

from 1864 to 1917. From 1889-1892 a smelter facility also operated here to produce copper from the East Mine ores; documentary records from this operation do not exist. This facility, along with another at nearby Betts Cove, constituted the largest integrated, non-fishery-related industrial complex outside St. John's, and possibly the largest in the country at the time. At Tilt Cove, there has been minimal industrial re-development and remnants of the 19th century mining and smelting facilities are relatively intact. Aside from mining and smelting, it appears (based on scrap material on site) that the operation may also have involved the quarrying and transport of marble from Cobb's Arm, New World Island.

The ore was handpicked (cobbed) at the mine surface and broken into pieces about 2-5 cm in diameter; the grade of ore at Tilt Cove for the smelter was at best 4% Cu. Copper smelting in the late 19th century was a complicated process, involving three key steps: (1) calcining, whereby the ore was dry roasted to expel arsenic (As) and sulphur (S) and to convert iron (Fe) to Fe-oxide, (2) melting to remove Fe-oxide, and (3) roasting and melting to completely remove S and produce metallic Cu. During the early melting stages, calcium (Ca) in the form of marble-limestone (CaCO₃) was added as a flux. Following calcining, in a typical operation, the ore was melted and roasted up to five more times to synthesize the final metallic Cu product. Apparently all of these steps were not carried out at the Tilt Cove facility.

From the first stage of melting, copper matte was collected in bowl-like pots; our geochemical data from the pot slag indicate a range of Cu concentrations from 1637 to 2702 ppm. In the final stages of processing, the copper matte should have been upgraded to the point that it represented nearly pure copper and the slag should also have become progressively more oxide-rich. At Tilt Cove, none of the final copper product remains, but slag from the heaps contains 0.5-0.7 % Cu and up to 1.7% Zn, thus indicating that the Tilt Cove process was not particularly efficient. Furthermore, the slag contains up to 5% S and is obviously not an Fe-oxide. The Tilt Cove operation was probably a feeder plant producing low-grade blister copper for further refining at Swansea. Geochemical data, however, also suggest an elemental consistency to the copper production at the smelter.

Although it was only operative for three years, the smelter had tremendous deleterious effects on the local environment as described by contemporary sources; these included consistently igniting forest fires. These effects are still discernable today, over 110 years after the facility closed. Geochemical data, for instance, indicate that As had been removed from the matte during the final smelting and was presumably volatilized out the chimney stack into the surrounding countryside. Other heavy metals are likewise enriched in soils around the chimneys.

Technology and the environment: a retrospective examination of 19th century mining and smelting operations at Tilt Cove, Newfoundland

WILTON, D.¹, RIGGS, K.¹, RENNIE, R.²,
AND KEALEY, G.³

1. Department of Earth Sciences, Memorial University, St. John's, NL A1B 3X5 ¶ 2. Department of History, Memorial University, St. John's, NL ¶ 3. Vice-President Research, University of New Brunswick, Fredericton, NB

In their first phase of production, the mines at Tilt Cove, on the northeastern tip of the Baie Verte Peninsula, were worked