

can no longer be seen, for example Fig. 13.4 or 15.6. Many of the diagrams have been cloned from the earlier edition and other publications and they are sometimes inconsistent.

There are also a few discrepancies between the chapters which illustrate the speed at which our understanding of the geology of Scotland is progressing and the need for this third edition. Perhaps we should ask the authors to start preparing the fourth edition for the year 2000. The introductory chapter was written whilst the others were in proof and therefore highlights the problems of the time required to prepare such a book. For example, the fossil evidence for a Lower Cambrian Age for the uppermost Dalradian is shown to be less certain than as stated by Johnson in Chapter 5. The Ben Vurich Granite also retains its  $514 \pm 6$  Ma age in the main body of the text of chapter 5 but has a  $590 \pm 2$  Ma age in Chapter 1.

From the point of view of a structural geologist the book provides a useful review of the Caledonides. However, there is little information on the recent developments in our understanding of the structure of offshore Scotland.

Despite these small shortcomings the book is a much welcomed update and a worthy addition to any bookshelf.

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### Flow through rocks

Phillips, O. M. 1991. *Flow and Reactions in Permeable Rocks*. Cambridge University Press, Cambridge, U.K. Price £40, \$59.50 (hardback).

The aim of this book is to bring together a disparate set of treatments of fluid flow relevant to geology. Some of the treatments may be familiar to readers of hydrogeological literature but the author brings in many subjects and generally strives for a more rigorous approach than can usually be found in basic hydrogeological texts. The maths appears hard going but a little perseverance can be worth it.

Chapter 2 deals with the basic physical and chemical principles which the book is based on, starting with geometric considerations of porosity, moving on to consider equations for motion of fluid elements through a matrix and dispersal and diffusion of dissolved species in a fluid with a concentration gradient. Darcy's law and permeability are given a thorough treatment. The chapter finishes by considering balances of energy and dissolved species.

The next two chapters have the theme of general characteristics of flow, starting with flow patterns, stream functions, vorticity and boundary conditions. Some scaling problems are also discussed. Flow patterns around isolated cracks, inclusions and flow along long lenticular layers are next, with flow transients and diffusion-induced flow rounding off this section. Still under the broad heading of General Flow Characteristics, Chapter 4 continues with patterns of reactions considering the approach to equilibrium, isothermal reaction fronts, mixing zones and isotherm-following reactions. This last section, and two other sections in this chapter on mixing and reaction patterns from faults and fractures and enhancement and destruction of porosity, should certainly be considered reading for any structural geologist thinking about fluid flow.

Chapter 5 deals with instabilities in such situations as brine invasion and salinity stabilization. Classic Rayleigh-Darcy type instabilities are discussed with their relevance to geological convection as well as specialist topics such as the important petroleum industry problem of Saffman-Taylor instabilities when a fluid of different density and viscosity displaces an interstitial fluid.

Chapter 6 provides a detailed, concise coverage of pressure-driven flows, more generally covered in the hydrogeological literature, but here dealing with more geological examples such as basin-wide fluid flow and mineralization distribution. The book finishes with a chapter on thermal convection with interesting examples such as submerged banks, convection and diagenesis in sloping isolated permeable strata, reefs and dolomitization.

The text of this book is clear and concise and can be read without rigorously following the mathematics, though the maths should be comprehensible to anyone with higher-level maths. The geological applications are thought-provoking and more meaningful to the general geologist than those found in similar texts written for hydrogeologists or in specialist literature. This book will be useful to those seeking

to quantify fluid flow, but should be read by any structural geologist who is considering fluid flow through rocks/fractures/faults/basins. Its a good starting point to get lots of equations and ideas. Sadly, it may be a little too expensive for Ph.D. students whom it may benefit most, but labs and libraries should certainly have it on their shelves for reference.

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### Capturing discussion on video

*Basin Development and Petroleum Exploration*. Geofilms Video, in conjunction with the Geological Society of London. 43 minutes. £42.50.

Finding myself with a spare evening, I expressed a desire to a colleague to spend a carefree hour or two watching an entertaining video. Unwise to be so unreserved, unguarded, unsuspecting, I was immediately presented with a copy of *Basin Development and Petroleum Exploration* and asked to provide critical comment.

Several moons and viewings later, I find myself still enquiring, "What message does this video champion?" and "For whom is it intended?" The cover informs us that it is "a record of the 1989 William Smith Lecture Meeting on Basin Development and Petroleum Exploration, and is designed to be the centre of discussion on this subject". Viewers expecting carefully edited highlights and action replays of the most revealing science and stimulating moments of the meeting will be desperately disappointed. In fact, the video consists of interviews with seven of the conference speakers that are linked by a rambling narrative from Dr Andrew Mackenzie.

The film fails with distinction. It lacks a coherent theme, has a poorly balanced content, in places misleads and suffers from too many subplots and minutiae. It begins with an obscure, animated cartoon illustrating (I think) plate tectonics and basin evolution that at first, second and all subsequent viewings seems irrelevant, as well as poorly produced. Andrew Mackenzie appears windswept and intensely sincere before backdrops of the Wytch Farm oilfield, the Bridport Sands and undisclosed stormy beach locations in southern England (the latter affectionately referred to as the 'continental margin').

The basic structure of the film leads me to assume the producers have tried to emulate an Open University format, but appear to lack the degree of professionalism or experience required for such an undertaking. The interviews are poorly structured and full of clichés. How, for example, the Bridport Sands relate to footwall uplift or thrust belts is not clear, to me at least. Each of the speakers interviewed, although widely acknowledged experts in their own fields (none of which include acting, apparently), expound their stilted, camera-shy opinions. We are confounded with the axiom "sandstones will deposit in depositional lows", led to believe "all geologists suffer from well-bore myopia" and asked to ponder "is there a place to catch all that oil?". Too many of the interviews appear staged but unrehearsed, expert but amateurish and detailed but introspective. One speaker divides basins into three categories, and then deems this such an obvious fact that he omits to define the three categories. Another argues that geometric and kinematic models of hanging wall geometries offer a means of investigating the evolution of faults in sedimentary basins and "provide a template for interpreting seismic sections". Mostly incorrectly, as all the models were listric.

My most damning condemnation of the film, however, is of the myth the film tries to propagate concerning organic geochemistry. The narrator and two of the speakers try to convince us that organic geochemistry has found more oil in basins than we would have done without it, and that this is the key to successful petroleum exploration. Apparently it's time to return to our "molecular roots". Indeed, "Time for a molecular comeback". Thank goodness for the common sense of John Martin to point out the fundamental importance of advanced seismic techniques and improved seismic interpretation. Not forgetting, as no cynical explorationist would, the significance of the actual market price of the commodity we're all rooting for in the basin.

The text of frames that the film cover advises "are best seen by using the pause or still frame facility on your video recorder" are mostly unreadable. They contain too much information, much of which is not self explanatory, and appear to be copies of the speaker's original transparencies.