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BOOK REVIEWS

The Avalon Terrane

Socci, A. D., Skehan, J. W. and Smith, G. W. (editors) 1990. *Geology of the Composite Avalon Terrane of Southern New England.* Geological Society of America, Special Paper 245. Geological Society of America, Boulder, Colorado, U.S.A. 254 pp. Price $45.00.

Most orogenic belts are complicated collages of terranes of uncertain provenance between continental forelands. Plate tectonic elements can be discerned readily but it is not clear, generally, how individual bits fit together in an evolving plate boundary system. This is a particular problem in the Appalachian–Caledonian orogen where ophiolites, andesites and rift sequences all testify to the operation of plate tectonics during the early Palaeozoic but where a massive post Arenig sinistral component of motion is imposed upon the whole system. Southeast of the 'Central Mobil Belt' (arc and oceanic terranes) of the Appalachian core lies a series of enigmatic 'blocks' or terranes from Georgia to central England that have a number of elements in common; late Precambrian volcano-sedimentary rift sequences and a distinctive Cambrian shallow-marine clastic sequence with a so-called 'Atlantic' fauna. This zone is called, commonly, the Avalonian composite terrane, from its most spectacular development in southeastern Newfoundland. In southern New England, mainly Connecticut, Rhode Island and eastern Massachusetts, the Avalonian rocks, the subject of this volume, are splendidly displayed along fine coastal sections in tunnels, and in glaciated inland exposures (just north of the southern margin of the Laurentide ice sheet).

In the last century, C. D. Walcott recognized that fossiliferous Cambrian rocks in the Boston region bear a close resemblance to those of the Avalonian Peninsula of southeastern Newfoundland. In the 1960s, Tuzo Wilson wrote his classic paper "Did the Atlantic close and then reopen?", one of the inceptive harbingers of applying plate tectonic ideas to old rocks, partly based upon the faunal and stratigraphic similarities of terranes noted by Walcott in the southeastern Appalachians and British Caledonides. Wilson regarded terranes like southern New England and southeastern Newfoundland as "bits of Europe left on North America following the Mesozoic/Cenozoic opening of the Atlantic". In the 1920s, Edward Bailey had noted, with great perception, that eastern Massachusetts and Connecticut are where the Hercynian Belt of 'Europe' crosses the Northern Appalachian–Caledonian belts to become the Central and Southern Appalachians; that is, where an early Palaeozoic orogenic belt is 'transected clockwise' by a late Palaeozoic belt.

This set of 13 papers on the southern New England portion of the composite Avalon terrane is an authoritative, up-to-date and excellent data summary and synthesis of the Palaeozoic evolution of a small but critical part of North America southeast of the Lake Char–Clinton Newbury fault zone. It is not a volume that establishes new principles but rather constitutes an essential source book for those interested in Appalachian–Caledonian evolution. The first chapter, by Nance, is a short incisive look at the whole Avalon Belt of the Northern Appalachians with a Proterozoic volcanic arc interpretation. Skehan and Rast, in the second chapter, develop a systematic analysis of the 'Baston terrane' and a model involving sequential extensional and compressional phases. Chapters 3–5, by Socci, Smith, Thompson and Hermes, focus on the Proterozoic–earliest Palaeozoic history of the region and derive models from detailed sedimentological and volcanic data. Subsequent chapters, in various combinations of Hermes, Murray, Cardoza, Hepburn, Hon, Ross, Durham, Ambers, Wintsch, Webster, Bernitz, Fout and Andrews demonstrate the role and power of trace element geochemistry of plutonic and volcanic rocks and their metamorphic derivatives in terrane discrimination, establishing stratigraphy and characterizing tectonic regimes. The last chapter, by Skehan and Rast, is an excellent synthesis of the Avalonian 'Superterrane' of southern New England in the context of Gondwana-related tectonic fragments and tectonic cycles around the old Iapetus Ocean.

I have enjoyed reading this volume, probably because of my long-term involvement with the Appalachian–Caledonian orogenic belt. It will form certainly an indispensable element of my library to be used as a data and ideas source book and is recommended to all those who believe that basic or orogenic geology will never be subsumed wholly by model building, and that field data still have a role to play in the Earth Sciences.

J. F. Dewey

Oxford, U.K.

Computers and geology

Hanley, J. T. and Merriam, D. F. (editors) 1990. *Microcomputer Applications in Geology, II. Series: Computers and Geology, Volume* 6. Pergamon Press, Oxford, U.K. 303 pp. Price £29.95 ($49.50) hardback.

The first volume of this collection remains one of the few books which, having taken the trouble to write off for an inspection copy, I decided I could not justify buying and consequently sent back. Futhermore, that view was reached wearing my computer-oriented geologist's hat, whilst this review of the second collection aims to evaluate from a structural geologist's viewpoint. Not an auspicious beginning, but I did find rather more of interest in this second volume. I think that few geologists would find it a worthwhile purchase but many could benefit from browsing through it.

The book is a collection of papers describing applications across a very wide range of geological disciplines and using the two commonest types of microcomputer. Of the 22 contributions, 13 relate specifically to IBM PCs and compatibles, eight to Macintoshes and one makes no mention of machine type. The application areas range from a hydrogeologic study of a waste disposal site to the modelling of shell morphology. There are also contributions covering subjects of wide applicability such as Fourier transforms, geographic information systems and the role of microcomputers in geological education. There is just one contribution specifically related to structural geology—"STRANA: A Macintosh computer program for the representation and statistical analysis of orientation data in structural geology" by Barchi and Guzzetti.

The book aims to function on two levels. At its most obvious it provides a forum for the presentation of complete solutions. If a program in the book is exactly what you are looking for then you will want a copy of it and around 70% of the software featured is available, in the public domain, through COGS—The Computer Oriented Geological Society. (COGS Disk Series, PO Box 1317, Denver, CO 80201-1317, U.S.A.) The structural application mentioned above is one of those available from this source. On a second level the book is a store cupboard of ideas for those geologists actively using microcomputers, either by developing their own software or by the use of standard, multi-purpose packages such as spreadsheets.

The STRANA package provides most of the expected facilities for the analysis and display of directional data. Plots of three-dimensional data can be produced using either equal-area or equal-angle projection whilst two-dimensional data can be shown in rose diagram form. A simple eigen analysis of the distribution can be performed but rather surprisingly there is no facility for contouring. The data are input via standard text files. These are organized as one file per "structural station". A station can be either a physical outcrop or a wider area considered to show homogeneity. This approach could lead to a multiplicity of files for a single area and/or to some rather lengthy editing sessions to organize them into sets of homogeneous data. I would prefer to use a package which helped me to decide on areas of homogeneity rather than one which required the decisions to be made in advance.

As for the remaining contributions, I must confess that there are