A DESCRIPTIVE CATALOGUE

OF THE

Rock Specimens and Minerals

IN THE

NATIONAL MUSEUM,

COLLECTED BY

The Geological Survey of Victoria;

WITH EXPLANATORY NOTES ON THEIR NATURE
AND MODE OF OCCURRENCE IN PLACE.

BY

ALFRED R. C. SELWYN,
DIRECTOR OF THE GEOLOGICAL SURVEY,
GEORGE H. F. ULRICH, F.G.S., C. DOYLY H. APLIN, ROBERT
ETHERIDGE, F.G.S., AND NORMAN TAYLOR.

MELBOURNE:
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INTRODUCTION.

The limited space available in the National Museum for the exhibition of the geological collection of rocks makes it impossible at present to display more than one suite of specimens. To render

ERRATA.

Page 18, No. 74. For "(Diabase)," read "(Diorite)."
18, No. 75. " "
18, No. 76. " "
18, Nos. 77 and 78. " "
18, Nos. 77 and 78, last line. For "some pyroxenic mineral," read "some amphibolic mineral."
72, No. 53. For "Morris' Plain," read "Morris' Claim."
74, No. 71. For "Dawson," read "Danson."
81, Note after 38a. For "specimen No. 38," read "No. 38a."
91, No. 2. For "Moryya," read "Moruya."
95, No. 15. For "(7)," read "(71)."
In List of Maps, No. 42. For "19. N.W.," read "19. S.E."

illustrate the Palæontology of Victoria.

The minerals are also arranged as a separate collection, and numbered consecutively to agree with the Descriptive Catalogue.

The published geological quarter-sheet maps, referred to on the specimen labels, are exhibited on the walls contiguous to the cases. Each map represents fifty-four square miles of country, and a copy of the geologically-colored sketch-map of the whole colony, on a scale of eight miles to one inch, is also exhibited. On the above-mentioned maps are letters and numbers—which
INTRODUCTION.

The limited space available in the National Museum for the exhibition of the geological collection of rocks makes it impossible at present to display more than one suite of specimens. To render the collection complete, it should comprise three sets—one of which should be arranged lithologically, to illustrate the composition, structure, and physical aspect of the rocks; a second, stratigraphically, to illustrate the order of succession of the several formations; and a third, topographically, to illustrate their geographical distribution.

In this collection the stratigraphical arrangement has been selected, as best adapted to afford special and general knowledge of the characters and aspect of the various rocks met with in each formation, while the colored label on each specimen, when compared with the similarly colored geological maps, shows approximately their geographical distribution. There are two labels on each specimen: the colored one indicates the formation to which the specimen belongs, the locality, and the reference number on the maps; the other is the Descriptive Catalogue number for each formation. Some of the specimens show examples of the fossils characteristic of the formation to which they belong; but a separate and complete collection of fossils, arranged stratigraphically, and named and described by Professor McCoy, is being prepared, and will fully illustrate the Palaeontology of Victoria.

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correspond with letters and numbers on the colored specimen labels, and thus indicate the exact spot on the map where each specimen was collected, and the formation it belongs to. The letters R., F., M., on the maps and labels, show whether the specimen is Rock, Fossil, or Mineral.

Illustrative horizontal sections, similar to the one accompanying § sheet 14 S.W., Maldon, will eventually be constructed for all the more interesting § sheets; and a system of lettering on the face of the map has been adopted, by which the student can easily ascertain the probable nature of the formations underlying those that occupy the surface (depicted by the color on the map) of any given area. The letter G. indicates Granite; C., Lower Silurian; S., Upper Silurian; V., Volcanic; T., Tertiary, &c.; and the number attached to the letter indicates the probable mineral or lithological character of the rock. Thus, V1. on TP3, on Cl. 2, indicates Volcanic formation (basalt) resting on Pliocene Tertiary gravel, or "lower gold drift," on a bottom of Lower Silurian slate and sandstone.

The arrangement of the specimens described in this Catalogue was planned and superintended by myself. The descriptions are the joint work of myself and colleagues, Messrs. Ulrich, Aplin, Etheridge, and Taylor. The analyses, when not otherwise stated, have been made by Mr. J. Cosmo Newbery, Analyst to the Survey.

ALFRED R. C. SELWYN,
Dir. Geo. Survey of Victoria.

Geological Survey Office,
May, 1868.
DESCRIPTIVE CATALOGUE.

IGNEOUS ROCKS.

PLUTONIC AND VOLCANIC.

The relations of these rocks indicate that they have, for the most part, been forced upwards from the interior of the earth in a fluid or semi-fluid (viscous) state. They have penetrated and overflowed other formations, and then become solid under varying conditions, either on or beneath the surface. The soft state in which they existed was probably due to great heat—hence the term "Igneous rocks," and their texture, as we now find them, is the result, partly, of the particular conditions under which they became solid, and is partly due to subsequent metamorphism. They are either compact, porphyritic, or crystalline granular, seldom fissile, but frequently vesicular or amygdaloidal. They also often occur in a wackenitic state (wacke*), this form being, in Victoria, very characteristic of the rocks of the Older Volcanic series. As volcanic ash, they occur in stratified layers, having much the appearance of true sedimentary aqueous rocks. They are classed under two principal divisions, expressive of their origin.

1. PLUTONIC—or those that became solid at a considerable depth in the interior of the earth (consequently under great pressure), and have been exposed at the surface by the removal of the once superincumbent strata.

2. VOLCANIC—or those that have been forced to the surface, and either flowed over it in a molten state, or been spread over it as ash.

These again may be divided into two classes expressive of their constitution:—

1. ACIDIC—or those rich in silica.
2. BASIC—or those poor in silica.

The average composition of these two classes of igneous rocks is, according to Cotta—

<table>
<thead>
<tr>
<th></th>
<th>Basic rocks</th>
<th>Acidic rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>45—55</td>
<td>60—80</td>
</tr>
<tr>
<td>Alumina</td>
<td>10—20</td>
<td>8—16</td>
</tr>
<tr>
<td>Protoxide (Iron)</td>
<td>1—15</td>
<td>1—15</td>
</tr>
<tr>
<td>Lime</td>
<td>1—10</td>
<td>1—5</td>
</tr>
<tr>
<td>Magnesia</td>
<td>1—6</td>
<td>0—4</td>
</tr>
<tr>
<td>Potash</td>
<td>1—4</td>
<td>1—6</td>
</tr>
<tr>
<td>Soda</td>
<td>1—5</td>
<td>1—6</td>
</tr>
<tr>
<td>Water</td>
<td>0—7</td>
<td>0—8</td>
</tr>
</tbody>
</table>

* Wacke is a German miner's term used to describe a decomposed state of igneous rocks poor in silica.
The separation between the two groups cannot be very rigidly carried out, as certain rocks of each group vary so greatly in their composition as actually to graduate into the opposite one. This is also the case as regards the Plutonic and Volcanic divisions, there being no definite depth of measurement that can be fixed as a boundary between these two kinds of formations: thus, each of the four groups may be characterized by some typical rock, and each may also be connected with the other group by means of rocks of an intermediate character and origin.

The groups may be represented as follows:

<table>
<thead>
<tr>
<th>Plutonic</th>
<th>Acidic ... Granite</th>
<th>Syenite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic ... Diorite</td>
<td></td>
</tr>
<tr>
<td>Volcanic</td>
<td>Acidic ... Trachyte</td>
<td>Porphyrite</td>
</tr>
<tr>
<td></td>
<td>Basic ... Basalt</td>
<td>Trachy-dolerite</td>
</tr>
<tr>
<td>Acidic</td>
<td>Plutonic ... Granite</td>
<td>Quartz porphyry</td>
</tr>
<tr>
<td></td>
<td>Volcanic ... Trachyte</td>
<td>Trachyte porphyry</td>
</tr>
<tr>
<td>Basic</td>
<td>Plutonic ... Diorite</td>
<td>Melaphyre</td>
</tr>
<tr>
<td></td>
<td>Volcanic ... Basalt</td>
<td>Diabase porphyrite</td>
</tr>
</tbody>
</table>

The former state of fusion of the Volcanic division of the igneous rocks is evident, as they may still be seen in process of formation from the lava of active volcanoes.

In the case of the other, or Plutonic division, their previous igneous fluidity is not always so apparent; and it seems not improbable that some granites, as well as other rocks of this class, are the result of the gradual metamorphism, in place, of stratified sedimentary rocks, through the effects of long-continued thermo-chemical action, in presence of water, and under high pressure, but unaccompanied by any such great heat as would be required to cause igneous fluidity. In any case it seems quite certain that many changes have taken place in the character and composition of igneous rocks subsequently to their first formation, causing the introduction or development in them of what are termed accessory minerals, chiefly, no doubt, under the influence of watery solutions and gases penetrating and permeating them. In this sense, nearly all rocks are, more or less, metamorphic, or, in other words, have assumed different mineral characters from what they possessed, either as original sediments or molten masses. This is not generally caused by the addition of new substances, but, in most cases, only through the re-arrangement, under peculiar chemical and physical influences, according to their affinities, of certain original constituents of the rock, resulting in the development of distinct minerals, and thus forming rocks, which, though differing greatly in external appearance, would not vary more in their ultimate chemical constituents than any two distinct pieces of sandstone, slate, or granite.

Granite is the principal rock of the Plutonic division of the acidic igneous rocks. It consists of a crystalline granular compound, in variable proportions, of felspar, quartz, and mica. In certain varieties there occur chlorite, talc, hornblende, and schorl. The felspar, chiefly orthoclase, is usually the predominant ingredient, the mica occupying the smallest place in typical granite. It is uncertain whether albite or
labradorite ever occur in the granitic compound, the species of triclinic felspar, often observed in it and generally supposed to be albite, having been found to be "oligoclase." The ingredients commonly considered as essential for granite are, nevertheless, sometimes replaced by others; and we consequently find many transitions from granite into other rocks, such as granitic porphyry, quartz porphyry, protogine (talcose granite), schorl rock, felstone, felspar porphyry, syenite, and greenstone: these latter rocks passing into the porphyritic, syenite, and greenstone groups, or the basic igneous rocks of the Plutonic division. Some of the specimens illustrate these transitions.

Syenite is a granular compound of orthoclase and hornblende.

Porphyrite consists of a felsitic matrix, with individual crystals of felspar (oligoclase or orthoclase), mica, or hornblende.

Greenstone is a compound of some species of felspar (not orthoclase) with hornblende, hypersthene, or augite. This class of rock is never found in the form of genuine lava, but always, more or less, shows its Plutonic origin, in which probably consists the whole difference (not very great) between it and the basalts, or the basic igneous rocks of the Volcanic division. It is highly probable that the same basic compound which, consolidating near the surface, produced the basaltic rock, when it attained the solid state at a greater depth, formed the greenstone. The basalts and greenstones, consequently, in general very much resemble each other, both in chemical composition and mineral character. The chlorite, by which some of the greenstones are alone distinguishable from the basalts, is usually a product of transmutation.

The following are some of the minerals occasionally found as accessories in granitic rocks:—Garnet, topaz, beryl, fluor spar, calcite, corundum, zircon, titanite, gold, oxide of tin, magnetic iron-ore, molybdenite, mispickel, &c.

Tin-ore, gold, titanite, magnetic iron, and corundum, occur in considerable quantity in the detrital matter in many of the granite districts in Victoria. No specimens showing these minerals embedded in granite have yet been found, and their occurrence in the drifts can only be explained, either by supposing them to have been originally distributed as grains through the mass of the rock in the detritus of which they are now found, or that veins containing these minerals traversed the strata which doubtless once covered the granite, and have since been entirely broken up and removed by denuding forces, which were not able to transport the heavier minerals. No veins or lodes have been found containing tin-ore, nor are there any authenticated instances in Victoria of auriferous quartz veins in the granite, though fragments of vein quartz, as well as of gneiss, mica, schist, and other metamorphic strata are not uncommon in the detritus that rests on the granite, and often contains rich deposits of tin-ore, fine gold with titanite, corundum, black tourmaline, zircon, sapphire, diamond, and other precious stones.

* Gold, and a new mineral compound, supposed to be gold and bismuth, occurs in granite veins associated with the Nuggety Reef, Maldon.
PLUTONIC ROCKS—CASE I.

Case I.

GRANITIC ROCKS.

1. **COARSE-GRAINED, TERNARY GRANITE.**
   Map No. Ra 38.
   *Near the top of Mount Tarrauntergower, ¼ sheet 14 S.W.*
   Occurs in the Silurian rocks; in places it has the appearance of graphic granite.

2. **BINARY GRANITE.**
   Map No. Mb 43.
   *Hughes's Tunnel (No. 3), Coliban Water Supply Contract, Mount Alexander, ¼ sheet 13 N.W.*
   The embedded crystals of felspar (orthoclase) are here seen distinctly. It also contains nests of tale.

3. **FELSPAR CRYSTAL (Orthoclase).**
   Map No. Mb 42.
   *Same locality as No. 2.*
   These crystals occur in a series of small dykes, running across the open cutting, 60 feet from south end of tunnel.

4. **BINARY GRANITE.**
   Map No. Ra 45.
   *Section 10, parish of Bradford, ¼ sheet 14 N.W.*
   Forms a dyke in granite. Large twin crystals of orthoclase.

5. **TOURMALINE CRYSTALS.**
   Map No. Mb 33.
   *East foot of Mount Alexander, below highest point, ¼ sheet 13 N.W.*
   Occurs in long radiating, prismatic crystals.

6. **DECOMPOSED GRANITE (Kao-lin or China Clay).**
   Map No. R 2.
   *Deep Creek, township of Bulla, ¼ sheet 7 S.E.*
   A company was formed in 1861 to work this deposit for exportation; but as the value of the best kaolin is only 18s. per ton, the enterprise was not successful, and had to be abandoned. It occurs in large quantity, and will doubtless be valuable when a local china manufacture is established.

7. **STEATITE (Variety of).**
   Map No. Mb 39.
   *Same locality as Nos. 2 and 3.*
   Hydrated silicate of magnesia and alumina. It occurs as a vein in a red ternary granite, 396 feet from north end of tunnel.

8. **HYDROUS SILICATE OF ALUMINA AND MAGNESIA.**
   *Same locality as last.*
   Occurs as a vein, 422 feet from north end of tunnel. It is colored green probably by oxide of iron.

9. **COARSE, TERNARY GRANITE.**
   List No. R (21)
   *Pyramid Hill.*
PLUTONIC ROCKS.—CASE I.

Lot 6, section 2a, Maldon. 1/4 sheet 14 S.W.
Occurs traversing Silurian rocks. It consists mainly of felspar, with patches composed of quartz and mica.

North of Mount Emu, parish of Sedgwick. 1/4 sheet 13 N.W.
Occurs in metamorphosed Lower Silurian rocks.

List No. R (SR 15)
Mansfield Road, Broken River.

Mount Tarrangower. 1/4 sheet 14 S.W.
From the same dyke as specimen No. 1.

Note.—The main dyke, from which No. 17 is taken, consists of a flesh-colored or yellowish granular base, in which are scattered crystals of hornblende, mica, and quartz (specimen No. 78). It passes, on its west side, into a white, flinty, nearly homogeneous rock, and then into an earthy, baked-looking granular rock; on its east side, into broad veins of a red crystalline rock and thin veins of a black and variously colored flinty rock (felstone) with wavy lines, as if the differently colored substances had been run together whilst in a pasty or semi-fluid condition.

18. Ternary Granite.
List No. R (SR 15)
Mansfield Road, Broken River.
Contains a few crystals of hornblende, but not in sufficient quantity to constitute a syenite.

Map No. Ra 56.
Friendship’s Reef. 1/4 sheet 14 N.W.

20. Granite.
Corner Inlet.

List No. R (SR 24)
Mount Bukerabuniel.

22. Fine-grained Granite.
List No. R (SR 23)
Mount Bukerabuniel.
Containing a vein of felspar and tourmaline.

Map No. Rb 31.
The Gap, Mount Alexander. 1/4 sheet 13 N.W.
White, and fine-grained, containing drusy cavities, coated with distinctly crystallized quartz and felspar only.

15. Quaternary Granite.
Map No. Ra 50.
Reef, south of Lake’s Reef. 1/4 sheet 14 N.W.
Composed of quartz, felspar, white mica and schorl.

Near Cemetery, Maldon. 1/4 sheet 14 N.W.
Almost pure felspar, occurring as a vein in a granite dyke.

South of parish of Baynton. 1/4 sheet 5 N.W.
Occurs in granite, on range west of the Lancefield road.

23. Ternary Granite.
Map No. Rb 31.
The Gap, Mount Alexander. 1/4 sheet 13 N.W.
See specimen No. 14.

24. Ternary and Binary Granite.
Map No. Rb (2a).
O’Keefe’s Tunnel (No. 4), Coliban Water Supply Contract, Preston Vale. 1/4 sheet 13 N.W.
One half of the specimen consists of quartz and felspar; the other of quartz, felspar and black mica. The felspar has a slightly blue tint. The specimen was taken from Government shaft No. 3.

25. Granite.
Livingstone’s Creek, near Omeo Goldfield.

26 and 27. Granite.
Map No. Rb 16 (1 & 3).
North of Mount Emu, parish of Sedgwick. 1/4 sheet 13 N.W.

Those marked with an * occur as dykes (Elvans).
Note.—It will be seen, from an examination of these specimens (Nos. 26 and 27, and No. 11), how widely individual specimens from granitic dykes occurring in other rocks differ amongst themselves. All these specimens were taken from within a yard of one another: No. 11 presenting a fine-grained appearance, with a vein of felspar; No. 26 very much coarser; and No. 27 showing an extremely coarse texture, with the plates of mica often forming small nests.

28. GRANITE. Map No. Ra 12.
Lot 1, section 1A, Maldon. ¼ sheet 14 S.W.
This specimen shows the junction of the granite and highly metamorphosed Lower Silurian rocks (hornfels).

29. TERNARY GRANITE.
Map No. Rb 21.
O'Keefe's Contract for Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.
The black portion consists of numerous fine plates of black mica, and contains small green patches, probably chlorite; also white crystals of orthoclase. These patches or bosses of mica are of frequent occurrence in granite.

30. TERNARY GRANITE.
List No. Ra 10.
Near Dandenong.
The felspar has a slightly red color. Attached is a piece of felspar porphyry.

31. TERNARY GRANITE.
Map No. Rb 38.
Hughes's Tunnel (No. 3), Coliban Water Supply Contract, Mount Alexander. ¼ sheet 13 N.W.
With red felspar, 300 feet from north end of tunnel. The sides of this specimen are covered with a yellowish-green mineral, colored by protoxide of iron.

32. TERNARY GRANITE.
Map No. R 1.
Gellibrand's Hill, section 8, parish of Will-Will-Rook. ¼ sheet 2 S.W.
With part of a dense, fine-grained micaceous boss. The granite of Gellibrand's Hill makes a good building stone, and was used for Prince's Bridge, the old Town Hall and the present Commissioner of Titles Office. See "Building Stones," No. 3.

33. EURITIC VEIN IN GRANITE.
Map No. Ra 57.
Spring Hut. ¼ sheet 14 N.W.
Those marked with an * occur as dykes (Elvans).

34. VEIN OF EURITE, with GRANITE.
List No. Re 10.
Dargan's Swamp.

35. GRANITE PORPHYRY.
Map No. Rb 45.
West side of Mount Alexander, parish of Harcourt. ¼ sheet 13 N.W.
Portion of a fine-grained granitic boss enclosed in granite. The base is composed of quartz and mica, with larger plates of black mica and white opaque crystals of orthoclase.

35A. TERNARY GRANITE.
List No. Rd 22.
About 1 mile N.E. of Station Peak. ¼ sheet 20 S.W.
The felspar is in large pieces, of a brownish-yellow color.

35B. TERNARY GRANITE.
List No. Rd 21.
Station Peak, near Geelong. ¼ sheet 19 S.E.
The felspar is of a red color.

36. TERNARY GRANITE.
List No. Re 6.
Range west of Mount Martha.

37. TERNARY GRANITE.
Mount Alexander. ¼ sheet 13 N.W.

38. TERNARY GRANITE.
Map No. Rb (24n).
Section 6, Sutton Grange. ¼ sheet 13 N.W.
This does not form a good building stone, as it decomposes in red spots.

39. TERNARY GRANITE.
Map No. Ra 93.
Pigeon Hill. ¼ sheet 14 N.W.
*40. Ternary Granite.  
Vanderloof's Paddock, south of Heathcote.  
Occurs in connection with a greenstone dyke. (See specimen No. 97, and Note following.)

41. Coarse, Ternary Granite.  
Mount Kosciusko, N.S.W.

42. Ternary Granite.  
List No. Re 7.  
Near Police Barracks, Dandenong.

43. Coarse, Ternary Granite.  
Lot 48, Carlsruhe.  
With large felspar crystals.

*44. Ternary Granite.  
Nuggetty Reef.  
This specimen is taken from the surface.

45. Ternary Granite.  
Hughes's Tunnel (No. 3), Coliban Water Supply Contract, Mount Alexander.  
This hard granite occurs in large patches here and there throughout the tunnel; the rest is so soft and decomposed as to require bricking.

*46. Ternary Granite.  
Nuggetty Reef.  
Same as specimen No. 44. Taken 250 feet from the surface.

*47. Ternary Granite.  
Nuggetty Reef.  
Same as Nos. 44 and 46. Taken 480 feet from the surface. The felspar is of a greenish tint.

*48. Ternary Granite.  
Near Irish Bill's Reef, Maldon.  
Very micaceous. It occurs as a vein in the Silurian rocks.

49. Ternary Granite.  
Near the Cemetery, Maldon.  

50. Ternary Granite.  
Conical Hill, foot of Mount William.

51. Ternary Granite.  
Spur running north from Conglomerate Range, between Riddell's Creek and Mount Macedon Range.  

52. Ternary Granite.  
South-west foot of Mount Alexander, parish of Harcourt.  
With portion of a micaceous boss.

53. Fine-grained, Ternary Granite.  
Dog Rocks, Geelong.  
The granite forming these rocks is generally coarse-grained, with large crystals of felspar.

54. Ternary Granite.  
O'Keefe's Contract for Coliban Water Supply, Preston Vale.  
Close-grained quartzose base, containing crystals of quartz, felspar and black mica: from shaft No. 3, at a depth of 60 yards.

55. Ternary Granite.  
Near Jannalfield.

56. Coarse Granite.  
Mount Hope.

57. Coarse Granite.  
Near Mount Monda.  
Weathering red from the decomposition of the iron in the mica.

58. Quaternary Granite.  
Bulgabie Creek, Dargo, Gippsland.

59. Ternary Granite.  
Chirrup Creek, Hopkins' Hill.  
With large plates of mica.

Those marked with an * occur as dykes (Elvans).
60. TERNARY GRANITE.
Map No. Rb (7a).
*Fraser's Contract for Coliban Water Supply, Preston Vale.*
½ sheet.
Obtained 4½ chains from north end of tunnel. It is exceedingly hard. The felspar is of a green color, and iron pyrites occur disseminated through the rock.

61. TERNARY GRANITE.
Map No. Rb 20.
*O'Keefe's Contract for Coliban Water Supply, Preston Vale.*
½ sheet 13 N.W.
Very hard, with white and bluish-white felspar (orthoclase and oligoclase respectively). From Government shaft No. 2. (See Table of Analyses, page 94.)

62. TERNARY GRANITE.
Map No. Ra 31.
*O'Keefe's Contract, Coliban Water Supply, Preston Vale.* 4 sheet 13 N.W.
From a dyke-like mass in the Silurian rocks.

63. TERNARY GRANITE.
List No. Rs 5.
*Ryrie's Flat, Badger Creek, Upper Yarra.*

64. TERNARY GRANITE.
List No. R (22)
*Carter's Rosebrook Station.*
Flesh-colored.

65. TERNARY GRANITE.
*O'Keefe's Contract, Coliban Water Supply, Preston Vale.* ¾ sheet 13 N.W.
From Government shaft No. 3, 116 yards from surface. The felspar is of a greenish-white tint, and has a peculiar pearly lustre.

66. TERNARY GRANITE.
Map No. Rb 19.
*O'Keefe's Contract, Coliban Water Supply, Preston Vale.* 4 sheet 13 N.W.
From bottom of Government shaft No. 1, 92 feet 7 inches from surface. It consists of grey quartz, black mica, and semi-decomposed yellow felspar.

67. SYENITIC GRANITE.
*Gabo island.*
It consists of red felspar, quartz, and hornblende. A good building stone, but expensive to work. Used in the General Post Office, the Custom House, and the Australasian Insurance Company's Offices.

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Case II.

GRANITIC ROCKS AND PORPHYRIES.

GRANITIC ROCKS—(continued).

68. GRANITE PORPHYRY.
Map No. Ra 3.
Near S.W. corner of lot 8, section 2A, Tarrangower. ½ sheet 4 S.W.
A grey felspathic base, with scattered quartz and felspar crystals, a little mica and iron pyrites; also rounded quartz grains. It weathers white.

69. TERNARY GRANITE.
Map No. Ra 13.
Near lot 10, section 2A, Maldon. ¼ sheet 14 S.W.
Occurs in Silurian rocks. It decomposes in patches.

70. TERNARY GRANITE.
List No. R (15)
*Mansfield Road, Broken River.*

71. TERNARY GRANITE.
Map No. Ra 10.
Section 2a, Baringhup. ¼ sheet 14 S.W.
Traversing granite, and consisting of a coarse granular base of quartz and felspar, with dark felspar crystals. It passes into a coarse granite.

Those marked with an * occur as dykes (Elvans).
72. Ternary Granite.
Map No. Rb 23.
O'Keefe's Contract, Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.

From Government shaft No. 3. Occurs traversing granite in a N.W. direction, and consists of a fine-grained white and flesh-colored granular base of quartz and felspar, with scattered quartz, felspar and mica.

73. Ternary Granite.
Map No. Ra 90.
Baringhup Road. ¼ sheet 14 N.W.

Hard fine-grained granite.

74. Ternary Granite.
Map No. Ra 59.
West of Bradford. ¼ sheet 14 N.W.

Coarse and fine grained granite, with thin quartz veins.

75. Ternary Granite.
Dog Rocks, Geelong. ¼ sheet 24 S.E.

Hard coarse and fine grained granite, with large felspar crystals.

76. Ternary Granite.
Map No. Rb 11.
Section 4, Sedgwick. ¼ sheet 13 N.W.

Granite and eurite, with orthoclase felspar.

77. Ternary Granite.
Map No. Ra 54.
Near N.E. corner of Municipal boundary, Maldon. ¼ sheet 14 N.W.

Fine-grained, granular, flesh-colored granite.

78. Felstone (in part).
Map No. Rb 80.
Range west of Lancefield Road, and south of parish of Baynton. ¼ sheet 5 N.W.

Occurs in granite, and contains rounded crystals of quartz. (See Note following specimen No. 17.)

79. Ternary Granite.
Map No. Rb 32.
East foot of Mount Alexander. ¼ sheet 13 N.W.

Of a light-red color, and containing very little mica.

80. Granite.
Map No. Ra 48.
Bryant's Station. ¼ sheet 14 S.W.

81. Granite Porphyry.
Map No. Rb 70.
East of Jews' Harp Creek, on road between sections 72 and 75, Langley. ¼ sheet 5 N.W.

Consists of a white, flinty base, with scattered felspar and quartz. It passes into a granular or earthy white rock, with black needles of schorl, dead white crystals of felspar and quartz.

82. Elvanite.
Map No. Rb 70.
Same locality as last.

White, earthy, felspathic base, with crystals of felspar and acicular crystals of hornblende.

83. Hard, Grey Granite.
Map No. Ra 91.
South of Dunolly Road. ¼ sheet 14 N.W.

Would make a good building stone.

84. Fine-grained Granite.
Map No. Rb 18.
South end of Mount Emu Range, parish of Sedgwick. ¼ sheet 13 N.W.

Granular, silico-felspathic base, with small plates of black mica.

85. Binary Granite.
Map No. Rb 32.
East foot of Mount Alexander. ¼ sheet 13 N.W.

Composed of quartz and flesh-colored felspar.

86. Granite.
Map No. Rb 30.
North end of the summit of Mount Alexander. ¼ sheet 13 N.W.

Fine-grained granite, with but little mica.

87. Eurite.
Map No. Ra 52.
Mosquito Reef. ¼ sheet 14 N.W.

88. Ternary Granite.
Map No. Rb 27.
The Gap, Mount Alexander. ¼ sheet 13 N.W.

Granular base of quartz and red felspar, with a little mica, and containing crystals of tourmaline.

*Those marked with an * occur as dykes (Elvans).
**89. Ternary Granite.**
Map No. Rb 27.
The Gap, Mount Alexander. ¾ sheet 13 N.W.
Similar to last.

**90. Binary Granite.**
Map No. Rb 41.
Hughes’s Contract, Coliban Water Supply, Wellington Flat, Sutton Grange. ¼ sheet 13 N.W.
Occurs running across open cutting as a small dyke in a N.W. direction, 60 feet from south end of tunnel (No. 3); white, with scarcely any mica.

**91. Eurite.**
Map No. Ra 53.
South end of Nuggety Reef. ¼ sheet 14 N.W.
A granular mixture of quartz and felspar.

**92. Ternary Granite.**
Map No. Ra 51.
Near N.W. corner of Municipal boundary, Maldon. ¼ sheet 14 N.W.
Hard, fine-grained, nearly binary granite.

**93. Granite.**
List No. Rb (20B).
Hanging Rock, Heathcote.
Brownish-grey rock, with the mica apparently decomposed.

**94. Granite.**
List No. Rb (19B).
Cemetery, Heathcote.
Very fine granular base, with white mica.

**95. Granite.**
List No. Rb (18B).
Hanging Rock, Heathcote.
Of a slightly yellow color, due to the partial decomposition of the felspar.

**96. Granite.**
List Rb (20B).
Cutting of Kyneton Road, Heathcote.
Of a light-green color.

**97. Granite.**
List No. Rb (20B).
Same locality as last.

**98. Eurite.**
Map No. Ra 8.
Pigeon Hill, Maldon. ¼ sheet 14 S.W.
Occurs in granite; a hard, granular, silico-felspathic base, with scattered, rounded quartz crystals.

**99. Eurite.**
Map No. Rb 34.
Top of hill in section 5, Harcourt. ¼ sheet 13 N.W.
This rock consists of a microcrystalline mixture, in nearly equal proportions, of flesh-colored orthoclase, a white striated felspar (most probably oligoclase) and quartz. (See Table of Analyses, page 94.)

**100. Eurite, Granitite.**
Mount Alexander. ¼ sheet 13 N.W.
Similar to the last; but, on account of the appearance of mica in places, the rock would come under the designation of “granitite.”

**101. Ternary Granite.**
Map No. Rb 24.
O’Keefe’s Shaft (No. 3), Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.
Very hard, fine-grained, grey felsstone, with quartz veins, occurring 50 feet from surface, and coated with an infiltration of carbonate of lime.

Note.—Specimens Nos. 93 to 97 are from a dyke to the westward of the Heathcote township. In places this dyke is of an ordinary granitic character, in others it passes into an eurite. The various colors are well represented by the specimens, the most permanent being of a light-brown, occasionally passing into light-green. In width it varies from 2 to 5 chains, and is traceable for 4 miles south of the Kyneton Road cutting, where it appears to pass into a thin granitic dyke, accompanied by greenstone. It is extensively used in Heathcote, both for building and kerbing, the harder varieties being well adapted for these purposes. It has also been used for making filters or “ drip-stones.” This dyke has probably some connection with one occurring in ¼ sheet 51 S.W.

*These marked with an * occur as dykes (Elvans).*
PLUTONIC ROCKS.—CASE II.

*102. EURITE. Map No. Rb 8.
Section 13, Sutton Grange, 4 sheet 13 N.W.
White, granular felspathic rock, with very little mica.

*103. TERNARY GRANITE. Map No. Rb 75.
Road between sections 48 and 49, parish of Langley, 4 sheet 5 N.W.
Brown, fine-grained, hard, granular granite, with very little mica.

*104. FELSPATHIC, GRANULAR ROCK. Map No. Ra 7.
Near allotment 2, section 2A, Maldon. 4 sheet 14 S.W.
Traverses Silurian rocks, and contains mica. Quartz is not visible, but forms, probably, a component part of the granular base.

*105. FELSPATHIC ROCK. Map No. Ra 33.
Near Jackson's Reef, Maldon. 4 sheet 14 S.W.
Dense, white base, with quartz and black flakes, probably decomposed mica.

*106. FELSPATHIC ROCK. Map No. Ra 34.
West branch of German Gully, Maldon. 4 sheet 14 S.W.
Similar to the last.

*107. FELSPATHIC ROCK. Map No. Ra 42.
Near the Otago Reef, Sandy Creek, Maldon. 4 sheet 14 S.W.
Occurs in Silurian, and consists of a fine white, granular base, with white mica.

*108. FELSPATHIC ROCK. Map No. Ra 94.
Victoria Reef. 4 sheet 14 N.W.
Similar to the last, with streaks of a pinkish tinge.

*109. FELSPATHIC ROCK. Map No. Ra 35.
Near east corner of lot 7, section 1B, Maldon. 4 sheet 14 S.W.
White, rather soft, felspathic and micaceous rock, with crystals of orthoclase, grains of quartz and plates of black mica.

*110. FELSPATHIC ROCK. Map No. Ra 37.
Near S.W. corner of lot 3, section 1C, Maldon. 4 sheet 14 S.W.
Grey, close-grained rock, with a felspathic base, and grains of quartz, felspar and mica.

*111. FELSPATHIC ROCK. Map No. Ra 36.
Near N.W. corner of lot 3, section 1C, Maldon. 4 sheet 14 S.W.
Grey, granular base of quartz, felspar and white mica, with blackish marks of (probably) mica. It has a slightly gneissose structure.

*112. FELSPATHIC ROCK. Map No. Ra 64.
Kangaroo Creek, south of Kangaroo township. 4 sheet 15 N.E.
Brown base, with whitish spots of decomposed felspar, and apparently fragments of sandstone and quartz. It occurs between two beds of black slate, rich in graptolites, which have been faulted and greatly dislocated by the dyke, but only very slightly altered in character.

*113. FELSPATHIC ROCK. Map No. Ra 6.
Tarra banks, near the Botanical Gardens. 4 sheet 15 S.E.
Yellow, fine-grained, granular base, probably quartz and felspar, with quartz grains. The beds of slate in connection with it have a cherty character.

*114. FELSPATHIC ROCK. Map No. Ra 65.
Same locality as the last.
White siliceous base, with quartz crystals.

*115. FELSPATHIC ROCK. Map No. Ra 66.
Same locality as the two last.
Brown and earthy, with small cavities from which some mineral has decomposed.

*116. FELSPATHIC ROCK. Map No. Ra 67.
Reservoir, Brisbane Ranges.
Argillaceous base, with embedded brown felspar crystals, and rounded particles of an unknown mineral, giving the rock an amygdaloidal appearance.

Those marked with an * occur as dykes (Elvins).

† This specimen comes from the same locality as specimens 67-70, Case III., and is most probably decomposed "diorite-porphyry." See Note, page 17.


Moonee Ponds. ¼ sheet 1 N.W.
Occurs in Upper Silurian; it resembles an older basaltic clay, with patches of a greenish, decomposed, probably magnesian mineral.

*118. Felspathic Rock.
Portland.
A white, felspathic base, with embedded crystals of quartz and glassy-looking felspar.
Presented by E. Dacomb, Esq.

*119. Scholar Rock.
Mount Singapore, Corner Inlet.
Black, fine-grained rock, consisting of tourmaline and quartz. Occurs traversing granite, and has been opened as an auriferous lode.

*120. Granitic Quartz Porphyry. Map No. R 94.
Back Creek, east of Spring Plains. ½ sheet 51 S.W.
Consists of a white, finely granular base, in which are embedded crystals of quartz and felspar, and a very little white mica. It commences at the granite boundary on Dr. Baynton's station, can be traced for about 4 miles due north (magnetic), and is most likely a continuation of the dyke that runs through Heathcote. (See Note following specimen No. 97.) It is sometimes mottled brown, red and white, and to the north loses its mica. It is sometimes very hard, but apparently decomposes easily. In places along its course the Lower Silurian rocks rest on it in cappings or outliers.

Same locality as last.
A combination of the double six-faced pyramid and hexagonal prism. These crystals are liberated by the decomposition of the rock, and may be collected from the surface gravel along the outcrop of the dyke.

PORPHYRIES.

1. Earthy Felspar Trap.
Map No. Ra 29.
Lot 3, parish of Newham. ¼ sheet 6 N.W.
Grey, earthy base, with embedded, rounded fragments, probably decomposed felspar.

2. Felspar Trap.
Map No. Ra 25c.
Brock's Monument, N.E. of Mount Macedon. ¼ sheet 6 N.W.
Partially decomposed felspar base, with crystals of semi-transparent felspar, and speckled with minute, black marks. (See "Building Stones," No. 20.)

3. Felspar Porphyry.
Map No. R 52.
Hill between Rochfort and Newham. ¼ sheet 5 S.W.
Brown base, with scattered, glassy-looking felspar crystals. (See "Building Stones," No. 18.)

4. Felspar Porphyry.
Map No. R 48.
Dividing Range, north of Newham. ¼ sheet 5 N.W.
Fine-grained, granitic base, with embedded felspar crystals. Occurs in granite. (See "Building Stones," No. 19.)

5. Felspar Porphyry.
Map No. Ra 27b.
Dryden's or Hanging Rock. Lot 6, Newham. ¼ sheet 6 N.W.
Light-grey base, speckled with black, with embedded felspar and quartz crystals, and patches of yellow, decomposed felspar. (See "Building Stones," No. 22.)

Note.—The "Hanging Rock" is a peculiar isolated outburst of felspar trap, of a light color, divided by numerous joints into rudely columnar forms, 30 to 40 feet in height, and exhibiting its structure well displayed in large circular and funnel-shaped cavities, which are abundant throughout the mass.

These marked with an * occur as dykes (Elvans).
PLUTONIC ROCKS.—CASES II, AND III.

*6. FELSpar Porphyry.  
Deep shaft on range between Daylesford and Deep Creek.  
Slate-colored rock, with embedded felspar and fragments of shale.

*7. FELSpar Porphyry.  
Same locality as last.  
Containing veins of a siliceous carbonate of lime.

*8. FELSpar Porphyry.  
Map No. Ra 45.  
Orr’s Kangaroo Creek. Lot 3, section 4, parish of Burke.  
1/4 sheet 9 S.W.  
White and yellow, granular, felspathic base, with small crystals of quartz and felspar.

*9. FELSpar Porphyry.  
Map No. Ra 5.  
South boundary of lot 4, section 2a, near S.W. corner of parish of Tarrangower. 1/4 sheet 14 S.W.  
Dense, grey, granitic base, with embedded felspar.

10. FELSpar Porphyry.  
Map No. Ra 16b.  
East flank of Mount Macedon.  
1/4 sheet 6 N.W.  
Light yellowish-brown, earthy base, with pinkish veins, and containing quartz crystals and decomposed pieces of felspar. (See “Building Stones,” No. 16.)

11. FELSpar Porphyry.  
Map No. Ra 26c.  
Mount Diogenes or “Camel’s Hump,” Mount Macedon. 1/4 sheet 6 N.W.  
Light-colored, granular base, with black specks, probably hornblende, and enclosing crystals of orthoclase, felspar and quartz.

12. FELSpar Porphyry.  
Map No. Ra 27c.  
Dryden’s or “Hanging Rock,” Lot 6, parish of Newham. 1/4 sheet 6 N.W.  
Granular, felspathic base, with crystals of felspar and dark specks, probably hornblende.

Case III.

PORPHYRIES (continued), SYENITES, GREENSTONES.

13. FELSpar Porphyry.  
Map No. Ra 26b.  
“Camel’s Hump,” Mount Macedon.  
1/4 sheet 6 N.W.  
Dark-grey, fine-grained (oligoclase), felspathic base, with crystals of yellow and glassy-looking felspar—oligoclase and orthoclase—and black specks, probably schorl or hornblende. (See Table of Analyses, page 94.)

14. FELSpar Porphyry.  
Map No. Ra 16c.  
East flank of Mount Macedon.  
1/4 sheet 6 N.W.  
Very dark, hard, sub-crystalline base, with yellowish-green crystals of glassy-looking felspar. (See “Building Stones,” No. 17.)

15. FELSpar Trap.  
Map No. Ra 16a.  
Same locality as the last.  
Dark-colored, hard, felspathic rock, without distinct crystals of felspar. (See “Building Stones,” No. 15.)

16. FELSpar Porphyry.  
Map No. Ra 25b.  
Brock’s Monument, N.E. of Mount Macedon.  
1/4 sheet 6 N.W.  
Grey, dense granular base, with crystals of glassy-looking orthoclase.

17. GRANITIO PORPHYRY.  
Map No. R 46.  
Dividing Range, north of Newham.  
1/4 sheet 5 S.W.  
Hard, grey base, with crystals of glassy-looking and white felspar, black mica, hornblende and quartz.

*18. GRANITIO PORPHYRY.  
List No. R 100.  
East of Barfold, parish of Em-  
berton. 1/4 sheet 13 S.E.  
Occurs in Silurian rocks, and consists of a grey, granitic base, with crystals of quartz, greenish-yellow felspar, a little mica and hornblende.

Those marked with an * occur as dykes (Elvans).
19. Felspar Porphyry.  
Map No. Rb 95.  
N.E. of parish of Baynton. ¼ sheet 51 S.W.  
Dark-grey, nearly homogeneous felspathic rock, with small crystals of felspar. Occurs at the junction of the Granite and Lower Silurian, associated with gneiss.

20. Granitic Porphyry.  
Map No. Rb 79.  
West of Lancefield Road, and south of the parish of Baynton. ¼ sheet 5 N.W.  
Occurs in granite. It consists of a dark-grey, crystalline base of quartz, felspar and hornblende, with scattered particles of amorphous quartz, crystals of felspar and a little mica. The quartz is occasionally coated with some dark-green mineral.

Map No. Rb 76.  
Section 50, Langley. ¼ sheet 5 N.W.  
Hard, dense, grey base, with crystals of felspar, rounded grains of quartz, and specks of magnetic pyrites and hornblende. Traverses granite.

22. Felspar Porphyry.  
Map No. Rb 71.  
Section 72, Langley. ¼ sheet 5 N.W.  
Similar to the last, with mica crystals.

23. Felspar Porphyry.  
Map No. Rb 95.  
N.E. of parish of Baynton. ¼ sheet 51 S.W.  
Dark base, with felspar crystals. Occurs with No. 19.

24. Felspar Porphyry.  
Map No. Rb 95.  
Same locality as last.  
Siliceous base, with felspar in small crystals, and black specks of either mica or some hornblende mineral. It occurs with Nos. 19 and 23.

25. Felspar Porphyry.  
Map No. Ra 58.  
Spring Hut. ¼ sheet 14 N.W.  
Occurs in granite. Dark-grey base, with crystals of felspar and rounded grains of quartz.

Map No. Ra 6.  
Near lots 12 and 13, parish of Baringhup. ½ sheet 14 S.W.  
Occurs with granite in Silurian; a fine-grained base, with mica, quartz and felspar crystals.

27. Felspar Porphyry.  
Map No. Ra 4.  
Lot 3, section 2a, Tarrangower. ¼ sheet 14 S.W.  
Occurs in Silurian. Light-grey, granitic base, with flesh-colored felspar crystals, a little quartz and mica.

28. Felspar Porphyry.  
Map No. Ra 5.  
Lot 4, section 2a, Tarrangower. ¼ sheet 14 S.W.  
Occurs in Silurian. Grey and flesh-colored base, with felspar and quartz crystals and a little mica.

29. Granitic Felspar Porphyry.  
List No. Rs 20.  
Rose's Gap, Grampians.  
Felspathic base, with quartz, felspar, and mica.

30. Syenitic Felspar Porphyry.  
List No. Rs 25.  
Same locality as last.  
Red, silico-felspathic base, with felspar and hornblende crystals and quartz.

31. Syenitic Porphyry.  
List No. Rs 26.  
Rose's Gap, Grampians.  
Flesh-colored, felspathic base, with hornblende, greenish-yellow felspar and quartz.

32. Felstone Porphyry.  
List No. Rsr 18.  
McKenzie's Falls, Grampians.  
Brown, flinty base, with glassy-looking felspar, quartz and a black mineral. It weathers yellow.

33. Felstone Porphyry.  
List No. Rsr 18.  
Same locality as the last.

Those marked with an * occur as dykes (Elvans).
35. **Felstone Porphyry.**  
   List No. Rs 17.  
   *Newbery’s Nob, Broken River.*  
   Hard, semi-flinty base, with quartz and felspar crystals, a little mica and hornblende. Weathers red.

36. **Micaceous Felspar Trap.**  
   *Dandenong Ranges.*  
   Dark-colored base, with much black mica in hexagonal plates.

37. **Felspar Porphyry.**  
   *Running Creek, Upper Yarra.*  
   Flesh-colored, silico-felspathic base, with enclosed crystals of felspar, quartz and hornblende.

38. **Felstone.**  
   *Diamond Creek, Upper Yarra.*  
   Flinty, greenish, felspathic rock, with crystals of glassy-looking felspar, quartz and little mica.

39. **Syenitic Felspar Porphyry.**  
   List No. Rs 12.  
   *Dargan’s Station, Dandenong.*  
   Dark-grey base, with felspar and hornblende crystals.

40. **Felspar Porphyry.**  
   List No. Rs 5.  
   *Dandenong Ranges.*  
   Dark, felspathic base, with much mica in hexagonal plates.

41. **Syenitic Porphyry.**  
   List No. Rs 11.  
   *Police Barracks, Dandenong.*  
   Grey base, with felspar, quartz and hornblende.

42. **Syenitic Porphyry.**  
   *King River.*  
   Felspathic base, with felspar, quartz, hornblende and two small embedded grains of garnet.

43. **Felstone Porphyry.**  
   List No. Rs 20.  
   *King River.*  
   Yellowish, felspathic base, with flesh-colored felspar, quartz and probably hornblende.

44. **Felstone Porphyry.**  
   List No. Rs 20.  
   *King River.*  
   Similar to the last, but flesh-colored.

45. **Felspar Porphyry.**  
   List No. Rs 60.  
   *Base of Mount Timbertop.*  
   Pinkish-grey, felspathic base, with felspar, quartz and probably hornblende.

46. **Felspar Porphyry.**  
   List No. Rs 58.  
   *Base of Mount Timbertop.*  
   A granular compound of white, opaque, triclinic felspar, quartz, and a dark mineral in six-sided plates (mica?) in a base, probably the same as No. 49.

47. **Decomposed Greenstone.**  
   List No. Rs 68.  
   *Same locality.*  
   Yellow, partially decomposed, magnesian rock, containing marks of crystals, probably hornblende.

48. **Felspar Porphyry.**  
   List No. Rs 57.  
   *Same locality.*  
   Pinkish felspathic base, with felspar and quartz crystals.

49. **Serpentine.**  
   List No. Rs 67.  
   *Same locality.*  
   Dense, dark-green, nearly black rock, with thin seams of chrysolite. (See Table of Analyses, page 94.)

50. **Syenite. (?)**  
   Map No. Ra 50.  
   *From drift in the bed of the Coliban River, east of Elphinstone.*  
   Composed of crystalline flesh-colored felspar, with granular chlorite.

51. **Felspar Porphyry.**  
   *Murindate Hill, Gippsland.*  
   Hard, white, felspathic base, with yellow felspar crystals and quartz grains.

*52. **Felspar Porphyry.**  
   Map No. Rd 37.  
   *Werribee Gorge.*  
   Hard, light-grey, felspathic base, with quartz and felspar. Occurs in black Silurian slate.

Those marked with an * occur as dykes (Elvans).
53. Hornblende Porphyry.

Upper Yarra.

The upper face of this specimen appears to be a vein, composed of a base of felspar, with hornblende crystals and a little white mica. The under side is the rock in which it occurs: a base of felspar, with greenish-black mica.

54. Felspar Porphyry.

Black Mountain, Snowy River, Gippsland.

Brown, felspathic base, with quartz and felspar crystals, and enclosed fragments of a black, probably hornblende mineral.

55. Aphanite (?)

List No. Rs 31.

Mount Dryden, Glenorchy.

Hard, light-green rock, composed of soda-felspar and silica.

56. Greenstone

List No. Rs 35.

Same locality as last.

Base of No. 55, with felspar crystals, partly decomposed.

Note.—The greenstone (diorite) composing the range to the east of the parish of Lancefield, is very variable in its lithological character. Mount William, at the extreme northern and highest part of the range, and at its junction with the Great Dividing Range, is composed of a very hard, dark-greenish-black, dense rock (aphanite), closely resembling a basalt, and with a metallic ring, when struck, like clinkstone; passing southwards to a lighter green, hard rock, with crystals of triclinic felspar, sometimes having the appearance of a greenish-white rock, with black dendritic (hornblende) markings. This stone (see "Building Stone Cubes," Nos. 11, 12, 13, and 14), were it not for its extreme hardness, and consequent difficulty and expense in quarrying and working up, would make a very handsome stone for building or ornamental purposes. Further south it passes into a black, highly crystalline, hornblende rock, and then again to a dark-green dense rock, with specks of iron pyrites. Near the centre of this range (see 1 sheet 5 S.E.) is a fault cutting off the greenstone. Its place is supplied by a very rich and heavy brown iron-ore, or hematite (see Mineral Collection, Case 13, No. 36). The greenstone weathers externally to a rusty-brown color. The unfossiliferous Silurian shales, resting as small outliers on the top of this greenstone range (probably the remains of a denudation of the sandstone upheaved by it), and also the contiguous rocks on the west side, are all highly metamorphosed, the shales being converted into a hard jaspery porcelainite. About a mile N.E. of Mount William is the site (locally called "The Native Tomahawk Quarries"), whence the aboriginal tribes of the neighboring districts have procured the greenstone used by them for making tomahawks. From the amount of broken stone covering a large area, this quarry must have been in use for a very lengthened period.

57. Greenstone

List No. Rs 34.

Same locality.

Greenish rock, having a felspathic base, with triclinic felspar crystals and a green mineral.

58. Greenstone

List No. Rs 30.

Same locality.

Dense, hard, dark-colored rock, composed of triclinic felspar and probably hornblende.

59. Porphyritic Diorite

Map No. R 24.

East of Lancefield. 1 sheet 5 S.E.

Grey base, with crystals of triclinic felspar, hornblende and occasionally arsenical pyrites. Very hard and heavy.

60. Dense Diorite

East of Lancefield. 1 sheet 5 S.E.

Dense, hard, dark-colored, hornblende rock. (See "Building Stones," Nos. 11, 12, 13, and 14.)
Mount Purrumbet, Lake Cooper.  
Greenish-black mottled rock, with specks of iron pyrites.

Same locality as last.  
The same base as last, with a few scattered crystals of triclinic felspar.

63. Greenstone.  
Mount Camel Range, Colbinabbin.  
A concretionary nodule. From a well 80 feet deep in greenstone; fresh, good water.

64. Greenstone (Diabase).  
Barrabool Hills, west of Geelong.  
\( 1/4 \) sheet 24 S.E.  
A hard, greenish-black, crystalline rock, probably composed of green labradorite and black augite, though the silica in the soluble portion is rather too low. The analysis by Mr. J. Cosmo Newbery gave as follows:—

<table>
<thead>
<tr>
<th>Soluble portion</th>
<th>Insoluble portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>46.74</td>
</tr>
<tr>
<td>Iron, sesqui-oxide</td>
<td>1.30</td>
</tr>
<tr>
<td>Alumina</td>
<td>29.05</td>
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<tr>
<td>Lime</td>
<td>14.36</td>
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<td>4.04</td>
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<tr>
<td>Potassa</td>
<td>1.75</td>
</tr>
<tr>
<td>Loss by ignition</td>
<td>100.00</td>
</tr>
</tbody>
</table>

*40.06 per cent. is soluble in hydrochloric acid.  
(See Table of Analyses, page 94.)

Note.—The diorite specimen 67, composed of pinkish felspar and black hornblende, was taken from a peculiar intrusive mass of rock, several acres in extent, that in most places, where exposed, consists of diorite, but assumes at others granite, syenite, porphyritic and brecciated characters. Thus, at its junction with the black graptolite slates of the neighborhood, where several small faults have been traced (see sketch on \( 1/4 \) sheet 15 N.E.), the rock bears the character of porphyry, more or less decomposed; whilst at another place, scarcely four chains off, the accession of black mica and some quartz renders the rather decomposed rock undistinguishable from decomposing granite; and from one of the small shafts, sunk for the purpose of examination, specimens of “epidosite” (vide No. 70) were also obtained. In small cavities of the porphyritic variety, crystals of “albite,” associated with abnormally formed quartz crystals, occur, and it was therefore probable that the felspar, entering into the composition of the rock, might also be “albite,” though the absence of the characteristic twinning on its cleavage planes gives it all the appearance of orthoclase. The result of Mr. J. C. Newbery’s analysis

65. Greenstone (Diabase).  
Same locality as last.  
Identical with No. 64, but more highly crystallized.

Near S.E. corner of section 15, parish of Metcalfe.  
(See Table of Analyses, page 94.)

67. Diorite.  
Tarilta, or Kangaroo, near Guildford.  
\( 1/4 \) sheet 15 N.E.  
See Note.  
(See Table of Analyses, page 94.)

68. Decomposed Diorite.  
Same locality as last.  
This specimen was taken from the junction with the graptolite slates of the neighborhood.  
See Note.

69. Decomposed Diorite.  
Same locality as 67.  
See specimen 68.  
See Note.

70. Epidosite (Epidote Rock).  
Same locality as 67.  
Composed of light-green epidote, quartz and occasionally crystals of hornblende. (See Table of Analyses, page 94 and No. 7.)  
See Note.
(see No. 6, Table of Analyses) proves it, however, clearly to be "albite," and the rock is therefore diorite, according to recent views on petrographical classification. The adjoining fossiliferous strata are not, or but very slightly, altered, and hand specimens can easily be obtained, in which one half consists of black slate, with well preserved graptolites, and the other of the porphyritic variety of the intrusive rock. The brecciated variety, apparently a mixture of chips of Silurian rock and of the dioritic paste, occurs in places only along the boundary of the two formations.

*71. Micaceous Diorite.
Castle Reef, Raspberry Creek, near Wood's Point.
Dense, greenish-grey base, probably an intimate mixture of triclinic felspar and hornblende. The mica occurs in silvery thin plates, and has a talcose appearance. It occurs as a dyke, in which rich auriferous quartz-veins are worked.

*72. Diorite (?)
Same locality as 71.
Probably No. 71, partially decomposed.

73. Greenstone (Diorite).
Near Bushy Creek, Hopkins' Hill.
Hard, dark-colored rock, composed of triclinic felspar and hornblende.

74. Greenstone (Diabase).
List No. R 125.
Summit of Mount Camel, near Heathcote.
Hard, black, fine-grained, crystalline rock.

75. Greenstone (Diabase).
List No. R 125.
Mount Camel.
Containing crystalline veins of calcite.

76. Greenstone (Diabase).
List No. R 125.
Mount Camel.
This rock has the appearance of being horizontally stratified. It contains veins of calcite and alternate layers of greenish and reddish colored fibrous crystals of some pyroxenic mineral.

This mineral is allied to "pyrosclerite," but differs materially from it in its chemical composition and physical properties, and therefore forms a new mineral species. It occurs massive, as a vein, in the Upper Silurian rocks, 4 miles north of Heathcote, and is traversed by thin seams of talc. Its hardness is 3-5; specific gravity, 2-53; color, various shades of green to black. It was originally mistaken for a copper-ore. It is translucent on the edges, fracture uneven and splintery; lustre earthy; takes a fair polish, and might, perhaps, be used for ornamental purposes. Before the blowpipe it becomes white, and fuses on the edges to a greyish-white, blebby glass; gives off water in a mattess; colors the beads of borax and salt of phosphorus faintly chrome-green, and is only partially soluble in strong acids.

A quantitative analysis by Mr. J. Cosmo Newbery gave the following results:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>47.15</td>
</tr>
<tr>
<td>Sesqui-oxide of chromium</td>
<td>7.61</td>
</tr>
<tr>
<td>Alumina</td>
<td>33.23</td>
</tr>
<tr>
<td>Magnesia</td>
<td>4.56</td>
</tr>
<tr>
<td>Water</td>
<td>6.23</td>
</tr>
</tbody>
</table>

From the same locality as last.
This specimen consists of a green and white mottled mixture of selwynite, talc and veins of a white mineral, or rather two minerals, of different degrees of hardness.

Those marked with an * occur as dykes (Klans).
VOLCANIC ROCKS.

Case IV.

OLDER VOLCANIC.

1. BASALT. List No. R 11 Rs.
   East of East Creek, Western Port.
   Black, dense and compact; contains a few embedded, crystalline grains of olivine and of a mineral with a bright bronzy lustre on the surface of cleavage.

2. BASALT. List No. R 6 Rs.
   West Head, east side, Western Port.
   Greenish-black; it seems to be an intimate mixture of felspar, augite and olivine.

3. BASALT.
   North Melbourne. ¼ sheet 1 N.W.
   Greenish-black, very dense and close-grained; contains olivine in crystalline grains; suitable for road metal.

4. DECOMPOSED BASALT.
   Bruthen Creek, Gippsland.
   An earthy mass of mottled appearance. Surface stained and coated with oxide of iron.

5. NODULE IN BASALT.
   King street, Melbourne. ¼ sheet 1 S.E.
   Illustrates the concretionary form of decomposition which takes place in basalt and other igneous rocks.

   North Melbourne. ¼ sheet 1 N.W.
   Associated with, and doubtless chiefly derived from, the iron constituents of the older basalt during decomposition.

7. BROWN IRON-ORE.
   Same locality.
   Very similar to No. 6.

8. EARTHY HEMATITE.
   Same locality.
   More oxidized than Nos. 6 and 7. Portion of a nodule in basalt.

9. DECOMPOSED BASALT.
   Deep Creek, Hurdy-gurdy.
   Very friable and incoherent; almost pisolitic, from the abundance of small ironstone nodules.

10. DECOMPOSED BASALT.
    Raleigh's Punt, Saltwater River. ¼ sheet 1 N.W.
    Has become a clay, but still exhibits the concretionary structure indicative of decomposition.

11. DECOMPOSED BASALT.

12. DECOMPOSED BASALT.
    Rleigh's Punt, Saltwater River. ¼ sheet 1 N.W.
    Has a thick, ferruginous, mammillated coating. Is rapidly passing into a brown, homogeneous clay.

13. DECOMPOSED BASALT.
    Same locality as last.
    Is also quickly passing into a clay; though not quite so much decomposed as No. 12.

14. DECOMPOSED BASALT.
    Deep Creek, Hurdy-gurdy.
    Of an olive-green color, when freshly broken, passing into a homogeneous clay.

15. DECOMPOSED BASALT.
    Forming a red, brown, and white mottled clay.

16. RED CLAY (Earthy).
    Map No. R 11.
    Section 7, Bolinda. ¼ sheet 7 N.E.
    Associated with, if not actually resulting from, the decomposition of basalt in situ, and underlying the newer basalt.
17. **Red Clay (Decomposed Basalt)**.  
List No. Rd 34.  
Stony-hut Creek, Mount Blackwood.  
Partly amygdaloidal, dark red, earthy clay, with a conchoidal fracture.

18. **Decomposed Basalt.**  
List No. R 3 Rs.  
S.W. of East Creek, Western Port.  
Has become a reddish, earthy clay, enclosing small nodules of similar composition, coated with brown iron-ore.

19. **Red, Basaltic Clay.**  
Western Port, east side.  
More argillaceous than No. 18.

20. **Red, Basaltic Clay.**  
Flemington.  
Not differing much from No. 19, except that it is more friable and full of yellow veins.

21. **Basaltic Clay.**  
Flemington.  
Resembles No. 20, but is even less homogeneous and coherent.

22. **Decomposed Basalt.**  
Queen's Ferry, Western Port.  
A mottled, steatitic clay; fracture of steatitic portions flat conchoidal.

23. **Decomposed Basalt.**  
Western Port, east side.  
Converted into a mottled, greenish brown and white, granular clay, rough to the feel; still shows concretionary lines.

24. **Decomposed Basalt.**  
Raleigh's Punt, Saltwater River.  
Structure completely obliterated; has changed to a mottled, yellow and white, earthy clay.

25. **Decomposed Basalt.**  
Queen's Ferry, Western Port.  
Has become converted into a red and greyish-white, banded clay. The greyish-white portion is mottled white, magnesian clay. It presents a smooth even surface, when cut.

26. **Decomposed Basalt.**  
Same locality as last.  
Consists only of the felspathic portions of the basalt. In color and character resembles the greyish-white portion of No. 25.

27. **Decomposed Basalt.**  
Flagstaff Hill, Melbourne.  
Converted into a soapy clay, retaining little but the felspathic elements of the rock. It is traversed by thin, ramifying veins of white, magnesian clay.

28. **Basaltic Clay.**  
Same locality as last.  
Greyish-white and somewhat earthy in appearance, but smooth, when cut.

29. **Basaltic Clay.**  
List No. R 2 Rs.  
Point S. W. of East Creek, Western Port.  
Mottled or marbled grey and white, cut surface very smooth, soapy to the touch.

30. **Basaltic Clay.**  
Western Port, east side.  
Color light dirty-grey, not very smooth to the touch, discolored by ferruginous matter, and concretionary.

31. **Basaltic Clay.**  
Map No. Rd 40.  
Batman's Hill, Melbourne.  
Cream-colored, streaked with veins of white, magnesian clay, along the course of which it readily comes asunder; not very soapy to the touch, except where the clay is present.

32. **Decomposed Basalt.**  
King street, Melbourne.  
Brown, grey and yellowish-brown, in bands, with thin divergent seams of “kaolin.”

33. **Amygdaloidal Basalt.**  
List No. Rd 34.  
Stony-hut Creek, Mount Blackwood.  
Cavities filled with a white and reddish, soap-like mineral, in some instances translucent. It is traversed by veins of a red hydro-silicate of alumina. Base dark brown.
34. Basaltic Clay.  
List No. R (on 1).  
_Hill between Korkuperrimul Creek and Lerderderg River, near Bacchus Marsh._
Greenish-grey and red colored base, with spots of white hydro-silicate of alumina, giving the rock a porphyritic appearance.

35. Decomposed Basalt.  
Map No. Rd 40.  
_Batman’s Hill, Melbourne, 4 sheet 1 S.E._
Color dark grey and red mottled, with veins and patches of white, magnesite clay, stained with iron.

36. Decomposed Basalt.  
Map No. Rd 40.  
_Same locality as last._
Same as No. 35, but in a more disintegrated condition, and with a larger proportion of white clay.

37. Basalt.  
Map No. R W 1.  
_Section 116, Darriwell, 4 sheet 19 S.W._
In process of decomposition. Color olive-brown, speckled with red, the result of the conversion of an embedded mineral into hydrous oxide of iron. Texture fine-grained granular.

38. Basalt.  
Map No. R W 1.  
_Section 116, Darriwell, 4 sheet 19 S.W._
Of a light reddish-grey color, earthy and fine granular in texture; in process of decomposition.

Map No. R W 1.  
_Same locality as last._
Similar to No. 38. Shows a few vesicular cavities.

40. Basalt.  
Map No. W 1.  
_Same locality as last._
Color greyish olive-brown, surface hollows covered with a green coating, consisting of silicate of protoxide of iron, spreading over the carbonate of lime beneath. Texture similar to No. 36.

41. Cellular Basalt.  
Map No. W 1.  
_Same locality as last._
Color brownish-grey, contains small embedded ironstone nodules, similar to those which constitute the ironstone gravel of the plains (“Bean-ore”).

42. Brown, Pisolitic Clay.  
List No. 10.  
_Korkuperrimul Creek._

43. Greenish-Grey Clay.  
List No. 8.  
_Korkuperrimul Creek._
Decomposed basalt.

44. Grey Clay.  
_Bruthen Creek, near Port Albert, Gippsland._
Contains traces of phosphoric acid.

46. Brown Clay.  
List No. 5.  
With oval, lighter brown pieces of some decomposed mineral.

47. Red Clay.  
List No. 16.  
_Phillip Island, Western Port Bay._
Similar to the last.

48. Various Clays.  
_Bruthen Creek, near Port Albert, Gippsland._
_Six specimens._
(a) (Dark-red.) Forms a fine red pigment, and can be used as red chalk.
(b) A soapy rock, dark bluish-black and red base, with green and brown spots, giving it a porphyritic appearance.
(c) A greenish-colored clay, with red portions like a; the green color is probably due to the silicate of the protoxide of iron.

Small fissures and cavities occur in these clays, filled with pieces of a mineral substance, which on analysis was found to be composed chiefly of phosphate of lime, phosphate of alumina and quartz, and to be more or less coated and impregnated with ores of copper (red oxide, silicate, carbonate and phosphate). The pieces have not, however, yet been found to occur in sufficient quantity to be of any economic value.

49. Basaltic Clays.  
_Korkuperrimul._
A chocolate-red base, with white streaks and spots; very aluminous and similar to 34.
Case V.

OLDER AND NEWER VOLCANIC.

OLDER VOLCANIC—(continued).

50. Amygdaloidal Basaltic Clay. List No. Rs. 79c.
   North Coast, Phillip Island.
   Light chocolate color, with roundish kernels and narrow veins of white silicate of alumina and magnesia. (See Table of Analyses, page 94.)

   North Coast, Phillip Island.
   Of marble-like appearance, colored brown, greyish-blue and white. (See Table of Analyses, page 94.)

   North Coast, Phillip Island.
   Amygdaloidal in parts.

   North Coast, Phillip Island.
   Dark brown, with white and yellow roundish kernels.

   North Coast, Phillip Island.
   Half grey, half dark red, and mottled.

   North Coast, Phillip Island.
   Light-grey and brown mottled.

   North Coast, Phillip Island.
   Of pretty uniform color throughout. (See Table of Analyses, page 94.)

   South Coast, Phillip Island.
   Red, grey and yellow mottled; portions consist of brown iron-ore.

   Pyramid Rock, Phillip Island.
   Of marble-like aspect; bluish-grey, brown and white mottled.

59. Black, fine-grained Basalt. List No. Rs. 82.
   Pyramid Rock, Phillip Island.
   In course of decomposition; traversed by innumerable thin, white clay veins. It shows a hackly fracture, and some portions are of a grey rusty color.

   North Coast, Phillip Island.
   The exterior of the nodule is decomposed to a yellowish-brown clay, while the interior yet remains a hard, dense basalt. Concentric rings in the exterior portion show the progress of the decomposition. (See Table of Analyses, page 94.)

   South Coast, Phillip Island.
   This specimen, though from its mode of occurrence evidently a decomposed basalt, has assumed the appearance of a brown iron-ore conglomerate; the pebble-like concretions of the rather argillaceous brown iron-ore being cemented together by a dark grey and brown ferruginous clay.
1. Dense, Black Basalt.  
S.W. of Kyneton.  ¼ sheet 9 S.E.  
Compact, hard and brittle, with a flat conchoidal fracture; contains minute crystalline grains of olivine, and perhaps nepheline, disseminated through it. The rock is in appearance very much like Lydian stone. An analysis gave the following results, 5 per cent. only being soluble in hydrochloric acid:—

<table>
<thead>
<tr>
<th>Soluble portion.</th>
<th>Insoluble portion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>34.50</td>
</tr>
<tr>
<td>Alumina</td>
<td>38.58</td>
</tr>
<tr>
<td>Manganese</td>
<td>trace</td>
</tr>
<tr>
<td>Iron</td>
<td>18.07</td>
</tr>
<tr>
<td>Lime</td>
<td>7.12</td>
</tr>
<tr>
<td>Magnesia</td>
<td>trace</td>
</tr>
<tr>
<td>Potash</td>
<td>8.41</td>
</tr>
<tr>
<td>Soda</td>
<td>1.43</td>
</tr>
<tr>
<td>Oxide of copper</td>
<td>trace</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>102.05</td>
</tr>
</tbody>
</table>

2. Dark, Compact Basalt.  
Map No. Ra 28a.  
Hill in section 28, north boundary of Woodend township.  ¼ sheet 10 N.E.  
With cavities containing olivine: quarried for road metal.

List No. Rs. 1.  
Mount Shadwell.  
Fine-grained and dark colored, containing nests of olivine in green and amber-colored, crystalline masses.

Jim Crow Creek.  ¼ sheet 15 S.E.  
Dark grey and compact, with fine-grained texture, and containing flattened vesicles.

5. Basalt.  
Map No. Ra 43.  
Quarry in reserve, section 52, Woodend.  ¼ sheet 9 S.E.  
Of a bluish-grey color, with felspar crystals (oligoclase) abundantly disseminated through it, and a few crystals of olivine. A good road metal.

Map No. Re 29.  
P.I. Claim, Durham Lead.  ¼ sheet 63 S.E.  
Of a grey color and fine-grained, with small scattered crystals of olivine and a patch of quartz. (See Table of Analyses, page 94.)

Map No. R. 60.  
Section 8, Newham.  ¼ sheet 5 S.W.  
Hard, dark and compact, close-grained and felspathic, containing a large amount of olivine. A good road metal.

8. Slaty Basalt.  
Map No. Ra 39.  
Lot 8, section 5, Burke.  ¼ sheet 9 S.W.  
It is slightly porphyritic, with small crystalline grains of olivine, triclinic felspar, a black mineral and a dark red transparent one, probably zircon or garnet. The base is very hard and dense.

8a. Slaty Basalt.  
S.W. of Kyneton ¼ sheet 9 S.E.  
This resembles an altered slate, and in place has a regular dip and strike, but varying in all directions. The rock is dense and of a mottled grey color.

Map No. Re 28.  
Hardie's Hill, near Crisis G. M. Co., Durham Lead.  ¼ sheet 63 S.E.  
Dark-colored, fine-grained, minutely vesicular and obscurely laminated.

Degraves' Mill, near Kyneton.  ¼ sheet 9 S.E.  
Of a dark grey color, containing cavities coated with crystals of chabasite, also grains of olivine and kernels of a white magnesian clay.

Map No. Ra 66.  
Table Hill, near Guildford.  ¼ sheet 15 N.E.  
Dark grey, with cavities containing carbonate of lime, spherosiderite and crystals of aragonite.

Map No. Ra 70.  
Little Red Hill, Church's Flat, Fryer's Creek.  ¼ sheet 15 N.E.  
Of a dark bluish-grey color. Occurs as a dyke, forming the eastern wall of a quartz reef. A compact, close-grained, porphyritic rock, containing embedded grains of triclinic felspar and olivine.
12. **Basalt (Anamesite).**
   Map No. Re 28.
   *Hardie's Hill, near Crisis G. M. Co., Durham Lead,* ½ sheet 63 S.E.
   Color brownish-grey: contains minute crystals of augite, olivine and triclinic felspar.

13. **Basalt (Anamesite).**
   Map No. Rb 8.
   *Section 37, Spring Plains,* ¼ sheet 13 N.E.
   Of a bluish-grey color, and has a minutely vesicular appearance, caused by the open and irregular aggregation of its constituents, producing a roughness of surface where broken. It contains minute crystals of specular iron, having a blue tarnish, and cavities coated with carbonate of lime, running in bands, and hyalite.

14. **Basalt (Anamesite).**
   Map No. Ra 101.
   *Farmers' Arms, Carisbrook road,* ¼ sheet 52 N.E.
   Of a brownish-grey color; finely vesicular.

15. **Basalt (Dolerite).**
   Map No. Ra 41.
   *Lot 76, Carlsruhe,* ¼ sheet 9 N.E.
   Color greyish-brown, very dense and close-grained, and possessing a marked crystalline texture; rich in olivine.

16. **Basalt (Anamesite).**
   *Wickliffe.*
   Color brownish-grey, with an open and porous sub-crystalline texture, giving the rock the appearance of being minutely vesicular.

17. **Basalt (Anamesite).**
   Map No. Rb 110.
   *Section 106, Redesdale,* ¼ sheet 13 N.E.
   Color grey: magnetic, with polarity; is dense and contains olivine.

18. **Basalt.**
   Map No. Re 5.
   *Leigh River,* ¼ sheet 64 N.E.
   Color dark grey; texture close-grained: contains a little olivine, and is suitable for building purposes. Specimen obtained from the lower flow.

19. **Basalt.**
   Map No. Ra 105.
   *Moolort,* ¼ sheet 52 N.E.
   Color greyish-brown; slightly vesicular, and containing triclinic felspar and small black grains, resembling augite and hematite. A good building stone.

20. **Basalt.**
   *Jim Crow Creek, Yandoit,* ¼ sheet 15 S.E.
   Color bluish-grey: texture very dense, almost pisolitic, with an uneven and hackly fracture; specimen obtained from the second layer near the termination of the lower flow. On exposure it crumbles to a gravel.

21. **Basalt (Lava).**
   *Mount Franklin,* ¼ sheet 15 S.E.
   Color dark ash-grey, minutely vesicular, earthy; fracture uneven, approaching to hackly: contains a little olivine and oligoclase.

**Note**—"The basaltic lava streams of the country surrounding Mount Franklin and Franklinford are of two different ages. The older is antecedent to, and has been denuded during the formation of the present main drainage channels, and now forms detached patches, capping isolated hills or long narrow stretches on the tops of ranges. The more recent streams have poured into the present valleys, and in their gradual descent from high points of eruption, appear, in some cases, to have covered the post pliocene, as well as the older and newer pliocene gold drifts (Jim Crow Creek and Mount Franklin streams). Only where they have acted as natural bars to, or lie in the line of the drainage from high levels, they are, in their turn, covered by recent alluvium (patch near Yandoit swamp, Franklinford, &c.). As regards lithological character, the two flows present no marked difference."—(Note, ¼ sheet 15 S.E.)
“The crater of Mount Franklin, for some distance down the outside and inside slopes, consists of a mixture of earthy scoriaceous basalt and real pumice-like scoria; the former containing pieces of transparent 'Oligoclase,' and irregular lumps, frequently above several pounds in weight, of 'Olivine,' which latter, through partial decomposition, has however lost its green color, presenting either a uniform brownish-red or brown, speckled with green, appearance. The bottom of the crater, lying about 250 feet below the highest point of the rim, has an area of several acres, and shows two very gentle rises of unequal size, divided by a narrow depression. As the whole of this area lies lower than the bottom of the rent in the rim of the crater, it is probable that its own, and the drainage down the inside walls of the latter, having no direct outflow, soaks off through the porous basalt of the mantle, and contributes largely to the numerous springs around the foot of the Mount.”—(Part of Note 1, ¼ sheet 15 S.E.)

“Towards the north end of the crater, a narrow and very precipitous rent in its side exposes thick, variously colored beds of volcanic ash, cinders and scoria-conglomerate, which dip at an angle of 17° towards the centre of the Mount. It remains doubtful, whether the ravine actually owes its origin to a side outbreak of basaltic lava—the source, perhaps, of the basaltic stream in the flat below—or whether it has simply been caused by strong flows of water from the top of the Mount.”

“The termination of the Jim Crow Creek flow is characterized by a very rugged surface and rocky escarpments, resembling the recent lava flows from the craters in the Western Districts.”—(Note 8, ¼ sheet 15 S.E.)

22. BASALT. Map No. Re 29. P.I. Claim, Durham Lead. ¼ sheet 63 S.E.
Color light-grey, close-grained, dense and compact: containing crystals of olivine and titaniferous iron.

23. BASALT. Flat-topped hill near Mortlake.
Color bluish-grey; fine-grained and minutely vesicular: contains olivine.

24. BASALT. Map No. Ra 46. Parish of Coliban, S.E. of Glenlyon. ¼ sheet 10 N.W.
Color light-grey; fine-grained and compact: small crystals of olivine abundant throughout.

25. BASALT. Map No. R 57. Lot 30, Newham, near the Jim-Jim. ¼ sheet 5 S.W.
Color light-grey; compact and close-grained, porphyritic, with embedded grains of a yellowish-white mineral (triclinic felspar) and small crystals of augite (?); affects the magnetic needle and exhibits a high degree of polarity.

Color light bluish-grey; compact, fine-grained and magnetic; porphyritic by imbedded crystals of triclinic felspar and decomposed grains of olivine.

27. BASALT (Dolerite). Map No. R 91. Magnet Hill, Baynton's Station. ¼ sheet 51 S.W.
Color light-grey; exhibits a confused crystalline texture. Small crystals of magnetic pyrites, mostly converted into brown iron-ore, abound throughout the mass, causing it to strongly affect the magnetic needle, with a high degree of polarity. A specimen of this basalt, cut into a long bar, will be found in the mineral collection.—Case XIII., No. 39.

Color brownish-grey; fine-grained, granular, slightly vesicular; vesicles coated and filled with carbonate of lime and sparry iron ( sphæresiderite).
26. **Basalt.**

*Map No. Ra 106.*

*Moolert, Newstead Road.* ¼ sheet 52 N.E.

Color ash-grey; slightly vesicular, fine-grained, dull, earthy: containing specular iron sparingly distributed throughout.

30. **Basalt.**

*Map No. Ra 103.*

*Deep Creek, Carisbrook.* ¼ sheet 52 N.E.

Color bluish-grey; texture rough and uneven, fracture uneven and hackly, slightly vesicular, vesicles generally compressed and flattened.

31. **Basalt.**

*S.W. of Kyneton.* ¼ sheet 9 S.E.

Color dark-grey; compact, fine-grained, with scattered crystals of augite and triclinic felspar.

32. **Volcanic Conglomerate.**

*Map No. Re 27.*

*Hardie’s Hill, North side.* ¼ sheet 63 S.E.

Consists of a mixture of volcanic scoriae (the vesicles filled with nodules and crystals of carbonate of lime), fragments of slate and sandstone, quartz, &c., embedded in a brown, earthy matrix.

33. **Basalt (Anamesite).**

*Map No. Ra 66.*

*Table Hill, near Guildford.* ¼ sheet 15 N.E.

Color grey; fine-grained, granular: contains crystals of labradorite (?) and specular iron disseminated through it.

34. **Basalt.**

*Map No. R 91.*

*Magnet Hill, Baynton.* ¼ sheet 51 S.W.

Color grey, mottled. The texture of this rock is irregular and obscurely laminated. The mottled appearance of the surfaces of fracture is probably due to the rock being in an incipient state of decomposition.

35. **Basalt.**

*Map No. Ra 32.*

*Lot 2, Newham.* ¼ sheet 6 N.W.

Color grey, mottled; more irregular in texture than the last, but without any tendency to lamination; in other respects much resembling it. A green mineral fills a cavity in this specimen.

36. **Amygdaloidal Basalt.**

*Gelantipy, Gippsland.*

Cavities or vesicles filled with carbonate of lime, more abundantly with hydrous oxide of iron, and also with grains of an opaline mineral (noble opal?). Very absorbent of moisture.

37. **Basalt.**

*Map No. Rb (38).*

*Section 37, Spring Plains.* ¼ sheet 13 N.E.

Color dark grey; rough granular and slightly vesicular.

38. **Basalt (Lava).**

*Map No. Ra 100.*

*Loddon Creek, Moolort.* ¼ sheet 52 N.E.

Color ash-grey; dull, earthy and has more the appearance of scoria than that of a basalt.

39. **Vesicular Basalt.**

*Map No. Re 28.*

*Hardie’s Hill, near Crisis G. M. Company.* ¼ sheet 63 S.E.

Dark bluish-grey rock, vesicles compressed and elongated.

40. **Basaltic Lava.**

*Mount Elephant.*

This rock is full of grains and nests of olivine, with crystals of felspar (oligoclase), which give it a porphyritic aspect. It includes also some small pebbles of other rocks.

41. **Scoriaceous Basalt.**

*Map No. Ra 112.*

*Mount Moolort.* ¼ sheet 52 N.E.

A mixture of compact and scoriaceous rock, in irregular bands or layers.

42. **Basaltic Slag, or Cinder.**

*List No. Rs 1.*

*Mount Shadwell.*

A black, cindery fragment, having a very woody grain and appearance: contains nests and grains of olivine.

43. **Vesicular Basalt (Anamesite).**

*Map No. Ra 122.*

*Moolort.* ¼ sheet 52 N.E.

Rubbly and uneven in texture; coarsely vesicular.
Mount Shadwell.
Rough, vesicular and slaggy looking; contains olivine sparingly.

46. Vesicular Basalt (Dolerite Lava).

47. Vesicular Basalt (Anamesite).
West bank of Loddon. Map No. Ra 96.
Vesicles very large.

48. Vesicular Basalt.
Cargerie Creek, Leigh River. Map No. Re 10.
With some of the vesicles filled with carbonate of lime.

49. Basalt (Dense Dolerite).
Section 6, Tullamarine. Map No. R. 8.
Color light pinkish-grey; fine-grained and vesicular on the surface. Vesicles containing specular iron and labradorite (?)

50. Scoria.
Vesicles coated with "hyalite."

51. Basalt (Dolerite).
Color grey; rough granular, "hyalite" in botryoidal aggregations occupying surface grooves and cavities. A good building stone.

52. Vesicular Basalt.
Vesicles partly coated with carbonate of lime.

53. Basalt (Dolerite).
This specimen is interesting, as showing the constituent minerals crystallized out freely in irregular shaped cavities dispersed throughout the mass: the augite in dark green, prismatic needles, and the felspar in white rectangular (or rhombic ?) plates. There are also some dark-colored, hexagonal plates amongst them, with an iridescent surface (specular iron?). This rock occurs in irregular patches and seams in ordinary grey basalt, a portion of which may be seen on the reverse side of the specimen. Extensive quarries opened in this basalt, or locally called "bluestone," have furnished much of the material used in the construction of the railway works near Malmsbury.

54. Vesicular Basalt.
Mount Shadwell. List No. Rs 1.
Contains large nests of olivine.

55. Vesicular Basalt.
Mount Shadwell. List No. Rs 1.
Dark grey, with crystalline grains of olivine.

56. Vesicular Basalt.
Mount Shadwell. List No. Rs 1.
Of a reddish-brown color; it presents an appearance of eroded cavities rather than true vesicles. These are coated with a yellow, crystalline mineral (olivine ?). The specimen encloses a large nest of olivine in course of conversion by decomposition into mica (rubel-lane ?).

Mount Shadwell.
This specimen represents a portion of the cast of a cylindrical hollow, or pipe, into which the lava has flowed. The central portion is entirely vesicular and scoriaceous, surrounded by concentric rings, or coats of dense texture, separable from each other, and presenting a striped surface on the planes of separation. Color reddish. Encloses a large fragment of felspar (oligoclase).

Mount Shadwell.
Of a reddish color and scoriaceous character; similar to above, except in form; contains embedded crystalline grains of olivine and also a large fragment of felspar (oligoclase).
VOLCANIC ROCKS.—CASE V.

Case VI.

NEWER VOLCANIC—(continued).

59. BASALTIC LAVA (Scoriaceous).

_Mount Shadwell._

Color blackish-grey; vesicles much compressed and flattened, giving to the rock an appearance of a fissile or laminated structure. Somewhat resembles specimen No. 42.

60. VESICULAR BASALT.

_Map No. Ra 102._

"Farmer's Arms," Carisbrook.

1/4 sheet 52 N.E.

In part amygdaloidal.

61. VESICULAR BASALT.

_Near Malmsbury._ 1/4 sheet 9 N.W.

Texture dense; vesicles compressed and elongated.

61A. BASALT.

_Barnold Co.'s Shaft, Barfold, Campaspe River._ 1/4 sheet 13 S.E.

Black and vesicular, with cavities containing botryoidal coatings of carbonate of lime (ferro-calcite). An analysis by Mr. J. C. Newbery, after separation of the carbonate of lime, gave:

<table>
<thead>
<tr>
<th>Soluble portion</th>
<th>Insoluble portion</th>
</tr>
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<tbody>
<tr>
<td>Silica</td>
<td>35.71</td>
</tr>
<tr>
<td>Alumina</td>
<td>49.11</td>
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<tr>
<td>Iron, sesqui-oxide</td>
<td>13.66 (Oxide of Iron) 14.08</td>
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<tr>
<td>Lime</td>
<td>1.07</td>
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<tr>
<td>Magnesia</td>
<td>0.52</td>
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<tr>
<td>Potash</td>
<td>0.03</td>
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<tr>
<td>Soda</td>
<td>7.24</td>
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<tr>
<td>Titanic acid</td>
<td>0.23</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.35</td>
</tr>
<tr>
<td>Water</td>
<td>102.15</td>
</tr>
</tbody>
</table>

39.19 per cent. was soluble in hydrochloric acid.

62. BASALT (Earthy Lava).

_List No. Rs 1._

_Mount Shadwell._

Color dull reddish; encloses pieces of olivine, partly decomposed, and small ironstone pebbles.

63. VOLCANIC SCORIA.

_Mount Franklin._ 1/4 sheet 15 S.E.

Attached to this scoriaceous fragment is a piece of the subjacent rock (probably Silurian slate), over which the lava flowed.

64. VOLCANIC SCORIA.

_List No. Rs 1._

_Mount Shadwell._

65. BASALTIC LAVA.

_List No. Rs 1._

_Mount Shadwell._

Somewhat resembling No. 57, except that the central portion is as dense as the outer, and the peculiarity of structure not so characteristically shown; contains nests of olivine.

66. VESICULAR SLAG.

_Map No. Ra 107._

Newstead Road, Moolort. 1/4 sheet 52 N.E.

Shows the cooled surface of flowing lava.

67. VOLCANIC CINDER.

_SCORIA._

Flat-topped hill, near Mortlake.

Similar to specimen No. 64.

68. VOLCANIC SCORIA.

_List No. Rs 1._

_Mount Shadwell._

Very cellular; the cause of the marked difference in the color of the cells is uncertain. It encloses fragments of felspar (oligoclase).

69. VOLCANIC SCORIA.

_Mount Franklin._ 1/4 sheet 15 S.E.

Dark, very cellular and light.

70. VOLCANIC SCORIA.

_Mount Elephant._

Similar to others.

71. VOLCANIC SCORIA.

_List No. Rs 1._

_Mount Shadwell._

Vesicles large, giving the specimen the appearance of a piece of honeycomb.
72. **Volcanic Scoria.**  
Very similar to No. 71.

73. **Volcanic Scoria.**  
*Mt. Franklin.*  
Similar to No. 69.

74. **Volcanic Cinder.**  
*List No. Rs 1. Mount Shadwell.*  
Encloses crystalline grains of oligoclase felspar and olivine.

75. **Volcanic Cinder.**  
*List No. Rs 1. Mount Shadwell.*  
Contains a little olivine, and some reddish rock is embedded in the cinder.

76. **Volcanic Scoria.**  
*List No. Rs 1. Mount Shadwell.*  
Similar to the last. In this instance the larger vesicles are somewhat spherically arranged, and are surrounded by a border of minute ones, very closely aggregated.

77. **Volcanic Scoria.**  
*Map No. Ra 110. Mount Moolort.*  
Vesicles presenting a very similar arrangement to specimen No. 76.

78. **Volcanic Ash.**  
*List No. Rs 1. Mount Shadwell.*  
A loose, earthy aggregate, very ferruginous.

79. **Volcanic Scoria.**  
*Mount Franklin.*  
Attached to a piece of light-grey, trachytic-looking lava.

80. **Volcanic Scoria.**  
*Mount Franklin.*  
Black, volcanic scoria, mixed and partly coated with silicate of lime and magnesia.

81. **Red, Ochrey Clay.**  
From underneath the upper basalt; baked-looking, and probably altered by contact with the molten basalt.

82. **Volcanic Ash.**  
*Map No. Ra 13. Section 17, Holden.*  
A loose, rough granular aggregate of red earthy lava grains and scoria.

83. **Volcanic Ash (Tufa).**  
*Lake Terang, Western district.*  
Closely resembling No. 82, but of a brown color and more roughly granular.

84. **Volcanic Ash (Tufa).**  
*Same locality as the last.*  
Similar to No. 83, but fine-grained and regularly bedded. Quarried and much used for local building purposes.

85. **Volcanic Tuff.**  
*List No. Rs 1. Mount Shadwell.*  
With ash.

86. **Volcanic Slag.**  
*List No. Rs 1. Mount Shadwell.*  
With ash.

87. **Slaggy Lava.**  
*Map No. Ra 13a. Rocky Gully in lot 10, Doutta Galla.*  
A good illustration of the cooling, during flow, of a thick viscous fluid, like molten rock.

88. **Volcanic Ash (Conglomerate).**  
*Map No. Rd 25. Section 61, Anakie.*  
Showing three distinct strata of fine and coarse material.
90. **Volcanic Ash.**  
Map No. Rd 25.  
*Section 61, Anakie. 1/4 sheet 19 N.E.*  
Of a brown color, with rounded pebbles intermixed; very dense.

91. **Brownish-Red Ash (Conglomerate).**  
Map No. Rd 25.  
*Same locality.*  
Showing a very conglomeritic structure.

92. **Brown, Scoriaceous Ash.**  
Map No. Rd 25.  
*Same locality.*

93. **Conglomeritic Ash.**  
Map No. Rd 25.  
*Same locality.*

94. **Brown, Rubbly Ash.**  
Map No. Rd 25.  
*Same locality.*  
With pebbles.

95. **Yellow, Rubbly Ash.**  
Map No. Rd 31.  
*Bank of small creek, section 24D, Tarneit. 1/4 sheet 8 S.W.*

96. **Ash.**  
Map No. Rd 31.  
*Same locality as the last.*

97. **Cream-colored Ash.**  
Map No. Rd 30.  
*Section 25B, Tarneit. 1/4 sheet 8 S.W.*

98. **Red, Columnar Clay.**  
*Werribee River.*  
The columnar structure seems due to alteration from contact with basalt.

99. **Basalt Lava.**  
Map No. Rd 25.  
*Section 61, Anakie Hill. 1/4 sheet 19 N.E.*  
Chocolate-colored and rather dense; earthy matrix enclosing crystals of hornblende, oligoclase and rubellane (red mica).

100. **Vesicular Anamesite.**  
Map No. Rd 30.  
*Section 25B, Tarneit. 1/4 sheet 8 S.W.*  
Brown matrix; vesicles filled with a yellowish, earthy substance.

101. **Red-and-Black Mottled Basalt.**  
Map No. Ra 12.  
*Red Rock, Buttlejorrk. 1/4 sheet 7 N.W.*
According to the different origin and mode of formation of these rocks they may be divided into three classes:

1. **Mechanical Deposits.**
   - a. Accumulated and stratified by water (aqueous).

2. **Chemical Precipitates.**
3. **Organic Processes.**
   - a. From the growth and accumulation of animal matter (zoogenic).
   - b. From the growth and accumulation of vegetable matter (phytogenic).

The above three classes may again be divided, according to their lithological and mineral characters, into the five following groups:

1. Arenaceous or Siliceous
2. Argillaceous or Aluminous
3. Calcareous
4. Ferruginous
5. Carbonaceous

Nearly all sedimentary rocks are stratified, that is, they lie in beds or layers, one above the other, and often quite parallel for long distances. With few exceptions these beds or layers are made up of larger or smaller fragments and particles (debris) of pre-existing rocks, washed together and deposited from a state of suspension in water. A few only are the result of chemical precipitate of mineral substances from aqueous solution —gypsum, rocksalt and some limestones,—and these usually possess a crystalline structure, not otherwise observed in "unaltered" rocks of sedimentary origin. Many contain organic remains (fossils), more or less distinct, while some are entirely composed of such. Most of these organisms are supposed to have lived and died in the water, at the bottom of which the sediment was being deposited, that now forms the rock they are now embedded in. Others, chiefly vegetable, have been washed or otherwise transported off adjoining dry land, or the land, on which they existed, has been submerged, and thus covered with sand, mud, or silt.

Respecting the igneous or unstratified rocks, it has been stated, that no marked line can be drawn between the various classes and subdivisions, as they are found, both in their physical and mineral characters and in their lithological relations, to merge into each other. This characteristic is also more or less common to the sedimentary and stratified rocks. The several sedimentary deposits have been divided into "formations" according to the order of their superposition, and consequently of their age, and these are gathered into four groups, representing longer periods of deposit:

1. Primary, or Palæozoic.
2. Secondary, or Mesozoic.
3. Tertiary, or Cainozoic.
4. Post Tertiary, or recent.

These divisions have no reference to mineral or lithological character, and no specimen of rock—such as sandstone, clay-slate, shale,
conglomerate, breccia, limestone, &c.—is exclusively confined to, or characteristic of, any geological age or formation; and therefore the geological age of a deposit will in no case afford information respecting the nature of the rock or its petrographic character. These characters are almost entirely dependent on circumstances, varying in each locality or country, and on the nature of the formation, from which the material, forming the rock, has been supplied, as well as on the physical influences, to which it may have been subjected since its original deposition. Thus, in the stratigraphical arrangement, adopted in this collection, specimens of sandstone, shale, conglomerate, breccia, limestone, ironstone, &c. occur in each geological period; and it may be observed, that some of the most recent Tertiary rock specimens are quite as hard, solid and compact as those, that belong to Secondary or Primary formations; and others, differing widely in geological age, are almost identical in their composition, texture and appearance.

**Sandstone.**—A typical sandstone may be described as consisting of small grains of some solid mineral, usually quartz, bound together into a solid rock, either by some cementing medium or by simple pressure. **If the grains are fine, it is a fine-grained sandstone; if coarse, a coarse-grained sandstone, &c.** If the cementing medium is lime, it becomes a calcareous sandstone; if iron, a ferruginous sandstone, &c. As the grains increase in size, it becomes either a grit or a conglomerate. **If the particles are angular, a breccia.**

**Argillaceous Shale and Clay-Slate** are laminated clay-rocks, formed from sediments of clayey mud, and have assumed their present form by a slow process of transmutation and mechanical consolidation. Admixtures of other matter, either during decomposition or subsequently, frequently render them either arenaceous, carbonaceous, micaceous, ferruginous, calcareous, or bituminous, as the case may be. They may both be described as laminated fissile rocks; in the one instance this texture is due to original stratification, and in the other to slaty cleavage. Clay-slate, though also distinctly stratified, does not readily separate, except along the cleavage-planes, which are quite independent of its original bedding. **It is not confined to any particular geological period, although the genuine clay-slates (roofing-slate, &c.) usually occur only in the older formations. There are, however, exceptions to this rule, and in the Swiss Alps genuine roofing-slates and also common arenaceous and micaceous clay-slates are found belonging to the chalk and even to the Tertiary periods.** The origin of slaty cleavage is still unsettled, but it is now generally supposed to be due to great lateral pressure, induced by forces in connection with the upheaval, disturbance and contortion of the rocks, in which it occurs. **It is more or less a characteristic feature of all the Lower Silurian and older rocks of Victoria, but is seldom, if ever, observed in any formation in Victoria newer than Upper Silurian.**

Sedimentary rocks are frequently much changed by infiltration of mineral matter or other metamorphic action, that tends to obliterate their original mechanical, granular structure, and they assume a semi-crystalline appearance, not unlike some rocks of undoubted igneous origin, and are then classed as Metamorphic Rocks.
PRIMARY OR PALÆOZOIC ROCKS.

LOWER PALÆOZOIC.

SILURIAN.
(METAMORPHIC AND UNALTERED.)

No formation that can be identified clearly as older than Lower Silurian has yet been recognized in Victoria. Perhaps, however, the rocks of some of the larger areas, mapped as metamorphic, represent a Cambrian or Laurentian series. In any case, much of the Lower Silurian is metamorphic, especially near the boundaries of granite masses. A large number of fossils have been collected, by the Geological Survey, from all parts of the colony, many of which are generically and specifically identical with those found in strata of Upper and Lower Silurian age in other countries. Specimens of some of them are exhibited in the Palaeontological collection, and figures and descriptions of the most interesting are being prepared by Professor McCoy for publication in the “Memoirs of the Museum.” The geological sketch-map shows that the Silurian rocks (represented by grey or slate color) occupy a very large surface area: they also constitute, with a few local exceptions, the true “bottom” or “bed rock” of all the Victorian goldfields, as well as the matrix or bounding walls of every known metalliferous vein, dyke, or reef; and they doubtless underlie, at a lesser or greater depth, a large portion of those tracts, where newer formations are found on the surface. The depth to which they are covered, and the age of the overlying formation, will, in each case, approximately determine the probable limits of any deep alluvial gold lead, because when it (the Tertiary deposit, or formation, in which the gold lead occurs) passes on to such newer and non-auriferous rocks, the supply of gold is, as it were, cut off; and though the gravel continues and presents no apparent difference, the lead at once becomes unprofitable. The Lower Silurian argillaceous beds are characterized by a more or less slaty and schistose structure, whilst the Upper consist mostly of jointed, rubbly, or concretionary shales and soft mudstones. Sandstones and sandy beds are common in both series: Only one limestone band (in the Upper) has yet been found, and even calcareous beds are rarely met with. Bands of conglomerate are also very rare, and the greater part of the formation seems to have been deposited in deep water. A considerable unconformity exists between the Upper and Lower series, and the total thickness of both is, probably, not less that 30,000 feet.

Building Stones.—Beds of freestone, generally a greenish-brown sandstone, are frequently met with, and are quarried for local building purposes. The stone can, however, seldom be procured of a uniform color and texture, in large quantity; and on this account, as well as from its being very subject to decay, when exposed to atmospheric action, the Silurian sandstone is not suitable for any extensive architectural or
engineering purposes. Examples of some of them are exhibited in the collection of dressed building stones. In the neighborhood of Castlemaine, Sandhurst, Maryborough and other goldfields' towns, quarries have been opened, and the stone has been used in the construction of some of the banks and other public and private buildings.

Flagging.—Excellent, blue flags or paving-stones occur in several districts. Those procured from Specimen Gully, near Castlemaine, are most extensively used, and will doubtless, ere long, supersede the imported Scotch flagging.

Slates.—Roofing-slates have been procured from several localities; but the quality of those hitherto brought into the market is very inferior. The best, as yet, are from Glen Maggie Creek, a tributary of the Macalister River, in Gippsland. No quarry has been opened there, and probably the cost of transport would preclude the slates being raised profitably at present.

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Case VII.

LOWER SILURIAN.

(Metamorphic in part.)

1. MICACEOUS SCHIST.
   Map No. Rb 29b.
   Section 8, Sutton Grange. 4 sheet 13 N.W.
   Mottled, with peculiar grey micaceous bands.

2. MICA SCHIST.
   Begg's Station, near Hopkins' Hill.
   The mica disposed in very thin layers.

3. GNEISS.
   Map No. R 95.
   N.E. of parish of Baynton. 4 sheet 51 S.W.
   With decomposed felspar.

4. METAMORPHIC SCHIST.
   South side of Hardie's Hill. 4 sheet 63 S.E.
   Gritty, with quartz grains in layers.

5. METAMORPHIC SCHIST.
   Map No. Re 30.
   West of Leigh River, opposite Hardie's Hill. 4 sheet 63 S.E.
   Of a peculiar greenish-grey color, fracture slightly hackly, having a talcose appearance, with a little silvery white mica.

6. SPOTTED SHALE.
   Map No. Rb 12.
   Happy Gully, parish of Sedgwick.
   The markings are probably due to the development, by metamorphic action, of some augitic (fahlnite) mineral. This peculiar kind of shale is only found near the junction of the granite and Silurian rocks, as at Lancefield, Baynton's Range, the Barfold Ranges, &c.

7. YELLOW SHALE.
   Map No. Re 30.
   West of Leigh River, opposite Hardie's Hill. 4 sheet 63 S.E.
   Laminated and quartzose.

8. MICA SCHIST.
   Map No. Rb 17.
   North of Mount Emu, Sedgwick.
   Grey, micaceous bands between yellow sandstone. The bands are of about equal thickness.

9. METAMORPHIC SLATE ROCK.
   Map No. Ra 95.
   Dunolly Road. 4 sheet 14 N.W.
   A band of mudstone occurring between a light-blue, metamorphic rock, with spots and markings similar to No. 6.
10. MICACEOUS SANDSTONE.  
Map No. Ra 11.
Mount Tarrangower.  4 sheet 14 S.W.
With laminae and veins of quartz.

11. FLAGSTONE.  
Map No. Ra 82.
Quarry near Nuggetty Gully, Maldon.  4 sheet 14 N.W.

12. MICACEOUS SANDSTONE.  
List No. R (69)
Hill between Kerang Range and East Charlton.
Metamorphic and very micaceous.

13. METAMORPHIC SCHIST.  
Map No. Ra 86.
Baringhup.  4 sheet 14 N.W.

14. METAMORPHIC ROCK.  
Map No. Ra 83.
North of Nuggetty Reef, Maldon.  4 sheet 14 N.W.
Fine-grained and micaceous. Would make a good flagstone.

15. METAMORPHIC SCHIST.  
Map No. Re 30.
West of Leigh River, opposite Hardie’s Hill.  4 sheet, 63 S.E.
Of a grey mottled color and with a hackly fracture.

16. HARD, BROWN SANDSTONE.  
Map No. Ra 120.
Loddon Creek, Moolort.  4 sheet 52 N.E.
Micaceous, and fine-grained.

17. QUARTZ ROCK.  
Map No. Ra 80.
Nuggetty Reef, Maldon.  4 sheet 14 N.W.

18. BLACK, METAMORPHIC ROCK.  
Map No. Ra 77.
Same locality as last.
A dense mixture of quartz and mica, with quartz veins and magnetic pyrites.

19. LIGHT-GREY SANDSTONE.  
Map No. Re 13.
Leigh River.  4 sheet 63 S.E.

20. FINE-GRAINED SANDSTONE.  
Mount Franklin.  4 sheet 15 S.E.
Dense and micaceous.

21. BLUE, METAMORPHOSED ROCK.  
Map No. Ra 88.
Range south of Dunolly Road.  4 sheet 14 N.W.
Very hard and dense (hornfels).

22. METAMORPHOSED ROCK.  
Map No. Ra 28.
Tunnelling Company’s lease, Lisle’s Reef, Mount Tarrangower.  3 sheet 14 S.W.
Hornfels, with magnetic pyrites.

23. ALTERED SHALE.  
List No. R (69)
Two miles north of Mount Cooper.
Having a very flinty character.

24. GREY, SILICEOUS SANDSTONE.  
List No. R (69)
Mount Deboolitic, Mull-mull.

25. QUARTZITE.  
Map No. Ra 89.
Range south of Dunolly Road.  3 sheet 14 N.W.

26. SILICEOUS BRECCIA.  
Map No. R 19.
Deep Creek, Springfield.  4 sheet 6 N.E.
A breccia composed of white, metamorphosed shales, porcellanite, occurring near the greenstone at Lancefield.

27. FINE, GREY, MICACEOUS SANDSTONE.  
Map No. Ra 81.
Mosquito Reef.  4 sheet 14 N.W.

28. FERRUGINOUS QUARTZITE.  
Map No. Ra 15.
Near Maldon Rifle Butts.  3 sheet 14 N.W.
A dense rock, composed of quartz, with white and dark bands of felspar and mica.

29. BLUE, METAMORPHIC ROCK.  
Map No. Ra 79.
Nuggety Reef, Maldon.  4 sheet 14 N.W.
A dense hornfels.

30. METAMORPHOSED ROCK.  
Map No. Ra 99.
Lohn’s Reef, Maldon.  4 sheet 14 N.W.
(See Table of Analyses, page 94.)
A good flagstone (hornfels).
### LOWER SILURIAN

<table>
<thead>
<tr>
<th>No.</th>
<th>Rock Type</th>
<th>Location and Map Numbers</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td><strong>Brown Slate</strong></td>
<td>List No. Rb 12b. Section 26, Spring Plains, 1/4 sheet 13 N.E.</td>
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<tr>
<td>2</td>
<td><strong>White Slate</strong></td>
<td>List No. Rb 16b. Section 26, Spring Plains, 1/4 sheet 13 N.E.</td>
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<td>3</td>
<td><strong>Purple Slate</strong></td>
<td>Near Newstead. 1/4 sheet 15 N.W.</td>
</tr>
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<td>4</td>
<td><strong>Yellow Slate</strong></td>
<td>Map No. Re 5. Crisis Company, Durham Lead. 1/4 sheet 63 S.E.</td>
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<td>5</td>
<td><strong>Grey-and-Yellow Slate</strong></td>
<td>Map No. Re 9. Gully, near Grenville. 1/4 sheet 63 S.E.</td>
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<tr>
<td></td>
<td><strong>The yellow portion is in very thin lamina.</strong></td>
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<td>6</td>
<td><strong>Purple Slate</strong></td>
<td>List No. Rb 12b. Section 26, Spring Plains, 1/4 sheet 13 N.E.</td>
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<td><strong>White-and-Purple Slate</strong></td>
<td>Map No. Fb 46. List No. Rb 13n. Section 29, Spring Plains, 1/4 sheet 13 N.E.</td>
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<td></td>
<td><strong>Containing portion of a graptolite.</strong></td>
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<tr>
<td>8</td>
<td><strong>Drab-colored Slate</strong></td>
<td>Map No. Re 16. One mile above mouth of Williamson’s Creek. 1/4 sheet 63 S.E.</td>
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<td>9</td>
<td><strong>White-and-Yellow Slate</strong></td>
<td>Map No. Ra 116. Deep Creek, Moolort. 1/4 sheet 52 N.E.</td>
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<tr>
<td>10</td>
<td><strong>Red Slate</strong></td>
<td>Map No. Fb 46. Section 29, Spring Plains. 1/4 sheet 13 N.E.</td>
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<tr>
<td></td>
<td><strong>Containing graptolites.</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><strong>Grey Slate</strong></td>
<td>Map No. Fb 35. Section 50, Spring Plains. 1/4 sheet 13 N.E.</td>
</tr>
<tr>
<td></td>
<td><strong>Containing hymenocaris.</strong></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><strong>Red Slate</strong></td>
<td>List No. Rb 13b. Map No. Fb 46. Section 29, Spring Plains. 1/4 sheet 13 N.E.</td>
</tr>
<tr>
<td>13</td>
<td><strong>Yellow-and-White Slate</strong></td>
<td>List No. Rb 10b. Section 26, Spring Plains. 1/4 sheet 13 N.E.</td>
</tr>
<tr>
<td>14</td>
<td><strong>Slaty Shale</strong></td>
<td>List No. Rb 26n. Section 5, Lyell. 1/4 sheet 13 N.W.</td>
</tr>
<tr>
<td>15</td>
<td><strong>Red, White and Yellow Shale</strong></td>
<td>List No. Rb 10b. Section 26, Spring Plains. 1/4 sheet 13 N.E.</td>
</tr>
<tr>
<td></td>
<td><strong>Soft and banded red, white and yellow.</strong></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td><strong>Green Slate</strong></td>
<td>Red Jacket Claim, Ballarat.</td>
</tr>
<tr>
<td>17</td>
<td><strong>Grey, Slaty Shale</strong></td>
<td>Map No. Re 19. Williamson’s Creek. 1/4 sheet 63 S.E.</td>
</tr>
<tr>
<td>18</td>
<td><strong>Slaty Shale</strong></td>
<td>Map No. Re 5. Crisis Company, Durham Lead. 1/4 sheet 63 S.E.</td>
</tr>
<tr>
<td></td>
<td><strong>(See Table of Analyses, page 94.)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Very soft.</strong></td>
<td></td>
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<tr>
<td>19</td>
<td><strong>Bluish-Grey Slate</strong></td>
<td>Map No. Ra 21. Welshman’s Reef, Sandy Creek. 1/4 sheet 14 S.W.</td>
</tr>
<tr>
<td>20</td>
<td><strong>Olive-colored Slate</strong></td>
<td>Map No. Re 23. Williamson’s Creek. 1/4 sheet 63 S.E.</td>
</tr>
<tr>
<td>21</td>
<td><strong>Slaty Shale</strong></td>
<td>Map No. Re 1. Garibaldi Company’s Claim. 1/4 sheet 63 S.E.</td>
</tr>
<tr>
<td></td>
<td><strong>Contains embedded crystals of iron pyrites (mundic).</strong></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td><strong>Grey Slate</strong></td>
<td>Map No. Re 6. Grenville Company’s Claim, Durham Lead. 1/4 sheet 63 S.E.</td>
</tr>
<tr>
<td></td>
<td><strong>Soft and satiny, with ferruginous markings on the planes of bedding.</strong></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td><strong>Yellow Slate</strong></td>
<td>List No. Sd 6. Containing graptolites.</td>
</tr>
</tbody>
</table>
24. Light-Brownish Slate.
List No. Ba 83.
Mouth of Miss Gully, Loddon River. ¼ sheet 15 N.E.
Containing phyllograptus.

25. Light-Brownish Slate.
Map No. Ba 82.
Hill on west bank of Campbell's Creek, between Aberdeen's and Tasher's.
With graptolites.

26. Light-Blue Slate.
Map No. Ba 82.
Same locality as the last.
Containing Didymograptus Logani (Hall). Var.: Australis (McCoy).

27. Slate.
Mount Franklin. ¼ sheet 15 S.E.
Underlying basalt; in extremely thin laminae.

28. Slate.
Same locality as the last.

29. Slate.
Same locality as No. 27.
This would form a tolerably good slate for economic purposes.

30. Light-Blue Slate.
Map No. Re 70.
City of Manchester Company.
Very soft, satiny and striated.

Map No. Re 2.
Enfield Company, Durham Lead.

32. Olive-Grey Slate.
Map No. Re 23.
Williamson's Creek. ¼ sheet 63 S.E.

33. Light-Grey Slate.
Map No. Re 4.
Leigh Consols Company, Durham Lead.

34. Dark-Grey Slate.
Map No. Mc 1.
City of Manchester Company.
Crystals of iron pyrites, well shown on the bedding planes.

35. Grey, Slaty Shale.
Map No. Re 2.
Enfield Company, Durham Lead.
With sparingly embedded cubes of iron pyrites.

Map No. Re 4.
Leigh Consols, Durham Lead.
With cubical crystals of pyrites, and cavities caused by the decomposition of similar crystals.

37. Satiny Slate.
Map No. Re 2.
Enfield Company's Claim, Durham Lead.
Fissile and full of iron pyrites.

38. Grey Slate.
Map No. Re 7.
City of Manchester Company's Claim.
Containing veins of iron pyrites and quartz.

Near syenitic dyke, Tarilta. ¼ sheet 15 N.E.
Containing various species of graptolites.

40. Black Slate.
Map No. Fe 17.
Carregie Creek, Leigh River.
Containing graptolites.
41. **Black Slate.** Map No. Fe 17.
    Same locality as last.
    Containing graptolites.

42. **Black Slate.**
    *Deddic River, Snowy River, S.E. Gippsland.*
    Containing white markings of Chias-tolite.

43. **Black Shaly Rock.**
    *Map No. R 99.*
    *Reef in Barfold Ranges. 4 sheet 13 S.E.*
    Occurs in the casing of a quartz reef (slickenside); very carbonaceous.

44. **Dark Shale.** Map No. R 99.
    *Barfold Ranges. 4 sheet 13 S.E.*
    Occurs with No. 43. It contains veins of carbonate of magnesia.

45. **Soft, White Rock.**
    *Sunbury, 4 sheet 7 N.E.*
    Finely arenaceous.

46. **Black, Carbonaceous Shale.**
    *Sunbury, 4 sheet 7 N.E.*
    Decomposed.

47. **Dark-Red Shale.**
    *Sunbury, 4 sheet 7 N.E.*
    The percentage of iron is too great to render it fit for a good fire-brick.

*Note.*—Specimens 45 to 47 are Silurian rocks, partly decomposed and broken up in situ.—The following remarks and analyses of these specimens, 45 to 47, by Mr. J. C. Newbery, may be found interesting:—

No. 45.—“A white, siliceous clay, makes a good fire-brick, resembling the Dinas brick from Glamorganshire. It must not be placed in those parts of the furnace, where it could be acted on by alkaline fluxes, or certain metallic oxides. It also ought to be kept in a dry place, on account of its porous nature.”—It gives on analysis—

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<td>93.858</td>
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<tr>
<td>Alumina</td>
<td></td>
<td></td>
<td></td>
<td>5.182</td>
</tr>
<tr>
<td>Magnesia</td>
<td></td>
<td></td>
<td></td>
<td>trace</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td>890</td>
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</tbody>
</table>

99.930

“It may be found advantageous to add roughly broken quartz, so as to make the brick contract and expand under changes of temperature evenly and without cracking. It would also be advisable to add about 1 per cent. of lime.”

No. 46.—“A black carbonaceous clay.”—Giving the following results:—

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<thead>
<tr>
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<tbody>
<tr>
<td>Silica</td>
<td></td>
<td></td>
<td>66.924</td>
</tr>
<tr>
<td>Alumina</td>
<td></td>
<td></td>
<td>17.201</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td></td>
<td>10.349</td>
</tr>
<tr>
<td>Magnesia</td>
<td></td>
<td></td>
<td>trace</td>
</tr>
<tr>
<td>Water, &amp;c.</td>
<td></td>
<td></td>
<td>6.008</td>
</tr>
</tbody>
</table>

100.482

“These clays would make good fire-bricks, where no lime or any fusible substance could come in contact with them, as the presence of such substances, together with the large percentage of iron, would cause them to fuse.”
48. **Fine-grained Sandstone.**  
*Map No. Re 15.*  
_Near City of Manchester Company._  ¼ sheet 63 S.E.  
Color yellow, with white mica.

49. **Fine-grained Sandstone.**  
*Map No. Re 13.*  
_Same locality as the last._  
Yellow with mica.

50. **Mottled Red-and-White Sandstone.**  
*Map No. Re 11.*  
_Gully near Grenville._  ¼ sheet 63 S.E.

51. **Brown, Micaceous Sandstone.**  
*Map No. Re 17.*  
_Near mouth of Williamson’s Creek._  ¼ sheet 63 S.E.

52. **Light Greenish-Brown, Micaceous Sandstone.**  
*Map No. Re 15.*  
_Same locality as No. 48._

53. **Brown Micaceous Sandstone.**  
*Map No. Re 8.*  
_Same locality as No. 50._

54. **Yellow Micaceous Sandstone.**  
*Map No. Re 8.*  
_Gully near Grenville._  ¼ sheet 63 S.E.

55. **Mottled Gritty Sandstone.**  
_Near Newstead._  ¼ sheet 15 N.W.

56. **Yellow Sandstone.**  
*Map No. Re 14.*  
_Near City of Manchester Company._  ¼ sheet 63 S.E.

57. **Soft Yellow Sandstone.**  
*Map No. Ra 85.*  
_Eaglehawk Reef._  ¼ sheet 14 N.W.  
Slightly mottled with white.

58. **Yellow Sandstone.**  
*List No. R (SR).*  
_Wickliffe._

59. **Yellow Sandstone.**  
*List No. Rb 12b.*  
_Section 26, Spring Plains._  ¼ sheet 13 N.E.  
_Underlying basalt._

60. **Yellow Sandstone.**  
*Map No. Re 14.*  
_Near City of Manchester Company._  ¼ sheet 63 S.E.  
Containing a large quantity of white mica.

61. **Yellow Micaceous Sandstone.**  
*List No. Rb 2b.*  
_Section 68, Spring Plains._  ¼ sheet 13 N.E.  
-With large plates of white mica._

62. **Micaceous Sandstone.**  
*Map No. Re 10.*  
_Gully near Grenville._  ¼ sheet 63 S.E.

63. **Micaceous Sandstone.**  
*Map No. Re 10.*  
_Same locality as the last._

64. **Fine-grained Sandstone.**  
*Map No. Re 26.*  
_South side of Hardie’s Hill._  ¼ sheet 63 S.E.

65. **Fine-grained Yellow Sandstone.**  
*List No. R (SR).*  
_Wickliffe._

66. **Coarse-grained Micaceous Sandstone.**  
*List No. Rb 1b.*  
_Section 67, Spring Plains._  ¼ sheet 13 N.E.  
_Underlying basalt._

67. **Coarse-grained Sandstone.**  
*List No. Rb 2b.*  
_Section 68, Spring Plains._  ¼ sheet 13 N.E.

68. **Mottled Yellow-and-Red Sandstone.**  
*Map No. Re 22.*  
_Williamson’s Creek._  ¼ sheet 63 S.E.

69. **Fine-grained, Micaceous Sandstone.**  
*Map No. Re 17.*  
_Near mouth of Williamson’s Creek._  ¼ sheet 63 S.E.

70. **Pinkish Sandstone.**  
_Near Newstead._  ¼ sheet 15 N.W.  
_With very little mica._
71. **White-and-Yellow Sandstone.** Map No. Rb 16B. 
Section 26, Spring Plains. ¼ sheet 13 N.E. 
(See Table of Analyses, page 94.)

72. **Pinkish Sandstone.** Map No. Ra 118. 
Parish of Moolort. ¼ sheet 52 N.E.

73. **Ferruginous Sandstone.** Map No. Ra 114. 
Parish of Carisbrook. ¼ sheet 52 N.E.

74. **Buff-colored Sandstone.** Map No. Re 30. 
Williamson’s Creek. ¼ sheet 63 S.E. 
Tolerably close-grained; would do for building purposes.

75. **Buff-colored, Micaceous Sandstone.** 
Road near Eagle Farm, Campbell’s Creek. ¼ sheet 15 N.E.

76. **Brown, Fine-grained Sandstone.** Map No. Ra 27. 
S.E. corner of Maldon Township. ¼ sheet 14 S.W. 
This stone is tolerably tough.

77. **Red Sandstone.** Map No. Ra 115. 
Parish of Carisbrook. ¼ sheet 15 N.E. 
Exceedingly fine-grained and soft.

78. **Buff-colored, Gritty Sandstone.** Near Yandoit. ¼ sheet 15 S.E.

79. **Buff-colored, Gritty Sandstone.** Leigh River. 
This stone would not make a building stone, as it has a tendency to flake off.

80. **Yellow, Micaceous Sandstone.** Map No. Ra 24. 
Near Eddison’s Store, Sandy Creek. ¼ sheet 14 S.W. 
Appears to break out in good flags; it is, however, a little too soft for that purpose.

81. **Flagstone.** List No. Rb 5a. Heathcote Road, Mia-mia. ¼ sheet 13 N.E. 
Makes a tolerably good flagstone.

82. **Fine-grained and Micaceous, Dark-Grey Sandstone.** Map No. Re 25. 
Williamson’s Creek. ¼ sheet 63 S.E. 
Slightly micaceous and tolerably tough.

83. **Dark Buff-colored Sandstone.** Map No. Re 13. 
Near City of Manchester Claim. ¼ sheet 63 S.E. 
Dense, close and fine-grained, with mica and slaty structure.

84. **Light-Grey, Micaceous Sandstone.** Map No. Re 6. 
Grenville Company’s Claim, Durham Lead. ¼ sheet 63 S.E. 
This specimen is almost verging on a schist.

85. **Grey Sandstone.** Map No. Re 7. 
City of Manchester Company’s Claim. ¼ sheet 63 S.E. 
Soft and close-grained, with schistose character.

86. **Grey, Micaceous Sandstone.** Map No. Re 1. 
Garibaldi Company’s Claim. ¼ sheet 63 S.E. 
Similar to 85.

87. **Soft, Greyish-White Sandstone.** Map No. Re 5. 
Crisis Company’s Claim, Durham Lead. ¼ sheet 63 S.E.

88. **Grey, Gritty Sandstone.** Map No. Re 18. 
Williamson’s Creek. ¼ sheet 63 S.E. 
Tough, micaceous, and fine-grained.

89. **Light-Grey Sandstone.** Map No. Re 3. 
Duke of Cornwall Company’s Claim. ¼ sheet 63 S.E. 
Very soft and micaceous, containing specks of iron pyrites.
90. Siliceous Sandstone (Quartzite). Map No. Re 24. Williamson’s Creek. \(\frac{1}{4}\) sheet 63 S.E.
Very hard, close-grained and compact.

Near Eddison’s Store, Sandy Creek. \(\frac{1}{4}\) sheet 14 S.W.
Very friable and coarse grained.

Section 2n, Lyell. \(\frac{1}{4}\) sheet 13 N.W.
Taken from bed of Myrtle Creek; contains a peculiar ferruginous marking.

Mia-mia. \(\frac{1}{4}\) sheet 13 N.E.
Very hard, the particles being firmly cemented together; immediately underlying basalt.

94. Red Grit. Mount Franklin. \(\frac{1}{4}\) sheet 15 S.E.
From under the basalt; contains ferruginous quartz veins.

Near City of Manchester Company’s Claim. \(\frac{1}{4}\) sheet 63 S.E.

Section 40, Redesdale. \(\frac{1}{4}\) sheet 13 N.E.
Makes an exceedingly good flagstone, and can be obtained of various thicknesses.

Williamson’s Creek. \(\frac{1}{4}\) sheet 63 S.E.
Coarse-grained. Would make a good stone for flagging, &c.

---

Case IX.

UPPER SILURIAN.

1. White, Micaceous Sandstone. Flemington. \(\frac{1}{4}\) sheet 1 N.W.
Mica in very fine plates.

2. Yellow, Micaceous Sandstone. Same locality as the last.

3. Yellow, Micaceous Sandstone. Yarra banks. \(\frac{1}{4}\) sheet 1 S.E.
Much coarser than the two preceding specimens.

4. Micaceous Sandstone. Flemington. \(\frac{1}{4}\) sheet 1 N.W.

5. Yellow, Micaceous Sandstone. Moonee Ponds Creek. \(\frac{1}{4}\) sheet 1 N.W.
Plates of mica are numerous and large.

Section 8, Will-Will-Rook. \(\frac{1}{4}\) sheet 2 S.W.

East of township of Heathcote.
Entirely composed of siliceous grains, assuming a very oolitic structure, cemented together in a ferruginous matrix; very friable.

Kilmore Creek. \(\frac{1}{4}\) sheet 4 S.W.
Contains sections of Encrinital stems, &c.

9. Dark-Blue Sandstone. Moonee Ponds Creek. \(\frac{1}{4}\) sheet 1 N.W.
Very hard and fine-grained, with quartz strings.
10. **Hard, Dark-Blue Sandstone.**
   List No. Rb 48.
   One mile north of Greensborough Bridge, Plenty River. ¼ sheet 2 S.E.

11. **Brown, Compact, Micaceous Sandstone.**
    List No. Rb 51.
    Rise west of Diamond Creek Bridge.
    Contains fossils. Used at above locality for building purposes. Cube No. 48a, "Building Stones," is the same stone, showing its capabilities for receiving ornamentation.

12. **Buff-colored, Close-grained Sandstone.**
    List No. Rb 47.
    Half a mile north of Greensborough Bridge, Plenty River. ¼ sheet 2 S.E.
    With ferruginous quartz veins; from the river-bank.

13. **Hard, Close-grained Sandstone.**
    Range east of Heathcote.
    Contains a few fossils. If in sufficient quantity, would make a good building stone.

14. **Hard, White, Siliceous Sandstone.**
    Same locality as the last.
    Entirely made up of fossil mollusca, principally of the genera orthis, rhyncocella, &c.

15. **Siliceous Sandstone.**
    List No. RBb 51.
    Summit of Mount Ida, near Heathcote.
    Containing shells similar to last, together with Encrinital stems.

16. **Red, Micaceous Sandstone.**
    List No. RBb 50.
    Range east of Heathcote.
    Containing fossils.

17. **Hard, White, Siliceous Sandstone.**
    List No. RBb 50.
    Range east of Heathcote.
    Full of fossils.

18. **White Sandstone.**
    List No. RBb 50.
    Range east of Heathcote.
    More porous than the last and containing fossils.

19. **Fossiliferous Breccia.**
    Drummond's Point, Gaffney's Creek.
    Entirely composed of fragments of organic remains: angular and partially rounded pieces of ferruginous sandstone and white mudstone, with a little clay. The fossils appear to be principally pieces of marine shells, and Encrinital stems.

19A. **Fossiliferous Breccia.**
    Near Alexandra Diggings, Goulburn River.
    Similar to the last.

20 and 21. **Brown, Micaceous Sandstone.**
    Moonee Ponds, near Flemington.
    ¼ sheet 1 N.W.
    Containing fossils. The Upper Silurian in this neighborhood consists of grey, white and brown shales and sandstones, containing fossils, corresponding to those of the "May Hill" sandstone of English geologists.

22 and 23. **Concretionary Sandstone.**
    Map No. R 7.
    Section 5, Bulina-bulla. ¼ sheet 7 S.E.

24. **Blue, Siliceous Sandstone.**
    Castle Reef G. M. Co., Raspberry Creek, near Wood's Point.
    With peculiar oval, ring-like impressions and ferruginous veins.

25. **Blue Mudstone.**
    List No. Rb 46.
    Greensborough Bridge, Plenty River. ¼ sheet 2 S.E.
    Finely micaceous.

26. **Micaceous, Yellow Mudstone.**
    List No. Rb 46.
    Same locality as the last.
    More shaly than the last.
27. **Banded, fine-grained Sandstone.**
   List No. Rb 46.
   One mile north of Greensborough Bridge, Plenty River. ¼ sheet 2 S.E.
   With ferruginous, gritty veins on face of joints.

28. **Micaceous Shale.**
   List No. Rb 50.
   Creek west of Diamond Creek.

29. **Blue, Slaty Shale.**
   List No. Rb 53.
   Diamond Reef, Diamond Creek.

30. **Blue, Slaty Shale.**
    List No. Rb 54.
    Same locality as the last.

31. **Pinkish-Brown Shale.**
    List No. Rb 56.
    Same locality as the last.

32 and 33. **Light and Dark Bluish-Grey Sandstone.**
   Costerfield, near Heathcote.
   Forming walls of the antimony reefs; covered with dark markings, probably organic.

34. **Purple, Rubbly Shale.**
    List No. Rb 22n.
    West of Mount Ida, near Heathcote.
    It forms the walls of the dyke in which the mineral “Selwynite” occurs, and has a porphyritic appearance.

35. **Mottled, fine-grained Breccia.**
    List No. R 121.
    Whiting’s Reef, 7 miles north of Heathcote.

36. **Fine, Micaceous, Concretionary Sandstone.**
   Moonee Ponds Creek. ¼ sheet 1 N.W.

37. **Brecciated, fine Conglomerate (Grit).**
   Buchan Road, near Boggy Creek, Gippsland.
   Exceedingly hard and compact, the component materials being of a small size and closely packed.

38. **Coarse Conglomerate.**
   Anderson’s Creek, Upper Yarra.

39. **Blue, Brecciated Conglomerate.**
   List No. Rb 55.
   Diamond Reef, Diamond Creek.
   Appears to be made up of rounded and angular pieces of blue, micaceous mudstone and sandstone, with iron pyrites plentifully scattered through it.

40. **Sandstone Breccia.**
   Greenstone range, east of Lancefield. ¼ sheet 5 S.E.
   Entirely composed of angular pieces of white, cherty rock in a ferruginous matrix.

41. **Limestone.**
   List No. Rd 3n 24.
   Yering Cave, Upper Yarra.
   A very handsome marble. (See No. 55, “Building Stones.”) Analysis:
   - Carbonate of lime ... 92.60
   - Magnesia ... 0.36
   - Iron ... 2.12
   - Manganese ... 0.48
   - Silica and clay ... 3.24
   Total ... 98.80

42 and 43. **Altered Shale.**
   Map No. R 41.
   Greenstone range, east of Lancefield. ¼ sheet 5 S.E.
   These shales occur flanking a greenstone range, and have undergone a high degree of metamorphism, converting them into jasper rock.

44. **Quartzite.**
   List No. R 122.
   N.W. of Mount Ida, Heathcote.
   This specimen shows the rock in two stages—gritty and compact. It was supposed in the neighborhood of its occurrence to be limestone.

45 and 46. **Dense, White Jasper Rock (in part brecciated).**
   Map No. Ra 31a.
   “Marble Hill,” section 73, Chintin. ¼ sheet 6 N.E.
   This rock is the so-called “Statuary Marble”! shown on old surveys of the above neighborhood.

47. **Banded Mudstone.**
   Map No. R 3.
   Moonee Ponds Creek, Broadmeadows. ¼ sheet 2 S.W.
UPPER PALÆOZOIC.

DEVÓNIAN, CARBONIFEROUS AND PERMIAN.

The specimens placed under the above heading are collected from groups of strata that occur in widely separated, more or less isolated, patches, from the Glenelg to the Snowy River. No remains of a fossil fauna have as yet been found in them, and fossil plants in a few localities only, viz.: Bacchus Marsh, the valley of the Devil’s River, the valley of the Avon in Gippsland and on Mount Tambo. The greatest development of these rocks occurs to the westward, in the Grampians, Victoria, Serra and Dundas ranges; and to the eastward, in North Gippsland, extending from Bushy Park and Liudenow north-westerly to Ben Cruachan and Mount Wellington, whence they probably also extend in outlying patches across the Dividing Range to the valley of the Devil’s River. They are certainly intermediate in age between the Upper Silurian, on the one hand, and the Carbonaceous or coal-bearing rocks on the other, which latter almost certainly rest on them under the greater part of the Gippsland plains, from Hayfield and Mewburn Park to Rosedale, Sale, Stratford, Lake Wellington, &c., and if so, preclude the existence of auriferous deep leads under these plains. The lithological character of the different beds, and the general physical aspect and prevailing color of the formation bear a very close resemblance to those of the Lower Carboniferous and Devonian formations of Britain. (For further details, see “Notes on the Physical Geography, Geology, and Mineralogy of Victoria”—Intercolonial Exhibition Essays, 1866.)

Traces of copper have been found in the shales of this formation on the Devil’s River, and thin veins of micaceous iron-ore occur in the Grampians.

Good freestone for building purposes, grindstones and flags for paving can be procured from these rocks in various localities.

In South Australia the copper lodes are associated with similar rocks, and with veins of micaceous iron-ore, also with thick beds of crystalline, white-and-grey marble or limestone. The latter has not been observed in Victoria, and it seems probable that the lower beds of the formation, with which, in South Australia, these valuable deposits are associated, are not represented here.

The areas occupied by this formation are colored light Indian red on the sketch-map, and numbered 8.
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<tr>
<th>No.</th>
<th>Description</th>
<th>Location</th>
<th>Author</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Quartzite</td>
<td>McKenzie’s Falls, Grampians</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>2.</td>
<td>Flesh-colored, fine-grained Sandstone</td>
<td>South Peak, Mount William</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>3.</td>
<td>Purple, Micaceous Sandstone</td>
<td>Hopkins’ River, 4 miles north of Hexham</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>4.</td>
<td>Thin-bedded, Purple, Micaceous Sandstone, Shale and Grit</td>
<td>Hopkins’ River, 4 miles north of Hexham</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>5.</td>
<td>Yellow-and-purple, coarse-grained, rather gritty Sandstone</td>
<td>Same locality as the last.</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>6.</td>
<td>Light Chocolate-colored Sandstone</td>
<td>Near Lockup, Rose’s Gap</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>7.</td>
<td>Red Sandstone</td>
<td>Mount Timbertop</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>8.</td>
<td>Sandstone</td>
<td>North Peak, Mount William, Grampian Range</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>9.</td>
<td>Indurated Shale</td>
<td>Beerjarg Camp, Broken River</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>10.</td>
<td>Slaty, Micaceous Shale</td>
<td>Same locality as the last.</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>11.</td>
<td>Fine-grained, Chocolate-colored Sandstone</td>
<td>East bluff of Mount Wellington, Gippsland</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>12.</td>
<td>Indurated Sandstone</td>
<td>Mount Wellington, Gippsland</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>13.</td>
<td>Fine, Micaceous Sandstone</td>
<td>Beerjarg Camp, Broken River</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>14.</td>
<td>Red Sandstone</td>
<td>Macalister Ranges, Gippsland</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>15.</td>
<td>Micaceous Sandstone</td>
<td>Same locality as the last.</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>16.</td>
<td>Siliceous Sandstone</td>
<td>Mouth of Stony Creek, Gippsland</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>17.</td>
<td>Purple Mudstone</td>
<td>Stony, or Moitun Creek, Dargo Road, Gippsland</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>18.</td>
<td>Micaceous Sandstone</td>
<td>Same locality as the last.</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
<tr>
<td>19.</td>
<td>White, Gritty Sandstone</td>
<td>Coliban River, S.W. of Kyneton</td>
<td>Presented by Dr. F. Mueller</td>
</tr>
</tbody>
</table>

(See Table of Analyses, page 94.)
Note.—A white, light-yellow, often banded sandstone, composed entirely of very fine, siliceous grains, overlies, in very thick beds, the Silurian rocks on the Coliban, in the neighborhood of Kyneton. Inter-stratified, thin beds of very coarse conglomerate, or pudding-stone, frequently occur; but fossils seem to be entirely absent. The sandstone has been used in several buildings in Kyneton and the neighborhood. It is soft and easily worked, but cannot be procured of uniform color in large quantities; and, though it sometimes seems to harden on exposure, it is very liable to exfoliate, and is, therefore, not a good building stone. The quarries are now abandoned. The Tertiary (Newer Pliocene) gold-bearing gravel beds overlie it in several places. The basalt, which overlies both, seems to have caused an alteration into hard, coarse quartz grit, numbers of large angular pieces of which are scattered round the respective boundaries.


Fine-grained, white freestone, similar to 19.

21. Yellow, Gritty Sandstone.  
Hopkins’ River, 4 miles north of Hexham.

22. Mottled Yellow-and-White, Gritty Sandstone.  
Coliban River, S.W. of Kyneton.  ¼ sheet 9 S.W.

See No. 19 and Note.

23. White, Siliceous Grit.  
List No. R (8)
South Peak, Mount William.

The grains of quartz appear to be cemented by felspathic matter.

List No. R (35)
North Peak, Mount William.

Resembles the last.

25. Red Sandstone.  
List No. R (15)
North Peak, Mount William.

List No. R (37)
Mount Zero.

The grains cemented by felspathic matter.

27. Coarse Grit.  
Hopkins’ River, 4 miles north of Hexham.

Very felspathic and uneven-grained.

List No. R (5)
North Peak, Mount William.

29. Gritty Conglomerate.  
List No. R (62)
Mount Timbertop.

A reddish, coarse grit, with felspar and large pebbles of red sandstone.

30. Coarse Grit.  
Hopkins’ River, 4 miles north of Hexham.

A white grit, with felspar.

31. Pinkish-Red Conglomerate.  
List No. R (39)
Mount Timbertop.

An altered conglomerate of pink-and-yellow sandstone and quartz, with included pebbles, and a porphyritic character.

32. Brecciated Conglomerate.  
List No. R (11)
Base of Mount Timbertop.

The oblong, rounded fragments all take parallel lines, and are much decomposed and oxidized.

33. Fine-grained, Red Sandstone.  
Summit of Mount Timbertop.

34. Fine, Micaceous Quartz Grit.  
Mount Tamboritta, Gippsland.
35. Gritty Quartz Conglomerate.
   *Hopkins' River, 4 miles north of Hexham.*
   Contains pebbles of pinkish quartz, with felspar.

   *Stony or Moitun Creek, Dargo Road, Gippsland.*
   The cavities are partially filled with brown clay.

37. Metamorphic Rock.
   List No. R (8)
   *Base of Mount Timbertop.*
   Hackly, fractured, greenish and brownish rock (hornfels).

38. Gritty Conglomerate.
   *Hopkins' River, 4 miles north of Hexham.*
   Same as No. 35, with large pebble of quartz and felspar porphyry.

   List No. R (SR 16)
   *Beerjarg Camp, Broken River.*

40. Conglomerate. List No. R (59)
    *Mount Timbertop.*
    Containing pebbles of indurated sandstone, quartz, &c.

41. Brecciated Conglomerate.
    List No. R (59)
    *Mount Timbertop.*
    Red, siliceous base, with quartz fragments and greenish altered sandstone.

42. Brecciated Conglomerate.
    List No. R (59)
    *Mount Timbertop.*
    Greenish rock, with quartz pebbles and green sandstone.

43. Pebble Conglomerate.
    Map No. Rd 35.
    *One mile and a half above Victoria Quarry, Korkuperrimul Creek. 1/4 sheet 11 S.E.*
    Enclosing a piece of decomposed granite.

44. Fossiliferous Limestone.
    *Buchan, Snowy River, S.E. Gippsland.*
    Hard, dark-grey, compact rock, affording a good building lime. If mixed with the proper proportion of clayey matter, it would also form a good cement.
    The following is the result of an analysis by Mr. J. C. Newbery:
    
    | Component          | Percentage |
    |--------------------|------------|
    | Carbonate of lime   | 87.72      |
    | Iron               | 2.29       |
    | Magnesia           | 0.23       |
    | Silica, clay, &c.  | 7.61       |
    | Total              | 97.85      |

45. Pebbly Conglomerate Shale.
   Map No. R (a 12).
   *Mia-mia. 1/4 sheet 13 N.E.*

46. Pebbly Conglomerate.
    Map No. R (a 12).
    *Same locality as the last.*

47. Pebbly Conglomerate.
    Map No. R (a 12).
    *Same locality as the last.*

48. Pebbly Conglomerate.
    List No. Rb 33n.
    *Under Robertson’s Station, Wild Duck Creek, near Heathcote.*

49. Yellow Sandstone.
    List No. Rb 33n.
    *Same locality as the last.*
    Occurs at the base of the pebble conglomerate.

    List No. Rb 33n.
    *Under Robertson’s Station, Wild Duck Creek, near Heathcote.*
geological survey, at the Mia-mia, on the Heathcote Road, no bottom being found at a depth of 30 feet. The conglomerate consists of a bluish-grey, very hard mud cement, sometimes having a slight yellow tinge (specimen 46), and in places interstratified with veins of an aluminous mineral. It becomes much lighter in color by exposure and soon crumbles to pieces. The pebbles contained in it vary much in size and consist of granites of various colors and textures, principally red and white; porphyries, indurated sandstones, quartz, red, white and blue; flinty quartzites; and a peculiar flint-colored rock, with red felspar crystals, weathering white. From one of the constituents of this latter rock having externally decomposed in horizontal lines, it has the appearance, at first sight, of gneiss. This deposit forms a very good, red soil, but is boggy and rotten in winter. At this locality it is very thin, the Silurian rocks cropping up in the almost flat gullies. On the Wild Duck Creek, however, a fine section—in many places at least 90 feet above the level of the creek—may be seen under Robertson’s Station (specimens 48, 49 and 50). The conglomerate is here capped by a yellowish grit (specimen 50), and rests on yellow sandstone (specimen 49), forming large open downs. About two miles higher up the Wild Duck Creek, near Wilton’s Station, the beds may be seen filling up depressions in the upturned edges of the Lower Silurian.

51. Copper Slate.

Mansfield, Devil’s River.

This specimen contains 2 per cent. of copper. In the mass the amount of copper varies. Carbonate of copper and lime occur in spots between the laminae.

52. Limestone.

Burnt Creek, near Mansfield.

This limestone makes excellent lime. It does not, however, occur in large quantity, and appears to consist of a few large and small blocks and boulders, partly embedded in the alluvium of two small, dry gullies, the sides of which consist of Upper Silurian shales and sandstones. Whether these blocks are the last remnants of a limestone formation that once covered the Silurian rocks of this locality, or are transported masses, is uncertain. The nearest known limestone, of similar character, occurs in Gippsland, near the copper mine on the Thomson. There are other large patches on the Buchan River and also at Bindi, near Livingstone.

53. Dense Quartz Rock.

List No. R (§)

Near Lock-up, Rose’s Gap.

54. Brown Sandstone.

Chinery’s Station, Devil’s River.

With fossil plants.
SECONDARY OR MESOZOIC ROCKS.

SECONDARY OR MESOZOIC PERIOD.

All the known coal-bearing rocks of Victoria belong to this period. They extend over an area of about 4,000 square miles, in three districts, viz.:

1. Western Port to Cape Patterson, Welshpool and the La Trobe River near Traralgon: 1,751 miles.
2. The Gellibrand River and Cape Otway to the Barrabool Hills and Indented Heads: 1,882 miles.
3. The junction of the Wannon and Glenelg, and neighborhood of Casterton, Digby, Merino and Coleraine: 349 miles.

They are represented on the Geological Sketch Map of the Colony by a brown tint, and numbered 7.

The coal rocks probably extend eastward, under a great part of the Gippsland plains, south of a line drawn from near Hayfield to Lake Wellington, but cannot be seen on the surface, being thickly overlaid, as at Bellarine and Queenscliff, by Tertiary rocks and recent alluvial deposits.

The specimens represent the general lithological character of the formation.
SECONDARY OR MESOZOIC ROCKS.—CASE XI.

Case XI.

CARBONACEOUS—MIocene AND OLDER PLIOCENE.

MESOZOIC.

CARBONACEOUS.

Coal-bearing rocks of Victoria.

1. **Grey Shale.**
   Queensferry, Deep Creek, Hurdy-gurdy, Western Port.
   Containing plants.

2. **Light-Grey Sandstone.**
   Carew and Feehan’s license, Kilcunda Run, Bass.
   From a shaft about 100 yards from outcrop of a coal seam, 18 inches thick, on coast.

3. **Conglomerate.**
   Barrabool Hills, Geelong. 4 sheet 24 S.E.
   See Note after No. 21.
   With large pebble of greenstone.

4. **Brecciated Sandstone.**
   Cape Patterson.
   List No. R (Fs 3).
   Containing plants.

5. **Spathic Iron.**
   Cape Patterson.
   Contains 34 per cent. of iron, equal to 70.5 per cent. of carbonate of iron.

6. **Brown Shale.**
   Den Hills Creek, a tributary of the Wannon River.
   Contains plants.

7. **Fine Clay-Shale.**
   Gladman’s Coal Prospecting Shaft, near the Moë.

8. **Conglomerate Breccia.**
   Den Hills.

9. **Light-Brown Shale.**
   Gladman’s Coal Prospecting Shaft, near the Moë.
   Containing plants.

10. **Shale, with Plants.**
    List No. R (Fs 16).

11 and 12. **Grey Shales, with Plants.**
   Queensferry, Deep Creek, Hurdy-gurdy, Western Port.

13. **Yellow Sandstone.**
    Barrabool Hills, Geelong. 4 sheet 24 S.E.
    Containing impressions of leaves. See Note after No. 21.

14. **Coarse Grit.**
    Geelong. 4 sheet 24 S.E.

15. **Fine-grained Sandstone.**
    Same locality as the last.

16 and 17. **Sandstone.**
   Bacchus Marsh.

In 1862 quarries were opened near Bacchus Marsh, and a considerable quantity of this stone was sent to Melbourne, and used in the

Note.—At Portarlington, on the Bellarine Peninsula, the Carbonaceous rocks come to the surface, and abound in broken fragments of Teniopteris. The sandstone was used in building the Portarlington mills; but it exfoliates rapidly, and is not a good or durable building material.
construction of the Treasury, the Custom House and the Parliamentary Library. It has not since been used in Melbourne. When opening the quarries, the beds were found to be very variable in composition, and so full of joints, as to make it both difficult and costly to obtain the stone in quantity, of the uniform texture and quality, essential in large buildings. It constitutes, however, a useful building stone for local purposes, or where small quantities only are required. Excellent grindstones could be procured from some of these beds. The buildings, above referred to, do not present favorable evidence, as regards its durability, when exposed to the atmosphere of the city. Some of the beds are full of fossil-plant remains. *Gangamopteris longifolius* (McCoy) is the most abundant species, a specimen of which is seen on No. 17.

18. BRECICATED SANDSTONE.
List No. R (Fs 3).
*Cape Liptrap*.
A greenish grit, containing pebbles of grey sandstone.

19. EARTHY CONglomerate.
*Den Hills*.
See No. 8.

20. BLACK SHALE.
*Barrabool Hills, Geelong*.
24 S.E.
Looks like Lydian stone, but is quite soft.

21. SANDSTONE.
Same locality as the last.
Fine-grained, and with vegetable impressions.

Note.—The Carbonaceous rocks of the Barrabool Hills, from which specimens Nos. 3, 13, 14, 15, 20 and 21 are taken, consist of a series of hard, thick-bedded, brown and grey sandstones, much jointed, and with thin veins of carbonate of lime; they alternate with shales and conglomerates, and have an average dip of E. 30° S., at an inclination of 1 in 4. Over the area comprised between the village of Ceres and the municipality of Newtown and Chilwell, about 3,000 feet of Carbonaceous strata crop out at the surface; the highest beds are found to the east and the lowest to the west. It is highly probable that this part of the series has been tested for coal in the Bellarine district, since an intermediate synclinal axis exists in the ground between Kensington and Geelong; and the Barrabool Hills’ sandstones, shales, &c., would thus be a recurrence at the surface of those bored through in the Bellarine district. The sandstones of the Barrabool Hills are extensively quarried and used for building purposes in and around Geelong. They are very variable in composition and durability, and their prevailing dull greenish-brown color renders them objectionable for large buildings, in which architectural effect is required.

22. BLACK, CARBONACEOUS CLAY AND SAND.
*Muddy Creek, South Gippsland*.
Containing quartz pebbles. This specimen is from the Muddy Creek coal boring.

23. FELSPATHIC CLAY-SHALE.
*Gladman’s Coal Prospecting Shaft, near the Moë*.

24. BLACK CLAY, with COAL.
*Cape Patterson*.
Probably a slickenside from the side of a fault. This is the so-called “Cape Patterson fire-clay.”

25. IRONSTONE.
*East shore of Western Port Bay, near Queensferry*.
A poor iron-ore.
List No. R (Cd 6).
Barrabool Hills, Geelong. 1 sheet
24 S.E.

27. Calcareous Sandstone.
Corinella Coal Shaft.
Eighteen feet thick about 25 feet from the surface. An analysis by Mr. J. C. Newbery gave the following results:

Silica ... ... 52.927
Carbonate of lime ... 37.710
Carbonate of iron ... 6.078
Water and loss ... 3.285

100.000

27A. Coal.
Corinella—Shaft No. 3.
Three-foot seam. Analysis:

Volatile matter ... 36.836
Fixed carbon ... 54.374
Hygroscopic water ... 2.430
Ash ... ... 6.360

100.000

33. Coal.
"Rock Vein," Cape Patterson.
Analysis by the late Mr. Charles Wood:

Volatile matter ... 36.836
Fixed carbon ... 54.374
Hygroscopic water ... 2.430
Ash ... ... 6.360

100.000

34. Coal.
"Queen Vein," Cape Patterson.
Analysis by the late Mr. Charles Wood:

Volatile matter ... 28.8
Fixed carbon ... 56.4
Hygroscopic water ... 4.0
Ash ... ... 10.8

100.000

35. Coal.
Corinella—Shaft No. 3.
Three-foot seam. Analysis:

Volatile matter ... 34.051
Fixed carbon ... 55.374
Hygroscopic water ... 4.376
Ash ... ... 6.199

100.000

36. Coal.
Corinella—Shaft No. 1.
Upper seam 4 feet. Analysis:

Volatile matter ... 31.927
Fixed carbon ... 54.535
Hygroscopic water ... 10.267
Ash ... ... 3.271

100.000

37. Coal.
Corinella—Shaft No. 1.
Lower seam; 2 feet 10 inches. Analysis:

Volatile matter ... 33.172
Fixed carbon ... 45.732
Hygroscopic water ... 1.785
Ash ... ... 19.311

100.000
38. Coal.  
No. 74.  
*Near Traralgon, South Gippsland.*

Analyses of shale of a dull black color, with small specks of bright coal disseminated through it; fracture slaty; indistinct fossil marks; contains about 4 per cent. of hygroscopic water:

<table>
<thead>
<tr>
<th>1.—Dried Specimen</th>
<th>2.—Raw Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile matter</td>
<td>Carbon</td>
</tr>
<tr>
<td>35.74</td>
<td>66.74</td>
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<td>Fixed carbon</td>
<td>Hydrogen</td>
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<td>42.68</td>
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<tr>
<td>Ash</td>
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<td>21.58</td>
<td>5.20</td>
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<tr>
<td>100.00</td>
<td>Sulphur</td>
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<tr>
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<td>Ash</td>
</tr>
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<td></td>
<td>21.58</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
</tr>
</tbody>
</table>

*Cape Patterson.*

From the "Rock Vein" coal.

40. Coal.  
*Griffiths’ Point.*

Seam 14 inches thick. Presented by Mr. William Hickinbotham.

*Note.—Specimens 27a to 40 will be found in Case XVI. (Minerals).*
TERTIARY OR CAINOZOIC AND RECENT PERIOD.

"The rock formations of the Tertiary, including the recent period, whether regarded in their economical, physical, or geological aspects, occupy by far the most prominent place in Victorian geological history. Strata of sedimentary or volcanic origin, referable to some section of Tertiary or recent time, occupy probably fully one-half, or over 40,000 square miles, of the surface of Victoria, forming deposits from a mere capping to over 300 feet thick. They are found resting unconformably on all the older formations, igneous and stratified, and range from sea-level to elevations of over 4,000 feet. They include groups of strata of earth, loam, sand, clay, gravel, conglomerate, ferruginous and calcareous sandstone and grits, hard quartz rocks, marble and other kinds of limestone, and various volcanic products, each of which has its more or less distinctive geological, paleontological, or mineral character, indicating it to be truly representative of the recognized Eocene, Miocene, Pliocene, or Pleistocene (including recent) deposits of Europe and other countries; the terms being applied here, however, simply to denote Lower, Middle, Upper and Recent Tertiaries, rather than exact synchronism with European beds, or any ascertained relative percentage of living and extinct forms in their fossil contents."—(Notes on the Physical Geography, Geology and Mineralogy of Victoria—Intercolonial Exhibition Essays, 1866.)

THE LOWER GOLD DRIFTS.

"The attention of the Geological Survey has lately been directed to the very important question of the age and probable auriferous or non-auriferous character of what are called the 'lower drifts of Victoria.' From the facts observed, the following conclusions have been arrived at:—

"1st. That these particular drifts are clearly antecedent in date to the Upper and Middle Miocene beds, under which they have now been traced, and therefore, that they are far older than the lowest Pliocene gravels, to which age the 'deep-lead' gravels of Ballarat, the 'White Hills' of Bendigo, and other similar rich gold-bearing gravels have been referred.

"2nd. That they do not probably contain gold in paying quantity, the reason being, that they are derived from the abrasion of quartz veins that themselves contained little or no gold, and that were probably formed by forces in operation, as long prior to those which produced the gold-bearing veins, as the denudation, producing the barren Miocene gravels, was prior to that which gave rise to the Pliocene productive ones."

The Tertiary formations afford, besides gold, tin-ore, also diamonds and other precious stones, lignite or brown coal, salt, limestones suitable
for mortars and cements; brick earths and clays for bricks, tiles and pottery of all kinds; also freestone and other stones suitable for building. Rich oxides of iron are also common, but not in beds sufficiently extensive, to be economically available. Examples of nearly all these will be found amongst the specimens:

**MIocene.**

These rocks are well represented from the mouth of Spring Creek to the Bird Rock, 14 miles south of Geelong, where a thickness of 273 feet of Miocene strata are exposed in fine cliff sections. The sequence of beds is as follows:

**Upper Miocene.**

- 80 feet. Hard, thin-bedded, sandy limestone (the calcareous portion consisting almost entirely of fossils), the probable equivalent of the Mount Gambier series, described by the Rev. Julian Woods.

**Middle Miocene.**

- 80 feet. Soft, brown, sandy clay.
- 30 " Brown, blue and yellow, sandy clays, containing abundance of gypsum.
- 1 foot. Very hard, crystalline sandstone.
- 12 feet. Brown, sandy clay, poor in gypsum.
- 1 foot. Very hard, crystalline sandstone.
- 5 feet. Brown sandstone, containing abundance of gypsum.
- 10 " Blue marl, containing septaria, gypsum and iron pyrites.
- 8 " Friable, thin sandstone, with thin bands of gypsum.

**Lower Miocene.**

- 1 foot. Very hard band of crystalline sandstone.
- 17 feet. Soft, brown sandstone, with thin bands of harder material.
- 20 " Thin-bedded, brown sandstone.
- 8 " Blue-and-grey, friable sandstone.

1. SANDSTONE Grit. List No. W (TM 8).
   - Section 14n, Darriwell. 4 sheet 19 S.W.
   - Light-brown, arenaceous sandstone, the grains apparently merely cemented by pressure.

2. SANDSTONE. List No. W (TM 8).
   - Same locality as No. 1.
   - Brown sandstone, similar to the above.

3. QUARTZITE. List No. W (TM 8).
   - Same locality as the last.
   - Red-and-yellow quartzite, the grains probably cemented by silica.

4. QUARTZITE. List No. W (TM 8).
   - Same locality as No. 1.
   - Mottled red-and-white, similar to the last.

5. SHELL LIMESTONE. List No. W (TM 2).
   - Maude, about 2 miles south along the east and west sides of the valley of the Moorabool River. 4 sheet 19 S.W.
   - This limestone occurs in irregular bands, about 2 feet thick, interstratified in the upper part of the older basalt. It takes a good polish, but is not in sufficient quantity for economic purposes.

   - About a mile west of Keilor. 4 sheet 1 N.W.
   - Brown-and-yellow, argillaceous rock, containing fragments of corals, spines of echini and other Tertiary fossils. An analysis gave the following results:
     - Carbonate of lime: 91.61%
     - Magnesia: 0.20%
     - Iron: 2.83%
     - Silica and clay: 5.66%
     - Total: 100.00%
   - It would make a good lime for building purposes.
7. Limestone. Map No. § 78.

Spring Creek, Barwon River, Burbarbool. ¼ sheet 24 S.E.

Soft, earthy limestone, enclosing sand; good for burning.


Hope’s Mill, Moorabool River. ¼ sheet 24 S.E.

Composed of spines of echini and fragments of polyzoa; makes a good building lime.


Same locality as the last.

Note.—A company was formed for the purpose of working this limestone for phosphate of lime; but, as will be seen from the following analysis by Mr. J. C. Newbery, it contains no phosphates whatever:

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Insoluble matter</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>6.791</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>0.344</td>
</tr>
<tr>
<td>Carbonate of lime</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>90.356</td>
</tr>
<tr>
<td>Magnesia</td>
<td>...</td>
<td>...</td>
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<tr>
<td>Water</td>
<td>...</td>
<td>...</td>
<td>18.09</td>
<td></td>
</tr>
</tbody>
</table>

99.300

The banks on either side of the River Moorabool, in the neighborhood of Hope’s Mill, are occupied by this limestone (specimens 8 and 9). The percentage of earthy matter in it is very small, and it would afford excellent lime for building purposes.

10. Limestone.

Moorabool. ¼ sheet 24 S.E.

Containing large echini spines, corals, shells and polyzoa.


Sections 1 and 2 Durdidwarran, and sections 18N, 19A, Darriwell. ¼ sheet 19 S.W.

Fossiliferous limestone from hard siliceous rock, underlying the older basalt and Upper Miocene. Probably of Lower Miocene age.

This limestone (No. 12), probably of Upper Eocene age, is a sample of the stone used by the late "Schnapper Point Cement Company." The percentage of siliceous matter is too low for a good hydraulic lime. Its power of hardening under water would be considerably increased by the addition of clayey matter in such proportions, as to raise the quantity of silica to about 25 per cent.

12. Septarian Limestone.

Schnapper Point, Hobson’s Bay.

Very argillaceous, and containing polyzoa. An analysis by the late Mr. C. S. Wood gave as under:

<table>
<thead>
<tr>
<th></th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate of lime</td>
<td>82.012</td>
</tr>
<tr>
<td>“ magnesia</td>
<td>1.506</td>
</tr>
<tr>
<td>“ iron</td>
<td>3.472</td>
</tr>
<tr>
<td>Clay and sand</td>
<td>10.427</td>
</tr>
<tr>
<td>Soluble silica</td>
<td>0.720</td>
</tr>
<tr>
<td>Water</td>
<td>1.809</td>
</tr>
<tr>
<td>Organic matter and loss</td>
<td>0.054</td>
</tr>
</tbody>
</table>

100.000

13. Limestone.

Keilor. ¼ sheet 1 N.W.


From the same locality as specimen No. 11.

18. Ferruginous Sandstone.

Mordialloc. List No. R (Fsm).

Soft and fine-grained; forms cliffs along the east coast of Hobson’s Bay; contains 24.26 per cent. of iron.


Upper Miocene.
20. **Quartz Pebbles.**

*Leigh River, near Steiglitz.*

From a 31-foot shaft in the Miocene gravels. The ferruginous coating, on analysis, gives 3 dwt. 6 grs. gold to the ton. The quartz contains no gold.

Mr. Newbery states, "that the coating of these pebbles contained iron, manganese and copper oxides, mixed with siliceous clay. The manganese and copper probably result from the decomposition of the ferruginous manganese ores, coating the rocks in the neighborhood."

21. **Limestone.**

*Shores of Lake Tyers, Gippsland*

Containing remains of polyzoa.

22. **White, Soft Limestone.**

*Benallic, Moorabool River.*

Porous stone, made up of fragments of marine shells, &c., cemented together by carbonate of lime. It is easily decomposed. The color varies with the amount of iron, but it is generally pale-yellow. An analysis by Mr. J. C. Newbery gave—

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate of lime</td>
<td>95.64</td>
</tr>
<tr>
<td>Magnesia</td>
<td>2.48</td>
</tr>
<tr>
<td>Iron</td>
<td>traces</td>
</tr>
<tr>
<td>Clay, &amp;c.</td>
<td>1.24</td>
</tr>
</tbody>
</table>

89.36

**OLDER PLIOCENE.**

So far as at present known, none of the productive gold drifts are older than the rocks classed as above; but, as no marine fossil remains have been found, either associated with, or overlying any productive gold drifts, the precise geological date of the earliest of these drifts is perhaps still somewhat uncertain; as is also the classification of some of the specimens of the subdivisions of the Upper Tertiary rocks.

1. **White Clay.** Map No. R 53.

*Section 8, Newham, ¼ sheet 5 S.W.*

A silicate of alumina and magnesia, from a hole (see Note) sunk by the Geological Survey in Older Pliocene drift, cropping out under the newer basalt escarpment.

*Note.—Particulars of hole sunk:*

- Soft, white clay, with vertical, vegetable stems... 6 feet
- Harder, stone-colored rock 8
- Soft, yellowish rock ... 6
- Breccia, containing fragments of other rocks ... 12
- Hard, greenish-yellow breccia ... 2
- Hard, coarse breccia ... 3
- Soft, white breccia ... 2
- Breccia, containing fragments of other rocks ... 4
- Very coarse breccia ... 3
- Alternating coarse and fine breccia, with thin seams of ferruginous breccia ... 10

Total ... 56 feet

Not bottomed.

2. **Impure Limestone.** Map No. R (M 1).

*Section 10, Will-Will-Rook, Moonee Ponds, ¼ sheet 2 S.W.*

It probably contains much magnesia, and was formerly burnt for lime. Occurs underlying newer basalt, with Tertiary quartzites and ferruginous grits.

This fresh-water limestone contains fossil shells (*Truncatella*). Its analysis by Mr. J. C. Newbery gave—

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica, clay, &amp;c.</td>
<td>4.467</td>
</tr>
<tr>
<td>Carbonate of lime</td>
<td>54.974</td>
</tr>
<tr>
<td>Carbonate of magnesia</td>
<td>39.007</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>1.476</td>
</tr>
</tbody>
</table>

99.924

3. **Impure Limestone.** Map No. R 18a.

*Small creek falling into the Saltwater River, near south boundary of parish of Doutta-Galla, ¼ sheet 1 N.W.*

Soft and earthy, associated with Tertiary, quartzose grit, underlying newer basalt.
Section 75, Redesdale, banks of Campaspe River. ¼ sheet 13 N.E.
Contains fragments of charcoal, and occurs overlying the ordinary quartz pebble cement, and underlying the newer basalt. A tunnel has been driven into it, from which a good spring of mineral water issues. No gold was obtained.

Lot 4, section 22, Bulla-bulla. ¼ sheet 7 N.E.
Occurs underlying post-Tertiary basalt, and resting on Tertiary, quartzose conglomerate.

S.W. of Baynton's Station. ¼ sheet 5 N.W.
Occurs, resting on granite, in very hard and thick, horizontal beds, cropping out in the banks of tributaries of the Jew's Harp Creek.

7. Limestone.
Duck Ponds. ¼ sheet 19 S.E. and 24 N.E.
Fresh-water limestone. It yields a good building lime, and may be made into cement, when mixed with a proper proportion of clayey matter; the best adapted for this purpose is a decomposed basalt, from the Older Volcanic rocks. Higher up the Duck Ponds Creek, wells have been sunk, showing the following section:

- Soft, sandy loam ...
- Rubbly limestone ...
- Compact limestone ...
  (containing Thaumasia and Limnea)
- Soft, rubbly limestone ...
- Calcareous, sandy clay ...
- Soft, decomposed basalt ...

Analysis by Mr. J. Cosmo Newbery, B.Sc.:
- Carbonate of lime ... 88:38
- Carbonate of magnesia ... 0:76
- Carbonate of iron ... 0:51
- Silica and clay ... 7:02

96:67

Water brackish. Bones of the kangaroo, wombat, &c., have been found in the limestone.

Lot 1, section 7, Doutta-Galla. ¼ sheet 1 N.W.
Occurs under newer basalt in concretionary nodules and layers.

Keilor. ¼ sheet 1 N.W.
Under newer basalt. This rock forms a marked feature in many places along the banks of the Saltwater River, where it occurs in patches and lines of whitish looking stones, contrasting strongly with the grey, rocky escarpment of the basalt, immediately above it.

10. Quartz Rock.
Deep Creek, Hurdy-gurdy, Western Port.
Containing rounded, transparent pebbles of quartz.

11. Quartz Rock.
Near Alberton, Gippsland.
Accompanying outcrop of older basalt.

12. Quartz Rock.
Saltwater River.

13. Quartzite.
Glen Maggie, Gippsland.
From under basalt-capped hills; probably Miocene.

Saltwater River.

Bradford Lead. ¼ sheet 14 N.W.

Map No. Re 11.
Cargerie Creek. ¼ sheet 64 N.E.
From bed of ironstone, 20 feet thick, underlying newer basalt.

Hard Hill. ¼ sheet 14 N.W.
18. **Dark-Red, Ferruginous Grit.**

*Carbery Creek. Sheet 64 N.E.*

From bed of ironstone, 20 feet thick, underlying newer basalt.

19. **Fine-grained, Red-and-Yellow Sandstone.**

*Flemington.* ¼ sheet 1 N.W.

With ironstone veins.


*Lot 1, section 7, Doutta-Galla. Sheet 1 N.W.*

Composed of grains and small pebbles of quartz, cemented by silica.

21. **Loosely-cemented Quartz Drift (Granitic).**

*Keilor.* ¼ sheet 1 N.W.

Underlies newer basalt.

22. **Ferruginous Grit.**

*Map No. R (a1).*

*Section 10, Will-Will-Rook.* ¼ sheet 2 S.W.

Mottled brown-and-yellow grit, underlying newer basalt.

23. **White Quartz Grit.**

*Map No. Ra 97.*

*Near the Cemetery, Bradford.* ¼ sheet 14 N.W.

Very friable, and containing much clay.

*Note.*—The Bradford Lead, ¼ sheet 14 N.W. (illustrated by specimens 15, 23, 25, 26 and 30), appears to be an extension of that occurring at the “Hard Hill” (see specimens 17 and 37), as it begins at about a similar height on the side of the gully opposite to where the other ceases. It commences as surfacing of angular quartz, cemented with granite detritus, and gradually deepens to about 80 feet near the southwest corner of the Bradford town reserve, where the deposit consists of alternating layers of white and variegated clay (kaolin) and granite detritus, resting on several feet of rounded quartz boulder drift. From the township reserve the lead extends across two small gullies, and reaches a third, beyond which it has not been traced.

The minerals found in this lead comprise:

(1.) **Smoky Quartz** in great quantity. The faces of the crystals are seldom perfect, on account of their having been water-worn; sometimes they contain crystals of iron pyrites (cubes) and molybdenite.

24. **Yellow Grit.** Map No. R 2.

*Lot 1, section 7, Doutta-Galla. Sheet 1 N.W.*

Friable, coarse, yellow grit.

25. **Coarse Grit.** Map No. Ra 66.

*Bradford Lead.* ¼ sheet 14 N.W.

Similar to No. 23.

26. **Cemented Granite Detritus.**

*Map No. Ra 61.*

*Bradford Lead.* ¼ sheet 14 N.W.

A mixture of quartz, mica and felspar.

27. **Grit.** Map No. Ra 67.

*West of Bradford.* ¼ sheet 14 N.W.

A fine grit of quartz and felspar, with large fragments of angular quartz.


*Sutton Grange.* ¼ sheet 13 N.W.

Very hard siliceous cement, cropping out at the junction of newer basalt and granite.

29. **Coarse Grit.**

*Map No. R (a2).*

*Section 17A, Tullamarine.* ¼ sheet 7 S.E.

Red, ferruginous grit.

30. **Clay Breccia.**

*Map No. Ra 65.*

*Bradford Lead.* ¼ sheet 14 N.W.

Angular and rounded fragments of white, baked-looking clay, cemented by a grey clay.
(2.) Amethyst.—Generally water-worn.
(3.) Topaz (blue).—Two specimens were found during the progress of the survey of this district.
(4.) Garnet, as small blood-colored and brown crystals embedded in smoky quartz; discovered by Mr. Hornsby, of Maldon.

Case XII.

OLDER, NEWER AND POST PLIOCENE.

OLDER PLIOCENE—(continued).

31. Ferruginous Grit.
Main land, south of Sandstone Island, Western Port Bay.
Hard brown ironstone, with included quartz pebbles, and hollowed by atmospheric action.

Thomson's, near Hayfield, Gippsland.
A mixture of coarse and fine angular and rounded quartz, cemented by oxide of iron.

33. Ferruginous Conglomerate (Cement).
Hills, 4½ miles north of Hexham.

34. Quartz Conglomerate (Cement).
Moonee Ponds. ¼ sheet 1 N.W.

35. Coarse Grit.
Section 10, Will-Will-Rook. ¼ sheet 2 S.W.
One part of these specimens consists of a hard, siliceous quartz rock, and the other of quartz grains (granitic), loosely connected by ferruginous clay. It occurs with Nos. 11 and 22.

Very hard quartz conglomerate, cropping out at the junction of the basalt and granite.

37. Conglomerate.
Map No. Ru 63.
Hard Hill. ½ sheet 14 N.W.
Large pebbles of quartz, sandstone and graphic granite, in a loosely adherent base of very micaceous, coarse granitic detritus. The lead of gold has been traced in a direction nearly parallel to the Nuggety lead, but keeping on the rise above the gully, along which the latter runs. It is probably identical with the Bradford lead.

38. Conglomerate.
Map No. R (a4).
Section 15, Bulla-bulla. ¼ sheet 7 N.E.
Pebbles of quartz grit in a fine, white, loosely adherent sand.

39. Ferruginous Conglomerate of "Cement."
Map No. Ru 70.
Forty-foot Lead. ½ sheet 14 N.W.
Large and small pebbles, cemented by brown iron-ore.

40. Ferruginous Quartz Cement.
Map No. R (a13).
Section 25, Spring Plains, banks of Campaspe River. ½ sheet 13 N.E.
Occurs at the junction of newer basalt and Lower Silurian, cropping out under the former, and usually containing gold.
41. Iron-Ore (Concretionary).
   No. 59.
   Flemington. ¼ sheet 1 N.W.
   Occurring with ferruginous Tertiary grits and fossiliferous sandstones.

42. Cellular Ironstone.
   Map No. R (M4).
   Moonee Ponds Creek, Section 10, Will-Will-Rook. ¼ sheet 2 S.W.
   Associated with hard, crystalline quartz rock and very friable quartz grit, underlying newer basalt.

43. Ironstone (Limonite).
   Lake Connewarre. ¼ sheet 29 N.W.
   Containing fossil wood. Overlying soft, brown, argillaceous sandstone, with fossils of the Miocene period, which crop out along the north and east boundaries of the lake.

44. Ironstone Cement (Ferruginous Grit).
   Map No. R (Ec 18).
   Tea-tree Creek, Cargerie Creek. ¼ sheet 64 N.E.
   Very hard and of great thickness; containing fossil wood.

45. Iron-Ore.
   Map No. R (Ec 18).
   Moonee Ponds, section 10, Will-Will-Rook. ¼ sheet 2 S.W.
   Contains 50°68 per cent. iron.

46. Argillaceous Ironstone.
   Rowsley, Parwan Creek.

47. Fossil Wood.
   From the Gold Drift of Table Hill, Tarilta. ¼ sheet 15 N.E.

48. Quartz Cement.
   West shore of Corner Inlet.
   Occurs capping granite.

49. Ash-Colored Sandstone.
   Map No. R (Aas).
   Section 6, Holden. ¼ sheet 7 S.E.
   Containing fossil wood and quartz pebbles, underlying newer basalt.

50. Yellow Quartzite.
   Saltwater River, near Keilor. ¼ sheet 1 N.W.

   List No. R (sr9).
   Glenorchy, Wimmera River.

52. Ferruginous Grit.
   List No. R (sr7).
   Donald’s Station, Lake Buloke.

53. Breccia.
   Map No. R (a10) 1 & 3.
   Section 5, Langwoorner, Campaspe River. ¼ sheet 13 N.E.
   From Westblade’s tunnel. A loose, brown breccia of angular, yellow-and-red sandstone and quartz pebbles, 10 feet thick, on which rests yellow clay, bands of quartz drift and sand. The most gold was obtained at the junction of the clay and breccia.

54. White Clay.
   From same locality as last.
   Fine, soft and greasy.

   From same locality as last.

NEWER PLIOCENE.

1. Sandstone.
   Map No. Ra 72.
   West bank of Loddon. ¼ sheet 14 N.W.
   Soft and fine-grained, occurring under newer basalt.

2. Cemented Granitic Detritus.
   Map No. Ra 62.
   Nuggetty Lead, Bradford. ¼ sheet 14 N.W.
   Chiefly pink-colored clay and mica.

Note.—(¼ sheet 14 N.W.):—The Nuggetty Lead commences below the Nuggetty Reef, near the granite boundary, in a narrow ravine, with granite on each side. At first it takes a general north-west course,
spreading over Nuggetty Flat, and then contracting to a few chains in width, till, at about a mile from the reef, it reaches and runs down the largest branch of the Bradford Creek, keeping on the eastern side of the flat till within about half a mile of Bradford Creek. The workings cease at this point, although it is probable that the 'lead' extends further in the direction of the creek. The holes, which have been sunk, are not of any great depth, but show two 'bottoms; the lower one consisting of red-and-grey, cemented granitic detritus, often with a great deal of yellow mica and fragments of granite; the upper bottom consists of Silurian shingle, quartz pebbles and fragments of curite, the latter probably from the dykes on the range near Nuggetty Reef. It is probably a channel of Older Pliocene date, filled up with Newer Pliocene and alluvial material.

3. **GRITTY SANDSTONE.**
   - Map No. Ra 46.
   - Lot 8, section 8, Bradford. ¼ sheet 14 N.E.
   - Highly ferruginous.

4. **SOFT, FINE-GRAINED SANDSTONE.**
   - Map No. Ra 71.
   - West bank of River Loddon. ¼ sheet 14 N.W.
   - With small ferruginous nodules.

5. **FERRUGINOUS, FELSPATHIC Grit (?).**
   - Map No. R 117.
   - Camp Reserve, Heathcote.
   - See Note on "Heathcote Drift," following No. 30.

6. **"CEMENT."**
   - Map No. Ra 41.
   - Hill to the east of Beehive Company's machine, Maldon. ⅛ sheet 14 S.W.
   - Cement covering “washdirt.” An indurated clay, enclosing angular quartz fragments.

7. **CEMENTED GRANITIC DETRITUS.**
   - Map No. Ra 74.
   - Dunolly Road. ¼ sheet 14 N.W.

8. **HARD FERRUGINOUS Grit (Cement).**
   - Map No. Ra 69.
   - Porcupine Flat, Bradford. ¼ sheet 14 N.W.
   - The grains of quartz in this specimen are firmly cemented, though with open interstices throughout, giving the rock a porous appearance.

9. **HARD FERRUGINOUS CONGLOMERATE.**
   - Map No. R 43.
   - North of parish of Lancefield. ⅛ sheet 5 S.E.

10. **AURIFEROUS CONGLOMERATE (Cement).**
    - Map No. Ra 29.
    - Head of Donkey Hill Lead, Maldon. ¼ sheet 14 S.W.

11. **PISOLITIC IRONSTONE.**
    - Map No. Ra 46.
    - Near lot 8, section 8, Bradford. ¼ sheet 14 N.E.
    - Resting on granite. Consists of a sandy matrix, thickly studded with red, spherical, concretionary nodules of a very ferruginous clay and grit.*

12. **PISOLITIC IRONSTONE.**
    - List No. R (s 38).
    - At foot of Granite Hills, 3 miles south of Carter's Rosebrook Station, Wimmera district.
    - Similar to No. 11.*

13. **AURIFEROUS CEMENTED GRAVEL.**
    - Map No. Ra 68.
    - Porcupine Flat, Bradford. ¼ sheet 14 N.W.
    - Angular and partly rounded quartz pebbles, in brown clay.

14. **BROWN IRON-ORE.**
    - Map No. R 54.
    - Section 7, Newham. ¼ sheet 5 S.W.
    - Enclosing fossil wood.

* These are most probably Older Pliocene.
15. **Brown Iron-Ore.**

   Map No. Ra 84.
   *Porcupine Flat.* \( \frac{1}{4} \) sheet 14 N.W.

16. **Limestone Marl.**

   List No. R. (sr 22).
   *From a well sunk at foot of Pyramid Hill.*

17. **Siliceous Breccia.**

   Map No. R 117.
   *West of Camp Reserve, Heathcote.*
   See Note following No. 20.

18. **Freshwater Limestone.**

   *Galena Point, Geelong.* \( \frac{1}{4} \) sheet 24 S.E.
   The so-called "marble;" it contains veins of calc-spar.

The following section is shown at Galena Point:

<table>
<thead>
<tr>
<th>Ft.</th>
<th>Inch.</th>
<th>Marly clay</th>
<th>7</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ferruginous, sandy clay</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thin-bedded limestone</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compact limestone</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rubbly, thin-bedded, poor limestone</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

This last contains abundance of Miocene fossils.

19. **Lignite.**

   Map No. R (a2)
   *North of parish of Lancefield.*
   \( \frac{1}{4} \) sheet 5 S.E.
   Occurs in a bed 15 feet thick at a depth of 45 feet. The section showed 30 feet of sandy gravel and granitic drift, laminated clays, yellow clays with rounded quartz pebbles and layers of gravel. 15 feet black clay, containing partially carbonized wood and nodules of iron pyrites, and lastly whitish-brown, sandy clay, with red streaks, passing into pipeclay.

20. **Magnesite (?)**

   Map No. R 117.
   *Near Camp Reserve, Heathcote.*

21. **Blue Clay.**

   Map No. R (M 40).
   *Spring Plains.* \( \frac{1}{4} \) sheet 13 N.E.
   Stiff, blue clay, with angular and rounded quartz and pieces of sandstone, and containing lenticular crystals and druses of gypsum. It is 5 feet thick, and rests on sandstone.

22. **White Earthy Limestone.**

   *Antwerp, 25 miles south of Lake Hindmarsh.*

The drift, from which specimens Nos. 5, 17 and 20 are derived, forms an extensive flat at the back of the Police Camp at Heathcote, and between it and a peculiar euritic dyke, locally called the "Hanging Rocks," on the west. Besides the specimens shown, the drift contains chalcedony, cements and breccias of various kinds, indurated and otherwise altered sandstones and nodules of magnesite.
POST PLIOCENE.

PLEISTOCENE.

1. CEMENTED ALLUvIAL DRIFT.
   Map No. R (a7).
   *Bullock Swamp, Emberton.*
   1/ sheet 13 S.E.
   Composed of rounded and angular pieces of quartz pebbles and sandstone, hard only, where exposed to atmospheric influence and running water.

2. GRANITE DETRITUS.
   Map No. Rb.
   *Wellington Flat, Sutton Grange.*
   1/ sheet 13 N.W.
   From the open cutting at north end of tunnel No. 3 for the Coliban Water Supply.

3. LOOSELY CEMENTED SAND AND Grit.
   Map No. Ra 75.
   *Bank of River Loddon.*
   1/ sheet 14 N.W.

4. LIMESTONE.
   Map No. Ra 98.
   *River Loddon.*
   1/ sheet 14 N.W.
   Analysis by Mr. J. Cosmo Newbery:
   - Silica, clay, &c. ... 44.240
   - Carb. lime ... 43.615
   - Magnesia ... 10.359
   - Phosphate of iron (\(2 FeO \cdot P_2O_5\)) ... 0.406 = 0.202 P0
   - Sesqui-oxide of iron ... 1.881
   - Total ... 100.501

5. Breccia.
   Map No. R (a8).
   *Lot 3, Redesdale.*
   1/ sheet 13 S.E.
   From a hole, 20 feet deep, through yellow, red and white clay, containing siliceous geodes, and also nodules of a siliceous breccia, of partly rounded quartz, sandstone and red shale; bottomed on shale.

6. IMPURE LIMESTONE.
   Map No. R 131.
   *Mia-mia Creek, Spring Plains.*
   1/ sheet 13 N.E.
   Occurs in nodules in a bed of calcareous clay, 1 foot 6 inches thick, under-lying black clay, and overlying recent drift.

7. FINE SAND.
   Map No. M 38.
   *Section 16, Hawkestone.*
   1/ sheet 13 S.E.
   This impalpable, white, micaceous powder is deposited round the funnel or crater-shaped basins of springs along the granite boundary.
BUILDING STONES, ETC.

PLUTONIC ROCKS.

Granites, Greenstones, Etc.

1. Granite.

Dividing Range, north of the parish of Lancefield. § sheet 5 N.E.

Gellibrand's Hill, parish of Will-Will-Rook. § sheet 2 S.W.

Near Moorabool, half a mile from Sutherland's Creek. § sheet 24 N.E.
Full of large felspar crystals.

5. Granite. Rd.
Same locality.

6. Euritic Granite. (25.)

7. Euritic Granite.

8. Euritic Granite.


Range east of parish of Lancefield. § sheet 5 S.E.

Same locality as above.

As above.

As above.

15. Felspar Porphyry. Ra 16a.
East flank of Mount Macedon. § sheet 6 N.W.

East flank of Mount Macedon. § sheet 6 N.W.

17. Felspar Porphyry. Ra 16c.
Same locality as last.

Deep Creek, parish of Newham. § sheet 5 S.W.

Dyke in granite north of parish of Newham, on Dividing Range. § sheet 5 S.W.

Brock's Monument, parish of Rochfort. § sheet 6 N.W.

Mount Diogenes or Camel's Hump, Mount Macedon. § sheet 6 N.W.

Dryden's or Hanging Rock, lot 6, parish of Newham. § sheet 6 N.W.
## VOLCANIC ROCKS

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>¼ sheet 19 N.E.</td>
<td>¼ sheet 7 N.W.</td>
<td>4 sheet 7 N.E.</td>
<td>¼ sheet 7 N.E.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ra 11.</td>
<td>Ra 36.</td>
<td>Similar to the last.</td>
<td>Ra 17.</td>
</tr>
<tr>
<td>Mount Aithen, parish of Buttlejorrk.</td>
<td>Lot 12, parish of Carlsruhe.</td>
<td></td>
<td>Magnet Hill, Gisborne.</td>
</tr>
<tr>
<td>¼ sheet 7 N.W.</td>
<td>¼ sheet 9 S.E.</td>
<td></td>
<td>6 S.W.</td>
</tr>
</tbody>
</table>

## STRATIFIED ROCKS

### Sandstones, Slates, Etc.

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Ra 7.</td>
<td>Ra 12a.</td>
<td>Ra 55.</td>
</tr>
<tr>
<td>Quarries or reserve, Jackson’s Creek, parish of Holden.</td>
<td>Quarry, east end of lagoon, opposite the Keilor Hotel.</td>
<td>Quarries at the back of the Castlemaine gaol.</td>
</tr>
<tr>
<td>7 S.E.</td>
<td>¼ sheet 1 N.W.</td>
<td>¼ sheet 14 S.E.</td>
</tr>
<tr>
<td>Of a white and light-brown color; a good building stone, and makes excellent grindstones.</td>
<td>Greenish-brown, micaceous sandstone, used for building.</td>
<td>Used for the gaol and other public and private buildings in Castlemaine.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>31A. Lower Silurian Sandstone.</th>
<th>38. Upper Silurian Sandstone.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same as above.</td>
<td>Roberts’ Quarry, Dry Creek, near Broadford.</td>
</tr>
<tr>
<td></td>
<td>¼ sheet 4 N.W.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Same as above.</td>
<td>Same as above.</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td>Used for paving, &amp;c.</td>
<td>Used for paving, &amp;c.</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>41.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>42. Sandstone.</th>
<th>42A. Sandstone.</th>
<th>43. Red Sandstone.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilcunda Quarry, Western Port.</td>
<td>Kilcunda Quarry, Western Port.</td>
<td>Shows the planes of bedding.</td>
</tr>
<tr>
<td><strong>Building Stones, Etc.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Range north of Lancefield, near granite boundary. ¼ sheet 5 N.E. Very micaceous and close-grained.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Blackish-Blue Lower Silurian Sandstone (Cube). R 34.</td>
<td>50. Flagstone. Campaspe River, section 40, parish of Redesdale. ¼ sheet 13 N.E.</td>
<td></td>
</tr>
<tr>
<td>Same as above.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same locality as last.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Gritty Sandstone.</td>
<td>52. Flagstone. Specimen Gully, Barker’s Creek. ¼ sheet 14 S.E. Used for flagging footpaths in Castlemaine, Melbourne, &amp;c.</td>
<td></td>
</tr>
<tr>
<td>48A. Upper Silurian Sandstone. Rb 51. Rise west of Diamond Creek Bridge.</td>
<td>54. Slate. Castlemaine (?).</td>
<td></td>
</tr>
</tbody>
</table>

**Marbles, Etc.**

| 56. Yellow Limestone. Keilor (?). Fossiliferous. | 60. Limestone. Mouth of Bream or Thompson’s Creek. ¼ sheet 29 S.W. |
| 57. Flesh-Colored Limestone. | 61. Fossiliferous Limestone. Full of quartz pebbles. |
MISCELLANEOUS ROCKS, MINERALS, ETC.

62. Foliated Gneissose Rock.*
   R 96.
   Barfold Ranges, in a shaft. 1/4 sheet 13 S.E.

63. Graptolite Slate.
   Fb 46.
   Section 29, parish of Spring Plains.
   1/4 sheet 13 N.E.

64. Fossil Coal Plants.

65. Silicified Wood.

66. Silicified Wood.

67. Fossil Wood.
   Deep Leads, Ballarat.
   Lignaceous matter completely replaced by iron pyrites (sulphide of iron), and containing gold.

68. Three Quartz Crystals, with Tourmaline and Felspar.
   Upper Goulburn.

69. Stalactite (Carb. Lime).
   Limestone Cavern, Cape Bridgewater.
   Presented by H. Morres, Assistant Surveyor.

70. Ironstone (Tertiary).
   Bullock Swamp, near Barfold.
   1/4 sheet 13 S.E.

71. Ironstone.
   Queensferry, Western Port.

72. Copper-Ore.
   Thomson River Copper Mining Co.
   Blue-and-green carbonate.
   Presented by the Tributors' Co.

* This will be found before No. 1, Case VII.—Metamorphic Rocks.
VICTORIAN MINERALS—CASE XIII.

VICTORIAN MINERALS.

Case XIII.

NATIVE METALS AND METALLIC MINERALS.

   Campbell's Reef, Moyston.

1A. Filamentous Gold in Quartz Crystal.
   Tarnagulla.
   Presented by Adam Burns, Esq., Manager of the Colonial Bank, Melbourne.

2. Gold in Quartz (Slickensides).
   Campbell's Reef, Moyston.

   All Nations Reef, Emerald Hill, Wood's Point District.

4. Laminated Gold in Quartz, with Zinc-blende.
   Beehive Reef, Maldon.
   Presented by J. Cosmo Newbery, Esq.

4A. Gold in Quartz.
   Morning Star Reef, Upper Goulburn.

5. Gold in Sandstone.
   Prior's Reef, Forest Creek, Castlemaine. 4 sheet 14 S.E.

6. Gold, with Chloro-Bromide of Silver.
   St. Arnaud.

7. Quartz, with Native Silver and Chloro-Bromide of Silver.
   Silver Reef, St. Arnaud.

   Wilson's Reef, St. Arnaud.

   Wilson's Reef, St. Arnaud.

10. Argentiferous Galena, with Iron Pyrites.
    St. Arnaud.

11. Silver-Ore.
    St. Arnaud.
    From below water-mark.

11A. Native Copper.
    St. Arnaud.

11B. Native Copper, Moss Copper in part.
    Thomson River, Gippsland.

12. Copper-Ore (Sulphide).
    Thomson River Mining Company, Gippsland.
    Contains 9½ per cent. of copper.

12A. Copper-Ore (Gossan).
    Thomson River, Gippsland.
    With blue and green carbonate of copper.

13. Copper-Regularus.
    Thomson River, Gippsland.
    Contains 40 per cent. of copper. That marked * contains 60 per cent.

13A. Copper and Iron Pyrites, with Sulphide of Antimony and Carbonate of Iron.
    Maldon.
    Contains 40 ozs. of gold to the ton and 19 per cent. of copper.
13B. Copper Pyrites (Sulphide of Copper and Iron).
   Thomson River.
   Disseminated through a greenish gossan.

14. Copper Pyrites and Galena.
   Mount Buller Quartz Mining Company, Howqua River.

15. Copper Pyrites (Sulphide of Copper and Iron).
   Thomson River.
   Contains 29 per cent, of copper.

15A. Covellite (Sulphide of Copper), with Pyrites and Galena.
   Dunolly.

16. Cerussite (Carbonate of Lead).
   Wilson's Reef, St. Arnaud.

16A. Mimetene (Arseniate of Lead).
   Wilson's Reef, St. Arnaud.
   In transparent hexagonal prisms, with adamantine lustre.

17. Pyromorphite (Phosphate of Lead).
   Presented by G. H. F. Ulrich, Esq.

17A. Galena (Sulphide of Lead).
   List No. 88.
   Campbell's Reef, Moyston, near Mount Ararat.
   Contains a large quantity of gold disseminated through it.

18. Native Bismuth, with Sulphide of Bismuth.

   Omeo District.
   Presented by J. B. Were, Esq.

20. Bismuthite (Carbonate of Bismuth).
   Clunes.
   With gold.

20A. Bismuthite (Carbonate of Bismuth).
   Tarrangower.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Oxide of bismuth</td>
<td>87:22</td>
<td>85:13</td>
</tr>
<tr>
<td>Protoxide of iron</td>
<td>0:34</td>
<td>{Sesqui-oxide}</td>
</tr>
<tr>
<td>Carbonic acid</td>
<td>5:55</td>
<td>5:10</td>
</tr>
<tr>
<td>Insoluble matter, clay, &amp;c.</td>
<td>3:46</td>
<td>6:71</td>
</tr>
<tr>
<td>Water</td>
<td>3:43</td>
<td>2:13</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100:00</td>
<td>106:35</td>
<td>98:99</td>
</tr>
</tbody>
</table>

1. Small grains, of uniform color throughout.
2. Larger grains, with discolored centre.
3. Piece ½-inch in diameter, with dark centre.

As shown by these results, the mineral cannot be considered as a well defined species. There is every reason to suppose, that it has actually been formed, or at least grown, in the drift, small particles, derived from quartz reefs in the neighborhood, having perhaps served as nuclei. Several specimens have been found enclosing small water-worn specks of alluvial gold.
21. Cassiterite (Stream Tin, Oxide of Tin).
   Beechworth.

22. Cassiterite (Stream Tin).
   Beechworth, Ovens District.

23. Cassiterite (Stream Tin).
   Beechworth.
   With zircons, topazes, &c.
   Presented by Mr. Dunn, 3/12/64.

24. Tin (Metallic).
   Reduced from Ovens tinstone.

25. Black Sand (containing Stream Tin).
   Beechworth.
   Presented by Mr. Dunn, 3/12/64.

   Tin Creek, Upper Yarra.
   Contains 33 per cent. of tin, the remainder being chiefly titaniferous and magnetic oxides of iron, with zircons and sapphires. Specific gravity 4.08.

27. Black Sand (Titaniferous Iron, containing Tin and Gold).
   Enterprise Claim, Black-dog Lead, Indigo.
   Obtained from two dishfulls of auriferous drift, at an average depth of 3 feet. The sample is supposed to contain about 5 dwts. of gold, and said to yield about 80 per cent. of tin.

28. Tin-Ore.
   Beechworth.
   Presented by Mr. Dunn, 3/12/64.

29. Black Sand.
   Beechworth.
   Specific gravity 6.15, containing 54 per cent. of tin.

   Cranbourne.
   Presented by Mr. McDonald.

30A. Meteoric Iron.
   Presented by J. C. Newbery, Esq.

   Spur of the Grampians, Carter’s Station.

   Near Tollgate, Pascoe Vale Road, sec. xv., Doutta Galla. ½ sheet 1 N.W.

   Greensite Range, east of Lancefield. ½ sheet 5 S.E.

   Near Cobalt Vein, Home Creek, Sloane’s Punt, Goulburn River.

37A. Mammilated Brown Ironstone.
   Queensferry, Western Port.

37B. Crystallized Hematite (Hydrous Oxide of Iron).
   Map No. M 39.
   Barfold Falls, Campaspe River. ¼ sheet 13 S.E.
   Occurs in glittering specks in an earthy deposit between the two flows of basalt. Under the microscope these specks appear as reddish-yellow, transparent crystals.

   Opossum Gully, South Muckleford.

   Magnet Hill, Baynton’s Station. ¼ sheet 51 S.W.
   The rock from which this bar is cut, contains minute perfect octahedrons of magnetic iron. It exhibits strong polarity, and, if suspended, will arrange itself in the magnetic meridian.

40. Black Sand (Titaniferous).
   From a tributary of the Gellibrand River, Cape Otway.

41. Black Sand (Titaniferous).
   Map No. M 34.
   Tunnel south of Mitchell’s Diggings, between the two falls of the Campaspe at Barfold. ¼ sheet 13 S.E.
42. **Black Sand (Titaniferous).**
Map No. M 33.
*Prospectors' Tunnel, Mitchell's Diggings, Campaspe.* 
\frac{1}{2} sheet 13 S.E.

43. **Black Sand (Titaniferous).**
Lerderderg River.
With gold and pebbles.

44. **Black Sand (Titaniferous).**
Map No. M 36.
*Hell's Corner, Baynton's Station.* 
\frac{1}{2} sheet 51 S.W.
Contains peculiar pink, crystalline, flat plates and grains with striated faces.

45. **Black Sand (Titaniferous).**
Map No. M 35.
Campaspe River, below Diggings. 
\frac{1}{2} sheet 13 S.E.
From tailings, after extracting the gold. It contains zircons and sapphires, &c.

46. **Black Sand (Titaniferous).**
Campaspe River, below Diggings. 
\frac{1}{2} sheet 13 S.E.

47. **Black Sand (Titaniferous and Magnetic Oxide of Iron).**
*Upper Yarra.*

48. **Black Sand (Titaniferous).**
*Horse-shoe Bend, Coliban River.* 
\frac{1}{2} sheet 13 N.E.
From Newer Pliocene drift, which contains \frac{1}{2} oz. of gold to the load.

49. **Black Sand (Titaniferous).**
*Below Horse-shoe Bend, Coliban River.* 
\frac{1}{2} sheet 13 N.E.
From surface—(Newer Pliocene). It contains \frac{1}{4} dwt. of gold to the load.

50. **Black Sand (Titaniferous).**
*Near Tambo Hotel, Tambo River, Gippsland.*
Very magnetic.

51. **Black Sand (Titaniferous).**
Map No. M 43.
Two miles below Stratford Lodge, Coliban River. 
\frac{1}{2} sheet 13 S.E.,

52. **Black Sand (Titaniferous).**
Map No. M 46.
*Argyle Gully, Heathcote.*
Contains gold and black octahedral crystals of chromite.

53. **Black Sand.**
Map No. M 45.
*Morris' Plain, Heathcote.*
Similar to the last.

53A. **Crystals of Chromite (Chromate of Iron).**
Heathcote.

54. **Magnetic Iron-Sand.**
*Yarra River.*
Coarse grains, very magnetic.

55. **Wolfram (Tungstate of Iron).**
*Near Maldon.*
This mineral occurs in a quartz reef, running along the top of the range between the Sandy Creek and the Loddon River, eight miles from Maldon, associated with native bismuth, ironglance, schorl, &c.

55A. **Scheelite (Tungstate of Lime).**
*Bradford Lead, Maldon.*
This crystal was found embedded in a pebble of smoky quartz.

56. **Sparry Carbonate of Iron and Lime.**

57. **Crystals of Carbonate of Iron.**

58. **Carbonate of Iron (in fossil wood).**
*Italians' Diggings, Barfold.* 
\frac{1}{2} sheet 13 S.E.
Occurs in lenticular, brown crystals, filling crevices in masses of charred wood, at the junction of the sandstone and basalt; from a tunnel in an old valley, 150 feet below the plain.

59. **Carbonate of Iron.**
*Steep Bank Rivulet, Wannon District.*

Occurred in fine needles and small, divergent, yellow, silky brushes, lining cavities in the basalt.


From a Quarrel half a mile south of the National School, Essendon. Occurs in basalt.

61. Spathic Iron (Carbonate of Iron).

Nodule from the shaft of the Corinella Coal Company, containing 70 per cent. of carbonate of iron.


Port Phillip Company’s Mine, Clunes. Occurs as drusy coatings of brownish-red, sub-transparent cubes on black manganese ore. The larger crystals show, like rhombohedrons of bournespar, a peculiar curvature of the faces, as recorded of the sub-species of cube-ore “Beudantite.” On the smaller crystals, however, this feature is absent, and it would therefore appear to be a character, incident on the growth of the crystals beyond a certain size. Some of the smaller crystals also show hemihedral planes of the octahedron. Before the blow-pipe this cube-ore gives a small trace of manganese. It probably results from the decomposition of arsenical pyrites.

63. Scorodite (Arseniate of Iron).

Poorly Reef, Dunolly. Occurs with gold in quartz as leek-green crystals, with an earthy or ochreous variety of arseniate of iron. It is always associated with arsenical pyrites.

64. Scorodite (Arseniate of Iron).


Blucher’s Reef, Maryborough.


Nicholson River, near Bairndale, Gippsland. Occurs in a yellow Silurian sandstone, as crystals and veins composed of thin, flexible, prismatic and translucent plates of various shades of blue, and often coated by mammillated brown carbonate of iron (sphärosiderite). Presented by William Jahn, Esq.


Phillip Island, Western Port Bay. Occurs in nodular, earthy masses of a pale small-blue color in the older basalt, especially in places, where recent guano deposits exist on the surface; its origin, in this instance, being most probably due to the water, percolating through the guano, becoming charged with phosphate of ammonia and acting on the iron of the decomposed basalt.


Bruthen Creek, near Port Albert, Gippsland. Occurs in the older basalt with ironstone. It was mistaken for copper-ore. The matrix, in which it occurs, contains 40 per cent. of iron.


Ballarat. Occurs in thin veins of a pale small-blue color, in finely laminated, soft, light-brown shales or mudstones.

69. Copperas (Sulphate of Iron).

City of Manchester Claim, Durham Lead, Leigh River. Occurs as an efflorescence (after exposure), on lignite, obtained 260 feet from the surface.

70. Copiapite (Basic Sulphate of Iron).

Spring Creek, near Geelong. This mineral, doubtless a product of the decomposition of iron pyrites, is disseminated through certain beds of the Upper Miocene
formation near Point Addis, Geelong, to such an amount (over 50 per cent.), as to render it probably of commercial importance. The beds have the appearance of a yellow sandstone. An analysis of a sample, by Mr. R. Daintree (formerly of the Geological Survey), the discoverer of the deposit, gave the following results:—

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphuric acid</td>
<td>18.278</td>
</tr>
<tr>
<td>Peroxide of iron</td>
<td>28.495</td>
</tr>
<tr>
<td>Potassa</td>
<td>4.092</td>
</tr>
<tr>
<td>Water of constitution</td>
<td>0.935</td>
</tr>
<tr>
<td>Water of combination</td>
<td>0.850</td>
</tr>
<tr>
<td>Insoluble residue</td>
<td>43.350</td>
</tr>
</tbody>
</table>

Rejecting moisture and insoluble matter, the contained mineral gave:—

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphuric acid</td>
<td>32.758</td>
</tr>
<tr>
<td>Peroxide of iron</td>
<td>47.482</td>
</tr>
<tr>
<td>Potassa</td>
<td>7.332</td>
</tr>
<tr>
<td>Water</td>
<td>12.428</td>
</tr>
</tbody>
</table>

These figures nearly correspond with an analysis by Rammelsberg of a yellow iron-ore from the brown coal of Kolosoruk in Bohemia, with the exception, that the latter contains about half a per cent. of lime in addition to its other constituents.

71. **Iron Pyrites** (Sulphide of Iron).
Catherine Reef, Sandhurst.
Presented by R. S. Dawson, Esq.

72. **Magnetic Pyrites and Iron Pyrites** (Sulphide of Iron).
Mount Buller Quartz Mining Company, Howqua River.
The massive variety contains 7 dwts., the crystalline one, 2 ozs. 14 dwts. of gold to the ton.

73. **Arsenical Iron Pyrites**.
Map No. M 31.
Barfold Range, Emberton. ¼ sheet 13 S.E.
Occurs in a quartz reef.

74. **Magnetic Pyrites and Iron Pyrites** (Sulphide of Iron).
See No. 72.

75. **Iron Pyrites**. List No. A 2a.
North of Lancefield. ¼ sheet 5 S.E.
Found at a depth of 45 feet in a bed of lignite and black clay, 15 feet thick, in a Newer Pliocene deposit.

76. **Iron Pyrites** (Sulphide of Iron).
Mariner's Reef, Maryborough.
Occurring crystallized in cubes. It contains only slight traces of gold.

77. **Iron Pyrites** (Sulphide of Iron).
Mariner's Reef, Maryborough.
In cubes, in shales with quartz veins.

78. **Iron Pyrites** (Sulphide of Iron).
Campbell's Reef, Moyston.
From tailings from North Star claim. It gives on assay 84 ozs. of gold to the ton.

79. **Arsenical Iron Pyrites**.
Map No. M 30 and 31.
Barfold Ranges. ¼ sheet 13 S.E.
In quartz, accompanied by scorodite occasionally.

79a. **Arsenical Pyrites** (Mispickel).
Whip Reef, Sandhurst.

80. **Magnetic Pyrites** (Pyrrhotine).
Map No. M 14.
Tiverton Reef and Lisle's Reef, Maldon.
See also page 55, "Physical Geography, Geology, and Mineralogy of Victoria," by Alfred R. C. Selwyn (Director of the Geological Survey) and G. H. F. Ulrich (Field Geologist).

81. **Pyrolusite** (Binoxide of Manganese).
Said to have come from the Upper Yarra.
82. Psilomelane (Black Ferro-Manganese Ore). 
Strathloddon.

This ore occurs in mammillary crusts and concretions in the quartz reefs of all the goldfields. It also occupies, in some of the auriferous conglomerates, the place of the brown oxide of iron, in cementing the pebbles together, and sometimes contains embedded specks of gold. In quartz reefs it appears to be one of the most recently-formed minerals, as, wherever in contact, it forms coatings over most of the others (gold, quartz, chloro-bromide of silver, iron and arsenical pyrites, &c.). Diallo- 

1. From Parkin's Reef, Tarrangower, mammillary crusts in crevices and joints of the quartz.
2. From Ramshorn Gully, Sandy Creek, narrow veins and mammillary crusts.
3. From Strathloddon, fine botryoidal crusts in crevices of hard ferruginous sandstone.
4. From Gippsland, massive, with cavities filled with earthy matter.

Though this ore differs considerably in chemical composition from the European ore, it would hardly be advisable to class it as a distinct mineral.

83. WAD (Earthy or Bog Manganese). 
Near Merton, Goulburn Valley.

83A. Diallo- 

1. Oxides of manganese ... 54°28 ... 49°28 ... 62°63 ... 77°14
2. Sesqui-oxide of iron ... 20°16 ... 18°73 ... 10°31 ... 6°03
3. Baryta ... 2°51 ... 4°21 ... 0°20 ... 11°33
4. Oxide of cobalt ... 2°86 ... 5°12 ... — ... —
5. Oxide of copper ... 0°92 ... 1°21 ... trace ... —
6. Lime ... 1°40 ... 1°60 ... — ... —
7. Alumina ... 5°12 ... — ... 1°43
8. Silica ... 6°21 ... 8°91 ... 4°60 ... 3°05
9. Water ... 12°02 ... 12°25 ... 16°01 ... 0°02

100°36 100°71 98°87 99°00

1. From Parkin's Reef, Tarrangower, mammillary crusts in crevices and joints of the quartz.
2. From Ramshorn Gully, Sandy Creek, narrow veins and mammillary crusts.
3. From Strathloddon, fine botryoidal crusts in crevices of hard ferruginous sandstone.
4. From Gippsland, massive, with cavities filled with earthy matter.

84. Earthy Cobalt-Ore. 
McKenzie's Diggings.

Composed of manganese, iron and cobalt in variable quantities. The cobalt varies from 1 to 14 per cent.

84A. Earthy Cobalt-Ore. 
Home Creek, Sloane's Punt, Goulburn River.

Similar to No. 84.

Note.—Extract from a report on cobalt-ores, by Mr. J. C. Newbery, Analyst to the Geological Survey:—“I have been in communication with the best metallurgical authorities in England, with regard to the value of the Victorian cobalt-ores, and have been informed that it is very doubtful, whether such ores (specimens Nos. 82, 84 and 84A), as I have described, could be profitably worked, on account of the large amount of cobalt now on the English market, and its steadily decreasing value. This is caused by the large quantity of nickel-ore, containing cobalt, that...
is brought to England from the Continent, and from which the cobalt is saved as a by-product. The demand for nickel, to be used in the manufacture of the basis of plated ware, is steadily increasing, while the demand for cobalt is daily diminishing, on account of the artificial blues introduced for the use of the dyer, calico-printer and papermaker. Still our cobalt-ore might be economically used—the saving being moderately easy, where it occurs in quartz reefs worked for gold, as at Alexandra diggings, where it coats the joints of the quartz with a botryoidal coating of considerable thickness—by passing the tailings through settling boxes, in which it would settle with the last of the gold, and be in an excellent form for removing gold from tailings by Plattner's chlorine process. The residue would also be of value for the generation of chlorine in chemical works. After either of these operations the cobalt could be saved. A process has been invented and tried in South Australia, in which the cobalt is extracted by smelting the ore with copper and, I believe, separating the metallic cobalt by liquation; but I have not heard that it has been attended with success."

<table>
<thead>
<tr>
<th>85. MOLYBDENITE (Sulphide of Molybdenum).</th>
<th>89. ACICULAR BLACK SULPHIDE OF ANTIMONY.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yea, Goulburn River.</strong></td>
<td><strong>Costerfield.</strong></td>
</tr>
<tr>
<td>Occurs associated with iron pyrites in granite.</td>
<td>Occurs sparingly in the steel-grey variety of the sulphide from the lowest workings.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>86. MOLYBDENITE (Sulphide of Molybdenum).</th>
<th>89A. ANTIMONY-GLANCE (Grey Antimony-Ore — Sulphide of Antimony).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yackandandah.</strong></td>
<td><strong>Costerfield.</strong></td>
</tr>
<tr>
<td>This mineral contains, according to assays, a small percentage of silver. It occurs in hexagonal plates in a quartz vein traversing granite.</td>
<td>Crystals, coating the faces of joints of the &quot;country.&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>87. MOLYBDENITE (Sulphide of Molybdenum).</th>
<th>89B. CRUDE ANTIMONY (Fused Sulphide of Antimony).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Map No. Mu 8.</strong></td>
<td><strong>Costerfield.</strong></td>
</tr>
<tr>
<td><strong>Close to the Maldon Brewery Springs. 3 sheet 14 N.W.</strong></td>
<td></td>
</tr>
<tr>
<td>Occurs sparingly dispersed in small scales through the granite.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>87A. CERVANTITE (Antimony-Ochre —Oxide of Antimony).</th>
<th>89C. GREY ANTIMONY-ORE (Sulphide of Antimony).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costerfield, near Heathcote.</strong></td>
<td><strong>Wood's Point.</strong></td>
</tr>
<tr>
<td>Occurs coating antimony-glance, and also in veins, but not below the water-level.</td>
<td>Presented by Mr. Verdon.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>88. ANTIMONY-GLANCE (Sulphide of Antimony).</th>
<th>90. GREY ANTIMONY-ORE (Sulphide of Antimony).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costerfield.</strong></td>
<td><strong>Doogalook, Yea.</strong></td>
</tr>
<tr>
<td>From the upper workings.</td>
<td>Presented by Mr. Verdon.</td>
</tr>
</tbody>
</table>

**Note.**—Antimony is generally found in connection with auriferous quartz, and is frequently impregnated with specks of gold. Assays have shown as much as 8 ozs. of gold and 80 ozs. of silver per ton.
**Case XIV.**

**SILICATES.**

**ZEOLITES.—FELSPARS.—PRECIOUS STONES.**

1. **NATROLITE (Mesotyple).**
   
   *Phillip Island, Western Port Bay.*
   
   Associated with analcime and calc-spar from the older basalt: Colorless and flesh-colored, rhombic-prismatic crystals, terminated by four-sided pyramids, sometimes united in reniform masses.

2. **CHABASITE.**
   
   *Pentland Hills, near Bacchus Marsh.*
   
   Occurs in druses of small, yellow, opaque, rhombohedral crystals, coating hollows in the basalt, and associated with a flesh-colored clay.

2A. **CHABASITE.**
   
   *Near Degraves’ Mill, Kyneton.*
   
   Small, white, semi-transparent, rhombohedral, striated crystals in drusy cavities of the newer basalt.

3. **ANALCIME.**
   
   *Phillip Island.*
   
   Occurs in regular trapezohedrons, filling cavities in the older basalt.

3A. **GMELINITE.**
   
   *Phillip Island.*
   
   In small yellow crystals: hexagonal prism, with pyramid and terminal plane.

4. **HERSCHELITE.**
   
   *Richmond Quarries.*
   
   In two double-hexagonal pyramids, the obtuse one perfect.
   
   Found by Mr. E. F. Pittman.

4A. **HERSCHELITE.**
   
   *Richmond Quarries. 1 sheet 1 S.E.*
   
   Occurs in fine druses, aggregated in rosette-like groups, and occasionally in solitary crystals. It was first discovered in Victoria, at the above locality, by Mr. C. S. Wilkinson, of the Geological Survey.

5. **HERSCHELITE.**
   
   *Richmond Quarries. 1 sheet 1 S.E.*
   
   Occurs in macles, embedded in a thin, crystalline crust, resting on a soapy, liver-colored clay, lining cracks and cavities of the newer basalt. The clay, above referred to, has a sort of prismatic structure when dry, and splits up like starch. It is sometimes accompanied by mammillary carbonate of lime and iron.

6. **HERSCHELITE.**
   
   *Fitzgibbon’s Quarry, Richmond. 1 sheet 1 S.E.*
   
   Occurs in macles—the tabular, six-sided, truncated pyramids crossing one another at various angles.

7. **HERSCHELITE.**
   
   *Richmond Quarries. 1 sheet 1 S.E.*
   
   Macles, coating newer scoriaceous basalt and filling cavities.

7A. **HEULANDITE.**
   
   *Lisle’s Reef, Maldon. 1 sheet 14 S.W.*
   
   Occurs as thin, drusy coatings in the crevices and joints of the metamorphic sandstone, accompanied by brownspar (carbonate of iron).

7B. **PHILLIPSITE.**
   
   *Near Degraves’ Mill, Kyneton. 1 sheet 9 S.E.*
   
   Occurs in newer basalt, associated with chabasite and carbonate of lime.

7C. **PHILLIPSITE, HERSCHELITE and BROWN CALCITE.**
   
   *Chambers’ Quarry, Richmond. 1 sheet 1 S.E.*
   
   The crystals of the two zeolites are well developed and nearly transparent.
8. ORTHOCLASE (Potash-Felspar).

_Hell’s Corner, Back Creek, Baynton._ 

Four miles east of township of Bradford, near Maldon. Occur in a patch of quartz in the granite.

_Note._—Orthoclase forms one of the principal constituents of granite. It also occurs in veins, either solid, or massively associated with quartz.

9. ALBITE (Soda-Felspar).

_Blacksmith’s Gully Reef, Fryers-town._ 

In narrow veins and druses, associated with quartz. Several parts of the reef assume a porphyritic appearance from embedded crystals of albite. An analysis, by the late Mr. C. S. Wood, gave the following results:

- Silica ... ... 68.73
- Alumina ... ... 20.55
- Sesqui-oxide of iron ... 0.20
- Lime ... ... trace
- Potassa ... ... trace
- Soda ... ... 10.43

_100.91_

10. OLIGOCALSE (Soda-Spodumen).

_Anakie Range._ 

In the newer basalt, associated with olivine and hornblende.

An analysis, by the late Mr. C. S. Wood, gave:

- Silica ... ... 64.22
- Alumina ... ... 23.87
- Sesqui-oxide of iron ... 1.53
- Lime ... ... trace
- Magnesia ... ... 0.38
- Soda with some potassa ... 9.87

_99.87_

11. OLIGOCALSE.

_Mount Franklin._ 

In scoriaceous basalt, often associated with large masses of olivine.

12. FIRE-CLAY.

_Lal-Lal, near Ballarat._ 

Occurs as a bed, 3 feet thick, covering a lignite deposit. It forms an excellent fire-clay. The following is an analysis by the late Mr. C. S. Wood:

- Insoluble silicate of alumina ... 92.60
- Soluble silicate of alumina ... 1.33
- Oxide of iron ... ... trace
- Soluble silica ... ... 0.53
- Water of constitution, driven off at red heat ... ... 5.80

_100.26_

13. PHOLERITE.

_Blacksmith’s Gully Reef, Fryers-town._ 

Occurs as soft, white, unctuous scales and coatings. Mr. Ulrich, of the Geological Survey, states “That, at the above locality, it has evidently arisen from the decomposition of albite, which is always in close contact with it, and more or less of a soft, crumbling character.” According to an analysis, by the late Mr. C. S. Wood, its composition is as follows:

- Silica ... ... 44.92
- Alumina ... ... 42.69
- Water ... ... 12.79

_100.40_

14. CLAY.

_Blacksmith’s Gully Reef, Fryers-town._ 

The clay in which pholerite occurs.

14A. SILICATE of ALUMINA and MAGNESIA.

_Lot 4, section 4, Redesdale._ 

Occurs in white and slate-colored seams, about 4 feet thick, under 5 feet of stiff clay, and rests on cellular basalt. From its great absorbent powers it might be used as fuller’s earth.
15. Selwynite.  
List No. R 120.

West of Mount Ida, near Heathcote.

Occurs as a vein in the Upper Silurian rocks, traversed by thin seams of talc, and accompanied by a white magnesian mineral and two other undetermined minerals. According to Mr. Ulrich, it is allied to pyrosclerite, but differs materially from it in its chemical composition and physical properties, and therefore forms a new mineral species, which is named after Mr. Alfred R. C. Selwyn, the Director of the Geological Survey of Victoria. A quantitative analysis, by Mr. J. Cosmo Newbery, afforded the following results:

<table>
<thead>
<tr>
<th>Silica</th>
<th>Sesqui-oxide of chromium</th>
<th>Alumina</th>
<th>Magnesia</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>47.15</td>
<td>7.61</td>
<td>33.23</td>
</tr>
</tbody>
</table>

Which gives as oxygen ratios of proto- and per-oxide bases and silica 1:9:12 corresponding to the formula—

\[ \text{MgO SiO}_3 + 3 (8/9 \text{Al}_2\text{O}_3 + 1/9 \text{Cr}_2\text{O}_3) \text{ SiO}_3 + 3 \text{ HO} ; \]

or,

\[ \left(1/10 \text{Mg}_3 + 9/10 \left(8/9 \text{Al}_2\text{O}_3 + 1/9 \text{Cr}_2\text{O}_3\right)\right) \text{ SiO}_3 6/5 + 1/3 \text{ HO}. \]

16. Biotite (Hexagonal Mica).  
_Fiddler's Reef, Forest Creek._

\( \frac{1}{4} \) sheet 14 S.E.

Occurs in a decomposed basaltic dyke.

17. Muscovite (Oblique or Common Mica).  
_Map No. M. 25._

_Hell's Corner, Baynton._  \( \frac{1}{4} \) sheet 51 S.W.

Occurs in nests in the granite, along its junction with the Lower Silurian sandstone, associated with tourmaline.

_Anakie Hills._  \( \frac{1}{4} \) sheet 19 N.E.

Occurs in crystals and crystalline pieces, with splendid cleavage planes, in scoriaceous basalt, associated with oligoclase. An analysis, by Mr. R. Daintree, late of the Geological Survey, afforded:

<table>
<thead>
<tr>
<th>Silica</th>
<th>Sesqui-oxide of iron</th>
<th>Alumina</th>
<th>Lime</th>
<th>Magnesia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>41.367</td>
<td>20.350</td>
<td>8.181</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.900</td>
<td></td>
<td>6.834</td>
</tr>
</tbody>
</table>

97.632

_Fiddler's Reef, Forest Creek._

\( \frac{1}{4} \) sheet 14 S.E.

_Marysville Company, Dalhousie._

Occurs with iron pyrites in quartz, associated with micaceous sandstone.

21. Obsidian (Buttons).  
_Plain near Mount Talbot Home Station, Wimmera District._

Specific gravity, 2.47.

Presented by Suetonius Officer, Esq.

22. Obsidian Ball.  
_Upper Regions Station, Horsham._

Specific gravity before the specimen was cut, 1.06.

Presented by Thomas Edols, Esq., through Messrs. Francis and McPherson.

Note.—Button-shaped, spheroidal pieces of obsidian are found abundantly scattered over the basaltic plains of Mounts Elephant, Ecles, &c., and the mud-plains of the Wimmera district, the latter far removed from any known craters or points of eruption. Specimen No. 22 is a
remarkable instance of an obsidian ball. From its low specific gravity, 1·06 (being only half that of the buttons, 2·47—Specimen No. 21), it was deemed advisable to have it cut. It now shows a cavity, having a beautiful polish. The following are the results of analyses, by Mr. J. Cosmo Newbery, of specimens 21, 24 and 24A:—

<table>
<thead>
<tr>
<th>Specie</th>
<th>Spec. 21, sp. gr. 2·47</th>
<th>Spec. 24, sp. gr. 2·41</th>
<th>Spec. 24a, sp. gr. 2·36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>73·70</td>
<td>72·23</td>
<td>68·45</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>6·08</td>
<td>2·28</td>
<td>7·21</td>
</tr>
<tr>
<td>Alumina</td>
<td>4·99</td>
<td>16·43</td>
<td>5·38</td>
</tr>
<tr>
<td>Lime</td>
<td>4·20</td>
<td>3·17</td>
<td>8·11</td>
</tr>
<tr>
<td>Magnesia</td>
<td>0·10</td>
<td>2·12</td>
<td>1·03</td>
</tr>
<tr>
<td>Protoxide of manganese</td>
<td>—</td>
<td>Peroxide of manganese 0·50</td>
<td>—</td>
</tr>
<tr>
<td>Titanic acid</td>
<td>—</td>
<td>—</td>
<td>0·30</td>
</tr>
<tr>
<td>Soda</td>
<td>5·20</td>
<td>4·65</td>
<td>7·36</td>
</tr>
<tr>
<td>Potassa</td>
<td>4·83</td>
<td>0·13</td>
<td>—</td>
</tr>
<tr>
<td>Loss by ignition</td>
<td>99·65</td>
<td>101·01</td>
<td>98·34</td>
</tr>
</tbody>
</table>

23. OBSIDIAN.  
Broadford. (?)

24. OBSIDIAN.  
List No. Md 18.  
Geelong District.

24A. BLUE OBSIDIAN.  
Geelong.  

Note.—Olivine occurs in all the newer basalts (except where they appear as true dolerites), especially round points of eruption, and may be regarded as an essential ingredient of these rocks. It varies in size from small grains to masses 12 to 18 inches in diameter. No crystals have hitherto been discovered.

27. TOURMALINE (Schorl).  
Map No. M 25.  
Hell's Corner, Back Creek, Baynton.  
Occurs in the surface drift at the junction of the granite and Silurian rocks, and is derived from the granite.

28. TOURMALINE CRYSTALS.  
Map No. M 25.  
Same locality as last.  
These crystals exhibit the terminal planes.

29. TOURMALINE.  
Dandenong.  
Black water-worn pebbles.  

Note.—Tourmaline (schorl) is of very frequent occurrence, but almost entirely confined to the plutonic and metamorphic older rocks,
being unknown in recent sedimentary and volcanic rocks. It is a constituent of schorl-rock, and occurs in granite, mica-schist, topaz-rock, &c. It occasionally occurs in sandstone, but only in the neighborhood of intruded rocks.

32. **Topaz.**

* Dunolly. (?)*  
Occurs in the gold drifts.

32A. **Topaz.**

* Bradford Lead, Maldon.*

32B. **Topaz (polished).**

* From the same locality.*

33. **Zircon (Hyacinth).**

* Map No. M 37.  
Teatree Creek, Lancefield. ½ sheet 5 N.E.*  
Occurs in the sand from the bottom of some holes sunk in a drift resting on basalt. The crystal is a combination of the square prism with the double four-sided pyramid.

34. **Topaz, Zircon, Sapphire, Gold, &c.**

* Map No. M 35.  
Separated from the black sand from the Campaspe River, below Mitchell’s Diggings, parish of Redesdale. ¼ sheet 13 S.E.*

*Note.*—Corundum occurs abundantly in the drifts of nearly all the goldfields in half angular, or roundish pieces, often nearly the size of a large bean. It has a conchoidal fracture, with (very rarely) indistinct crystal and cleavage planes. Specific gravity, 3·98; hardness, sometimes over 9. An analysis, by Mr. J. Cosmo Newbery, of Specimen No. 38, gave—

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td></td>
<td>53·5</td>
</tr>
<tr>
<td>Alumina</td>
<td></td>
<td>67·37</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td></td>
<td>28·04</td>
</tr>
<tr>
<td>Magnesia</td>
<td></td>
<td>0·30</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td>0·61</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>101·67</strong></td>
</tr>
</tbody>
</table>

38C. **Garnet Crystals in Quartz.**

* Bradford Lead, Maldon.*  
These crystals are apparently not very rare in pebbles and crystals of smoky and transparent quartz in a certain portion of the Bradford Lead. They vary in size from a small pin's head to that of a small pea, and their general form is a combination of the leucitohedron with the rhombic dodecahedron.

38D. **Garnet Sand.**

* Hell’s Corner, Baynton’s Station.*

35. **Zircons.**

* Dandenong.*

36. **Sapphires.**

* From a tributary of the Gellibrand River, Cape Otway.*  
Presented by J. M. Allan, Esq.

37. **Sapphires.**

* Beechworth.*  
Presented by Mr. Dunn, 3 | 12 | 64.

38. **Oriental Amethyst (Ruby—Species of Sapphire).**

* Pakenham, Dandenong District.*  
Hexagonal prism with rhombohedral planes.  
Presented by the Rev. Dr. Bleasdale.

38A. **Black Corundum.**

* Dandenong Goldfield.*

38B. **Emery (Massive Black Corundum).**

* Koh-i-noor Claim, Ballarat.*  
Occurs in the gold drift.
Quartz and its Varieties.

The following remarks on Quartz are taken from "Notes on the Physical Geography, Geology and Mineralogy of Victoria":—

Quartz is, as the "massive variety," the most common of colonial minerals, represented by the thousands of auriferous and non-auriferous reefs that traverse our Silurian rocks, and also as extensive beds of "quartz rock," some nearly 40 feet in thickness, in the lower Miocene tertiary formation. It is partly, and perhaps more commonly, white opaque, or what might be called "milky quartz," partly vitreous, semi-translucent. Sometimes it shows, especially in veins traversing the granite, a greasy lustre—"greasy quartz." In the Belltopper reef, Taradale, it is quite sugary or fine granular; in some of the St. Arnaud and Heathcote reefs cellular; and in most auriferous reefs there occur opaque patches of a uniform brown or yellow color—"ferruginous quartz." Druses of crystals occur in all reefs, yet not in such abundance as in the European ore lodes. Fine, very perfect, opaque white crystals (double hexagonal pyramid with narrow planes of the prism) occur in an Elvan dyke on the Back Creek, near Dr. Baynton's station (41 sheet 51 S.W. Map No. Mb 26. See specimen No. 50). In quartz veins traversing the granite, near Pigeon Hill, Tarrangower, specimens of the so-called "Hauben" or "Hood quartz" are occasionally found. Some peculiar crystals were discovered by Mr. Norman Taylor, of the Geological Survey, which exhibit in a striking manner their growth. (See specimens No. 43 and following note). Large and fine crystals of quartz enclosing "actinolite," and accompanied by large and perfect crystals of felspar, were found in a bed of granite drift and clay, in the Coliban River, below Orr's station (Stratford Lodge).

Quartz occurs also, though, generally speaking, only in moderate abundance, in a transparent crystallized slate, and in colored varieties, fine enough to be cut for jewellery. Thus we have Rock crystal, both as crystals of large size, sometimes rich in rare planes, and as pebbles; the latter frequently found in the Older and Newer Pliocene gold drifts, though seldom of sufficient size to make them valuable. Curved and twin-like crystals are also frequent, and several have been found with filamental tufts of "Chlorite" in the centre.

The varieties hitherto discovered in Victoria are:

1. Rock crystal.—Distinct crystals and waterworn pebbles.
2. Smoky Topaz and Cairngorm.—As pebbles in drifts, and in some quartz veins traversing granite.
3. Amethyst.—Occurs similarly to the last.
4. Prase.—Of rare occurrence.
5. Chalcedony.—Chiefly occurs as mammillary coatings of cavities in the newer basalt, and as nodules and pebbles derived from the older basalt, &c.
6. Cornelian.—Rarely as pebbles in drifts.
7. **Agate.**—Ocurs in the Beechworth drifts, and on the Cape Otway coast.

8. **Cat’s-eye, Onyx and Sardonyx** have been reported from Beechworth, &c., but seem to be very scarce.

9. **Flint.**—Abundantly scattered through the sands along the Cape Otway and Warrnambool coast line, probably derived from tertiary formations.

10. **Silicified Wood.**—Ocurs abundantly in large blocks in some of the tertiary formations.

11. **Jasper.**—Common along the western sea coast, and also in some drifts.

12. **Hornstone and Chert.**—Occur abundantly in veins as sharp angular pieces along the Greenstone boundary, Lancefield, being a product of metamorphic action.

13. **Lydianstone, Touchstone.**—Ocurs in drifts and in narrow veins in Silurian rocks in the neighborhood of Greenstone.

14. **Opal.**—With the exception of “Precious opal,” reported by Dr. Bleasdale as occurring at Beechworth, all the other varieties are of frequent occurrence, viz.: Hyalite, Semit-opal, Opal-jasper, Wood-opal.

39. **REEF QUARTZ.**  
*Map No. R 105.*  
*Mia-mia Ranges. 1/4 sheet 13 N.E.*  
This quartz presents a peculiar feature: it is not found “in situ,” but the portion exhibited is one of a number of similar pieces, all possessing the same saddle-like form, and found scattered over the surface; it has a concretionary structure externally, and varies in thickness from one to six or eight inches.

40. **SILICEOUS CONCRETION.**  
*Map No. R 27.*  
*Banks of the Glenelg River.*  

41. **SILICO-CALCAREOUS CONCRETION.**  
*Map No. M 29.*  
*Near Barfold. 1/4 sheet 13 S.E.*  
Found in a hole in yellow, red and white clay, with siliceous geodes and breccias.

42. **GRANULAR QUARTZ.**  
*Mount Franklin. 1/4 sheet 15 S.E.*  
Ocurs in the basalt of this extinct crater.

43. **QUARTZ CRYSTALS.**  
*Map No. M 27.*  
*Near N.E. corner of the parish of Langley. 1/4 sheet 5 N.W.*  

*Note.*—These peculiar and rare crystals were discovered by Mr. Norman Taylor, of the Geological Survey, in a bed of yellow clay, resting on the granite. They occur as a horizontal vein, the walls (upper and lower) of which were externally nearly flat, the crystals pointing inwards, and the intermediate space being occupied by a stiff yellow clay and flat plates of quartz. The crystals—some of which are nearly 2 inches long and three-quarters of an inch thick—are composed of a slightly smoky quartz, with hard rough faces, surrounding, a small opaque or milky quartz crystal, about one-third the size of the external one, and very rarely in the centre. The polished specimens exhibit the gradual growth or building up of the crystal in a very marked manner, by a series of deeper colored, smoky lines, parallel to the terminal faces of the internal crystal. One specimen appears to be split and traversed by
another crystal, though the apices of the two sides of the fracture are perfect crystals themselves. Another has the appearance of having been broken in half, slipped, and been re-cemented; but such is apparently not the case, as both parts show the terminal planes of the pyramid along the line of junction. In both these instances, however, it is probable that the faces have grown since the fracture. Several crystals show the central one projecting through the base of the prism of the external one, and a transverse section through both crystals exhibits a series of concentric hexagons.

44. Quartz Crystals.  
Blacksmith’s Gully, Castlemaine.  
$\frac{3}{4}$ sheet 9 N.W.
Abnormally developed crystals.

45. Rock Crystal and Smoky Quartz of Cairngorm.  
Bradford Lead.  
$\frac{3}{4}$ sheet 14 N.W.
From the Older Pliocene gold drift. Many other minerals, such as scheelite, garnet, molybdenite, iron pyrites, &c., occur in these quartz crystals. (See 55A, case 13; 38C, case 14, &c.)

46. Quartz Crystals.  
Blacksmith’s Gully Reef, Fryer’s Creek District.  
$\frac{3}{4}$ sheet 9 N.W.
Similar to No. 44.

47. Quartz Crystals.  
Scott and Hurley’s Morning Star Reef, Wood’s Point.
These perfect crystals occur, in small patches, in various reefs, and are generally loosely cemented by oxide of iron.

48. Quartz Rock.  
Bradford Lead.  
$\frac{3}{4}$ sheet 14 N.W.
From the Older Pliocene drift.

49. Amethyst Quartz.  
Bradford Lead.  
$\frac{3}{4}$ sheet 14 N.W.
From the Older Pliocene gold drift.

50. Quartz Crystals.  
Back Creek, east of parish of Glenhope.  
$\frac{1}{4}$ sheet 51 S.W.
These occur in a large Elvan dyke in the Lower Silurian rocks. Their form is a combination of the double six-faced pyramid and the hexagonal prism.

51. Quartz Crystals.  
Maldon.  
Occurring in a dyke.

52. Flint.  
Phillip Island Beach.

53. Quartz.  
Section 23, parish of Merriang.  
$\frac{1}{4}$ sheet 3 S.W.
Occurs, associated with olivine, in the basalt from near a point of eruption (Gleeson’s Hill).

54. Quartz.  
Quarry near Court House, Kilmore.  
$\frac{1}{4}$ sheet 4 S.W.
Occurs in basalt, associated with hyalite.

55. Chalcedony.  
Phillip Island, Western Port Bay.
With rounded cavities, containing yellow carbonate of lime, showing a slightly stellar form. Occurs in the Older Basalt. Presented by Mr. J. C. Newbery.

56. Chalcedony.  
Phillip Island.
The carbonate of lime has here disappeared, leaving the cavities empty. Presented by Mr. J. C. Newbery.

57. Chalcedony.  
Phillip Island.
With a small vein of quartz passing through it. Presented by Mr. J. C. Newbery.

58. Chalcedony.  
Heathcote, near Police Camp.
From the gold drift.

59. Chalcedony.  
Phillip Island.
From the older basalt.
60. **Chalcedony.**  
*Spring Creek, Beechworth District.*  
Pseudo-crystals, with cavities containing water. For a description of these peculiar crystals, see page 71, "Physical Geography, Geology and Mineralogy of Victoria."  
Presented by Mr. E. Dunn.

61. **Chalcedony.**  
*Phillip Island Beach.*  
Pebbles derived from the older basalt.  
Presented by Mr. C. O'Byly H. Aplin.

62. **Chalcedony.**  
*Phillip Island.*  
From a cavity in basalt.

63 and 63A. **Chalcedony and Jasper.**  
*Moroka River, Gippsland.*  
Nodule No. 63, containing an infiltration of chalcedony and quartz.

64 to 95 (inclusive)—**Pebbles.**  
*Cape Otway Coast.*  
Jaspers, breccias, porphyries, sandstone, greenstone, &c.

96. **Mammillated Quartz.**  
*Phillip Island.*  
Presented by Mr. J. C. Newbery.

97. **Flint.**  
*Cape Otway Coast.*  
Occurs scattered through the beach sand, and is probably derived from the tertiary formations of Miocene age, of which the cliffs are formed.

98. **Silicified Wood.**  
List No. W  
*Parish of Durridwarrah.*  
1 sheet 19 S.W.  
Occurs in a hard, siliceous rock underlying older basalt and Miocene (probably Lower Miocene) beds.

99. **Silicified Wood.**  
*Glennaggie, Gippsland.*  
From a pebble-drift of probably Miocene age.

100. **Siliceous Stalagmitic Incrustation.**  
*Back Creek, Baynton.*  
1 sheet 5 N.W.  
From a cave in the granite.

101.
Case XV.

SILICATES, CARBONATES, ETC.

Opal Varieties.

   Riddell's Creek. ¼ sheet 6 S.W.
   Occurs in a band of irregular lumps and nodules in the newer basalt.

103. Semi-Opal.
   From the Basalt, Sunbury.

103A. Opal.
   From the Basalt, Sunbury.
   External portion colored brown, some parts white, vesicular and friable, containing iron pyrites; internal portion colored blue and opalescent. Both portions become opaque and white on heating. The brown contains 6.8 per cent. of water, and has a specific gravity of 2.049; the blue contains 8.5 per cent. of water, and its specific gravity is 2.038. Both contain sesqui-oxide of iron and alumina.

   Bullangoorook, or Bullancrook.
   Similar to No. 102.
   Presented by Mrs. Matson.

105. Common Opal.
   Gelantipy, Gippsland.
   In basalt.

106. Opaline Quartz.
   Heathcote.
   Occurs in the Newer Pliocene drift, near Police Reserve.

107. Hyalite (Müller's glass).
   Map No. Ra 37.
   Kyneton Police Reserve. ¼ sheet 9 S.E.
   Coating a doleritic newer basalt.

108. Hyalite.
   Map No. M 21.
   Near Court House, Kilmore. ¼ sheet 4 S.W.
   Coating basalt and associated with quartz.

109. Chloropal (?)
   Map No. Ra 15.
   Near Sunbury. ¼ sheet 7 N.E.
   Occurs in nodular masses in decomposed basalt, and was supposed, at one time, to be copper-ore.

110. Opalized Wood.
   Map No. W
   Durdidwarrah. ¼ sheet 19 S.W.
   Brown opal, with the wood-structure clearly visible.

CARBONATES, ETC.

1. Calc-Spar (Carbonate of Lime).
   List No. Re 19.
   Moë, Gippsland.
   Occurs in veins in the carbonaceous rocks.

2. Calc-Spar.
   List No. S 4 and 7.
   Campbell's Reef, Moyston.
   The only known quartz reef in which calc-spar occurs.

3. Calc-Spar.
   List No. Rb 12a.
   Messrs. Fraser's Contract for the Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.
   Forms a thin vein in granite, in the upper part of the shaft, associated with quartz, talc and felspar.

4. Calcite (Carbonate of Lime).
   Phillip Island, Western Port Bay.
   Occurs in crystals in the Older Basalt.
   Presented by Mr. J. C. Newberry.
5. Arragonite (Carbonate of Lime).
   Chambers' Quarry, Richmond.  
   ¼ sheet 1 S.E.
   In fine needles, collected in radiating tufts.

6. Calcite.
   Degraves' Mill, Kyneton.  
   ¼ sheet 9 S.E.
   Fine yellow scalenohedrons, with two rhombohedrons, associated with chabasite.

Note.—This mineral occurs very abundantly in the lowest basaltic flow immediately under the Falls. It bears a close resemblance to "chalcedony," forming semi-transparent, botryoidal crusts and globular nobs of a bluish or yellowish white color; whilst its fine concentric radiating structure, mostly accompanied by a change to a darker color, gives it the appearance of "spherosiderite." The external surfaces are generally coated with a thin, brittle crust of bright-brown, glittering carbonate of iron, sometimes decomposed to yellow oxide. According to an analysis by Mr. J. C. Newbery it varies slightly in composition, according to color: the darker portions containing most iron and manganese. An average specimen gave:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Carbonate of lime</td>
<td>72.43</td>
</tr>
<tr>
<td>Iron</td>
<td>20.65</td>
</tr>
<tr>
<td>Magnesia</td>
<td>5.00</td>
</tr>
<tr>
<td>Manganese</td>
<td>1.92</td>
</tr>
</tbody>
</table>

100.00

Its hardness is 3.5—sp. gr. 2.86.

On comparing this composition with the minerals classed under "Dolomite," a very great difference will be observed, especially as regards lime and magnesia; we have consequently thought it not unjustifiable to call this mineral "Ferro-calcite." It is probable, that it represents a part-pseudomorph after "spherosiderite," by exchange of carbonate of lime for carbonate of iron.

11. Calcite.  
   Map No. Mu 16.  
   Lennox's Reef, near Mount Tarrawarunga.  
   ¼ sheet 14 S.W.
   Occurs in obtuse rhombohedrons. Minute specks of iron pyrites occur on the apices of some of the crystals.

12. Dog-tooth Spar.
   Degraves' Mill, Kyneton.  
   ¼ sheet 9 S.E.
   Aggregations of yellow, long-pointed crystals (hexagonal prism), with acute rhombohedron; coating cavities in basalt.

13. Ferro-Calcite.
   Saltwater River, 3 miles above Keilor Bridge.  
   ¼ sheet 1 N.W.
   Same as No. 10. Coats cavities in vesicular basalt.

   Ballan.  
   In fibrous, radiating nodules. From tunnel on Mr. Lyons' property.
Tunnelling Co.'s Lease, Lisle's Reef, Mount Tarrangower.  
\( \frac{1}{2} \) sheet 14 S.W.  
On metamorphic sandstone.

16. **Dog-tooth Spar.**  
Degraves' Mill, Kyneton.  
In basalt. Similar to No. 12.

16A. **Calcite.**  
Geelong.  
Light yellow, acute rhombohedrons, coating limestone.

17. **Freshwater Limestone.**  
Map No. Ra 1.  
Muckleford Creek, lot 4, section 4, Strangways.  \( \frac{1}{2} \) sheet 15 N.E.  
Containing cavities filled with fine crystals of "arragonite" and "calcite." The former are especially characterized by fine terminal planes, which are seldom found on those occurring in the basalt.

17A. **Carbonate of Lime.**  
Guildford.  
Mammillary coatings of cavities in the basalt.

18. **Carbonate of Lime.**  
Map No. Ra 37.  
Police Reserve, Kyneton.  \( \frac{1}{2} \) sheet 9 S.E.  
Coating "hyalite" in mammillated crusts, filling cavities in the basalt.

19. **Calc-Spar.**  
Phillip Island, Western Port Bay.  
In older basalt.

20. **Limestone.** Map No. R 130.  
Section 46, Redesdale.  \( \frac{1}{2} \) sheet 13 N.E.  
Occurs in lumps and horizontal veins, in a red-and-yellow mottled clay, full of ironstone pebbles, under 8 feet of basalt, and overlying grey, cellular basalt. It is nearly pure, and burns and slakes well, but is not abundant.

21. **Calcareous Deposit.**  
Map No. M 41.  
Stone-jug Creek, Spring Plains.  \( \frac{1}{2} \) sheet 13 N.E.  
Occurs, underlyng the basalt, in a bed a few inches thick, formed apparently by infiltration or absorption of carbonate of lime into the vegetable tissue of a moss, and the subsequent decomposition of the moss leaving the carbonate of lime in its exact form. It is a beautiful object under a strong magnifying power.

22. **Carbonate of Lime Crystals.**  
Wilson's Farm, Keilor.  \( \frac{1}{2} \) sheet 1 N.W.  
Coating basalt.

23. **Calcereous Deposit.**  
Map No. M 28.  
Near Peevor's Station, Langley.  \( \frac{1}{2} \) sheet 9 N.E.  
Occurs in cakes from 1 to 2 feet thick, overlying a porphyritic dyke (in the bed and banks of a tributary of the Cam-paspe), from the joints of which bubbles of carboxonic acid gas are constantly rising.

23A. **Carbonate of Lime and Magnesia, with Hydrated Sesqui-Oxide of Iron.**  
Deposited by a mineral spring (Seltzer water) near Ballan.

24. **Limestone.** Lab. No. 2, 3/7/65.  
Cliffs at Curdie's Inlet.  
White granular powder, containing 84 per cent. of lime. An analysis by Mr. J. Cosmo Newbery gave the following results:—  
Carbonate of lime ... 84.438  
Carbonate of magnesia trace  
Carbonate of soda ... 1.74  
Sesqui-oxide of iron ... 2.93  
Alumina ... 1.13  
Soluble silica { 7.325  
Insoluble clay, &c. } ...  
Phosphoric acid ... trace  
Water ... 1.518  
99.081

25. **Magnesite (Carbonate of Magnesia).** List No. Mu 10.  
Lot 7, parish of Tarrangower, near Loddon River.  
Occurs in nodular masses in surface drift. These nodules, on analysis, are found, not to consist of pure carbonate of magnesia, but to contain small and variable quantities of the carbonates of lime and iron, with a little clayey matter. Magnesite has lately been profitably employed by the "aerated bread" companies, for the production of pure carbonic acid gas, and is likewise in demand for the manufacture of "fluid magnesia."

26. **Brown Limestone (Marble).**  
Gippsland.
27. Carbonate of Magnesia.
   Rushworth.

   Near Mount Ida, Heathcote.
   Occurs in veins, accompanying Selwynite.

28A. Magnesite.
   Jim Crow Creek. 4 sheet 15 N.E.
   From Older Pliocene drift. This drift contains a layer of white soapy clay, in which are formed, by exposure to the atmosphere, grains and nodular masses of this mineral.

29. Silico-Calcareous Nodule.
   List No. Ra 214.
   Saltwater River, 1/2 miles above Keilor. 4 sheet 1 N.W.
   Occurs in basaltic clay.

   Lisle's Reef, Tarrangower. 4 sheet 14 S.W.
   Occurs, associated with "spathic iron" and "heulandite," in narrow veins in the walls of the metamorphic sandstone, bounding the above reef.

31. Dolomite (with small crystals of probably "Heulandite").
   Lisle's Reef, Tarrangower. 4 sheet 14 S.W.
   Occurs like No. 30.

31A. Phosphate of Lime, with Silica and Alumina.
   Bruthen Creek, Gippsland.
   Coating cavities of decomposed basalt, and associated with quartz and carbonate of copper.

32. Selenite (Gypsum, Sulphate of Lime).
   Bird Rock, south of Barwon Heads. 4 sheet 28 S.E.
   Occurs in thin veins, lenticular patches and concretionary masses, in the Upper Miocene sandstones and clays, along the coast from Jan-Juc Creek to Point Addis, near Geelong; and also in the Cape Otway district.

   Section 24n, Spring Plains. 4 sheet 15 N.E.
   Occurs in a stiff, blue clay, resting on sandstone, as lenticular crystals and druses.

33A. Selenite.
   Batman's Swamp. 4 sheet 1 N.W.
   Occurs in single and twin crystals, and lenticular masses.

34. Epsomite (Epsom Salts, Sulphate of Magnesia).
   Eaglehawk Reef, Maldon.
   Occurs as an efflorescence in the above reef.

35. Alum Shale.
   Sunbury. 4 sheet 7 S.E.
   Occurring in black pyritous shales.

36 and 36A. Glauber's Salt (Sulphate of Soda). Map No. M 32.
   Mitchell's Diggings, Campaspe River. 4 sheet 13 S.E.
   Occurs as crystals and scaly efflorescences on the walls of the Prospectors' Tunnel, in a soft, white sandstone.

37. Salt (Chloride of Sodium).
   Greenvale Lakes, near the Hopkins River, north of Winklella.
   Occurs in considerable quantities as a crust in the beds of saline lakes and lagoons of the western portion of Victoria, being the result of slow evaporation during the summer months.
CARBONACEOUS MINERALS.

37A. Lignite (Brown Coal).

City of Manchester Claim, Durham Lead. 1 sheet 63 S.E.

With crystals of efflorescent sulphate of iron, from the auriferous drift, 260 feet below the surface.

This deposit of lignite is nearly 120 feet in thickness. It consists of an irregular mixture of brown or brownish-black, earthy, bituminous coal, real "brown coal," with "lignite," i.e., portions, composed of branches, trunks and stumps of trees ("Conifers"). Occasionally, thin and rather shattered seams of jet are met with; also narrow, lenticular patches and small roundish pieces of two kinds of resin. Only a few narrow clay seams intersect this enormous mass of lignite; and iron pyrites is, so far as examination goes, very sparingly distributed. The following analyses are by the late Mr. C. Wood:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed carbon</td>
<td>29·3</td>
<td>27·9</td>
<td>26·7</td>
<td>38·5</td>
</tr>
<tr>
<td>Volatile matter</td>
<td>20·7</td>
<td>22·1</td>
<td>23·3</td>
<td>21·0</td>
</tr>
<tr>
<td>Hygroscopic water</td>
<td>48·7</td>
<td>48·7</td>
<td>48·7</td>
<td>40·0</td>
</tr>
<tr>
<td>Ash</td>
<td>1·3</td>
<td>1·3</td>
<td>1·3</td>
<td>0·5</td>
</tr>
<tr>
<td>Total</td>
<td>100·0</td>
<td>100·0</td>
<td>100·0</td>
<td>100·0</td>
</tr>
</tbody>
</table>

38. Recent Bituminous Deposit.

From the Grampians.

Found coating the bottoms of caves, being, according to an analysis by Mr. J. C. Newbery, a nitrogenous body, and probably the result of a peculiar decomposition of animal excrement and other matter.

Note.—Specimens 39 and 40 were not found in place, but were picked up in the bed of the creek.

41. Copaline. (?)

Lignite bed, Bass River.

37B. Lignite (Brown Coal).

Lal-Lal.

Occurs in extensive deposits in the Miocene formation.


Coal Creek, Cape Patterson.

Presented by N. Levi, Esq., M.L.A.

40. Copaline. (?)

Cape Patterson.

Presented by N. Levi, Esq., M.L.A.

42. Copaline (?) in Lignite.

Bass River.
FOREIGN AUSTRALASIAN MINERALS.

Case XVI.

AUSTRALASIAN COLONIES.

1. Auriferous Quartz.
   Waipori, New Zealand.

   Moruya, New South Wales.
   Iron and arsenical pyrites, zinccblend, galena, &c.

2A. Native Platinum.
   New Zealand.
   Presented by George Foord, Esq.

   Kapanga Co., Coromandel, Auckland, New Zealand.
   Presented by Abraham Lincoln, Esq.

4. Copper-Ore (Black Ore).
   Lab. No. 44/41.
   Currawang, New South Wales.
   Decomposed sulphide of copper, with sulphate and carbonate of lead in quartz.
   Yields 24 per cent. of copper.

4A. Copper-Ore—Malachite.
   Lab. No. 44 6/41.
   Currawang, New South Wales.
   Surface ore, containing 40.65 per cent. of copper.

5. Copper-Ore and Gossan.
   Peak Downs, Queensland.

6. Copper-Ore—Variegated or Peacock Copper-Ore.
   South Australia.

6A. Native Copper.
   South Australia.

7. Copper-Ore and Gossan.
   Quedong Copper Mining Co., Maneroo, New South Wales.

8. Copper Pyrites.
   Quedong, Maneroo, New South Wales.

9. Galena (Sulphide of Lead).
   Quedong, Maneroo, New South Wales.
   Contains 81 per cent. of lead and 13 ozs. 7 dwt's. 20 grs. of silver per ton.

10. Lead-Ore—Cerussite (Carbonate of Lead).
    Quedong, near Bombala, Maneroo, New South Wales.
    Presented by Mr. W. Allen.

10A. Lead-Ore.
    Same locality as last.
    Consisting chiefly of carbonate of lead, containing 49 per cent. of lead and
    11 ozs. 19 dwt's. 2 grs. of silver per ton.

    Franklin Harbor, South Australia.
    Containing 63 per cent. of iron.
    Presented by Mr. Larnach.

    Rockhampton, Queensland.
    Presented by Dr. Mueller.

12A. Black Sand, with Tin.
    New South Wales.
    Sp. gr. 6.06, contains 64 per cent. of tin.
12b. PLATINUM SAND.
     Otago, Bluff Harbor.

12c. RED OXIDE OF IRON.
     Carpenteria.
     Contains 63 per cent. of iron.

12d. COBALTINE.
     Victoria.
     Presented by George Foord, Esq.

13. NEPHRITE (Jade).
     New Zealand.
     Used by the natives for tomahawks and ornaments.

14. WHITE MICA.
     Near Mount Gipps, Barrier Ranges. (?)
     Colored by oxide of iron.

15. BLACK MICA.
     South Australia.

16. WHITE MICA.
     South Australia.
     In granite, forming the matrix of No. 17.

17. BERYL.
     South Australia.
     Frequent, as imbedded crystals, in a very coarse-grained granite.

18. GREEN MICA IN SCHIST.
     Barrier Ranges.

19. CHALCEDONY AND JASPER.
     Carnley’s Harbor, Auckland Islands.
     Pebbles from the water-courses at the foot of the Ranges.

20. PRASÉ. (?)

21. CHERT.
     Fraser, Dunstan Diggings, New Zealand.
     These chippings led to the discovery of chipped-stone weapons in beds of supposed Miocene age in New Zealand.

22. LIMESTONE (White Marble).
     Murrumbidgee River, N. S. W.
     Contains 93.75 per cent. of carbonate of lime.

23. CALC-SPAR.
     New Zealand. (?)

23a. ARSENATE OF LIME (Pharmacolite). (?)
     Capanga Company’s Claim, Coromandel, Auckland, New Zealand.
     Presented by Abraham Lincolne, Esq.

24 and 25. STALACTITES (Carbonate of Lime).
     Caves on the Murrumbidgee.
     Presented by C. S. Wilkinson, Esq.

26. CARBONATE OF LIME.
     Caves on the Murrumbidgee.
     Presented by C. S. Wilkinson, Esq.

27. STALACTITE (Carbonate of Lime).
     Mount Gambier, S. Australia.
     Presented by Lindsay Clark, Esq., District Surveyor.

28. DOG-TOOTH SPAR (Carbonate of Lime).
     Mount Gambier, S. Australia.
     Presented by Lindsay Clark, Esq., District Surveyor.

28a. PHOSPHATE OF LIME CONCRETION.
     South Sea Islands.
     Guano deposit.
     Presented by Mr. Larnach.

29. SILICO-CALCAREOUS PIPE.
     Homebush West, Barrier Ranges.
     From a well, 200 feet deep.

30. SILICO-CALCAREOUS CONCRETIONS.
     Great Bight of Australia.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td><strong>31. SELENITE (Gypsum, Sulphate of Lime).</strong>&lt;br&gt; <em>Lachlan District, N. S. W.</em>&lt;br&gt; From a well.</td>
<td><strong>35. TASMANITE (Dysodile?).</strong>&lt;br&gt; <em>Tasmania.</em></td>
</tr>
<tr>
<td><strong>32. SELENITE.</strong>&lt;br&gt; <em>Locality same as No. 31.</em></td>
<td><strong>36. KEROSENE MINERAL.</strong>&lt;br&gt; <em>N. W. Coast of Tasmania.</em></td>
</tr>
<tr>
<td><strong>33. VOLCANIC CINDER.</strong>&lt;br&gt; <em>Mount Gambier, South Australia.</em>&lt;br&gt; Presented by Lindsay Clark, Esq., District Surveyor.</td>
<td>An analysis gave:—&lt;br&gt; Water ... ... 1·59&lt;br&gt; Volatile matters ... 67·36&lt;br&gt; Fixed carbon ... 25·83&lt;br&gt; Ash ... ... 5·22&lt;br&gt; 100·00&lt;br&gt; Presented by Mr. Larnach.</td>
</tr>
<tr>
<td><strong>34. SILICIFIED WOOD.</strong>&lt;br&gt; <em>Totarra, New Zealand.</em>&lt;br&gt; Presented by S. McGowan, Esq.</td>
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<tr>
<td>Page. No.</td>
<td></td>
</tr>
<tr>
<td>10 99</td>
<td>Eutritic Rock, from dyke, Mount Alexander</td>
</tr>
<tr>
<td>13 13</td>
<td>Felspar Porphyry, Mount Macedon</td>
</tr>
<tr>
<td>15 49</td>
<td>Serpentine, Mount Timbertop</td>
</tr>
<tr>
<td>17 64</td>
<td>Greenstone (Diabase), Geelong</td>
</tr>
<tr>
<td>67 70a</td>
<td>Felspar from Diorite, Tariita</td>
</tr>
<tr>
<td>70b</td>
<td>Epidosite, Tariita</td>
</tr>
<tr>
<td>22 50</td>
<td>Green portion of Epidosite, Tariita</td>
</tr>
<tr>
<td>22 51</td>
<td>Old Basalt, Phillip Island</td>
</tr>
<tr>
<td>60a 60b</td>
<td>Ditto ditto</td>
</tr>
<tr>
<td>23 6a</td>
<td>Newer Basalt, Durham Lead</td>
</tr>
<tr>
<td>6b</td>
<td>Ditto ditto</td>
</tr>
<tr>
<td>36 18</td>
<td>Mudstone (Silurian), Durham Lead</td>
</tr>
<tr>
<td>40 71</td>
<td>Sandstone (Silurian), Spring Plains</td>
</tr>
<tr>
<td>45 10</td>
<td>Red Shale (Upper Palaeozoic), Broken River</td>
</tr>
</tbody>
</table>

**TABLE OF ANALYSES.**
ANALYSES.

1. (61.) GRANITE.—The white and bluish felspars represent respectively orthoclase and oligoclase, the latter showing faint striæ. These are associated with common black mica and quartz. The analysis is of the mass, as the felspars could not be separated from each other.

2. (99.) ECRIPTIC ROCK.—Consists of two felspars intermingled with quartz, so thoroughly mixed that a separate analysis of the felspars could not be made. One of them is striated; the analysis shows it to be oligoclase. In some portions of the specimen black mica was found (vide No. 100), which would bring the rock into the class designated by G. Rose as granite, and by Fournet as miarolite.

3. (13.) FELSIPAR PORPHYRY.—The crystals rendering the mass porphyritic are yellow striated oligoclase and glassy non-striated orthoclase. The analysis of the matrix gives almost exactly the composition of oligoclase. Whether the small black specks which the rock occasionally contains are hornblende or schorl, which they most resemble, could not be determined, on account of their small quantity.

4. (49.) SERPENTINE.—The analysis of the mass clearly proves the rock to be serpentine, closely resembling the serpentine from the Radau Valley in the Harz Mountains: the fracture, showing that the rock has a tendency to turn into schiller-spar, has also its black color and its association with chrysotile.

5. (64.) GREENSTONE (Diabase).—The analysis of the soluble and insoluble portions of this rock are given on page 17 of the Catalogue. The analysis in mass also tends to prove the composition of the rock. From the appearance of the specimens of the rock it could not be clearly ascertained whether the greenish-black mineral associated with the felspathic component was augite or hornblende. The analysis of the soluble portion proves it to be labradorite; and as this species of felspar is always associated with augite, the rock should be called diabase. The greenish element of the mass is probably chlorite.

6. (57.) FELSIPAR FROM Diorite.—The portion taken was perfectly separated from all matrix, and the analysis shows it to be albite.

7. (70a, 70b.) Epidosite.—The rock consists of quartz, epidote, and hornblende. The analysis 70a is of the rock with the hornblende separated, and resembles that given by Dr. Hunt of the epidosite of Canada. 70b was another portion, containing less free quartz. It had a specific gravity of from 3.21 to 3.26, and taking the specific gravity of epidote as 3.4, 19 per cent. of the silica may be deducted as quartz, which will leave $SiO_2$ 41—$Al_2O_3$ 25—$Fe_2O_3$ 19—$CaO$ 15, which is the composition of an iron epidote.

8. (50.) OLDER BASALTIC CLAY.—Color light brown; 59 per cent. soluble in hydrochloric acid. The analysis is of the soluble portion.

9. (51.) AMYGDALOIDAL BASALTIC CLAY.—A specimen closely resembling No. 51 gave the analysis; 50 per cent. was soluble in hydrochloric acid.

10. (56.) RED BASALTIC CLAY.—The analysis is from a specimen closely resembling No. 56; 58 per cent. was soluble in hydrochloric acid. The analysis is of the soluble portion.

11. (60a-b.) The analysis is from a nodule which closely resembled the interior portions of No. 60; 49 per cent. was soluble in hydrochloric acid. 60a is the soluble portion, 60b the insoluble.

12. (6.) NEWER BASALTIC.—Basalt (a) is the soluble portion, which is 24 per cent. of the whole; (b) is the insoluble.

13. (30.) METAMORPHIC ROCK.—Color black, structure semi-crystalline; closely resembling ordinary hornfels in appearance and composition.

14. (18.) SLATTY SHALE (Mudstone).—Soft, free from grits; easily fused before the blowpipe.

15. (7.) WHITE-AND-YELLOW SANDSTONE.—Formed of white transparent quartz grains, cemented together by a white or yellow paste.

16. (10.) FINE MICACEOUS SLATTY SANDSTONE.—Easily cleaved.

For other analyses of the Newer Volcanic, vide pages 23 and 28 of the Catalogue.
### Comparative Tabular Arrangement of Stratified Rocks.

<table>
<thead>
<tr>
<th>Systems</th>
<th>Groups</th>
<th>Periods</th>
<th>Victorian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Tertiary</td>
<td>In progress</td>
<td>Cenozoic</td>
<td>Largely represented: Gold gravels, sand, clay, cement, gravel, drift, limestone, lignite, &amp;c. Contemporaneous volcanic rocks.</td>
</tr>
<tr>
<td></td>
<td>Recent and Pleistocene</td>
<td></td>
<td>Hamilton, Geelong, Cape Otway, &amp;c. Marine fossils Mt. Eliza beds; clay, limestone, &amp;c. abundant.</td>
</tr>
<tr>
<td>Tertiary</td>
<td>Pliocene</td>
<td></td>
<td>&quot;Carbonaceous&quot; or coal-bearing beds—Cape Patterson, Cape Otway, Traralgon, Welshpool, and Wannon. Temoloptera and Zanites-beds and Unio.</td>
</tr>
<tr>
<td></td>
<td>Miocene</td>
<td>Upper Mesozoic</td>
<td>Kyneton, Bacchus, Marsh, Ballan. Ganomopteris McCoy.</td>
</tr>
<tr>
<td></td>
<td>Eocene</td>
<td>Lower Mesozoic</td>
<td></td>
</tr>
<tr>
<td>Cretaceous</td>
<td>Chalk</td>
<td>Upper Palaeozoic</td>
<td>Represented by Gruachan, Buchan, &amp;c. Carboniferous and &quot;carbonaceous&quot; beds—Buchan, River, Gruachan, Avon, Cape Otway, Western Port, Cape Grim, &amp;c.</td>
</tr>
<tr>
<td></td>
<td>Greensand</td>
<td>Lower Palaeozoic</td>
<td></td>
</tr>
<tr>
<td>Oolitic</td>
<td>Wealden</td>
<td>Palaeozoic Primary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oolite</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triassic</td>
<td>Saliferous</td>
<td>Mesozoic or Secondary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Muschelkalk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper new red sandstones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permian</td>
<td>Magnesian limestone</td>
<td>Upper Palaeozoic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower new red sandstone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carboniferous</td>
<td>Coal measures</td>
<td>Palaeozoic Primary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Millstone grit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mountain limestone</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower coal measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devonian or Old</td>
<td>Upper</td>
<td>Lower Palaeozoic</td>
<td>&quot;Bed rock&quot; of all the gold-fields. East of Melbourne and west of Mt. Useful West of Melbourne and Heathcote and east of Mt. Useful.</td>
</tr>
<tr>
<td>Red Sandstone</td>
<td>Middle with fossiliferous limestone</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carboniferous</td>
<td>Upper Silurian</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower Silurian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silurian</td>
<td>Cambrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laurentian</td>
<td>Mica and chlorite schists</td>
<td></td>
<td>Upper Glenelg and North-east Gippsland.</td>
</tr>
<tr>
<td></td>
<td>Gneiss and granitoid schists</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* These numbers refer only to the Geological sketch-map, but not to Geological quarter-sheets.

† The gold is sometimes found on a Graulite "bottom," especially near its junction with the Lower Palaeozoic rocks.
MAPS, REPORTS, AND PAPERS
PUBLISHED BY
GEOLOGICAL SURVEY DEPARTMENT.

1. Index Map to the Geological Survey.
2. Evelyn and Mornington, half-inch to one mile.
3. Sections from Mickleham to Mount Korhara, highest point of Dandenong Ranges.
4. Geological Map of Ballarat, eight chains to one inch.
5. Quarter-sheet 1, N.E., Heidelberg.
6. do. 1, N.W., Keilor.
7. do. 1, S.E., St. Kilda.
8. do. 1, S.W., Williamstown.
9. do. 2, N.W., Kimeehere.
10. do. 2, S.W., Broadmeadows.
11. do. 2, N.E., Mount Disappointment.
12. do. 2, N.W., Wallan Wallan.
13. do. 2, S.E., St. Kilda.
14. do. 2, S.W., Williamstown.
15. do. 3, N.W., Kinlochewe.
16. do. 3, S.W., Broadmeadows.
17. do. 3, N.E., Mount Disappointment.
18. do. 3, N.W., Wallan Wallan.
19. do. 3, S.E., St. Kilda.
20. do. 3, S.W., Williamstown.
21. do. 4, S.W., Kilmore.
22. do. 5, S.E., Lancefield.
23. do. 5, S.W., Rochford.
24. do. 6, N.E., Romsey.
25. do. 6, N.W., Mount Macedon.
26. do. 6, S.E., Bulla Bulla.
27. do. 6, S.W., Werribee.
28. do. 7, N.E., Sunbury.
29. do. 7, N.W., Mount Aitken.
30. do. 7, S.E., Bulla Bulla.
31. do. 7, S.W., Walhalla.
32. do. 8, S.E., Tarneit.
33. do. 8, S.W., Werribee.
34. do. 9, N.E., Langley.
35. do. 9, N.W., Taradale.
36. do. 9, S.E., Tarneit.
37. do. 9, S.W., Werribee.
38. do. 10, N.E., Woodend.
39. do. 10, N.W., Mount Macedon.
40. do. 10, S.E., Ballarat.
41. do. 10, S.W., Ballarat.
42. do. 11, N.E., Kyneton.
43. do. 11, S.E., Holcombe.
44. do. 12, N.E., Woodend.
45. do. 12, N.W., Glenlyon.
46. do. 12, S.E., Ballarat.
47. do. 12, S.W., Wallan Wallan.
48. do. 13, N.E., Castlemaine.
49. do. 13, S.E., Elphinstone.
50. do. 13, S.W., Wallan Wallan.
51. do. 14, S.W., Wallan Wallan.
52. do. 14, N.E., Guildford.
53. do. 15, N.E., Rylstone.
54. do. 16, N.E., Romsey.
55. do. 16, N.W., Mount Macedon.
56. do. 16, S.E., Ballarat.
57. do. 16, S.W., Wallan Wallan.
58. do. 17, N.E., Castlemaine.
59. do. 17, S.E., Elphinstone.
60. do. 17, S.W., Wallan Wallan.
61. do. 18, N.E., Guildford.
62. do. 18, S.E., Kyneton.
63. do. 18, S.W., Wallan Wallan.
64. do. 19, N.E., Castlemaine.
65. do. 19, S.E., Elphinstone.
66. do. 19, S.W., Wallan Wallan.
67. do. 20, N.E., Castlemaine.
68. do. 20, S.E., Elphinstone.
69. do. 20, S.W., Wallan Wallan.
70. do. 21, N.E., Castlemaine.
71. do. 21, S.E., Elphinstone.
72. do. 21, S.W., Wallan Wallan.
73. do. 22, N.E., Castlemaine.
74. do. 22, S.E., Elphinstone.
75. do. 22, S.W., Wallan Wallan.
76. do. 23, N.E., Castlemaine.
77. do. 23, S.E., Elphinstone.
78. do. 23, S.W., Wallan Wallan.
79. do. 24, N.E., Castlemaine.
80. do. 24, S.E., Elphinstone.
81. do. 24, S.W., Wallan Wallan.
82. do. 25, N.E., Castlemaine.
83. do. 25, S.E., Elphinstone.
84. do. 25, S.W., Wallan Wallan.
85. do. 26, N.E., Castlemaine.
86. do. 26, S.E., Elphinstone.
87. do. 26, S.W., Wallan Wallan.
88. do. 27, N.E., Castlemaine.
89. do. 27, S.E., Elphinstone.
90. do. 27, S.W., Wallan Wallan.
91. do. 28, N.E., Castlemaine.
92. do. 28, S.E., Elphinstone.
93. do. 28, S.W., Wallan Wallan.
94. do. 29, N.E., Castlemaine.
95. do. 29, S.E., Elphinstone.
96. do. 29, S.W., Wallan Wallan.
97. do. 30, N.E., Castlemaine.
98. do. 30, S.E., Elphinstone.
99. do. 30, S.W., Wallan Wallan.
A DESCRIPTIVE CATALOGUE

OF THE

Rock Specimens and Minerals

IN THE

NATIONAL MUSEUM,

COLLECTED BY

The Geological Survey of Victoria;

WITH EXPLANATORY NOTES ON THEIR NATURE
AND MODE OF OCCURRENCE IN PLACE.

BY

ALFRED R. C. SELWYN,
DIRECTOR OF THE GEOLOGICAL SURVEY,

GEORGE H. F. ULRICH, F.G.S., C. D'OYLY H. APLIN, ROBERT
ETHERIDGE, F.G.S., AND NORMAN TAYLOR.

MELBOURNE:
BY AUTHORITY: JOHN FERRES, GOVERNMENT PRINTER.

1868.
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INTRODUCTION.

The limited space available in the National Museum for the exhibition of the geological collection of rocks makes it impossible at present to give more than one suite of specimens. To render

ERRATA.

Page 18, No. 74. For "(Diabase)," read "(Diorite)."
" 18, No. 75.  "  "  "
" 18, No. 76.  "  "  "
" 18, Nos. 77 and 78.  "  "
" 18, Nos. 77 and 78, last line. For "some pyroxenic mineral," read "some amphibolic mineral."
" 72, No. 53. For "Morris' Plain," read "Morris' Claim."
" 74, No. 71. For "Dawson," read "Danson."
" 81, Note after 38b. For "specimen No. 38," read "No. 38A."
" 91, No. 2. For "Moruya," read "Moruya."
" 95, No. 15. For "(7)," read "(71)."

illustrate the Paleontology of Victoria.

The minerals are also arranged as a separate collection, and numbered consecutively to agree with the Descriptive Catalogue.

The published geological quarter-sheet maps, referred to on the specimen labels, are exhibited on the walls contiguous to the cases. Each map represents fifty-four square miles of country, and a copy of the geologically-colored sketch-map of the whole colony, on a scale of eight miles to one inch, is also exhibited. On the above-mentioned maps are letters and numbers—thus \( F_8 \)—which
INTRODUCTION.

The limited space available in the National Museum for the exhibition of the geological collection of rocks makes it impossible at present to display more than one suite of specimens. To render the collection complete, it should comprise three sets—one of which should be arranged lithologically, to illustrate the composition, structure, and physical aspect of the rocks; a second, stratigraphically, to illustrate the order of succession of the several formations; and a third, topographically, to illustrate their geographical distribution.

In this collection the stratigraphical arrangement has been selected, as best adapted to afford special and general knowledge of the characters and aspect of the various rocks met with in each formation, while the colored label on each specimen, when compared with the similarly colored geological maps, shows approximately their geographical distribution. There are two labels on each specimen: the colored one indicates the formation to which the specimen belongs, the locality, and the reference number on the maps; the other is the Descriptive Catalogue number for each formation. Some of the specimens show examples of the fossils characteristic of the formation to which they belong; but a separate and complete collection of fossils, arranged stratigraphically, and named and described by Professor McCoy, is being prepared, and will fully illustrate the Paleontology of Victoria.

The minerals are also arranged as a separate collection, and numbered consecutively to agree with the Descriptive Catalogue.

The published geological quarter-sheet maps, referred to on the specimen labels, are exhibited on the walls contiguous to the cases. Each map represents fifty-four square miles of country, and a copy of the geologically-colored sketch-map of the whole colony, on a scale of eight miles to one inch, is also exhibited. On the above-mentioned maps are letters and numbers—thus \( F_s^0 \) —which
INTRODUCTION.

Correspond with letters and numbers on the colored specimen labels, and thus indicate the exact spot on the map where each specimen was collected, and the formation it belongs to. The letters R., F., M., on the maps and labels, show whether the specimen is Rock, Fossil, or Mineral.

Illustrative horizontal sections, similar to the one accompanying sheet 14 S.W., Maldon, will eventually be constructed for all the more interesting ¼ sheets; and a system of lettering on the face of the map has been adopted, by which the student can easily ascertain the probable nature of the formations underlying those that occupy the surface (depicted by the color on the map) of any given area. The letter G. indicates Granite; C., Lower Silurian; S., Upper Silurian; V., Volcanic; T., Tertiary, &c.; and the number attached to the letter indicates the probable mineral or lithological character of the rock. Thus, V1. on TP3. on Cl. 2., indicates Volcanic formation (basalt) resting on Pliocene Tertiary gravel, or "lower gold drift," on a bottom of Lower Silurian slate and sandstone.

The arrangement of the specimens described in this Catalogue was planned and superintended by myself. The descriptions are the joint work of myself and colleagues, Messrs. Ulrich, Aplin, Etheridge, and Taylor. The analyses, when not otherwise stated, have been made by Mr. J. Cosmo Newbery, Analyst to the Survey.

ALFRED R. C. SELWYN,
Dir. Geo. Survey of Victoria.

Geological Survey Office,
May, 1868.
DESCRIPTIVE CATALOGUE.

IGNEOUS ROCKS.

PLUTONIC AND VOLCANIC.

The relations of these rocks indicate that they have, for the most part, been forced upwards from the interior of the earth in a fluid or semi-fluid (viscous) state. They have penetrated and overflowed other formations, and then become solid under varying conditions, either on or beneath the surface. The soft state in which they existed was probably due to great heat—hence the term "Igneous rocks;" and their texture, as we now find them, is the result, partly, of the particular conditions under which they became solid, and is partly due to subsequent metamorphism. They are either compact, porphyritic, or crystalline granular, seldom fissile, but frequently vesicular or amygdaloidal. They also often occur in a wackenitic state (wacke*), this form being, in Victoria, very characteristic of the rocks of the Older Volcanic series. As volcanic ash, they occur in stratified layers, having much the appearance of true sedimentary aqueous rocks. They are classed under two principal divisions, expressive of their origin.

1. Plutonic—or those that became solid at a considerable depth in the interior of the earth (consequently under great pressure), and have been exposed at the surface by the removal of the once superincumbent strata.

2. Volcanic—or those that have been forced to the surface, and either flowed over it in a molten state, or been spread over it as ash.

These again may be divided into two classes expressive of their constitution:

1. Acidic—or those rich in silica.
2. Basic—or those poor in silica.

The average composition of these two classes of igneous rocks is, according to Cotta—

<table>
<thead>
<tr>
<th></th>
<th>Basic rocks</th>
<th>Acidic rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>45—55</td>
<td>60—80</td>
</tr>
<tr>
<td>Alumina</td>
<td>10—20</td>
<td>8—16</td>
</tr>
<tr>
<td>Prot oxide &amp; Iron</td>
<td>1—15</td>
<td>1—15</td>
</tr>
<tr>
<td>Lime</td>
<td>1—10</td>
<td>1—5</td>
</tr>
<tr>
<td>Magnesia</td>
<td>1—6</td>
<td>0—4</td>
</tr>
<tr>
<td>Potash</td>
<td>1—4</td>
<td>1—6</td>
</tr>
<tr>
<td>Soda</td>
<td>1—5</td>
<td>1—6</td>
</tr>
<tr>
<td>Water</td>
<td>0—7</td>
<td>0—8</td>
</tr>
</tbody>
</table>

* Wacke is a German miner's term used to describe a decomposed state of igneous rocks poor in silica.
The separation between the two groups cannot be very rigidly carried out, as certain rocks of each group vary so greatly in their composition as actually to graduate into the opposite one. This is also the case as regards the Plutonic and Volcanic divisions, there being no definite depth of measurement that can be fixed as a boundary between these two kinds of formations: thus, each of the four groups may be characterized by some typical rock, and each may also be connected with the other group by means of rocks of an intermediate character and origin.

The groups may be represented as follows:—

**Plutonic**
- Acidic ...
- Basic ...
- Granite
- Diorite
- Syenite

**Volcanic**
- Acidic ...
- Basic ...
- Trachyte
- Basalt
- Trachy-dolerite
- Porphyrite

**Acidic**
- Plutonic ...
- Volcanic ...
- Trachyte
- Trachyte porphyry

**Basic**
- Plutonic ...
- Volcanic ...
- Diorite
- Basalt
- Melaphyre
- Diabase porphyrite

The former state of fusion of the Volcanic division of the igneous rocks is evident, as they may still be seen in process of formation from the lava of active volcanoes.

In the case of the other, or Plutonic division, their previous igneous fluidity is not always so apparent; and it seems not improbable that some granites, as well as other rocks of this class, are the result of the gradual metamorphism, in place, of stratified sedimentary rocks, through the effects of long-continued thermo-chemical action, in presence of water, and under high pressure, but unaccompanied by any such great heat as would be required to cause igneous fluidity. In any case it seems quite certain that many changes have taken place in the character and composition of igneous rocks subsequently to their first formation, causing the introduction or development in them of what are termed accessory minerals, chiefly, no doubt, under the influence of watery solutions and gases penetrating and permeating them. In this sense, nearly all rocks are, more or less, metamorphic, or, in other words, have assumed different mineral characters from what they possessed, either as original sediments or molten masses. This is not generally caused by the addition of new substances, but, in most cases, only through the re-arrangement, under peculiar chemical and physical influences, according to their affinities, of certain original constituents of the rock, resulting in the development of distinct minerals, and thus forming rocks, which, though differing greatly in external appearance, would not vary more in their ultimate chemical constituents than any two distinct pieces of sandstone, slate, or granite.

**Granite** is the principal rock of the Plutonic division of the acidic igneous rocks. It consists of a crystalline granular compound, in variable proportions, of felspar, quartz, and mica. In certain varieties there occur chlorite, talc, hornblende, and schorl. The felspar, chiefly orthoclase, is usually the predominant ingredient, the mica occupying the smallest place in typical granite. It is uncertain whether albite or
labradorite ever occur in the granitic compound, the species of triclinic felspar, often observed in it and generally supposed to be albite, having been found to be "oligoclase." The ingredients commonly considered as essential for granite are, nevertheless, sometimes replaced by others; and we consequently find many transitions from granite into other rocks, such as granitic porphyry, quartz porphyry, protogine (talcose granite), schorl rock, felstone, felspar porphyry, syenite, and greenstone: these latter rocks passing into the porphyritic, syenite, and greenstone groups, or the basic igneous rocks of the Plutonic division. Some of the specimens illustrate these transitions.

**Syenite** is a granular compound of orthoclase and hornblende.

**Porphyrite** consists of a felsitic matrix, with individual crystals of felspar (oligoclase or orthoclase), mica, or hornblende.

**Greenstone** is a compound of some species of felspar (not orthoclase) with hornblende, hypersthene, or augite. This class of rock is never found in the form of genuine lava, but always, more or less, shows its Plutonic origin, in which probably consists the whole difference (not very great) between it and the basalts, or the basic igneous rocks of the Volcanic division. It is highly probable that the same basic compound which, consolidating near the surface, produced the basaltic rock, when it attained the solid state at a greater depth, formed the greenstone. The basalts and greenstones, consequently, in general very much resemble each other, both in chemical composition and mineral character. The chlorite, by which some of the greenstones are alone distinguishable from the basalts, is usually a product of transmutation.

The following are some of the minerals occasionally found as accessories in granitic rocks:—Garnet, topaz, beryl, fluor spar, calcite, corundum, zircon, titanite, gold, oxide of tin, magnetic iron-ore, molybdenite, mispickel, &c.

Tin-ore, gold, titanite, magnetic iron, and corundum, occur in considerable quantity in the detrital matter in many of the granite districts in Victoria. No specimens showing these minerals embedded in granite have yet been found,* and their occurrence in the drifts can only be explained, either by supposing them to have been originally distributed as grains through the mass of the rock in the detritus of which they are now found, or that veins containing these minerals traversed the strata which doubtless once covered the granite, and have since been entirely broken up and removed by denuding forces, which were not able to transport the heavier minerals. No veins or lodes have been found containing tin-ore, nor are there any authenticated instances in Victoria of auriferous quartz veins in the granite, though fragments of vein quartz, as well as of gneiss, mica, schist, and other metamorphic strata are not uncommon in the detritus that rests on the granite, and often contains rich deposits of tin-ore, fine gold with titanite, corundum, black tourmaline, zircon, sapphire, diamond, and other precious stones.

* Gold, and a new mineral compound, supposed to be gold and bismuth, occurs in granite veins associated with the Nuggety Reef, Maldon.
PLUTONIC ROCKS.—CASE I.

Case I.

GRANITIC ROCKS.

1. Coarse-grained, Ternary Granite.
   Map No. Ra 38.
   Near the top of Mount Tarra-nogower. 1/4 sheet 14 S.W.
   Occurs in the Silurian rocks; in places it has the appearance of graphic granite.

2. Binary Granite.
   Map No. Mb 43.
   Hughes’s Tunnel (No. 3), Coliban Water Supply Contract, Mount Alexander. 1/4 sheet 13 N.W.
   The embedded crystals of felspar (orthoclase) are here seen distinctly.
   It also contains nests of talc.

2a. Binary Granite.
   Staughton’s Run, near Anakie Hills, 1/4 sheet 19 N.E.

2b. Crystal of Felspar.
   List No. Rd 27.
   Section 24, parish of Lara, near Duck Ponds Creek. 1/4 sheet 19 N.E.
   Fine-grained granite, with a large amount of mica.

3. Felspar Crystal (Orthoclase).
   Map No. Mb 42.
   Same locality as No. 2.
   These crystals occur in a series of small dykes, running across the open cutting, 60 feet from south end of tunnel.

   Map No. Ra 45.
   Section 10, parish of Bradford. 1/4 sheet 14 N.W.
   Forms a dyke in granite. Large twin crystals of orthoclase.

5. Tourmaline Crystals.
   Map No. Mb 33.
   East foot of Mount Alexander, below highest point. 1/4 sheet 13 N.W.
   Occurs in long radiating, prismatic crystals.

6. Decomposed Granite (Kao-lin or China Clay).
   Map No. R 2.
   Deep Creek, township of Bulla. 1/4 sheet 7 S.E.
   A company was formed in 1861 to work this deposit for exportation; but as the value of the best kaolin is only 18s. per ton, the enterprise was not successful, and had to be abandoned. It occurs in large quantity, and will doubtless be valuable when a local china manufacture is established.

7. Steatite (Variety of).
   Map No. Mb 39.
   Same locality as Nos. 2 and 3. Hydrated silicate of magnesia and alumina. It occurs as a vein in a red ternary granite, 396 feet from north end of tunnel.

8. Hydrous Silicate of Alu-mina and Magnesia.
   Same locality as last.
   Occurs as a vein, 422 feet from north end of tunnel. It is colored green probably by oxide of iron.

   List No. R (21)
   Pyramid Hill.
Lot 6, section 2a, Maldon. ¼ sheet 14 S.W.
Occurs traversing Silurian rocks. It consists mainly of felspar, with patches composed of quartz and mica.

11. **Granite.** Map No. Rb 16.
North of Mount Emu, parish of Sedgwick. ¼ sheet 13 N.W.
Occurs in metamorphosed Lower Silurian rocks.

12. **Coarse-grained Granite.**
List No. R (SB)
Mansfield Road, Broken River.

13. **Fine-grained, Ternary Granite.** Map No. Ra 38.
Mount Tarrangower. ¼ sheet 14 S.W.
From the same dyke as specimen No. 1.

**Note.**—The main dyke, from which No. 17 is taken, consists of a flesh-colored or yellowish granular base, in which are scattered crystals of hornblende, mica, and quartz (specimen No. 75). It passes, on its west side, into a white, flinty, nearly homogenous rock, and then into an earthy, baked-looking granular rock; on its east side, into broad veins of a red crystalline rock and thin veins of a black and variously colored flinty rock (felstone) with wavy lines, as if the differently colored substances had been run together whilst in a pasty or semi-fluid condition.

The Gap, Mount Alexander. ¼ sheet 13 N.W.
White, and fine-grained, containing drusy cavities, coated with distinctly crystallized quartz and felspar only.

15. **Quaternary Granite.**
Map No. Ra 50.
Reef, south of Lahn’s Reef. ¼ sheet 14 N.W.

16. **Felspar.** Map No. Ra 55.
Near Cemetery, Maldon. ¼ sheet 14 N.W.
Almost pure felspar, occurring as a vein in a granitic dyke.

17. **Felstone.** Map No. Rb 80.
South of parish of Baynton. ¼ sheet 5 N.W.
Occurs in granite, on range west of the Lancefield road.

18. **Ternary Granite.**
List No. R (SB)
Mansfield Road, Broken River.
Contains a few crystals of hornblende, but not in sufficient quantity to constitute a syenite.

19. **Ternary Granite.**
Map No. Ra 56.
Friendship’s Reef. ¼ sheet 14 N.W.

20. **Granite.**
Corner Inlet.

21. **Coarse, Ternary Granite.** List No. R (SB)
Mount Bukerabanuel.

22. **Fine-grained Granite.**
List No. R (SB)
Mount Bukerabanuel.
Containing a vein of felspar and tourmaline.

23. **Ternary Granite.**
Map No. Rb 31.
The Gap, Mount Alexander. ¼ sheet 13 N.W.
See specimen No. 14.

24. **Ternary and Binary Granite.**
Map No. Rb (2a).
O’Keefe’s Tunnel (No. 4), Coliban Water Supply Contract, Preston Vale. ¼ sheet 13 N.W.
One half of the specimen consists of quartz and felspar; the other of quartz, felspar and black mica. The felspar has a slightly blue tint. The specimen was taken from Government shaft No. 3.

25. **Granite.**
Livingstone’s Creek, near Omeo Goldfield.

26 and 27. **Granite.**
Map No. Rb 16 (1 & 3).
North of Mount Emu, parish of Sedgwick. ¼ sheet 13 N.W.

Those marked with an * occur as dykes (Elvans).
Note.—It will be seen, from an examination of these specimens (Nos. 26 and 27, and No. 11), how widely individual specimens from granitic dykes occurring in other rocks differ amongst themselves. All these specimens were taken from within a yard of one another: No. 11 presenting a fine-grained appearance, with a vein of felspar; No. 26 very much coarser; and No. 27 showing an extremely coarse texture, with the plates of mica often forming small nests.

28. **Granite.** Map No. Ra 12.
   Lot 1, section 1A, Maldon. ¼ sheet 14 S.W.
   This specimen shows the junction of the granite and highly metamorphosed Lower Silurian rocks (hornfels).

   O’Keefe’s Contract for Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.
   The black portion consists of numerous fine plates of black mica, and contains small green patches, probably chlorite; also white crystals of orthoclase. These patches or bosses of mica are of frequent occurrence in granite.

   Near Dandenong.
   The felspar has a slightly red color. Attached is a piece of felspar porphyry.

31. **Ternary Granite.** Map No. Rb 38.
   Hughes’s Tunnel (No. 3), Coliban Water Supply Contract, Mount Alexander. ¼ sheet 13 N.W.
   With red felspar, 300 feet from north end of tunnel. The sides of this specimen are covered with a yellowish-green mineral, colored by protoxide of iron.

32. **Ternary Granite.** Map No. Rb 1.
   Gellibrand’s Hill, section 8, parish of Will-Will-Rook. ¼ sheet 2 S.W.
   With part of a dense, fine-grained micaceous boss. The granite of Gellibrand’s Hill makes a good building stone, and was used for Prince’s Bridge, the old Town Hall and the present Commissioner of Titles Office. See “Building Stones,” No. 3.

33. **Eutric Vein in Granite.** Map No. Ra 57.
   Spring Hut. ¼ sheet 14 N.W.

34. **Vein of Eutrite, with Granite.** List No. Re 10.
   Dargan’s Swamp.

35. **Granite Porphyry.** Map No. Rb 45.
   West side of Mount Alexander, parish of Harcourt. ¼ sheet 13 N.W.
   Portion of a fine-grained granitic boss enclosed in granite. The base is composed of quartz and mica, with larger plates of black mica and white opaque crystals of orthoclase.

35A. **Ternary Granite.** List No. Rd 22.
   About 1 mile N.E. of Station Peak. ¼ sheet 20 S.W.
   The felspar is in large pieces, of a brownish-yellow color.

35B. **Ternary Granite.** List No. Rd 21.
   Station Peak, near Geelong. ¼ sheet 19 S.E.
   The felspar is of a red color.

   Range west of Mount Martha.

37. **Ternary Granite.** Mount Alexander. ¼ sheet 13 N.W.

38. **Ternary Granite.** Map No. Rb (24n).
   Section 6, Sutton Grange. ¼ sheet 13 N.W.
   This does not form a good building stone, as it decomposes in red spots.

39. **Ternary Granite.** Map No. Ra 93.
   Pigeon Hill. ¼ sheet 14 N.W.

Those marked with an * occur as dykes (Elvans).
**PLUTONIC ROCKS.—CASE I.**

*40. TERNARY GRANITE.
Map No. R 111.
Vanderloft’s Paddock, south of Heathcote.
Occurs in connection with a greenstone dyke. (See specimen No. 97, and Note following.)

41. COARSE, TERNARY GRANITE.
Mount Kosciusko, N.S.W.

42. TERNARY GRANITE.
List No. Re 7.
Near Police Barracks, Dandenong.

43. COARSE, TERNARY GRANITE.
Map No. Ra 44.
Lot 48, Carlsruhe. ¼ sheet 9 S.E.
With large felspar crystals.

*44. TERNARY GRANITE.
Map No. Ra 49.
Nuggetty Reef. ¼ sheet 14 N.W.
This specimen is taken from the surface.

45. TERNARY GRANITE.
Map No. Rb 37.
Hughes’s Tunnel (No. 3), Coliban Water Supply Contract, Mount Alexander. ¼ sheet 13 N.W.
This hard granite occurs in large patches here and there throughout the tunnel; the rest is so soft and decomposed as to require bricking.

*46. TERNARY GRANITE.
Map No. Ra 49.
Nuggetty Reef. ¼ sheet 14 N.W.
Same as specimen No. 44. Taken 250 feet from the surface.

*47. TERNARY GRANITE.
Map No. Ra 49.
Nuggetty Reef. ¼ sheet 14 N.W.
Same as Nos. 44 and 46. Taken 480 feet from the surface. The felspar is of a greenish tint.

*48. TERNARY GRANITE.
Map No. Ra 18.
Near Irish Bill’s Reef, Maldon. ¼ sheet 14 S.W.
Very micaceous. It occurs as a vein in the Silurian rocks.

49. TERNARY GRANITE.
Map No. Ra 92.
Near the Cemetery, Maldon. ¼ sheet 14 N.W.

50. TERNARY GRANITE.
List No. Rs 14.
Conical Hill, foot of Mount William.

51. TERNARY GRANITE.
Map No. Ra 19.
Spur running north from Conglomerate Range, between Riddell’s Creek and Mount Macedon Range. ½ sheet 6 S.W.

52. TERNARY GRANITE.
Map No. Rb 45.
South-west foot of Mount Alexander, parish of Harcourt. ½ sheet 13 N.W.
With portion of a micaceous boss.

53. FINE-GRAINED, TERNARY GRANITE.
Dog Rocks, Geelong. ¼ sheet 24 S.E.
The granite forming these rocks is generally coarse-grained, with large crystals of felspar.

54. TERNARY GRANITE.
Map No. Rb 25.
O’Keefe’s Contract for Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.
Close-grained quartzose base, containing crystals of quartz, felspar and black mica: from shaft No. 3, at a depth of 60 yards.

55. TERNARY GRANITE.
List No. Re 1.
Near Janefield.

56. COARSE GRANITE.
List No. Ra 49.
Mount Hope.

57. COARSE GRANITE.
List No. Re 4.
Near Mount Monda.
Weathering red from the decomposition of the iron in the mica.

58. QUATERNARY GRANITE.
Bulagabie Creek, Dargo, Gippsland.

59. TERNARY GRANITE.
List No. R (½)
Chirrup Creek, Hopkins’ Hill.
With large plates of mica.

Those marked with an * occur as dykes (Elvans).
60. Ternary Granite.  
Map No. Rb (7a).  
Fraser’s Contract for Coliban Water Supply, Preston Vale.  
¾ sheet.

Obtained 4½ chains from north end of tunnel. It is exceedingly hard. The felspar is of a green color, and iron pyrites occur disseminated through the rock.

61. Ternary Granite.  
Map No. Rb 20.  
¾ sheet 13 N.W.

Very hard, with white and bluish-white felspar (orthoclase and oligoclase respectively). From Government shaft No. 2. (See Table of Analyses, page 94.)

*62. Ternary Granite.  
Map No. Ra 31.  
Brewery Springs, Maldon. ¾ sheet 14 N.W.

From a dyke-like mass in the Silurian rocks.

63. Ternary Granite.  
List No. Re 5.  
Ryrie’s Flat, Badger Creek, Upper Yarra.

64. Ternary Granite.  
List No. R (822)  
Carter’s Rosebrook Station.

Flesh-colored.

65. Ternary Granite.  
O’Keefe’s Contract, Coliban Water Supply, Preston Vale. ¾ sheet 13 N.W.

From Government shaft No. 3, 116 yards from surface. The felspar is of a greenish-white tint, and has a peculiar pearly lustre.

66. Ternary Granite.  
Map No. Rb 19.  
O’Keefe’s Contract, Coliban Water Supply, Preston Vale. ¾ sheet 13 N.W.

From bottom of Government shaft No. 1, 92 feet 7 inches from surface. It consists of grey quartz, black mica, and semi-decomposed yellow felspar.

67. Syenitic Granite.  
Gabo Island.

It consists of red felspar, quartz, and hornblende. A good building stone, but expensive to work. Used in the General Post Office, the Custom House, and Ryrie’s Flat, Badger Creek, Upper the Australasian Insurance Company’s Offices.

Case II.  
GRANITIC ROCKS AND PORPHYRIES.

GRANITIC ROCKS—(continued).

*68. Granite Porphyry.  
Map No. Ra 3.  
Near S.W. corner of lot 8, section 2a, Tarrangower. ¾ sheet 4 S.W.

A grey felspathic base, with scattered quartz and felspar crystals, a little mica and iron pyrites; also rounded quartz grains. It weathers white.

*69. Ternary Granite.  
Map No. Ra 13.  
Near lot 10, section 2a, Maldon. ¾ sheet 14 S.W.

Occurs in Silurian rocks. It decomposes in patches.

70. Ternary Granite.  
List No. R (15)  
Mansfield Road, Broken River.

*71. Ternary Granite.  
Map No. Ra 10.  
Section 2a, Baringhup. ¾ sheet 14 S.W.

Traversing granite, and consisting of a coarse granular base of quartz and felspar, with dark felspar crystals. It passes into a coarse granite.

Those marked with an * occur as dykes (Elvans).
**72. TERNARY GRANITE.**

Map No. Rb 23.

O'Keefe's Contract, Coliban Water Supply, Preston Vale. ¼ sheet 13 N.W.

From Government shaft No. 3. Occurs traversing granite in a N.W. direction, and consists of a fine-grained white and flesh-colored granular base of quartz and felspar, with scattered quartz, felspar and mica.

**73. TERNARY GRANITE.**

Map No. Ra 90.

Baringhup Road. ¼ sheet 14 N.W.

Hard fine-grained granite.

*74. TERNARY GRANITE.*

Map No. Ra 59.

West of Bradford. ¼ sheet 14 N.W.

Coarse and fine-grained granite, with thin quartz veins.

**75. TERNARY GRANITE.**

Dog Rocks, Geelong. ¼ sheet 24 S.E.

Hard coarse and fine-grained granite, with large felspar crystals.

**76. TERNARY GRANITE.**

Map No. Rb 11.

Section 4, Sedgwick. ¼ sheet 13 N.W.

Granite and eurite, with orthoclase felspar.

**77. TERNARY GRANITE.**

Map No. Ra 54.

Near N.E. corner of Municipal boundary, Maldon. ¼ sheet 14 N.W.

Fine-grained, granular, flesh-colored granite.

**78. FELSTONE (in part).**

Map No. Rb 80.

Range west of Lancefield Road, and south of parish of Banyton. ¼ sheet 5 N.W.

Occurs in granite, and contains rounded crystals of quartz. (See Note following specimen No. 17.)

**79. TERNARY GRANITE.**

Map No. Rb 32.

East foot of Mount Alexander. ¼ sheet 13 N.W.

Of a light-red color, and containing very little mica.

**80. GRANITE.**

Map No. Ra 48.

Bryant's Station. ¼ sheet 14 S.W.

**81. GRANITE PORPHYRY.**

Map No. Rb 70.

East of Jews' Harp Creek, on road between sections 72 and 75, Langley. ¼ sheet 5 N.W.

Consists of a white, flinty base, with scattered felspar and quartz. It passes into a granular or earthy white rock, with black needles of schorl, dead white crystals of felspar and quartz.

**82. ELVANITE.**

Map No. Rb 70.

Same locality as last.

White, earthy, felspathic base, with crystals of felspar and acicular crystals of hornblende.

**83. HARD, GREY GRANITE.**

Map No. Ra 91.

South of Dunolly Road. ¼ sheet 14 N.W.

Would make a good building stone.

**84. FINE-GRAINED GRANITE.**

Map No. Rb 18.

South end of Mount Emu Range, parish of Sedgwick. ¼ sheet 13 N.W.

Granular, silico-felspathic base, with small plates of black mica.

**85. BINARY GRANITE.**

Map No. Rb 32.

East foot of Mount Alexander. ¼ sheet 13 N.W.

Composed of quartz and flesh-colored felspar.

**86. GRANITE.**

Map No. Rb 30.

North end of the summit of Mount Alexander. ¼ sheet 13 N.W.

Fine-grained granite, with but little mica.

**87. EURITE.**

Map No. Ra 52.

Mosquito Reef. ¼ sheet 14 N.W.

**88. TERNARY GRANITE.**

Map No. Rb 27.

The Gap, Mount Alexander. ¼ sheet 13 N.W.

Granular base of quartz and red felspar, with a little mica, and containing crystals of tourmaline.

*Those marked with an * occur as dykes (Elvans).*
10

PLUTONIC ROCKS.—CASE II.

   Hanging Rock, Heathcote.
   Brownish-grey rock, with the mica apparently decomposed.

   Cemetery, Heathcote.
   Very fine granular base, with white mica.

   Hanging Rock, Heathcote.
   Of a slightly yellow color, due to the partial decomposition of the felspar.

*96. Granite. List Rb (20B).
   Cutting of Kyneton Road, Heathcote.
   Of a light-green color.

   Same locality as last.

Note.—Specimens Nos. 93 to 97 are from a dyke to the westward of the Heathcote township. In places this dyke is of an ordinary granitic character, in others it passes into an eurite. The various colors are well represented by the specimens, the most permanent being of a light-brown, occasionally passing into light-green. In width it varies from 2 to 5 chains, and is traceable for 4 miles south of the Kyneton Road cutting, where it appears to pass into a thin granitic dyke, accompanied by greenstone. It is extensively used in Heathcote, both for building and kerbing, the harder varieties being well adapted for these purposes. It has also been used for making filters or "drip-stones." This dyke has probably some connection with one occurring in ½ sheet 51 S.W.

   Pigeon Hill, Maldon. ½ sheet 14 S.W.
   Occurs in granite; a hard, granular, silico-felspathic base, with scattered, rounded quartz crystals.

   Top of hill in section 5, Harcourt. ½ sheet 13 N.W.
   This rock consists of a microcrystalline mixture, in nearly equal proportions, of flesh-colored orthoclase, a white striated felspar (most probably oligoclase) and quartz. (See Table of Analyses, page 94.)

   Mount Alexander. ½ sheet 13 N.W.
   Similar to the last; but, on account of the appearance of mica in places, the rock would come under the designation of "granitite."

   O'Keefe's Shaft (No. 3), Coliban Water Supply, Preston Vale. ½ sheet 13 N.W.
   Very hard, fine-grained, grey felsite, with quartz veins, occurring 50 feet from surface, and coated with an infiltration of carbonate of lime.

Those marked with an * occur as dykes (Elwes).
PLUTONIC ROCKS.—CASE II.

White, granular felspathic rock, with very little mica.

*103. Ternary Granite. Map No. Rb 75. Road between sections 48 and 49, parish of Langley. ¼ sheet 5 N.W.
Brown, fine-grained, hard, granular granite, with very little mica.

*104. Felspathic, Granular Rock. Map No. Ra 7. Near allotment 2, section 2a, Maldon. ¼ sheet 14 S.W.
Traverses Silurian rocks, and contains mica. Quartz is not visible, but forms, probably, a component part of the granular base.

Dense, white base, with quartz and black flakes, probably decomposed mica.

*106. Felspathic Rock. Map No. Ra 34. West branch of German Gully, Maldon. ¼ sheet 14 S.W.
Similar to the last.

*107. Felspathic Rock. Map No. Ra 42. Near the Otago Reef, Sandy Creek, Maldon. ¼ sheet, 14 S.W.
Occurs in Silurian, and consists of a fine white, granular base, with white mica.

Similar to the last, with streaks of a pinkish tinge.

*109. Felspathic Rock. Map No. Ra 35. Near east corner of lot 7, section 1b, Maldon. ¼ sheet 14 S.W.
White, rather soft, felspathic and micaceous rock, with crystals of orthoclase, grains of quartz and plates of black mica.

*110. Felspathic Rock. Map No. Ra 37. Near S.W. corner of lot 3, section 1c, Maldon. ¼ sheet 14 S.W.
Grey, close-grained rock, with a felspathic base, and grains of quartz, felspar and mica.

*111. Felspathic Rock. Map No. Ra 36. Near N.W. corner of lot 3, section 1c, Maldon. ¼ sheet 14 S.W.
Grey, granular base of quartz, felspar and white mica, with blackish marks of (probably) mica. It has a slightly gneissose structure.

*112. Felspathic Rock.† Map No. Ra 64. Kangaroo Creek, south of Kangaroo township. ¼ sheet 15 N.E.
Brown base, with whitish spots of decomposed felspar, and apparently fragments of sandstone and quartz. It occurs between two beds of black slate, rich in graptolites, which have been faulted and greatly dislocated by the dyke, but only very slightly altered in character.

*113. Felspathic Rock. Yarra banks, near the Botanical Gardens. ¼ sheet 1 S.E.
Yellow, fine-grained, granular base, probably quartz and felspar, with quartz grains. The beds of slate in connection with it have a cherty character.

*114. Felspathic Rock. Same locality as the last.
White siliceous base, with quartz crystals.

*115. Felspathic Rock. Same locality as the two last.
Brown and earthy, with small cavities from which some mineral has decomposed.

Argillaceous base, with embedded brown felspar crystals, and rounded particles of an unknown mineral, giving the rock an amygdaloidal appearance.

Those marked with an * occur as dykes (Elvans).
† This specimen comes from the same locality as specimens 67-70, Case III., and is most probably "decomposed" diorite-porphyry. See Note, page 17.
*117. Decomposed Rock.
   Map No. R 8.
   Moonee Ponds. 1/4 sheet 1 N.W.
   Occurs in Upper Silurian; it resembles an older basaltic clay, with patches of a greenish, decomposed, probably magnesian mineral.

*118. Felspathic Rock.
   Portland.
   A white, felspathic base, with embedded crystals of quartz and glassy-looking felspar.
   Presented by E. Dacomb, Esq.

*119. Schorl Rock.
   Mount Singapore, Corner Inlet.
   Black, fine-grained rock, consisting of tourmaline and quartz. Occurs traversing granite, and has been opened as an auriferous lode.

*120. Granitic Quartz Porphyry.
   Map No. R 94.
   Back Creek, east of Spring Plains. 1/4 sheet 51 S.W.
   Consists of a white, finely granular base, in which are embedded crystals of quartz and felspar, and a very little white mica. It commences at the granite boundary on Dr. Baynton's station, can be traced for about 4 miles due north (magnetic), and is most likely a continuation of the dyke that runs through Heathcote. (See Note following specimen No. 97.) It is sometimes mottled brown, red and white, and to the north loses its mica. It is sometimes very hard, but apparently decomposes easily. In places along its course the Lower Silurian rocks rest on it in cappings or outliers.

121. Quartz Crystals.
   Same locality as last.
   A combination of the double six-faced pyramid and hexagonal prism. These crystals are liberated by the decomposition of the rock, and may be collected from the surface gravel along the outcrop of the dyke.

PORPHYRIES.

1. Earthy Felspar Trap.
   Map No. Ra 29.
   Lot 3, parish of Newham. 1/4 sheet 6 N.W.
   Grey, earthy base, with embedded, rounded fragments, probably decomposed felspar.

2. Felspar Trap.
   Map No. Ra 25c.
   Brooch's Monument, N.E. of Mount Macedon. 1/4 sheet 6 N.W.
   Partially decomposed felspar base, with crystals of semi-transparent felspar, and speckled with minute, black marks. (See "Building Stones," No. 20.)

3. Felspar Porphyry.
   Map No. R 52.
   Hill between Rochfort and Newham. 1/4 sheet 5 S.W.
   Brown base, with scattered, glassy-looking felspar crystals. (See "Building Stones," No. 18.)

*4. Felspar Porphyry.
   Map No. R 48.
   Dividing Range, north of Newham. 1/4 sheet 5 N.W.
   Fine-grained, granitic base, with embedded felspar crystals. Occurs in granite. (See "Building Stones," No. 19.)

5. Felspar Porphyry.
   Map No. Ra 27b.
   Dryden's or Hanging Rock. Lot 6, Newham. 1/4 sheet 6 N.W.
   Light-grey base, speckled with black, with embedded felspar and quartz crystals, and patches of yellow, decomposed felspar. (See "Building Stones," No. 22.)

Note.—The "Hanging Rock" is a peculiar isolated outburst of felspar trap, of a light color, divided by numerous joints into rudely columnar forms, 30 to 40 feet in height, and exhibiting its structure well displayed in large circular and funnel-shaped cavities, which are abundant throughout the mass.

Those marked with an * occur as dykes (Elvans).
*6. **Felspar Porphyry.**

*Deep shaft on range between Daylesford and Deep Creek.*

Slate-colored rock, with embedded felspar and fragments of shale.

*7. **Felspar Porphyry.**

*Same locality as last.*

Containing veins of a siliceous carbonate of lime.

*8. **Felspar Porphyry.**

*Orr’s Kangaroo Creek. Lot 3, section 4, parish of Burke. 4 sheet 9 S.W.*

White and yellow, granular, felspathic base, with small crystals of quartz and felspar.

*9. **Felspar Porphyry.**

*South boundary of lot 4, section 2A, near S.W. corner of parish of Tarrangower. 4 sheet 14 S.W.*

Dense, grey, granitic base, with embedded felspar.

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**Case III.**

**Porphyries (continued), Syenites, Greenstones.**

10. **Felspar Porphyry.**

*Map No. Ra 16b. East flank of Mount Macedon. 4 sheet 6 N.W.*

Light yellowish-brown, earthy base, with pinkish veins, and containing quartz crystals and decomposed pieces of felspar. (See “Building Stones,” No. 16.)

11. **Felspar Porphyry.**

*Map No. Ra 26c. Mount Diogenes or “Camel’s Hump,” Mount Macedon. 4 sheet 6 N.W.*

Light-colored, granular base, with black specks, probably hornblende, and enclosing crystals of orthoclase, felspar and quartz.

12. **Felspar Porphyry.**

*Map No. Ra 27c. Drydens or “Hanging Rock,” Lot 6, parish of Newham. 4 sheet 6 N.W.*

Granular, felspathic base, with crystals of felspar and dark specks, probably hornblende.

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13. **Felspar Porphyry.**

*Map No. Ra 26b. “Camel’s Hump,” Mount Macedon. 4 sheet 6 N.W.*

Dark-grey, fine-grained (oligoclase), felspathic base, with crystals of yellow and glassy-looking felspar—oligoclase and orthoclase—and black specks, probably schorl or hornblende. (See Table of Analyses, page 94.)

14. **Felspar Porphyry.**

*Map No. Ra 16c. East flank of Mount Macedon. 4 sheet 6 N.W.*

Very dark, hard, sub-crystalline base, with yellowish-green crystals of glassy-looking felspar. (See “Building Stones,” No. 17.)

15. **Felspar Trap.**

*Map No. Ra 16a. Same locality as the last.*

Dark-colored, hard, felspathic rock, without distinct crystals of felspar. (See “Building Stones,” No. 15.)

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16. **Felspar Porphyry.**

*Map No. Ra 25b. Brock’s Monument, N.E. of Mount Macedon. 4 sheet 6 N.W.*

Grey, dense granular base, with crystals of glassy-looking orthoclase.

17. **Granitic Porphyry.**

*Map No. R 46. Dividing Range, north of Newham. 4 sheet 5 S.W.*

Hard, grey base, with crystals of glassy-looking and white felspar, black mica, hornblende and quartz.

18. **Granitic Porphyry.**

*List No. R 100. East of Barfold, parish of Em-berton. 4 sheet 13 S.E.*

Occurs in Silurian rocks, and consists of a grey, granitic base, with crystals of quartz, greenish-yellow felspar, a little mica and hornblende.

*18. Granitic Porphyry.*

*List No. R 100. East of Barfold, parish of Emberton. 4 sheet 13 S.E.*

Occurs in Silurian rocks, and consists of a grey, granitic base, with crystals of quartz, greenish-yellow felspar, a little mica and hornblende.
19. Felspar Porphyry.  
Map No. Rb 95.  
_N.E. of parish of Baynton._  
1 sheet 51 S.W.

Dark-grey, nearly homogenous felspathic rock, with small crystals of felspar. Occurs at the junction of the Granite and Lower Silurian, associated with gneiss.

**20. Granitic Porphyry.**  
Map No. Rb 79.  
_West of Lancefield Road, and south of the parish of Baynton._  
1 sheet 5 N.W.

Occurs in granite. It consists of a dark-grey, crystalline base of quartz, felspar and hornblende, with scattered particles of amorphous quartz, crystals of felspar and a little mica. The quartz is occasionally coated with some dark-green mineral.

**21. Felspar Porphyry.**  
Map No. Rb 76.  
_Section 50, Langley._  
1 sheet 5 N.W.

Hard, dense, grey base, with crystals of felspar, rounded grains of quartz, and specks of magnetic pyrites and hornblende. Traverses granite.

**22. Felspar Porphyry.**  
Map No. Rb 71.  
_Section 72, Langley._  
1 sheet 5 N.W.

Similar to the last, with mica crystals.

**23. Felspar Porphyry.**  
Map No. Rb 95.  
_N.E. of parish of Baynton._  
1 sheet 51 S.W.

Dark base, with felspar crystals. Occurs with No. 19.

**24. Felspar Porphyry.**  
Map No. Rb 95.  
_Same locality as last._

Siliceous base, with felspar in small crystals, and black specks of either mica or some hornblende mineral. It occurs with Nos. 19 and 23.

**25. Felspar Porphyry.**  
Map No. Ra 58.  
_Spring Hut._  
1 sheet 14 N.W.

Occurs in granite. Dark-grey base, with crystals of felspar and rounded grains of quartz.

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*26. Felspar Porphyry.**  
Map No. Ra 6.  
_Near lots 19 and 13, section 2A, parish of Baringhup._  
1 sheet 14 S.W.

Occurs with granite in Silurian; a fine-grained base, with mica, quartz and felspar crystals.

**27. Felspar Porphyry.**  
Map No. Ra 4.  
_Lot 3, section 2A, Tarrangower._  
1 sheet 14 S.W.

Occurs in Silurian. Light-grey, granitic base, with flesh-colored felspar crystals, a little quartz and mica.

**28. Felspar Porphyry.**  
Map No. Ra 5.  
_Lot 4, section 2A, Tarrangower._  
1 sheet 14 S.W.

Occurs in Silurian. Grey and flesh-colored base, with felspar and quartz crystals and a little mica.

**29. Granitic Felspar Porphyry.**  
List No. Rs 20.  
_Rose's Gap, Grampians._

Felspathic base, with quartz, felspar, and mica.

**30. Syenitic Felspar Porphyry.**  
List No. Rs 25.  
_Same locality as last._

Red, silico-felspathic base, with felspar and hornblende crystals and quartz.

**31. Syenitic Porphyry.**  
List No. Rs 26.  
_Rose's Gap, Grampians._

Flesh-colored, felspathic base, with hornblende, greenish-yellow felspar and quartz.

**32. Felstone Porphyry.**  
List No. Rsr 18.  
_McKenzie's Falls, Grampians._

Brown, flinty base, with glassy-looking felspar, quartz and a black mineral. It weathers yellow.

**33. Felstone Porphyry.**  
List No. Rsr 18.  
_Same locality as the last._

---

Those marked with an * occur as dykes (Elvans).
PLUTONIC ROCKS.—CASE III.

35. **Felstone Porphyry.**
List No. Rs 17.
Newbery's Nob, Broken River.
Hard, semi-flinty base, with quartz and felspar crystals, a little mica and hornblende. Weathers red.

36. **Micaceous Felspar Trap.**
Dandenong Ranges.
Dark-colored base, with much black mica in hexagonal plates.

37. **Felspar Porphyry.**
Running Creek, Upper Yarra.
Flesh-colored, silico-felspathic base, with enclosed crystals of felspar, quartz and hornblende.

38. **Felstone.**
Diamond Creek, Upper Yarra.
Flinty, greenish, felspathic rock, with crystals of glassy-looking felspar, quartz and little mica.

39. **Syenitic Felspar Porphyry.**
List No. Re 12.
Dargan's Station, Dandenong.
Dark-grey base, with felspar and hornblende crystals.

40. **Felspar Porphyry.**
List No. Rd 5.
Dandenong Ranges.
Dark, felspathic base, with much mica in hexagonal plates.

41. **Syenitic Porphyry.**
List No. Re 11.
Police Barracks, Dandenong.
Grey base, with felspar, quartz and hornblende.

42. **Syenitic Porphyry.**
King River.
Felspathic base with felspar, quartz, hornblende and a small embedded garnet.

43. **Felstone Porphyry.**
List No. Rs 20.
King River.
Yellowish, felspathic base, with flesh-colored felspar, quartz and probably hornblende.

44. **Felstone Porphyry.**
List No. Rs 20.
King River.
Similar to the last, but flesh-colored.

45. **Felspar Porphyry.**
List No. Rs 60.
Base of Mount Timbertop.
Pinkish-grey, felspathic base, with felspar, quartz and probably hornblende.

46. **Felspar Porphyry.**
List No. Rs 58.
Base of Mount Timbertop.
A granular compound of white, opaque, triclinic felspar, quartz, and a dark mineral in six-sided plates (mica?) in a base, probably the same as No. 49.

47. **Decomposed Greenstone.**
List No. Rs 68.
Same locality.
Yellow, partially decomposed, magnesian rock, containing marks of crystals, probably hornblende.

48. **Felspar Porphyry.**
List No. Rs 57.
Same locality.
Pinkish felspathic base, with felspar and quartz crystals.

49. **Serpentine.**
List No. Rs 67.
Same locality.
Dense, dark-green, nearly black rock, with thin seams of chrysolite. (See Table of Analyses, page 94.)

50. **Syenite. (?)**
Map No. Ra 50.
From drift in the bed of the Coliban River, east of Elphinstone.
Composed of crystalline flesh-colored felspar, with granular chlorite.

51. **Felspar Porphyry.**
Murindate Hill, Gippsland.
Hard, white, felspathic base, with yellow felspar crystals and quartz grains.

52. **Felspar Porphyry.**
Map No. Rd 37.
Werribee Gorge.
Hard, light-grey, felspathic base, with quartz and felspar. Occurs in black Silurian slate.

*Those marked with an * occur as dykes (Elvans).
16 PLUTONIC ROCKS.—CASE III.

53. Hornblende Porphyry.

*Upper Yarra.*

The upper face of this specimen appears to be a vein, composed of a base of felspar, with hornblende crystals and a little white mica. The under side is the rock in which it occurs: a base of felspar, with greenish-black mica.

54. Felspar Porphyry.

Black Mountain, Snowy River, Gippsland.

Brown, felspathic base, with quartz and felspar crystals, and enclosed fragments of a black, probably hornblende mineral.

55. Aphanite (?).

Mount Dryden, Glenorchy.

Hard, light-green rock, composed of soda-felspar and silica.

56. Greenstone.

List No. Rs 35.

Same locality as last.

Base of No. 55, with felspar crystals, partly decomposed.

Note.—The greenstone (diorite) composing the range to the east of the parish of Lancefield, is very variable in its lithological character. Mount William, at the extreme northern and highest part of the range, and at its junction with the Great Dividing Range, is composed of a very hard, dark-greenish-black, dense rock (aphanite), closely resembling a basalt, and with a metallic ring, when struck, like clinkstone; passing southwards to a lighter green, hard rock, with crystals of triclinic felspar, sometimes having the appearance of a greenish-white rock, with black dendritic (hornblendic) markings. This stone (see "Building Stone Cubes," Nos. 30, 31, and 32), were it not for its extreme hardness, and consequent difficulty and expense in quarrying and working up, would make a very handsome stone for building or ornamental purposes. Further south it passes into a black, highly crystalline, hornblendic rock, and then again to a dark-green dense rock, with specks of iron pyrites. Near the centre of this range (see ½ sheet 5 S.E.) is a fault cutting off the greenstone. Its place is supplied by a very rich and heavy brown iron-ore, or hematite (see Mineral Collection, Case 13, No. 36). The greenstone weathers externally to a rusty-brown color. The unfossiliferous Silurian shales, resting as small outliers on the top of this greenstone range (probably the remains of a denudation of the sandstone upheaved by it), and also the contiguous rocks on the west side, are all highly metamorphosed, the shales being converted into a hard jaspery porcelanite. About a mile N.E. of Mount William is the site (locally called "The Native Tomahawk Quarries"), whence the aboriginal tribes of the neighboring districts have procured the greenstone used by them for making tomahawks. From the amount of broken stone covering a large area, this quarry must have been in use for a very lengthened period.

57. Greenstone. List No. Rs 34.

Same locality.

Greenish rock, having a felspathic base, with triclinic felspar crystals and a green mineral.


Same locality.

Dense, hard, dark-colored rock, composed of triclinic felspar and probably hornblende.

59. Porphyritic Diorite.

Map No. R 24.

East of Lancefield. ½ sheet 5 S.E.

Grey base, with crystals of triclinic felspar, hornblende and occasionally arsenical pyrites. Very hard and heavy.

60. Dense Diorite.

East of Lancefield. ½ sheet 5 S.E.

Dense, hard, dark-colored, hornblendic rock. (See "Building Stones," Nos. 11, 12, 13, and 14.)

Those marked with an * occur as dykes (Elvans).
Mount Parrambool, Lake Cooper.
Greenish-black mottled rock, with specks of iron pyrites.

Same locality as last.
The same base as last, with a few scattered crystals of triclinic felspar.

63. GREENSTONE.
Mount Camel Range, Colbinabbin.
A concretionary nodule. From a well 80 feet deep in greenstone; fresh, good water.

64. GREENSTONE (Diabase).
Barrabool Hills, west of Geelong. 1 sheet 24 S.E.
A hard, greenish-black, crystalline rock, probably composed of green labradorite and black augite, though the silica in the soluble portion is rather too low. The analysis by Mr. J. Cosmo Newbery gave as follows:—*

<table>
<thead>
<tr>
<th>Soluble portion</th>
<th>Insoluble portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>46.34</td>
</tr>
<tr>
<td>Iron, sesqui-oxide</td>
<td>1.29</td>
</tr>
<tr>
<td>Alumina</td>
<td>29.05</td>
</tr>
<tr>
<td>Lime</td>
<td>14.56</td>
</tr>
<tr>
<td>Magnesia</td>
<td>3.44</td>
</tr>
<tr>
<td>Soda</td>
<td>4.21</td>
</tr>
<tr>
<td>Potassa</td>
<td></td>
</tr>
</tbody>
</table>

100.95          99.04

* 40.68 per cent. is soluble in hydrochloric acid.
(See Table of Analyses, page 94.)

Note.—The diorite specimen 67, composed of pinkish felspar and black hornblende, was taken from a peculiar intrusive mass of rock, several acres in extent, that in most places, where exposed, consists of diorite, but assumes at others granite, syenitic, porphyritic and brecciated characters. Thus, at its junction with the black graptolite slates of the neighborhood, where several small faults have been traced (see sketch on 1 sheet 15 N.E.), the rock bears the character of porphyry, more or less decomposed; whilst at another place, scarcely four chains off, the accession of black mica and some quartz renders the rather decomposed rock undistinguishable from decomposing granite; and from one of the small shafts, sunk for the purpose of examination, specimens of “epidosite” (vide No. 70) were also obtained. In small cavities of the porphyritic variety, crystals of “albite,” associated with abnormally formed quartz crystals, occur, and it was therefore probable that the felspar, entering into the composition of the rock, might also be “albite,” though the absence of the characteristic twinning on its cleavage planes gives it all the appearance of orthoclase. The result of Mr. J. C. Newbery’s analysis

65. GREENSTONE (Diabase).
Same locality as last.
Identical with No. 64, but more highly crystallized.

66. DIORITE. Map No. R 98.
Near S.E. corner of section 15, parish of Metcalfe. 1 sheet 13 S.E.
A very hard rock. It occurs traversing Silurian strata, and is composed of triclinic felspar and hornblende.

67. DIORITE.
Tarilta, or Kangaroo, near Guildford. 1 sheet 15 N.E.
See Note.
(See Table of Analyses, page 94.)

68. DECOMPOSED DIORITE.
Same locality as last.
This specimen was taken from the junction with the graptolite slates of the neighborhood.
See Note.

69. DECOMPOSED DIORITE.
Same locality as 67.
See specimen 68.
See Note.

70. EPIDOSITE (Epidote Rock).
Same locality as 67.
Composed of light-green epidote, quartz and occasionally crystals of hornblende. (See Table of Analyses, page 94 and No. 7.)
See Note.
PLUTONIC ROCKS.—CASE III.

(see No. 6, Table of Analyses) proves it, however, clearly to be “albite,” and the rock is therefore diorite, according to recent views on petrographical classification. The adjoining fossiliferous strata are not, or but very slightly, altered, and hand specimens can easily be obtained, in which one half consists of black slate, with well preserved graptolites, and the other of the porphyritic variety of the intrusive rock. The brecciated variety, apparently a mixture of chips of Silurian rock and of the dioritic paste, occurs in places only along the boundary of the two formations.

*71. Micaceous Diorite.
Castle Reef, Raspberry Creek, near Wood’s Point.
Dense, greenish-grey base, probably an intimate mixture of triclinic felspar and hornblende. The mica occurs in silvery thin plates, and has a talcose appearance. It occurs as a dyke, in which rich auriferous quartz-veins are worked.

*72. Diorite (?)
Same locality as 71.
Probably No. 71, partially decomposed.

73. Greenstone (Diorite).
Near Bushy Creek, Hopkins’ Hill.
Hard, dark-colored rock, composed of triclinic felspar and hornblende.

74. Greenstone (Diabase).
List No. R 125.
Summit of Mount Camel, near Heathcote.
Hard, black, fine-grained, crystalline rock.

75. Greenstone (Diabase).
List No. R 125.
Summit of Mount Camel.
Dark greenish-black rock, made up of crystals of hornblende, with a little felspar.

76. Greenstone (Diabase).
List No. R 125.
Mount Camel.
Containing crystalline veins of calcite.

77 and 78. Greenstone (Diabase).
List No. R 124.
Blake’s Farm, 4 miles south of Mount Camel.
This rock has the appearance of being horizontally stratified. It contains veins of calcite and alternate layers of greenish and reddish colored fibrous crystals of some pyroxenic mineral.

79. Selwynite.
List No. Rb 21b.
This mineral is allied to “pyrosclerite,” but differs materially from it in its chemical composition and physical properties, and therefore forms a new mineral species. It occurs massive, as a vein, in the Upper Silurian rocks, 4 miles north of Heathcote, and is traversed by thin seams of tale. Its hardness is 3.5, specific gravity, 3.53; color, various shades of green to black. It was originally mistaken for a copper-ore. It is translucent on the edges, fracture uneven and splintery; lustre earthy; takes a fair polish, and might, perhaps, be used for ornamental purposes. Before the blowpipe it becomes white, and fuses on the edges to a greyish-white, blebby glass; gives off water in a mattrass; colors the beads of borax and salt of phosphorus faintly chrome-green, and is only partially soluble in strong acids. A quantitative analysis by Mr. J. Cosmo Newbery gave the following results:

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>47.15</td>
</tr>
<tr>
<td>Sesqui-oxide of chromium</td>
<td>7.61</td>
</tr>
<tr>
<td>Alumina</td>
<td>33.23</td>
</tr>
<tr>
<td>Magnesia</td>
<td>4.56</td>
</tr>
<tr>
<td>Water</td>
<td>6.23</td>
</tr>
</tbody>
</table>

80. Selwynite (in part).
List No. Rb 21b.
From the same locality as last.
This specimen consists of a green and white mottled mixture of selwynite, tale and veins of a white mineral, or rather two minerals, of different degrees of hardness.

Those marked with an * occur as dykes (Elvans).
VOLCANIC ROCKS.

Case IV.

OLDER VOLCANIC.

1. BASALT. List No. R 1L
   East of East Creek, Western Port.
   Black, dense and compact; contains a few embedded, crystalline grains of olivine and of a mineral with a bright bronzy lustre on the surface of cleavage.

2. BASALT. List No. R 6Rs.
   West Head, east side, Western Port.
   Greenish-black; it seems to be an intimate mixture of felspar, augite and olivine.

3. BASALT.
   North Melbourne. 4 sheet 1 N.W.
   Greenish-black, very dense and close-grained; contains olivine in crystalline grains; suitable for road metal.

4. DECOMPOSED BASALT.
   Bruthen Creek, Gippsland.
   An earthy mass of mottled appearance. Surface stained and coated with oxide of iron.

5. NODULE IN BASALT.
   King street, Melbourne. 4 sheet 1 S.E.
   Illustrates the concretionary form of decomposition which takes place in basalt and other igneous rocks.

   North Melbourne. 4 sheet 1 N.W.
   Associated with, and doubtless chiefly derived from, the iron constituents of the older basalt during decomposition.

7. BROWN IRON-ORE.
   Same locality.
   Very similar to No. 6.

8. EARTHY HEMATITE.
   Same locality.
   More oxidized than Nos. 6 and 7. Portion of a nodule in basalt.

9. DECOMPOSED BASALT.
   Deep Creek, Hurdy-gurdy.
   Very friable and incoherent; almost pisolitic, from the abundance of small ironstone nodules.

10. DECOMPOSED BASALT.
    Flemington. 4 sheet 1 N.W.
    Has become a clay, but still exhibits the concretionary structure indicative of decomposition.

11. DECOMPOSED BASALT.

12. DECOMPOSED BASALT.
    Raleigh's Punt, Saltwater River. 4 sheet 1 N.W.
    Has a thick, ferruginous, mammilated coating. Is rapidly passing into a brown, homogeneous clay.

13. DECOMPOSED BASALT.
    Same locality as last.
    Is also quickly passing into a clay; though not quite so much decomposed as No. 12.

14. DECOMPOSED BASALT.
    Deep Creek, Hurdy-gurdy.
    Of an olive-green color, when freshly broken, passing into a homogeneous clay.

15. DECOMPOSED BASALT.
    Forming a red, brown, and white mottled clay.

16. RED CLAY (Earthly).
    Map No. R 11.
    Section 7, Bolinda. 4 sheet 7 N.E.
    Associated with, if not actually resulting from, the decomposition of basalt in situ, and underlying the newer basalt.
17. Red Clay (Decomposed Basalt).
   Stony-hut Creek, Mount Blackwood.
   Partly amygdaloidal, dark red, earthy clay, with a conchoidal fracture.

18. Decomposed Basalt.
   List No. R 3 Rs.
   S.W. of East Creek, Western Port.
   Has become a reddish, earthy clay, enclosing small nodules of similar composition, coated with brown iron-ore.

   Western Port, east side.
   More argillaceous than No. 18.

   Flemington.
   Not differing much from No. 19, except that it is more friable and full of yellow veins.

   Flemington.
   Resembles No. 20, but is even less homogeneous and coherent.

22. Decomposed Basalt.
   Queen’s Ferry, Western Port.
   A mottled, steatitic clay; fracture of steatitic portions flat conchoidal.

23. Decomposed Basalt.
   Western Port, east side.
   Converted into a mottled, greenish brown and white, granular clay, rough to the feel; still shows concretionary lines.

24. Decomposed Basalt.
   Raleigh’s Punt, Saltwater River.
   Structure completely obliterated; has changed to a mottled, yellow and white, earthy clay.

25. Decomposed Basalt.
   Queen’s Ferry, Western Port.
   Has become converted into a red and greyish-white, banded clay. The greyish-white portion is mottled white, magnesian clay. It presents a smooth even surface, when cut.

   Same locality as last.
   Consists only of the felspathic portions of the basalt. In color and character resembles the greyish-white portion of No. 25.

27. Decomposed Basalt.
   Flagsstaff Hill, Melbourne.
   Converted into a soapy clay, retaining little but the felspathic elements of the rock. It is traversed by thin, ramifying veins of white, magnesian clay.

   Same locality as last.
   Greyish-white and somewhat earthy in appearance, but smooth, when cut.

   List No. R 2 Rs.
   Point S. W. of East Creek, Western Port.
   Mottled or marbled grey and white, cut surface very smooth, soapy to the touch.

   Western Port, east side.
   Color light dirty-grey, not very smooth to the touch, discolored by ferruginous matter, and concretionary.

   Map No. Rd 40.
   Batman’s Hill, Melbourne.
   Cream-colored, streaked with veins of white, magnesian clay, along the course of which it readily comes asunder; not very soapy to the touch, except where the clay is present.

32. Decomposed Basalt.
   King street, Melbourne.
   Brown, grey and yellowish-brown, in bands, with thin divergent seams of “kaolin.”

33. Amygdaloidal Basalt.
   List No. Rd 34.
   Stony-hut Creek, Mount Blackwood.
   Cavities filled with a white and reddish, soap-like mineral, in some instances translucent. It is traversed by veins of a red hydro-silicate of alumina. Base dark brown.
34. Basaltic Clay.
   List No. R (or 1).
   Hill between Korkuperrimul Creek and Lerderderg River, near Bacchus Marsh.
   Greenish-grey and red colored base, with spots of white hydro-silicate of alumina, giving the rock a porphyritic appearance.

35. Decomposed Basalt.
   Map No. Rd 40.
   Batman’s Hill, Melbourne. 1 S.E.
   Color dark grey and red mottled, with veins and patches of white, magnesian clay, stained with iron.

36. Decomposed Basalt.
   Map No. Rd 40.
   Same locality as last.
   Same as No. 35, but in a more disintegrated condition, and with a larger proportion of white clay.

37. Basalt.
   Map No. R W 1 MMB 1.
   Section 116, Darriwell. ½ sheet 19 S.W.
   In process of decomposition. Color olive-brown, speckled with red, the result of the conversion of an embedded mineral into hydrous oxide of iron. Texture fine-grained granular.

38. Basalt.
   Map No. R W 1 MMB 1.
   Section 116, Darriwell. ½ sheet 19 S.W.
   Of a light reddish-grey color, earthy and fine granular in texture; in process of decomposition.

   Map No. R W 1 MMB 1.
   Same locality as last.
   Similar to No. 38. Shows a few vesicular cavities.

40. Basalt.
   Map No. W 1 MMB 1.
   Same locality as last.
   Color greyish olive-brown, surface hollows covered with a green coating, consisting of silicate of protoxide of iron, spreading over the carbonate of lime beneath. Texture similar to No. 36.

41. Cellular Basalt.
   Map No. W 1 MMB 1.
   Same locality as last.
   Color brownish-grey, contains small embedded ironstone nodules, similar to those which constitute the ironstone gravel of the plains (“Bean-ore”).

42. Brown, Pisolitic Clay.
   List No. 10.
   Korkuperrimul Creek.

43. Greenish-Grey Clay.
   List No. 8.
   Korkuperrimul Creek.
   Decomposed basalt.

44. Grey Clay.
   Bruthen Creek, near Port Albert, Gippsland.

45. Soft, Mottled Clay.
   Bruthen Creek, near Port Albert, Gippsland.
   Contains traces of phosphoric acid.

46. Brown Clay.
   List No. 5.
   With oval, lighter brown pieces of some decomposed mineral.

47. Red Clay.
   List No. 16.
   Phillip Island, Western Port Bay.
   Similar to the last.

48. Various Clays.
   Bruthen Creek, near Port Albert, Gippsland.
   Six specimens.

   (a) (Dark-red.) Forms a fine red pigment, and can be used as red chalk.

   (b) A soapy rock, dark bluish-black and red base, with green and brown spots, giving it a porphyritic appearance.

   (c) A greenish-colored clay, with red portions like a; the green color is probably due to the silicate of the protoxide of iron.

Small fissures and cavities occur in these clays, filled with pieces of a mineral substance, which on analysis was found to be composed chiefly of phosphate of lime, phosphate of alumina and quartz, and to be more or less coated and impregnated with ores of copper (red oxide, silicate, carbonate and phosphate). The pieces have not, however, yet been found to occur in sufficient quantity to be of any economic value.

49. Basaltic Clays.
   Korkuperrimul.
   A chocolate-red base, with white streaks and spots; very aluminous and similar to 34.
VOLCANIC ROCKS.—CASE V.

Case V.

OLDER AND NEWER VOLCANIC.

OLDER VOLCANIC—(continued).

50. AMYGDALOIDAL BASALTIC CLAY. List No. Rs. 79c.
North Coast, Phillip Island.
Light chocolate color, with roundish kernels and narrow veins of white silicate of alumina and magnesia. (See Table of Analyses, page 94.)

51. AMYGDALOIDAL BASALTIC CLAY. List No. Rs 79c.
North Coast, Phillip Island.
Of marble-like appearance, colored brown, greyish-blue and white. (See Table of Analyses, page 94.)

52. GREY-AND-WHITE BASALTIC CLAY. List No. Rs 79b.
North Coast, Phillip Island.
Amygdaloidal in parts.

53. AMYGDALOIDAL BASALTIC CLAY. List No. Rs 79e.
North Coast, Phillip Island.
Dark brown, with white and yellow roundish kernels.

54. BASALTIC CLAY. List No. Rs 79f.
North Coast, Phillip Island.
Half grey, half dark red, and mottled.

55. BASALTIC CLAY. List No. Rs 79h.
North Coast, Phillip Island.
Light-grey and brown mottled.

56. RED, BASALTIC CLAY. List No. Rs 79n.
North Coast, Phillip Island.
Of pretty uniform color throughout. (See Table of Analyses, page 94.)

57. BASALTIC CLAY. List No. Rs 80.
South Coast, Phillip Island.
Red, grey and yellow mottled; portions consist of brown iron-ore.

58. BASALTIC CLAY. List No. Rs 81.
Pyramid Rock, Phillip Island.
Of marble-like aspect; bluish-grey, brown and white mottled.

59. BLACK, FINE-GRAINED BASALT. List No. Rs. 82.
Pyramid Rock, Phillip Island.
In course of decomposition; traversed by innumerable thin, white clay veins. It shows a hackly fracture, and some portions are of a grey rusty color.

60. NODULE OF PARTLY DECOMPOSED BASALT. List No. Rs 79a.
North Coast, Phillip Island.
The exterior of the nodule is decomposed to a yellowish-brown clay, while the interior yet remains a hard, dense basalt. Concentric rings in the exterior portion show the progress of the decomposition. (See Table of Analyses, page 94.)

61. BASALTIC, BROWN IRON-ORE CONGLOMERATE. List No. Rs 80.
South Coast, Phillip Island.
This specimen, though from its mode of occurrence evidently a decomposed basalt, has assumed the appearance of a brown iron-ore conglomerate; the pebble-like concretions of the rather argillaceous brown iron-ore being cemented together by a dark grey and brown ferruginous clay.
NEWER VOLCANIC.

1. Dense, Black Basalt.
   S.W. of Kyneton. ½ sheet 9 S.E.
   Compact, hard and brittle, with a flat conchoidal fracture; contains minute crystalline grains of olivine, and perhaps nepheline, disseminated through it. The rock is in appearance very much like Lydian stone. An analysis gave the following results, 5 per cent. only being soluble in hydrochloric acid:—

<table>
<thead>
<tr>
<th>Soluble portion</th>
<th>Insoluble portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>34°80</td>
</tr>
<tr>
<td>Alumina</td>
<td>88°58</td>
</tr>
<tr>
<td>Manganese</td>
<td>1°01</td>
</tr>
<tr>
<td>Iron</td>
<td>1°07</td>
</tr>
<tr>
<td>Lime</td>
<td>1°12</td>
</tr>
<tr>
<td>Magnesia</td>
<td>1°01</td>
</tr>
<tr>
<td>Potash</td>
<td>2°21</td>
</tr>
<tr>
<td>Soda</td>
<td>0°03</td>
</tr>
<tr>
<td>Titanic acid</td>
<td>1°43</td>
</tr>
<tr>
<td>Water</td>
<td>9°00</td>
</tr>
<tr>
<td>Oxide of copper</td>
<td>trace</td>
</tr>
</tbody>
</table>

   Total: 102°05

2. Dark, Compact Basalt.
   Map No. Ra 28a.
   Hill in section 28, north boundary of Woodend township. ½ sheet 10 N.E.
   With cavities containing olivine: quarried for road metal.

   List No. Rs. 1.
   Mount Shadwell.
   Fine-grained and dark colored, containing nests of olivine in green and amber-colored, crystalline masses.

   Jim Crow Creek. ½ sheet 15 S.E.
   Dark grey and compact, with fine-grained texture, and containing flattened vesicles.

5. Basalt.
   Quarry in reserve, section B2, Woodend. ½ sheet 9 S.E.
   Of a bluish-grey color, with felspar crystals (oligoclase) abundantly disseminated through it, and a few crystals of olivine. A good road metal.

   Map No. Rc 29.
   P. I. Claim, Durham Lead. ¼ sheet 63 S.E.
   Of a grey color and fine-grained, with small scattered crystals of olivine and a patch of quartz. (See Table of Analyses, page 94.)

   Map No. R. 60.
   Section 8, Newham. ½ sheet 55 S.W.
   Hard, dark and compact, close-grained and felspathic, containing a large amount of olivine. A good road metal.

8. Slaty Basalt.
   Map No. Ra 39.
   Lot 8, section 5, Burke. ¼ sheet 9 S.W.
   It is slightly porphyritic, with small crystalline grains of olivine, triclinic felspar, a black mineral and a dark red transparent one, probably zircon or garnet. The base is very hard and dense.

8a. Slaty Basalt.
   S.W. of Kyneton ¼ sheet 9 S.E.
   This resembles an altered slate, and in place has a regular dip and strike, but varying in all directions. The rock is dense and of a mottled grey color.

   Map No. Rc 28.
   Hardie's Hill, near Crisis G. M. Co., Durham Lead. ¼ sheet 63 S.E.
   Dark-colored, fine-grained, minutely vesicular and obscurely laminated.

    Degraves' Mill, near Kyneton. ¼ sheet 9 S.E.
    Of a dark grey color, containing cavities coated with crystals of chabasite, also grains of olivine and kernels of a white magnesian clay.

    Map No. Ra 66.
    Table Hill, near Guildford. ¼ sheet 15 N.E.
    Dark grey, with cavities containing carbonate of lime, spherosiderite and crystals of arragonite.

    Map No. Ra 70.
    Little Red Hill, Church's Flat, Fryer's Creek. ¼ sheet 15 N.E.
    Of a dark bluish-grey color. Occurs as a dyke, forming the eastern wall of a quartz reef. A compact, close-grained, porphyritic rock, containing embedded grains of triclinic felspar and olivine.
Map No. Re 28.  
Hardie’s Hill, near Crisis G. M. Co., Durham Lead.  ¼ sheet 63 S.E.  
Color brownish-grey: contains minute crystals of augite, olivine and triclinic felspar.

Map No. Re 8.  
Section 37, Spring Plains.  ¼ sheet 13 N.E.  
Of a bluish-grey color, and has a minutely vesicular appearance, caused by the open and irregular aggregation of its constituents, producing a roughness of surface where broken. It contains minute crystals of specular iron, having a blue tarnish, and cavities coated with carbonate of lime, running in bands, and hyalite.

Map No. Ra 101.  
Farmers’ Arms, Carisbrook road.  ¼ sheet 52 N.E.  
Of a brownish-grey color; finely vesicular.

15. Basalt (Dolerite).  
Map No. Ra 41.  
Lot 76, Carlsruhe.  ¼ sheet 9 N.E.  
Color greyish-brown, very dense and close-grained, and possessing a marked crystalline texture; rich in olivine.

Wickliffe.  
Color brownish-grey, with an open and porous sub-crystalline texture, giving the rock the appearance of being minutely vesicular.

Note—“The basaltic lava streams of the country surrounding Mount Franklin and Franklinford are of two different ages. The older is antecedent to, and has been denuded during the formation of the present main drainage channels, and now forms detached patches, capping isolated hills or long narrow stretches on the tops of ranges. The more recent streams have poured into the present valleys, and in their gradual descent from high points of eruption, appear, in some cases, to have covered the post pliocene, as well as the older and newer pliocene gold drifts (Jim Crow Creek and Mount Franklin streams). Only where they have acted as natural bars to, or lie in the line of the drainage from high levels, they are, in their turn, covered by recent alluvium (patch near Yandoit swamp, Franklinford, &c.). As regards lithological character, the two flows present no marked difference.”—(Note, ¼ sheet 15 S.E.)
“The crater of Mount Franklin, for some distance down the outside and inside slopes, consists of a mixture of earthy scoriaceous basalt and real pumice-like scoriae; the former containing pieces of transparent 'Oligoclase,' and irregular lumps, frequently above several pounds in weight, of 'Olivine,' which latter, through partial decomposition, has however lost its green color, presenting either a uniform brownish-red or brown, speckled with green, appearance. The bottom of the crater, lying about 250 feet below the highest point of the rim, has an area of several acres, and shows two very gentle rises of unequal size, divided by a narrow depression. As the whole of this area lies lower than the bottom of the rent in the rim of the crater, it is probable that its own, and the drainage down the inside walls of the latter, having no direct outflow, soaks off through the porous basalt of the mantle, and contributes largely to the numerous springs around the foot of the Mount.”—(Part of Note 1, 1/4 sheet 15 S.E.)

“Towards the north end of the crater, a narrow and very precipitous rent in its side exposes thick, variously colored beds of volcanic ash, cinders and scoriaceous conglomerate, which dip at an angle of 17° towards the centre of the Mount. It remains doubtful, whether the ravine actually owes its origin to a side outbreak of basaltic lava—the source, perhaps, of the basaltic stream in the flat below—or whether it has simply been caused by strong flows of water from the top of the Mount.”

“The termination of the Jim Crow Creek flow is characterized by a very rugged surface and rocky escarpments, resembling the recent lava flows from the craters in the Western Districts.”—(Note 8, 1/4 sheet 15 S.E.)

22. BASALT. Map No. Re 29. P.I. Claim, Durham Lead. 1/4 sheet 63 S.E.
   Color light-grey, close-grained, dense and compact: containing crystals of olivine and titaniferous iron.

23. BASALT. Flat-topped hill near Mortlake.
   Color bluish-grey; fine-grained and minutely vesicular: contains olivine.

24. BASALT. Map No. Ra 46. Parish of Coliban, S.E. of Glenlyon. 1/4 sheet 10 N.W.
   Color light-grey; fine-grained and compact: small crystals of olivine abundant throughout.

25. BASALT. Map No. R 57. Lot 30, Newham, near the Jim-Jim. 1/4 sheet 5 S.W.
   Color light-grey; compact and close-grained, porphyritic, with embedded grains of a yellowish-white mineral (triclinic felspar) and small crystals of augite (?); affects the magnetic needle and exhibits a high degree of polarity.

   Color light bluish-grey; compact, fine-grained and magnetic; porphyritic by imbedded crystals of triclinic felspar and decomposed grains of olivine.

27. BASALT (Dolerite). Map No. R 91. Magnet Hill, Baynton’s Station. 1/4 sheet 51 S.W.
   Color light-grey; exhibits a confused crystalline texture. Small crystals of magnetic pyrites, mostly converted into brown iron-ore, abound throughout the mass, causing it to strongly affect the magnetic needle, with a high degree of polarity. A specimen of this basalt, cut into a long bar, will be found in the mineral collection.—Case XIII., No. 39.

   Color brownish-grey; fine-grained, granular, slightly vesicular; vesicles coated and filled with carbonate of lime and sparry iron (epidotesiderite).
Moolort, Newstead Road.  ¼ sheet 52 N.E.
Color ash-grey; slightly vesicular, fine-grained, dull, earthy, containing specular iron sparingly distributed throughout.

Deep Creek, Carisbrook.  ¼ sheet 52 N.E.
Color bluish-grey; texture rough and uneven, fracture uneven and hackly, slightly vesicular, vesicles generally compressed and flattened.

S.W. of Kyneton.  ½ sheet 9 S.E.
Color dark-grey; compact, fine-grained, with scattered crystals of augite and triclinic felspar.

32. Volcanic Conglomerate.
Map No. Re 27.
Hardie's Hill, North side.  ¼ sheet 63 S.E.
Consists of a mixture of volcanic scoria (the vesicles filled with nodules and crystals of carbonate of lime), fragments of slate and sandstone, quartz, &c., embedded in a brown, earthy matrix.

33. Basalt (Anamesite).
Map No. Ra 66.
Table Hill, near Guildford.  ¼ sheet 15 N.E.
Color grey; fine-grained, granular, contains crystals of labradorite (?) and specular iron disseminated through it.

Magnet Hill, Baynton.  ¼ sheet 51 S.W.
Color grey, mottled. The texture of this rock is irregular and obscurely laminated. The mottled appearance of the surfaces of fracture is probably due to the rock being in an incipient state of decomposition.

Lot 2, Newham.  ¼ sheet 6 N.W.
Color grey, mottled; more irregular in texture than the last, but without any tendency to lamination; in other respects much resembling it. A green mineral fills a cavity in this specimen.

36. Amygdaloidal Basalt.
Gelantipy, Gippsland.
Cavities or vesicles filled with carbonate of lime, more abundantly with hydrous oxide of iron, and also with grains of an opaline mineral (noble opal?). Very absorbent of moisture.

Section 37, Spring Plains.  ¼ sheet 13 N.E.
Color dark grey; rough granular and slightly vesicular.

38. Basalt (Lava).  Map No. Ra 100.
Loddon Creek, Moolort.  ¼ sheet 52 N.E.
Color ash-grey; dull, earthy and has more the appearance of scoria than that of a basalt.

Map No. Re 28.
Hardie's Hill, near Crisis G. M. Company.  ¼ sheet 63 S.E.
Dark bluish-grey rock, vesicles compressed and elongated.

40. Basaltic Lava.
Mount Elephant.
This rock is full of grains and nests of olivine, with crystals of felspar (oligoclase), which give it a porphyritic aspect. It includes also some small pebbles of other rocks.

41. Scoriaceous Basalt.
Map No. Ra 112.
Mount Moolort.  ¼ sheet 52 N.E.
A mixture of compact and scoriaceous rock, in irregular bands or layers.

42. Basaltic SLAG, or Cinder.
List No. Rs 1.
Mount Shadwell.
A black, cindery fragment, having a very woody grain and appearance; contains nests and grains of olivine.

43. Vesicular Basalt (Anamesite).
Map No. Ra 122.
Moolort.  ¼ sheet 52 N.E.
Rubbly and uneven in texture; coarsely vesicular.
Mount Shadwell.
Rough, vesicular and slaggy looking: contains olivine sparingly.

46. Vesicular Basalt (Dolerite Lava).
Map No. Re 4.
Leigh River (upper flow). 4 sheet 64 N.E.
Dark brown color.

47. Vesicular Basalt (Anamesite).
Map No. Ra 96.
West bank of Loddon. 4 sheet 14 N.W.
Vesicles very large.

48. Vesicular Basalt.
Map No. Re 10.
Cargerie Creek, Leigh River. 4 sheet 64 N.E.
With some of the vesicles filled with carbonate of lime.

49. Basalt (Dense Dolerite).
Section 6, Tullamarine. 4 sheet 2 S.W.
Color light pinkish-grey; fine-grained and vesicular on the surface. Vesicles containing specular iron and labradorite (?)

50. Scoria.
Map No. M 7.
Lot 10, section 11, Yuroke. 4 sheet 2 N.W.
Vesicles coated with "hyalite."

51. Basalt (Dolerite).
Near Malmsbury. 4 sheet 9 N.W.
Color grey; rough granular, "hyalite" in botryoidal aggregations occupying surface grooves and cavities. A good building stone.

52. Vesicular Basalt.
Stone-Jug Creek, Spring Plains. 4 sheet 13 N.E.
Vesicles partly coated with carbonate of lime.

53. Basalt (Dolerite).
Near Malmsbury. 4 sheet 9 N.W.
This specimen is interesting, as showing the constituent minerals crystallized out freely in irregular shaped cavities dispersed throughout the mass: the augite in dark green, prismatic needles, and the felspar in white rectangular (or rhombic?) plates. There are also some dark-colored, hexagonal plates amongst them, with an iridescent surface (specular iron?). This rock occurs in irregular patches and seams in ordinary grey basalt, a portion of which may be seen on the reverse side of the specimen. Extensive quarries opened in this basalt, or locally called "bluestone," have furnished much of the material used in the construction of the railway works near Malmsbury.

54. Vesicular Basalt.
List No. Rs 1.
Mount Shadwell.
Contains large nests of olivine.

55. Vesicular Basalt.
List No. Rs 1.
Mount Shadwell.
Dark grey, with crystalline grains of olivine.

56. Vesicular Basalt.
List No. Rs 1.
Mount Shadwell.
Of a reddish-brown color; it presents an appearance of eroded cavities rather than true vesicles. These are coated with a yellow, crystalline mineral (olivine?). The specimen encloses a large nest of olivine in course of conversion by decomposition into mica (rubellite?).

Mount Shadwell.
This specimen represents a portion of the cast of a cylindrical hollow, or pipe, into which the lava has flowed. The central portion is entirely vesicular and scoriaceous, surrounded by concentric rings, or coats of dense texture, separable from each other, and presenting a striped surface on the planes of separation. Color reddish. Encloses a large fragment of felspar (oligoclase).

Mount Shadwell.
Of a reddish color and scoriaceous character; similar to above, except in form; contains embedded crystalline grains of olivine and also a large fragment of felspar (oligoclase).
Case VI.

NEWER VOLCANIC—(continued).

59. BASALTIC LAVA (Scoriaceous).
   Mount Shadwell.
   Color blackish-grey; vesicles much compressed and flattened, giving to the rock an appearance of a fissile or laminated structure. Somewhat resembles specimen No. 42.

60. VESICULAR BASALT.
   Map No. Ra 102.
   "Farmer’s Arms," Carisbrook.
   \frac{1}{4} sheet 52 N.E.
   In part amygdaloidal.

61. VESICULAR BASALT.
   Near Malmsbury. \frac{1}{4} sheet 9 N.W.
   Texture dense; vesicles compressed and elongated.

61A. BASALT.
   Barfold Coal’s Shaft, Barfold, Campaspe River. \frac{1}{4} sheet 13 S.E.
   Black and vesicular, with cavities containing botryoidal coatings of carbonate of lime (ferro-calcite). An analysis by Mr. J. C. Newbery, after separation of the carbonate of lime, gave:

   \begin{tabular}{lcc}
   & Soluble portion. & Insoluble portion. \\
   Silex & 35.71 & 54.16 \\
   Alumina & 40.11 & 19.37 \\
   Iron, sesqui-oxide & 13.00 & (Oxide of iron) 14.03 \\
   Lime & 1.97 & 3.14 \\
   Magnesia & 0.52 & 0.85 \\
   Potash & 0.63 & 7.13 \\
   Soda & 3.24 & \\
   Titanic acid & 0.72 & 0.08 \\
   Manganese & .. & .. \\
   Water & 1.36 & .. \\
   \hline
   & 99.18 & 102.15 \\
   \end{tabular}

   30.19 per cent. was soluble in hydrochloric acid.

62. BASALT (Earthy Lava).
   Mount Shadwell.
   Color dull reddish; encloses pieces of olivine, partly decomposed, and small ironstone pebbles.

63. VOLCANIC SCORIA.
   Mount Franklin. \frac{1}{4} sheet 15 S.E.
   Attached to this scoriaceous fragment is a piece of the subjacent rock (probably Silurian slate), over which the lava flowed.

64. VOLCANIC SCORIA.
   List No. Rs 1.
   Mount Shadwell.

65. BASALTIC LAVA.
   List No. Rs 1.
   Mount Shadwell.
   Somewhat resembling No. 57, except that the central portion is as dense as the outer, and the peculiarity of structure not so characteristically shown; contains nests of olivine.

66. VESICULAR SLAG.
   Map No. Ra 107.
   Newstead Road, Moolort. \frac{1}{4} sheet 52 N.E.
   Shows the cooled surface of flowing lava.

67. VOLCANIC \{ CINDER, SCORIA.
   Flat-topped hill, near Mortlake.
   Similar to specimen No. 64.

68. VOLCANIC SCORIA.
   List No. Rs 1.
   Mount Shadwell.
   Very cellular; the cause of the marked difference in the color of the cells is uncertain. It encloses fragments of felspar (oligoclase).

69. VOLCANIC SCORIA.
   Mount Franklin. \frac{1}{4} sheet 15 S.E.
   Dark, very cellular and light.

70. VOLCANIC SCORIA.
   Mount Elephant.
   Similar to others.

71. VOLCANIC SCORIA.
   List No. Rs 1.
   Mount Shadwell.
   Vesicles large, giving the specimen the appearance of a piece of honeycomb.
72. **Volcanic Scoria.**

Map No. R 9.

*Section 13, Yuroke.* 4 sheet 2 N.W.

Very similar to No. 71.

73. **Volcanic Scoria.**

*Mount Franklin.* 4 sheet 15 S.E.

Similar to No. 69.

74. **Volcanic Cinder.**

*List No. Rs 1.*

*Mount Shadwell.*

Encloses crystalline grains of oligoclase felspar and olivine.

75. **Volcanic Cinder.**

*List No. Rs 1.*

*Mount Shadwell.*

Contains a little olivine, and some reddish rock is embedded in the cinder.

76. **Volcanic Cinder.**

*List No. Rs 1.*

*Mount Shadwell.*

Similar to the last. In this instance the larger vesicles are somewhat spherically arranged, and are surrounded by a border of minute ones, very closely aggregated.

77. **Volcanic Cinder.**

*List No. Ra 110.*

*Mount Moolort.* 4 sheet 52 N.E.

Vesicles presenting a very similar arrangement to specimen No. 76.

78. **Volcanic Ash.**

*List No. Rs 1.*

*Mount Shadwell.*

A loose, earthy aggregate, very ferruginous.

79. **Volcanic Scoria.**

*Mount Franklin.* 4 sheet 15 S.E.

Attached to a piece of light-grey, trachytic-looking lava.

80. **Volcanic Scoria.**

*Mount Franklin.* 4 sheet 15 S.E.

Black, volcanic scoria, mixed and partly coated with silicate of lime and magnesia.

81. **Red, Ochrey Clay.**

Map No. R 14.

*Budd’s Station, Wallan-Wallan.* 4 sheet 3 N.W.

From underneath the upper basalt; baked-looking, and probably altered by contact with the molten basalt.

82. **Volcanic Ash.**

*Map No. Ra 13.*

*Section 17, Holden.* 4 sheet 7 S.E.

A loose, rough granular aggregate of red earthy lava grains and scoria.

83. **Volcanic Ash (Tufa).**

*Lake Terang, Western district.*

Closely resembling No. 82, but of a brown color and more roughly granular.

84. **Volcanic Ash (Tufa).**

*Same locality as the last.*

Similar to No. 83, but fine-grained and regularly bedded. Quarried and much used for local building purposes.

85. **Volcanic Tuff.**

*Map No. M 5.*

*Lot 10, section 11, Yuroke.* 4 sheet 2 N.W.

Contains small fragments of quartz, as if from a granite.

86. **Volcanic Slag.**

*List No. Rs 1.*

*Mount Shadwell.*

With ash.

87.

88. **Slaggy Lava.**

*Map No. Ra 13a.*

*Rocky Gully in lot 10, Doutta Galla.* 4 sheet 1 N.W.

A good illustration of the cooling, during flow, of a thick viscous fluid, like molten rock.

89. **Volcanic Ash (Conglomerate).**

*Map No. Rd 25.*

*Section 61, Anakie.* 4 sheet 19 N.E.

Showing three distinct strata of fine and coarse material.
90. **VOLCANIC ASH.**
   Map No. Rd 25.
   *Section 61, Anakie. ¼ sheet 19 N.E.*
   Of a brown color, with rounded pebbles intermixed; very dense.

91. **BROWNISH-RED ASH (Conglomerate).**
   Map No. Rd. 25.
   *Same locality.*
   Showing a very conglomeritic structure.

92. **BROWN, SCORIACEOUS ASH.**
   Map No. Rd 25.
   *Same locality.*

93. **CONGLOMERITIC ASH.**
   Map No. Rd 25.
   *Same locality.*

94. **BROWN, RUBBLY ASH.**
   Map No. Rd 25.
   *Same locality.*
   With pebbles.

95. **YELLOW, RUBBLY ASH.**
   Map No. Rd 31.
   *Bank of small creek, section 24D, Tarneit. ¼ sheet 8 S.W.*

96. **ASH.**
   Map No. Rd 31.
   *Same locality as the last.*

97. **CREAM-COLORED ASH.**
   Map No. Rd 30.
   *Section 25b, Tarneit. ¼ sheet 8 S.W.*

98. **RED, COLUMNAR CLAY.**
   Werribee River.
   The columnar structure seems due to alteration from contact with basalt.

99. **BASALT LAVA.**
   Map No. Rd 25.
   *Section 61, Anakie Hill. ¼ sheet 19 N.E.*
   Chocolate-colored and rather dense; earthy matrix enclosing crystals of hornblende, oligoclase and rubellite (red mica).

100. **VESICULAR ANAMESITE.**
    Map No. Rd 30.
    *Section 25b, Tarneit. ¼ sheet 8 S.W.*
    Brown matrix; vesicles filled with a yellowish, earthy substance.

101. **RED-AND-BLACK MOTTLED BASALT.**
    Map No. Ra 12.
    *Red Rock, Buttlejorruk. ¼ sheet 7 N.W.*
STRATIFIED OR SEDIMENTARY ROCKS.

According to the different origin and mode of formation of these rocks they may be divided into three classes:

1. Mechanical Deposits.
   a. Accumulated and stratified by water (aqueous).
   b. Accumulated and stratified by wind (aerial).

2. Chemical Precipitates.

   a. From the growth and accumulation of animal matter (zoogenic).
   b. From the growth and accumulation of vegetable matter (phytogenic).

The above three classes may again be divided, according to their lithological and mineral characters, into the five following groups:

1. Arenaceous or Siliceous deposits.
2. Argillaceous or Aluminous.
3. Calcareous.
4. Ferruginous.
5. Carbonaceous.

Nearly all sedimentary rocks are stratified, that is, they lie in beds or layers, one above the other, and often quite parallel for long distances. With few exceptions these beds or layers are made up of larger or smaller fragments and particles (debris) of pre-existing rocks, washed together and deposited from a state of suspension in water. A few only are the result of chemical precipitate of mineral substances from aqueous solution—gypsum, rock-salt and some limestones—and these usually possess a crystalline structure, not otherwise observed in "unaltered" rocks of sedimentary origin. Many contain organic remains (fossils), more or less distinct, while some are entirely composed of such. Most of these organisms are supposed to have lived and died in the water, at the bottom of which the sediment was being deposited, that now forms the rock they are now embedded in. Others, chiefly vegetable, have been washed or otherwise transported off adjoining dry land, or the land, on which they existed, has been submerged, and thus covered with sand, mud, or silt.

Respecting the igneous or unstratified rocks, it has been stated, that no marked line can be drawn between the various classes and subdivisions, as they are found, both in their physical and mineral characters and in their lithological relations, to merge into each other. This characteristic is also more or less common to the sedimentary and stratified rocks. The several sedimentary deposits have been divided into "formations" according to the order of their superposition, and consequently of their age, and these are gathered into four groups, representing longer periods of deposit:

1. Primary, or Paleozoic.
2. Secondary, or Mesozoic.
3. Tertiary, or Cainozoic.
4. Post Tertiary, or recent.

These divisions have no reference to mineral or lithological character, and no specimen of rock—such as sandstone, clay-slate, shale,
conglomerate, breccia, limestone, &c.—is exclusively confined to, or characteristic of, any geological age or formation; and therefore the geological age of a deposit will in no case afford information respecting the nature of the rock or its petrographic character. These characters are almost entirely dependent on circumstances, varying in each locality or country, and on the nature of the formation, from which the material, forming the rock, has been supplied, as well as on the physical influences, to which it may have been subjected since its original deposition. Thus, in the stratigraphical arrangement, adopted in this collection, specimens of sandstone, shale, conglomerate, breccia, limestone, ironstone, &c. occur in each geological period; and it may be observed, that some of the most recent Tertiary rock specimens are quite as hard, solid and compact as those, that belong to Secondary or Primary formations; and others, differing widely in geological age, are almost identical in their composition, texture and appearance.

Sandstone.—A typical sandstone may be described as consisting of small grains of some solid mineral, usually quartz, bound together into a solid rock, either by some cementing medium or by simple pressure. If the grains are fine, it is a fine-grained sandstone; if coarse, a coarse-grained sandstone, &c. If the cementing medium is lime, it becomes a calcareous sandstone; if iron, a ferruginous sandstone, &c. As the grains increase in size, it becomes either a grit or a conglomerate. If the particles are angular, a breccia.

Argillaceous Shale and Clay-Slate are laminated clay-rocks, formed from sediments of clayey mud, and have assumed their present form by a slow process of transmutation and mechanical consolidation. Admixtures of other matter, either during decomposition or subsequently, frequently render them either arenaceous, carbonaceous, micaceous, ferruginous, calcareous, or bituminous, as the case may be. They may both be described as laminated fissile rocks; in the one instance this texture is due to original stratification, and in the other to slaty cleavage. Clay-slate, though also distinctly stratified, does not readily separate, except along the cleavage-planes, which are quite independent of its original bedding. It is not confined to any particular geological period, although the genuine clay-slates (roofing-slate, &c.) usually occur only in the older formations. There are, however, exceptions to this rule, and in the Swiss Alps genuine roofing-slates and also common arenaceous and micaceous clay-slates are found belonging to the chalk and even to the Tertiary periods. The origin of slaty cleavage is still unsettled, but it is now generally supposed to be due to great lateral pressure, induced by forces in connection with the upheaval, disturbance and contortion of the rocks, in which it occurs. It is more or less a characteristic feature of all the Lower Silurian and older rocks of Victoria, but is seldom, if ever, observed in any formation in Victoria newer than Upper Silurian.

Sedimentary rocks are frequently much changed by infiltration of mineral matter or other metamorphic action, that tends to obliterate their original mechanical, granular structure, and they assume a semi-crystalline appearance, not unlike some rocks of undoubted igneous origin, and are then classed as Metamorphic Rocks.
PRIMARY OR PALÆOZOIC ROCKS.

LOWER PALÆOZOIC.

SILURIAN.

(METAMORPHIC AND UNALTERED.)

No formation that can be identified clearly as older than Lower Silurian has yet been recognized in Victoria. Perhaps, however, the rocks of some of the larger areas, mapped as metamorphic, represent a Cambrian or Laurentian series. In any case, much of the Lower Silurian is metamorphic, especially near the boundaries of granite masses. A large number of fossils have been collected, by the Geological Survey, from all parts of the colony, many of which are generically and specifically identical with those found in strata of Upper and Lower Silurian age in other countries. Specimens of some of them are exhibited in the Palæontological collection, and figures and descriptions of the most interesting are being prepared by Professor McCoy for publication in the "Memoirs of the Museum." The geological sketch-map shows that the Silurian rocks (represented by grey or slate color) occupy a very large surface area; they also constitute, with a few local exceptions, the true "bottom" or "bed rock" of all the Victorian goldfields, as well as the matrix or bounding walls of every known metalliferous vein, dyke, or reef; and they doubtless underlie, at a lesser or greater depth, a large portion of those tracts, where newer formations are found on the surface. The depth to which they are covered, and the age of the overlying formation, will, in each case, approximately determine the probable limits of any deep alluvial gold lead, because when it (the Tertiary deposit, or formation, in which the gold lead occurs) passes on to such newer and non-auriferous rocks, the supply of gold is, as it were, cut off; and though the gravel continues and presents no apparent difference, the lead at once becomes unprofitable. The Lower Silurian argillaceous beds are characterized by a more or less slaty and schistose structure, whilst the Upper consist mostly of jointed, rubbly, or concretionary shales and soft mudstones. Sandstones and sandy beds are common in both series. Only one limestone band (in the Upper) has yet been found, and even calcareous beds are rarely met with. Bands of conglomerate are also very rare, and the greater part of the formation seems to have been deposited in deep water. A considerable unconformity exists between the Upper and Lower series, and the total thickness of both is, probably, not less than 30,000 feet.

Building Stones.—Beds of freestone, generally a greenish-brown sandstone, are frequently met with, and are quarried for local building purposes. The stone can, however, seldom be procured of a uniform color and texture, in large quantity; and on this account, as well as from its being very subject to decay, when exposed to atmospheric action, the Silurian sandstone is not suitable for any extensive architectural or
engineering purposes. Examples of some of them are exhibited in the collection of dressed building stones. In the neighborhood of Castlemaine, Sandhurst, Maryborough and other goldfields' towns, quarries have been opened, and the stone has been used in the construction of some of the banks and other public and private buildings.

**Flagging.**—Excellent, blue flags or paving-stones occur in several districts. Those procured from Specimen Gully, near Castlemaine, are most extensively used, and will doubtless, ere long, supersede the imported Scotch flagging.

**Slates.**—Roofing-slates have been procured from several localities; but the quality of those hitherto brought into the market is very inferior. The best, as yet, are from Glen Maggie Creek, a tributary of the Macalister River, in Gippsland. No quarry has been opened there, and probably the cost of transport would preclude the slates being raised profitably at present.

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**Case VII.**

**LOWER SILURIAN.**

**Metamorphic in part.**

1. **Micaceous Schist.**  
   Map No. Rb 29B.  
   **Section 8, Sutton Grange.**  
   ¼ sheet 13 N.W.  
   Mottled, with peculiar grey micaceous bands.

2. **Mica Schist.**  
   **Begg's Station, near Hopkins' Hill.**  
   The mica disposed in very thin layers.

3. **Gneiss.**  
   Map No. R 95.  
   **N.E. of parish of Baynton.**  
   ¼ sheet 51 S.W.  
   With decomposed felspar.

4. **Metamorphic Schist.**  
   **South side of Hardie's Hill.**  
   ¼ sheet 63 S.E.  
   Gritty, with quartz grains in layers.

5. **Metamorphic Schist.**  
   Map No. Re 30.  
   **West of Leigh River, opposite Hardie's Hill.**  
   ¼ sheet 63 S.E.  
   Of a peculiar greenish-grey color, fracture slightly hackly, having a talcose appearance, with a little silvery white mica.

6. **Spotted Shale.**  
   Map No. Rb 12.  
   **Happy Gully, parish of Sedgwick.**  
   ¼ sheet, 13 N.W.  
   The markings are probably due to the development, by metamorphic action, of some augitic (fahlunite) mineral. This peculiar kind of shale is only found near the junction of the granite and Silurian rocks, as at Lancefield, Baynton's Range, the Barfold Ranges, &c.

7. **Yellow Shale.**  
   Map No. Re 30.  
   **West of Leigh River, opposite Hardie's Hill.**  
   ¼ sheet 63 S.E.  
   Laminated and quartzose.

8. **Mica Schist.**  
   Map No. Rb 17.  
   **North of Mount Emu, Sedgwick.**  
   ¼ sheet 13 N.W.  
   Grey, micaceous bands between yellow sandstone. The bands are of about equal thickness.

9. **Metamorphic Slate Rock.**  
   Map No. Ra 95.  
   **Dunolly Road.**  
   ¼ sheet 14 N.W.  
   A band of mudstone occurring between a light-blue, metamorphic rock, with spots and markings similar to No. 6.
10. Micaceous Sandstone.  
Map No. Ra 11.  
Mount Tarrangower.  1/2 sheet 14 S.W.  
With laminæ and veins of quartz.

11. Flagstone.  
Map No. Ra 82.  
Quarry near Nuggetty Gully, Maldon.  1/2 sheet 14 N.W.  

12. Micaceous Sandstone.  
List No. R (SB 11)  
Hill between Kerang Range and East Charlton.  
Metamorphic and very micaceous.

Map No. Ra 86.  
Baringhup.  1/2 sheet 14 N.W.

Map No. Ra 83.  
North of Nuggetty Reef, Maldon.  1/2 sheet 14 N.W.  
Fine-grained and micaceous. Would make a good flagstone.

15. Metamorphic Schist.  
Map No. Re 30.  
West of Leigh River, opposite Hardie's Hill.  1/4 sheet, 63 S.E.  
Of a grey mottled color and with a hackly fracture.

Map No. Ra 120.  
Loddon Creek, Moolort.  1/4 sheet 62 N.E.  
Micaceous, and fine-grained.

17. Quartz Rock.  
Map No. Ra 80.  
Nuggetty Reef, Maldon.  1/2 sheet 14 N.W.

Map No. Ra 77.  
Same locality as last.  
A dense mixture of quartz and mica, with quartz veins and magnetic pyrites.

Map No. Re 13.  
Leigh River.  1/4 sheet 63 S.E.

20. Fine-grained Sandstone.  
Mount Franklin.  1/4 sheet 15 S.E.  
Dense and micaceous.

Map No. Ra 88.  
Range south of Dunolly Road.  1/4 sheet 14 N.W.  
Very hard and dense (hornfels).

22. Metamorphosed Rock.  
Map No. Ra 28.  
Tunnelling Company's lease, Lisle's Reef, Mount Tarrangower.  1/4 sheet 14 S.W.  
Hornfels, with magnetic pyrites.

23. Altered Shale.  
List No. R (SB 25)  
Two miles north of Mount Cooper.  
Having a very flinty character.

List No. R (SB 12)  
Mount Deboolitic, Moolool.  

25. Quartzite.  
Map No. Ra 89.  
Range south of Dunolly Road.  1/4 sheet 14 N.W.

26. Siliceous Breccia.  
Map No. R 19.  
Deep Creek, Springfield.  1/4 sheet 6 N.E.  
A breccia composed of white, metamorphosed shales, porcellanite, occurring near the greenstone at Lancefield.

27. Fine, Grey, Micaceous Sandstone.  
Map No. Ra 81.  
Mosquito Reef.  1/4 sheet 14 N.W.

28. Ferruginous Quartzite.  
Map No. Ra 15.  
Near Maldon Rifle Butts.  1/4 sheet 14 N.W.  
A dense rock, composed of quartz, with white and dark bands of felspar and mica.

29. Blue, Metamorphic Rock.  
Map No. Ra 79.  
Nuggetty Reef, Maldon.  1/4 sheet 14 N.W.  
A dense hornfels.

30. Metamorphosed Rock.  
Map No. Ra 99.  
Lahn's Reef, Maldon.  1/4 sheet 14 N.W.  
(See Table of Analyses, page 94.)  
A good flagstone (hornfels).
LOWER SILURIAN.

2. White Slate. List No. Rb 169. Section 26, Spring Plains. ¼ sheet 13 N.E.
8. Drab-colored Slate. Map No. Re 16. One mile above mouth of Williamson's Creek. ¼ sheet 63 S.E.
24. **Light-Brownish Slate.**
   List No. Ba 83.
   Mouth of Miss Gully, Loddon River. ¼ sheet 15 N.E.
   Containing *Phyllograptus*.

25. **Light-Brownish Slate.**
   Map No. Ba 82.
   Hill on west bank of Campbell’s Creek, between Aberdeen’s and Tasker’s.
   With graptolites.

26. **Light-Blue Slate.**
   Map No. Ba 82.
   Same locality as the last.
   Containing *Didymograptus Logani* (Hall). Var.: *Australis* (McCoy).

27. **Slate.**
   Mount Franklin. ¼ sheet 15 S.E.
   Underlying basalt; in extremely thin laminæ.

28. **Slate.**
   Same locality as the last.

29. **Slate.**
   Same locality as No. 27.
   This would form a tolerably good slate for economic purposes.

30. **Light-Blue Slate.**
   Map No. Re 70.
   City of Manchester Company. ¼ sheet 63 S.E.
   Very soft, satiny and striated.

31. **Very Light-Grey Slate.**
   Map No. Re 2.
   Enfield Company, Durham Lead. ¼ sheet 63 S.E.

32. **Olive-Grey Slate.**
   Map No. Re 23.
   Williamson’s Creek. ¼ sheet 63 S.E.

33. **Light-Grey Slate.**
   Map No. Re 4.
   Leigh Consols Company, Durham Lead. ¼ sheet 63 S.E.
   Containing minute, embedded crystals of iron pyrites (mundic).

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**Case VIII.**

**LOWER SILURIAN—(continued).**

34. **Dark-Grey Slate.**
   Map No. Mc 1.
   City of Manchester Company. ¼ sheet 63 S.E.
   Crystals of iron pyrites, well shown on the bedding planes.

35. **Grey, Slaty Shale.**
   Map No. Re 2.
   Enfield Company, Durham Lead. ¼ sheet 63 S.E.
   With sparingly embedded cubes of iron pyrites.

36. **Grey, Slaty Shale.**
   Map No. Re 4.
   Leigh Consols, Durham Lead. ¼ sheet 63 S.E.
   With cubical crystals of pyrites, and cavities caused by the decomposition of similar crystals.

37. **Satiny Slate.**
   Map No. Re 2.
   Enfield Company’s Claim, Durham Lead. ¼ sheet 63 S.E.
   Fissile and full of iron pyrites.

38. **Grey Slate.**
   Map No. Re 7.
   City of Manchester Company’s Claim. ¼ sheet 63 S.E.
   Containing veins of iron pyrites and quartz.

39. **Black Slate.**
   Near syenitic dyke, Tarilla. ¼ sheet 15 N.E.
   Containing various species of graptolites.

40. **Black Slate.**
   Map No. Fe 17.
   Cargerie Creek, Leigh River. ¼ sheet 64 S.E.
   Containing graptolites.
### PRIMARY OR PALÆOZOIC ROCKS.—CASE VIII.

<table>
<thead>
<tr>
<th>No.</th>
<th>Rock Type</th>
<th>Map No.</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td><strong>Black Slate</strong></td>
<td>Fe 17</td>
<td>Same locality as last</td>
<td>Containing graptolites.</td>
</tr>
<tr>
<td>42</td>
<td><strong>Black Slate</strong></td>
<td></td>
<td><strong>Deddie River, Snowy River, S.E.</strong></td>
<td>Gippsland. Containing white markings of Chias-tolite.</td>
</tr>
<tr>
<td>43</td>
<td><strong>Black Shaly Rock</strong></td>
<td>R 99</td>
<td>Reef in Barfold Ranges 13 S.E.</td>
<td>Occurs in the casing of a quartz reef (slickenside); very carbonaceous.</td>
</tr>
<tr>
<td>44</td>
<td><strong>Dark Slate</strong></td>
<td>R 99</td>
<td>Barfold Ranges, 1/4 sheet 13 S.E.</td>
<td>Occurs with No. 43. It contains veins of carbonate of magnesia.</td>
</tr>
<tr>
<td>45</td>
<td><strong>Soft, White Rock</strong></td>
<td></td>
<td>Sunbury, 1/4 sheet 7 N.E.</td>
<td>Finely arenaceous.</td>
</tr>
<tr>
<td>46</td>
<td><strong>Black, Carbonaceous Shale</strong></td>
<td></td>
<td>Sunbury, 1/4 sheet 7 N.E.</td>
<td>Decomposed.</td>
</tr>
<tr>
<td>47</td>
<td><strong>Dark-Red Shale</strong></td>
<td></td>
<td>Sunbury, 1/4 sheet 7 N.E.</td>
<td>The percentage of iron is too great to render it fit for a good fire-brick.</td>
</tr>
</tbody>
</table>

**Note.**—Specimens 45 to 47 are Silurian rocks, partly decomposed and broken up in situ.—The following remarks and analyses of these specimens, 45 to 47, by Mr. J. C. Newbery, may be found interesting:—

**No. 45.**—"A white, siliceous clay, makes a good fire-brick, resembling the Dinas brick from Glamorganshire. It must not be placed in those parts of the furnace, where it could be acted on by alkaline fluxes, or certain metallic oxides. It also ought to be kept in a dry place, on account of its porous nature."—It gives on analysis—

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>93.858</td>
</tr>
<tr>
<td>Alumina</td>
<td>5.182</td>
</tr>
<tr>
<td>Magnesia</td>
<td>Trace</td>
</tr>
<tr>
<td>Water, &amp;c.</td>
<td>8.90</td>
</tr>
</tbody>
</table>

**99.930**

"It may be found advantageous to add roughly broken quartz, so as to make the brick contract and expand under changes of temperature evenly and without cracking. It would also be advisable to add about 1 per cent. of lime."

**No. 46.**—"A black carbonaceous clay."—Giving the following results:—

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>66.924</td>
</tr>
<tr>
<td>Alumina</td>
<td>17.201</td>
</tr>
<tr>
<td>Iron</td>
<td>10.349</td>
</tr>
<tr>
<td>Magnesia</td>
<td>Trace</td>
</tr>
<tr>
<td>Water, &amp;c.</td>
<td>6.008</td>
</tr>
</tbody>
</table>

**100.482**

"These clays would make good fire-bricks, where no lime or any fusible substance could come in contact with them, as the presence of such substances, together with the large percentage of iron, would cause them to fuse."
48. **Fine-grained Sandstone.**
   Map No. Re 15.
   Near City of Manchester Company. \( \frac{1}{4} \) sheet 63 S.E.
   Color yellow, with white mica.

49. **Fine-grained Sandstone.**
   Map No. Re 13.
   Same locality as the last.
   Yellow with mica.

50. **Mottled Red-and-white Sandstone.**
   Map No. Re 11.
   Gully near Grenville. \( \frac{1}{4} \) sheet 63 S.E.

51. **Brown, Micaceous Sandstone.**
   Map No. Re 17.
   Near mouth of Williamson's Creek. \( \frac{1}{4} \) sheet 63 S.E.

52. **Light Greenish-brown, Micaceous Sandstone.**
   Map No. Re 15.
   Same locality as No. 48.

53. **Brown Micaceous Sandstone.**
   Map No. Re 8.
   Same locality as No. 50.

54. **Yellow Micaceous Sandstone.**
   Map No. Re 8.
   Gully near Grenville. \( \frac{1}{4} \) sheet 63 S.E.

55. **Mottled Gritty Sandstone.**
   Near Newstead. \( \frac{1}{4} \) sheet 15 N.W.

56. **Yellow Sandstone.**
   Map No. Re 14.
   Near City of Manchester Company. \( \frac{1}{4} \) sheet 63 S.E.

57. **Soft Yellow Sandstone.**
   Map No. Ra 85.
   Eaglehawk Reef. \( \frac{1}{4} \) sheet 14 N.W.
   Slightly mottled with white.

58. **Yellow Sandstone.**
   List No. R (SR) 3.
   Wickliffe.

59. **Yellow Sandstone.**
   List No. Rb 12n.
   Section 26, Spring Plains. \( \frac{1}{4} \) sheet 13 N.E.
   Underlying basalt.

60. **Yellow Sandstone.**
   Map No. Re 14.
   Near City of Manchester Company. \( \frac{1}{4} \) sheet 63 S.E.
   Containing a large quantity of white mica.

61. **Yellow Micaceous Sandstone.**
   List No. Rb 2r.
   Section 68, Spring Plains. \( \frac{1}{4} \) sheet 13 N.E.
   With large plates of white mica.

62. **Micaceous Sandstone.**
   Map No. Re 10.
   Gully near Grenville. \( \frac{1}{4} \) sheet 63 S.E.

63. **Micaceous Sandstone.**
   Map No. Re 10.
   Same locality as the last.

64. **Fine-grained Sandstone.**
   South side of Hardie's Hill. \( \frac{1}{4} \) sheet 63 S.E.

65. **Fine-grained Yellow Sandstone.**
   List No. R (SR) 3.
   Wickliffe.

66. **Coarse-grained Micaceous Sandstone.**
   List No. Rb 1b.
   Section 67, Spring Plains. \( \frac{1}{4} \) sheet 13 N.E.
   Underlying basalt.

67. **Coarse-grained Sandstone.**
   List No. Rb 2b.
   Section 68, Spring Plains. \( \frac{1}{4} \) sheet 13 N.E.

68. **Mottled Yellow-and-red Sandstone.**
   Map No. Re 22.
   Williamson's Creek. \( \frac{1}{4} \) sheet 63 S.E.

69. **Fine-grained, Micaceous Sandstone.**
   Map No. Re 17.
   Near mouth of Williamson's Creek. \( \frac{1}{4} \) sheet 63 S.E.

70. **Pinkish Sandstone.**
   Near Newstead. \( \frac{1}{4} \) sheet 15 N.W.
   With very little mica.
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Map Number/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.</td>
<td>WHITE-AND-YELLOW SANDSTONE. Map No. Rb 16B. Section 26, Spring Plains. 1 sheet 13 N.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See Table of Analyses, page 94.)</td>
<td></td>
</tr>
<tr>
<td>72.</td>
<td>PINKISH SANDSTONE. Map No. Ra 118. Parish of Moolort. 1 sheet 52 N.E.</td>
<td></td>
</tr>
<tr>
<td>73.</td>
<td>FERRUGINOUS SANDSTONE. Map No. Ra 114. Parish of Carisbrook. 1 sheet 52 N.E.</td>
<td></td>
</tr>
<tr>
<td>74.</td>
<td>BUFF-COLORED SANDSTONE. Map No. Re 30. Williamson's Creek. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tolerably close-grained; would do for building purposes.</td>
<td></td>
</tr>
<tr>
<td>75.</td>
<td>BUFF-COLORED, MICAUSEOUS SANDSTONE. Road near Eagle Farm, Campbell's Creek. 1 sheet 15 N.E.</td>
<td></td>
</tr>
<tr>
<td>76.</td>
<td>BROWN, FINE-GRAINED SANDSTONE. Map No. Ra 27. S.E. corner of Maldon Township. 1 sheet 14 S.W.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This stone is tolerably tough.</td>
<td></td>
</tr>
<tr>
<td>77.</td>
<td>RED SANDSTONE. Map No. Ra 115. Parish of Carisbrook. 1 sheet 15 N.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exceedingly fine-grained and soft.</td>
<td></td>
</tr>
<tr>
<td>78.</td>
<td>BUFF-COLORED, Gritty SANDSTONE. Near Yandoit. 1 sheet 15 S.E.</td>
<td></td>
</tr>
<tr>
<td>79.</td>
<td>BUFF-COLORED, Gritty SANDSTONE. Leith River.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This stone would not make a building stone, as it has a tendency to flake off.</td>
<td></td>
</tr>
<tr>
<td>80.</td>
<td>YELLOW, MICAUSEOUS SANDSTONE. Map No. Ra 24. Near Edisson's Store, Sandy Creek. 1 sheet 14 S.W.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Appears to break out in good flags; it is, however, a little too soft for that purpose.</td>
<td></td>
</tr>
<tr>
<td>81.</td>
<td>FLAGSTONE. List No. Rb 58. Heathcote Road, Mia-mia. 1 sheet 13 N.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Makes a tolerably good flagstone.</td>
<td></td>
</tr>
<tr>
<td>82.</td>
<td>FINE-GRAINED AND MICAUSEOUS, DARK-GREY SANDSTONE. Map No. Re 25. Williamson's Creek. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slightly micaceous and tolerably tough.</td>
<td></td>
</tr>
<tr>
<td>83.</td>
<td>DARK BUFF-COLORED SANDSTONE. Map No. Re 13. Near City of Manchester Claim. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dense, close and fine-grained, with mica and slaty structure.</td>
<td></td>
</tr>
<tr>
<td>84.</td>
<td>LIGHT-GREY, MICAUSEOUS SANDSTONE. Map No. Re 6. Grenville Company's Claim, Durham Lead. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This specimen is almost verging on a schist.</td>
<td></td>
</tr>
<tr>
<td>85.</td>
<td>GREY SANDSTONE. Map No. Re 7. City of Manchester Company's Claim. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soft and close-grained, with schistose character.</td>
<td></td>
</tr>
<tr>
<td>86.</td>
<td>GREY, MICAUSEOUS SANDSTONE. Map No. Re 1. Garibaldi Company's Claim. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Similar to 85.</td>
<td></td>
</tr>
<tr>
<td>87.</td>
<td>SOFT, GREYISH-WHITE SANDSTONE. Map No. Re 5. Crisis Company's Claim, Durham Lead. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td>88.</td>
<td>GREY, Gritty SANDSTONE. Map No. Re 18. Williamson's Creek. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tough, micaceous, and fine-grained.</td>
<td></td>
</tr>
<tr>
<td>89.</td>
<td>LIGHT-GREY SANDSTONE. Map No. Re 3. Duke of Cornwall Company's Claim. 1 sheet 63 S.E.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very soft and micaceous, containing specks of iron pyrites.</td>
<td></td>
</tr>
</tbody>
</table>
Williamson's Creek. ¼ sheet 63 S.E.
Very hard, close-grained and compact.

91. **Soft, Yellow Grit.**
Map No. Ra 24.
Near Eddison's Store, Sandy Creek. ¼ sheet 14 S.W.
Very friable and coarse grained.

92. **Soft, White Grit.**
List No. Rb 25b.
Section 2n, Lyell. ¼ sheet 13 N.W.
Taken from bed of Myrtle Creek; contains a peculiar ferruginous marking.

93. **Coarse, Brown Grit.**
List No. Rb 1b.
Mia-mia. ¼ sheet 13 N.E.
Very hard, the particles being firmly cemented together; immediately underlying basalt.

94. **Red Grit.**
Mount Franklin. ¼ sheet 15 S.E.
From under the basalt; contains ferruginous quartz veins.

95. **Fine-grained, Yellow Sandstone.** Map No. Re 12.
Near City of Manchester Company's Claim. ¼ sheet 63 S.E.

96. **Dark-colored, Siliceous Sandstone.** List No. Rb 11b.
Section 40, Redesdale. ¼ sheet 13 N.E.
Makes an exceedingly good flagstone, and can be obtained of various thicknesses.

97. **Yellow, Siliceous Sandstone.** Map No. Re 24.
Williamson's Creek. ¼ sheet 63 S.E.
Coarse-grained. Would make a good stone for flagging, &c.

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**Case IX.**

**UPPER SILURIAN.**

1. **White, Micaceous Sandstone.**
Flemington. ¼ sheet 1 N.W.
Mica in very fine plates.

2. **Yellow, Micaceous Sandstone.**
Same locality as the last.

3. **Yellow, Micaceous Sandstone.**
Yarra banks. ¼ sheet 1 S.E.
Much coarser than the two preceding specimens.

4. **Micaceous Sandstone.**
Flemington. ¼ sheet 1 N.W.

5. **Yellow, Micaceous Sandstone.**
Moonee Ponds Creek. ¼ sheet 1 N.W.
Plates of mica are numerous and large.

Section 8, Will-Will-Rook. ¼ sheet 2 S.W.

East of township of Heathcote.
Entirely composed of siliceous grains, assuming a very oolitic structure, cemented together in a ferruginous matrix; very friable.

8. **Yellow Grit.** List No. RB 20.
Kilmore Creek. ¼ sheet 4 S.W.
Contains sections of Encrinital stems, &c.

9. **Dark-Blue Sandstone.**
Moonee Ponds Creek. ¼ sheet 1 N.W.
Very hard and fine-grained, with quartz strings.
10. **Harp, Dark-Blue Sandstone.**  
   List No. Rb 48.  
   One mile north of Greensborough Bridge, Plenty River. 2 S.E.

11. **Brown, compact, Micaceous Sandstone.**  
   List No. Rb 51.  
   Rise west of Diamond Creek Bridge.  
   Contains fossils. Used at above locality for building purposes. Cube No. 48a, "Building Stones," is the same stone, showing its capabilities for receiving ornamentation.

12. **Buff-colored, close-grained Sandstone.**  
   List No. Rb 47.  
   Half a mile north of Greensborough Bridge, Plenty River. 2 S.E.  
   With ferruginous quartz veins; from the river-bank.

13. **Hard, close-grained Sandstone.**  
   Range east of Heathcote.  
   Containing a few fossils. If in sufficient quantity, would make a good building stone.

14. **Hard, White, Siliceous Sandstone.**  
   Same locality as the last.  
   Entirely made up of fossil mollusca, principally of the genera orthis, rhyncconella, &c.

15. **Siliceous Sandstone.**  
   List No. RBb 51.  
   Summit of Mount Ida, near Heathcote.  
   Containing shells similar to last, together with Encrinital stems.

16. **Red, Micaceous Sandstone.**  
   List No. RBb 50.  
   Range east of Heathcote.  
   Containing fossils.

17. **Hard, White, Siliceous Sandstone.**  
   List No. RBb 50.  
   Range east of Heathcote.  
   Full of fossils.

18. **White Sandstone.**  
   List No. RBb 50.  
   Range east of Heathcote.  
   More porous than the last and containing fossils.

19. **Fossiliferous Breccia.**  
   Drummond's Point, Gaffney's Creek.  
   Entirely composed of fragments of organic remains: angular and partially rounded pieces of ferruginous sandstone and white mudstone, with a little clay. The fossils appear to be principally pieces of marine shells, and Encrinital stems.

19A. **Fossiliferous Breccia.**  
   Near Alexandra Diggings, Goulburn River.  
   Similar to the last.

20 and 21. **Brown, Micaceous Sandstone.**  
   Moonee Ponds, near Flemington. 1 N.W.  
   Containing fossils. The Upper Silurian in this neighborhood consists of grey, white and brown shales and sandstones, containing fossils, corresponding to those of the "May Hill" sandstone of English geologists.

22 and 23. **Concretionary Sandstone.**  
   Map No. R 7.  
   Section 5, Bulla-bulla. 2 S.E.

24. **Blue, Siliceous Sandstone.**  
   Castle Reef, G. M. Co., Raspberry Creek, near Wood's Point.  
   With peculiar oval, ring-like impressions and ferruginous veins.

25. **Blue Mudstone.**  
   List No. Rb 46.  
   Greensborough Bridge, Plenty River. 2 S.E.  
   Finely micaceous.

26. **Micaceous, Yellow Mudstone.**  
   List No. Rb 46.  
   Same locality as the last.  
   More shaly than the last.
27. Banded, fine-grained Sandstone.  
List No. Rb 46.  
One mile north of Greensborough Bridge, Plenty River. ¼ sheet 2 S.E.  
With ferruginous, gritty veins on face of joints.

List No. Rb 50.  
Creek west of Diamond Creek.

29. Blue, Slaty Shale.  
List No. Rb 53.  
Diamond Reef, Diamond Creek.

30. Blue, Slaty Shale.  
List No. Rb 54.  
Same locality as the last.

List No. Rb 56.  
Same locality as the last.

32 and 33. Light and Dark Bluish-Grey Sandstone.  
Costerfield, near Heathcote.  
Forming walls of the antimony reefs; covered with dark markings, probably organic.

34. Purple, Rubbly Shale.  
List No. Rb 22b.  
West of Mount Ida, near Heathcote.  
It forms the walls of the dyke in which the mineral “Selwynite” occurs, and has a porphyritic appearance.

35. Mottled, fine-grained Breccia.  
List No. R 121.  
Whiting’s Reef, 7 miles north of Heathcote.

36. Fine, Micaceous, Conglomerary Sandstone.  
Moonee Ponds Creek. ¼ sheet 1 N.W.

37. Brecciated, fine Conglomerate (Grit).  
Buchan Road, near Boggy Creek, Gippsland.  
Exceedingly hard and compact, the component materials being of a small size and closely packed.

38. Coarse Conglomerate.  
Anderson’s Creek, Upper Yarra.

39. Blue, Brecciated Conglomerate.  
List No. Rb 55.  
Diamond Reef, Diamond Creek.  
Appears to be made up of rounded and angular pieces of blue, micaceous mudstone and sandstone, with iron pyrites plentifully scattered through it.

40. Sandstone Breccia.  
Greenstone range, east of Lancefield. ¼ sheet 5 S.E.  
 Entirely composed of angular pieces of white, cherty rock in a ferruginous matrix.

41. Limestone.  
List No. Rd 3b 24.  
Yering Cave, Upper Yarra.  
A very handsome marble. (See No. 55, “Building Stones.”) Analysis:—  
Carbonate of lime ... ... 92:60  
” magnesia ... ... 0:36  
” iron ... ... 2:12  
” manganese ... ... 0:48  
Silica and clay ... ... 3:24  
98:80

42 and 43. Altered Shale.  
Map No. R 41.  
Greenstone range, east of Lancefield. ¼ sheet 5 S.E.  
These shales occur flanking a greenstone range, and have undergone a high degree of metamorphism, converting them into jasper rock.

44. Quartzite.  
List No. R 122.  
N.W. of Mount Ida, Heathcote.  
This specimen shows the rock in two stages—gritty and compact. It was supposed in the neighborhood of its occurrence to be limestone.

45 and 46. Dense, White Jasper Rock (in part brecciated).  
Map No. Ra 31a.  
“Marble Hill,” section 79, Chintin. ¼ sheet 6 N.E.  
This rock is the so-called “Statuary Marble”1 shown on old surveys of the above neighborhood.

47. Banded Mudstone.  
Map No. R 3.  
Moonee Ponds Creek, Broadmeadows. ¼ sheet 2 S.W.
44 PRIMARY OR PALÆOZOIC ROCKS.

UPPER PALÆOZOIC.

DEVONIAN, CARBONIFEROUS AND PERMIAN.

The specimens placed under the above heading are collected from groups of strata that occur in widely separated, more or less isolated, patches, from the Glenelg to the Snowy River. No remains of a fossil fauna have as yet been found in them, and fossil plants in a few localities only, viz. : Bacchus Marsh, the valley of the Devil's River, the valley of the Avon in Gippsland and on Mount Tambo. The greatest development of these rocks occurs to the westward, in the Grampians, Victoria, Serra and Dundas ranges; and to the eastward, in North Gippsland, extending from Bushy Park and Lindenow north-westerly to Ben Cruachan and Mount Wellington, whence they probably also extend in outlying patches across the Dividing Range to the valley of the Devil's River. They are certainly intermediate in age between the Upper Silurian, on the one hand, and the Carbonaceous or coal-bearing rocks on the other, which latter almost certainly rest on them under the greater part of the Gippsland plains, from Hayfield and Mewburn Park to Rosedale, Sale, Stratford, Lake Wellington, &c., and if so, preclude the existence of auriferous deep leads under these plains. The lithological character of the different beds, and the general physical aspect and prevailing color of the formation bear a very close resemblance to those of the Lower Carboniferous and Devonian formations of Britain. (For further details, see "Notes on the Physical Geography, Geology, and Mineralogy of Victoria"—Intercolonial Exhibition Essays, 1866.)

Traces of copper have been found in the shales of this formation on the Devil's River, and thin veins of micaceous iron-ore occur in the Grampians.

Good freestone for building purposes, grindstones and flags for paving can be procured from these rocks in various localities.

In South Australia the copper lodes are associated with similar rocks, and with veins of micaceous iron-ore, also with thick beds of crystalline, white-and-grey marble or limestone. The latter has not been observed in Victoria, and it seems probable that the lower beds of the formation, with which, in South Australia, these valuable deposits are associated, are not represented here.

The areas occupied by this formation are colored light Indian red on the sketch-map, and numbered 8.
Case X.

DEVONIAN, CARBONIFEROUS AND PERMIAN.


3. Purple, Micaceous Sandstone.
   Hopkins' River, 4 miles north of Hexham.

4. Thin-bedded, Purple, Micaceous Sandstone, Shale and Grit.
   Hopkins' River, 4 miles north of Hexham.

5. Yellow-and-purple, coarse-grained, rather gritty Sandstone.
   Same locality as the last.


7. Red Sandstone.
   List No. R (15) Mount Timbertop.

8. Sandstone.

9. Indurated Shale.
   List No. R (16) Beerjarg Camp, Broken River.
   Particles of carbonate of copper occur on the faces of the beds.

10. Slaty, Micaceous Shale.
    List No. R (16) Same locality as the last.
    Often very micaceous on the planes of bedding.
    (See Table of Analyses, page 94.)

    East bluff of Mount Wellington, Gippsland.
    Presented by Dr. F. Mueller.

12. Indurated Sandstone.
    Mount Wellington, Gippsland.
    Presented by Dr. F. Mueller.

13. Fine, Micaceous Sandstone. R (8R)
    Beerjarg Camp, Broken River.
    Showing ripple marks. (See Table of Analyses, page 94.)

    Macalister Ranges, Gippsland.
    Presented by Dr. F. Mueller.

15. Micaceous Sandstone.
    Same locality as the last.
    Red sandstone, with green mica.
    Presented by Dr. F. Mueller.

16. Siliceous Sandstone.
    Mouth of Stony Creek, Gippsland.
    Siliceous red and grey sandstone, with fossil vegetable impressions.

17. Purple Mudstone.
    Stony, or Moitun Creek, Dargo Road, Gippsland.
    Purplish-red mudstone, with greenish mottlings.

18. Micaceous Sandstone.
    Same locality as the last.
    Reddish and greenish-grey, micaceous sandstone, with fossil vegetable impressions. The green markings are probably due to carbonate of copper.

19. White, Gritty Sandstone.
    Coliban River, S.W. of Kyneton. ¼ sheet 9 S.W.
    See Note.
Note.—A white, light-yellow, often banded sandstone, composed entirely of very fine, siliceous grains, overlies, in very thick beds, the Silurian rocks on the Coliban, in the neighborhood of Kyneton. Inter-stratified, thin beds of very coarse conglomerate, or pudding-stone, frequently occur; but fossils seem to be entirely absent. The sandstone has been used in several buildings in Kyneton and the neighborhood. It is soft and easily worked, but cannot be procured of uniform color in large quantities; and, though it sometimes seems to harden on exposure, it is very liable to exfoliate, and is, therefore, not a good building stone. The quarries are now abandoned. The Tertiary (Newer Pliocene) gold-bearing gravel beds overlie it in several places. The basalt, which overlies both, seems to have caused an alteration into hard, coarse quartz grit, numbers of large angular pieces of which are scattered round the respective boundaries.

Fine-grained, white freestone, similar to 19.


22. Mottled Yellow-and-White, Gritty Sandstone. Coliban River, S.W. of Kyneton. ½ sheet 9 S.W.
See No. 19 and Note.

South Peak, Mount William.
The grains of quartz appear to be cemented by felspathic matter.

North Peak, Mount William.
Resembles the last.

North Peak, Mount William.

Mount Zero.
The grains cemented by felspathic matter.

Very felspathic and uneven-grained.

North Peak, Mount William.

29. Gritty Conglomerate. List No. R (8)
Mount Timbertop.
A reddish, coarse grit, with felspar and large pebbles of red sandstone.

A white grit, with felspar.

31. Pinkish-Red Conglomerate. List No. R (8)
Mount Timbertop.
An altered conglomerate of pink-and-yellow sandstone and quartz, with included pebbles, and a porphyritic character.

32. Brecciated Conglomerate. List No. R (8)
Base of Mount Timbertop.
The oblong, rounded fragments all take parallel lines, and are much decomposed and oxidized.


34. Fine, Micaceous Quartz Grit. Mount Tamboritta, Gippsland.
35. **Gritty Quartz Conglomerate.**
   *Hopkins' River, 4 miles north of Hexham.*
   Contains pebbles of pinkish quartz, with felspar.

36. **Cellular, Siliceous Rock.**
   *Stony or Moitian Creek, Dargo Road, Gippsland.*
   The cavities are partially filled with brown clay.

37. **Metamorphic Rock.**
   List No. R (B 69)
   *Base of Mount Timbertop.*
   Hackly, fractured, greenish and brownish rock (hornfels).

38. **Gritty Conglomerate.**
   *Hopkins' River, 4 miles north of Hexham.*
   Same as No. 35, with large pebble of quartz and felspar porphyry.

39. **Hard, Slaty Shale.**
   List No. R (B 16)
   *Beerjary Camp, Broken River.*

40. **Conglomerate.** List No. R (B 19)
    *Mount Timbertop.*
    Containing pebbles of indurated sandstone, quartz, &c.

41. **Brecciated Conglomerate.**
    List No. R (B 59)
    *Mount Timbertop.*
    Red, siliceous base, with quartz fragments and greenish altered sandstone.

42. **Brecciated Conglomerate.**
    List No. R (B 59)
    *Mount Timbertop.*
    Greenish rock, with quartz pebbles and green sandstone.

43. **Pebble Conglomerate.**
    Map No. Rd 35.
    *One mile and a half above Victoria Quarry, Korkuperrimul Creek. ½ sheet 11 S.E.*
    Enclosing a piece of decomposed granite.

44. **Fossiliferous Limestone.**
    *Buchan, Snowy River, S.E. Gippsland.*
    Hard, dark-grey, compact rock, affording a good building lime. If mixed with the proper proportion of clayey matter, it would also form a good cement. The following is the result of an analysis by Mr. J. C. Newbery:
    - Carbonate of lime ... 87.72
    - Iron ... 2.29
    - Magnesia ... 0.23
    - Silica, clay, &c. ... 97.85

45. **Pebby Conglomerate Shale.**
    Map No. R (a 12).
    *Mia-mia. ½ sheet 13 N.E.*

46. **Pebby Conglomerate.**
    Map No. R (a 12).
    *Same locality as the last.*

47. **Pebby Conglomerate.**
    Map No. R (a 12).
    *Same locality as the last.*

48. **Pebby Conglomerate.**
    List No. Rb 33n.
    *Under Robertson's Station, Wild Duck Creek, near Heathcote.*

49. **Yellow Sandstone.**
    List No. Rb 33n.
    *Same locality as the last.*
    Occurs at the base of the pebble conglomerate.

50. **Greenish-Brown Grit.**
    List No. Rb 33n.
    *Under Robertson's Station, Wild Duck Creek, near Heathcote.*

The formation, from which specimens 45, 46, and 47 are taken, is an extension of the beds occurring at the Wild Duck Creek, near Heathcote (specimens 48, 49, and 50), and probably either the base of the Carbonaceous series or the top of the Upper Palæozoic beds; but fossils not having been discovered, its exact age is somewhat doubtful. Specimens Nos. 45, 46, and 47 were taken from a hole sunk by the
geological survey, at the Mia-mia, on the Heathcote Road, no bottom being found at a depth of 30 feet. The conglomerate consists of a bluish-grey, very hard mud cement, sometimes having a slight yellow tinge (specimen 46), and in places interstratified with veins of an aluminous mineral. It becomes much lighter in color by exposure and soon crumbles to pieces. The pebbles contained in it vary much in size and consist of granites of various colors and textures, principally red and white; porphyries, indurated sandstones, quartz, red, white and blue, flinty quartzites; and a peculiar flint-colored rock, with red felspar crystals, weathering white. From one of the constituents of this latter rock having externally decomposed in horizontal lines, it has the appearance, at first sight, of gneiss. This deposit forms a very good, red soil, but is boggy and rotten in winter. At this locality it is very thin, the Silurian rocks cropping up in the almost flat gullies. On the Wild Duck Creek, however, a fine section—in many places at least 90 feet above the level of the creek—may be seen under Robertson's Station (specimens 48, 49 and 50). The conglomerate is here capped by a yellowish grit (specimen 50), and rests on yellow sandstone (specimen 49), forming large open downs. About two miles higher up the Wild Duck Creek, near Wilton's Station, the beds may be seen filling up depressions in the upturned edges of the Lower Silurian.

51. Copper Slate.

*Mansfield, Devil's River.*

This specimen contains 2 per cent. of copper. In the mass the amount of copper varies. Carbonate of copper and lime occur in spots between the laminæ.

52. Limestone.

*Burnt Creek, near Mansfield.*

<table>
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<th>Component</th>
<th>Mass</th>
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<tr>
<td>Iron and alumina</td>
<td>2.92</td>
</tr>
<tr>
<td>Carbonate of lime</td>
<td>95.55</td>
</tr>
<tr>
<td>Magnesia</td>
<td>trace</td>
</tr>
<tr>
<td>Silica and insoluble matter</td>
<td>1.53</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
</tr>
</tbody>
</table>

This limestone makes excellent lime. It does not, however, occur in large quantity, and appears to consist of a few large and small blocks and boulders, partly embedded in the alluvium of two small, dry gullies, the sides of which consist of Upper Silurian shales and sandstones. Whether these blocks are the last remnants of a limestone formation that once covered the Silurian rocks of this locality, or are transported masses, is uncertain. The nearest known limestone, of similar character, occurs in Gippsland, near the copper mine on the Thomson. There are other large patches on the Buchan River and also at Bindi, near Livingstone.

53. Dense Quartz Rock.

*List No. R (18)*

*Near Lock-up, Rose's Gap.*

54. Brown Sandstone.

*Chinery's Station, Devil's River.*

With fossil plants.
SECONDARY OR MESOZOIC PERIOD.

All the known coal-bearing rocks of Victoria belong to this period. They extend over an area of about 4,000 square miles, in three districts, viz.:

Western Port to Cape Patterson, Welshpool and the La Trobe River near Traralgon ... 1,751 Miles.
La Trobe River near Traralgon ... 1,751
The Gellibrand River and Cape Otway to the Barrabool Hills and Indented Heads ... 1,882
The junction of the Wannon and Glenelg, and neighborhood of Casterton, Digby, Merino and Coleraine ... 349

They are represented on the Geological Sketch Map of the Colony by a brown tint, and numbered 7.

Plant remains of numerous genera and species have been found in them. A new species of Unio (Unio Dacombii—McCoy) is the only fossil animal yet discovered. Coal and freestone are the only minerals known, as occurring in quantity sufficient to be economically valuable. The coal seams are for the most part, although of good quality, too thin to be profitably worked. With the exception of those near Cape Patterson, none have been discovered that would yield as much as 20 inches of good coal, and these generally occur in very inaccessible positions. Basalt and other forms of volcanic rock are the only igneous rocks associated with the Carbonaceous strata. Calc-spar frequently occurs, as veins, in the joints and fissures of the rock. The formation does not apparently contain any metallic minerals, except iron in the form of carbonate (clay iron-ore) and oxide; but neither occur in sufficient quantity to be of economic value.

The coal rocks probably extend eastward, under a great part of the Gippsland plains, south of a line drawn from near Hayfield to Lake Wellington, but cannot be seen on the surface, being thickly overlaid, as at Bellarine and Queenscliff, by Tertiary rocks and recent alluvial deposits.

The specimens represent the general lithological character of the formation.
Case XI.

CARBONACEOUS—MIocene AND OLDER PLIOCENE.

MESOZOIC.

CARBONACEOUS.

(Coal-bearing rocks of Victoria.)

   Queensferry, Deep Creek, Hurdy-gurdy, Western Port.
   Containing plants.

2. Light-Grey Sandstone.
   List No. Rb 62.
   Carew and Freehan's license, Kilcunda Run, Bass.
   From a shaft about 100 yards from outcrop of a coal seam, 18 inches thick, on coast.

3. Conglomerate.
   Barrabool Hills, Geelong. ½ sheet 24 S.E.
   See Note after No. 21.
   With large pebble of greenstone.

4. Brecciated Sandstone.
   List No. R (Fs 3).
   Cape Patterson.
   Containing plants.

5. Spathic Iron.
   Cape Patterson.
   Contains 34 per cent. of iron, equal to 70·4 per cent. of carbonate of iron.

   Den Hills Creek, a tributary of the Wannon River.
   Contains plants.

7. Fine Clay-Shale.
   Gladman's Coal Prospecting Shaft, near the Moë.

8. Conglomerate Breccia.
   Den Hills.

   Gladman's Coal Prospecting Shaft, near the Moë.
   Containing plants.

10. Shale, with Plants.
    List No. R (Fs 16).

   Queensferry, Deep Creek, Hurdy-gurdy, Western Port.

    Barrabool Hills, Geelong. ½ sheet 24 S.E.
    Containing impressions of leaves. See Note after No. 21.

    Geelong. ½ sheet 24 S.E.

15. Fine-grained Sandstone.
    Same locality as the last.

Note.—At Portarlington, on the Bellarine Peninsula, the Carbonaceous rocks come to the surface, and abound in broken fragments of Teniopteris. The sandstone was used in building the Portarlington mills; but it exfoliates rapidly, and is not a good or durable building material.

16 and 17. Sandstone.
   Bacchus Marsh.

In 1862 quarries were opened near Bacchus Marsh, and a considerable quantity of this stone was sent to Melbourne, and used in the
construction of the Treasury, the Custom House and the Parliamentary Library. It has not since been used in Melbourne. When opening the quarries, the beds were found to be very variable in composition, and so full of joints, as to make it both difficult and costly to obtain the stone in quantity, of the uniform texture and quality, essential in large buildings. It constitutes, however, a useful building stone for local purposes, or where small quantities only are required. Excellent grindstones could be procured from some of these beds. The buildings, above referred to, do not present favorable evidence, as regards its durability, when exposed to the atmosphere of the city. Some of the beds are full of fossil-plant remains. *Gangamopteris longifolius* (McCoy) is the most abundant species, a specimen of which is seen on No. 17.

18. BRECCIATED SANDSTONE.

*List No. R (Fs 3).*

*Cape Liptrap.*

A greenish grit, containing pebbles of grey sandstone.

19. EARTHY CONGLOMERATE.

*Den Hills.*

See No. 8.

Note.—The Carbonaceous rocks of the Barrabool Hills, from which specimens Nos. 3, 13, 14, 15, 20 and 21 are taken, consist of a series of hard, thick-bedded, brown and grey sandstones, much jointed, and with thin veins of carbonate of lime; they alternate with shales and conglomerates, and have an average dip of E. 30° S., at an inclination of 1 in 4. Over the area comprised between the village of Ceres and the municipality of Newtown and Chilwell, about 3,000 feet of Carbonaceous strata crop out at the surface; the highest beds are found to the east and the lowest to the west. It is highly probable that this part of the series has been tested for coal in the Bellarine district, since an intermediate synclinal axis exists in the ground between Kensington and Geelong; and the Barrabool Hills’ sandstones, shales, &c., would thus be a recurrence at the surface of those bored through in the Bellarine district. The sandstones of the Barrabool Hills are extensively quarried and used for building purposes in and around Geelong. They are very variable in composition and durability, and their prevailing dull greenish-brown color renders them objectionable for large buildings, in which architectural effect is required.

20. BLACK SHALE.

*Barrabool Hills, Geelong. 1/4 sheet 24 S.E.*

Looks like Lydian stone, but is quite soft.

21. SANDSTONE.

*Same locality as the last.*

Fine-grained, and with vegetable impressions.

22. BLACK, CARBONACEOUS CLAY AND SAND.

*Muddy Creek, South Gippsland.*

Containing quartz pebbles. This specimen is from the Muddy Creek coal boring.

23. FELSPATHIC CLAY-SHALE.

*Gladman’s Coal Prospecting Shaft, near the Moë.*

24. BLACK CLAY, with COAL.

*Cape Patterson.*

Probably a slickenside from the side of a fault. This is the so-called "Cape Patterson fire-clay."

25. IRONSTONE.

*East shore of Western Port Bay, near Queensferry.*

A poor iron-ore.
26. **SILICIFIED WOOD.**
   List No. R (Cd 6).
   Barrabool Hills, Geelong. 
   1 sheet
   24 S.E.

27. **CALCAREOUS SANDSTONE.**
   *Corinella Coal Shaft.*
   Eighteen feet thick about 25 feet from the surface. An analysis by Mr. J. C. Newbery gave the following results:
   - Silica: 52.927
   - Carbonate of lime: 37.710
   - Carbonate of iron: 6.078
   - Water and loss: 3.285
   
   **Analysis by Mr. J. C. Newbery**
   - Volatile matter: 36.836
   - Fixed carbon: 54.374
   - Hygroscopic water: 2.430
   - Ash: 5.360
   
27A. **COAL.**
   *Cape Patterson.*
   From 8-inch seam.

28. **COAL.**
   *Bass River.*
   List No. Rd 2.

29. **COAL.**
   *Cross-over Creek, north of Red Hill, Gippsland Road.*
   This lignite is from a seam 55 feet thick. It has a dull black color, conchoidal fracture, is brittle, burns only at a high temperature, and with a yellow flame, and forms no coke. An analysis by Mr. J. C. Newbery gave as follows:
   - Raw Lignite
     - Fixed carbon: 33.17
     - Volatile matter: 41.25
     - Hygroscopic water: 17.73
     - Ash: 5.83
   - Lignite, Dried
     - Fixed carbon: 60.10
     - Volatile matter: 57.11
     - Hygroscopic water: 18.40
     - Ash: 7.11
   
   **Analysis by Mr. J. C. Newbery**
   - Fixed carbon: 35.17
   - Volatile matter: 41.25
   - Hygroscopic water: 17.73
   - Ash: 7.11

30. **COAL.**
   *Creek on east side of Bass River.*
   List No. Rd 3.

31. **COAL.**
   *Wormbete Ranges.*

32. **COAL.**
   *Loutitt Bay.*
   Analysis:
   - Volatile matter: 30.845
   - Fixed carbon: 39.158
   - Ash: 29.861
   - Water: 0.136
   
   **Analysis by Mr. J. C. Newbery**
   - Volatile matter: 36.836
   - Fixed carbon: 54.374
   - Hygroscopic water: 2.430
   - Ash: 5.360

33. **COAL.**
   "Rock Vein," Cape Patterson.
   Analysis by the late Mr. Charles Wood:
   - Volatile matter: 36.836
   - Fixed carbon: 54.374
   - Hygroscopic water: 2.430
   - Ash: 5.360
   100.000

34. **COAL.**
   "Queen Vein," Cape Patterson.
   Analysis by the late Mr. Charles Wood:
   - Volatile matter: 28.8
   - Fixed carbon: 56.4
   - Hygroscopic water: 4.0
   - Ash: 10.8
   100.000

35. **COAL.**
   *Corinella—Shaft No. 3.*
   Three-foot seam. Analysis:
   - Volatile matter: 34.051
   - Fixed carbon: 55.374
   - Hygroscopic water: 4.376
   - Ash: 6.199
   100.000

36. **COAL.**
   *Corinella—Shaft No. 1.*
   Upper seam 4 feet. Analysis:
   - Volatile matter: 31.927
   - Fixed carbon: 54.533
   - Hygroscopic water: 10.267
   - Ash: 3.271
   100.000

37. **COAL.**
   *Corinella—Shaft No. 1.*
   Lower seam; 2 feet 10 inches. Analysis:
   - Volatile matter: 33.172
   - Fixed carbon: 45.732
   - Hygroscopic water: 1.785
   - Ash: 19.311
   100.000
38. **Coal.**

*No. 74.*

_Near Traralgon, South Gippsland._

Analyses of shale of a dull black color, with small specks of bright coal disseminated through it; fracture slaty; indistinct fossil marks; contains about 4 per cent. of hygroscopic water:

<table>
<thead>
<tr>
<th></th>
<th>1.—Dried Specimen</th>
<th>2.—Raw Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile matter</td>
<td>35.74</td>
<td>Carbon</td>
</tr>
<tr>
<td>Fixed carbon</td>
<td>42.68</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>Ash</td>
<td>21.55</td>
<td>Oxygen and nitrogen</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Sulphur</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ash</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>100.00</th>
</tr>
</thead>
</table>

39. **Coke.**

_Cape Patterson._

From the “Rock Vein” coal.

40. **Coal.**

*Griffiths’ Point._

Seam 14 inches thick. Presented by Mr. William Hickinbotham.

Note.—Specimens 27a to 40 will be found in Case XVI. (Minerals).
TERTIARY OR CAINozoic and Recent Period.

"The rock formations of the Tertiary, including the recent period, whether regarded in their economical, physical, or geological aspects, occupy by far the most prominent place in Victorian geological history. Strata of sedimentary or volcanic origin, referable to some section of Tertiary or recent time, occupy probably fully one-half, or over 40,000 square miles, of the surface of Victoria, forming deposits from a mere capping to over 300 feet thick. They are found resting unconformably on all the older formations, igneous and stratified, and range from sealevel to elevations of over 4,000 feet. They include groups of strata of earth, loam, sand, clay, gravel, conglomerate, ferruginous and calcareous sandstone and grits, hard quartz rocks, marble and other kinds of limestone, and various volcanic products, each of which has its more or less distinctive geological, palæontological, or mineral character, indicating it to be truly representative of the recognized Eocene, Miocene, Pliocene, or Pleistocene (including recent) deposits of Europe and other countries; the terms being applied here, however, simply to denote Lower, Middle, Upper and Recent Tertiaries, rather than exact synchronism with European beds, or any ascertained relative percentage of living and extinct forms in their fossil contents."—(Notes on the Physical Geography, Geology and Mineralogy of Victoria—Intercolonial Exhibition Essays, 1866.)

The Lower Gold Drifts.

"The attention of the Geological Survey has lately been directed to the very important question of the age and probable auriferous or non-auriferous character of what are called the 'lower drifts of Victoria.' From the facts observed, the following conclusions have been arrived at:—

"1st. That these particular drifts are clearly antecedent in date to the Upper and Middle Miocene beds, under which they have now been traced, and therefore, that they are far older than the lowest Pliocene gravels, to which age the 'deep-lead' gravels of Ballarat, the 'White Hills' of Bendigo, and other similar rich gold-bearing gravels have been referred.

"2nd. That they do not probably contain gold in paying quantity, the reason being, that they are derived from the abrasion of quartz veins that themselves contained little or no gold, and that were probably formed by forces in operation, as long prior to those which produced the gold-bearing veins, as the denudation, producing the barren Miocene gravels, was prior to that which gave rise to the Pliocene productive ones."

The Tertiary formations afford, besides gold, tin-ore, also diamonds and other precious stones, lignite or brown coal, salt, limestones suitable
for mortars and cements; brick earths and clays for bricks, tiles and pottery of all kinds; also freestone and other stones suitable for building. Rich oxides of iron are also common, but not in beds sufficiently extensive, to be economically available. Examples of nearly all these will be found amongst the specimens:

**MIOCENE.**

These rocks are well represented from the mouth of Spring Creek to the Bird Rock, 14 miles south of Geelong, where a thickness of 273 feet of Miocene strata are exposed in fine cliff sections. The sequence of beds is as follows:

### Upper Miocene.

80 feet. Hard, thin-bedded, sandy limestone (the calcareous portion consisting almost entirely of fossils), the probable equivalent of the Mount Gambier series, described by the Rev. Julian Woods.

### Middle Miocene.

- **80 feet.** Soft, brown, sandy clay.
- **30 "** Brown, blue and yellow, sandy clays, containing abundance of gypsum.
- **1 foot.** Very hard, crystalline sandstone.
- **12 feet.** Brown, sandy clay, poor in gypsum.
- **1 foot.** Very hard, crystalline sandstone.
- **5 feet.** Brown sandstone, containing abundance of gypsum.
- **10 "** Blue marl, containing septaria, gypsum and iron pyrites.
- **8 "** Friable, thin sandstone, with thin bands of gypsum.

### Lower Miocene.

- **1 foot.** Very hard band of crystalline sandstone.
- **17 feet.** Soft, brown sandstone, with thin bands of harder material.
- **20 "** Thin-bedded, brown sandstone.
- **8 "** Brown sandstone, containing abundance of gypsum.

1. **SANDSTONE GRIT.** List No. W W 1.
   *Section 14n, Darriwell, 1/4 sheet 19 S.W.*
   Light-brown, arenaceous sandstone, the grains apparently merely cemented by pressure.

2. **SANDSTONE.** List No. W W 1.
   *Same locality as No. 1.*
   Brown sandstone, similar to the above.

3. **QUARTZITE.** List No. W W 1.
   *Same locality as the last.*
   Red-and-yellow quartzite, the grains probably cemented by silica.

4. **QUARTZITE.** List No. W W 1.
   *Same locality as No. 1.*
   Mottled red-and-white, similar to the last.

5. **SHELL LIMESTONE.** List No. W W 1.
   *Maude, about 2 miles south along the east and west sides of the valley of the Moorabool River, 1/4 sheet 19 S.W.*
   This limestone occurs in irregular bands, about 2 feet thick, interstratified in the upper part of the older basalt. It takes a good polish, but is not in sufficient quantity for economic purposes.

   *About a mile west of Keilor, 1/4 sheet 1 N.W.*
   Brown-and-yellow, argillaceous rock, containing fragments of corals, spines of echini and other Tertiary fossils. An analysis gave the following results:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate of lime</td>
<td>91.61</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.20</td>
</tr>
<tr>
<td>Iron</td>
<td>2.53</td>
</tr>
<tr>
<td>Silica and clay</td>
<td>5.06</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.00</td>
</tr>
</tbody>
</table>

It would make a good lime for building purposes.

Spring Creek, Barwon River, Barrabool. Map sheet 24 S.E.

Soft, earthy limestone, enclosing sand; good for burning.


Hope's Mill, Moorabool River. Map sheet 24 S.E.

Composed of spines of echini and fragments of polyzoa; makes a good building lime.


Same locality as the last.

Note. — A company was formed for the purpose of working this limestone for phosphate of lime; but, as will be seen from the following analysis by Mr. J. C. Newbery, it contains no phosphates whatever:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insoluble matter</td>
<td>6.791</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>0.344</td>
</tr>
<tr>
<td>Carbonate of lime</td>
<td>90.356</td>
</tr>
<tr>
<td>Magnesia</td>
<td>trace</td>
</tr>
<tr>
<td>Water</td>
<td>1.809</td>
</tr>
</tbody>
</table>

The banks on either side of the River Moorabool, in the neighborhood of Hope's Mill, are occupied by this limestone (specimens 8 and 9). The percentage of earthy matter in it is very small, and it would afford excellent lime for building purposes.

10. Limestone.

Moorabool. Map sheet 24 S.E.

Containing large echini spines, corals, shells and polyzoa.


Sections 1 and 2 Dardidwarran, and sections 18B, 19A, Darriwell. Map sheet 19 S.W.

Fossiliferous limestone from hard siliceous rock, underlying the older basalt and Upper Miocene. Probably of Lower Miocene age.

12. Septarian Limestone.

Schnapper Point, Hobson's Bay.

Very argillaceous, and containing polyzoa. An analysis by the late Mr. C. S. Wood gave as under:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate of lime</td>
<td>82.012</td>
</tr>
<tr>
<td>Magnesia</td>
<td>15.06</td>
</tr>
<tr>
<td>Iron</td>
<td>34.72</td>
</tr>
<tr>
<td>Clay and sand</td>
<td>10.427</td>
</tr>
<tr>
<td>Soluble silica</td>
<td>0.720</td>
</tr>
<tr>
<td>Water</td>
<td>1.809</td>
</tr>
<tr>
<td>Organic matter and loss</td>
<td>0.054</td>
</tr>
</tbody>
</table>

This limestone (No. 12), probably of Upper Eocene age, is a sample of the stone used by the late "Schnapper Point Cement Company." The percentage of siliceous matter is too low for a good hydraulic lime. Its power of hardening under water would be considerably increased by the addition of clayey matter in such proportions, as to raise the quantity of silica to about 25 per cent.

13. Limestone.

Keilor. Map sheet 1 N.W.


18. Ferruginous Sandstone.

Mordialloc. Map sheet 1 N.W.

Soft and fine-grained; forms cliffs along the east coast of Hobson's Bay; contains 24.26 per cent. of iron.


Mordialloc.

Upper Miocene.
20. QUARTZ PEBBLES.
Leigh River, near Steiglitz.
From a 31-feet shaft in the Miocene gravels. The ferruginous coating, on analysis, gives 3 dwts. 6 grs. gold to the ton. The quartz contains no gold.
Mr. Newbery states, "that the coating of these pebbles contained iron, manganese and copper oxides, mixed with siliceous clay. The manganese and copper probably result from the decomposition of the ferruginous manganese ores, coating the rocks in the neighborhood."

21. LIMESTONE.
Shores of Lake Tyers, Gippsland.
Containing remains of polyzoa.

22. WHITE, SOFT LIMESTONE.
Benallic, Moorabool River.
Porous stone, made up of fragments of marine shells, &c., cemented together by carbonate of lime. It is easily decomposed. The color varies with the amount of iron, but it is generally pale-yellow. An analysis by Mr. J. C. Newbery gave—

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate of lime</td>
<td>95·64</td>
</tr>
<tr>
<td>Magnesia</td>
<td>2·48</td>
</tr>
<tr>
<td>Iron</td>
<td>traces</td>
</tr>
<tr>
<td>Clay, &amp;c.</td>
<td>1·24</td>
</tr>
</tbody>
</table>

99·36

OLDER PLIOCENE.

So far as at present known, none of the productive gold drifts are older than the rocks classed as above; but, as no marine fossil remains have been found, either associated with, or overlying any productive gold drifts, the precise geological date of the earliest of these drifts is perhaps still somewhat uncertain; as is also the classification of some of the specimens of the subdivisions of the Upper Tertiary rocks.

1. WHITE CLAY. Map No. R 53.
Section 8, Newham, ¼ sheet 5 S.W.
A silicate of alumina and magnesia, from a hole (see Note) sunk by the Geological Survey in Older Pliocene drift, cropping out under the newer basalt escarpment.

Note.—Particulars of hole sunk:
Soft, white clay, with vertical, vegetable stems ... 6 feet
Harder, stone-colored rock 8 "
Soft, yellowish rock ... 6 "
Breccia, containing fragments of other rocks ... 12 "
Hard, greenish-yellow breccia ... 2 "
Hard, coarse breccia ... 3 "
Soft, white breccia ... 2 "
Breccia, containing fragments of other rocks ... 4 "
Very coarse breccia ... 3 "
Alternating coarse and fine breccia, with thin seams of ferruginous breccia ... 10 "

Total ... 56 feet

Not bottomed.

2. IMPURE LIMESTONE. Map No. R (M 1).
Section 10, Will-Will-Rook, Moonee Ponds, ¼ sheet 2 S.W.
It probably contains much magnesia, and was formerly burnt for lime. Occurs underlying newer basalt, with Tertiary quartzites and ferruginous grits.
This fresh-water limestone contains fossil shells (Truncatella). Its analysis by Mr. J. C. Newbery gave—

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica, clay, &amp;c.</td>
<td>4·467</td>
</tr>
<tr>
<td>Carbonate of lime</td>
<td>54·974</td>
</tr>
<tr>
<td>Carbonate of magnesia</td>
<td>39·007</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>1·476</td>
</tr>
</tbody>
</table>

99·924

3. IMPURE LIMESTONE. Map No. Ra 18a.
Small creek falling into the Saltwater River, near south boundary of parish of Doutta-Galla, ¼ sheet 1 N.W.
Soft and earthy, associated with Tertiary, quartzose grit, underlying newer basalt.
Section 75, Redesdale, banks of Campaspe River. \(\frac{1}{4}\) sheet 13 N.E.
Contains fragments of charcoal, and occurs overlying the ordinary quartz pebble cement, and underlying the newer basalt. A tunnel has been driven into it, from which a good spring of mineral water issues. No gold was obtained.

5. BLACK, ARGILLACEOUS ROCK. Map No. Ra 10.
Lot 4, section 22, Bulla-bulla. \(\frac{1}{4}\) sheet 7 N.E.
Occurs underlying post-Tertiary basalt, and resting on Tertiary, quartzose conglomerate.

6. CLAY, with GRANITIC DETRITUS. Map No. R (a5).
S.W. of Baynton’s Station. \(\frac{1}{4}\) sheet 5 N.W.
Occurs, resting on granite, in very hard and thick, horizontal beds, cropping out in the banks of tributaries of the Jew’s Harp Creek.

7. LIMESTONE. Duck Ponds. \(\frac{1}{4}\) sheet 19 S.E. and 24 N.E.
Fresh-water limestone. It yields a good building lime, and may be made into cement, when mixed with a proper proportion of clayey matter; the best adapted for this purpose is a decomposed basalt, from the Older Volcanic rocks. Higher up the Duck Ponds Creek, wells have been sunk, showing the following section:—

- Soft, sandy loam ... ... 4 feet
- Rubby limestone ... 6 "
- Compact limestone ... 4 "
  (containing Planorbus and Limnea)
- Soft, rubby limestone ... 6 "
- Calcareous, sandy clay ... 4 "
- Soft, decomposed basalt ... 2 "

Analysis by Mr. J. Cosmo Newbery, B.Sc.:—

<table>
<thead>
<tr>
<th>Component</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate of lime</td>
<td>88:38</td>
</tr>
<tr>
<td>Carbonate of magnesia</td>
<td>9:76</td>
</tr>
<tr>
<td>Carbonate of iron</td>
<td>9:31</td>
</tr>
<tr>
<td>Silica and clay</td>
<td>7:02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>96:67</td>
</tr>
</tbody>
</table>

Water brackish. Bones of the kangaroo, wombat, &c., have been found in the limestone.

8. IMPURE, SILICEOUS LIMESTONE. Map No. R 11.
Lot 1, section 7, Douutta-Galla. \(\frac{1}{4}\) sheet 1 N.W.
Occurs under newer basalt in concretionary nodules and layers.

9. WHITE QUARTZITE.
Keilor. \(\frac{1}{4}\) sheet 1 N.W.
Under newer basalt. This rock forms a marked feature in many places along the banks of the Saltwater River, where it occurs in patches and lines of whitish looking stones, contrasting strongly with the grey, rocky escarpment of the basalt, immediately above it.

10. QUARTZ ROCK.
Deep Creek, Hurdy-gurdy, Western Port.
Containing rounded, transparent pebbles of quartz.

11. QUARTZ ROCK. Map No. R (a1).
Section 10, Will-Will-Rook. \(\frac{1}{4}\) sheet 2 S.W.
Under newer basalt. Same as No. 9.

12. QUARTZ ROCK.
Near Alberton, Gippsland.
Accompanying outcrop of older basalt.

13. QUARTZITE.
Glen Maggie, Gippsland.
From under basalt-capped hills; probably Miocene.

14. FINE-GRAINED, RED, FERRUGINOUS SANDSTONE.
Saltwater River.

Bradford Lead. \(\frac{1}{4}\) sheet 14 N.W.

16. BROWN, FERRUGINOUS GRIT. Map No. Re 11.
Cargerie Creek. \(\frac{1}{4}\) sheet 64 N.E.
From bed of ironstone, 20 feet thick, underlying newer basalt.

17. CEMENTED GRANITIC DETRITUS. Map No. Ra 64.
Hard Hill. \(\frac{1}{4}\) sheet 14 N.W.
*Cargerie Creek.* ½ sheet 64 N.E.
From bed of ironstone, 20 feet thick, underlyng newer basalt.

19. **Fine-grained, Red-and-Yellow Sandstone.** 
*Flemington.* ½ sheet 1 N.W.
With ironstone veins.

*Lot 1, section 7, Doutta-Galla.* ½ sheet 1 N.W.
Composed of grains and small pebbles of quartz, cemented by silica.

21. **Loosely-cemented Quartz Drift (Granitic).** 
*Keilor.* ½ sheet 1 N.W.
Underlies newer basalt.

22. **Ferruginous Grit.** Map No. R (a1).
*Section 10, Will-Will-Rook.* ½ sheet 2 S.W.
Mottled brown-and-yellow grit, underlyng newer basalt.

23. **White Quartz Grit.** Map No. Ra 97.
*Near the Cemetery, Bradford.* ½ sheet 14 N.W.
Very friable, and containing much clay.

24. **Yellow Grit.** Map No. R 2.
*Lot 1, section 7, Doutta-Galla.* ½ sheet 1 N.W.
Friable, coarse, yellow grit.

25. **Coarse Grit.** Map No. Ra 66.
*Bradford Lead.* ½ sheet 14 N.W.
Similar to No. 23.

26. **Cemented Granite Detritus.** Map No. Ra 61.
*Bradford Lead.* ½ sheet 14 N.W.
A mixture of quartz, mica and felspar.

27. **Grit.** Map No. Ra 67.
*West of Bradford.* ½ sheet 14 N.W.
A fine grit of quartz and felspar, with large fragments of angular quartz.

*Sutton Grange.* ½ sheet 13 N.W.
Very hard siliceous cement, cropping out at the junction of newer basalt and granite.

29. **Coarse Grit.** Map No. R (a2).
*Section 17A, Tullamarine.* ½ sheet 7 S.E.
Red, ferruginous grit.

30. **Clay Breccia.** Map No. Ra 65.
*Bradford Lead.* ½ sheet 14 N.W.
Angular and rounded fragments of white, baked-looking clay, cemented by a grey clay.

**Note.**—The Bradford Lead, ½ sheet 14 N.W. (illustrated by specimens 15, 23, 25, 26 and 30), appears to be an extension of that occurring at the "Hard Hill" (see specimens 17 and 37), as it begins at about a similar height on the side of the gully opposite to where the other ceases. It commences as surfacing of angular quartz, cemented with granite detritus, and gradually deepens to about 80 feet near the southwest corner of the Bradford town reserve, where the deposit consists of alternating layers of white and variegated clay (kaolin) and granite detritus, resting on several feet of rounded quartz boulder drift. From the township reserve the lead extends across two small gullies, and reaches a third, beyond which it has not been traced.

The minerals found in this lead comprise:

1. **Smoky Quartz** in great quantity. The faces of the crystals are seldom perfect, on account of their having been water-worn; sometimes they contain crystals of iron pyrites (cubes) and molybdenite.
(2.) Amethyst.—Generally water-worn.
(3.) Topaz (blue).—Two specimens were found during the progress of the survey of this district.
(4.) Garnet, as small blood-colored and brown crystals embedded in smoky quartz; discovered by Mr. Hornsby, of Maldon.

Case XII.

OLDER, NEWER AND POST PLIOCENE.

OLDER PLIOCENE—(continued).

31. Ferruginous Grit.  
Main land, south of Sandstone Island, Western Port Bay.
Hard brown ironstone, with included quartz pebbles, and hollowed by atmospheric action.

Thomson’s, near Hayfield, Gippsland.
A mixture of coarse and fine angular and rounded quartz, cemented by oxide of iron.

33. Ferruginous Conglomerate  
(Cement).  
Hills, 4½ miles north of Hexham.

34. Quartz Conglomerate  
(Cement).  
Map No. 61.  
Moonee Ponds.  ¼ sheet 1 N.W.

35. Coarse Grit.  
Map No. R (a1).  
Section 10, Will-Will-Rook.  ¼ sheet 2 S.W.
One part of these specimens consists of a hard, siliceous quartz rock, and the other of quartz grains (granitic), loosely connected by ferruginous clay. It occurs with Nos. 11 and 22.

36. “Cement.”  
Map No. Rb 8.  
Sutton Grange.  ¼ sheet 13 N.W.
Very hard quartz conglomerate, cropping out at the junction of the basalt and granite.

37. Conglomerate.  
Map No. Ru 63.  
Hard Hill.  ¼ sheet 14 N.W.
Large pebbles of quartz, sandstone and graphic granite, in a loosely adherent base of very micaceous, coarse granitic detritus. The lead of gold has been traced in a direction nearly parallel to the Nuggetty lead, but keeping on the rise above the gully, along which the latter runs. It is probably identical with the Bradford lead.

38. Conglomerate.  
Map No. R (a4).  
Section 15, Bulla-bulla.  ¼ sheet 7 N.E.
Pebbles of quartz grit in a fine, white, loosely adherent sand.

39. Ferruginous Conglomerate  
(or “Cement”).  
Map No. Ra 70.  
Forty-foot Lead.  ¼ sheet 14 N.W.
Large and small pebbles, cemented by brown iron-ore.

40. Ferruginous Quartz Cement.  
Map No. R (a13).  
Section 25, Spring Plains, banks of Campaspe River.  ¼ sheet 13 N.E.
Occurs at the junction of newer basalt and Lower Silurian, cropping out under the former, and usually containing gold.
41. Iron-Ore (Concretionary).
   Flemington. 4 sheet 1 N.W.
   Occurring with ferruginous Tertiary grits and fossiliferous sandstones.

42. Cellular Ironstone.
   Map No. R (M4).
   Moonee Ponds Creek, Section 10, Will-Will-Rook. 4 sheet 2 S.W.
   Associated with hard, crystalline quartz rock and very friable quartz grit, underlying newer basalt.

43. Ironstone (Limonite).
   Lake Connewarre. 4 sheet 29 N.W.
   Containing fossil wood. Overlying soft, brown, argillaceous sandstone, with fossils of the Miocene period, which crop out along the north and east boundaries of the lake.

44. Ironstone Cement (Ferruginous Grit).
   Map No. R (Fe 18).
   Tea-tree Creek, Cargerie Creek. 4 sheet 64 N.E.
   Very hard and of great thickness; containing fossil wood.

45. Iron-Ore.
   Moonee Ponds, section 10, Will-Will-Rook. 4 sheet 2 S.W.
   Contains 50-68 per cent. iron.

46. Argillaceous Ironstone.
   Rowsley, Parwan Creek.

47. Fossil Wood.
   From the Gold Drift of Table Hill, Tarilta. 4 sheet 15 N.E.

48. Quartz Cement.
   West shore of Corner Inlet.
   Occurs capping granite.

49. Ash-colored Sandstone.
   Map No. R (Aa8).
   Section 6, Holden. 4 sheet 7 S.E.
   Containing fossil wood and quartz pebbles, underlying newer basalt.

50. Yellow Quartzite.
   Saltwater River, near Keilor. 4 sheet 1 N.W.

   List No. R (sn9).
   Glenorchy, Wimmera River.

52. Ferruginous Grit.
   List No. R (sn7).
   Donald's Station, Lake Buloke.

53. Breccia.
   Map No. R (a10) 1 & 3.
   Section 5, Langwoorner, Campaspe River. 4 sheet 13 N.E.
   From Westblade's tunnel. A loose, brown breccia of angular, yellow-and-red sandstone and quartz pebbles, 10 feet thick, on which rests yellow clay, bands of quartz drift and sand. The most gold was obtained at the junction of the clay and breccia.

54. White Clay.
   From same locality as last.
   Fine, soft and greasy.

   From same locality as last.

NEWER PLIOCENE.

1. Sandstone.
   Map No. Ra 72.
   West bank of Loddon. 4 sheet 14 N.W.
   Soft and fine-grained, occurring under newer basalt.

   Note.—(4 sheet 14 N.W.)—The Nuggetty Lead commences below the Nuggetty Reef, near the granite boundary, in a narrow ravine, with granite on each side. At first it takes a general north-west course,
spreading over Nuggetty Flat, and then contracting to a few chains in width, till, at about a mile from the reef, it reaches and runs down the largest branch of the Bradford Creek, keeping on the eastern side of the flat till within about half a mile of Bradford Creek. The workings cease at this point, although it is probable that the 'lead' extends further in the direction of the creek. The holes, which have been sunk, are not of any great depth, but show two 'bottoms; the lower one consisting of red-and-grey, cemented granitic detritus, often with a great deal of yellow mica and fragments of granite; the upper bottom consists of Silurian shingle, quartz pebbles and fragments of eurite, the latter probably from the dykes on the range near Nuggetty Reef. It is probably a channel of Older Pliocene date, filled up with Newer Pliocene and alluvial material.

3. **Gritty Sandstone.**
   Map No. Ra 46.
   Lot 8, section 8, Bradford. ¼ sheet 14 N.E.
   Highly ferruginous.

4. **Soft, fine-grained Sandstone.**
   Map No. Ra 71.
   West bank of River Loddon. ¼ sheet 14 N.W.
   With small ferruginous nodules.

5. **Ferruginous, Felspathic Grit (†).**
   Map No. R 117.
   Camp Reserve, Heathcote.
   See Note on "Heathcote Drift," following No. 20.

6. **"Cement."**
   Map No. Ra 41.
   Hill to the east of Beehive Company's machine, Maldon. ¼ sheet 14 S.W.
   Cement covering "washdirt." An indurated clay, enclosing angular quartz fragments.

7. **Cemented granitic detritus.**
   Map No. Ra 74.
   Dunolly Road. ¼ sheet 14 N.W.

8. **Hard ferruginous Grit (Cement).**
   Map No. Ra 69.
   Porcupine Flat, Bradford. ¼ sheet 14 N.W.
   The grains of quartz in this specimen are firmly cemented, though with open interstices throughout, giving the rock a porous appearance.

9. **Hard ferruginous Conglomerate.**
   Map No. R 43.
   North of parish of Lancefield. ¼ sheet 5 S.E.

10. **Auriferous Conglomerate (Cement).**
    Map No. Ra 29.
    Head of Donkey Hill Lead, Maldon. ¼ sheet 14 S.W.

11. **Pisolitic Ironstone.**
    Map No. Ra 46.
    Near lot 8, section 8, Bradford. ¼ sheet 14 N.E.
    Resting on granite. Consists of a sandy matrix, thickly studded with red, spherical, concretionary nodules of a very ferruginous clay and grit.*

12. **Pisolitic Ironstone.**
    List No. R (s 38).
    At foot of Granite Hills, 3 miles south of Carter's Rosebrook Station, Wimmera district.
    Similar to No. 11.*

13. **Auriferous cemented gravel.**
    Map No. Ra 68.
    Porcupine Flat, Bradford. ¼ sheet 14 N.W.
    Angular and partly rounded quartz pebbles, in brown clay.

14. **Brown Iron-ore.**
    Map No. R 54.
    Section 7, Newham. ¼ sheet 5 S.W.
    Enclosing fossil wood.

* These are most probably Older Pliocene.
15. **Brown Iron-Ore.**  
*Map No. Ra 84.*  
*Porcupine Flat. ¹/₄ sheet 14 N.W.*

16. **Limestone Marl.**  
*List No. R (sr 22).*  
*From a well sunk at foot of Pyramid Hill.*

17. **Siliceous Breccia.**  
*Map No. R 117.*  
*West of Camp Reserve, Heathcote.*  
See Note following No. 20.

18. **Freshwater Limestone.**  
*Galena Point, Geelong. ¹/₄ sheet 24 S.E.*  
The so-called “marble;” it contains veins of cale-spar.

The following section is shown at Galena Point:—

<table>
<thead>
<tr>
<th>Ft.</th>
<th>Inch.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marly clay</td>
<td>...</td>
</tr>
<tr>
<td>Ferruginous, sandy clay</td>
<td>10 0</td>
</tr>
<tr>
<td>Thin-bedded limestone</td>
<td>3 6</td>
</tr>
<tr>
<td>Compact limestone</td>
<td>...</td>
</tr>
<tr>
<td>Rubbly, thin-bedded, poor limestone</td>
<td>6 0</td>
</tr>
<tr>
<td>This last contains abundance of Miocene fossils.</td>
<td></td>
</tr>
</tbody>
</table>

19. **Lignite.**  
*Map No. R (a2).*  
*North of parish of Lancefield. ¹/₄ sheet 5 S.E.*  
Occurs in a bed 15 feet thick at a depth of 45 feet. The section showed 30 feet of sandy gravel and granitic drift, laminated clays, yellow clays with rounded quartz pebbles and layers of gravel, 15 feet black clay, containing partially carbonized wood and nodules of iron pyrites, and lastly whitish-brown, sandy clay, with red streaks, passing into pipeclay.

20. **Magnesite (?)**  
*Map No. R 117.*  
*Near Camp Reserve, Heathcote.*

21. **Blue Clay.**  
*Map No. R (M 40).*  
*Spring Plains. ¹/₄ sheet 13 N.E.*  
Stiff, blue clay, with angular and rounded quartz and pieces of sandstone, and containing lenticular crystals and druses of gypsum. It is 5½ feet thick, and rests on sandstone.

22. **White Earthy Limestone.**  
*List No. R sr 14.*  
*Antwerp, 25 miles south of Lake Hindmarsh.*

The drift, from which specimens Nos. 5, 17 and 20 are derived, forms an extensive flat at the back of the Police Camp at Heathcote, and between it and a peculiar curitic dyke, locally called the “Hanging Rocks,” on the west. Besides the specimens shown, the drift contains chalcedony, cements and breccias of various kinds, indurated and otherwise altered sandstones and nodules of magnesite.
POST PLEISTOCENE.

Pleistocene.

1. Cemented Alluvial Drift.  
   Map No. R (a7).  
   Bullock Swamp, Emberton.  
   ¼ sheet 13 S.E.  
   Composed of rounded and angular pieces of quartz pebbles and sandstone, hardonly, where exposed to atmospheric influence and running water.

2. Granite Detritus.  
   Map No. Rb.  
   Wellington Flat, Sutton Grange.  
   ¼ sheet 13 N.W.  
   From the open cutting at north end of tunnel No. 3 for the Coliban Water Supply.

3. Loosely Cemented Sand and Grit.  
   Map No. Ra 75.  
   Bank of River Loddon.  
   ¼ sheet 14 N.W.

4. Limestone.  
   Map No. Ra 98.  
   River Loddon.  
   ¼ sheet, 14 N.W.  
   Analysis by Mr. J. Cosmo Newbery:
   
<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica, clay, &amp;c.</td>
<td>44.240</td>
</tr>
<tr>
<td>Carb. lime</td>
<td>33.615</td>
</tr>
<tr>
<td>Magnesia</td>
<td>10.359</td>
</tr>
<tr>
<td>Phosphate of iron</td>
<td>0.406</td>
</tr>
<tr>
<td>(2 FeO PO₄)</td>
<td>0.202</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>1.881</td>
</tr>
</tbody>
</table>

5. Breccia.  
   Map No. R (a8).  
   Lot 3, Redesdale.  
   ¼ sheet 13 S.E.  
   From a hole, 20 feet deep, through yellow, red and white clay, containing siliceous geodes, and also nodules of a siliceous breccia, of partly rounded quartz, sandstone and red shale; bottomed on shale.

6. Impure Limestone.  
   Map No. R 131.  
   Mia-mia Creek, Spring Plains.  
   ¼ sheet 13 N.E.  
   Occurs in nodules in a bed of calcareous clay, 1 foot 6 inches thick, under-lying black clay, and overlying recent drift.

7. Fine Sand.  
   Map No. M 38.  
   Section 16, Hawkestone.  
   ¼ sheet 13 S.E.  
   This impalpable, white, micaceous powder is deposited round the funnel or crater-shaped basins of springs along the granite boundary.
BUILDING STONES, ETC.

PLUTONIC ROCKS.

Granites, Greenstones, Etc.

1. Granite.

   Dividing Range, north of the parish of Lancefield. ¼ sheet 5 N.E.

   Gellibrand's Hill, parish of Will-Will-Rook. ¼ sheet 2 S.W.

4. Granite.
   Near Moorabool, half a mile from Sutherland's Creek. ¼ sheet 24 N.E.
   Full of large felspar crystals.

5. Granite.
   Same locality.

6. Euritic Granite. (25.)

7. Euritic Granite.

8. Euritic Granite.


    Range east of parish of Lancefield. ¼ sheet 5 S.E.

    Same locality as above.

    As above.

    As above.

15. Felspar Porphyry. Ra 16a.
    East flank of Mount Macedon. ¼ sheet 6 N.W.

    East flank of Mount Macedon. ¼ sheet 6 N.W.

17. Felspar Porphyry. Ra 16c.
    Same locality as last.

    R 49.
    Deep Creek, parish of Newham. ¼ sheet 5 S.W.

19. Felspar Porphyry.
    R 50.
    Dyke in granite north of parish of Newham, on Dividing Range. ¼ sheet 5 S.W.

    Brock's Monument, parish of Rochfort. ¼ sheet 6 N.W.

    Mount Diogenes or Camel's Hump, Mount Macedon. ¼ sheet 6 N.W.

    Dryden's or Hanging Rock, lot 6, parish of Newham. ¼ sheet 6 N.W.
## VOLCANIC ROCKS.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Location</th>
<th>Sheet Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Basaltic Scoriae (Anakie Hills)</td>
<td>1/4 sheet 19 N.E.</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Red Basalt (Red Rock)</td>
<td>1/4 sheet 7 N.W.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Black Basalt (? Sunbury Hill)</td>
<td>1/4 sheet 7 N.E.</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Basalt (Mount Holden)</td>
<td>1/4 sheet 7 N.E.</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Basalt (Mount Aitken)</td>
<td>1/4 sheet 7 N.W.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Basalt (Lot 12)</td>
<td>1/4 sheet 9 S.E.</td>
<td></td>
</tr>
</tbody>
</table>

## STRATIFIED ROCKS.

### Sandstones, Slates, Etc.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Location</th>
<th>Sheet Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Lower Silurian Sandstone</td>
<td>Quarries or reserve, Jackson's Creek, parish of Holden.</td>
<td>1/4 sheet 7 S.E.</td>
</tr>
<tr>
<td>31a</td>
<td>Lower Silurian Sandstone</td>
<td>Same as above.</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Upper Silurian Sandstone</td>
<td>Quarry, east end of lagoon, opposite the Keilor Hotel.</td>
<td>1/4 sheet 1 N.W.</td>
</tr>
<tr>
<td>33</td>
<td>Sandstone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Sandstone</td>
<td>(26).</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Sandstone</td>
<td>(29).</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Soft, Yellow Sandstone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Lower Silurian Sandstone</td>
<td>Quarries at the back of the Castlemaine gaol.</td>
<td>1/4 sheet 14 S.E.</td>
</tr>
<tr>
<td>38</td>
<td>Upper Silurian Sandstone</td>
<td>Roberts' Quarry, Dry Creek, near Broadford.</td>
<td>1/4 sheet 4 N.W.</td>
</tr>
<tr>
<td>39</td>
<td>Upper Silurian Sandstone</td>
<td>Same as above.</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Upper Silurian Sandstone</td>
<td>Same as above.</td>
<td>R 16.</td>
</tr>
<tr>
<td>41</td>
<td>Sandstone</td>
<td>Kileunda Quarry, Western Port.</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Sandstone</td>
<td>Kileunda Quarry, Western Port.</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Red Sandstone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
44. BLACKISH-BLUE LOWER SILURIAN SANDSTONE. R 33.
Range north of Lancefield, near granite boundary. ¼ sheet 5 N.E.
Very micaceous and close-grained.

45. BLACKISH-BLUE LOWER SILURIAN SANDSTONE (Cube). R 34.
Same as above.

46. BROWN, MICACEOUS LOWER SILURIAN SANDSTONE. R 35.
Same locality as last.

#47. GRITTY SANDSTONE.

48. SILICEOUS SANDSTONE. W

48A. UPPER SILURIAN SANDSTONE. Rb 51.
Rise west of Diamond Creek Bridge.

49. SANDSTONE.
*Macedon River, west of Gisborne. ¼ sheet 6 S.W.
Presented by T. Hamilton, Esq.

50. FLAGSTONE. R 127.
*Campaspe River, section 40, parish of Redesdale. ¼ sheet 13 N.E.

51. FLAGSTONE. R 127.
Same locality as last.

52. FLAGSTONE. Ra 54.
*Specimen Gully, Barker's Creek. ¼ sheet 14 S.E.
Used for flagging footpaths in Castlemaine, Melbourne, &c.

53 and 53A. ROOFING SLATE.
*Moorabool Quarries.
Presented by the Hon. J. B. Humffray.

54. SLATE.
*Castlemaine (?).

MARBLES, ETC.

55. MARBLE (Upper Silurian Limestone).
*Yering Cave, Upper Yarra.

56. YELLOW LIMESTONE.
*Keilor. (?)
Fossiliferous.

57. FLESH-COLORED LIMESTONE.

58. Plioene LIMESTONE. Rd 17.
*Mount Colite, Barwon Heads. ¼ sheet 29 N.W.
Occurs interstratified with sandstones.

59. WHITE LIMESTONE (Cube).
*Point Galena, Geelong. ¼ sheet 24 S.E.
Post Pliocene.

60. LIMESTONE. Rd 18.
*Mouth of Bream or Thompson's Creek. ¼ sheet 29 S.W.

61. FOSSILIFEROUS LIMESTONE.
Full of quartz pebbles.
### MISCELLANEOUS ROCKS, MINERALS, ETC.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>Foliated Gneissose Rock.*</td>
<td>R 96. Barfold Ranges, in a shaft. ¼ sheet 13 S.E.</td>
</tr>
<tr>
<td>63</td>
<td>Graptolite Slate.</td>
<td>Fb 46. Section 29, parish of Spring Plains. ¼ sheet 13 N.E.</td>
</tr>
<tr>
<td>64</td>
<td>Fossil Coal Plants.</td>
<td>Cd.</td>
</tr>
<tr>
<td>65</td>
<td>Silicified Wood.</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Silicified Wood.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ligneous matter completely replaced by iron pyrites (sulphide of iron), and containing gold.</td>
</tr>
<tr>
<td>68</td>
<td>Three Quartz Crystals, with Tourmaline and Felspar.</td>
<td>Upper Goulburn.</td>
</tr>
<tr>
<td>70</td>
<td>Ironstone (Tertiary).</td>
<td>a6. Bullock Swamp, near Barfold. ¼ sheet 13 S.E.</td>
</tr>
<tr>
<td>71</td>
<td>Ironstone.</td>
<td>Queensferry, Western Port.</td>
</tr>
<tr>
<td>72</td>
<td>Copper-Ore.</td>
<td>Thomson River Copper Mining Co. Blue-and-green carbonate. Presented by the Tributors' Co.</td>
</tr>
</tbody>
</table>

* This will be found before No. 1, Case VII.—Metamorphic Rocks.
### VICTORIAN MINERALS.

#### Case XIII.

**NATIVE METALS AND METALLIC MINERALS.**

1. **Gold in Quartz.** List No. S.5.
   - Campbell’s Reef, Moyston.

1A. **Filamentous Gold in Quartz Crystal.**
   - Tarnagulla.
   - Presented by Adam Burns, Esq., Manager of the Colonial Bank, Melbourne.

2. **Gold in Quartz (Slickensides).**
   - Campbell’s Reef, Moyston.

3. **Gold, with Iron Pyrites, in Crystallized Quartz.**
   - All Nations Reef, Emerald Hill, Wood’s Point District.

4. **Laminated Gold in Quartz, with Zinc-blende.**
   - Beehive Reef, Maldon.
   - Presented by J. Cosmo Newbery, Esq.

4A. **Gold in Quartz.**
   - Morning Star Reef, Upper Goulburn.

5. **Gold in Sandstone.**
   - Prior’s Reef, Forest Creek, Castlemaine. Sheet 14 S.E.

6. **Gold, with Chloro-Bromide of Silver.**
   - St. Arnaud.

7. **Quartz, with Native Silver and Chloro-Bromide of Silver.**
   - Silver Reef, St. Arnaud.

8. **Galena, Iron Pyrites, Zinc-blende, &c.**
   - Wilson’s Reef, St. Arnaud.

9. **Galena, Iron Pyrites, Zinc-blende, &c.**
   - Wilson’s Reef, St. Arnaud.

10. **Argentiferous Galena, with Iron Pyrites.**
    - St. Arnaud.

11. **Silver-Ore.**
    - St. Arnaud.
    - From below water-mark.

11A. **Native Copper.**
    - St. Arnaud.

11B. **Native Copper, Moss Copper in part.**
    - Thomson River, Gippsland.

12. **Copper-Ore (Sulphide).**
    - Thomson River Mining Company, Gippsland.
    - Contains 9½ per cent. of copper.

12A. **Copper-Ore (Gossan).**
    - Thomson River, Gippsland.
    - With blue and green carbonate of copper.

13. **Copper-Regulus.**
    - Thomson River, Gippsland.
    - Contains 40 per cent. of copper. That marked * contains 60 per cent.

13A. **Copper and Iron Pyrites, with Sulphide of Antimony and Carbonate of Iron.**
    - Maldon.
    - Contains 40 ozs. of gold to the ton and 19 per cent. of copper.
13B. COPPER PYRITES (Sulphide of Copper and Iron).
  Thomson River.
  Disseminated through a greenish gossan.

14. COPPER PYRITES AND GALENA.
  Mount Buller Quartz Mining Company, Howqua River.

15. COPPER PYRITES (Sulphide of Copper and Iron).
  Thomson River.
  Contains 29 per cent. of copper.

15A. COVELLINE (Sulphide of Copper), with PYRITES and GALENA.
  Dunolly.

16. CERUSITE (Carbonate of Lead).
  Wilson’s Reef, St. Arnaud.

16A. MIMETENE (Arseniate of Lead).
  Wilson’s Reef, St. Arnaud.
  In transparent hexagonal prisms, with adamantine lustre.

17. PYROMORPHITE (Phosphate of Lead).
  Presented by G. H. E. Ulrich, Esq.

17A. GALENA (Sulphide of Lead).
  List No. S 8.
  Campbell’s Reef, Moyston, near Mount Ararat.
  Contains a large quantity of gold disseminated through it.

18. NATIVE BISMUTH, with Sulphide of Bismuth.

19. NATIVE BISMUTH.
  Omeo District.
  Presented by J. B. Were, Esq.

20. BISMUTHITE (Carbonate of Bismuth).
  Clunes.
  With gold.

20A. BISMUTHITE (Carbonate of Bismuth).
  Tarrangower.

Occurs in tolerable abundance in the washing-stuff of Ramshorn Gully, Sandy Creek, Tarrangower. It forms grey or yellowish-white round and nodular pieces, from a few grains to several pennyweights, the larger of which show usually, on being broken, a dark color, tending towards grey—metallic in the centre. Its chemical composition, as determined by a quantitative analysis by Mr. J. C. Newbery, is as follows:—

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxide of bismuth</td>
<td>87:22</td>
<td>85:13</td>
<td>76:22</td>
</tr>
<tr>
<td>Protoxide of iron</td>
<td>0:34</td>
<td>{ Sesqui-oxide }</td>
<td>1:28</td>
</tr>
<tr>
<td>Carbonic acid</td>
<td>5:55</td>
<td>5:10</td>
<td>3:28</td>
</tr>
<tr>
<td>Insoluble matter, clay, &amp;c.</td>
<td>3:46</td>
<td>6:71</td>
<td>9:35</td>
</tr>
<tr>
<td>Water</td>
<td>3:43</td>
<td>2:13</td>
<td>6:83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100:00</strong></td>
<td><strong>100:35</strong></td>
<td><strong>98:99</strong></td>
</tr>
</tbody>
</table>

1. Small grains, of uniform color throughout.
2. Larger grains, with discolored centre.
3. Piece 4-inch in diameter, with dark centre.

As shown by these results, the mineral cannot be considered as a well defined species. There is every reason to suppose, that it has actually been formed, or at least grown, in the drift, small particles, derived from quartz reefs in the neighborhood, having perhaps served as nuclei. Several specimens have been found enclosing small water-worn specks of alluvial gold.
21. Cassiterite (Stream Tin, Oxide of Tin).
   Beechworth.

22. Cassiterite (Stream Tin).
   Beechworth, Ovens District.

23. Cassiterite (Stream Tin).
   Beechworth.
   With zircons, topazes, &c.
   Presented by Mr. Dunn, 3/12/64.

24. Tin (Metallic).
   Reduced from Ovens tinstone.

25. Black Sand (containing Stream Tin).
   Beechworth.
   Presented by Mr. Dunn, 3/12/64.

   Tin Creek, Upper Yarra.
   Contains 33 per cent. of tin, the remainder being chiefly titaniferous and magnetic oxides of iron, with zircons and sapphires. Specific gravity 4.08.

27. Black Sand (Titaniferous Iron, containing Tin and Gold).
   Enterprise Claim, Black-dog Lead, Indigo.
   Obtained from two dishfuls of auriferous drift, at an average depth of 3 feet. The sample is supposed to contain about 5 dwt. of gold, and said to yield about 80 per cent. of tin.

28. Tin-Ore.
   Beechworth.
   Presented by Mr. Dunn, 3/12/64.

29. Black Sand.
   Beechworth.
   Specific gravity 6.15, containing 54 per cent. of tin.

   Cranbourne.
   Presented by Mr. McDonald.

30A. Meteoric Iron.
   Presented by J. C. Newbery, Esq.

   Spur of the Grampians, Carter's Station.

   Map No. R 4.
   Near Tollgate, Pascoe Vale Road, sec. xv., Doutta Galla. 1/2 sheet 1 N.W.

   Greenstone Range, east of Lancefield, 1/4 sheet 5 S.E.

   Near Cobalt Vein, Home Creek, Sloane's Punt, Goulburn River.

37A. Mammillated Brown Ironstone.
   Queensferry, Western Port.

37B. Crystallized Hematite (Hydrous Oxide of Iron).
   Map No. M 39.
   Barfold Falls, Campaspe River. 1/4 sheet 13 S.E.
   Occurs in glittering specks in an earthy deposit between the two flows of basalt. Under the microscope these specks appear as reddish-yellow, transparent crystals.

   Opossum Gully, South Muckleford.

   Magnet Hill, Baynton's Station. 1/4 sheet 51 S.W.
   The rock from which this bar is cut, contains minute perfect octahedrons of magnetic iron. It exhibits strong polarity, and, if suspended, will arrange itself in the magnetic meridian.

40. Black Sand (Titaniferous).
   From a tributary of the Gellibrand River, Cape Otway.

41. Black Sand (Titaniferous).
   Map No. M 34.
   Tunnel south of Mitchell's Digings, between the two falls of the Campaspe at Barfold. 1/4 sheet 13 S.E.
42. **Black Sand (Titaniferous).**
   Map No. M 33.
   Prospectors' Tunnel, Mitchell's Diggings, Campaspe. ¼ sheet 13 S.E.

43. **Black Sand (Titaniferous).**
   Lerderderg River.
   With gold and pebbles.

44. **Black Sand (Titaniferous).**
   Map No. M 36.
   Hell's Corner, Baynton's Station. ¼ sheet 51 S.W.
   Contains peculiar pink, crystalline, flat plates and grains with striated faces.

45. **Black Sand (Titaniferous).**
   Map No. M 35.
   Campaspe River, below Diggings. ¼ sheet 13 S.E.
   From tailings, after extracting the gold. It contains zircons and sapphires, &c.

46. **Black Sand (Titaniferous).**
   Campaspe River, below Diggings. ¼ sheet 13 S.E.
   Contains peculiar pink, crystalline, flat plates and grains with striated faces.

47. **Black Sand (Titaniferous and Magnetic Oxide of Iron).**
   Upper Yarra.

48. **Black Sand (Titaniferous).**
   Horse-shoe Bend, Coliban River. ¼ sheet 13 N.E.
   From Newer Pliocene drift, which contains ½ oz. of gold to the load.

49. **Black Sand (Titaniferous).**
   Below Horse-shoe Bend, Coliban River. ¼ sheet 13 N.E.
   From surface—(Newer Pliocene). It contains ¼ dwt. of gold to the load.

50. **Black Sand (Titaniferous).**
   Near Tambo Hotel, Tambo River, Gippsland.
   Very magnetic.

51. **Black Sand (Titaniferous).**
   Map No. M 43.
   Two miles below Stratford Lodge, Coliban River. ¼ sheet 13 S.E.

52. **Black Sand (Titaniferous).**
   Map No. M 46.
   Argyle Gully, Heathcote.
   Contains gold and black octahedral crystals of chromite.

53. **Black Sand.**
   Map No. M 45.
   Morris' Plain, Heathcote.
   Similar to the last.

53A. **Crystals of Chromite** (Chromate of Iron).
   Heathcote.

54. **Magnetic Iron-Sand.**
   Yarra River.
   Coarse grains, very magnetic.

55. **Wolfram** (Tungstate of Iron).
   Near Maldon.
   This mineral occurs in a quartz reef, running along the top of the range between the Sandy Creek and the Loddon River, eight miles from Maldon, associated with native bismuth, ironglance, schorl, &c.

55A. **Scheelite** (Tungstate of Lime).
   Bradford Lead, Maldon.
   This crystal was found embedded in a pebble of smoky quartz.

56. **Sparry Carbonate of Iron and Lime.**

57. **Crystals of Carbonate of Iron.**

58. **Carbonate of Iron** (in fossil wood).
   Italians' Diggings, Barfoold. ¼ sheet 13 S.E.
   Occurs in lenticular, brown crystals, filling crevices in masses of charred wood, at the junction of the sandstone and basalt; from a tunnel in an old valley, 150 feet below the plain.

59. **Carbonate of Iron.**
   Steep Bank Rivulet, Wannon District.
59. A, B, C, and D. Florsferrri
(Carbonate of Lime and Iron).

  Richmond Quarries. § sheet 1
  S.E.
  Occurs in fine needles and small, di-
  vergent, yellow, silky brushes, lining
  cavities in the basalt.

60. Spherosiderite (Carbonate
  of Iron).
  From a Quarry half a mile south
  of the National School, Essendon.
  Occurs in basalt.

61. Spathic Iron (Carbonate of
  Iron).
  Corinella.
  Nodule from the shaft of the Cori-
  nellia Coal Company, containing 70 per
  cent. of carbonate of iron.

62. Pharmacosiderite (Arsen-
  niate of Iron).
  Port Phillip Company's Mine,
  Clunes.
  Occurs as drusy coatings of brownish-
  red, sub-transparent cubes on black
  manganese ore. The larger crystals
  show, like rhombohedrons of brownspar,
  a peculiar curvature of the faces, as re-
  corded of the sub-species of cube-ore
  "Beudantite." On the smaller crystals,
  however, this feature is absent, and it
  would therefore appear to be a character,
  incident on the growth of the crystals
  beyond a certain size. Some of the
  smaller crystals also show hemihedral
  planes of the octahedron. Before the
  blow-pipe this cube-ore gives a small
  trace of manganese. It probably results
  from the decomposition of arsenical
  pyrites.

63. Scorodite (Arseniate of
  Iron).
  Poverty Reef, Dunolly.
  Occurs with gold in quartz as leek-
  green crystals, with an earthy or ochre-
  ous variety of arseniate of iron. It is
  always associated with arsenical pyrites.

64. Scorodite (Arseniate of
  Iron).
  Blucher's Reef, Maryborough.
  Presented by G. H. F. Ulrich, Esq.

65. Scorodite (Arseniate of
  Iron).
  Blucher's Reef, Maryborough.

66. Vivianite (Phosphate of
  Iron).
  Nicholson River, near Bairnsdale,
  Gippsland.
  Occurs in a yellow Silurian sandstone,
  as crystals and veins composed of thin,
  flexible, prismatic and translucent
  plates of various shades of blue, and
  often coated by mamillated brown
  carbonate of iron (spherosiderite).
  Presented by William Jahn, Esq.

67. Blue Iron-Earth (Earthy
  Vivianite—Phosphate of Iron).
  Phillip Island, Western Port Bay.
  Occurs in nodular, earthy masses of
  a pale smalt-blue color in the older
  basalt, especially in places, where recent
  guano deposits exist on the surface;
  its origin, in this instance, being most
  probably due to the water, percolating
  through the guano, becoming charged
  with phosphate of ammonia and acting
  on the iron of the decomposed basalt.

67A. Vivianite (in part—Phos-
  phate of Iron).
  Bruthen Creek, near Port Albert,
  Gippsland.
  Occurs in the older basalt with iron-
  stone. It was mistaken for copper-ore.
  The matrix, in which it occurs, contains
  40 per cent. of iron.

68. Blue Iron-Earth (Earthy
  Vivianite—Phosphate of Iron).
  Ballarat.
  Occurs in thin veins of a pale small-
  blue color, in finely laminated, soft, light-
  brown shales or mudstones.

69. Copperas (Sulphate of Iron).
  City of Manchester Claim, Dur-
  ham Lead, Leigh River.
  Occurs as an efflorescence (after ex-
  posure), on lignite, obtained 260 feet from
  the surface.

70. Copiapite (Basic Sulphate of Iron).
  Spring Creek, near Geelong.
  This mineral, doubtless a product of the decomposition of iron
  pyrites, is disseminated through certain beds of the Upper Miocene
formation near Point Addis, Geelong, to such an amount (over 50 per cent.), as to render it probably of commercial importance. The beds have the appearance of a yellow sandstone. An analysis of a sample, by Mr. R. Daintree (formerly of the Geological Survey), the discoverer of the deposit, gave the following results:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphuric acid</td>
<td>18.278</td>
</tr>
<tr>
<td>Peroxide of iron</td>
<td>28.495</td>
</tr>
<tr>
<td>Potassa</td>
<td>4.092</td>
</tr>
<tr>
<td>Water of constitution</td>
<td>6.935</td>
</tr>
<tr>
<td>Water of combination</td>
<td>0.850</td>
</tr>
<tr>
<td>Insoluble residue</td>
<td>43.350</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>102.000</strong></td>
</tr>
</tbody>
</table>

Rejecting moisture and insoluble matter, the contained mineral gave:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphuric acid</td>
<td>32.758</td>
</tr>
<tr>
<td>Peroxide of iron</td>
<td>47.482</td>
</tr>
<tr>
<td>Potassa</td>
<td>7.332</td>
</tr>
<tr>
<td>Water</td>
<td>12.428</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.000</strong></td>
</tr>
</tbody>
</table>

These figures nearly correspond with an analysis by Rammelsberg of a yellow iron-ore from the brown coal of Kolosoruk in Bohemia, with the exception, that the latter contains about half a per cent. of lime in addition to its other constituents.

71. **Iron Pyrites** (Sulphide of Iron).
   Catherine Reef, Sandhurst.
   Presented by R. S. Dawson, Esq.

72. **Magnetic Pyrites and Iron Pyrites** (Sulphide of Iron).
   Mount Buller Quartz Mining Company, Howqua River.
   The massive variety contains 7 dwts., the crystalline one, 2 ozs. 14 dwts. of gold to the ton.

73. **Arsenical Iron Pyrites**.
   Map No. M 31.
   Barfold Range, Emberton. ¼ sheet 13 S.E.
   Occurs in a quartz reef.

74. **Magnetic Pyrites and Iron Pyrites** (Sulphide of Iron).
   See No. 72.

75. **Iron Pyrites**. List No. A 2a.
   North of Lancefield. ¼ sheet 5 S.E.
   Found at a depth of 45 feet in a bed of lignite and black clay, 15 feet thick, in a Newer Pliocene deposit.

76. **Iron Pyrites** (Sulphide of Iron).
   Mariner's Reef, Maryborough.
   Occurring crystallized in cubes. It contains only slight traces of gold.

77. **Iron Pyrites** (Sulphide of Iron).
   Mariner's Reef, Maryborough.
   In cubes, in shales with quartz veins.

78. **Iron Pyrites** (Sulphide of Iron).
   Campbell's Reef, Moyston.
   From tailings from North Star claim. It gives on assay 84 ozs. of gold to the ton.

79. **Arsenical Iron Pyrites**.
   Map No. M 30 and 31.
   Barfold Ranges. ¼ sheet 13 S.E.
   In quartz, accompanied by scorodite occasionally.

79a. **Arsenical Pyrites** (Mispickel).
   Whip Reef, Sandhurst.

80. **Magnetic Pyrites** (Pyrrhotine).
   Map No. Mu 14.
   Tiverton Reef and Lisle’s Reef, Maldon.
   See also page 55, “Physical Geography, Geology, and Mineralogy of Victoria,” by Alfred R. C. Selwyn (Director of the Geological Survey) and G. H. F. Ulrich (Field Geologist).

81. **Pyrolusite** (Binoxide of Manganese).
   Said to have come from the Upper Yarra.
82. Psilomelane (Black Ferro-Manganese Ore).

Strathloddon.

This ore occurs in mammillary crusts and concretions in the quartz reefs of all the goldfields. It also occupies, in some of the auriferous conglomerates, the place of the brown oxide of iron, in cementing the pebbles together, and sometimes contains embedded specks of gold. In quartz reefs it appears to be one of the most recently-formed minerals, as, wherever in contact, it forms coatings over most of the others (gold, quartz, chloro-bromide of silver, iron and arsenical pyrites, &c.). Diallogite and cube-ore, which have been found at Clunes coating it, are rare exceptions. Its formation seems to be going on rapidly at the present time. The following are the results of analyses, by Mr. J. Cosmo Newbery, of psilomelane from different localities:

<table>
<thead>
<tr>
<th></th>
<th>1. From Parkin’s Reef, Tarrangower, mammillary crusts in crevices and joints of the quartz.</th>
<th>2. From Ramshorn Gully, Sandy Creek, narrow veins and mammillary crusts.</th>
<th>3. From Strathloddon, fine botryoidal crusts in crevices of hard ferruginous sandstone.</th>
<th>4. From Gippsland, massive, with cavities filled with earthy matter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxides of manganese</td>
<td>54°28</td>
<td>49°28</td>
<td>62°63</td>
<td>77°14</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>20°16</td>
<td>18°73</td>
<td>10°31</td>
<td>6°03</td>
</tr>
<tr>
<td>Baryta</td>
<td>2°51</td>
<td>4°21</td>
<td>0°20</td>
<td>11°33</td>
</tr>
<tr>
<td>Oxide of cobalt</td>
<td>2°86</td>
<td>5°12</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Oxide of copper</td>
<td>0°92</td>
<td>1°21</td>
<td>trace</td>
<td>—</td>
</tr>
<tr>
<td>Lime</td>
<td>1°40</td>
<td>1°00</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alumina</td>
<td>—</td>
<td>5°12</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Silica</td>
<td>6°21</td>
<td>8°91</td>
<td>4°60</td>
<td>3°05</td>
</tr>
<tr>
<td>Water</td>
<td>12°02</td>
<td>12°25</td>
<td>16°01</td>
<td>0°02</td>
</tr>
<tr>
<td>100°36</td>
<td>100°71</td>
<td>98°87</td>
<td>99°00</td>
<td></td>
</tr>
</tbody>
</table>

1. From Parkin’s Reef, Tarrangower, mammillary crusts in crevices and joints of the quartz.
2. From Ramshorn Gully, Sandy Creek, narrow veins and mammillary crusts.
3. From Strathloddon, fine botryoidal crusts in crevices of hard ferruginous sandstone.
4. From Gippsland, massive, with cavities filled with earthy matter.

Though this ore differs considerably in chemical composition from the European ore, it would hardly be advisable to class it as a distinct mineral.

83. Wad (Earthy or Bog Manganese).

Near Merton, Goulburn Valley.

83A. Diallogite (Carbonate of Manganese).

Port Phillip Company’s Mine, Clunes.

Forms mammillated and botryoidal crusts of a rose-red color on quartz and psilomelane. Presented by R. H. Bland, Esq.

84. Earthy Cobalt-Ore.

McKenzie’s Diggings.

Composed of manganese, iron and cobalt in variable quantities. The cobalt varies from 1 to 14 per cent.

84A. Earthy Cobalt-Ore.

Home Creek, Sloane’s Punt, Goulburn River.

Similar to No. 84.

Note.—Extract from a report on cobalt-ores, by Mr. J. C. Newbery, Analyst to the Geological Survey:—“I have been in communication with the best metallurgical authorities in England, with regard to the value of the Victorian cobalt-ores, and have been informed that it is very doubtful, whether such ores (specimens Nos. 82, 84 and 84A), as I have described, could be profitably worked, on account of the large amount of cobalt now on the English market, and its steadily decreasing value. This is caused by the large quantity of nickel-ore, containing cobalt, that
is brought to England from the Continent, and from which the cobalt is saved as a by-product. The demand for nickel, to be used in the manufacture of the basis of plated ware, is steadily increasing, while the demand for cobalt is daily diminishing, on account of the artificial blues introduced for the use of the dyer, calico-printer and papermaker. Still our cobalt-ore might be economically used—the saving being moderately easy, where it occurs in quartz reefs worked for gold, as at Alexandra diggings, where it coats the joints of the quartz with a botryoidal coating of considerable thickness—by passing the tailings through settling boxes, in which it would settle with the last of the gold, and be in an excellent form for removing gold from tailings by Plattner's chlorine process. The residue would also be of value for the generation of chlorine in chemical works. After either of these operations the cobalt could be saved. A process has been invented and tried in South Australia, in which the cobalt is extracted by smelting the ore with copper and, I believe, separating the metallic cobalt by liquation; but I have not heard that it has been attended with success.”

85. Molybdenite (Sulphide of Molybdenum).
Yea, Goulburn River.
Occurs associated with iron pyrites in granite.

86. Molybdenite (Sulphide of Molybdenum).
Yackandandah.
This mineral contains, according to assays, a small percentage of silver. It occurs in hexagonal plates in a quartz vein traversing granite.

Close to the Maldon Brewery Springs. ½ sheet 14 N.W.
Occurs sparingly dispersed in small scales through the granite.

87A. Ceravantite (Antimony-Ochre—Oxide of Antimony).
Costerfield, near Heathcote.
Occurs coating antimony-glance, and also in veins, but not below the water-level.

88. Antimony-Glance* (Sulphide of Antimony).
Costerfield.
From the upper workings.

Note.—Antimony is generally found in connection with auriferous quartz, and is frequently impregnated with specks of gold. Assays have shown as much as 8 ozs. of gold and 80 ozs. of silver per ton.
Case XIV.

SILICATES.

ZEOLITES.—FELSPARS.—PRECIOUS STONES.

1. NATROLITE (Mesotype).
   Phillip Island, Western Port Bay.
   Associated with analcime and calc-spar from the older basalt; Colorless and flesh-colored, rhombic-prismatic crystals, terminated by four-sided pyramids, sometimes united in reniform masses.

2. CHABASITE.
   Pentland Hills, near Bacchus Marsh.
   Occurs in druses of small, yellow, opaque, rhombohedral crystals, coating hollows in the basalt, and associated with a flesh-colored clay.

3. ANALCIME.
   Phillip Island.
   Occurs in regular trapezohedrons, filling cavities in the older basalt.

3A. GMELINITE.
   Phillip Island.
   In small yellow crystals; hexagonal prism, with pyramid and terminal plane.

4. HERSCHELITE.
   Richmond Quarries.
   In two double-hexagonal pyramids, the obtuse one perfect. Found by Mr. E. F. Pittman.

4A. HERSCHELITE.
   Richmond Quarries. ¼ sheet 1 S.E.
   Occurs in fine druses, aggregated in rosette-like groups, and occasionally in solitary crystals. It was first discovered in Victoria, at the above locality, by Mr. C. S. Wilkinson, of the Geological Survey.

5. HERSCHELITE.
   Richmond Quarries. ¼ sheet 1 S.E.
   Occurs in macles, embedded in a thin, crystalline crust, resting on a soapy, liver-colored clay, lining cracks and cavities of the newer basalt. The clay, above referred to, has a sort of prismatic structure when dry, and splits up like starch. It is sometimes accompanied by mammillarly carbonate of lime and iron.

6. HERSCHELITE.
   Fitzgibbon's Quarry, Richmond. ¼ sheet 1 S.E.
   Occurs in macles—the tabular, six-sided, truncated pyramids crossing one another at various angles.

7. HERSCHELITE.
   Richmond Quarries. ¼ sheet 1 S.E.
   Macles, coating newer scoriaceous basalt and filling cavities.

7A. HEULANDITE.
   Lisle's Reef, Maldon. ¼ sheet 14 S.W.
   Occurs as thin, drusy coatings in the crevices and joints of the metamorphic sandstone, accompanied by brownspor (carbonate of iron).

7B. PHILLIPSITE.
   Near Degraves' Mill, Kyneton. ¼ sheet 9 S.E.
   Occurs in newer basalt, associated with chabasite and carbonate of lime.

7C. PHILLIPSITE, HERSCHELITE and BROWN CALCITE.
   Chambers' Quarry, Richmond. ¼ sheet 1 S.E.
   The crystals of the two zeolites are well developed and nearly transparent.
8. Orthoclase (Potash-Felspar).

Hells Corner, Back Creek, Baynton. § sheet 51 S.W.

Occurs in combination with quartz, tourmaline and mica, along the boundary between the granite and Lower Silurian rocks.

Note.—Orthoclase forms one of the principal constituents of granite. It also occurs in veins, either solid, or massively associated with quartz.

8a. Orthoclase Crystals ("Baveno" Twins).

Three miles east of township of Bradford, near Maldon.

Occur in a patch of quartz in the granite.

9. Albite (Soda-Felspar).

Blacksmith's Gully Reef, Fryers-town. § sheet 15 N.E.

In narrow veins and druses, associated with quartz. Several parts of the reef assume a porphyritic appearance from embedded crystals of albite. An analysis, by the late Mr. C. S. Wood, gave the following results:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>68.73</td>
</tr>
<tr>
<td>Alumina</td>
<td>20.55</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>0.20</td>
</tr>
<tr>
<td>Lime</td>
<td>trace</td>
</tr>
<tr>
<td>Potassa</td>
<td>trace</td>
</tr>
<tr>
<td>Soda</td>
<td>10.43</td>
</tr>
</tbody>
</table>

Total: 99.91%

10. Oligoclase (Soda-Spodumen).

Anake Range. § sheet 19 N.E.

Occurs in the newer basalt, associated with olivine and hornblende.

An analysis, by the late Mr. C. S. Wood, gave:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>64.22</td>
</tr>
<tr>
<td>Alumina</td>
<td>23.87</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>1.53</td>
</tr>
<tr>
<td>Lime</td>
<td>trace</td>
</tr>
<tr>
<td>Magnesia</td>
<td>0.38</td>
</tr>
<tr>
<td>Soda with some potassa</td>
<td>9.87</td>
</tr>
</tbody>
</table>

Total: 99.87%

11. Oligoclase.

Mount Franklin. § sheet 15 S.E.

In scoriaceous basalt, often associated with large masses of olivine.

12. Fire-Clay

Lal-Lal, near Ballarat.

Occurs as a bed, 3 feet thick, covering a lignite deposit. It forms an excellent fire-clay. The following is an analysis by the late Mr. C. S. Wood:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insoluble silicate of alumina</td>
<td>92.60</td>
</tr>
<tr>
<td>Soluble silicate of alumina</td>
<td>1.33</td>
</tr>
<tr>
<td>Oxide of iron</td>
<td>trace</td>
</tr>
<tr>
<td>Soluble silica</td>
<td>0.53</td>
</tr>
<tr>
<td>Water of constitution, driven off at red heat</td>
<td>5.80</td>
</tr>
</tbody>
</table>

Total: 100.26%

13. Pholerite.

Blacksmith's Gully Reef, Fryers-town. § sheet 15 N.E.

Occurs as soft, white, unctuous scales and coatings. Mr. Ulrich, of the Geological Survey, states "That, at the above locality, it has evidently arisen from the decomposition of albite, which is always in close contact with it, and more or less of a soft, crumbling character." According to an analysis, by the late Mr. C. S. Wood, its composition is as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>44.92</td>
</tr>
<tr>
<td>Alumina</td>
<td>42.69</td>
</tr>
<tr>
<td>Water</td>
<td>12.79</td>
</tr>
</tbody>
</table>

Total: 100.40%


Blacksmith's Gully Reef, Fryers-town. § sheet 15 N.E.

The clay in which pholerite occurs.

14A. Silicate of Alumina and Magnesia.

Lot 4, section 4, Redesdale. § sheet 13 S.E.

Occurs in white and slate-colored seams, about 4 feet thick, under 5 feet of stiff clay, and rests on cellular basalt. From its great absorbent powers it might be used as fuller's earth.
15. SELWYNITE. List No. R 120.
West of Mount Ida, near Heathcote.

Occurs as a vein in the Upper Silurian rocks, traversed by thin seams of talc, and accompanied by a white magnesian mineral and two other undetermined minerals. According to Mr. Ulrich, it is allied to pyrosclerite, but differs materially from it in its chemical composition and physical properties, and therefore forms a new mineral species, which is named after Mr. Alfred R. C. Selwyn, the Director of the Geological Survey of Victoria. A quantitative analysis, by Mr. J. Cosmo Newbery, afforded the following results:

Silica 
Sesqui-oxide of chromium 
Alumina 
Magnesia 
Water 

\[ \text{MgO SiO}_2 + 3 (\frac{8}{9} \text{Al}_2\text{O}_3 + \frac{1}{9} \text{Cr}_2\text{O}_3) \text{SiO}_2 + 3 \text{HO} ; \]

or,

\[ \left(\frac{1}{10} \text{MgO} + \frac{9}{10} \left(\frac{8}{9} \text{Al}_2\text{O}_3 + \frac{1}{9} \text{Cr}_2\text{O}_3\right)\right) \text{SiO}_2 6/5 + 1/3 \text{HO}. \]

Note.—Button-shaped, spheroidal pieces of obsidian are found abundantly scattered over the basaltic plains of Mounts Elephant, Eales, &c., and the mud-plains of the Wimmera district, the latter far removed from any known craters or points of eruption. Specimen No. 22 is a
remarkable instance of an obsidian ball. From its low specific gravity, 1·06 (being only half that of the buttons, 2·47—Specimen No. 21), it was deemed advisable to have it cut. It now shows a cavity, having a beautiful polish. The following are the results of analyses, by Mr. J. Cosmo Newbery, of specimens 21, 24 and 24a:—

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Sp. Gr.</th>
<th>Silica</th>
<th>Sesqui-oxide of iron</th>
<th>Alumina</th>
<th>Lime</th>
<th>Magnesia</th>
<th>Protopxide of manganese</th>
<th>Titanic acid</th>
<th>Soda</th>
<th>Potassa</th>
<th>Loss by Ignition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spec. 21</td>
<td>2·47</td>
<td>73·70</td>
<td>6·08</td>
<td>4·99</td>
<td>4·20</td>
<td>0·10</td>
<td></td>
<td>5·20</td>
<td>4·83</td>
<td>0·55</td>
<td>99·65</td>
</tr>
<tr>
<td>Spec. 24</td>
<td>2·31</td>
<td>72·23</td>
<td>6·28</td>
<td>16·43</td>
<td>3·17</td>
<td>2·12</td>
<td></td>
<td>4·65</td>
<td>0·13</td>
<td>7·36</td>
<td>101·01</td>
</tr>
<tr>
<td>Spec. 24a</td>
<td>2·36</td>
<td>68·45</td>
<td>6·71</td>
<td>5·38</td>
<td>8·11</td>
<td>1·03</td>
<td></td>
<td>7·36</td>
<td>98·34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. OBSIDIAN.

Broadford. (?)

24. OBSIDIAN.

List No. Md 18.

Geelong District.

24A. BLUE OBSIDIAN.

Geelong.

Note.—Olivine occurs in all the newer basalts (except where they appear as true dolerites), especially round points of eruption, and may be regarded as an essential ingredient of these rocks. It varies in size from small grains to masses 12 to 18 inches in diameter. No crystals have hitherto been discovered.

25. OLIVINE.

Mount Franklin. ¼ sheet 15 S.E.

Green, granular, or sub-crystalline masses, occurring in the scoriaceous basalt of this extinct crater.

26. OLIVINE.

Mount Franklin. ¼ sheet 15 S.E.

A reddish and green, sub-crystalline mass in vesicular grey basalt.

27. TOURMALINE (Schorl).

Map No. M 25.

Hell’s Corner, Back Creek, Baynton. ½ sheet 51 S.W.

Occurs in the surface drift at the junction of the granite and Silurian rocks, and is derived from the granite.

28. TOURMALINE CRYSTALS.

Map No. M 25.

Same locality as last.

These crystals exhibit the terminal planes.

29. TOURMALINE.

Dandenong.

Black water-worn pebbles.

Note.—Tourmaline (schorl) is of very frequent occurrence, but almost entirely confined to the plutonic and metamorphic older rocks,

30. SCHORL.

Map No. Mu 15.

Near the Brewery, Maldon. ¼ sheet 14 N.W.

Radiating crystals in granite.

31. SCHORL.

Map No. Ra 52.

Specimen Gully, Barker’s Creek. ¼ sheet 14 S.E.

Stellar tufts on the faces of joints in altered sandstone, at the junction of the granite and slate rocks.

31A. SCHORL.

A water-worn crystal.
being unknown in recent sedimentary and volcanic rocks. It is a constituent of schorl-rock, and occurs in granite, mica-schist, topaz-rock, &c. It occasionally occurs in sandstone, but only in the neighborhood of intruded rocks.

32. **Topaz.**
   Dunolly, (?)
   Occurs in the gold drifts.

32A. **Topaz.**
   Bradford Lead, Maldon.

32B. **Topaz (polished).**
   From the same locality.

33. **Zircon (Hyacinth).**
   Map No. M 37.
   Teatree Creek, Lancefield. ½ sheet 5 N.E.
   Occurs in the sand from the bottom of some holes sunk in a drift resting on basalt. The crystal is a combination of the square prism with the double four-sided pyramid.

34. **Topaz, Zircon, Sapphire, Gold, &c.**
   Map No. M 35.
   Separated from the black sand from the Campaspe River, below Mitchell’s Diggings, parish of Redesdale. ½ sheet 13 S.E.

35. **Zircons.**
   **Dandenong.**

36. **Sapphires.**
   From a tributary of the Gellibrand River, Cape Otway.
   Presented by J. M. Allan, Esq.

37. **Sapphires.**
   Beechworth.
   Presented by Mr. Dunn, 3 | 12 | 64.

38. **Oriental Amethyst (Ruby—Species of Sapphire).**
   Pakenham, Dandenong District.
   Hexagonal prism with rhombohedral planes.
   Presented by the Rev. Dr. Bleasdale.

38A. **Black Corundum.**
   Dandenong Goldfield.

38B. **Emery (Massive Black Corundum).**
   Koh-i-noor Claim, Ballarat.
   Occurs in the gold drift.

**Note.**—Corundum occurs abundantly in the drifts of nearly all the goldfields in half angular, or roundish pieces, often nearly the size of a large bean. It has a conchoidal fracture, with (very rarely) indistinct crystal and cleavage planes. Specific gravity, 3'98; hardness, sometimes over 9. An analysis, by Mr. J. Cosmo Newbery, of Specimen No. 38, gave—

<table>
<thead>
<tr>
<th>Substance</th>
<th>Quantity</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>...</td>
<td>5'35</td>
</tr>
<tr>
<td>Alumina</td>
<td>...</td>
<td>67'37</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>...</td>
<td>28'04</td>
</tr>
<tr>
<td>Magnesia</td>
<td>...</td>
<td>0'30</td>
</tr>
<tr>
<td>Water</td>
<td>...</td>
<td>0'61</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>101'67</strong></td>
</tr>
</tbody>
</table>

38C. **Garnet Crystals in Quartz.**
   Bradford Lead, Maldon.

These crystals are apparently not very rare in pebbles and crystals of smoky and transparent quartz in a certain portion of the Bradford Lead.

38D. **Garnet Sand.**
   Hell’s Corner, Baynton’s Station.

They vary in size from a small pin's head to that of a small pea, and their general form is a combination of the leucitohedron with the rhombic dodecahedron.
The following remarks on Quartz are taken from "Notes on the Physical Geography, Geology and Mineralogy of Victoria":—

Quartz is, as the "massive variety," the most common of colonial minerals, represented by the thousands of auriferous and non-auriferous reefs that traverse our Silurian rocks, and also as extensive beds of "quartz rock," some nearly 40 feet in thickness, in the lower Miocene tertiary formation. It is partly, and perhaps more commonly, white opaque, or what might be called "milky quartz," partly vitreous, semi-translucent. Sometimes it shows, especially in veins traversing the granite, a greasy lustre—"greasy quartz." In the Belltopper reef, Taradale, it is quite sugary or fine granular; in some of the St. Arnaud and Heathcote reefs cellular; and in most auriferous reefs there occur opaque patches of a uniform brown or yellow color—"ferruginous quartz." Druses of crystals occur in all reefs, yet not in such abundance as in the European ore lodes. Fine, very perfect, opaque white crystals (double hexagonal pyramid with narrow planes of the prism) occur in an Elvan dyke on the Back Creek, near Dr. Baynton's station (1/4 sheet 51 S.W. Map No. Mb 26. See specimen No. 50). In quartz veins traversing the granite, near Pigeon Hill, Tarrangower, specimens of the so-called "Hauben" or "Hood quartz" are occasionally found. Some peculiar crystals were discovered by Mr. Norman Taylor, of the Geological Survey, which exhibit in a striking manner their growth. (See specimens No. 43 and following note). Large and fine crystals of quartz enclosing "actinolite," and accompanied by large and perfect crystals of felspar, were found in a bed of granite drift and clay, in the Coliban River, below Orr's station (Stratford Lodge).

Quartz occurs also, though, generally speaking, only in moderate abundance, in a transparent crystallized slate, and in colored varieties, fine enough to be cut for jewellery. Thus we have Rock crystal, both as crystals of large size, sometimes rich in rare planes, and as pebbles; the latter frequently found in the Older and Newer Pliocene gold drifts, though seldom of sufficient size to make them valuable. Curved and twin-like crystals are also frequent, and several have been found with filamental tufts of "Chlorite" in the centre.

The varieties hitherto discovered in Victoria are:

1. Rock crystal.—Distinct crystals and waterworn pebbles.
2. Smoky Topaz and Cairngorm.—As pebbles in drifts, and in some quartz veins traversing granite.
3. Amethyst.—Occurs similarly to the last.
4. Prase.—Of rare occurrence.
5. Chalcedony.—Chiefly occurs as mammillary coatings of cavities in the newer basalt, and as nodules and pebbles derived from the older basalt, &c.
6. Cornelium.—Rarely as pebbles in drifts.
VICTORIAN MINERALS.—CASE XIV.

7. **Agate.**—Occurs in the Beechworth drifts, and on the Cape Otway coast.

8. **Cat's-eye, Onyx and Sardonyx** have been reported from Beechworth, &c., but seem to be very scarce.

9. **Flint.**—Abundantly scattered through the sands along the Cape Otway and Warrnambool coast line, probably derived from tertiary formations.

10. **Silicified Wood.**—Occurs abundantly in large blocks in some of the tertiary formations.

11. **Jasper.**—Common along the western sea coast, and also in some drifts.

12. **Hornstone and Chert.**—Occur abundantly in veins as sharp angular pieces along the Greenstone boundary, Lancefield, being a product of metamorphic action.

13. **Lydianstone, Touchstone.**—Occurs in drifts and in narrow veins in Silurian rocks in the neighborhood of Greenstone.

14. **Opal.**—With the exception of “Precious opal,” reported by Dr. Bleasdale as occurring at Beechworth, all the other varieties are of frequent occurrence, viz.: Hyalite, Semi-opal, Opal-jasper, Wood-opal.

39. **Reef Quartz.**

Map No. R 105.

Mia-mia Ranges. 1/2 sheet 13 N.E.

This quartz presents a peculiar feature: it is not found “in situ,” but the portion exhibited is one of a number of similar pieces, all possessing the same saddle-like form, and found scattered over the surface; it has a concretionary structure externally, and varies in thickness from one to six or eight inches.

40. **Siliceous Concretion.**

Banks of the Glenelg River.

41. **Silico-Calcareous Concretion.**

Map No. M 29.

Near Barfold. 1/2 sheet 13 S.E.

Found in a hole in yellow, red and white clay, with siliceous geodes and breccias.

42. **Granular Quartz.**

Mount Franklin. 1/4 sheet 15 S.E.

Occurs in the basalt of this extinct crater.

43. **Quartz Crystals.**

Map No. M 27.

Near N.E. corner of the parish of Langley. 1/4 sheet 5 N.W.

Note.—These peculiar and rare crystals were discovered by Mr. Norman Taylor, of the Geological Survey, in a bed of yellow clay, resting on the granite. They occur as a horizontal vein, the walls (upper and lower) of which were externally nearly flat, the crystals pointing inwards, and the intermediate space being occupied by a stiff yellow clay and flat plates of quartz. The crystals—some of which are nearly 2 inches long and three-quarters of an inch thick—are composed of a slightly smoky quartz, with hard rough faces, surrounding a small opaque or milky quartz crystal, about one-third the size of the external one, and very rarely in the centre. The polished specimens exhibit the gradual growth or building up of the crystal in a very marked manner, by a series of deeper colored, smoky lines, parallel to the terminal faces of the internal crystal. One specimen appears to be split and traversed by...
another crystal, though the apices of the two sides of the fracture are perfect crystals themselves. Another has the appearance of having been broken in half, slipped, and been re-cemented; but such is apparently not the case, as both parts show the terminal planes of the pyramid along the line of junction. In both these instances, however, it is probable that the faces have grown since the fracture. Several crystals show the central one projecting through the base of the prism of the external one, and a transverse section through both crystals exhibits a series of concentric hexagons.

44. Quartz Crystals.
Map No. M 4.
Blacksmith's Gully, Castlemaine, ¼ sheet 9 N.W.
Abnormally developed crystals.

45. Rock Crystal and Smoky Quartz or Cairngorm.
Map No. Ma 18.
Bradford Lead, ½ sheet 14 N.W.
From the Older Pliocene gold drift.

46. Quartz Crystals.
Map No. Ra 56.
Blacksmith’s Gully Reef, Fryer’s Creek District. ½ sheet 9 N.W.
Similar to No. 44.

47. Quartz Crystals.
Scott and Hurley’s Morning Star Reef, Wood’s Point.
These perfect crystals occur, in small patches, in various reefs, and are generally loosely cemented by oxide of iron.

48. Quartz Rock.
Map No. Ma 18.
Bradford Lead, ½ sheet 14 N.W.
From the Older Pliocene drift.

49. Amethyst Quartz.
Map No. Ma 18.
Bradford Lead, ½ sheet 14 N.W.
From the Older Pliocene gold drift.

50. Quartz Crystals.
Back Creek, east of parish of Glenhope, ¼ sheet 51 S.W.
These occur in a large Elvan dyke in the Lower Silurian rocks. Their form is a combination of the double six-faced pyramid and the hexagonal prism.

51. Quartz Crystals.
Maldon.
Occurring in a dyke.

52. Flint.
Phillip Island Beach.

53. Quartz.
Section 23, parish of Merriang. ¼ sheet 3 S.W.
Occurs, associated with olivine, in the basalt from near a point of eruption (Gieson’s Hill).

54. Quartz.
Map No. M 21.
Quarry near Court House, Kilmore. ¼ sheet 4 S.W.
Occurs in basalt, associated with hyalite.

55. Chalcedony.
Phillip Island, Western Port Bay.
With rounded cavities, containing yellow carbonate of lime, showing a slightly stellar form. Occurs in the Older Basalt. Presented by Mr. J. C. Newbery.

56. Chalcedony.
Phillip Island.
The carbonate of lime has here disappeared, leaving the cavities empty. Presented by Mr. J. C. Newbery.

57. Chalcedony.
Phillip Island.
With a small vein of quartz passing through it. Presented by Mr. J. C. Newbery.

58. Chalcedony.
Heathcote, near Police Camp.
From the gold drift.

59. Chalcedony.
Phillip Island.
From the older basalt.
60. Chaledony.

*Spring Creek, Beechworth District.*

Pseudo-crystals, with cavities containing water. For a description of these peculiar crystals, see page 71, "Physical Geography, Geology and Mineralogy of Victoria."

Presented by Mr. E. Dunn.

61. Chaledony.

*Phillip Island Beach.*

Pebbles derived from the older basalt.

Presented by Mr. C. D'Oyly H. Aplin.

62. Chaledony.

*Phillip Island.*

From a cavity in basalt.

63 and 63a. Chaledony and Jasper.

*Moroka River, Gippsland.*

Nodule No. 63, containing an infiltration of chaledony and quartz.

64 to 95 (inclusive)—Pebbles.

*Cape Otway Coast.*

Jaspers, breccias, porphyries, sandstone, greenstone, &c.

96. Mammillated Quartz.

*Phillip Island.*

Presented by Mr. J. C. Newbery.

97. Flint.

*Cape Otway Coast.*

Occurs scattered through the beach sand, and is probably derived from the tertiary formations of Miocene age, of which the cliffs are formed.

98. Silicified Wood.

*List No. TM 17*

*Parish of Durdidwarrah.* ¼ sheet 19 S.W.

Occurs in a hard, siliceous rock underlyng older basalt and Miocene (probably Lower Miocene) beds.


*Glenmaggie, Gippsland.*

From a pebble-drift of probably Miocene age.

100. Siliceous Stalagmitic Incrustation.

*Map No. M 24.*

*Back Creek, Baynton.* ¼ sheet 5 N.W.

From a cave in the granite.

101.
Case XV.

SILICATES, CARBONATES, ETC.

Opal Varieties.

102. **Opal Jasper.** Map No. Ra 20.

*Riddell's Creek.* ¼ sheet 6 S.W.

Occurs in a band of irregular lumps and nodules in the newer basalt.

103. **Semi-Opal.**

*From the Basalt, Sunbury.*

103A. **Opal.**

*From the Basalt, Sunbury.*

External portion colored brown, some parts white, vesicular and friable, containing iron pyrites; internal portion colored blue and opalescent. Both portions become opaque and white on heating. The brown contains 6.8 per cent. of water, and has a specific gravity of 2.049; the blue contains 8.5 per cent. of water, and its specific gravity is 2.038. Both contain sesqui-oxide of iron and alumina.

104. **Opal Jasper.** Map No. Ra 21.

*Bullangocrook, or Bullancrook.*

Similar to No. 102. Presented by Mrs. Matson.

105. **Common Opal.**

*Gelantipy, Gippsland.*

In basalt.

106. **Opaline Quartz.**

*Heathcote.*

Occurs in the Newer Pliocene drift, near Police Reserve.

107. **Hyalite** (Müller's glass).

*Kyneton Police Reserve.* ¼ sheet 9 S.E.

Coating a doleritic newer basalt.


*Near Court House, Kilmore.* ¼ sheet 4 S.W.

Coating basalt and associated with quartz.

109. **Chloropal (?)**

*Near Sunbury.* ¼ sheet 7 N.E.

Occurs in nodular masses in decomposed basalt, and was supposed, at one time, to be copper-ore.

110. **Opalized Wood.**

*Durridwarrah.* ¼ sheet 19 S.W.

Brown opal, with the wood-structure clearly visible.

CARBONATES, ETC.

1. **Calc-Spar (Carbonate of Lime).**

List No. Re 19.

*Moët, Gippsland.*

Occurs in veins in the carbonaceous rocks.

2. **Calc-Spar.** List No. S 4 and 7.

*Campbell's Reef, Moyston.*

The only known quartz reef in which calspar occurs.

3. **Calc-Spar.** List No. Rb 12a.

*Messrs. Fraser's Contract for the Coliban Water Supply, Preston Vale.* ¼ sheet 13 N.W.

Forms a thin vein in granite, in the upper part of the shaft, associated with quartz, tale and felspar.

4. **Calcite** (Carbonate of Lime).

*Phillip Island, Western Port Bay.*

Occurs in crystals in the Older Basalt. Presented by Mr. J. C. Newberry.
5. Arragonite (Carbonate of Lime).

Chambers' Quarry, Richmond. 1 sheet 1 S.E.

In fine needles, collected in radiating tufts.

6. Calcite.

Degraves' Mill, Kyneton. 1 sheet 9 S.E.

Fine yellow scalenohedrons, with two rhombohedrons, associated with chabasite.

Note.—This mineral occurs very abundantly in the lowest basaltic flow immediately under the Falls. It bears a close resemblance to "chalcedony," forming semi-transparent, botryoidal crusts and globular nobs of a bluish or yellowish white color; whilst its fine concentric radiating structure, mostly accompanied by a change to a darker color, gives it the appearance of "sphærosiderite." The external surfaces are generally coated with a thin, brittle crust of bright-brown, glittering carbonate of iron, sometimes decomposed to yellow oxide. According to an analysis by Mr. J. C. Newbery it varies slightly in composition, according to color: the darker portions containing most iron and manganese. An average specimen gave:

<table>
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<tr>
<th>Substance</th>
<th>Percentage</th>
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<tr>
<td>Carbonate of lime</td>
<td>72.43</td>
</tr>
<tr>
<td>iron</td>
<td>20.65</td>
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<tr>
<td>magnesia</td>
<td>5.00</td>
</tr>
<tr>
<td>manganese</td>
<td>1.92</td>
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</tbody>
</table>

Its hardness is 3.5—sp. gr. 2.86.

On comparing this composition with the minerals classed under "Dolomite," a very great difference will be observed, especially as regards lime and magnesia; we have consequently thought it not unjustifiable to call this mineral "Ferro-calcite." It is probable, that it represents a part-pseudomorph after "sphærosiderite," by exchange of carbonate of lime for carbonate of iron.


Lennox's Reef, near Mount Tarra-rangower. 1 sheet 14 S.W.

Occurs in obtuse rhombohedrons. Minute specks of iron pyrites occur on the apices of some of the crystals.

12. Dog-tooth Spar.

Degraves' Mill, Kyneton. 1 sheet 9 S.E.

Aggregations of yellow, long-pointed crystals (hexagonal prism), with acute rhombohedron; coating cavities in basalt.

13. Ferro-Calcite.

Saltwater River, 3 miles above Keilor Bridge. 1 sheet 1 N.W.

Same as No. 10. Coats cavities in vesicular basalt.


Ballan. 1 sheet.

In fibrous, radiating nodules. From tunnel on Mr. Lyons' property.
Tunnelling Co.'s Lease, Lisle's Reef, Mount Tarrangower. ½ sheet 14 S.W.
On metamorphic sandstone.

16. **Dog-tooth Spar.**
Degraves' Mill, Kyneton.
In basalt, similar to No. 12.

16A. **Calcite.**
Geelong.
Light yellow, acute rhombohedrons, coating limestone.

17. **Freshwater Limestone.**
Map No. Ra 1.
Muchleford Creek, lot 4, section 4, Strangways. ½ sheet 15 N.E.
Containing cavities filled with fine crystals of "arragonite" and "calcite." The former are especially characterized by fine terminal planes, which are seldom found on those occurring in the basalt.

17A. **Carbonate of Lime.**
Guildford.
Mammillar coating of cavities in the basalt.

18. **Carbonate of Lime.**
Map No. Ra 37.
Police Reserve, Kyneton. ½ sheet 9 S.E.
Coating "hyalite" in mammillated crusts, filling cavities in the basalt.

19. **Calc-Spar.**
Phillip Island, Western Port Bay.
In older basalt.

20. **Limestone.**
Map No. R 130.
Section 46, Redesdale. ½ sheet 13 N.E.
Occurs in lumps and horizontal veins, in a red-and-yellow mottled clay, full of ironstone pebbles, under 8 feet of basalt, and overlying grey, cellular basalt. It is nearly pure, and burns and slakes well, but is not abundant.

21. **Calcaceous Deposit.**
Map No. M 41.
Stone-jug Creek, Spring Plains. ½ sheet 13 N.E.
Occurs, underlaying the basalt, in a bed a few inches thick, formed apparently by infiltration or absorption of carbonate of lime into the vegetable tissue of a moss, and the subsequent decomposition of the moss leaving the carbonate of lime in its exact form. It is a beautiful object under a strong magnifying power.

22. **Carbonate of Lime Crystals.**
Wilson's Farm, Keilor. ½ sheet 1 N.W.
Coating basalt.

23. **Calcaceous Deposit.**
Map No. M 28.
Near Pever's Station, Langley. ½ sheet 9 N.E.
Occurs in cakes from 1 to 2 feet thick, overlying a porphyritic dyke (in the bed and banks of a tributary of the Campaspe), from the joints of which bubbles of carbonic acid gas are constantly rising.

23A. **Carbonate of Lime and Magnesia, with Hydrated Sesqui-Oxide of Iron.**
Deposited by a mineral spring (Seltzer water) near Ballan.

24. **Limestone.** Lab. No. 2, 3/7/65.
Cliffs at Curdie's Inlet.
White granular powder, containing 84 per cent. of lime. An analysis by Mr. J. Cosmo Newbery gave the following results:

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<th>Component</th>
<th>Quantity</th>
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<td>Carbonate of lime</td>
<td>84.438</td>
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<tr>
<td>Carbonate of magnesia</td>
<td>trace</td>
</tr>
<tr>
<td>Carbonate of soda</td>
<td>1.74</td>
</tr>
<tr>
<td>Sesqui-oxide of iron</td>
<td>2.93</td>
</tr>
<tr>
<td>Alumina</td>
<td>1.13</td>
</tr>
<tr>
<td>Soluble silica</td>
<td>7.325</td>
</tr>
<tr>
<td>Insoluble clay, &amp;c.</td>
<td>1.518</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>trace</td>
</tr>
<tr>
<td>Water</td>
<td>99.081</td>
</tr>
</tbody>
</table>

25. **Magnesite (Carbonate of Magnesia).** List No. Mu 10.
Lot 7, parish of Tarrangower, near Loddon River.

Occurs in nodular masses in surface drift. These nodules, on analysis, are found, not to consist of pure carbonate of magnesia, but to contain small and variable quantities of the carbonates of lime and iron, with a little clayey matter. Magnesite has lately been profitably employed by the "aerated bread" companies, for the production of pure carbonic acid gas, and is likewise in demand for the manufacture of "fluid magnesia."

26. **Brown Limestone (Marble).**
Gippsland.
27. **Carbonate of Magnesia.**
   *Rushworth.*

   *Near Mount Ida, Heathcote.*
   Occurs in veins, accompanying “Selwynite.”

28A. **Magnesite.**
   *Jim Crow Creek. ¾ sheet 15 N.E.*
   From Older Pliocene drift. This drift contains a layer of white soapy clay, in which are formed, by exposure to the atmosphere, grains and nodular masses of this mineral.

29. **Silico-Calcareous Nodule.**
   List No. Ra 214.
   *Saltwater River, ½ miles above Keilor. ¾ sheet 1 N.W.*
   Occurs in basaltic clay.

30. **Dolomite—Brown Spar**
   (Carbonate of Lime and Magnesia).
   *Lisle’s Reef, Tarrangower. ½ sheet 14 S.W.*
   Occurs, associated with “spathic iron” and “heulandite,” in narrow veins in the walls of the metamorphic sandstone, bounding the above reef.

31. **Dolomite** (with small crystals of probably “Heulandite”).
   *Lisle’s Reef, Tarrangower. ½ sheet 14 S.W.*
   Occurs like No. 30.

31A. **Phosphate of Lime, with Silica and Alumina.**
   *Bruthen Creek, Gippsland.*
   Coating cavities of decomposed basalt, and associated with quartz and carbonate of copper.

32. **Selenite (Gypsum, Sulphate of Lime).**
   *Bird Rock, south of Barwon Heads. ¾ sheet 28 S.E.*
   Occurs in thin veins, lenticular patches and concretionary masses, in the Upper Miocene sandstones and clays, along the coast from Jan-Juc Creek to Point Addis, near Geelong; and also in the Cape Otway district.

33. **Selenite.** Map No. M 40.
   *Section 24b, Spring Plains. ¾ sheet 13 N.E.*
   Occurs in a stiff, blue clay, resting on sandstone, as lenticular crystals and druses.

33A. **Selenite.**
   *Batman’s Swamp. ¼ sheet 1 N.W.*
   Occurs in single and twin crystals, and lenticular masses.

34. **Epsomite (Epsom Salts, Sulphate of Magnesia).**
   *Eaglehawk Reef, Maldon.*
   Occurs as an efflorescence in the above reef.

35. **Alum Shale.**
   *Sunbury. ¾ sheet 7 S.E.*
   Occurring in black pyritous shales.

36 and 36A. **Glauber Salt (Sulphate of Soda).** Map No. M 32.
   *Mitchell’s Diggings, Campaspe River. ¾ sheet 13 S.E.*
   Occurs as crystals and scaly efflorescences on the walls of the Prospectors’ Tunnel, in a soft, white sandstone.

37. **Salt (Chloride of Sodium).**
   *Greenvale Lakes, near the Hopkins River, north of Wickliffe.*
   Occurs in considerable quantities as a crust in the beds of saline lakes and lagoons of the western portion of Victoria, being the result of slow evaporation during the summer months.
CARBONACEOUS MINERALS.

37A. LIGNITE (Brown Coal).

*City of Manchester Claim, Durham Lead, 1/4 sheet 63 S.E.*

With crystals of efflorescent sulphate of iron, from the auriferous drift, 260 feet below the surface.

This deposit of lignite is nearly 120 feet in thickness. It consists of an irregular mixture of brown or brownish-black, earthy, bituminous coal, real "brown coal," with "lignite," *i.e.*, portions, composed of branches, trunks and stumps of trees ("Conifers"). Occasionally, thin and rather shattered seams of jet are met with; also narrow, lenticular patches and small roundish pieces of two kinds of resin. Only a few narrow clay seams intersect this enormous mass of lignite; and iron pyrites is, so far as examination goes, very sparingly distributed. The following analyses are by the late Mr. C. Wood:—

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed carbon</td>
<td>29.3</td>
<td>27.9</td>
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<td>20.7</td>
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<td>1.3</td>
<td>1.3</td>
<td>0.5</td>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

38. Recent Bituminous Deposit.

*From the Grampians.*

Found coating the bottoms of caves, being, according to an analysis by Mr. J. C. Newbery, a nitrogenous body, and probably the result of a peculiar decomposition of animal excrement and other matter.

*Note.*—Specimens 39 and 40 were not found in place, but were picked up in the bed of the creek.


*Coal Creek, Cape Patterson.*

Presented by N. Levi, Esq., M.L.A.

40. Copaline. (?)

*Cape Patterson.*

Presented by N. Levi, Esq., M.L.A.

41. Copaline. (?)

*Lignite bed, Bass River.*

42. Copaline (?) in Lignite.

*Bass River.*
FOREIGN AUSTRALASIAN MINERALS.—CASE XVI.

FOREIGN AUSTRALASIAN MINERALS.

Case XVI.

AUSTRALASIAN COLONIES.

1. Auriferous Quartz.
   Waipori, New Zealand.

   Moryya, New South Wales.
   Iron and arsenical pyrites, zincblende, galena, &c.

2A. Native Platinum.
   New Zealand.
   Presented by George Foord, Esq.

   Kapanga Co., Coromandel, Auckland, New Zealand.
   Presented by Abraham Lincolne, Esq.

4. Copper-Ore (Black Ore).
   Lab. No. 44/41.
   Currawang, New South Wales.
   Decomposed sulphide of copper, with sulphate and carbonate of lead in quartz.
   Yields 24 per cent. of copper.

4A. Copper-Ore—Malachite.
   Lab. No. 44 6/41.
   Currawang, New South Wales.
   Surface ore, containing 40.65 per cent. of copper.

5. Copper-Ore and Gossan.
   Peak Downs, Queensland.

6. Copper-Ore—Variegated or Peacock Copper-Ore.
   South Australia.

6A. Native Copper.
   South Australia.

7. Copper-Ore and Gossan.
   Quedong Copper Mining Co., Maneroo, New South Wales.

8. Copper Pyrites.
   Quedong, Maneroo, New South Wales.

9. Galena (Sulphide of Lead).
   Quedong, Maneroo, New South Wales.
   Contains 81 per cent. of lead and 13 ozs. 7 dwts. 20 grs. of silver per ton.

10. Lead-Ore—Cerusite (Carbonate of Lead).
    Quedong, near Bombala, Maneroo, New South Wales.
    Presented by Mr. W. Allen.

10A. Lead-Ore.
    Same locality as last.
    Consisting chiefly of carbonate of lead, containing 49 per cent. of lead and 11 ozs. 19 dwts. 2 grs. of silver per ton.

    Franklin Harbor, South Australia.
    Containing 63 per cent. of iron.
    Presented by Mr. Larnach.

    Rockhampton, Queensland.
    Presented by Dr. Mueller.

12A. Black Sand, with Tin.
    New South Wales.
    Sp. gr. 6.06, contains 64 per cent. of tin.
12b. **Platinum Sand.**
*Otago, Bluff Harbor.*

12c. **Red Oxide of Iron.**
*Carpentaria.*
Contains 63 per cent. of iron.

12d. **Cobaltine.**
*Victoria.*
Presented by George Foord, Esq.

13. **Nephrite (Jade).**
*New Zealand.*
Used by the natives for tomahawks and ornaments.

14. **White Mica.**
*Near Mount Gipps, Barrier Ranges. (†)*
Colored by oxide of iron.

15. **Black Mica.**
*South Australia.*

16. **White Mica.**
*South Australia.*
In granite, forming the matrix of No. 17.

17. **Beryl.**
*South Australia.*
Frequent, as imbedded crystals, in a very coarse-grained granite.

18. **Green Mica in Schist.**
*Barrier Ranges.*

19. **Chalcedony and Jasper.**
*Carney's Harbor, Auckland Islands.*
Pebbles from the water-courses at the foot of the Ranges.

20. **Prase. (?)**

21. **Chert.**
*Fraser, Dunstan Diggings, New Zealand.*
These chippings led to the discovery of chipped-stone weapons in beds of supposed Miocene age in New Zealand.

22. **Limestone (White Marble).**
*Murrumbidgee River, N. S. W.*
Contains 93.75 per cent. of carbonate of lime.

23. **Calc-Spar.**
*New Zealand. (†)*

23a. **Arseniate of Lime (Pharmacolite). (†)**
*Capanga Company's Claim, Coromandel, Auckland, New Zealand.*
Presented by Abraham Lincolne, Esq.

24 and 25. **Stalactites (Carbonate of Lime).**
*Caves on the Murrumbidgee.*
Presented by C. S. Wilkinson, Esq.

26. **Carbonate of Lime.**
*Caves on the Murrumbidgee.*
Presented by C. S. Wilkinson, Esq.

27. **Stalactite (Carbonate of Lime).**
*Mount Gambier, S. Australia.*
Presented by Lindsay Clark, Esq., District Surveyor.

28. **Dog-tooth Spar (Carbonate of Lime).**
*Mount Gambier, S. Australia.*
Presented by Lindsay Clark, Esq., District Surveyor.

28a. **Phosphate of Lime Concretion.**
*South Sea Islands.*
Guano deposit.
Presented by Mr. Larnach.

29. **Silico-Calcareous Pipe.**
*Honebush West, Barrier Ranges.*
From a well, 200 feet deep.

30. **Silico-Calcareous Concretions.**
*Great Bight of Australia.*
31. Selenite (Gypsum, Sulphate of Lime).
   *Lachlan District, N. S. W.*
   From a well.

32. Selenite.
   *Locality same as No. 31.*

33. Volcanic Cinder.
   *Mount Gambier, South Australia.*
   Presented by Lindsay Clark, Esq., District Surveyor.

34. Silicified Wood.
   *Totarra, New Zealand.*
   Presented by S. McGowan, Esq.

35. Tasmanite (Dysodile?).
   *Tasmania.*

   *N. W. Coast of Tasmania.*
   An analysis gave:
   
<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1.59</td>
</tr>
<tr>
<td>Volatile matters</td>
<td>67.36</td>
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<tr>
<td>Fixed carbon</td>
<td>25.83</td>
</tr>
<tr>
<td>Ash</td>
<td>5.22</td>
</tr>
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<td>100.00</td>
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</table>

   Presented by Mr. Larnach.
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>61</td>
<td>Granite, Preston Vale</td>
<td>70·18</td>
<td>10·99</td>
<td>7·67</td>
<td>...</td>
<td>2·66</td>
<td>1·43</td>
<td>3·18</td>
<td>5·93</td>
<td>0·51</td>
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<tr>
<td>10</td>
<td>99</td>
<td>Pervite Rock, from dyke, Mount</td>
<td>78·05</td>
<td>13·87</td>
<td>traces</td>
<td>...</td>
<td>0·74</td>
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<td>0·25</td>
<td>6·50</td>
<td>0·27</td>
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<tr>
<td>13</td>
<td>13</td>
<td>Felspar Porphyry, Mount Macedon</td>
<td>65·97</td>
<td>18·11</td>
<td>traces</td>
<td>4·82</td>
<td>0·98</td>
<td>traces</td>
<td>traces</td>
<td>traces</td>
<td>10·17</td>
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<td>15</td>
<td>49</td>
<td>Serpentine, Mount Timbertop</td>
<td>39·90</td>
<td>18·20</td>
<td>traces</td>
<td>...</td>
<td>36·80</td>
<td>traces</td>
<td>...</td>
<td>...</td>
<td>15·40</td>
</tr>
<tr>
<td>17</td>
<td>64</td>
<td>Greenstone (Diabase), Geelong</td>
<td>50·84</td>
<td>12·92</td>
<td>0·52</td>
<td>6·99</td>
<td>14·35</td>
<td>10·97</td>
<td>1·83</td>
<td>traces</td>
<td>0·71</td>
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<tr>
<td>67</td>
<td></td>
<td>Felspar from Diopite, Tarlita</td>
<td>67·70</td>
<td>20·50</td>
<td>traces</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>10·00</td>
<td>...</td>
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</tr>
<tr>
<td>70a</td>
<td></td>
<td>Epidosite, Tarlita</td>
<td>59·62</td>
<td>17·86</td>
<td>5·60</td>
<td>...</td>
<td>14·65</td>
<td>traces</td>
<td>traces</td>
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<td>2·48</td>
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<tr>
<td>70b</td>
<td></td>
<td>Green portion of Epidosite, Tarlita</td>
<td>51·80</td>
<td>20·80</td>
<td>15·20</td>
<td>...</td>
<td>12·20</td>
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<td>...</td>
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<tr>
<td>22</td>
<td>50</td>
<td>Older Basalt, Phillip Island</td>
<td>37·22</td>
<td>21·16</td>
<td>9·11</td>
<td>...</td>
<td>7·02</td>
<td>6·21</td>
<td>8·46</td>
<td>8·80</td>
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<td>51</td>
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<td>Ditto</td>
<td>25·45</td>
<td>28·67</td>
<td>12·50</td>
<td>...</td>
<td>6·07</td>
<td>4·37</td>
<td>0·91</td>
<td>5·32</td>
<td>15·48</td>
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<td>55</td>
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<td>Ditto</td>
<td>35·24</td>
<td>17·18</td>
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<td>5·21</td>
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<td>3·10</td>
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<td>60b</td>
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<td>49·46</td>
<td>8·21</td>
<td>...</td>
<td>16·32</td>
<td>7·26</td>
<td>18·76</td>
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<tr>
<td>23</td>
<td>6a</td>
<td>Newer Basalt, Durham Lead</td>
<td>35·44</td>
<td>8·13</td>
<td>31·43</td>
<td>...</td>
<td>5·24</td>
<td>17·33</td>
<td>...</td>
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<tr>
<td>6b</td>
<td></td>
<td>Ditto</td>
<td>54·73</td>
<td>19·12</td>
<td>...</td>
<td>6·03</td>
<td>10·14</td>
<td>5·05</td>
<td>2·11</td>
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<td>35</td>
<td>30</td>
<td>Metamorphic Rock, Mount Tarra-</td>
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<td>6·02</td>
<td>traces</td>
<td>traces</td>
<td>traces</td>
<td>traces</td>
<td>2·81</td>
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<td>36</td>
<td>18</td>
<td>Mudstone (Silurian), Durham Lead</td>
<td>55·67</td>
<td>30·95</td>
<td>6·94</td>
<td>...</td>
<td>1·63</td>
<td>2·67</td>
<td>...</td>
<td>1·94</td>
<td>0·69</td>
</tr>
<tr>
<td>40</td>
<td>71</td>
<td>Sandstone (Silurian), Spring Plains</td>
<td>84·54</td>
<td>11·46</td>
<td>3·09</td>
<td>...</td>
<td>traces</td>
<td>0·59</td>
<td>traces</td>
<td>traces</td>
<td>2·01</td>
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<tr>
<td>45</td>
<td>10</td>
<td>Red Shale (Upper Palaeozoic), Broken</td>
<td>64·68</td>
<td>10·91</td>
<td>6·71</td>
<td>...</td>
<td>6·23</td>
<td>2·38</td>
<td>1·50</td>
<td>6·71</td>
<td>...</td>
</tr>
</tbody>
</table>

**Table of Analyses**

MnO = 46 TiO₂ = 0·04
1. (61.) Granite.—The white and bluish felspars represent respectively orthoclase and oligoclase, the latter showing faint strie. These are associated with common black mica and quartz. The analysis is of the mass, as the felspars could not be separated from each other.

2. (99.) Euxinic Rock.—Consists of two felspars intermingled with quartz, so thoroughly mixed that a separate analysis of the felspars could not be made. One of them is striated; the analysis shows it to be oligoclase. In some portions of the specimen black mica was found (vide No. 100), which would bring the rock into the class designated by G. Rose as granite, and by Fournet as milarite.

3. (18.) Felspar Porphyry.—The crystals rendering the mass porphyritic are yellow striped oligoclase and glassy non-striated orthoclase. The analysis of the matrix gives almost exactly the composition of oligoclase. Whether the small black specks which the rock occasionally contains are hornblende or schorl, which they most resemble, could not be determined, on account of their small quantity.

4. (49.) Serpentine.—The analysis of the mass clearly proves the rock to be serpentine, closely resembling the serpentine from the Radau Valley in the Hartz Mountains; the fracture, showing that the rock has a tendency to turn into schiller-spar, has also its black and its association with chrysotile.

5. (64.) Greenstone (Diabase).—The analysis of the soluble and insoluble portions of this rock are given on page 17 of the Catalogue. The analysis also tends to prove the composition of the rock. From the appearance of the specimens of the rock it could not be clearly ascertained whether the greenish-black mineral associated with the felspathic component was augite or hornblende. The analysis of the soluble portion proves it to be labradorite; and as this species of felspar is always associated with augite, the rock should be called diabase. The greenish element of the mass is probably chlorite.

6. (67.) Felspar from Diorite.—The portion taken was perfectly separated from all matrix, and the analysis shows it to be albite.

7. (70a, 70b.) Epidotite.—The rock consists of quartz, epidote, and hornblende. The analysis 70a is of the rock with the hornblende separated, and resembles that given by Dr. Hunt of the epidotite of Canada. 70b was another portion, containing less free quartz; it had a specific gravity of from 3.21 to 3.26, and taking the specific gravity of epidote as 3.4, 19 per cent. of the silica may be deducted as quartz, which will leave SiO₂ 41—Al₂O₃ 25—Fe₂O₃ 19—CaO 15, which is the composition of an iron epidote.

8. (50.) Older Basaltic Clay.—Color light brown; 59 per cent. soluble in hydrochloric acid. The analysis is of the soluble portion.

9. (51.) Amygdaloidal Basaltic Clay.—A specimen closely resembling No. 51 gave the analysis; 59 per cent. was soluble in hydrochloric acid.

10. (55.) Red Basaltic Clay.—The analysis is from a specimen closely resembling No. 56; 58 per cent. was soluble in hydrochloric acid. The analysis is of the soluble portion.

11. (60a-b.) The analysis is from a nodule which closely resembled the interior portions of No. 60; 49 per cent. was soluble in hydrochloric acid. 60a is the soluble portion, 60b the insoluble.

12. (6.) Newer Basaltic.—Basalt (a) is the soluble portion, which is 24 per cent. of the whole; (b) is the insoluble.

13. (30.) Metamorphic Rock.—Color black, structure semi-crystalline; closely resembling ordinary hornfels in appearance and composition.

14. (18.) Slaty Shale (Mudstone).—Soft, free from grits; easily fused before the blowpipe.

15. (7.) White-And-Yellow Sandstone.—Formed of white transparent quartz grains, cemented together by a white or yellow paste.

16. (10.) Fine Micaceous Shaly Sandstone.—Easily cleaved.

For other analyses of the Newer Volcanic, vide pages 23 and 28 of the Catalogue.
### Comparative Tabular Arrangement of Stratified Rocks.

#### British.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Periods</th>
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</thead>
<tbody>
<tr>
<td>Tertiary</td>
<td>In progress</td>
</tr>
<tr>
<td></td>
<td>Recent and Pleistocene</td>
</tr>
<tr>
<td>Lias</td>
<td>Recent and Tertiary</td>
</tr>
<tr>
<td>Oolite</td>
<td>Chalk</td>
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<td>Greensand</td>
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<td>Jurassic</td>
<td>Wealden</td>
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<tr>
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<td>Oolite</td>
</tr>
<tr>
<td></td>
<td>Lias</td>
</tr>
<tr>
<td>Triassic</td>
<td>Saliferous</td>
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<td>Mesozoic</td>
<td>Muschelkalk</td>
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<tr>
<td>Permian</td>
<td>Upper new red sandstones</td>
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<td>Lower new red sandstone</td>
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<td>Coal measures</td>
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<td>Millstone grit</td>
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<tr>
<td></td>
<td>Mountain limestone</td>
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<td>Lower coal measures</td>
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<tr>
<td>Silurian</td>
<td>Upper</td>
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<td></td>
<td>Middle with fossiliferous limestone</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Laurentian</td>
<td>Upper Silurian</td>
</tr>
<tr>
<td></td>
<td>Lower Silurian</td>
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<tr>
<td></td>
<td>Cambrian</td>
</tr>
<tr>
<td>Metamorphic and Igneous of all ages</td>
<td>Mica and chlorite schists</td>
</tr>
<tr>
<td></td>
<td>Gneiss and granitoid schists</td>
</tr>
<tr>
<td></td>
<td>Hypzoic</td>
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</tbody>
</table>

#### Victorian.

<table>
<thead>
<tr>
<th>Largely represented</th>
<th>Contemporaneous volcanic rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold gravels, sand, clay, cement, gravel, drift, limestone, lignite, &amp;c.</td>
<td></td>
</tr>
<tr>
<td>Hamilton, Geelong, Cape Otway, &amp;c. Marine fossils</td>
<td></td>
</tr>
<tr>
<td>Mt. Eliza beds, clay, limestone, &amp;c. abundant</td>
<td></td>
</tr>
</tbody>
</table>

*These numbers refer only to local sketch-map, but not to Geological quarter-sheets.

† The gold is a few times found, especially near its junction with the Lower Paleozoic rocks.