

Geology and the New Global Tectonics

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two figure numbers rounded to one significant figure, would be 7×10^4 and not 6×10^4 , c) conclude that the numbers therefore refer to different things, but ask what are they? d) wonder why neither number can be reproduced more closely using the data in table 5.1.

This is not the only section which gives trouble but I have spent considerable time going over it since it is illustrative of what I believe to be the basic weakness of the book. Numbers, equations and assumptions, some justified and some not, too often spring out of nowhere; symbols appear which may or may not have been defined earlier (there are still one or two I haven't been able to find again although they may be buried somewhere), and lack of references in the text often makes it very difficult to determine whether the author is making a quantum jump in logic on his own or relying on the work of others. Numbered equations and a table of symbols would certainly make life easier, and the lack of a good bibliography is inexcusable. The "Reading list" contains seven items amongst which are the *Encyclopedia Britannica* and the *Journal of Geophysical Research* (all of it); some specific references appear in the GI but many of them are difficult to match to the text. In fact this is a book which would require considerable time (certainly more than I can devote) for a very sophisticated student or teacher to unravel in order to make their own assessment of the validity or otherwise of some of the author's end results.

It seems to me that Elder has taken what may well have been a very successful lecturing technique and attempted to transfer that technique lock, stock and barrel into the printed form. Unfortunately, what may be legitimate scribbles and approximations in the classroom, where students can ask questions when the waters become muddy, require tidying up before they get into print.

It would require very little effort to tidy up the numbers and make them self consistent while at the same time preserving what I believe is Elder's main intent - to encourage students to make order of magnitude calculations for limiting cases so as to establish limits on what is reasonable and what is unreasonable.

After all, surely in addition to encouraging students to "think conceptually"

we should also be encouraging them to set out their ideas clearly (as well as concisely) and above all to make sure that numerical supportive evidence is self consistent and reproducible.

In summary, then, the basic idea behind the book is good but in my opinion it is too poorly executed to be worth buying.

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Geology and the New Global Tectonics

By J. Robert Janes
Macmillan of Canada,
468 p., 1976.
\$12.50

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Charles Lyell first published his *Principles of Geology* in 1831. It brought geology into the forefront of science and completely changed the understanding of the earth and its inhabitants. Janes' book may well bring about a change in the study of geology in secondary schools in Canada. A decade ago, the attitude prevailed that geology should be the prerogative of the universities but landings on the moon excited the teenagers. The relationship of geology and environment further advanced the science as a worthy endeavour for secondary schools. The geographer capitalized! The Canadian Geoscience Council produced a report of consensus from secondary school teachers that a textbook was not really needed. The teaching of geology in high schools in Canada is increasing slowly. Several texts produced in the United States are available. But these never cover the Canadian occurrences of earthquakes, the origin of potash deposits in Saskatchewan, the character of the Athabaska tar sands, mineral deposits of the Canadian Shield, and astrophysics which Canada has more than any other country.

The book has 13 chapters which are arranged to capture, first with the

spectacular, the imagination of the young reader. Chapter 1 is devoted to plate tectonics with a text including many "hard" facts which may require modification later. "The North Atlantic is widening at a speed of about three cm/year and the South Atlantic is moving somewhat faster". Numerous simple but comprehensive diagrams show plate distribution, topography of the ocean bottom, and a cross section of the crust with mid-ocean ridge and subduction zone. Chapter 2 on earthquakes leads with a report on the 1964 Alaska event almost in newspaper style, a resumé table of the severest quakes with death tolls since the year 858 to the four major quakes of 1976, and a resumé of earthquakes in Canada. The theoretical explanation of shock waves, seismographs and a resumé of the Richter scale should be adequate for secondary school students. The chapter continues with the earth's magnetic field, a comparison of continental and oceanic crust, isostasy, tsunamis, and earthquake prediction and prevention. (These topics may not seem related but the arrangement is quite acceptable). Chapter 3 covers volcanoes - types, character of lava with chemical analysis, volcanic gases and diatremes. A review of some of the traditional - Vesuvius, Pelée, Kilauea - is followed by a review of volcanism in British Columbia - Edziza, Garibaldi) and also short discussion of volcanic sequences in the Precambrian. Closing the chapter with paleomagnetism in the ocean's floor does seem out of place.

Now with the student firmly in his grasp, Janes continues with the realities of igneous intrusions such as the Monteregian Hills and Muskox, then sedimentary rocks with types and classifications, distinctive features and origins. The discussion of salt domes overlooks occurrences on the Atlantic Shelf and the Arctic but the character of deep sea oozes, with manganese nodules and their recovery, and relationship to plate tectonics is commendable. The chapter on metamorphic rocks covers agents, rock types with discussion of the role of heat, pressure, water and the significance of metamorphic grade. The chapter ends with granitization.

The remaining chapters cover geologic structures, weathering and ground water, erosion, glaciation, time and

fossils, economic and environment geology, and the earth in time and space. The section on mining methods and ore treatment could have been complemented with a treatment of drilling for oil.

Janes writes in a very comprehensive style, sometimes resorting to colloquials - "quartz is a most resistant mineral and tends to hang around for an incredible length of time", "mud over the top of the corals may mean a major storm - a snuffing out of the reefs" and "black-basalt headlands knife out into the lake". All measurements are metric. The illustrations are numerous, regularly spaced on almost every page, and generally of a high quality although some colour transparencies were used for black and white pictures resulting in a loss of definition. The book is remarkably free of typographical errors but the editor is not consistent whether the word data is singular or plural. There is some Canadiana which would have been included - Norman Bowen as author of the igneous reaction series, time subdivisions of the Precambrian, and description of a big oil field such as Leduc or Redwater to complement the two large mines. Some professionals may quarrel with his interpretations but the students should react very positively to this book with its bright orange cover with an attractive picture of some hoodoos.

How can we get a copy in every school library in Canada? Some "concerned" citizens in Alberta will certainly object to Chapter 11 which utilizes evolution. But why not just buy a copy and after you have read it, send it as a gift to the school librarian!

MS received August 5, 1977

Field Geology in Colour

by D. E. B. Bates and J. F. Kirkaldy
Blandford Press, Poole, Dorset, England
 215 p., 1976.
 £2.75.

Reviewed by Robert F. Leggett
 531 Echo Drive
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It is now more than a century ago since Canon Charles Kingsley, a noted Anglican leader in England who was also a

popular writer and lecturer, coined the phrase "Geology is the people's Science." To some extent Geology still does hold this special place in Britain, the continued progress of the Geologists Association (of London), and its excellent publications, showing clearly the widespread British amateur interest in the science. One result of this more general interest in Geology in Great Britain is the continued publication of good books on the science, designed for the non-specialist reader. A new example of such books is so good, and in one respect so unusual, that the writer feels it desirable to bring it to the attention of the Canadian earth science community.

Field Geology in Colour is one volume in the "Blandford Colour Series"; its title came quite by chance to the attention of the writer and he managed to procure a copy. It is, in the first place, the best value for the money (in the field of geological books) that he has ever seen. A well-bound, clearly-printed, convenient, pocket-sized (12 by 19 cm) book, it is distinguished by 156 beautifully printed colour plates. How this can be sold for £2.75 (say \$5.00) is, to a North American, a delightful mystery. It raises interesting questions about some of the inflated prices now charged by some European publishers for their books on this continent.

While clearly intended for the amateur geologist (one of the authors, Professor Kirkaldy, is a Past President of the Geologists Association), the volume could prove of great use to many students of geology. There will probably be many older people who not only will be delighted by the illustrations but may also learn from its pages things that they should have known, as the writer certainly has.

The book starts with a 45-page description of the elements of geological field work, admirable in its clarity and followed by 35 pages giving an equally good guide to rocks and structures to be observed in the field. Sixty four pages contain the coloured plates, the same number of pages being used for adequate descriptions of all the plates, aided (where necessary) by 34 simple line sketches. A few more pages present miscellaneous information such as a guide to field photography. In the introduction, reference is made to the *Code for Geological Field Work* published by the Geologists Association,

another indication of the interest of the British public in Geology.

The colour plates naturally dominate the book. They seem to show every conceivable type of geological structure, soil and rock that would normally be encountered in ordinary field work. As would be expected, the majority of the illustrations show exposures in all parts of Great Britain and Ireland, but nine other countries (and the Channel Islands) are also represented in this magnificent collection. Only two of the 156 photographs fail to meet the general high standard; the views of pillow lava in Plates 119 and 120 are not as "pillow-like" as some exposures that the writer has seen (even in the Isle of Man!); but these are minor criticisms indeed. Plate 15, to mention but one example, is a full-page view in excellent colours which combines varved clay, a glacial drop-stone, foreset bedding, and Gondwana Land, the view being of an exposure north of Sao Paulo, Brazil.

It is encouraging to find so few terms that might puzzle North American readers. The old British expression *drift* is used sparingly, more particularly in mentioning the *drift-maps* of the British Geological Survey. Elsewhere the word *soil* is used as it should be, with *top-soil* also correctly used. The somewhat rare word *Head* is used in relation to solifluction deposits. On the other hand the frequent use of *turbidites*, occasionally in a slightly questionable way, would seem to be almost a reflection of current interest in these sediments on this continent.

All told, it is a thoroughly good book, clearly written, beautifully illustrated, and international in its coverage. One can imagine few better introductions to Geology in the Field than this volume. As Geology continues to regain the recognition in Canada that is its due, readers of *Geoscience Canada* may care to remember that there is this little volume available which can add so much to their own explanations given to recruits to the people's science.