

Searching for the Source of the Titanic Headstones

T+365 Update: New Work on the Ritcey Headstone and
Sampling of the Chickahominy / Sheriff Stuart Quarry
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Introduction

This report is the fourth in a series detailing the (slow) progress in finding the source of the Titanic headstones in Halifax. This report, and all previous reports, are available on the Internet at: earthsciences.dal.ca/www/titanicgranite

This report covers two aspects of the work done since T+122: investigation of the Ritcey headstone in Halifax, and investigation of samples collected from the Chickahominy / Sheriff Stuart Quarry near Bocabec in SW New Brunswick. The Ritcey headstone is important because it is a potential source of more material for petrographic and chemical work. The Chickahominy / Sheriff Stuart Quarry is important because T+122 identified it as, so far, the best match to the Titanic headstones and we needed more material to determine the extent of variability in that quarry.

The Ritcey Headstone

In T+122, I made a case for the headstone of Susan Ritcey, who died in 1916, to be the same as the Titanic headstones. Its size, shape, and macroscopic texture appeared to be essentially indistinguishable from nearby Titanic headstones. The first part of this section deals with the work done to acquire a sample of this headstone for petrographic and chemical analysis, and the second part covers what I have discovered petrographically about this headstone.

Sampling and Restoration of the Ritcey Headstone

Because we need more Titanic material for petrographic, geochemical, and geochronological work, and because it is almost impossible to obtain any more material from Titanic headstones in the Fairview Lawn Cemetery, it was essential to this investigation that we be able to sample the headstone of Susan Ritcey. With his trademark determination, Alan Ruffman tracked down the correct branch of the Ritcey family, obtained from them the Ritcey family tree (which I used to determine that Susan Ritcey and I have a common ancestor, one Johann Martin Götz, who came to Halifax from Germany in 1751), and obtained the Ritcey family's permission to allow us to sample Susan's headstone. Images of the sampling and restoration appear on the next page.



Sampling of the Ritcey Headstone at Heritage Memorials



Restoration of the Ritcey Headstone in Fairview Lawn Cemetery
(upper left - before front; lower left - before back;
upper right - after front; lower right - after, back)



High-resolution scanned image of the Baxter Headstone, courtesy of Tom Duffett.



Macroscopic comparison of Baxter and Ritcey Headstones. Scanning of Baxter and outdoor photography of Ritcey accounts for the apparent difference in colour.

Petrography of the Ritcey Headstone

If the Ritcey headstone were set among the Titanic headstones just 15 m away, it would not seem at all out of place, in terms of its macroscopic features such as size, shape, colour and even the polishing of only two of its five surfaces. But does this similarity stand up under microscopic examination?

On the next page are high-resolution scans of both Titanic thin sections and two of the four Ritcey thin sections. To a petrological eye, these are similar enough in terms of grain size, distribution of opaque minerals, tiny apatite grains, and degree of alteration to have come from the same source. One notable difference is that both Baxter (Titanic) thin sections contain small amounts (<2%) of the mineral olivine, but none of the four Ritcey thin sections contains any. This difference turns out to be only bad luck in sectioning the Ritcey headstone, because a quick visit back to the cemetery shows that the Ritcey marker does contain olivine, albeit much less than 2% (images below).



Rusty Altered Olivine Grains in the Ritcey Headstone

Baxter



Ritcey



Comparison of Baxter (Titanic) and Ritcey Thin Sections.

Mineral Chemistry of the Ritcey Headstone

Most rock-forming minerals in igneous rocks are members of solid-solution series. It means that the minerals, unlike quartz which is always SiO_2 , have variable compositions where one chemical element substitutes for another, e.g., olivine $(\text{Fe}, \text{Mg}, \text{Ni})_2\text{SiO}_4$ meaning that the sum of Fe, Mg, and Ni atoms will be 2 for every 1 Si and 4 O atoms; or clinopyroxene $(\text{Ca}, \text{Na})(\text{Mg}, \text{Fe}, \text{Mn})\text{Si}_2\text{O}_6$, meaning that $\text{Ca} + \text{Na} = 1$ atom, $\text{Mg} + \text{Fe} + \text{Mn} = 1$ atom for every 2 Si atoms and 6 O atoms, . etc.

In rocks such as black granite / gabbros, it is not uncommon for the individual minerals to show variable, or zoned, compositions. The beauty of olivine is that it is rarely zoned, and I was hoping to use it to compare compositions of Baxter, Ritcey, and any candidate quarries. The scarcity of olivine made this approach difficult, so instead I tried to analyze the opaque minerals, ilmenite and titanomagnetite. Trouble is, they are also members of solid-solution series and are prone to being zoned, thusly:

ilmenite (Fe,Mg,Mn)TiO₂

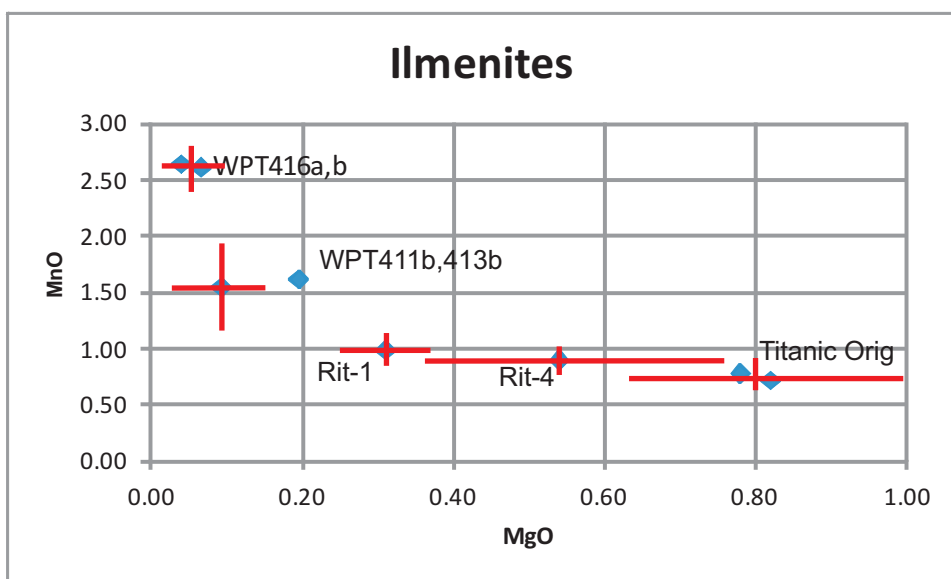
titanomagnetite (Fe,Mg,Mn,V,Cr,Ti)₂O₃

so already we are on shaky ground by using these minerals to make comparisons.

First, here are the analytical data showing the mean chemical compositions of the minerals in each thin section

Rock Sample	Mineralogy	Cr ₂ O ₃	MgO	FeO	V ₂ O ₃	MnO	TiO ₂	Total
TM Titanic Original Repeat	Tit-Mag	0.21	0.19	82.75	1.10	0.21	5.01	89.48
TM WPT416a	Tit-Mag	0.12	0.01	84.97	0.92	0.46	6.39	92.87
TM Titanic Original	Tit-Mag	0.21	0.11	87.34	0.77	0.13	2.26	90.82
TM Ritcey-4	Tit-Mag	0.25	0.17	88.19	1.13	0.03	1.06	90.83
TM Ritcey-1	Tit-Mag	0.21	0.05	88.76	1.04	0.03	0.73	90.83
TM WPT416b	Tit-Mag	0.09	0.03	89.47	0.16	0.22	2.79	92.76
TM WPT416b Repeat	Tit-Mag	0.50	0.02	89.51	0.97	0.01	1.73	92.74
TM WPT411b	Tit-Mag	0.08	0.03	90.56	0.55	0.05	1.32	92.58
I WPT416b	Ilm	0.00	0.04	46.43	0.00	2.64	49.44	98.55
I WPT416a	Ilm	0.02	0.07	46.63	0.00	2.61	49.16	98.49
I WPT411b	Ilm	0.00	0.20	47.74	0.00	1.62	47.89	97.45
I Titanic Original Repeat	Ilm	0.00	0.82	48.05	0.00	0.72	47.46	97.05
I Titanic Original	Ilm	0.02	0.78	48.09	0.00	0.78	47.90	97.57
I Ritcey-1	Ilm	0.01	0.31	48.16	0.30	0.99	47.98	97.45
I WPT416b Repeat	Ilm	0.03	0.09	48.29	0.00	1.55	48.35	98.32
I Ritcey-4	Ilm	0.00	0.54	48.52	0.11	0.90	47.27	97.23

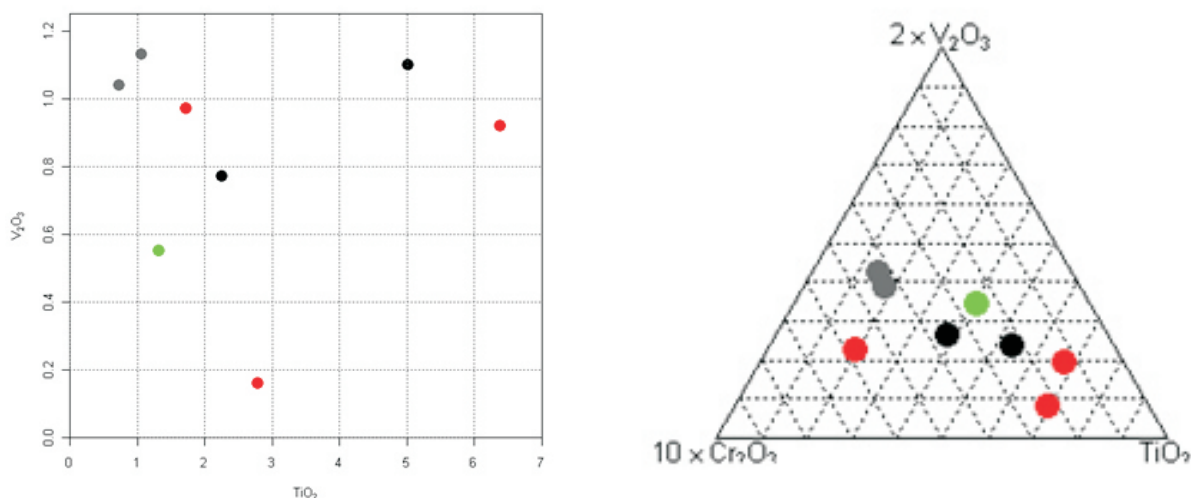
And on the next page are the chemical plots to compare the mineral compositions.



Blue diamonds - average; red bars - ranges.

Within analytical/statistical error, Titanic Original and Rit-4 could be the same, and likewise Rit-4 and Rit-1 could also be the same (of course, they ARE the same, showing the wide range of variation in single samples). The Halifax headstones appear to be analytically/statistically distinctly different from the SWNB WPT samples, and therefore may not be related; however, given the ability of plutons to fractionate, and the potential for zoning in single hand specimens, and even single crystals, we cannot entirely rule out a connection. It's a pity there were no zoned olivines in these sections. Bottom line: inconclusive ilmenites.

Titanomagnetites



Black - Titanic Original; Grey - Ritcey; Red - WPT416a,b; Green - WPT411b
 Again, within sample variation (e.g., Titanic Original and WPT416a,b) is so large that these samples could be the same. Less variation in Ritcey grains sets them slightly apart (but they are almost certainly the same material as Titanic Original).
 Bottom line: given the wide scatter in one just sample (WPT416a,b), all these samples could have come from the same place.

Conclusion about the Ritcey Headstone

At the present level of investigation, there is no macroscopic, microscopic, or mineral compositional evidence that the Ritcey headstone is significantly different from the Baxter headstone. We shall proceed from this point on the basis that Ritcey = Baxter (Titanic).

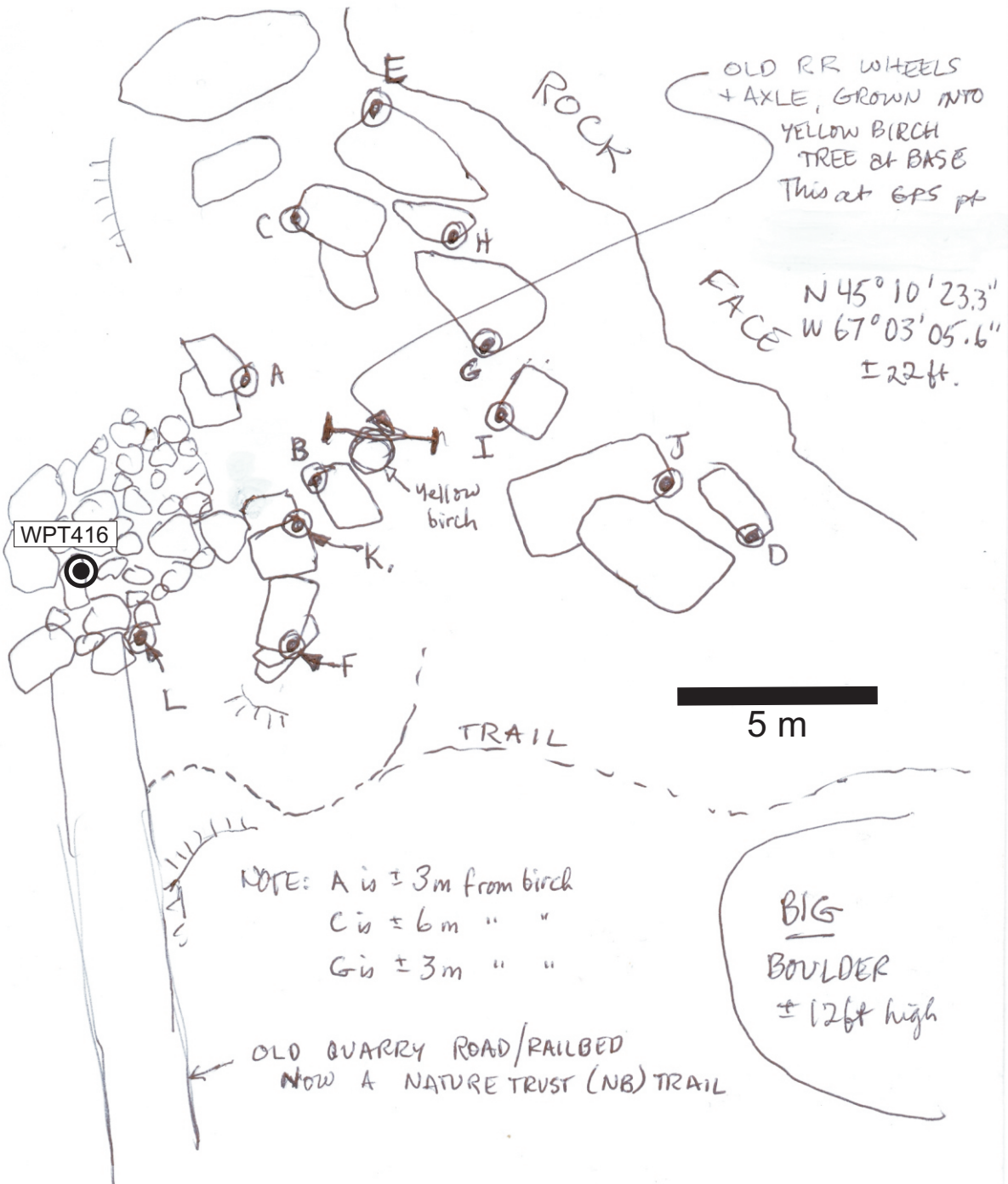
Samples from Chickahominy/Sheriff Stuart Quarry

In T+122, we determined that, of all the samples collected in SWNB in the summer of 2012, one of the two (WPT416a) from Chickahominy Quarry was the best match for the Titanic headstones. But those two samples from Chickahominy were different, and we needed to determine how much mineralogical and textural variability existed in this quarry. To this end, Dave Stevens, kindly offered to collect an additional suite of 15 samples, just before snow covered the landscape in December 2012. His sample location map appears on the next page.

Of those 15 new samples, the 5 best matches were made into polished thin sections, shown in the scan on the following page. (My samples 416a and 416b were also collected from the rubble pile below this quarry). These seven samples from this quarry confirm a substantial variation in mineralogy and texture here. In terms of grain-size, alteration, and distribution of opaque minerals, the best matches for the Titanic/Ritcey combination appear to be samples 411b, 416a, and 126I.

CHICKAHOMINY QUARRY

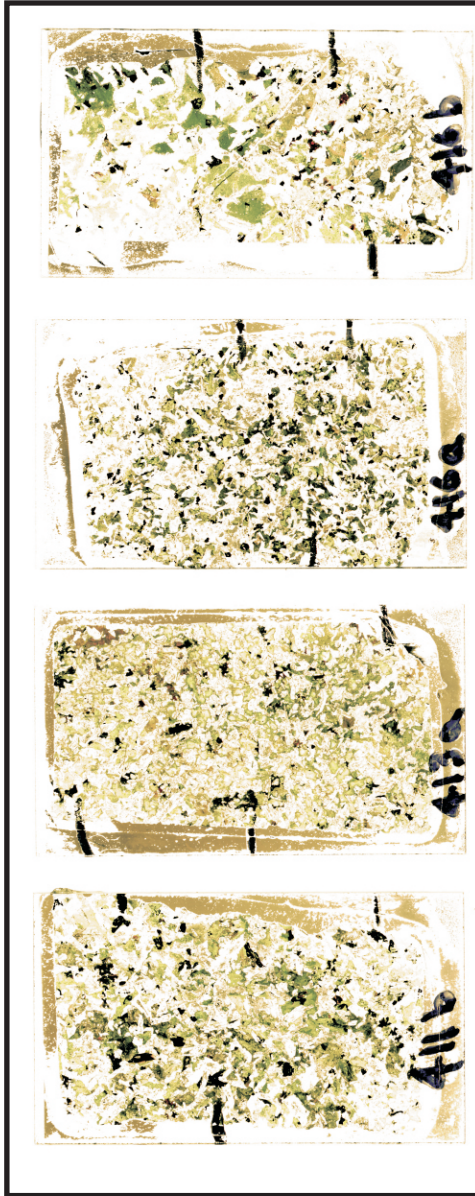
↑ N. (magnetic)



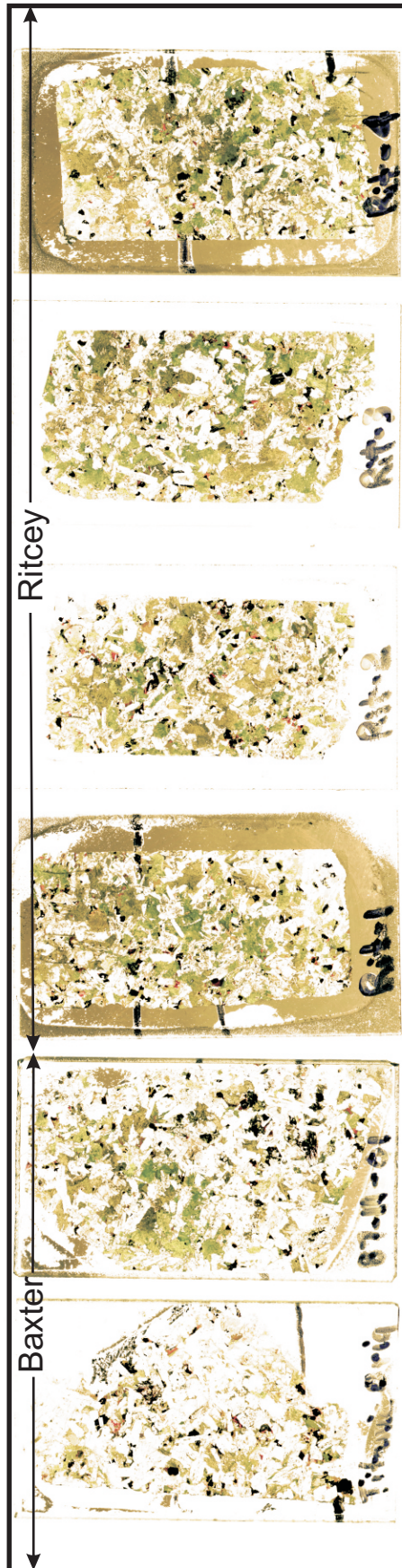
Dave Stevens' (20121206) sketch map of the Chickahominy / Sheriff Stuart Quarry, and sample locations for my WPT416 and his "126A-L" samples.

Petrographic Family Portrait

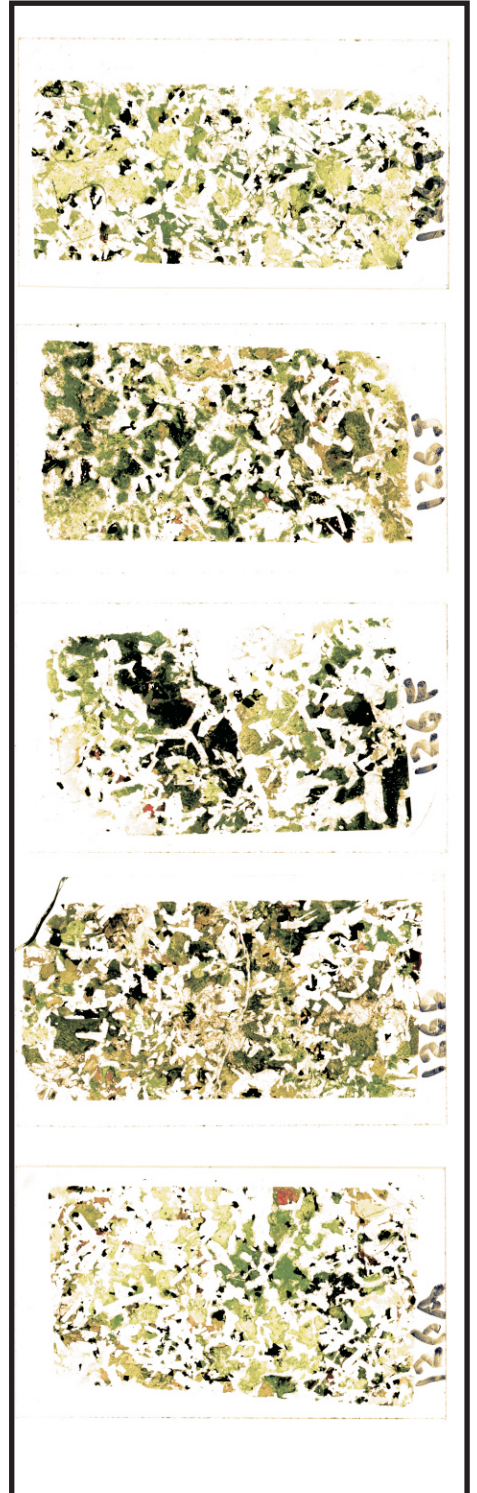
cousins and siblings are nice, but we are looking for identical twins!



Barrie Clarke
 SW New Brunswick
 (WPT411,413 Bayside
 WPT416a,b Stuart)



Halifax
 Titanic Headstones

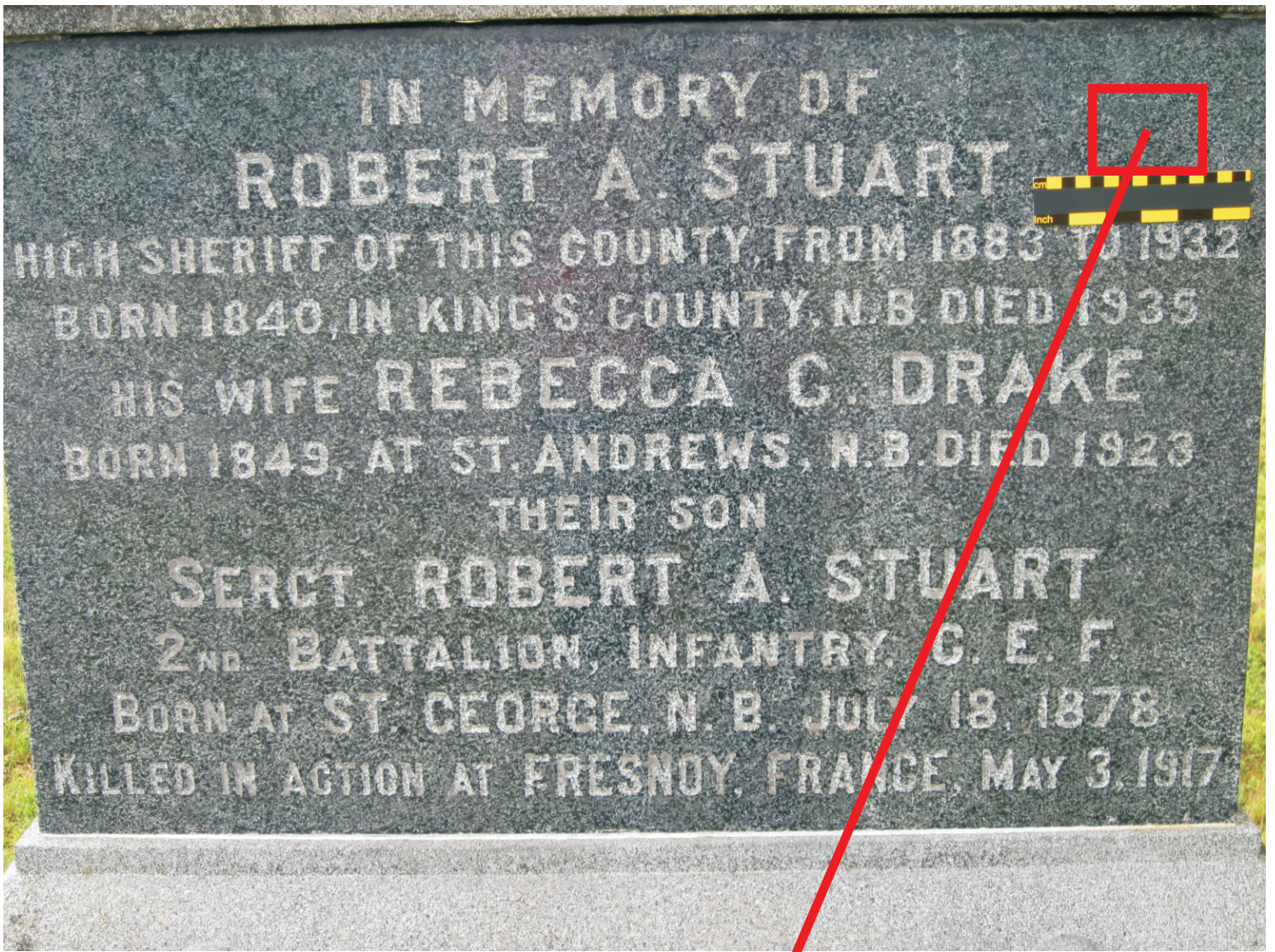


Dave Stevens
 Chickahominy /
 Sheriff Stuart Quarry

Was the Chickahominy / Sheriff Stuart Quarry the Source of the Titanic Headstones?

On the next page is a composite of several images. At the top is the monument of Sheriff Robert A. Stuart in the Rural Cemetery in St. George. The date of his death was 1935, a full 23 years after the Titanic headstones were quarried. At the bottom is an enlargement of the texture of the Stuart headstone in the centre, surrounded by several images from randomly selected Titanic headstones in Halifax. The mineralogical (including the brown olivines, just like the Titanic headstones) and textural comparison is rather good.

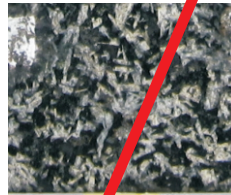
If the Stuart headstone were taken from the same quarry as the Titanic headstones, but 23 years later, then the degree of textural homogeneity in the quarry is rather remarkable - and much more uniform than the textures of the 17 samples we now have from this quarry. Perhaps Stuart knew, at the time of quarrying, how famous the Titanic headstones would be, and retained a block for himself way back in 1912.



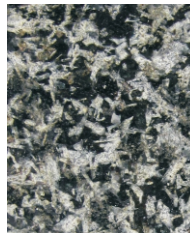
Titanic



Titanic



Titanic



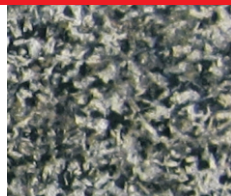
Stuart



Titanic



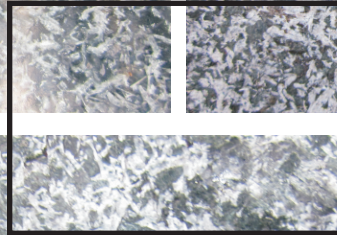
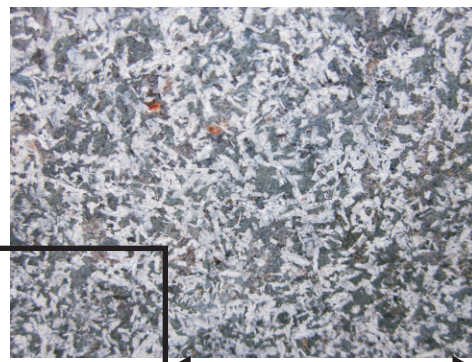
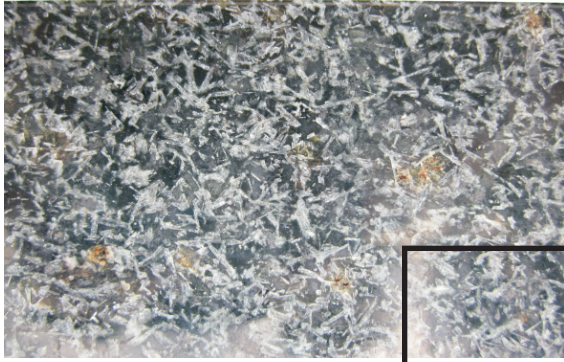
Titanic



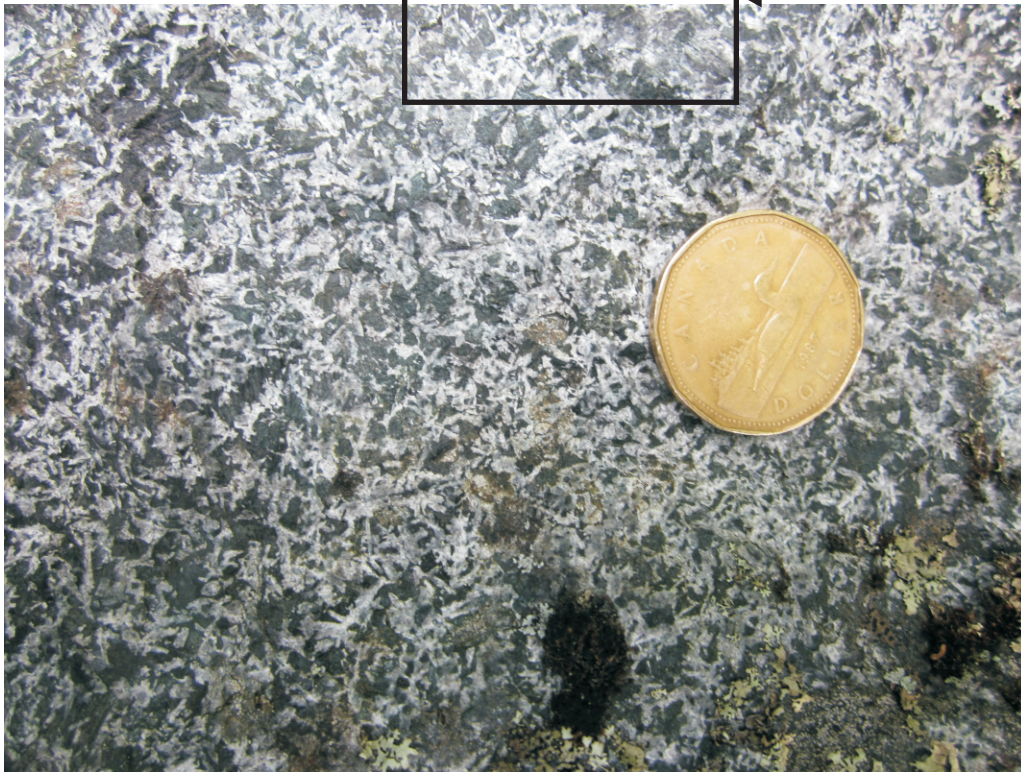
Stuart = Titanic?

Stuart Headstone

Ritcey Headstone (= Titanic)



enlarge these three images and compare!



Broken Block in Chickahominy / Sheriff Stuart Quarry

So far, my principal conclusion is that, *at least for headstones*:

Ritcey (= Titanic) = Stuart

None of the 17 samples from the Stuart Quarry seems to be a really good match, but one of the photos I took in the quarry (above) still looks promising.

Now, a bit of Sherlock Holmes detective work. Let's say that the White Star Line made some inquiries about headstones in May 1912. Where is the most prominent monument-making operation in the Maritimes? St. George, NB. Who is the most prominent man in that town? Why, that might be Robert A. Stuart, Charlotte County Sheriff and, just coincidentally, quarry owner. Who might Mr. Stuart recommend as a supplier of a suitably sombre black granite? Answer obvious. We now need to find some living relatives of Robert A. Stuart. Perhaps they have letters, documents, photograph albums, etc. of their famous ancestor that would shed some light on this Stuart-as-source hypothesis.

If not the Stuart quarry, perhaps there is still some other quarry in the St. George Batholith with the right petrological properties. If so, from what other quarry might Sheriff Stuart have obtained the Titanic headstones, and his own marker?

Next Steps

1. Spend some time at NBDNR in Fredericton using old maps, air photos, and satellite imagery to pin down locations of old quarries.
2. Return to Chickahominy / Stuart Quarry for further sampling.
3. Visit and sample other black granite quarries in the region.
4. Pursue official archival records of Robert A. Stuart and his quarrying operations.
5. Try to locate living members of the Stuart family to see if there are any verbal, written, or photographic records of the Stuart Quarry.
6. Do some preliminary whole-rock geochemical analyses of all black granite materials currently in hand.
7. Launch high-precision whole-rock geochemical analysis and geochronological analysis when we have a suitable mineralogical and textural candidate sample,.
8. Write another update report as developments warrant.

Acknowledgements

As usual, these reports would not be possible without the generous support of many others, including this time (in no particular order):

The Ritcey Family, for giving us permission to sample the headstone of A. Susan Ritcey

Alan Ruffman, for his considerable efforts in making sampling of the Ritcey headstone possible

Heritage Memorials of Windsor, Nova Scotia, for cutting and restoring the Ritcey headstone

Günter Bähler and the Swiss Titanic Society, for covering the cost of sampling and preparing the Ritcey headstone, and for covering the cost of the mineral analyses

Dan Conlin and Maritime Museum of the Atlantic, for permitting us to cut a 5-mm-wide sliver off the Baxter headstone

Dave Stevens, for obtaining 15 more samples from the Chickahominy / Sheriff Stuart Quarry

Gordon Brown, for preparing the polished thin sections so professionally

Tom Duffett, for scanning the Baxter headstone and Coutts photograph, and for posting these update reports on-line

Les Fyffe of NBDNR, for sharing his broad knowledge about the region

Gwen Martin, for sharing her knowledge about the history of quarrying black granite in New Brunswick

Kathy Bockus of the St. Croix Courier for her continuing professional interest in this project

In Memorium

It is with sadness that I note the passing of Burton Coutts, grandson of William Coutts, the co-owner of one of the stone-cutting businesses in St. George. Burton showed great interest in this search, and he and I visited the Titanic headstones together in the summer of 2012. After that visit, he gave me this wonderful undated picture of his grandfather (standing, second from left, with bowler hat) posing with his workers at the stone-cutting sheds in St. George. Possibly some, or even all, of those men knew the answer to the riddle of the origin of the Titanic headstones.





Suspect gabbro still at large. Please report any sightings to the RCMP (Ruffman Clarke Monument Project)