Context:
Gabriola petroglyph archaeoastronomy

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The calendar man petroglyph at DgRw258 on Gabriola Island

by Nick Doe

Context

Petroglyph site DgRw258 is one of six outliers of the well-known Church and Boulton sites, DgRw192[1] and DgRw193,[2] on the south side of Gabriola Island. All sites are flat, or gently-sloping, sandstone plains in glades no more than 70 metres across; and all are scattered either side of a line running two kilometres northwest from the Church site.

The previously-described five petroglyph sites—DgRw224,[3] DgRw228,[4] DgRw229,[5] DgRw234,[3] and DgRw230 [6]—all share the remarkable property that the petroglyphs at those sites have either significant geographical orientations (N,S,E,W), or alignments with the long, subparallel fractures in the sandstone,[7] or with intriguing combinations of both. Some of the many petroglyphs at the Church site also have one or other of these properties.[8]

There is strong evidence at the sites that the petroglyph orientations have been determined in part using the sun.[9] In addition, DgRw228 is probably a solar calendar based on a year of nine 40-day "months", and, exceptionally, DgRw230 includes a map of the night sky.

The additional site I am about to describe is no exception to this general pattern.

The sites

The plains on Gabriola are glaciated sandstone bedrock surrounded by coastal Douglas-fir forest. There have no soil—they have never supported trees—and because of the dryness of the summers, virtually the only flora on them is a patchy covering of mosses and lichen. This flora has, until recently, played a crucial role in protecting the sandstone surfaces from salt-weathering.[10]

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[1] Mary & Ted Bentley, *Gabriola: Petroglyph Island*, pp.16–71 (1998 ed.), pp.16–28 (1981 ed.), Sono Nis Press. Formerly the Weldwood site.

[2] So-called because it was discovered by Molly Boulton, Nelder's daughter. See Mary & Ted Bentley (*ibid*), pp.72–82 (1998 ed.).

[3] Doe, N.A., *Alignment of the petroglyphs at sites DgRw224 and -234*, *SHALE* 17, pp.33–40, September 2007.

[4] Doe, N.A., *A most unusual petroglyph*, *SHALE* 10, pp.25–32, January 2005. Doe, N.A., *Observing the winter solstice at DgRw228*, *SHALE* 17, pp.41–44, January 2005

[5] Doe, N.A., *Alignment and geometry of petroglyphs at site DgRw229*, *SHALE* 17, pp.24–32, September 2007.

[6] Doe, N.A., *Paleoastronomy at petroglyph site DgRw230*, *SHALE* 17, pp.45–48, September 2007. Doe, N.A., *Stars in stone—Ursa Major, Orion, and Gemini petroglyphs at DgRw230*, *SHALE* 18, pp.7–17, April 2008.

[7] Doe, N.A., *Gabriola's fractures—their origins*, *SHALE* 20, pp.3–12, April 2009, and Doe, N.A., *The orientation of fractures on Gabriola*, *SHALE* 20, pp.41–55, April 2009.

[8] Remarks on DgRw192 in *SHALE* 17, pp.31–32 (ibid), and in *SHALE* 20, p.41 (ibid).

[9] Doe, N.A., *Petroglyphs and equinoxes*, *SHALE* 14, pp.10–14, September 2006.

[10] Doe, N.A., *Salt-weathering of upper Nanaimo Group sandstone*, *SHALE* 23, pp.35–56, March 2010.

Although there are a few glacial features remaining on the sandstone, the striae that must have been there, have long-since weathered away except at one site, where characteristically wavering Nye-channel striae have been preserved, presumably because the channel collects and stores freshwater run-off that partially protects the surface from salt accumulation.[11]

All of the sandstone bedrock at these sites has been fractured. The fractures dip steeply into the bedrock and so surface erosion alone cannot obliterate them. They mostly date back to the Eocene, 55- and 42-million years ago, and are associated with folding that created the Gulf Islands.[12]

At DgRw258, there are two sets of fractures. The most conspicuous runs in parallel lines N20ºE all across the site. These are A-set extension (pull-apart) fractures that sometimes have minor strike slip. They occur everywhere on Gabriola.

The second set, possibly younger in geological time, are mid-island variants of the G-set fractures (N47ºE north-island) and

Figure 1: An A-set fracture running from N20ºE (NE at the bottom of the photograph) with several G/F-set fractures crossing it from N60ºE. Such fractures in both sets are abundant at the site.

The slight offset in the A-set fracture is common for this set. The crescent shaped hollow to the left of the compass is a concretion that has been partially eroded by acidic run-off.

[11] Doe, N.A., *Gabriola's glacial drift—striae and grooves*, *SILT* 8-2, pp.9–10, 2014. Although there are, as far as I am aware, no petroglyphs on Gabriola that incorporate glacial striae, there is at least one 16 km away on Harewood Plain, Vancouver Island, that does, DgRx 009, *SILT* 8-2 pp.5–6.

[12] Although some of the hairline fractures on the plain might be the result of stress relief during deglaciation, if they are, they have the nature of joints and are nowhere near being as conspicuous and as regular in orientation as are the Eocene fractures.

F-set fractures (N73ºE south-island) that are probably related to the two major hybrid strike-slip faults on Gabriola.[13] They run on the DgRw258 plain at N60ºE.

The human figure glyph

The petroglyphs at DgRw258 include one human figure that is stylistically similar to other carvings on the island.

As noted in the caption to Figure 3, there are several things to note about the design of the face:

—the head is facing as close to east as it is possible to get. The carver was intend on portraying the figure (himself?) observing the rising sun;

—the carver has chosen to have one of the G/F-set fractures run N60ºE through the face, even though there is an abundance of blemish-free sandstone available. This is also an outstanding and significant feature of the figure at DgRw229;

—a line from the petroglyph's right eye to the tip of the upper of two "ears" on the same side of the face points exactly north. The style of the ears is the same as at other sites, particularly the calendar site DgRw228. The right eye was also used as a reference point at DgRw229 where the right eye is carved in noticeably more detail than the left eye;

—a line from the right eye to the tip of the lower of the two ears runs exactly parallel with the A-set fractures at this site. The carver was evidently intent on drawing attention to these fractures as well.

Figure 2: An overview of the figure at DgRw258. The bottom of the 40cm-ruler is pointing exactly east. Although conceivably, there was once a body, there is no trace of one now. I suspect not, but if there had been one, spalling would have destroyed it.

The lines

Besides the human figure petroglyph, there are also several—at least three, probably more—short lines on the plain that run exactly north-south.

These "reference" lines occur at other sites, though they more usually run east-west

[13] At the north end, from Cox Bay to LeBoeuf Bay (dextral), and at the south end, from the Maples to Peterson Bay (sinistral).

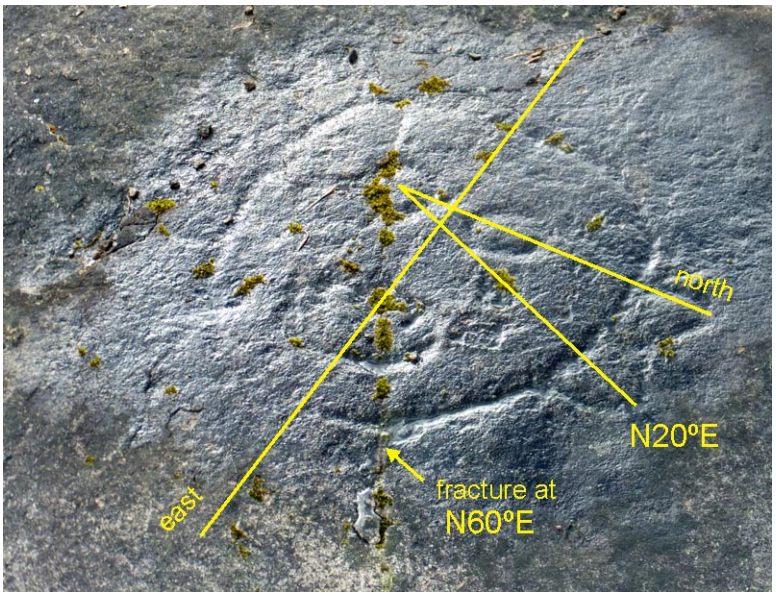

Figure 3: A closer view of the head. It is about 30 cm in diameter. Note that the head is facing as close to east as it is possible to get.

The carver has chosen to have a fracture run through the face, even though there is an abundance of blemish-free sandstone available.

A line from its right eye to the tip of the upper of the two ears points exactly north. A line from the right eye to the tip of the lower of the two ears runs exactly parallel with the most conspicuous set of fractures at this site.

rather than north-south; however, at the site DgRw234 a short distance away from DgRw258, there are reference lines at both orientations.

A site interpretation

If we accept for the moment that it was a deliberate choice of the carver to have a fracture running through the face, the question then to ask is, why did the carver choose one from the G/F-set rather than one from the more remarkable A-set of fractures that run right across the plain?

Here's one answer.

The site slopes gently toward the northeast making it a good site for observing the rising of the sun. One characteristic of the sun that must have been, and is, obvious to everyone, is that throughout the year, it rises at an azimuth that moves from southeast to northeast in the first half of the year, and from northeast back to southeast in the second half of the year.

Summer

Two of the most interesting events to have recorded would have been the sun's azimuth at sunrise on the days of the solstices. In principle, if one knew the azimuth of sunrise on the day of the summer solstice, for example, one would know by observation, which day that was.

Figure 4: Two of several short lines on the plain that run exactly north-south. They appear to be pecked, but they might be chatter marks; I see no geological explanation for their orientation; and the absence of similar lines at other orientations suggests they were not created by logging equipment. They are about 20 metres from the main glyph, E20ºS and E50ºS on the sides of broad shallow channels running NW-SE that might be Nye channels. The one on the left appears to have been carved so deeply that it has avoided being destroyed by spalling: either that or it it is not nearly as old as many people think petroglyphs are.

However, there is a practical snag with this approach to time keeping. At the summer solstice, the azimuth at sunrise scarcely changes from one day to the next. At this particular site, the azimuth of the mid-summer[14] sunrise is N52ºE, but at that time, it is only changing at a rate of 1º every 18 days or so. It would be impossible to pin down the exact day of the solstice by this method, and knowing the day of the solstice to an accuracy of plus or minus two weeks (say) would not be a very impressive accomplishment. N52ºE by the way is the direction of the downward slope at the site, and the glyph is sixty metres away from any trees in that direction.

The solution to this problem is, or used to be, well known to navigators and surveyors. When they wanted to determine the Greenwich time of local noon by measuring the altitude of the sun, instead of trying to determine when the sun was highest, they observed the altitude some arbitrary time before it reached its maximum height in the

[14] My calculations were for the year 1500 AD, which changes the dates of the solstices from today's dates by several days, but does little else.

middle of the day, and then waited until after noon until it was at the same height. Noon was then taken to be half-way between the times the sun was at this altitude.

So, using this approach, our petroglyph observer could observe the azimuth of the rising sun, some days before the solstice, and then wait until it rose again at that same azimuth some days after the solstice. The day of the solstice would then have been mid-way between these two dates. After a few years' observations, all that would be needed to identify the day of the solstice is an azimuth to observe, and a knowledge of the number of days following its rise at that azimuth one had to wait.

What would be a good azimuth to use? Well, 40 days before and 40 after the solstice, the rate of change of azimuth is 0.4º per day, which is probably sufficient for you to be able to nail down the day it rises at a particular azimuth to within two or three days, perhaps even closer if you used a conspicuous tree, sixty metres away, to monitor azimuth. And where is the azimuth of sunrise 40 days before and after the solstice at this site? It is N59ºE, almost the same as the orientation of the G/F-set fractures.

But why, you ask, 40 days? My answer, because just 325 metres away from this site there is a petroglyph calendar that has been constructed on the principle that the year can be divided into nine "months', each lasting 40 days. The carver must have known how to, and been accustomed to, counting off 40 days, so that's the number he used.

Winter?

The summer solstice was only one of the two interesting times of the year for the observer, the other being, of course, the winter solstice. At this site, the azimuth of the mid-winter sunrise is about S53ºE.

Now, as remarked earlier, there are today no glacial striae at this site, but this is only because it has been stripped of the moss that used to protect them from salt-weathering. Just 250 metres away, there is a site that has recently had its cover of sand and gravel removed for construction purposes, and it displays a wonderfully clear set of glacial striae. They run, as do all the major sets of glacial striae on the bedrock of Gabriola, from the northwest, about N55ºW.[15]

So here's a conjecture. The petroglyph carver, before beginning his work, must have had to strip away hundreds of years of accumulated moss covering, just as the Bentleys did in the 1970s.[16] And the chances are very good, that at that time, there were glacial striae still visible on this plain. And the orientation of the striae? Well, N55ºW on average, or if you look the way the ice was flowing, S55ºE, which is pretty close to the azimuth of sunrise in mid-winter. I bet the petroglyph carver noticed this. He wouldn't have known what had created the striae, but, what a coincidence that, pointing at the rising sun in the middle of winter, there were striae created by ice.

Conclusions

Before an analysis of this site was made, it was my surmise that the petroglyphs in this area were either all carved by the same person, or under the direct supervision of one person. The analysis at this site just strengthens that belief. I find it hard to believe that the calendar site DgRw228 and

[15] Doe, N.A., *Gabriola's glacial drift—striae and grooves*, SILT 8-2, p.11, 2014. There's a picture of them on page 2.

[16] Presumbaly forest fires would have kept the accumulation from being thousands of years.

this one were not carved for the same purpose. And if this is so, what we have at DgRw258 is a self-portrait of the carver.

The supposition that the precise alignments at these sites are in some way "coincidental" is refuted by the alignment of this one. There are no exceptions in six sites to the idea that the petroglyph carver was an astute observer of both the movement of the sun and the orientation of the factures in the sandstone.

To view the petroglyphs solely as works of art is a mistake. They are also scientific observatories constructed by someone who was an exceptionally skilled observer and who had a fine analytic ability.

I remain very much of the mind that the carver put humankind mid-way between heaven, represented by the sun and stars, and earth, represented by the fractures in the sandstone. Placing some of his figures at other sites in this group at orientations exactly mid-way between geographic orientations, as determined by observations of the sun, and geological orientations, as determined by observations of the fractures, invites this interpretation. But I accept, that this might be more to do with my culture than his.

Whatever the truth, the fact that the petroglyphs at these sites are fast disappearing without having been properly recorded, or without much recognition of what they are, is, I believe, a disservice to the carver and his people.[17] ◊

[17] Doe, N.A., *Petroglyphs—discovery and demise*, *SILT* 6, 2013.