

internal fertilisation requirements since they have to settle sufficiently close together for this to occur (D. J. Crisp, University College of North Wales). Although external fertilisation occurs in the sessile marine gastropod group of the vermetids proximity seems equally necessary for their survival (R. N. Hughes, University College of North Wales). Reproduction is not, however, so basic a factor as environmental conditions in the spacing of serpulid worms since the same species may occur singly as well as in aggregations (H. A. Ten Hove, State University of Utrecht). This is also shown by clustering of serpulids in Ardbear Lough, County Galway, where they aggregate densely on restricted areas of suitable substrate in otherwise favourable parts of the Lough (D. W. J. Bosence, Goldsmiths' College, London).

The final paper of the meeting (J. C. Coulson and F. Dixon, University of Durham) linked coloniality and sexual reproduction in a study of kittiwake colonies in which the protection and stability afforded by colonial association supports successful and constant breeding pairs in inner areas whereas in outer areas of colonies breeding and adult survival rates are lower and divorce rates higher. Even so the system is not inbreeding because young birds are recruited from other colonies.

The role of suspension feeding in coloniality is important for echinoderms (G. F. Warner, University of Reading) and invites generalisation for other groups also. Suspension feeding allows crowding of aquatic benthonic organisms but, as in the case of starfish, dense aggregates may be a predatory response to food shortage.

Competition for space was mentioned by many contributors but discussed in its own right by J. B. C. Jackson (The Johns Hopkins University). In an analysis of the relative success of species on hard substrata of tropical reef environments the particular success of corporate colonial organisms in two aspects essential for establishment was emphasised—effectiveness in competing for space (outward growth) and effectiveness in establishing a particular level in the water column for food supply (upward growth). Thus colonials always prevail over solitaries even though colonials generally settle later. Solitary sedentary species hold their own if they aggregate in the ways described for barnacles, vermetids, rudists and serpulids, or if they grow upward.

For the four main themes of the meeting the starting point is cooperation. In marine organisms this is made possible (necessary for some) by the suspension feeding habit. Sedentary marine organisms must also compete for space. Alternatively competition for

space also leads to gregarious coloniality which arises when sexual reproduction rather than cooperation alone may be significant. Such generalisations derive from consideration of the groups referred to at the meeting. These also included coelenterates, ascidians and graptolites but not social insects, fish schooling behaviour or gregarious and social behaviour in mammals. Perhaps cooperation, space competition, feeding and reproduction are also consistent themes which can be carried through to the most complex colonial/social species of all, *Homo sapiens*. □

## Informatics

from Kevin P. Jones

Informatics 4, organised by the Aslib Co-ordinate Indexing Group, was held on April 5–7, 1976 at the University of Lancaster. The proceedings will be published by Aslib.

THE original Russian definition of informatics, by Mikhailov, Chernyi and Giliarevskii (*Osnovy Informatiki*, Moscow, 1968), that it is the learned discipline which studies the structure and properties (but not the actual content) of scholarly-information activity, its theory, history, methodology and organisation, provided the starting point for several papers. If this definition is taken with R. A. Fairthorne's assertion (*Informatics 3*, Aslib, in the press) that the target for informatics should be the automation of skills based on linguistic experience, together with the fact that the conferences have been deliberately interdisciplinary, then it should be possible to gain some impression of what the *Informatics* conferences have set out to achieve.

The inter-relationships between linguistic structure and meaning have provided a dominant theme through all the conferences. These may be traced in Margaret Masterman's (Cambridge Language Research Unit) contributions, which have developed the hypothesis that as it is now technologically feasible to store what amounts to a 'library' on magnetic disks then it is desirable to develop techniques for extracting information from them while retaining its original meaning. Her theory has explored the automatic partitioning of text by the use of rhetorical figures and the applicability of LIST processing languages, notably LISP 1.5, to semantic structures.

The analysis of structure within large textual units was explored by W. John Hutchins (University of East Anglia). Clearly the elucidation of this structure

must form the basis for decisions on what a text is about in both manual and automated systems. Interestingly, this paper, which had been developed from the standpoint of indexing need, shared common ground with Yorick Wilk's (University of Edinburgh) exploration of frame theory from artificial intelligence: both commented on story structures. Wilks was critical of frame structures, particularly those which attempt to map the system's (or robot's) environment as the structures tend to alternate between inadequacy and over-complexity. It is clear that it is going to be extremely difficult to mirror by machine man's ability to focus on his environment and correlate this with earlier experience.

Two lively interactive systems were described. One was developed at the University of Aston by John Fisher (Herriott Watt University) as part of his development of a *Functional Theory of Language*. Verbs, notably an explicitly performative class, achieve an unusual prominence in Fisher's theory and careful categorisation of these has enabled highly inferential programs to be written which are capable of generating a genuine man-machine dialogue. Robert Oddy's (University of Aston) novel approach to information retrieval bridged the narrowing gap between artificial intelligence and information retrieval. Oddy's program replaces normal Boolean search strategies by an automatic modelling technique which attempts to reflect the enquirer's needs by constructing large semantic networks.

The history of the thesaurus, or conceptual wordbook, was reviewed by Tom McArthur (Longmans), from Bishop Wilkins through Roget to the author's *Lexicon of Contemporary English*. Thesauri have been widely exploited in the design of information retrieval systems to provide semantic frameworks for assisting indexing and searching operations.

Informatics originated in the USSR and it was pleasant that Professor Vladuts was present at the conference, from VINITI—his formal contribution consisted of a survey of current Soviet research within information languages.

Fairthorne, who has been closely associated with Informatics in the United Kingdom, has frequently castigated librarians and information scientists for their disregard for theory. Informatics 4 not only showed that a broad base for theoretical development is fully justified, but that the careful application of theory can lead to great improvements in practice. Peter Noerr (British Library) has applied computers to a bibliographical classification using relational operators, an operation thought to be impossible only a few years ago. □