Tasmania

DEPARTMENT OF MINES

GEOLOGICAL SURVEY RECORD

No. 2

# STICHTITE

## A New Tasmanian Mineral

NOTES BY VARIOUS AUTHORS, COLLECTED AND EDITED

BY

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## ILLUSTRATIONS.

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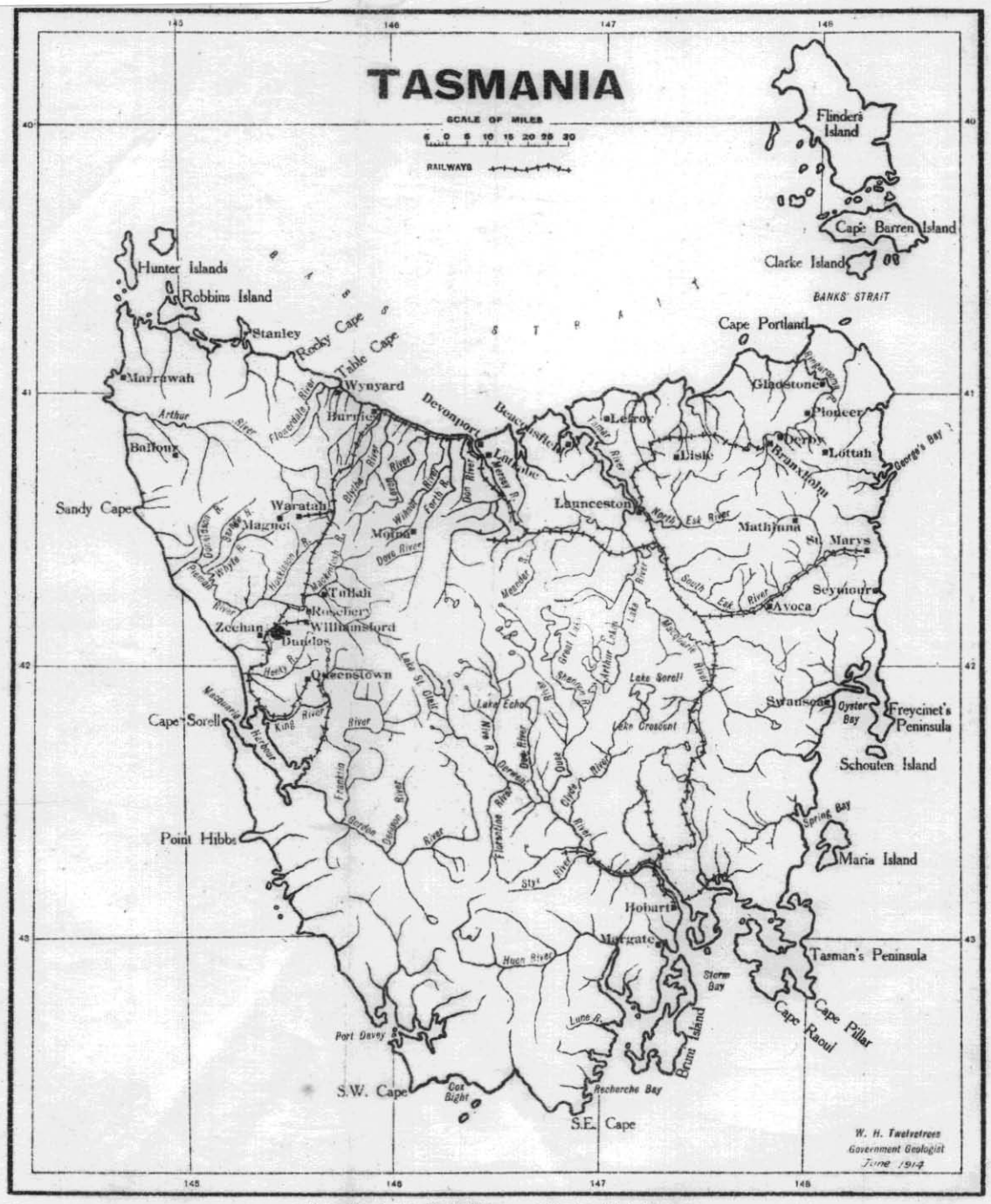
# LOCALITY MAP

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# Stichtite : A New Tasmanian Mineral.

## I.—PREFACE.

The following papers and notes on the new mineral stichtite have been collected for publication so as to be easily accessible to those interested in Tasmanian mineralogy. The occurrence of this mineral in Tasmania has been known since 1891, but up to the end of 1909 it was referred to kämmererite,, a chrome chlorite of similar colour. In 1910, however, the late W. F. Petterd, in publishing in his catalogue of the Minerals of Tasmania (pp. 167-170) an analysis made by Mr. A. S. Wesley at Mt. Lyell, gave it the name of stichtite, after Mr. Robt. Sticht, general manager of the Mt. Lyell Company's properties. Professor Ernst-Carroll, of Neuchâtel, in 1912, not quite satisfied with the reference to this mineral, requested me to transmit samples of fresh material for analysis and critical examination at the Mineralogic-petrological Institute in Zürich, of which Professor Dr. U. Grubenmann, the leading authority on the crystalline schists, is the chief. His assistant, Privat Dozent Dr. Laura Hezner, carried out the research work, and has prepared a paper on same, which, with her permission, is reproduced in an English form in this Record.

In addition are W. F. Petterd's references to the mineral, taken from his catalogue; and also a note supplied to him by Mr. L. K. Ward, B.E., late Assistant Government Geologist of Tasmania, and now Government Geologist of South Australia.

The stichtite occurs in patches and ramifying veins in serpentine on the razor-back crest of a ridge above the Adelaide silver-lead mine, Dundas. The brown colour of the weathered outcrops makes it easy to miss the mineral until its rich lilac or violet colour is revealed by freshly-broken surfaces.

The serpentine is the altered form of some variety of the ultra-basic rocks which in Tasmania are developed in connection with the margins of granite massifs in the west-

ern part of the island. It is of Devonian age, and the parent rock was intrusive in the Pre-Silurian Dundas series of slates and breccias. The locality named is the only place in Tasmania where this mineral has been found.

It is believed that this collection of references will be appreciated by mineralogists and others, as presenting all the information so far available in respect of a unique mineral.

W. H. TWELVETREES,
Government Geologist.

Launceston June 19, 1914.

## II.—DESCRIPTION OF THE MINERAL.

By Mr. W. F. Petterd.

Stichtite (carbonato-hydrate of magnesium, chrome and iron).—This is beyond doubt an unrecorded mineral species which has hitherto been known under the name of kämmererite, and is referred to by the writer under that apellation in the "Catalogue of the Minerals of Tasmania, 1896."* A specimen was exhibited by Messrs. Stitt and Cullingsworth at the Tasmanian Exhibition, held in Launceston in 1891, and named by these gentlemen kämmererite, which term has been retained until the present time (1910). This error was doubtless caused by its remarkable similarity to the mineral indicated, both as regards colour and general physical characters, a resemblance so close, in fact, as to make it readily excusable, since the supposed identity was made out without a complete analysis. It has been aptly referred to by Mr. R. Sticht in a letter to the writer as "masquerading under the name of a massive form of kämmererite." The writer has great pleasure in dedicating this new mineral species to Mr. Robert Sticht, the well-known general manager of the Mt. Lyell Mining and Railway Company, who has rendered material assistance in the production of this catalogue. At the same time it is necessary to state that its detection as a substance of special interest is due to Mr. A. S. Wesley, the chief chemist to the Mt. Lyell Company, who, by the analysis now published of a portion of a specimen contained in his mineral cabinet, and by subsequent research, established its specific distinction from any mineral species hitherto described.

It is related, and may be said to belong, to the genus pyroaurite ($R_2'''O_3$, $6MgO$, $CO_2$, $3H_2O$), the greater portion of the $Fe_2O_3$ being replaced by $Cr_2O_3$, or otherwise a carbonato-hydrate of Mg, Cr and Fe, developed from the alteration of the numberless minute chromite crystals and particles in the presence of serpentine.

* "Catalogue of the Minerals of Tasmania," by W. F. Petterd, 1910, pp. 167–169.

An analysis gave the following result:—

| | Per cent. |
|---|---|
| $Cr_2O_3$ | 11·5 |
| $Fe_2O_3$ | 9·0 |
| MgO | 36·0 |
| $CO_2$ | 7·2 |
| $H_2O$ | 36·1 |
| | 99·8 |

(R. Sticht.)

answering to the formula $(CrFe_2)O_3$, $6MgO$, $CO_2$, $13H_2O$, in which $Cr_2O_3$ approximately 3:2. Hardness 1·5.

Specific gravity (determined by Mr. L. K. Ward) 2·20; that of a second and almost pure example (that is with only two or three small specks of yellow-green serpentine) 2·12.

At the same time the specific gravity is desirable of an absolutely clear and fresh specimen. The streak is a very pale lilac to almost white. Its wet chemical reactions are that it is soluble in HCl, with effervescence which is very brisk when the acid is heated. It affords an intensely bright-green solution, with a limited flocculent turbidity as a precipitate. The pyrognostic characteristics are that it assumes a bronze colour when heated on coal, and then becomes perceptibly magnetic.

This new species of mineral is only known to occur in the amorphous condition. It may be foliated to compact, and is not rarely granular. Its colour is a most beautiful and intense lilac shade, and is thus of considerable attractiveness. In respect of colouration it stands alone amongst the minerals of this State. It weathers on exposed surfaces to a brown tint, and is considerably roughened by numerous slightly protruding fragments of partially decomposed chromite. The smaller samples of the stichtite often have as a nucleus one or more minute fragments of the chromite, which thus to an extent reveal its origin. In habit it forms irregularly-shaped masses, veins, and blebs, in a pale yellowish-green serpentine, more rarely showing ill-defined bands of the new mineral. At times the serpentine is irregularly speckled with patches of lilac-coloured stichtite, which vary in size from extremely minute to 10 or 12 mm., and then form mineral specimens of a unique character and peculiar beauty, the green of the serpentine contrasting strongly and favourably with the lilac stichtite.

W. F. PETTERD.

## III.—NOTE ON THE OPTICAL CHARACTERS OF STICHTITE.

By Mr. L. K Ward, B.A., B.E.

This mineral forms irregularly-shaped masses, veins and blebs in serpentine at Dundas in the neighbourhood of the Adelaide Mine. Weathered surfaces are deep brown, but the fresh mineral varies in colour from lilac or rose-pink to deep purple. It is at this place usually associated with crystalline chromite. The chromite crystals appear to have in many cases served as nuclei, about which the stichtite has developed. Its distribution is sporadic. Microscopically it appears to be built up of radiating plates and tufts.

*Optical Properties in Thin Section.*

Colour—Pale rose to brownish rose.

Pleochroism—Absent.

Birefringence—Strong, giving 2nd to 3rd order colours in sections not exceeding 0·03 mm. in thickness.

Extinction of fibres—Straight.

Optical character (measured with respect to the elongation of the fibres)—Positive.

Structure—Fibres and tufts, sometimes curved, radially disposed about nuclei of chromite. The radiating aggregates are wrapped round with a mosaic of small scales and fibres.

Note.—Optical properties require further investigation. Only one thin section available for examination.

L. K. WARD.

* "Catalogue of the Minerals of Tasmania," by W. F. Petterd, 1910, pp. 169-70.

# IV.—ON A NEW CHROME-BEARING MAGNESIUM HYDROXY-CARBONATE.

By Dr. Laura Hezner, in Zürich.*

The Mineralogic-petrographical Institute of the federal Technical High School in Zurich has received from Prof. Ernst-Carroll in Neuchâtel an almost mono-mineral rock for chemical analysis.

It comes from Dundas on the west coast of Tasmania, where it is associated with a handsome light-green serpentine, which contains numerous grains of chromite of about the size of peas.

The rock under investigation (two lenticular pieces bounded by gliding planes) is of lilac colour (cardinal tint 22, violet, m in Radde's international colour scale), and consists almost entirely of a scaly, mica-like mineral which reminds one of lepidolite. Nevertheless, its cleavage is less perfect than in that mineral, and its lustre less vivid and somewhat oily. Nodules of the green serpentine lie sporadically between the parallel-arranged flakes and pass into the rock substance without defined boundaries. The appearance is as if the violet mineral has been derived from the serpentine. This supposition is confirmed by the fact that the grains of chromite in the latter have been converted entirely or partially into a similar, though finer, violet-coloured substance. Besides the nodules of serpentine, there are still present in the lilac-coloured rock small grains of chromite visible under the lens on crushing the stone.

The violet-coloured rock and the accompanying serpentine have been subjected to quantitative chemical analysis, giving the following results:—

| | Serpentine. | Violet Rock. |
|---|---|---|
| $SiO_2$ ... ... ... ... ... ... ... | 38·70 | 3·87 |
| $TiO_2$ ... ... ... ... ... ... ... | — | — |
| $CO_2$ ... ... ... ... ... ... ... | — | 10·45 |
| $Al_2O_3$ ... ... ... ... ... ... | — | — |
| $Cr_2O_3$ ... ... ... ... ... ... | 3·60 | 20·44 |
| $Fe_2O_3$ ... ... ... ... ... ... | — | — |
| FeO ... ... ... ... ... ... ... | 2·54 | 1·10 |
| MnO ... ... ... ... ... ... ... | — | — |
| CaO ... ... ... ... ... ... ... | — | — |

* Centralblatt f. Min., &c., 1912, No. 18.

| | Serpentine. | Violet Rock. |
|---|---|---|
| MgO... ... ... ... ... ... ... | 40·75 | 37·12 |
| $H_2O$ (120 −) ... ... ... ... | 0·81 | 0·95 |
| $H_2O$ (120 +) ... ... ... ... | 14·01 | 26·31 |
| | 100·41 | 100·24 |
| Sp. gr. ... ... ... ... ... ... | 2·53 | 2·16 |

The low silica content of analysis 2 must be attributed to the nodules of serpentine, and is at the same time a measure of the amount of residual serpentine still surviving. The ferrous oxide was calculated in the chromite. In this way the following composition of the rock results:— 3·2 $H_4Mg_3Si_2O_9$ Serpentine, 1·5 $FeCr_2O_4$ chromite, 23·8 ($MgCO_3$, 2·5 $Mg(OH)_2$, $Cr(OH)_3$, 2 $H_2O$)—a violet-coloured scaly mineral = chromiferous Mg-hydroxycarbonate or 11·23 per cent. serpentine, 5·26 per cent. chromite and 83·51 per cent. Mg-hydroxycarbonate.

If for verification we calculate from these components the weight percentages requisite for the formulæ, the following values are obtained:—

| | |
|---|---|
| $SiO_2$ ... ... ... ... ... ... | 3·87 |
| $CO_2$ ... ... ... ... ... ... | 10·48 |
| $Cr_2O_3$ ... ... ... ... ... | 20·43 |
| FeO ... ... ... ... ... ... | 1·08 |
| MgO ... ... ... ... ... ... | 37·25 |
| $H_2O$... ... ... ... ... ... | 26·89 |

The agreement with the values obtained is so close as to establish the accuracy of the analytical results. The violet scaly mineral accordingly belongs to the magnesium hydroxycarbonates, and has the formula—

$$2MgCO_3 \quad 5Mg(OH)_2 \quad 2Cr(OH)_3 \quad 4H_2O,$$

from which the following theoretical composition can be calculated:—

| | |
|---|---|
| MgO ... ... ... ... ... ... | 38·06 |
| $Cr_2O_3$ ... ... ... ... ... | 20·65 |
| $H_2O$ ... ... ... ... ... ... | 29·34 |
| $CO_2$ ... ... ... ... ... ... | 11·95 |
| | 100·00 |

The derivation of the mineral from the serpentine assumes a complete expulsion of the silica, which is replaced

by $CO_2$ and $H_2O$. With this is associated a relatively strong enrichment of Cr, while the Mg content remains approximately constant.

Among known magnesium hydroxycarbonates this mineral has the closest analogy with brugnatellite—

$$MgCO_3 \quad 5Mg(OH)_2 \quad Fe(OH)_3 \quad 4H_2O.$$

The latter also is a lamellar mineral of micaceous habit, which has been found in serpentinised peridotite. In the Tasmanian mineral, however, the iron is represented completely by chromium and the quantitative ratios between the carbonate, the hydroxides and water are 2 : 5 : 2 : 4 instead of 1 : 5 : 1 : 4. Brugnatellite is only known from a single locality (Torre Santa Maria, near Ciappanico, Lombardy). There is consequently lacking the breadth of experience which would enable it to be determined with certainty whether the proportions of the individual components are really constant or are variable within certain limits. In the latter case our Tasmanian mineral would represent a chrome-brugnatellite.

In conclusion I wish to express my thanks to the Director of the Mineralogic-petrographical Institute, Professor Dr. U. Grubenmann, for entrusting to me this beautiful material for investigation.

L. HEZNER.

# V.—ON THE MINERAL STICHTITE.

By Dr. A. Himmelbauer, University of Vienna.
(Communicated to the Mineralogical Society of Vienna.)*

Dr. Laura Hezner, in a note on a new chrome-bearing magnesiumhydroxycarbonate has described a new mineral from serpentine in Tasmania. This mineral having a striking resemblance to hydrotalcite, in an investigation of which I am now engaged, I applied to Prof. Ernst-Carroll in Neuchâtel, who provided me with fresh material for examination.

The mineral, as remarked by Dr. Hezner, has a greasy to mother-of-pearl lustre, and forms lilac-coloured scales with a good basal cleavage. I found its hardness to be between that of gypsum and rock salt, *i.e.*, $1\frac{3}{4}$. I determined the density of pure flakes by the fluid method as 2·161.

Optical examination of the mineral gave the following results:—Optically uniaxial, in some places feebly biaxial, negative. In cleavage flakes the refractive index was determined as 1·542 by the immersion method (benzol and nitrobenzol). In thin section I further determined its double refraction $\omega - \varepsilon$ as 0·026 (measured with the Zeiss movable quartz wedge). In accordance with this rather considerable birefringence the laminae of the mineral show lively interference colours. Further, a weak pleochroism showed itself, $\omega > \varepsilon$

According to Dr. Hezner's analysis, the formula would be $2MgCO_3\ 5Mg(OH)_2\ 2Cr(OH)_3\ 4H_2O$.

The microscopic radial arrangement of the flakes round grains of chromite indicate clearly that the latter mineral provided the chrome content, while the magnesium content of the new mineral was derived from the serpentine.

Entirely analogous conditions are known to me in the hydrotalcite of Norway, only in the formula for the latter aluminium enters instead of chrome, and partly also nickel instead of magnesium.

This mineral therefore is allied to a series of serpentine minerals, hydrotalcite, pyroaurite, and as Dr. Hezner points out, brugnatellite. Further relationships which these minerals have in common with other combinations of magnesium and aluminium will be discussed in my forthcoming work on hydrotalcite.

* Tschermak's mineral. u. petrogr. Mitt. Band xxxii. Heft 1/2., 1913.

The new mineral has received the name stichtite (Petterd's "Catologue of the Minerals of Tasmania," p. 167), after R. Sticht, general manager of the Mt. Lyell Mine, in Tasmania. It occurred in serpentinised rock in the vicinity of Dundas, on the west coast of Tasmania. This serpentinous rock intrudes the Dundas slates provisionally included in the Cambro-Ordovician, and is itself of Devonian age.

A. HIMMELBAUER.

PLATE I

# STICHTITE

IN SERPENTINE ROCK, NEAR DUNDAS.

## EXPLANATION OF PHOTOMICROGRAPH.

Serpentine rock showing the mineral Stichtite in fibrous radial tufts bordering crystals of chromite. Photographed in plain light × 19.