

strating on a manageable scale the operation of many of the fundamental processes studied in structural geology.

REFERENCES

- Gilbert, G. K. 1877. Geology of the Henry Mountains, Utah, United States Geographical and Geological Survey of the Rocky Mountain Region.
- Hyndman, D. W. & Alt, D. 1987. Radial dykes, laccoliths and gelatin models. *J. Geol.* **95**, 763–774.
- Jones, O. T. & Pugh, W. J. 1949. The Laccolithic Series. *Am. J. Sci.* **247**, 353–371.
- Koch, F. G., Johnson, A. M. & Pollard, D. D. 1981. Monoclinical bending of strata over laccolithic intrusions. *Tectonophysics* **74**, T21–T31.
- Pollard, D. D. & Johnson, A. M. 1973. Mechanics of growth of some laccolithic intrusions in the Henry Mountains of Utah. *Tectonophysics* **18**, 311–354.

R. Nicholson

Manchester, U.K.

Guided through the Cordillera

Hill, M. L. (editor) 1987. *Centennial Field Guide: Cordilleran Section*. The Geological Society of America, Boulder, Colorado, U.S.A. 532 pp. Price \$43.50.

Geologists are fundamentally concerned with the study of the solid earth, that is the study of rocks and minerals, their byproducts, and their behavior. Thus, I am pleased to see that as part of the DNAG series of the Geological Society of America is publishing a collection of Centennial Field Guide volumes describing field trips where one can look at classic examples of rocks and their behavior.

The Cordilleran Centennial Guide describes 100 trips in the States of Alaska (nine trips), Arizona (six), California (44), Hawaii (four), Nevada (12), Oregon (eight), Washington (13) and the Province of British Columbia (four). These trips deal with the topics of accreted terranes (12 trips), active faults (14), archeology (one), Cenozoic volcanism (24), economic geology (12), engineering geology (12), geomorphology (41), landslides (6), metamorphic and igneous rocks (37), stratigraphy and sedimentation (61), and structural geology (50). Each field trip guide, 2–6 pages long, includes sections on the site location, accessibility, significance, description and useful references.

Although not a book one would read from cover to cover, this set of field guides is well written and informative. The consistent organization of individual sections and layout of the text as a whole provide a means of quickly finding trips of interest. Clearly the space constraints did not allow for an in-depth discussion of each region. Thus the reader should be aware that some of the interpretations reflect the bias of the author(s), and that other interpretations for some of the areas do exist. But this is a common aspect of scientific writing, and would be hard to get around, given the length of each article. Each guide does provide an easily read, quick overview of an area and lists sources of additional information (including maps, additional articles, and the authors). I think this format will be particularly useful to teachers in search of good field trips, and to anyone interested in learning about new areas in the Cordillera.

I presume space constraints also dictated the number of field guides included. Some 'classic' localities are notably absent, for example the accessible and spectacular Sierra Nevada batholith in California. However, overall I found the text well organized and well written. I think that anyone interested in Cordilleran geology will find this a useful reference book.

The field guide costs \$43.50 in the U.S., and is well constructed with a hardbound cover. The cover consists of a superb photograph showing the eastern escarpment of the Sierra Nevada. I found the price very reasonable given the construction and amount of text.

Scott R. Paterson

Los Angeles, U.S.A.

The Tangshan earthquake disaster, 1976

Chen Yong, Kam-ling Tsoi, Chen Feibi, Gao Zhenhuan, Zou Qijia and Chen Zhangli (editors) 1988. *The Great Tangshan Earthquake of 1976: An Anatomy of Disaster*. Pergamon Press, Oxford. 153 pp. Price £20.00, \$36.00 (hardback).

This book records what happened when an earthquake reported to be $M 7.3$ struck an area of northeast China within which neither seismological nor geological evidence indicated the likelihood of such a major event. Coming only just over a year after Chinese scientists had successfully predicted the $M 7.3$ Haicheng earthquake, the Tangshan shock dealt a blow not only to that city and its surroundings but also to confidence in earthquake prediction in China. That before 1976 Chinese seismologists and tectonicians did not regard the Tangshan area as likely to experience an event exceeding intensity VI on their scale (one comparable to the modified Mercalli scale) was not surprising in view of the evidence available to them. In the event, the maximum intensity recorded during the Tangshan earthquake was XI.

From the perspective of readers of the *Journal of Structural Geology* the principal benefit to be gained from this account of the Tangshan earthquake is the poignant reminder that brittle deformation events are not just ancient and of theoretical interest, but happen today and can profoundly alter peoples lives and the economy of a nation. The main shock of the 1976 Tangshan earthquake occurred at 3.42 a.m. on 28 July during a period of hot weather, which shortly after the earthquake was followed by several days of heavy rain; weather which slowed and hampered rescue efforts. An $M 7.1$ aftershock also caused much additional damage. The focal depth of the main shock was 11 km, wave-front modelling indicating that 120 km of the fault was ruptured. The displacement on the nearly vertical $N30^\circ E$ -trending fault is thought, from ground surface measurements, to have caused 1.5 m of right-lateral slip combined with 20–70 cm of vertical motion. The latter involved the uplift of the block to the northwest of the fault and the subsidence of the one to the southeast of it. Surface breaks, mainly fissures, associated with the earthquake were numerous, but only a few are classified as of tectonic origin. The remainder are interpreted as superficial phenomena related to the liquefaction of 25,000 km² of the alluvial plain.

In addition to geophysical and geological information, and an analysis of the main shock and its aftershocks, much of the book is concerned with describing the physical and social impact the earthquakes had on the Tangshan area. There is a thoughtful discussion of how the effects of future earthquake disasters can be mitigated by planning and the efficient management of rescue services. In this context, the editors (all from the State Seismological Bureau) stress importance of accurate earthquake zoning and urban planning, and also point out the value of a city's parks during rescue operations.

The death toll of the Tangshan earthquake was, according to this book, 240,000 with 7000 families completely eliminated. Estimates by some Western experts of fatalities caused by the Tangshan earthquake were higher, even as great as 1,000,000. Seventy-eight per cent of the city's industrial plant is reported to have been destroyed, together with 650,000 of 680,000 residential buildings. Some damage was even reported from Beijing, about 150 km from the epicentre. Another consequence of the Tangshan earthquake was the spread of earthquake phobia throughout China, with many people, including the residents of Beijing, leaving their homes in the period immediately after the shock.

The half-tone illustrations, though of poor quality, are mainly illuminating and, in some cases, even moving. The captions to a few of the half tones seem inappropriate and propagandist. For example, the caption to fig. 2.3 reads—"A local unit of the People's Liberation Army hurrying to the disaster area", the photograph showing a slightly blurred column of soldiers with shovels over their shoulders running past collapsed buildings. The author's description, in the text, of the efforts of medical staff to carry out emergency operations using makeshift equipment, such as a catheter made from the rubber tubing surrounding copper wire, is, however, both sensitive and vivid.

In summary, although this is a book that records what happened during a tragically disastrous tectonic event, and which heightens awareness of the risks accompanying great earthquakes, it is difficult to identify the market at which it is aimed. At £20.00 for a slim hardback, I suspect there will be few purchasers other than earth science and engineering institutions.

P. L. Hancock

Bristol, U.K.