make use of the same units, content, and linguistic form, they have usually assumed that higher level perceptual processes are simply the reverse of the corresponding production processes, like the bidirectional reactions in chemical formulae. For example, Gordon and Meyer (1984, Figure 1) use a flow chart to summarize current theories of speech perception-production incorporating this 'symmetry assumption': arrows in one direction represent perceptual processes, while arrows in the opposite direction represent production processes.

Symmetry between the processes for perception and production has been a popular assumption (see Fodor, Bever and Garrett, 1974), perhaps in part because it enables researchers to devote all of their efforts to studying perception. If perception and production processes are symmetric, studies of production are redundant and unnecessary: solving the problem of perception also solves the problem of production. Like the separate-and-unequal tradition discussed in Chapter 1, the symmetry assumption subordinates action and encourages researchers to treat listening and speaking as independent systems.

The main point of Jarvella and Deutsch is that the symmetry assumption does not hold in general, and that perception and production processes are asymmetric: Using measures of processing time, Jarvella and

Deutsch show that speakers and listeners process the linguistic structure of a descriptive utterance in fundamentally different ways. This finding is important not just for current theories, but for the more general separate-and-unequal tradition whereby studies of perception-without-action are considered desirable and sufficient.

Whatever its underlying cause, the Jarvella-Deutsch asymmetry must be added to the growing list of asymmetries between perception versus production, which includes the effects of listening practice (see MacKay, 1984), and differences between recognition versus production vocabularies (the fact that children can usually recognize and understand a word long before they can use it in speech production; Clark and Hecht, 1983). Another companion in the list is the maximal rate asymmetry, the fact that speech perception can proceed much more quickly than speech production: Computer-compressed speech remains perceptually intelligible at 5 to 7 times the rate that people can produce speech of comparable intelligibility (Foulke and Sticht, 1969). This rate asymmetry reflects an inherent processing difference and cannot be completely explained in terms of the muscular or biomechanical factors involved in speech production (see MacKay, 1984). Nor does this complete the rapidly expanding list: a comparison of slips of the tongue versus slips of the ear reveals additional asymmetries which theories of perception-production must capture (see MacKay, 1984). As Jarvella and Deutsch point out, detailed theoretical analyses of the processes underlying listening and speaking are not just interesting and important, but necessary to capture the differences between them.

Cutler (Chap 2) takes a different and largely descriptive, rather than process oriented, approach to the relations between perception and production. Cutler argues that speakers make syntactic, lexical, and even phonological choices which are directed by the requirements of the listener for understanding an utterance, and that utterance production depends more on the nature of the listener's perceptual processes than on the production process itself, even in the articulation of phonological elisions and assimilations. Perhaps the producer takes the listener into account on-line in blocking certain phonological elisions, because the listener is there looking on and listening. Or perhaps elision-blocking rules, originally learned or invented for the sake of a listener, have become incorporated for automatic execution within the speaker's production system. Processing questions such as these remain to be answered, but are in principle subject to experimental test and disconfirmation. If speakers can be shown, say via videotape, to produce identical elisions and assimilations when talking aloud and on-line to a listener, and when silently mouthing to them-

selves (see Campbell (Chap 7)), one could conclude that an on-line listener is unnecessary for application of elision-blocking rules.

Cutler's paper stimulates another interesting question. Cutler argues that speakers creating new words avoid base-transforming derivations a difficult for listeners to perceive and comprehend (a hypothesis which suggests some easily-carried-out experiments for determining how listeners understand different types of neologism and perceive them under perceptually degraded conditions). The question is why the base forms in so many words undergo radical transformation in languages such as English, German and Russian. What opposing forces at the time of creation have enabled these perceptually problematic base-transforming derivatives to become accepted into the language?

Cutler's most interesting, or as she puts it, radical claim comes at the end of her paper and concerns an apparent exception to her 'perceptual constraint' hypothesis, the fact that speakers virtually camouflage word boundary information which would seem to be extremely helpful for listeners to have. Her hypothesis is that rhythmic stress and intonation provide the missing boundary cues, but exactly what this 'beneficial organizing function of rhythm' is, and how listeners use this information to segment the speech signal into words remains to be determined.

References

- Clark, E. V., and Hecht, B. F. (1983). Comprehension, production and language acquisition. *Annual Review of Psychology*, **34**, 325-49.
- Fodor, J. A., Bever, T. G. and Garrett, M. F. (1974). *The psychology of language*. New York: McGraw-Hill.
- Foulke, E., and Sticht, T. (1969). Review of research on the intelligibility and comprehension of accelerated speech. *Psychological Bulletin*, **72**, 50-62.
- Gordon, P. C., and Meyer, D. E. (1984). Perceptual-motor processing of phonetic features in speech. *Journal of Experimental Psychology: Human Perception and Performance*, **10**, 153-78.
- MacKay, D. G. (1984). The asymmetrical relationship between speech perception and production. *Perception and Action Report #8*. Center for interdisciplinary Research, University of Bielefeld, FRG. Also in press in H. Heuer and A. Sanders (Eds) *Tutorials in Perception and Action*. Hillsdale, NJ: Erlbaum.