

THE MINERALS OF TASMANIA.

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To the geologist, the fascinating science of mineralogy must always be of the utmost importance, as it defines with remarkable exactitude the chemical constituents and combinations of rock masses, and, thus interpreting their optical and physical characters assumed, it plays an important part in the elucidation of the mysteries of the earth's crust. Moreover, in addition, the minerals of a country are invariably intimately associated with its industrial progress, in addition to being an important factor in its igneous and metamorphic geology. In this dual aspect this State affords a most prolific field, perhaps unequalled in the Commonwealth, for serious consideration.

In this short article, I propose to review the subject of the mineralogy of this Island in an extremely concise manner, the object being, chiefly, to afford the members of the Australasian Association for the Advancement of Science a cursory glimpse into Nature's hidden objects of wealth, beauty, and scientific interest. It will be readily understood that the restricted space at the disposal of the writer effectually prevents full justice being done to an absorbing subject, which is of almost universal interest, viewed from the one or the other aspect. The economic result of practical mining operations, as carried on in this State, has been of a most satisfactory character, and has, without doubt, added greatly to the national wealth; but, for detailed information under this head, reference must be made to the voluminous statistical information, and the general progress, and other reports, issued by the Mines Department of the local Government. Suffice it to say, under this head, that metallic ores and metals to the gross value of about fifteen million pounds sterling have been won during the past decade.

This short article has been prepared for the collector of minerals as such, thus leaving the geological aspect of the subject to other hands, and the economic side of the question to its special State Department. It will be found that this Island is one of the most favoured hunting-grounds

for the mineral collector; its diversified topographical character, with numerous mountains and valleys, affords special facilities for the prospector and miner, while its geology offers the wide range of the crystalline quartzite and schists of the Archæan and Silurian epochs to the Tertiary and Recent formations. In addition, the Island presents an almost boundless variety of igneous rocks, ranging from the older and almost indecipherable felsites to the effusive melilite and normal basalt, with their varieties.

A prominent feature on the North-West and North-East and granite bosses, enclosing pegmatite dykes and elvan courses, which afford the minerals peculiar to these acidic rocks. The serpentine intrusions of the North and North-West add diversity to the region available to the mineralogist, while the apparently intrusive Mesozoic dolerite, which claims so large an extent of the Island, is not an altogether barren field for the ardent mineral collector. On almost every side something great or small will be found worthy of attention, and, should the excursion be extended to the northern portion of the State, the most advanced enthusiast may rest assured that ample scope will be found for hammer and bag, with every reasonable certainty of his being able to add to the cabinet specimens both rare in nature and fine in quality.

Concise Retrospect of the More Important and Interesting Minerals Known to Occur.

Among the native elements may be mentioned the beautifully-crystallised alluvial masses of gold which have been and still are occasionally obtained in the district immediately west of the mining township of Waratah. Native bismuth occurs, disseminated through a hornblende matrix, at Mount Ramsay, and, in association with fluor, wolframite, and chalcopyrite, at Mount Black, and a mass, weighing 55 lbs., was obtained near Weldborough in alluvial tin-drift. Native copper is found, as foil of extreme tenuity, in the cleavages of the killas, or slate, adjacent to the celebrated Mount Bischoff Mine, and is abundant in the form of arborescent masses about Mount Lyell; in fact, at one locality it has been worked as an ore of the metal. Native silver occurs at several of the Zeehan and Heazlewood mines, and some remarkably beautiful examples have occasionally come to light. Sulphur has been obtained in some quantity in the Mount Bischoff workings, and a limited dusting of this element has been observed on some of the galenite won at

the Montana Mine, Zeehan. Diamonds have been shown as from the Mount Donaldson district, Pieman River; but the reported find needs confirmation. Osmiridium occurs in association with gold at the Savage River and other localities north of the Pieman, and, in small particles, near the Blue Tier, Beaconsfield. This alloy has been extensively sought for recently for the iridium contents, but with only scant success as regards quantity. Native iron is known from two recorded meteorites; the first obtained at the Blue Tier, and the second, a small but veritable specimen, from the Castray River. (Proc. Royal Soc., Tas., 1901.) Tellurides are not actually known to occur, but the refining of bismuth from the Shepherd and Murphy Mine, Bell Mount, reveals the fact that tellurium occurred as a contamination. It is, therefore, reasonable to anticipate the discovery of telluride of this metal. In the sulphides the majority of those usually encountered in metalliferous localities are abundant, with several of exceptional occurrence, such as dufrenosite, huascolite, stromeyerite, zinkenite, and jamiesonite. Stannite is mined as an ore at the Oonah Mine, Zeehan, where it is occasionally found intermixed with bismuthenite, a most unusual association. Fahlerz, or tetrahedrite, is remarkably abundant, often highly argentiferous, such as that mined at the Curtin and Davis Mine, near Ringville, where it frequently assays several hundreds of ounces of silver to the ton; while specimens have been obtained at the Hercules Mine assaying as high as 3000 ounces. At the Heazlewood, a richly-nickeliferous variety of pentlandite occurs, which has been named heazlewoodite. Bornite of most beautiful colouration is commonly found in the Mount Lyell district, and stibnite only occurs in the auriferous reefs of the Lefroy district. Tennantite is said to occur at the Mount Lyell Mine, associated with cupriferous pyrite and chalcopyrite. On the North-East Dundas field, compound sulphides of unrecognised species are occasionally met with. They are homogeneous interchanges of the elements S, As, Bi, Cu, Fe, and Pb, with more or less Ag and Au. A remarkably fine example was obtained at the No. 1 Curtin and Davis Mine, in the form of an interwoven group of large prismatic crystals, longitudinally striate. This, on analysis, proved to be a sulphide of bismuth and antimony, with small proportions of iron and copper. To this I propose to apply the specific name of histrixite (porcupine ore). The metallic minerals of this portion of the State are well worthy of study. At Mounts Reid and Murchison are enormous deposits of the mixed sulphides of Fe, P, Zn, and Cu—all more or less auriferous (sometimes to a high

degree) and argentiferous. They are, apparently, the result of metasomatic replacement. The arsenides and sulph-arsenides are but sparsely represented in variety, but are occasionally abundant individually. Arsenopyrite is very characteristic of the mineral field in the vicinity of the Scamander River, and leucopyrite occurs in the Colebrook Mine, in company with axinite and pyrrhotite, and also contaminates the ores of the North-East Dundas district. At Barn Bluff, zones of the older schists occur, impregnated with pyrrhotite and cupriferous pyrite. A noticeable feature in this last-mentioned district is that, on the exposure of the freshly-taken-out mineralised rock it is quickly coated with an efflorescence of white and yellow iron sulphates. At the McKimmie Mine, near the junction of the serpentine and Silurian slates, some quantity of massive pure niccolite was obtained and exported, but it is not now accessible. The compounds of Cl, Br, and I are but sparsely represented; the superficial portions of some of the silver-lead lodes occasionally contain appreciable quantities of cerargyrite, embolite, and, still more rarely, iodyrite. A very impure Halite, occurs at the Salt Pans, east of Oatlands, and atacamite has been observed in comparatively small spangles on the outcrop of the Comet Mine. The most noticeable discovery in this group is a species recently described under the name of petterdite, and collected in the silicious outcrop of the Britannia Mine, near Zeehan. It is a chloride of lead, containing As_2O_5 , and P_2O_7 , with a smaller quantity of Sb_2O_5 . It occurs in imbricate groups of quasi-hexagonal plates of somewhat large size and attractive appearance.

Of the fluorine compounds, fluorite is abundant at the Mount Bischoff Mine, where, also, prosopite—a hydrous fluorite of aluminium and calcium—also occurs as a secondary product. At the Republic Tin Mine, Ben Lomond, as well as at the Mount Black Mine, fluorite is obtained from white to a dark purple colour, sometimes in well-cut but small cubes. Its variety, chlorophane, occurs at Bischoff and Hampshire in amorphous and crystalline bunches.

In the assemblage containing the oxides of the gold, iron, and tin groups, the number is naturally somewhat extensive, and, individually, often exists in considerable quantity, such as asbolite (occasionally cobaltiferous); hematite—that at the Blythe River being of remarkable purity, and practically inexhaustible abundance—limonite, pyrolusite, &c. Among the more noticeable are the fine crystal developments of cuprite in the vicinity of Mount Lyell. Its lovely

variety, chalcotrichite, occurs in small capillary tufts of an intense crimson colour at the Colebrook Mine, near Ringville. The sapphire occasionally abounds in tin-drift in the North-East mining districts, and is sometimes of the beautiful royal blue so eagerly sought after by gem-hunters. The pleonaste, or black spinel, on the same tin-fields, is one of the many common minerals known to the miner as "Black Jack." On the Zeehan and Dundas field very fine specimens of stilpnesiderite and massicot have been met with. Cassiterite occurs in fine, well-developed, intensely black crystals—often macled—at the Lottah Mine at Blue Tier, Bell Mount, and Storey's Creek, in the Ben Lomond district. At Constables' Creek, on the North-East Coast, bunches of well-formed mahogany-coloured crystal groups have been met with, and at Mount Bischoff the impregnations of this mineral in the local topaz-porphyry are of special interest.

At the Rex Hill Mine, the tin-ore is impregnated throughout a granite rock, in which the large orthoclase crystals are pseudomorphed to cassiterite, this being the first recorded instance of such a replacement in this State, or, perhaps, outside the classical locality in Cornwall, England. Alluvial tin is found in great profusion of colouration; it varies from glassy (almost colourless), to amber, brown, and ruby, hence the local appellations of resin tin, ruby tin, and so on.

Among the oxides of the elements of the arsenic and sulphur groups, nothing worthy of special mention has been exhumed, with the exception of wolframite, bismite, and cervantite.

Chief among the elements of the carbon-silicon group is the oxide of the latter quartz. It appears here in hosts of varieties, even for so variable a mineral. Among the more common forms are rock crystal, chalcedony, cornelian, cacholong, and infusorial earth. The milk-opal, with an occasional splash of the fire and colour of the precious variety, is abundant, impregnating and seaming the Permo-Carboniferous sandstone at Bothwell, and wood opal (silica after organic matter) has been obtained in very beautiful and perfect examples, so much so that much of the material is worthy the attention of the lapidary. In the bi-silicates, which comprise the rock forming iron-magnesium minerals, are pyroxene and hornblende, with their array of conflicting variations, both as regards diversity of colour and growth. In the Heazlewood district, the rhombic form, bronzite, and its variety bastite, are obtained in characteristic development, and the monoclinic diallage, often altered to schiller-spar, occurs at the same locality. Well-formed crystals of

augite of fair size may be collected in quantity near the Railway Bridge which spans the Hellyer River. At the Colebrook Mine, uralite reaches a remarkable state of development. The average specimens of hornblende, tremolite, and actinolite are found, while beryl of comparatively enormous size, but dull colouration, occurs in a pegmatite dyke about 500 yards north of the Republic Mine, Ben Lomond. It is associated with extremely fine and perfect crystals of an almost white orthoclase, the individuals of which sometimes reach several inches in length, and are occasionally twinned.

Among the unisilicates, axinite is to the front as a prominent species. It is almost solely confined to the igneous formation known as the Colebrook Mine. It is in large violet-coloured plates, freely interspersed in association with calcite, pyrrhotite, datolite, arsenical and iron pyrites. Garnet of several sub-species is occasionally met with, and a new manganese variety, which has been named Johnstonite, has been discovered in the peculiar rocks at Port Cygnet. At Hampshire Hills there is an extensive development of well-crystallised idocrase, which, practically, illustrates a contact phenomenon. The white silvery lithia variety of muscovite, which is termed zinnwaldite, is plentiful in the tin-districts on the North-East Coast. Of the whole group of feldspars, as occurring in this State, orthoclase has its highest crystallographic development. In the trachytes and phonolites of Port Cygnet wonderfully-fine crystals are easily broken free of the rock, and these often show both Baveno and Carlsbad twinning; its variety, sanidine, also occurs at the same locality in almost colourless glassy crystals. A massive white scapolite has been unearthed at Beaconsfield. Saussurite is abundant in the altered gabbros of the Heazlewood district. In the alluvial tin-drifts of the North-East and at Shekelton, near Table Cape, the zircon occurs in extreme profusion. Many from the former locality are really nice gem-stones when properly cut, and are reported to be among the most lustrous in the world. In the rock-forming section of the group we can claim hauynite, nephelite, and melilite, all old-world forms only recently identified as occurring here, the last giving its prefix to a basaltic rock at Shannon Tier.

Here we must note those remarkable pellets of mystery, the only known form of acidic volcanic glass which has, so far been discovered in the Island, and which are usually termed obsidian buttons, but more recently obsidianites and australites. Whence came they, and why have they been so long neglected by our local geologists and physicists?

Although obscure in appearance and diminutive in size, they are difficult of interpretation, and offer a field of investigation worthy of any student of natural phenomena. That they are extra-terrestrial is almost beyond doubt; in any case, it is obviously apparent that they can have no connection with the known Tertiary volcanic rocks as occurring here, for these are all of basic composition. The writer is strongly of the opinion that but one shower of these objects occurred, in post-Pliocene times, which impinged upon the earth in a north-western track, crudely extending from this Island to Victoria, from thence to the northern part of West Australia, and thence to the western islands of the Malay Archipelago. It has been noticed that examples collected from many points along the track indicated have the same general characteristics as regards form, colouration, size, and composition. Moreover, they almost invariably present the same amount of surface abrasion. Recent writers have shown that there are reasonable grounds for the supposition that they are of meteoric origin, but there still exists a remarkable diversion of opinion as to their source.

In the sub-silicates we possess a few species which will repay attention, not the least interesting being the water-clear topaz, which occurs so abundantly about Mount Cameron, at Bell Mount, and at Killikrankie Bay, Flinders Island. These make veritable gem-stones of high lustre and limpid beauty, and are often used as such. Sometimes they are of unusually large size and good crystallographic development. The variety pycnite occurs at Bischoff; in patches of radiating disks. The ordinary black schorl, or, more scientifically, tourmaline, is very abundant in large masses and radiating bunches wherever the stanniferous granite prevails. A hair-brown variety has been collected near the northern flank of Mount Heemskirk, and its near ally, zeuxite, which assumes an aciculated habit, is plentiful at Mount Bischoff, its only locality in this Island. Our local petrologists know how microscopically abundant and disseminated sphene has proved to be. At the Lucy River, a tributary of the Pieman, our only known sillimanite schist occurs. In the zeolites, we have a goodly array of species, in conformity with the variety and profusion of their parents, the effusive and other igneous rocks. Analcite is often met with in the hauyne-phonolite of the Port Cygnet series. The prevailing dolerite affords scolecite, which affects a radiating structure. In the nephelinite of the Shannon Tier the white natrolite is extremely plentiful, freely bespattering the rock with bunches, and coating the

vughs. At Bell Mount, remarkably-fine double-terminated crystals of gmelinite have been obtained. The ordinary forms, such as chabazite, phacolite, and phillipsite, are to be found in more or less quantity, and in all states of preservation, where the Tertiary effusive rocks prevail. In the basaltvitrophyre, which is, apparently, common about Sheffield, numerous beautiful zeolites abound, including radiating masses of stilbite several inches in length. The margarophyllite section embraces a large number of those indefinite so-called mineral species which, as a rule, do not afford the mineralogist any serious interest. It includes the normal chlorite, and a variety poor in iron, which is termed leuchtenbergite, which has been identified in the variolite rock at the Magnet Mine, beyond Waratah. In every way, typical gilbertite is abundant at the Anchor Tin Mine. Sericite occurs as sericite-schist, and talc of a beautiful pale-green colouration and glimmering lustre has been discovered on the north flank of the Meredith Range. A thin seam of green pyrophyllite, highly auriferous, occurs at the Mount Lyell Mine, as a thin flucan between the ore-body and the adjacent country-rock. Serpentine in considerable variability is prominent at the Forth, near Beaconsfield, at the Heazlewood, on the Huskisson River, and at Dundas, that from the last-mentioned locality often showing splashes and blebs of kammererite. At the Heazlewood this substance appears to merge into the ultra-basic and gabbroid rocks of the locality. In the class of anhydrous phosphates, apatite is only known in very limited quantity at the Hampshire Hills; the same may be said of mimetite and plumbogummite. Pyromorphite, in compact entanglements of the hexagonal prisms of a peculiar dark-green colour, has been found plentiful at one of the Zeehan silver-lead mines, and carminite has recently been identified from the Magnet Mine. At the Britannia Mine, Zeehan, a small quantity of campylite, showing the characteristic barrel-shaped crystals, is known to occur. Quite recently diligent search has been made for the phosphate of the cerium metals, monazite, on account of the thorium contents, which element, in the form of nitrate, is used in the manufacture of the incandescent gas mantles. It has been found to occur in the form of heavy alluvial sand, practically, wherever the granite is met with. In this form it has been obtained at the Stanley River, a tributary of the Pieman, at Mount Stronach, at the Pioneer Mine, at the South Esk Tin Mine, and at Derby; but, so far, not in sufficient quantity to render it of economic value. Of the hydrous phosphates, wavellite is, perhaps, the most abundant and

mineralogically interesting. It is found in aggregates of mining, radiating disks of silvery white, implanted on the cleavages of the Silurian slate at Back Creek. It is often accompanied by varisite, and a little of the former has been noticed at Mount Ramsay. Clustering radiating acicular bunches of pale blue symplectite occur on ferro-manganese gossan in the upper levels of the Magnet Mine, and evansite has been obtained at Zeehan under similar circumstances. At the Comet, Dundas, and other silver-lead mines, masses of bindheimite have been mined, but good examples are not now, by any means, easily obtainable. Of the tungstates, &c., a few species are known to occur occasionally, such as scheelite (Mount Ramsay), wolframite, and a small quantity of vanadinite.

The sulphates and chromates of the metals are always of interest, and welcome additions to the cabinet of the collector, as they are often beautifully crystallised and attractively coloured. The Comet Mine has become somewhat celebrated as the producer of, perhaps, the finest groups of anglesite that have been found in the Commonwealth, and the carbonates of lead (cerussite) from the same mine have an almost equal reputation. But the mineral which has rendered this State famous among collectors in all parts of the world is the inimitable crocoisite, especially that obtained some few years back at the Adelaide Mine, Dundas. Its intensely-bright hyacinth-red colour, prismatic habit, and adamantine lustre render it one of the most attractive objects in the mineral world, and it has, consequently, been most eagerly sought after by all who admire Nature's handiwork. Few collectors of any note are now without specimens of this beautiful substance, but still the demand appears to continue; from far and wide, applications are continually being made for the mineral as occurring in the Dundas Mine. It has also been obtained at a few other localities, notably, in the Heazlewood district and at the Magnet Mine.

On the East Coast, the extremely-rare phospho-chromate of lead and copper, vauquelinite, has been obtained. It assumes a curious siskin-green colour, and is almost invariably amorphous, without any indication of crystallisation. It has been thought to be practically confined to the silver-lead region of Siberia, and, therefore, its detection in this State is of more than passing interest.

The hydrous section is represented by alunogen, epsomite, melanterite, and a few others of like nature, including a peculiar group of iron-chrome sulphates from the Blue Tier,

near Beaconsfield. In the carbonates we have fine crystallised cerussite from the Mount Reid and Comet mines, and equally attractive delicate-pink rhodochrosite from the Hercules Mine. On all our silver-lead fields siderite is a common lode gangue, and, as such, it not unrarely shows finely-developed crystals, and the same applies to the dolomite of the Magnet Mine. In the hydrous class of carbonates is the local dundasite, and the bright apple-green zaratite—the latter confined to the serpentine region at the Heazlewood. It is, undoubtedly, the finest occurrence known of this comparatively rare substance. In habit it assumes a varnish-like coating on pentlandite and chromite. The carbonates of copper malachite and azurite both occur, but not nearly so highly developed as at many localities on the Mainland.

Among the hydro-carbons there are a few worthy of more than passing interest, among which may be mentioned the tasmanite of the Mersey, the pelionite, or tannel coal, of Mount Pelion, and the asphaltum found on the eastern Bass Straits islands; but, unfortunately, not in quantity to render it of commercial importance. With the Tertiary lignite at Macquarie Harbour, masses of copalite, or a species allied thereto, are often met with. It burns with a bright, smoky flame, and gives off an aromatic odour.

In conclusion, it may be well to remark that the total number of distinct species known to mineralogical science may be estimated at between two and three thousand, and of this number a few years' investigation has resulted in the discovery and recording of not less than 300 in Tasmania; so it may be conceded that within the restricted confines of this Island we have an unusually prolific harvest of these compounds and native elements. In all reasonable probability, this is a larger number than has been recorded for any equal area on the surface of the globe, an area, moreover, which is, apparently, far from exhausted. It may be of interest to state that about forty species occurring here have not, so far as known, been discovered on the mainland of Australia, while at least five are not known elsewhere. Several of the more prominent for beauty and scientific interest, such as crocoisite, vauquelinite, zaratite, datolite, and axinite, were, until recent years, supposed to be confined to classic localities, but in our little Island are comparatively abundant and attainable.
