

A writing, a fact that we literate investigators tend to underestimate. Today we are building the information superhighway, and for several millennia the written word has been a primary medium of cultural transmission, but for at least a thousand millennia before that, the main medium of information transfer from generation to generation was the well-beaten path of word of mouth. Language was already a highly refined biological product, complete with all its modern appurtenances, long before writing was invented.

Unlike the illiterate of today and yesterday, we don't just hear language; we see it, neatly broken into words separated by spaces, strung out in speaking order across visual space. This view is as much a triumph of artifice as the view we get of the moon through a telescope. In the Fifties, Albert Lord recorded the illiterate bards of Yugoslavia, relict masters of the oral tradition's ancient mnemonic arts. When he interviewed them about specific 'words' and 'lines' of their epic poems, they were baffled. These bards had a sense of 'sound groups', but their productions were not readily analysable by them into words, lines, sentences. Of course, their sound streams were analysable into the standard grammatical categories, but this analysis is a sophisticated product of 'science': it breaks language down into elements that are not directly 'given' in perception, even though the adept rely on recovering just such perceptual cues to guide their own practices.

The science of linguistics has slowly evolved over several millennia, if we count, as we should, the pioneering (and sometimes strangely stumbling) attempts at analysis by such early masters of self-consciousness as Plato and Aristotle. What was a word? How could meaning reside in a sound? Why are some sequences of words better than others, and how many dimensions of comparison are there? Some utterances are false but beautiful, others are true but ugly or boring, and still others are not even up to being true or false – they are nonsensical or incoherent, or ungrammatical. How can this be? Grammar and logic and rhetoric and poetics all took their proper places as parts of the systematic analysis of language, but it was only in the 20th century that the various phenomena of language began to come into focus. And once that happened, linguistics was ready for its Newton, or its Einstein: Noam Chomsky. Building on the foundations provided by earlier logicians and linguists, Chomsky showed how the protean complexities of language could be analysed – along at least some of their dimensions – with mathematical precision.

The most striking discovery Chomsky made was that we were misled by the view of language we got through the prisms of writing. Words are not just beads of sound strung together in a line, with tiny gaps of silence in between. The processes that generate the sentences we speak and the processes that parse or analyse the sentences we hear have a beautiful structure inaudible to the naked ear and invisible to the ill-clothed eye of the literate speaker. It is the structure of a tree, with a trunk and branches, not a string of pearls.

Chomsky's slender 1957 book, *Syntactic Structures*, was an application to natural languages such as English of the results of an ambitious theoretical investigation he had undertaken into the logical space of all possible algorithms for generating and recognising the sentences of all possible languages. In this book, Chomsky introduced early versions of

## Wired for Sound

Daniel Dennett

### The Language Instinct: How the Mind Creates Language

by Steven Pinker.

Allen Lane, 493 pp., £20, 11 April, 0 713 99099 6

### Patterns in the Mind: Language and Human Nature

by Ray Jackendoff.

Harvester, 256 pp., £11.95, 1 October 1993, 0 74500 963 7

his new grammatical formalisms for language, and thus was born the modern science of linguistics. Soon the intellectual world was abuzz with rumours and myths about this arcane new field of language-chemistry. Was it, as many hoped, a passing fad? Or was it the beginning of the end for the non-scientific, 'humanistic' study of languages and the magnificent things we make out of them? For a while there in the Sixties and Seventies, if you wanted to study language, you had to take sides. Were you 'for' Chomskyan linguistics or 'against' it?

In my own field of philosophy, the rise of Chomsky tore apart one of its most popular 'disciplines': the philosophy of language. It simply ended the reign of the informal set of practices known as ordinary language philosophy, allowing a few important ideas to survive as founding elements of a new sub-discipline called pragmatics: J.L. Austin's analysis of speech acts, and H.P. Grice's analysis of 'conversational implicatures'. Those philosophers of language with a taste for formalism generally took to the new linguistics with enthusiasm, some abandoning their professional titles as philosophers to become linguists, and others serving, to this day, as useful bridges between the disciplines. As one who has often tried to play this bridging role, I must admit that it has not been at all comfortable, for the communication gap has steadily widened over the years. The triumphalism of the Chomskians, their haughty attitude toward the benighted boos who thought they could say anything worth saying about language without first mastering the latest daunting dialect of Chomskysese, and the bewildering infighting among the rival schools of thought, eventually discouraged most philosophers from paying further close attention. What had seemed at first to be a major, unequivocal scientific step forward soon splintered into vicious wrangling over technicalities that put one in mind of Ptolemaic epicycles. We tended to avert our eyes, hoping that a clear victor would emerge in due course.

The other neighbouring disciplines of cognitive science – psychology and psycholinguistics, neuroscience, artificial intelligence – have passed through similar incommunicado periods. The general attitude among cognitive scientists has been that since the linguists seemed to think they could do it all without benefit of controlled experiments (they just consulted their grammatical intuitions, which had long since been sullied by their own theories), and since they thought the brain was irrelevant, they could just go off and play their mandarin mind-games among themselves, while the rest of us got on with solid, lab-based science. The relations between the linguists and the others in cognitive science, which started off so well, have not been cordial in recent years.

Chomsky himself should be held partly responsible. He is a master polemicist with an apparently irresistible thirst for combat, and his particular brand of rhetoric, which begins with cleverly unsympathetic caricatures of the opposition, and proceeds to heights of howling ridicule, has been adoringly aped by many of his followers. But I think those days and those bad manners are coming to a close, thank goodness.

We now have two new books that handsomely repair the damage, lucidly telling the

world – not just cognitive scientists – what those people in linguistics have actually discovered about our dear darling, language. Both books explain, with vivid examples, just how linguistics has made and confirmed its surprising discoveries, and both surefootedly open up the huge space of wider implications about the human mind that linguists have always proclaimed to be the ultimate fruits of their inquiries. Ray Jackendoff, one of Chomsky's star pupils but always a brave and independent thinker who never got swept up in the various intrigues and manias, and Steven Pinker, one of Chomsky's star colleagues but also one who has staunchly resisted the local strains of contagious hysteria, have each written an accessible, entertaining, authoritative introduction to the modern science of language.

Both books present accurate surveys of the current cutting edge in linguistics, and explain how it was created. Comparing their respective coverage of the various topics is gratifying, for they agree right down the line, not only on the facts, but on the bearing of the facts on the larger issues. For everybody who works in these fields, this is in itself an enormous contribution, for as I have already told both authors, I don't think either book taught me any facts about linguistics I didn't already know, but until I read the books I didn't know I knew them. I would not – and should not – have trusted my own judgment. Thanks to their books, a sturdy, reliable, detailed version of the fruits of linguistics will finally become available to those who cannot devote a career to figuring out which authorities to believe about the prospects and fates of which theories.

Both authors describe the theoretical importance of research on the natural languages of the deaf, such as American Sign Language, and they also draw much the same conclusions from important studies of language pathology due to brain damage, and language acquisition under abnormal circumstances. In the course of this, they confirm in great detail what should always have been obvious, but was often contested in the heat of battle: a good science of language will unify research in linguistics, psychology and neuroscience.

What are the differences, then, between the books? Pinker's is almost twice as long, and includes fascinating excursions into somewhat more far-flung curiosities and controversies. I particularly recommend his witty – but not mean-spirited – debunking of the 'language-mavens', those self-appointed authorities on the proprieties of language who have worked for centuries to get us all to give ourselves airs when we use words. Pulling the rug out from under these well-meaning scolds is not the independent digression into social criticism one might think: Pinker grounds his criticisms firmly in the undeniable facts about language as a biological phenomenon that have emerged in recent research. He introduces the topic with a deliciously apt comparison: 'Imagine that you are watching a nature documentary. The video shows the usual gorgeous footage of animals in their natural habitats. But the voice-over reports some troubling facts. Dolphins do not execute their swimming strokes properly. White-crowned sparrows carelessly debate their calls... Who is this announcer, anyway?' Yes, a grammar is a normative system, which quite sharply distinguishes between proper

and improper combinations, but it is also a natural phenomenon, designed over the aeons by evolution. The comically short-sighted attempts by old-style grammarians to give Mother Nature a little assistance in the quality control department betray a fundamental misapprehension about language that Pinker seeks – successfully – to dispel.

Both authors agree in large measure on the implications of linguistics for models of how the human mind works. Pinker emphasises the multiplicity of semi-independent cognitive gadgets that compose the mind, while Jackendoff emphasises the overarching unity of some of the design features of these gadgets; but this hardly counts as a disagreement, except perhaps for the somewhat different strategic morals one might care to draw about what to investigate or model next. What they agree on is much more important: the hard evidence that the brain systematically transforms mental representations or structures of data as coded in the brain. (Most of these are representations that you and I are not directly privy to via introspection, by the way.) Some of the more cautious investigators in neuroscience have been particularly sceptical of 'cognitive' models, which airily postulate various systems of internal representation that get transformed and processed in various ways. It is certainly true that cognitivists have often gone overboard in their enthusiasm for ill-grounded and fantastical models of information-processing purportedly going on somewhere or other (who cares where) in the brain, but underlying these excesses is a solid body of work that establishes beyond any reasonable doubt that the brain does engage in a host of processes that can be described and predicted by such representational models – and only by them. Jackendoff is more concerned than Pinker to meet the sceptics about representation head-on, so those readers with conceptual or philosophical scruples about the very idea of internal systems of representation will obtain their satisfaction more directly from Jackendoff.

Linguistic phenomena are not the only mental phenomena that fall dramatically into place once we reconceive of them in such representational terms, but they are among the clearest, and they thus provide an excellent base for further operations. Each system of representation has a format or structure that puts quite specific demands on what can be represented within it – its grammar, in an extended sense. Jackendoff's book is built around a single theme with variations, developed first for language and then for music (he is himself a professional musician and the author of important theoretical work on music). He then turns the same analysis to vision, and – the top quark of psychology – thought. In each domain we discover the same theses either already confirmed or well on their way to confirmation. First, the Argument for Mental Grammar establishes that for the domain in question 'our ability to make sense of novel stimuli is supported by a set of abstract patterns that are specialised for that domain.' Second, the Argument for Innate Knowledge establishes that 'we learn the patterns we do in part because our brains are genetically programmed with substantial aspects of these patterns in advance.' Third, the Argument for the Construction of Experience establishes that our experience and understanding of stimuli in each domain 'is actively constructed by our minds, making essential use of the abstract mental patterns specific to that domain'.

Pinker would agree with all these claims, and would add that it is not just a happy accident that our minds should be structured this way: evolution has designed various semi-independent mechanisms in our brains to perform these tasks in these highly effective ways. In stressing this further Darwinian step, Pinker is trying to repair one of the other unfortunate cracks in the bridge between disciplines: Chomsky has always been strangely

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unwilling to consider evolutionary theorising about why the structures his linguistics was uncovering should be designed the way they were, and it has been *de rigueur* among linguists to ignore – to the point of hostile rejection – all evolutionary thinking in their disci-

pline. Linguistics should be more like physics than like biology, they have said, with the master, and language is unlike anything else in the universe, as if it were a gift from God.

Those days are over, too. It is a joy to witness, at last, the promise of linguistics ful-

filled, not quite the way its own heroes anticipated, but – as one would expect – even better than they had imagined, thanks to its joining forces with its neighbours. Now we can get on with it, noting with a historian's tolerant eye the biases that prevented the pioneers

from seeing all and only the strengths in their own work. And now, we can present to a still anxious world of outsiders a front that is more calmly united, not by a particular scientific ideology but by a cornucopia of results. □