

PREFACE

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Thematic issue: gold deposits of Brazil

Brazil has been a major producer of gold since the 18th century, when it was the world's largest producer for more than 100 years mainly from rich placer concentrations of the Quadrilátero Ferrífero region. During the last decade of the 20th century, it again took on significant status, with company production from hard-rock mines, and alluvial gold derived largely from surficial mining by garimpeiros in the Amazon region, responsible for an annual production of between 40 and 110 tonnes (t) gold between 1980 and 1999, peaking in 1988. In all, estimates of total gold produced from Brazil are imprecise largely because of unrecorded production before the 20th century and uncertainties in production by garimpeiros in that period and especially more recently. A rough estimate would include at least 500 t Au from the Quadrilátero Ferrífero (mainly Morro Velho, Passajem, and Raposos) from the early 1800s to 1980, 500 t Au from lodes throughout Brazil since 1980, and 750 t Au from the garimpeiros also during the last two decades. In addition, hundreds of tonnes of Au were recovered in the 1800s from placer concentrations located downstream from the Quadrilátero Ferrífero lodes. With more than 2,000 t Au recovered from a variety of metallogenic provinces, Brazil clearly has been one of the world's great gold producers and continues to be recognized for its significant resources of the precious metal.

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Despite the rich history of gold mining, there are few comprehensive (descriptive plus genetic) accounts of individual gold deposits in the western literature, and even fewer reviews of the major gold fields (provinces or camps) in any language. In addition, those papers that are published are commonly extremely contradictory in terms of the origin of the deposits (syngenetic, remobilized syngenetic and epigenetic models commonly applied to the same deposits) and the timing of the mineralization and/or remobilization events (Archean to Paleoproterozoic to Neoproterozoic for the same deposit). Thus, the aim of this thematic issue of *Mineralium Deposita* was to generate a series of papers about Brazil's most important gold fields, which would include comprehensive, modern-day reviews of many of the larger gold deposits themselves. Authors were requested by the editors not only to provide geological descriptions and resulting genetic interpretations of the gold deposits, but also to place them in the context of their regional tectonic setting and their temporal place within the evolution of the hosting terranes or provinces. It was recognized from the outset that some reviews would be more comprehensive than others because some gold provinces have had a long history of mining and research (e.g., Quadrilátero Ferrífero), whereas others (e.g., Tapajós and Carajás in Amazon region) have been only recently discovered with little published research and few company data released in some instances. However, the issue was designed to produce the best possible overviews based upon the combined existing knowledge and new scientific data of recognized experts on the metallogenic characteristics of each of the chosen gold provinces.

The thematic issue opens with a paper by Hartmann and Delgado that provides a highly informative, concise review of "Cratons and orogenic belts of the Brazilian Shield and their contained Gold Deposits". The complex evolution of the Precambrian shield areas of Brazil is detailed in terms of available robust geochronology and the gold provinces are placed in a tectonic and temporal framework. A key feature of the paper is a new tectonic

map, which better defines the major cratons and orogenic belts of Brazil and the position of the gold fields within these areas. Thorman et al. then provide a paper on “Major Brazilian gold deposits – 1982 to 1999” in which they overview the history of exploration and mining in Brazil, provide thumbnail sketches of the major gold deposits and gold fields, and impart important statistical data on gold distribution within specific host rocks and age ranges. Importantly, they briefly mention Morro do Ouro, a probable Neoproterozoic orogenic gold deposit that provided close to 10% of Brazil’s gold production during the last two decades. If there is a notable omission from this volume, then it clearly was our inability to find an acceptable paper that discusses this significant lode system within the Brasília fold belt.

The two part contribution by Lobato et al. on the Quadrilátero Ferrífero, Brazil’s premier gold province, not only reflects the importance of Archean host rocks in general (about two-thirds of Brazil’s production according to Thorman et al.), but also the fact that almost half of Brazil’s historic production has come from the province, including 470 t from the famous, long-lived Morro Velho deposit. Part I of Lobato et al. defines the tectonic, magmatic and structural setting of the Quadrilátero Ferrífero, whereas part II describes the geology of its contained gold deposits and examines their genesis. Importantly, Lobato et al. interpret the deposits as Archean orogenic gold lodes, which is in contrast to previous suggestions that they were Archean syngenetic concentrations remobilized by later events. Santos et al. on “Gold deposits of the Tapajós and Alta Floresta domains, Tapajós-Parima orogenic belt, Amazon Craton, Brazil” provide the first comprehensive paper concerning the tectonic evolution and gold mineralization in a region that has been famous for its well-publicized production of gold through the activities of garimpeiros in the past decade or more. As alluvial mining declines rapidly in this part of the Amazon, attention is focused on the nature of the probable orogenic and intrusion-related hypogene deposits in the granitoid-dominated Paleoproterozoic arc and back-arc environments that make up the Tapajós-Parima orogenic belt. Villas and Santos provide a discussion on “The gold deposits of the Carajás mineral province: deposit styles and metallogenesis”, in which they suggest that there are multiple gold mineralization styles in Archean host rocks. This is a mineral province that many explorationists regard as one of the most highly prospective terrains for Fe-oxide Cu–Au–REE deposits on Earth.

A paper by da Silva et al., entitled “The Rio Itapicuru greenstone belt, Bahia, Brazil: geologic evolution and review of gold mineralization”, provides a tectonic and regional setting for this Paleoproterozoic province, and descriptions and genetic models for the orogenic gold deposits within it. These deposits include Fazenda Brasileira, which has been one of the top five producers in Brazil for the past decade and a deposit not discovered until the modern exploration era. Texeira et al. then provide a paper entitled “Gold mineralization in the Serra de Jacobina region, Bahia, Brazil: tectonic framework and metallogenesis” in which they present an integrated study of this Paleoproterozoic province. Importantly, they conclude that an epigenetic model is most appropriate for the Jacobina deposit, in contrast to some earlier models that ascribed it a paleoplacer origin by analogy with the Witwatersrand, South Africa and Tarkwa, Ghana, deposits. Finally, Jost and Fortes present a paper on “Gold deposits and occurrences of the Crixás goldfield, central Brazil” in which they suggest that these gold deposits, which are hosted in Archean rocks, were remobilized and/or re-shaped during Archean, Paleoproterozoic and Neoproterozoic tectonic events.

Most of the gold deposits are interpreted by the authors as orogenic gold deposits that were deposited late in the deformational, metamorphic and magmatic histories of their hosting Archean (Quadrilátero Ferrífero) or Paleoproterozoic (Tapajós-Parima, Rio Itapicuru, Serra de Jacobina) terranes, which are typically defined as deformed arc and/or back-arc sequences. Modern geological and geochronological data presented by the various authors provide little evidence for any important Precambrian syngenetic, volcanogenic gold systems. The deposits of the Carajás province and Crixás gold field appear more enigmatic with additional integrated geological studies, including well-constrained robust geochronology, required to resolve uncertainties in their genesis, at least in the opinion of the three editors of this thematic issue. Rare mention of any shallow epithermal or related gold deposit types as being important in Brazil reflects the mature landscape and deeply eroded Precambrian terranes that underlie most of the country. Only gold deposit types that have developed in mid to deep crustal levels during the Precambrian, or that have been later eroded to form paleoplacers, appear to have made significant contributions to Brazil’s overall gold endowment.