Grammatical Man — Information, Entropy, Language and Life *by Jeremy Campbell*
(Penguin, Ringwood, Vic., 1984) pp. 319, $10.95(pb), ISBN 0 14 022504 8.

If the purpose of this book is to stimulate the imagination of people who have never come across information theory, then it will probably succeed admirably. Jeremy Campbell is a journalist and he writes with all the enthusiasm of a reporter hot on the trail of a story; in this lies both the strength and weakness of the book, as his opening words in the foreword suggest.

> This book is an attempt to tell the story of information theory and how it evolved out of the ferment of scientific activity during the Second World War. The results of this wartime research were not simply to redefine a word which had long remained tantalizingly vague. Rather, an entirely new science was born, making it possible to examine intractable problems from a higher vantage point of knowledge. (p.11)

If your eyebrows went up at this point, because you had not given information theory such a grand place in the scheme of things and feel as though you may have missed something important, don't worry. You are at least one step ahead of Mr. Campbell, whose enthusiasm for the intellectual apple he has just discovered has almost completely blinded him to the fact that many others have taken a bite out of the same fruit and come away with indigestion rather than knowledge.

This is not a critical history of the influence of information theory on research and intellectual life in the last half of the century, but is a celebration of the many who have applied ideas about information processing to problems in their field — however loosely or unsuccessfully. The author seems well able to ignore critical reservations even if they come from the founding fathers. He quotes Shannon's admirable caution, when after a decade of public interest in his work, he wrote that information theory "has perhaps ballooned to an importance beyond its actual accomplishments. . . Seldom do more than a few of nature's secrets give way at any one time". But, undeterred, Mr. Campbell goes on:

> Yet it was clear from the very beginning that the theory shed light on deep fundamental questions well beyond the scope of radio engineering. It intruded into many intellectual domains, bearing on paradoxes unsolved for centuries suggesting a new perspective on problems that philosophy had wrestled with all through its history. (p.17)

Clearly there is no point in letting arguments or facts get in the way of a good story! What follows is a well written if at times loose, exaggerated and inaccurate account of information theory and its applications.

Part One, 'Establishing the Theory of Information', contains a mixture of biographical anecdotes about the main founders and one of the clearest accounts I have seen of the ideas which surround the mathematical theory of communication. Unfortunately the author stops short of presenting the actual mathematics of the theory. Since the formulae and their derivation are reasonably simple and certainly elegant, this is a shame. They would have been appropriate for a non-technical book and would have given the reader some further insight into why the theory was so enthusiastically applied. The

formulae would have also shed light on a number of issues that have continually dogged the useful application of the theory. When Shannon and Weaver used the term 'information' they were doing so in a precise mathematical sense which could only be applied to finite systems in which the units to be measured were discreet known entities. One of the problems that has continually prevented anything other than a loose application of the ideas behind the theory is that it is not clear, outside electronic engineering, what are the units to be measured; this is particularly the case in areas such as language, picture perception or even biology.

Part Two, 'Nature as an Information Process', begins to explore the applications of information theory to biology and linguistics, but it becomes quickly apparent that Campbell is using a much more generalised notion of information than was ever present in the original theory.

> Once the genes are seen as information first and chemistry second, once their all-important role as symbols is recognized, then the barriers dividing one science from another come down. Chemistry no longer owns exclusive rights to the genes. They become one of the different kinds of symbol systems, including the very rich and expressive system of human language. (p.91)

Such a broad notion was expressed by Charles Sanders Pierce at the turn of the century in his development of a theory of semiotics and was already part of the intellectual climate into which information theory was born. The book is littered with semiotic ideas, but incorrectly attributes them to information theory. What may come as a surprise to students of linguistics is the way Chomskyian linguistics is slotted into the grand progression of information theory and, according to the author, provides a complete and satisfactory account of language, albeit with the qualification that it is "still open to vigorous debate" (p.97). There are many such distortions where the author seems to ignore unresolved debates in favour of a clear narrative where the heroes are great thinkers and the villains are paradox, doubt and ignorance. Unfortunately our intellectual life does not yield quite so easily to such journalistic schemes and by the half way mark this easy style could become irritating.

Part Three, 'Coding Language, Coding Life', continues the progression of ideas from Chomskyian linguistics and introduces some ideas about biological evolution which are certainly fascinating but beyond the competence of this reviewer to comment on.

Finally in the fourth part, 'How the Brain Puts It All Together', the level of generality goes to theories of mind, knowledge and society. The most useful chapter in this part, 'The strategies of seeing', once again shows Campbell at his best — explaining a set of abstract ideas in a lucid and lively style. The radical ideas of the late J. J. Gibson on perception deserve to be more widely understood and debated, and Campbell does an admirable job in drawing out their main features and implications. The chapter is only marred by the neglect, after an all too brief introduction, of the ideas of R. L. Gregory, which would have provided a sharp contrast to Gibson's position. Predictably there follows a chapter on dreams and then the obligatory chapter on left and right hemispheres.

The final chapter (on social theory) and the Afterword (linking Aristotle with DNA) reveal how information theory conveniently supports the

contemporary mythologies of information technology and pluralist democracy.

> The new information machines make people aware of variety. More than that, the machines are agents of variety; they can both stimulate and satisfy a demand for it. . . The lesson of information theory is that choice and constraint can coexist as partners, enabling a system, be it a living organism, a language, or a society, to follow the arrow not of entropy but of history. (p.265)

It is comforting to know that we have the best of all theories as we move towards the best of all possible worlds.

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The Management Implications of New Information Technology *edited by Nigel Piercy*
(Croom Helm, London and Sydney, 1984) pp. 299, $33.95, ISBN 0 7099 2073 3.

This is a difficult book to review in that while it raises and explores a variety of the issues generated by new information technology for the corporation and its managers, it is too restricted in its perspective: restricted in the sense that the contributors, by operating within a framework of management and the corporation as it is, leave some critical issues in abeyance. In particular, issues such as the potential for global bureaucratisation (i.e., new forms of worker and consumer domination) and the impact on older concepts of managerial legitimacy (i.e., with information accessibility enhanced, the rationale for managerial authority may be eroded) receive only slight attention.

The orientation of the bulk of the book's contents is more toward the conventional mechanical and engineering aspects of new information technology. While some weight is given to the 'employment impact' and to 'changes in work practices', the conclusions are no further advanced than those of the earlier soul-searching on the consequences of automation.

In other words, while the formal, mechanical and trade union related problems are canvassed, the human impact on people at work — at all levels in the heirarchy — while of dramatic economic and social importance, is left in the too-hard basket. Possibly this omission is a problem inherent in collections of papers. A real discipline is lacking as each author explores his own narrow field.

I am suggesting that a crucial question raised by the new information technology is either avoided or not raised by the editors and contributors: what are the mainsprings of technology choice and innovation within the firm? Is it a choice concerned with cost reduction or is it more related to control or disciplinary techniques over employees and over the organisation. Also, I become a little uncomfortable with the contributors general