Economic Geology, v. 101, pp. 1623–1625

REVIEWS

Geology and Exploration of New Zealand Mineral Deposits. A. B. CHRISTIE AND R. L. BRATHWAITE, Editors. Australasian Institute of Mining and Metallurgy Monograph 25. Pp 350. 2006. ISBN 978 1 920806 52 1. Price A$80.

This book is one of a series, published since 1962 by the AusIMM, that focuses on aspects of mining and economic geology of the Oceania region. Monograph 25 is the third of a series devoted to New Zealand, following Monographs 4 and 13. Another monograph, published by the Institute of Geological and Nuclear Sciences, dealt with the tectonics and metallogeny of New Zealand and provides a comprehensive list of all deposits and occurrences known as of 1993 (Brathwaite and Pirajno, 1993).

Monograph 25 is edited by two well-known geoscientists who have devoted most of their professional life to the economic geology of New Zealand, a country not especially renowned for its mining industry but with the considerable advantage of having a range of tectonic settings conducive to several kinds of ore systems within a comparatively small geographic area. This rare advantage provides the international geoscientific community with insights into the relationship between ore-making systems and tectonic environments.

Monograph 25 comprises a total of 47 papers, with 21 papers that describe epithermal systems, nine on orogenic gold-tungsten-antimony lodes, eight on alluvial gold and placer iron sands deposits, and three that deal with offshore minerals such as ferromanganese nodules and fascinating accounts of submarine ore systems in the Kermadec arc. One paper treats the unusual, alkaline-related Sams Creek gold deposit, whereas others provide an awareness of the exploration for and uses of industrial minerals (halloysite and zeolites deposits). Although discussed in Monograph 13 (Kear, 1989), missing from this volume are the Ni-Cu magmatic sulfide mineralization of the Riwaka Complex and the intrusion-related Mo and W-Sn systems of the South Island. This is somewhat disappointing because short papers and/or updates on these important ore systems would have been welcome.

Although each paper is only 8 to 10 pages long, the editors have ensured adequate coverage of the relevant topics together with a comprehensive list of references that cover practically all that is known about the particular subject. The figures are good, clear, and all consistently drafted in the same style, although in places differences in gray shadings are not easy to discern.

Following an introduction and an overview of New Zealand's geologic framework and associated mineral deposits by the editors, the monograph is divided into eight sections, essentially based on geography, but also taking into consideration mineral deposit types. The sections are as follows: (1) Northland, (2) Hauraki gold field, (3) Taupo Volcanic Zone, (4) North Island coastal iron sands, (5) Marlborough and Nelson regions, (6) West coast region, (7) Otago and Southland regions, and (8) Offshore minerals. Each section provides a variety of short papers that encompass a series of ore systems.

In the introduction, the editors discuss the comparatively new legislation that regulates the mining and exploration industry. New Zealand has spectacular scenery and its environmentally conscious inhabitants strive to preserve the natural beauty of the country. New Zealanders have managed to restructure legislation to allow mining and exploration, providing that certain strict guidelines are maintained. This has been particularly successful with alluvial and iron sands mining in the South Island, thereby providing an example of how the mining industry and a pristine environment can coexist.

The overview chapter for the monograph begins with a summary of New Zealand's geology and associated mineral occurrences. The second paper in this chapter summarizes GIS modelling of gold deposits. Overviews of the VMS deposits and PGE prospects follow. Placer ilmenite along the west coast and the alluvial gold operations of central Otago and near Greymouth, all on the South Island, are then summarized.

The chapter on Northland contains one paper on halloysite clays, and a second on Hg- and Au-Ag–bearing epithermal sinter deposits north of Auckland. Next is the chapter on the Hauraki gold field, truly one of the best natural laboratories in the world for the study of epithermal ore systems. This section, understandably, has the largest number of papers (17). A regional overview, with excellent figures detailing all known deposits and occurrences, is followed by papers on structural and tectonic controls, geophysical signatures, caldera controls, exploration, geology, and mining history of several of the epithermal systems, including the well-known Karangahake and Waihi-Martha Hill deposits. Very useful here are insights into the geophysical signatures and historical backgrounds.

I have to lament, however, two things. One is that a geologic summary and/or a table of volcanic stratigraphy of the Hauraki gold field could have been presented in the introductory paper, thereby avoiding unnecessary repetition of the regional geology in each paper. The space saved could have been utilized for more text. The second is that gold grades and production data are presented as a mix of ounces and/or metric units, often in the same table. For an international audience, particularly the surging Asian economies, it would have been best to use only metric units.

The next chapter is focused on the enthralling Taupo Volcanic Zone, where present-day near-surface and surface expression of epithermal systems can be observed first hand. One paper details the well-established models of the Taupo geothermal and the White Island magmatic-hydrothermal systems. The coastal iron sand deposits of the North Island follow with two papers. The chapter on Marlborough and Nelson includes two papers: one describing the Marlborough Schist belt and the other discussing the unusual gold- and sulfide-bearing peralkaline intrusions at Sams Creek in northwestern Nelson. For the west coast region, two papers review exploration and geology of the historical Reefton gold field.

These are followed by three papers on alluvial gold mining, including that associated with the historical Kaniere dredge. Another paper presents a summary of the Au-bearing veins of the Southern Alps. Descriptions of orogenic Au ± W ores systems, such as Glenorchy, Shotover-Macetown, and the world-class Macraes deposit, are presented in the chapter on Otago and Southland. Three papers on offshore minerals include material on the intraoceanic Kermadec arc submarine vent systems, on which cutting-edge research has been conducted, and the ferromanganese nodules on the Campbell plateau.

This new monograph on the geology of and exploration for mineral deposits in New Zealand complements the previously published monographs which, taken all together, effectively provide a comprehensive treatise. The layout, figures, and presentations are all of high quality, and the price is very affordable. This monograph is highly recommended to academics, researchers, geoscientists, and engineers in the mining and exploration industry.

REFERENCES

Brathwaite, R. L., Pirajno, F. 1993, Metallogenic map of New Zealand: Institute of Geological and Nuclear Sciences, Monograph 3, 215 p.

Kear, D., 1989, Mineral deposits of New Zealand: The Australasian Institute of Mining and Metallurgy, Monograph 13, 225 p.

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January 14, 2006

Gold Provinces of [the] World. M. M. Konstantinov. Pp. 358. 16 color plates in Appendix. Scientific World, Moscow. 2006. In Russian. ISBN 5-89176-361-3. Price US$40. To order, e-mail, <mmkonstantinov@mail.ru>.

This Russian monograph is an attempt to describe the gold provinces of the world from the point of view of the Soviet classification of mineral deposit types. The author is a well-known geologist who started his career about 50 years ago and who has since worked in almost all the gold provinces of the former Soviet Union (FSU). In the introduction, Konstantinov declares his aim is to educate a new generation of geoscientists about gold metallogeny not only of the FSU, but also, using a systematic approach, most major gold provinces of the world.

The chapters of the monograph can be grouped into three parts of unequal lengths. The first part, chapter 1, contains a description of the fundamentals of what is known in Russia as "formational analysis," as applied to mineral deposit classification, which was widely used in the FSU. Each formation (the closest Western equivalent would be an association) is named after its type minerals, such as gold-quartz, gold-silver, and gold-sulfide. Each formation is believed to occur in a specific setting and host rock. For example, the gold-silver formation occurs in volcanic rocks and is genetically related to these rocks (in Western terminology this would be the epithermal class of deposits). Such correspondence may exist between many Russian "formations" and Western mineral deposit types, but not consistently. For non-Russian geologists who are able to read Russian, this chapter can be used as a textbook on the Soviet-Russian classification system of gold deposit types.

Chapters 2 through 5 contain a systematic description of world's gold provinces and their deposits, which are discussed in chronological order, from Archean through Proterozoic and Paleozoic to Mesozoic-Cenozoic. The description of each province starts with regional information about tectonics and stratigraphy, providing a background for discussion of the metallogeny. Almost exclusively, these descriptions are based on the old geosynclinal concept with features such as blocks and megadomes. The tectonic description is mostly based on the Russian compilations by the Academician Khain that were published in 1971. These compilations were used in describing practically all provinces and, with few exceptions, have not been updated; the text reads as if nothing has been achieved regarding the tectonic understanding of the orogenic systems since the early 1970s. As a result, Konstantinov had to work around the reality of plate tectonics, particularly when describing ores of the younger Mesozoic-Cenozoic orogenic belts, but, even in these environments, plate tectonics concepts are generally not mentioned, although there is some limited information on such for the Urals and a part of North American Cordillera.

The descriptions of individual deposits are usually of high quality, although they may be too brief for some important deposits, such as the large Natalka deposit in the Russian northeast. Modern descriptions are provided for deposits of the FSU provinces, whereas non-FSU deposit descriptions are mainly out of date, although the United States and Peru deposits are notable up-to-date exceptions. The non-FSU descriptions are sometimes based on 30- to 40-year-old publications, particularly for countries that were under the FSU influence. Even for the FSU territory, the metallogeny of the Transbaikal province is based on publications from the 1930s. The deposits chosen for description are sometimes puzzling, particularly in such provinces as West Africa, where most of the largest deposits are not even mentioned. Although the giant Ashanti deposit is mentioned, a detailed description is given for some much smaller deposits, and is again solely based on Russian work in the area. In South America, nothing is stated about the Carajas district or Venezuelan gold deposits. Indian, Tanzanian, and Congolese gold deposits are not described at all. Almost nothing can be found about gold in the Altai-Sayan region of Asia or in Mongolia. All Chinese deposits are described under the Chinese shield subchapter. The Chinese descriptions are typically difficult to follow owing to a lack of proper maps. The Carlin-like deposits in southern China are never mentioned. Important examples from the Tethyan belt are restricted to those gold deposits of the Balkans and the Caucasus. In addition, the metallogenic maps for gold provinces outside of the FSU usually do not have authors, suggesting they were all compiled by the author. Some of these are not adequate, particularly for Western Australia, where material from the 1970s was used and deposits such as Telfer are not even mentioned or shown on the maps. The deposit descriptions outside of the FSU are often based on Russian compilations, typically published after a brief field visit and without reference to the original source of information.

Deposit descriptions often deviate to silver, tin, and other metals or non-gold deposit types such as Broken Hill. At the same time, copper-gold porphyries are almost entirely ignored, although the Tien Shan province in the FSU is a host to one of the world's largest Cu-Au porphyries at Almalyk. The porphyry class is mentioned in relation to the Vasilkovskoe deposit in Kazakhstan, which for some reason is correlated with Fort Knox in Alaska, and in relation to the circum-Pacific orogens in some rare examples.

Chapter 6, with a poorly translated English title, is the quintessence of the author's understanding of gold metallogeny, with a focus on topics such as gold deposits through geologic time, geochemistry of ore systems, facies of gold formations, biogenic concentration of gold, convection in gold-bearing systems, problems of gold giants, oxide-sulfide (or redox) ore-bearing systems, ore preparation stage for formation of giant deposits, and rock volume occupied by the deposits. This contains some useful ideas that are rarely found in the international literature. Chapter 7 briefly describes the role of deposit models in exploration, mostly focussing on geochemical and mineralogical aspects. It contains some valuable comments on exploration techniques and mineral zonation.

One of the major problems with this book is the apparent absence of any kind of scientific and technical editorial touch or, at the least, a pre-publication peer review. Apart from scientific and data source problems, there are numerous misprints and inconsistent spellings of geographic and deposit names, particularly when transliterated into Russian. Regarding the illustrations, sometimes more deposits can be found in the explanations than are shown on the maps, and vice versa. There are also several almost identical repetitions of major blocks of text in different parts of the book.

The quality of presented information is very unequal between the FSU and non-FSU deposits. There is very little information about the reserves and resources of the described deposits, regardless of their geographic position or political jurisdiction. The book, therefore, might be best called "Gold Provinces of the World: A Soviet Perspective." Nevertheless, it can still be useful as a good source for material about gold deposits developed or found in the FSU.

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January 14, 2007