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Metallogeny of Tin

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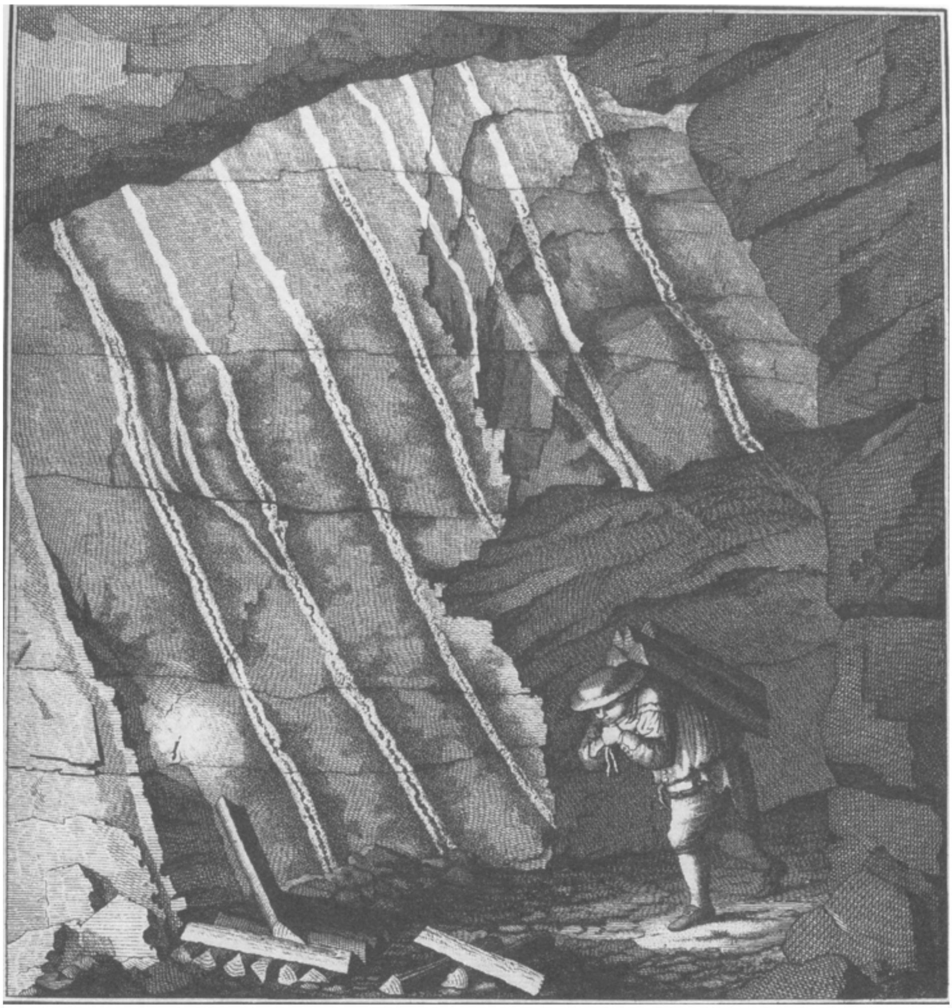

Mining by fire setting in the Geyer tin deposit, Erzgebirge, 18th century. Sheeted tin-bearing veins with greisenized rims in the Geyer granite stock (Charpentier 1778:Fig. 3). Charpentier is the first to note the importance of hydrothermal overprint in tin ore formation based on the observation of the gradual nature of the rock sequence of vein-greisen-granite

"Das Bekannte überhaupt ist darum,
weil es bekannt ist, nicht erkannt."
(Hegel 1807:25)

Preface

The search for tin dates back to the earliest days of civilization. For about 40 years, world tin mining has oscillated at a level of 150,000-250,000 t Sn/year, with a mine output in 1989 of 210,000 t Sn (MCS 1990). This figure corresponds to a current annual value of about US$ 1.5 billion and places tin ninth on the metal market behind iron, gold, uranium, copper, zinc, silver, platinum and nickel.

Tin deposits belong to the granite-related ore deposit spectrum which includes many metals vital to current and future technologies such as Cu, W, Mo, U, Nb, Ta, Ag, Au, Sb, Bi, As, Pb, Zn, REE, Be, Ga and Li. The granitic rocks associated with tin and tin-tungsten deposits have long been identified as a special group of granites, the so-called tin granites. These rocks provide a unique opportunity to study the magmatic and hydrothermal history of tin ore formation. Tin granites are more easily identifiable as parent rocks for tin (and tungsten) mineralization than is the case for other mineralized granitic rocks such as molybdenum and copper porphyries. The magmatic molybdenum and copper distribution patterns are more complex (control by sulfide solubilities), and commonly obliterated by fluid interaction. The relatively simple situation of tin granites provides therefore an invaluable opportunity to study some metallogenic aspects of magmatic-hydrothermal ore deposits in general.

The present study attempts to develop a general metallogenic model for tin in identifying the essential or relevant processes in tin ore formation. The methodological principle is based on an interplay between a background of some basic petrogenetic concepts and a number of specific local and regional data on tin deposits and tin provinces, with particular reference to those areas with which the author is most familiar with (Bolivia, SE Asia, Europe). This inductive approach condenses the many apparently specific complexities encountered in individual ore deposits to a few major processes of general importance. The inherent reductionism may have a personal bias which is probably inevitable in any simple and broad-scale picture ("Après tout, la raison est bien l'esclave des passions"; Feyerabend 1979:210). The critical problem of the relevance of those factors chosen for our model can be judged by its degree of consistency and predictive capability for new and analogous cases.

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