

**Philip Lieberman**, *The speech of primates*. *Janua Linguarum series minor*, 148. The Hague: Mouton, 1972. Pp. 133.

I am all in favour of having collections of an author's work brought together from a range of periodicals whose discovery would take one throughout all the floors in a library – but only if the theme is genuinely specific and coherent, and only if editorial time and effort has been spent on welding them together into a presentable whole. In the present case, the thematic autonomy of this volume is well-justified; but its presentation leaves a lot to be desired.

Lieberman has added an Introduction to two of his own papers and four co-authored papers published between 1968 and 1972. The first is a comparative spectrographic and oscillographic study of a set of vocalizations of captive rhesus monkey, chimpanzee, and gorilla, related to human speech; the second is largely a spectrographic study of neonatal cries, with an end discussion that compares them in general terms to non-human primates; the third is a detailed study of the vocal tract limitations on vowels in non-human primates, with particular reference to the rhesus monkey; the fourth is a primarily methodological review of the use of the acoustic theory of speech production in the analysis of primate vocalizations; the fifth is a comparative study of the anatomical characteristics of Neanderthal man, newborn and adult human; and the sixth recapitulates this, adding a comparison with chimpanzee.

The work reported has both negative and positive value. It first provides evidence and argument which helps to squash some of the fallacious assumptions about the basis of human speech. Secondly, it provides a novel and closely argued account of the relationship between speech, ontogenetic and phylogenetic development, and indicates a number of points of departure for future study. In the Introduction (6–7), three main themes are outlined: (i) 'adult homo-sapiens has a species-specific vocal tract that is necessary for producing the sounds of human speech . . .'; (ii) 'the human vocal tract evolved for the function of speech . . .'; and (iii) 'the evolution of human speech is explicable in terms of the Darwinian process of mutation and natural selection', i.e. it 'must have evolved from a form that is similar to the non-human primate'.

Theme one really contains two points: the issue of species-specificity, and that of necessity, i.e. that human sounds REQUIRE a complex production apparatus, such as is found in the human vocal tract. Lieberman points out that there are many statements which deny both these implications – stating either that animal sounds are often similar to human and are sufficiently well developed to permit the articulation of words, or that some alternative quite arbitrary system of sounds would do just as well (101–2). Lieberman's arguments deny both implications, but they focus on the evidence for and against the first: 'the nonhuman primates would not be capable of producing human speech even if they had the



requisite mental ability. Unlike man, [they] . . . do NOT appear to change the shape of their supralaryngeal vocal tracts by moving their tongues' (28–9). For anatomical reasons (e.g. the size and position of the tongue, and especially the range of possible variations in pharyngeal cross-sectional area, negligible in primates), primate vocal tracts 'cannot assume the range of shape changes characteristic of human speech' (31); they also lack laryngeal control, such that the output tends to be aperiodic (34). The argument of papers 5 and 6, for instance, is essentially as follows: given the limiting articulations for human speech of the universal vowel triangle [i, a, u], then the corresponding limitations on speech production of other species can be studied by determining the largest vowel triangle that its articulatory system is capable of generating (114). The vocal tracts of Neanderthal man and chimpanzee were reconstructed on the basis of the comparative anatomy of skulls, and compared with adult and neonatal modern man. A computer-generated model of the human vocal tract was constructed, and the formant frequencies of Neanderthal and chimpanzee that best approximated the human vowels were computed, scaled and inserted. The resulting overlapping and confusion of the vowel areas indicated that these species would be inherently incapable of producing the required range of sounds. Possible counter-arguments are also discussed – for example, the auditory transcriptions of ape calls, and the like, in which diphthongs and other symbols are commonly used. Lieberman discusses an example of this in paper 1: he argues, convincingly, that the apparent change in vowel quality in a sound transcribed /aw/ is due to a change in the energy content of the waveform rather than to a change in the configuration of the supralaryngeal vocal tract. The most one can say about primates is that they 'have the anatomical ability to control some phonologic features like voicing, nasality, and lip rounding' (74) – though whether they might be being used in any genuine phonological sense is of course undeterminable without appropriate ethological study.

A particularly compelling point arises out of the comparison between the primates and neonatal man (papers 2, 5 and 6). It shows clearly that neonates are very similar to primates in vocal behaviour. They 'start life equipped with a vocal tract that differs from that of the adult . . . in configuration as well as in size' (49), and which is similar to the primate's in many laryngeal respects, e.g. the height of the epiglottis, the size and position of the tongue, the dimensions of the upper pharynx. The comparative anatomical study that introduces Neanderthal man into the discussion – which I found the most interesting paper in the book – underlines this point. This paper shows how many of the obvious differences between the skulls of newborn and adult man, and Neanderthal, are primarily a function of the disparity in size: drawn equally, and viewed laterally, Newborn man more closely resembles Neanderthal than Adult man (79–80). The similarities are indeed striking, and they prompt many questions; in particular Lieberman asks (51) when and under what conditions (he does not



ask why) do human infants go beyond the non-human stage? Such questions can only be answered by longitudinal studies of vocalization in the first year of life; and comparative anthropological studies are also needed, to take account of the not inconsiderable amount of skeletal variation the world over.

Lieberman's second theme is well argued. His data, especially in paper 1, reinforce strongly the view that the mutations in humans that make speech possible have brought with them a loss in the efficiency of other 'vegetative' functions, e.g. respiration, chewing, safety mechanism against choking. This is of course contrary to the myth that speech production is a by-product of the use of devices whose primary purpose was eating and breathing – a view which can be traced back to the seventeenth century, and which is still uncritically taught. The main comparative point that has to be made is that the human larynx on the whole is a relatively unsatisfactory mechanism for respiration, etc., as it has developed – as instanced by the number of fatalities from choking each year.

Lieberman's third theme is the least well-treated, as one might expect: making 'valid inferences on the evolution of human language by studying the evolution of the human vocal apparatus' (3) is at best a speculative and risky exercise. One accepts the presence of a fair amount of speculation in a book on this topic, of course, but one would like to see it introduced as succinctly as possible, and not over-stated. I was unhappy on both these issues in this book. For a brief example of the first point, I would cite the expository redundancy (6). 'The total picture that emerges is one in which the anatomical structures that are necessary for human speech production and the neural mechanisms that are also necessary for human speech perception developed either coevally or sequentially' – which I read as the assertion that either they developed at the same time or they did not! The second point, over-statement, is particularly unfortunate, as it is so unnecessary. Lieberman's opening page, for example, begins with an apologia for his title (viz. 'Speech', as opposed to, say, 'Vocalization'), and rapidly modulates into an attack on the view that language is (a) a 'uniquely human behavioral attribute', and (b) 'the result of a special act of creation'. He then says that his studies refute this uniqueness view. Well, of course, his studies do not do any such thing. They do not seem to bear on his first point at all (indeed, I am unclear why he makes it, as his whole argument is in support of a species-specific conclusion); and concerning the second point, at best he has only provided a persuasive argument for taking an (*N.B.* not *THE*) evolutionary hypothesis seriously. It goes too far to say that 'modern man's speech-producing mechanism has CLEARLY evolved, through the Darwinian process of mutation and natural selection, from an ancestral form that is similar to the vocal apparatus of living non-human primates' (3, my emphasis). This he has not shown, nor can show, at present. He himself admits that we know nothing about the 'bridge' that has to be built between the older fossil hominids and modern man (37), and it is difficult to see how one can in principle get at such information as the phylogenetic nature



of rapid articulatory movement or the relationship between skeletal structure and soft tissue, which are essential to any argument.

Again, there is over-statement about the neglect and significance of phonetics. 'Linguists have . . .', he says, 'tended to ignore the phonetic level of language and speech production. The prevailing assumption is that the interesting action is at the syntactic and semantic levels, and that just about any sequence of arbitrary sounds would do for the transfer of linguistic information' (122). Apart from this being unfair to many, two points need to be made. Firstly, Lieberman gives no argument AGAINST the importance of syntax and semantics; and indeed these areas seem very close later (39) when he talks about 'the two necessary conditions for the presence of speech and language, output mechanism and central mental ability'. Secondly, and more important, I do not see how 'Human language depends crucially on the ability of all human beings to produce and to perceive the sounds of human speech' (1). How does 'crucially' relate to the previous quotation? Of course, it depends on what 'depends' means: but as Lieberman admits that language is possible in the absence of speech, the encoding process being simply less rapid and efficient, the force of the point is much reduced.

As I suggested, there are many valuable insights in this book, but their organization obscures. Little attempt has been made to make a consistent editorial presentation (some papers have abstracts, some do not; footnote and reference styles vary), and there is an unacceptable amount of repetition between the various papers. The acoustic theory of speech production is introduced and summarized some five times, and there are many comparative anatomical summaries on identical lines. Some of the figures have been cut out (of paper 4), to avoid repeating those already provided in papers 1-3, but no page cross-references are given. Part of the cost of this volume might have been better spent on such editorial matters, instead of, say, on such expensive paper. Lieberman's argument would have come across much better if he had rewritten the papers into a single book on this topic. As it stands, far more time than is necessary is needed in order to extract its essence.

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