Geyserland – a guide to the volcanoes and geothermal areas of Rotorua (2002) by Bruce Houghton and Bradley Scott. Geological Society of New Zealand Guidebook No. 13. 48 pp. ISBN 0-908678-92-4

Introduction

The publication in November 2002 of the second edition of the Society's 'Geyserland' guidebook is most welcome. The first edition was by far the best seller of the GSNZ guidebook series (although the special Japanese edition never really took off, figuratively or literally) and this updated version is sure also to be popular. The new guide is very attractive thanks to the wide use of colour photographs and figures, an informative yet readable (and occasionally witty) text, and a pleasing layout and design. The authors Bruce Houghton and Brad Scott are to be congratulated for their hard work and insight. So, too, is Simon Nathan who contributed many of the new, mostly top-quality photographs that make the book especially attractive (there are more than 30 colour photographs in the book, some spectacular). Simon also helped maintain the momentum that ensured the book was published after various delays. The editor and designer, Eileen McSaveney, is also commended for her work. As well as the interesting content and attractive design, the book appeals because it is printed on good quality paper (the 'silky' covers even feel good) and it is perfect in size (B5) for use in the car and for packing in the suitcases of overseas visitors. Finally, it is very reasonably priced ($NZ17.95 incl. GST and postage and packing in New Zealand). For all these reasons, it therefore deserves to sell well.

Content

After a very short introduction about the special character of the Rotorua district, the first part of the book is divided into appropriate sections dealing with (1) volcanism and associated nomenclature, (2) calderas (including descriptions of Rotorua and Okataina caldera systems), (3) geothermal activity and associated features, and (4) Rotorua City and associated volcanic features and hazards. The second part provides descriptive notes and figures for three tours in the Rotorua area. Tour 1 covers geothermal fields south of Rotorua (Wairakei, Waiotapu, Waimangu), Tour 2 encircles Lake Rotorua and includes descriptions of the Whakarewarewa geyser field, and Tour 3 deals with a trip to Mt Tarawera. Maps and photographs illustrate the text for each of these tours. Unfortunately, Tour 3 suffers in comparison with the other two in that the proposed stops are no longer readily accessible: the Crater Rd section (Stop 1, p.45) is badly overgrown, as is the comparable cutting directly across the road; and Stops 2-6 (pp.46-48) on Mt Tarawera itself are now closed to the public, being attainable only via (expensive) guided tours.

In my view, there are some deficiencies in the book.
(1) Nomenclature. Many of the formal stratigraphic names used for the deposits, although still valid, pre-date the proposals of Froggatt & Lowe (1990). For example, the authors refer to the

Rotoiti 'Breccia', Taupo 'Pumice', and Whakatane 'Ash', etc. (e.g., see table p. 10). Most publications now use the nomenclature of Froggatt & Lowe (1990) or a less formal but none-the-less systematic system (e.g., 'Rotorua tephra').

(2) Ages. The authors missed an opportunity to use calibrated (calendar) ages throughout the guide. Instead, a mix of calendar, radiocarbon and radiometric ages is used. Radiocarbon ages can be calibrated to *c.* 24,000 cal. yr BP using INTCAL98 (Stuiver *et al.*, 1998), and the use of such calibrated ages for eruptives is now common (e.g., Lowe *et al.*, 1999; Sandiford *et al.*, 2001; Newnham *et al.*, 2003). For example, the Rerewhakaaitu eruption occurred *c.* 17,600 cal. yr BP, equivalent to 14,700 ^{14}C yr BP, and the Mamaku eruption occurred *c.* 8050 cal. yr BP, equivalent to 7250 ^{14}C yr BP. There are some inconsistencies in usage. For example, Rotoiti eruptives are recorded at 65,000 years old in the text but on p. 11 (map of paleo-lake levels) they are evidently 42,000 years old. In fairness, the actual age of these eruptives is currently uncertain, and estimates range from around 43,000 to 62,000 cal. yrs BP (e.g., Lowe & Hogg, 1995; Berryman *et al.*, 2000; Lian & Shane, 2000; Sandos *et al.*, 2001; Charlier *et al.*, 2003). Nevertheless, the same (estimated) age should be used throughout the guide. Similarly, Kaharoa eruptives are listed variously as 600, 600–700, or 700 years old. A wiggle-match date has been obtained recently for the Kaharoa eruption, the initial explosive plinian phases occurring in the winter of A.D. 1314 (12 (Hogg *et al.*, 2003), equivalent to 636 (12 cal. yr BP ('BP' by convention being A.D. 1950). To avoid the endless problem of the Tarawera eruption occurring 115 years ago (p.10) or 116 years ago (p.45) depending on when 'present' is defined, I would suggest using 'BP' (i.e., before A.D. 1950) or 'before A.D. 2000', or simply list the calendar date of the eruption, leaving the reader to calculate the number of years that has elapsed since the event.

(3) Cartography. On p. 45 units A to E are listed in the key but are not shown in the accompanying figure. This figure also uses the out-of-favour term 'airfall' (Lowe & Hunt, 2001). On the route map on p.37 the roads are shown as dashed lines, a personal dislike (I prefer full lines).

(4) Disputable statements.
(a) Page 3: A description of the process of volcanism is followed by the sentence "Volcanoes are the resulting landforms." This is far too restrictive because volcanism and its products modify landforms in various ways other than simply producing 'volcanoes'.
(b) Page 9: The Rotoiti Breccia (Ignimbrite) is described as the youngest ignimbrite in 'the district'. The validity of this statement depends partly on where the 'district' boundaries lie, but I suspect Mangaone Subgroup units, Oruanui Ignimbrite, Taupo Ignimbrite, or even Kaharoa eruptive units might qualify for this chronological distinction.
(c) Page 23: The phreatic eruption in Kuirau Park (Rotorua) of 26 January, 2001, is reported to have lasted 10 to 15 minutes. Although a tourist sign at the site also states this, witnesses to the event reported a duration of less than 5 minutes (one witness timed the eruption at four and a half minutes) (Roger Briggs & Ashley Cody, pers. comm. 2003).

(d) Page 34: In the figure, the entire line of craters formed on the massif of Mt Tarawera in the A.D. 1886 eruption is labelled 'chasm'. However, only the southwestern-most crater, visible at a distance from the west and south, strictly should bear this name (Keam, 1988; Lowe *et al.*, 2002).
(e) Page 44: It is stated that very fine ash from the A.D. 1886 Tarawera eruption was blown south and east to reach Hawke's Bay. According to Thomas (1888), effectively no ash was deposited in Hawke's Bay, all being blown north and east (the southernmost locality along the east coast to receive ashfall was near Tolaga Bay) (see also Keam, 1988). The basis for the delineation of the southeasterly part of the map of the Tarawera fallout zone shown in Pullar & Birrell (1973) is uncertain.

Conclusion

The new edition of 'Geyserland' is an excellent publication, the points noted above being of relatively minor concern. The guidebook is useful both for the general public and as a good starting point for students. It is an ideal gift for overseas academics and students who have visited the area. (I have given several copies already to Japanese visitors.) The new colour photographs and figures, the updated and authoritative text, and the pleasing layout and production all provide for a well-priced and useful purchase.

References

Berryman, K.; Marden, M.; Eden, D.; Mazengarb, C.; Ota, Y.; Moriya, I. 2000. Quaternary river terraces of the Waipaoa River, East Coast, New Zealand, and their tectonic and palaeoclimatic significance. *New Zealand Journal of Geology and Geophysics* 43, 229-245.

Charlier, B.L.A.; Peate, D.W.; Wilson, C.J.N.; Lowenstern, J.B.; Storey, M.; Brown, S.J.A. 2003. Crystallisation ages in coeval silicic magma bodies: ^{238}U-^{230}Th disequilibrium evidence from the Rotoiti and Earthquake Flat eruption deposits, Taupo Volcanic Zone, New Zealand. *Earth and Planetary Science Letters* 206, 441-457.

Froggatt, P.C.; Lowe, D.J. 1990. A review of late Quaternary silicic and some other tephra formations from New Zealand: their stratigraphy, nomenclature, distribution, volume, and age. *New Zealand Journal of Geology and Geophysics* 33, 89-109.

Hogg, A.G., Higham, T.F.G.; Lowe, D.J., Palmer, J.G.; Reimer, P.J.; Newnham, R.M. 2003. A wiggle-match date for Polynesian settlement of New Zealand. *Antiquity* 77 (1) in press.

Keam, R. 1988. "Tarawera: the Volcanic Eruption of 10 June 1886". R.F. Keam, Auckland.

Lian O.B.; Shane P.A. 2000. Optical dating of paleosols bracketing the widespread Rotoehu tephra, North Island, New Zealand. *Quaternary Science Reviews* 19, 1649-1662.

Lowe, D.J.; Hogg, A.G. 1995. Age of the Rotoehu Ash – comment. *New Zealand Journal of Geology and Geophysics* 38, 399-402.

Lowe, D.J.; Hunt, J.B. 2001. A summary of terminology used in tephra-related studies. In: Juvigné, E.T. & Raynal, J.-P. (eds) "Tephras: Chronology, Archaeology". *Les Dossiers de l'Archeo-Logis* 1: 17-22.

Lowe, D.J.; Newnham, R.M.; Ward, C.M. 1999. Stratigraphy and chronology of a 15 ka sequence of multi-sourced silicic tephras in a montane peat bog, eastern North Island, New Zealand. *New Zealand Journal of Geology and Geophysics* 42, 565-579.

Lowe, D.J.; Newnham, R.M.; McCraw, J.D. 2002. Volcanism and early Maori in New Zealand. Pp. 126-161 in Torrence, R. & Grattan, J. (eds) "Natural Disasters and Cultural Change". Routledge, London.

Newnham, R.M.; Eden, D.N.; Lowe, D.J.; Hendy, C.H. 2003. Rerewhakaaitu Tephra, a land–sea marker for the Last Termination in New Zealand, with implications for global climate change. *Quaternary Science Reviews* 22, 289-308.

Pullar, W. A.; Birrell, K. S. 1973. Age and distribution of late Quaternary pyroclastic and associated cover deposits of the Rotorua and Taupo area, North Island, New Zealand. *New Zealand Soil Survey Report* 1.

Sandiford, A.; Alloway, B.V.; Shane, P. 2001. A 28,000-6600 cal yr record of local and distal volcanism preserved in a paleolake, Auckland, New Zealand. *New Zealand Journal of Geology and Geophysics* 44, 323-336.

Sandos, G.M.; Bird, M.I.; Pillans, B.; Fifield, L.K.; Alloway, B.V.; Chappell, J.; Hausladen, P.A.; Ameth, A. 2001. Radiocarbon dating of wood using different pretreatment procedures: application to the chronology of Rotoehu Ash, New Zealand. *Radiocarbon* 43, 239-248.

Stuiver, M.; Reimer, P.J.; Bard, E.; Beck, J.W.; Burr, G.S.; Hughen, K.A.; Kromer, B.; McCormac, G.; van der Plicht, J.; Spurk, M. 1998. INTCAL98 radiocarbon age calibration, 24,000–0 cal AD. *Radiocarbon* 40, 1041-1083.

Thomas, A.P.W. 1888. "Report on the Eruption of Tarawera and Rotomahana, New Zealand", Government Printer, Wellington.

David J. Lowe
Department of Earth Sciences, University of Waikato, Private Bag 3105, Hamilton