

232  
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RECORD OF OBSIDIANITES, OR OBSIDIAN  
BUTTONS, IN TASMANIA.

By W. H. TWELVETREES.

[Read August 7, 1905, before the Royal Society of Tasmania.]

DURING recent years some more of these interesting though still mysterious objects have been found in Tasmania, and it seems desirable to place the localities on record, as a knowledge of their distribution and conditions of occurrence may assist in forming some idea of their age.

The locality list brought up to date stands as follows:—

1. Weldborough, Union Claim and elsewhere.
2. Fossil Creek, a tributary of Main Creek.
3. Springfield, near Scottsdale.
4. St. Leonards.
5. Cox Bight.
6. Middleton Creek, Long Plain.
7. St. Helens.
8. Supply Rivulet, River Tamar.
9. Pioneer Tin Mine.
10. Amber Creek, near Gladstone.
11. Wyniford River.
12. Moorina.
13. Camden Plain, Mt. Barrow.
14. Lisle gold diggings.
15. Back Creek, Lefroy.
16. Thomas' Plains.
17. Norfolk Range.
18. Schouten Main.
19. Tallywong Creek, Weldborough.
20. Hunt P.A. Mine, Derwent Creek.
21. Thureau's Deep Lead Mine, near St. Helens.
22. Smith's Creek, Long Plain.

It may be as well to record the information obtained as to their occurrence before the particulars pass into oblivion. It seems to be clear that no evidence has come to light which would require us to assign to them a date so far back as early or middle Tertiary. They have nowhere been found in gravel protected by the middle Tertiary basalt. I have repeatedly made enquiry at Derby, but always with negative results.

27

2 OBSIDIANITES, OR OBSIDIAN BUTTONS, IN TASMANIA.

1. *Union Claim, Weldborough.*—Mr. J. C. Macmichael found a perfect specimen of the button type in the sluice-box at the old Union Tin Mine on Fancy Creek. It came from clay 6 feet below the surface overlying tin-bearing gravels, believed to be of Quaternary age. Several specimens were also obtained by Mr. Gaylor.

2. *Fossil Creek.*—One was found in the Quaternary tin-wash of Fossil Creek, a tributary of Main Creek, a mile and a half north of the preceding locality.

3. *Springfield.*—This button was found by Mr. John Cherry at the bottom of a 6-inch bed of quartz-wash, lying on granite, and at 2 feet 6 inches from the surface. Mr. Cherry also found another lying on the surface of the ground a mile distant.

4. *St. Leonards.*—Mr. Simmonds obtained one two years ago half a mile south of St. Leonards railway station, on the surface of soil in a field which had been ploughed at one time. The specimen was well worn.

5. *Cox Bight.*—These specimens were found by Mr. Christopher Iles, when working the tin-drift at this bay on the south coast. The drift is derived from the granite which forms a patch at the southern end of the Bathurst Range. The buttons were found at a height of 100 feet above the sea, under 2 feet of button-grass peat and on the top of about 3 feet of tin-wash, the latter reposing on the bedrock.

6. *Middleton Creek, Long Plain.*—Mr. Simmonds reports one found here in gold-bearing wash, at 3 feet from the surface.

7. *St. Helens.*—A peculiar horn-shaped or shell-shaped fragment, similar to some forms found in Western Australia, came into the possession of Mr. Geo. A. Waller, from some unknown locality near St. Helens.

8. *Supply Rivulet.*—A specimen from here was found by the late Dr. Milligan, and reported to the Geological Society of London by the Rev. W. B. Clarke in 1856 as a volcanic bomb.

9. *Pioneer Tin Mine.*—In 1903 Mr. Cecil E. Ryan, the general manager, showed me a fragment of a button found on the mine at 4 feet from the surface, and resting on a bed of pug or clay 16 feet thick. Below this clay was a layer of fine puggy drift 10 feet thick, over 4 feet of wash of decomposed granite, which, in its turn, reposed on the granite bedrock. Although this is the direction of the

Tertiary Wyniford River, there is reason to believe that the superficial clay is of more recent date.

10. *Amber Creek*.—Mr. Tompsett has found several buttons in alluvial tin-drift in the basin of Amber Creek, near Gladstone. This drift has been deposited since the streams of the district have begun to flow in their present channels.

11. *Wyniford River*.—Mr. C. E. Ryan informed me of another button which was found in some shallow alluvial tin workings on the Wyniford River, about a mile above the Pioneer Mine. The descending section of the workings shows 1 foot of soil, covering 3 feet of sandy clay, which rests upon 2 feet of tin-bearing wash lying on granite. The button was in the stratum of clay at 18 inches from the surface. The age of the clay may be accepted as Quaternary.

12. *Moorina*.—Last year Mr. J. A. Thomson, of Moorina, showed me a button which he had found a few weeks previously in surface tin-workings in a blind creek at Moorina, 60 or 70 feet above the Ringarooma River. Soft creek gravel prevailed for 2½ feet from the surface; below this was a layer of hard cemented gravel, 2 feet thick, and in the middle of the latter the obsidianite was found. Age, Quaternary.

13 and 14. *Camden Plain and Lisle*.—Several specimens were found by Mr. T. Bessell in the well-known gold-bearing gravels at these localities.

15. *Back Creek, Lefroy*.—Mr. R. H. Wallcott reports that there is a specimen with this label in the Technological Museum, Melbourne. I have ascertained that this was found by Mr. J. Birkett, in 1881, with two other specimens at the White Lead, Back Creek, in alluvial gold-wash, 12 feet from the surface, all in a space of 6 feet square. One, a dumb-bell form, was taken to Melbourne by Mr. Birkett, and given by him to Mr. Rule, the then Curator of the Technological Museum.

16. *Thomas' Plains (Weldborough)*.—Some are known from this locality, but I have no particulars of the individual occurrences.

17. *Norfolk Range*.—Several have been found in the stanniferous drift derived from this range. Mr. Geo. A. Waller obtained specimens which had been collected about 7 miles north of Pieman Heads.

18. *Schouten Main*.—Mr. Bingham found specimens in recent tin-wash at Schouten Main, 3 or 4 feet from the surface, in the flat ground below Gill's Mine.

19. *Tallywong Creek, near Weldborough*.—Mr. Rundle found one at the head of Tallywong Creek, on the table-land between Main Creek and the Weld River, in the tail-race, when working shallow stanniferous alluvial some 4 or 5 feet thick.

20. *Hunt P.A. Mine*.—Mr. Simmonds found a button in the sluice-box of this mine, on Derwent Creek, 2 miles south of George River, when he was manager of the property.

21. *Thureau's Deep Lead Mine*.—Mr. Baird found one at this mine, 3 miles east of the preceding. A 15-foot bed of wash was being treated, but it is not known whether the specimen came from the top or bottom of the deposit.

22. *Smith's Creek, Long Plain*.—The specimen found here is of a bolt-like form,\* and was obtained in alluvial quartz-drift, 10 feet from the surface, when sluicing for gold in 1891.

Of course, the argument founded on the absence of specimens from the Tertiary drifts is a negative one. The evenness of size in the constituents of these leads indicates much rolling, and it may be urged that the brittle glass would succumb to the forces of attrition, and only ill-recognisable fragments of it survive. On the other hand, the discovery of well-preserved, unrolled, and sometimes remarkably shining and fresh-looking specimens in surface soil and shallow modern gravel is a strong indication of an age subsequent to that of the Tertiary sediments.

None of the discoveries in Western Australia, South Australia, New South Wales, or Queensland have been made in undoubted Tertiary deposits. The specimens have been found on the surface of the ground, in clay deposits, in travertine, in auriferous drift, in desert sand-hills, but so far no positive proof of their existence in Tertiary leads has been forthcoming. It would appear, as suggested to me by Mr. W. F. Petterd, that, whatever their source, they fell at one time in an extensive shower, which embraced within its range the whole of Australia and Tasmania.

\* Figures 7, 8, 9 in Pro. Roy. Soc. Tas. 1897, "On the occurrence of Obsidian Buttons in Tasmania," Petterd and Twelvetrees.

In order to procure a thoroughly authoritative and complete analysis of the glass composing these buttons, I applied to the Director of the Geological Survey of the United States (Mr. C. D. Walcott), who permitted the work to be carried out in the Survey laboratory. Two obsidianites, one from the Upper Weld, the other from the Pieman, were sent, and have been analysed by Dr. Hillebrand, the distinguished chemist of the Survey, whose results are as follow:—

|                                       | Upper Weld. | Pieman.      |
|---------------------------------------|-------------|--------------|
| SiO <sub>2</sub> ... ..               | 69·80       | 73·59        |
| TiO <sub>2</sub> ... ..               | 0·80        | 0·70         |
| ZrO <sub>2</sub> ... ..               | ?           | 0·01         |
| Al <sub>2</sub> O <sub>3</sub> ... .. | 15·02       | 12·35        |
| Fe <sub>2</sub> O <sub>3</sub> ... .. | 0·40        | 0·38         |
| FeO ... ..                            | 4·65        | 3·79         |
| NiO ... ..                            | ?           | none         |
| MnO ... ..                            | 0·18        | 0·15         |
| CaO ... ..                            | 3·20        | 3·76         |
| SrO ... ..                            | none        | faint trace  |
| BaO ... ..                            | ?           | faint trace  |
| MgO ... ..                            | 2·47        | 1·80         |
| K <sub>2</sub> O ... ..               | 2·56        | 1·93         |
| Na <sub>2</sub> O ... ..              | 1·29        | 1·03         |
| Li <sub>2</sub> O ... ..              | good trace  | strong trace |
| H <sub>2</sub> O below 105°C.         | not est.    | 0·27         |
| H <sub>2</sub> O above 105°C.         | not est.    | 0·53         |
| P <sub>2</sub> O <sub>5</sub> ... ..  | none        | none         |
| S ... ..                              | ?           | none         |
|                                       | <hr/> <hr/> | <hr/> <hr/>  |
|                                       | 100·37      | 100·29       |

Sp. gr. 2·454  
at 18°C.

Sp. gr. 2·428  
at 22°C.

Dr. Hillebrand, in a note kindly sent with this exhaustive analysis, remarks that analysis No. 1 is in so far incomplete as the water could not be determined for lack of material, and there is probably some error in the value given for one of the larger constituents, since the summation is in excess of 100, even without the water, which in all probability is present. He adds:—"The analyses revealed compositions which, while not absolutely unique in petrographic literature, are seemingly approached but once or twice. Very unusual is the molecular preponderance of potash over soda in a rock of this character, so high in lime. According to Dr. Cross' calculations, the Weld specimen corresponds with Almerose in the new classification of Cross, Iddings, Pirsson, and Washington, which is represented on page 219 of Wash-

ington's Chemical Analyses of Igneous Rocks, by an analysis of a cordierite-audseite of Osann's from Almeria, in Spain. (Z.d.D., Geol. Ges. XL., 701, 1888.) The Pieman specimen, in Washington's book, is unnamed, but falls in rang 4, sub-rang 2 (p. 143). The physical character of the glass is in nowise different from that of the usual igneous glasses. The buttons have been of considerable interest to those geologists to whom I showed them before analysis, but while not disputing the difficulty of accounting for them, not one will for a moment admit the possibility of a cosmic origin,\* or rather, that such bodies could assume the shape shown. The latter seems to be decidedly artificial, in accord with one of the suggestions I see mentioned in the paper of Mr. Walcott's, which you were so good as to send me."

The analyses of the two rocks to which Dr. Hillebrand refers are as follow:—

|                                       | Cordierite-audseite. |  | Segregation in Granite. |  |
|---------------------------------------|----------------------|--|-------------------------|--|
|                                       | Almeria.             |  | Silesia.                |  |
| SiO <sub>2</sub> ... ..               | 63.75                |  | 68.87                   |  |
| Al <sub>2</sub> O <sub>3</sub> ... .. | 17.62                |  | 16.42                   |  |
| Fe <sub>2</sub> O <sub>3</sub> ... .. | 3.00                 |  | 1.91                    |  |
| FeO ... ..                            | 3.26                 |  | 2.06                    |  |
| MgO ... ..                            | 3.41                 |  | 2.54                    |  |
| CaO ... ..                            | 2.50                 |  | 4.64                    |  |
| Na <sub>2</sub> O ... ..              | 1.75                 |  | 1.25                    |  |
| K <sub>2</sub> O ... ..               | 2.40                 |  | 1.10                    |  |
| H <sub>2</sub> O+ ... ..              | 2.77                 |  | 1.12                    |  |
|                                       | <u>100.45</u>        |  | <u>99.91</u>            |  |

The relations of these analyses are perhaps best brought out by reducing the percentages to molecular ratios, as under:—

|                                       | Weld  | Pieman. | Audseite. | Granite segr. |
|---------------------------------------|-------|---------|-----------|---------------|
| SiO <sub>2</sub> ... ..               | 1.163 | 1.226   | 1.063     | 1.148         |
| Al <sub>2</sub> O <sub>3</sub> ... .. | 0.147 | 0.121   | 0.172     | 0.161         |
| Fe <sub>2</sub> O <sub>3</sub> ... .. | 0.002 | 0.003   | 0.019     | 0.012         |
| FeO ... ..                            | 0.065 | 0.052   | 0.045     | 0.029         |
| MgO ... ..                            | 0.061 | 0.045   | 0.085     | 0.064         |
| CaO ... ..                            | 0.057 | 0.067   | 0.045     | 0.083         |
| Na <sub>2</sub> O ... ..              | 0.020 | 0.016   | 0.030     | 0.020         |
| K <sub>2</sub> O ... ..               | 0.027 | 0.021   | 0.025     | 0.012         |

The mean of 18 reliable analyses of obsidian selected by Dr. Washington gives a SiO<sub>2</sub> percentage of 73.85

\* Dr F E. Suess in his treatise on Moldavites maintains a cosmic origin for these natural glasses, which he calls Tektites, dividing the Group into (1) Moldavites, (2) Billitonites, (3) Australites. Australites = obsidianites of Mr. R. H. Walcott, Melbourne.

(= mol. ratio 1.231). The obsidianites vary somewhat in their silica contents, from acid to neutral, but it is easy to see that they are not composed of a glass sufficiently basic to have been derived from our basaltic centres of eruption: and as volcanoes which have emitted acid or sub-acid glass are unknown in Tasmania, the origin of the obsidianites must be sought elsewhere. Dr. Hillebrand's remarks upon their shape being due to artificial causes show how difficult it is for geologists at a distance to appreciate the mode of occurrence. Discussion of the question of origin, however, does not fall within the scope of this paper, which aims merely to place on record facts relating to distribution and constitution.

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