SHORT COMMUNICATION

USE OF THE PICTOGRAPH

by R. M. C. EAGAR

IN their recently published book, 'Principles of Paleontology', Raup and Stanley (1971) have reproduced four text-figures from an early paper of mine (1947) in which I developed the pictographic method, including the variation diagram, for illustrating and comparing a number of highly variable faunas of the non-marine bivalve genus *Carbonicola* (text-fig. 1). The shells characterize a small thickness of measures in the *lenisulcata* Zone (Westphalian A) of the British Pennine coalfields. Similar pictographs have been subsequently constructed for anthracosiid and myalinid faunas on a number of other Carboniferous horizons by several other workers, including myself. Raup and Stanley, after pointing to the advantages of this method of illustration (which incidentally supplies accurate drawings rather than 'sketches' of the variants), have written, 'The variation diagram, used in conjunction with a carefully constructed pictograph, provides a good first impression of morphologic variation. This method is anything but rigorous, however, because the pictograph is highly subjective and is probably not reproducible by an independent worker. To analyse variation more effectively, we must turn to formal statistical techniques.' The latter are then illustrated with examples from the brachiopods and echinoids.

The three sentences which I have quoted are unfortunate in their implications, particularly with regard to the value of the pictograph in work on non-marine bivalve faunas of the Coal Measures.

The pictograph, with or without the use of variation diagrams (strictly speaking 'distribution diagrams'), was not intended to be an analytic instrument for application to variable communities and assemblages without the supplementation of biometry and statistics; nor has it ever been used by me without 'formal statistical techniques', although the results of these were not always *fully* recorded in the published texts. The pictograph, moreover, was developed to be used equally as 'a first impression of variation' and as an adjunct and supplement to biometry and statistics, which alone cannot deal adequately with the relatively featureless lateral outline of the 'mussel'. The precise position and spread of the figured shells in the pictograph, which has admittedly a subjective element, is immaterial to the fact that pictographic arrangement, if carried out conscientiously, is bound to convey information which is additional to that obtainable from statistics. Essentially this information consists of demonstrable correlations of certain unmeasurable features of shell outline and their varied expression, all of which constitute the morphic trends, and so the 'look' of the fauna. If two investigators worked in isolation on large samples of the same non-marine bivalve community, then their pictographs very probably would differ in certain details, but the message conveyed in terms of morphic correlations would be the same. Confronted later with each

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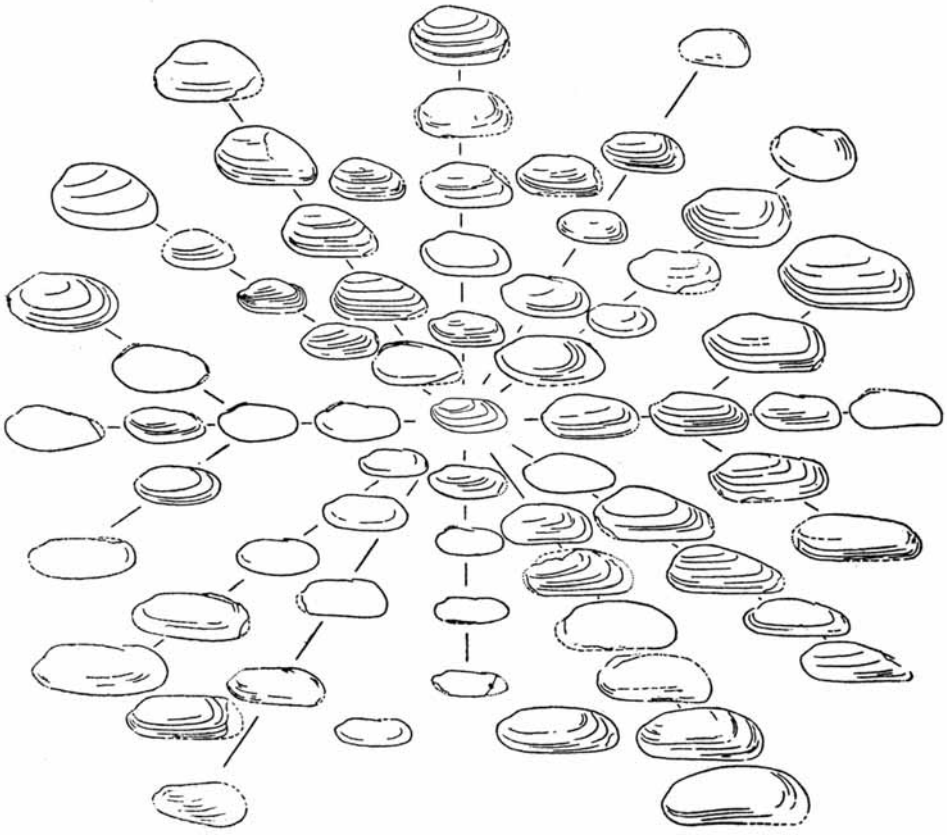
other's work, it is hardly conceivable that they would not instantly recognise their community. With the addition of a few essential results from 'standard statistical procedures' any reader of their publications would also do the same.



TEXT-FIG. 1. Part of 'the standard diagram', a pictograph showing variation around *Carbonicola fallax* Wright (central norm) for shells in the succession above the Soft Bed–Bassy Mine, near the base of Westphalian A, Pennine Coal Measures. All shells ×3/5. (Reproduced by permission of the Councils of the Royal Society of London and the Linnean Society).

Used in conjunction with the formal statistical treatment of the shells, the variation diagram, in my experience, provides all that is required within our particular field of study, that of the palaeoecology, systematics and use of non-marine shells for stratigraphical ends (see also George 1971, fig. 4, although this is a special case). Further attempts precisely to define variation have not generally met with success because of the past existence of small local differences in variational ranges and modes. For instance Leitch's work (1940) on *Anthraconaia* of the *A. salteri-modiolaris-adamsi*

group, in which statistical equations were used to define a biospecies in terms of three related variables, has been shown (Eagar 1968) to be systematically unsound and to rest on an inadequate stratigraphical basis. This does not, of course, mean that similar methods may not sometimes prove applicable to less variable marine biospecies.

In summary, the pictograph, as far as I have developed it, is a specific technique for describing and comparing variation in collections of highly variable Carboniferous non-marine bivalves. As such, used in combination with standard biometrical and statistical procedures, the pictograph makes a larger contribution to the description and analysis of variation than the authors of 'Principles of Paleontology' have maintained.

REFERENCES

EAGAR, R. M. C. 1947. A study of a non-marine lamellibranch succession in the *Anthraconaia lenisulcata* Zone of the Yorkshire Coal Measures. *Phil. Trans. roy. Soc. London*, **B 233**, 1–54.

—— 1968. *Studies of some Upper Carboniferous non-marine Bivalvia and other faunas.* Thesis for the degree of D.Sc. in the University of Glasgow, Paper 45, 35 pp.

GEORGE, T. N. 1971. Systematics in palaeontology. President's Anniversary Address. *Quart. Jl geol. Soc. London*, **127**, 197–245.

LEITCH, D. 1940. A statistical investigation of the Anthracomyas of the basal Similis–Pulchra Zone in Scotland. *Quart. Jl geol. Soc. London* **96**, 13–37.

RAUP, D. M. and STANLEY, S. M. 1971. *Principles of Paleontology*. W. H. Freeman & Co., San Francisco. x+388 pp.

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