

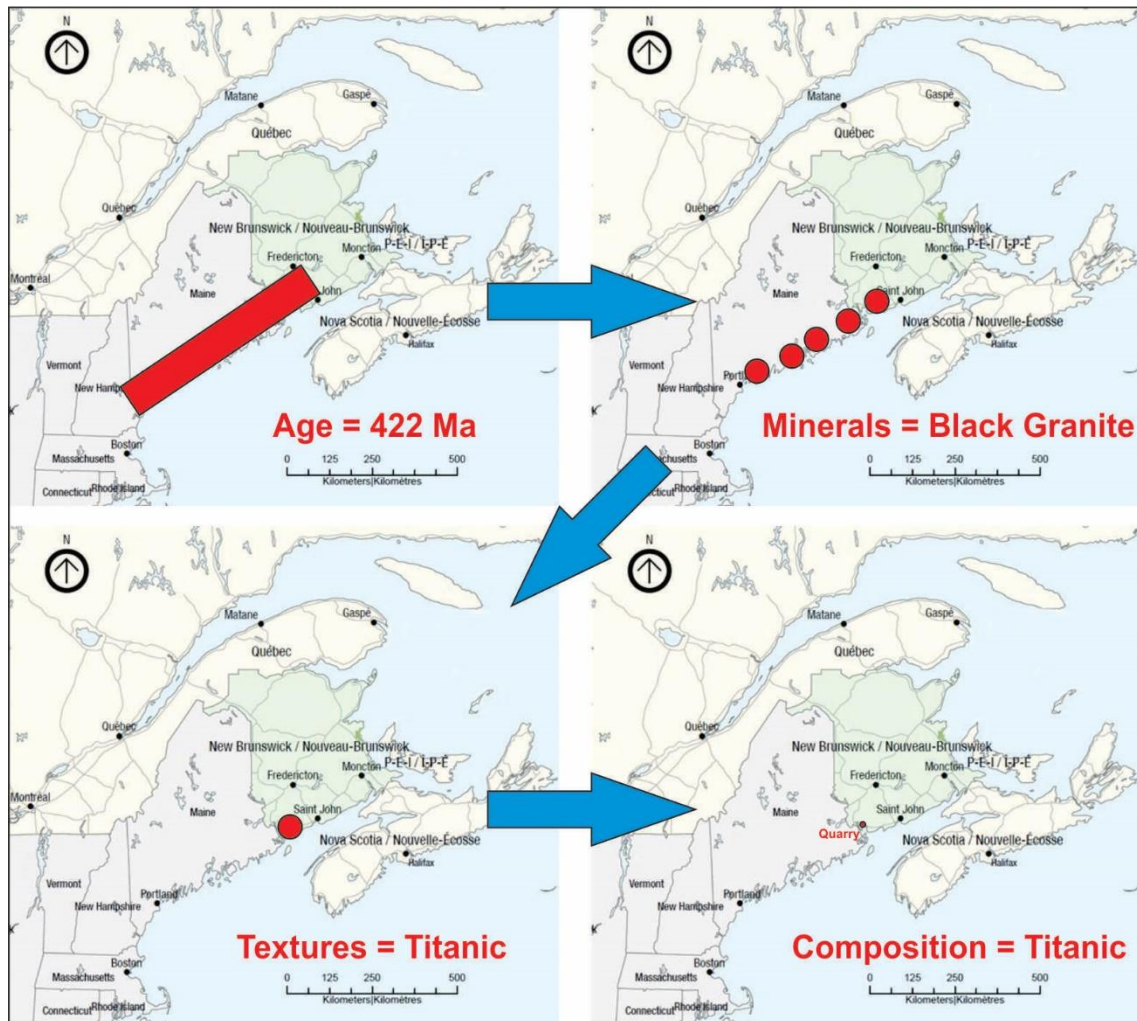
Searching for the Source

of the

Titanic Headstones

T+1095 Update: A Solution to the Problem

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The **figure** on the title page shows how:

- the age of 422 Ma on zircons from the Titanic headstones focuses the search on a coastal belt of plutonic rocks in Maine and New Brunswick
- the gabbroic compositions of the Titanic headstones restrict the search to only some of the 422 Ma plutonic rocks in Maine and New Brunswick
- the textures of the Titanic headstones exclude the 422 Ma gabbros from Maine and restrict the search to only some of those 422 Ma gabbros in SW New Brunswick
- the chemical compositions of the Titanic headstones provide a good match to one of the fourteen gabbro quarries in SW New Brunswick.

The **abstract** on the next page is the one presented at the annual meeting of the Atlantic Geoscience Society in Sackville, NB, on January 31, 2015. The full manuscript is now in preparation and should be published later this year (2015) or early next year (2016). Until then, the most detailed account is Kathy Bockus' article in the St. Croix Courier and Halifax Magazine: <http://halifaxmag.com/features/titanic-tombstones/>

The **final page** is just traditional in these reports. This unique “snowflake” texture of the Titanic headstones turned out to be a defining characteristic in restricting the search to the gabbros of SW New Brunswick.

And here is a partial list of **acknowledgements** to people and organizations who gave generously of their time and ideas to help make this project a success:

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Applied Forensic Igneous Petrogenesis: Locating the Source Quarry for the “Black Granite” Titanic Headstones in Halifax, Nova Scotia

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In Halifax, Nova Scotia, 149 victims of the 1912 sinking of the Titanic lie beneath petrologically identical “black granite” headstones. Those headstones, supplied by the White Star Line, arrived in Halifax in late 1912, but no known historical document reveals their source. They consist of a medium- to coarse-grained olivine-bearing gabbro, with cumulus phases consisting of randomly oriented euhedral plagioclase laths (An_{50-70}), corroded olivine ($\sim Fo_{63}$), and titanomagnetite (7.5 wt.% TiO_2) with Ti-hornblende and biotite reaction rims, and intercumulus material consisting of titanite ($\sim Wo_{43}En_{42}Fs_{15}$) with reaction rims of titaniferous hornblende, both of which are variably uranitized. Three types of evidence (*quantitative* – radiometric age of 422 Ma, zircon U/Th ratios, olivine FeO/(FeO+MgO) ratios, clinopyroxene trace-element compositions, whole-rock chemical compositions; *qualitative* – mineral assemblage, modal proportions, textural parameters, style and degree of alteration; and *circumstantial* – regional reputation, quarrying history, local logistics, regional transportation, McGrattan “paperweight”) connect the Titanic headstones to the St. George Batholith in SW New Brunswick. Precise matching of any dimension stone to its source quarry is problematic, because that stone no longer resides in the quarry. Given this constraint, one of three possible conditions must obtain: (i) if the correct quarry is homogeneous on a scale larger than the quarry, all the physical, chemical, and temporal parameters of the quarry walls and floor will perfectly match those of the headstones; (ii) if the correct quarry is monotonically heterogeneous on a scale larger than the quarry, the physical and chemical parameters of the walls and floor of the quarry will bracket those of the headstones, and the ages will match precisely; or (iii) if the correct quarry is erratically heterogeneous, the physical and chemical parameters in the walls and floor of the quarry may not bracket some, or even all, of these parameters in the headstones, but the ages will still match precisely. In the case of the Titanic headstones, most quantitative parameters in the quarry fall under condition (ii) above, but some parameters (Sr, Zr, Hf, Ga, middle REEs) fall under condition (iii). No individual line of evidence, on its own, is sufficient to identify the source quarry, but the combination of the cumulative weight of all the quantitative, qualitative, and circumstantial evidence plus a process of elimination suggests that the Charles Hanson Quarry near Bocabec, SW New Brunswick, is the source for the gabbroic Titanic headstones in Halifax. More information is available at: earthsciences.dal.ca/www/titanicgranite



The distinctive "snowflake" texture of the Titanic headstones, caused by random orientations of plagioclase crystals.