Mineralogy of Southern India. By Captain J. CAMPBELL, *21st Regiment, M. N. I.*

I fear that the subject of petrology in India will hardly be considered an interesting one, except to the man of professed scientific attainment, or to the tyro who may be seeking information. To the first, the publication of the crude remarks of my note-book will afford an opportunity of identifying the various rocks, which I have met with in Southern India; while to the latter, the various notes and extracts from the published works of authors, will serve as an index to books, where he can procure more complete information, and where the subject can be fully studied. I shall not attempt to classify the rocks, but give the names in the irregular order as I find them entered; as any more perfect attempt at arrangement, would lead to a consideration of the principles of the science of "Descriptive Petrology," a subject on which I purpose hereafter to hazard some remarks, after the manner of Dr. Macculloch's work on "Rocks."

Black Diallage.

This beautiful rock is well known in Southern India as forming the famed pillars of Sultan Tippoo's tomb at Seringapatam. Buchanan Hamilton first called it Hornblende Rock, to which it bears some resemblance, and the error which he committed has been copied by a number of careless observers, who could not plead the want of leisure, and the pressure of business of collection, which is a sufficient excuse for Buchanan's mistake; and some hasty and prejudiced men have got in a rage at their blunders having been pointed out. The remarks of both Capt. Newbold, 23rd Regt. M. N. I. and myself, shewing that it was not Hornblende Rock, appeared simultaneously in the Madras Journal of Science; but I believe priority is properly due to Capt. Newbold, who visited the locality before me, though I was not aware at the time of my visit that he had been there.

The characters of the rock are as follow. Colour: bluish, lead coloured black; with the polished surface jet black nearly, shewing very little of the speckled appearance of black granite, except where the surface is wetted. Fracture: irregular and granular, shewing to the lens some minutely lined tabular crystals of Hornblende, and small pearly coloured splintery crystals of felspar. Structure: much the same as black granite, aggregated, of confused imperfectly fibrous and radiating crystals of a lead colour, mixed with similar crystals of pearly felspar. Structure: something resembling that of actinolite: Streak whitish. Infusible by the most intense heat, a few minute specks only intermixing slightly, but becomes whitened: is more brittle than black granite.

In looking at the pillars of Sultan Tippoo's tomb, I suspected at once that they were not made of black granite, from the absence of the speckled appearance. On enquiry I found that no one could point out the quarries from which the stone had been brought; but I received credible information, that the Sultan was very fond of it in architecture, and that a considerable quantity had been brought at various times. I therefore went off, hammer in hand, to examine the Sultan's old palace, long since used as the gun-carriage manufactory, where the fine moulded bases under the wooden pillars of the Durbar attracted my attention; and on cleaning one, with a coarse cloth and water, from the dirt and whitewash which coated it, I found it to be formed of the identical stone of the famous pillars. My hammer therefore speedily procured me a specimen, and from the ease and readiness with which it snapped off, I was at once convinced of the correctness of my former guess. I have not been able to identify this rock with any similar one described by authors as having been found in Europe, and Macculloch's definitions are not very precise. Serpentine by Macculloch is not classed as forming a compound rock of any

kind; and as this rock is decidedly compound, I have preferred considering it as a compound of Diallage; because Macculloch ("Rocks," page 648) says, that Diallage occurs in Shetland of a black colour, and forms a compound rock with felspar, of a brown colour. As Macculloch most likely never saw the Diallage rock of Shetland polished, it is very probable that there is little difference in the colour of the fracture, which he calls dark grey and brown, and I have called bluish, lead colour black, so as to maintain some ideal resemblance to the colour of the fracture of black granite. To prove the composition of a compound rock is a difficult matter, unless it can be freely examined in sites: this I had no opportunity of doing; but Capt. Newbold visited Tauvicairy, where the stone is said to have been quarried. I have not his remarks at hand to refer to; but from some specimens sent me by Dr. Cole of Madras, I may be allowed to doubt, if he saw the real rock; as those specimens, though very small, seemed to be a variety more like Serpentine, and certainly much more Magnesian than the black Diallage. Chemical analysis also of a compound rock is not a certain guide; but as it affords considerable assistance I publish the following quantitative analysis, though with some diffidence, as the analysis of a Magnesian rock is not an easy job, while our means in India are very imperfect, and I have not yet had leisure to make a good one. The rock, powdered, was a "grey white" colour. The analysis, heated red-hot, lost 3-40 per cent. of weight; but ignited for fifteen minutes more, lost 4-73 per cent. It had been found that caustic potash did not decompose the analysis readily, therefore mixed with carbonate of soda, and ignited; dissolved in muriatic acid, evaporated to dryness, &c., acidulated, and water added, and filtered to separate the silica. The filtered solution was precipitated by excess of ammonia, and allowed to stand a night to separate manganese: it was then filtered, and evaporated to near dryness, diluted again with water and

decomposed by carbonate of potash, according to Dr. Thomson's method, to separate the magnesia; but this was not satisfactorily done. The magnesia after weighing was superacidulated with sulphuric acid, and then dissolved in water; a few flocks remained, either lime or some lead, from the acid not being quite pure. The precipitate of ammonia was boiled with caustic potash to take of alumina, which was again separated after filtering, by muriate of ammonia. The ferruginous residue left on the filter was re-dissolved in muriatic acid, and precipitated afresh by ammonia, and an attempt was made to suspend manganese by an excess of muriate of ammonia, but it was not proved satisfactorily that the analysis contained manganese. The iron was considered to be in the state of protoxide. Several analyses were made, but they were all imperfect in one point or other, and an attempt to separate manganese by benzoic acid also failed: however, the subjoined proportions may be considered as a tolerable approximation:—

Silica, ...	48.93
Magnesia, ...	29.31
Protoxide of iron, ...	9.23
Alumina, ...	6.29
Water, ...	4.73 and volatile matter.

As the analysis was infusible, it is not probable that it contained an alkali, and the loss is within the limits of a quantitative analysis.

Salem yellow Wood-stone.

This is a very beautiful mineral, and I believe quite new in petrology, for I have been unable to find any notice by authors of a similar one. I think the name is quite as good as any coined one, and the only objection may be in the use of the word 'wood-stone,' as it has no resemblance to the mineral generally so called. In my earlier notes I find it called 'Salem yellow woody mineral.' I have not seen it in sites, but

found my specimen, a piece of about 18 inches long, and exactly like a piece of a branch of a tree, in a nullah in the Salem magnesia formation. I think Mr. Fisher of Salem told me he had seen it in sites in Mr. Heath's chromate of iron mines. The outer surface of the specimen was water-worn in the nullah, and the smooth surface thus produced and the brownish tint it had acquired, made the resemblance to a bit of old wood almost perfect, and in consequence I told the lascar with me to split it. Its characters are,—Specific gravity: light, not much heavier than water. Colour: a buff yellow. Structure: continued fibrous-like wood, not thready like amianthus, but rather box-wood, breaking short off. Hardness: can be scraped smooth with the knife, like hard chalk; and the scraped surface smooth. Contains extraneous matter (ferruginous?) between the fibres, in parts. Adheres strongly to the tongue, like a bit of new tobacco pipe; hygrometric power great. It is associated with statactitia iron ore (vide), the reedy marks, in the sides of which seem to be caused by the fibrous structure of this mineral, and suggest the idea of its having been squeezed in a pasty state through fissures. The best analysis, which I have had leisure to make, is subject to the same objections as before; but I give it for want of a better. A portion of the mineral picked as free from iron as possible, scraped down with a knife, triturated in an agate mortar, was tough and cohered like chalk. It was fluxed in a silver crucible with caustic potash, as carbonate of soda had very little effect on it. In boiling the muriatic solution, a precipitate of white flocks appeared, which again disappeared when the solution became concentrated, but did not again re-appear after diluting and again boiling. This gave rise to the idea, that the mineral contained titanium, but in a fresh analysis the precipitate on boiling did not appear. In two analyses the characteristic blue colour of copper appeared in the ammoniacal solution, from which the iron and alumina were precipitated; but it

was doubted if the copper had not been taken up from the silver crucible, which might not be quite pure. The analysis contained no lime. The following is a tolerable approximation to the composition:—

Silica, ...	40.11	(and Titanic acid ?)
Magnesia, ...	39.15	
Iron, (peroxide,)	6.84	
Alumina, ...	0.53	
Copper, (oxide,)	0.50 ?	
Water, ...	13.50	volatilized by heat.
	100.63	

The iron was supposed to be in the state of peroxide, as yellow ochres, &c. are thus coloured. No reliance can of course be placed on the quantity of water, as the mineral was hygrometric, but the other numbers have been computed from the weight of the ignited analysis.

Naggery black Pot-stone.

This is another magnesian mineral, from the Naggery hills, north-west of Madras, given to me by Mr. Fisher of Salem. It is cut into snuff-boxes, &c. by the natives of the place. I have no account of its geological associations. Characters are—Colour: lead coloured black, much the same as black granite: Structure, imperfectly granular, and homogeneous: fracture, imperfectly conchoidal; imperfectly granular to lens: appears a little speckled. Lustre magnesian, and bluish. Streaks bluish white. Smell: sulphurous. Spec. grav. much less than black granite. Tough, and with difficulty broken: hardness but little more than steatite, or pot-stone: feels rough, but perceptibly greasy. I do not find that I have attempted to analyse it.

Binary Granite.

A granular aggregation of white quartz, and resplendent or glistening felspar. The crystals of each mineral being each perfectly formed, and totally distinct, so as to be easily

recognised by a lens; yet cohering after the peculiar manner of granite rocks. Is a graduation from the prevailing Hornblendic granite of Southern India, and is generally found associated with micaceous varieties. Is found near Ryacottah, and is so tough as to require blasting to separate the blocks. Has a perfect cuboidal cleavage, and if polished would form a very beautiful building stone.

Pegmatite.

A binary compound of crystalline quartz and felspar, more or less saccharine. It differs from binary granite in the felspar, not forming resplendent crystals, but having an arenaceous or an earthy appearance. It forms extensive beds in the schistose series of rocks of Southern India, but has no regular cleavage, and is generally so loose in aggregation as to break readily to pieces, and sometimes crumbles down, so as to be used as a road-making material. The term Pegmatite was first used by the French geologists, as applied to binary granite; but, as Dr. Benza has used the term in the same sense as I have now defined it, I have therefore preserved it. Dr. Boase, (Primary Geology, page 203,) uses the term as synonymous with graphic granite, and classes it with the schists of Cornwall, with which he says it graduates. Dr. Macculloch (Rocks, page, 340) describes it as a variety of "red primary sandstone," but his theoretic distinction I do not allow to be correct, unless people choose to consider my "schistose series" as being of derivative origin; but in itself or its associations, the structure of the rock is totally different from the "coherence" of the composing materials of the secondary sandstones. In Southern India, it seldom is found without some slight admixture of Mica or Hornblende.

Eurite.

This is a French term, and applied to the Weiss-stein or white-stone of Werner. It was first used in Indian petrology by Dr. Benza, but he has not been very precise in his application of the term: and though I have visited much of

the localities described by him, I am unable to define the rock to which he intended to apply it, as he seems to have used it for pegmatite when it was very white, and for binary granite when it was too far distant for him to perceive the crystalline structure of the felspar. Dr. Boase (Primary Geology, page 203,) defines the difference between pegmatite and eurite to "be according to the size of the grains; the former being large and crystalline, the latter, small and intimately blended or actually combined."

Graphic Granite.

This rock is rather rare: it occasionally occurs among the porphyritic series. It is a variety of granular quartz porphyry, being composed of contorted lamina of quartz embedded in a granular paste of felspar, or in compact felspar. The lamina of quartz are contorted into fantastic shapes, something like the characters of the Nagaree dialect. Dr. Macculloch's definition also applies well to the Indian rock. "The quartz and felspar, which compose it, are aggregated in lengthened parallel prisms. The prismatic structure therefore is seen in one direction; while, in the reverse, the peculiar appearance, whence the term is derived, becomes visible. That appearance is produced by the cross section of the quartz prisms. These are frequently triangular, occasionally hexagonal and flattened; and in a few rare instances, the two minerals form alternating laminæ."

Saccharine Felspar.

The only work in which I have met with this term was in a work called, (I think) Journal of Popular Science. The name is suggested by the resemblance of the mineral to close-grained loaf sugar. It is soft enough to be scraped with a knife. Fracture: earthy granular; melts before the blow-pipe. I have not analysed it, and am unable to state whether it contains potash or soda. It occurs in Southern India in the porphyritic series, and found embedded in large masses, di-

vided into prisms by cracks. In the hill of Palicondah, near Vellore, it is very common; it is never associated with quartz rock, but generally occurs where euritic granite forms hills of any size.

Schorl quartz Porphyry.

This is a rare and very beautiful rock in Southern India: it is composed of crystals of black schorl, embedded in a paste of homogeneous and translucent quartz. As I believe it is not known in Europe, at least it has not been defined by any author I have met with, it is therefore one of those rocks for which I have been obliged to invent names. To avoid loading the science with mere unmeaning words, I have proposed to take Dr. Macculloch's definition of "Porphyry," in a generic sense, as a rock composed of crystals of one mineral, embedded in a continuous non-crystalline paste of another. Thus the definition of this rock becomes "Black schorl in quartz porphyry;" and by dropping the preposition, and as I know of no schorl in India which is not black, we have "schorl quartz porphyry," which is surely a practical defining term, sufficiently convenient for use, without requiring any great jaw-deflecting exertion. It is easily distinguished from hornblende by the appearance of the crystals, which are of a jet black colour; neither lined on the surface, nor imperfectly tabular. The fracture of the crystals, irregular and conchoidal, and resplendent and shining. They are very brittle, and yield easily to the knife: melt very easily before the blowpipe, and intumesce in a peculiar manner, by which they can at once be recognised, even when very minute indeed. This rock is very different from what Boase calls "schorl rock," which he distinctly defines to be an *aggregation* with "*crystals of quartz*," is found South of Paulwole, about twenty-five miles South of Ryacottah, and in the "Trap Dyke formation of Mallapanbetta" (which vide hereafter,) in which it forms beautiful rocks with crystals of schorl, an inch nearly in thickness. It seems also to have been

mentioned by Dr. Heyne, as found near Hurryhur in Mysore. Of its associations in India I do not know much, but I think it belongs to the porphyritic or schistose series.

Schorl felspar Porphyry.

This is a rare rock, and I do not know much about it. I have only met with it forming part of the mass of the Ryacottah rock, in the veins of hornblende felspar porphyry, from which, like the last, it is easily distinguished by the behaviour of the crystals of schorl before the blow-pipe flame. It is composed of black schorl in saccharine felspar.

Schorl Rock.

I believe I may put this down in the list of those I have seen in Southern India; but as I have not any specimens at hand, I am unable to define its character, and as I cannot find any record of the examination of them in my notes, I must state what I recollect. The rock is found in mass in a deep nullah at south-east end of the (Mallapanbetta Trap dyke formation,) and almost exactly resembles black granite, except perhaps in being a little more lead-coloured and more brittle, and the structure of very minute aggregated crystals. When properly examined, it might prove to be a " black schorlaceous granite." I have never seen it in any other locality, and in consequence I suppose the specimens have been forgotten, among other pursuits.

Clay-stone.

Not common in Southern India, but occurs occasionally among the porphyritic series, and sometimes associated with white quartz; and it graduates into wacké. Fracture: dull and earthy, or imperfectly granular, or imperfectly conchoidal, or imperfectly splintery. Is harder than wacké, and differs from laterite in not being cellular; in being finer and more regular in structure, like the fracture of a brown spar; and being much heavier than an earthy rock, and a solid stone. From wacké it differs in being hard and firm, and not coarse

earthy. Ure defines it as soft and easily broken, in which he differs from Macculloch. Might be called "Ferruginous clay-stone," as all the specimens are highly ferruginous, and coloured red from peroxide of iron: and then the connection with rubble or red chalk, and red ochre, would be established.

Silicious Schist.

Not common: found only among rocks of the porphyritic series on the Topoor ghaut. Fracture, even: small grains of quartz visible in it. Is infusible. Colour, bluish black. Is Lydian stone, according to Thomson's and Ure's definition; but differs from flinty slate, in not having a slaty fracture. According to Brooke's, is flinty slate; is called black jasper by some writers. Macculloch separates two kinds, apparently much the same, into flinty slate, and a quartzose variety of argillaceous schist, which he argues have a different geological position. It seems to be a silicious variety of basalt, as some varieties of basalt do not melt easily before the blow-pipe, and only imperfectly intumesce a little, and turn white, in consequence perhaps of being silicous.

Felspar Porphyry.

Is formed of large crystals of felspar, embedded in a crystalline base of resplendent felspar. The embedded crystals are often of very large size, and sometimes of a beautiful flesh colour, which gives the rock a very handsome appearance. The felspar is characterised by being infusible, or very nearly so, before the blow-pipe, and even in a smith's forge it is hardly melted; in which it differs materially from the felspar of European petrologists. In character it does not seem to agree with the felspar porphyry, described by Bakewell; because he describes the paste or base as being formed of *compact* felspar (compact earthy felspar.) It graduates into pegmatite and graphic granite. It is a common rock in the porphyritic or schistose series, in which it forms extensive

beds; and it is characteristic of this formation, for it never forms hills or mountains, or any extensive formation of elevated points. Occurs as wall-sided dykes in the schistose series near Anchetty, west of Ryacottah, and in Congoondy, and also on the top of the Naiknairy ghaut. I may assert, I believe, that wherever I have seen it, it is accompanied with evidences of igneous action, slides, injections, dykes and metamorphic action on the adjacent rocks. I cannot help thinking it probable, that the enormous masses and formations of porphyry "said to be found in Norway," are not of felspar porphyry, but of porphyritic granite, like the Yailgerry hills of Salem perhaps. Felspar porphyry never has a cleavage, and is never used as a building stone in Southern India.

Quartz Rock

is found in great profusion in beds and dykes in the schistose series, and is commonly used for fluxing into glass with the mineral carbonate of soda, by the bangle maker. It is sometimes found embedded in granite, in irregular masses of 3 or 4 inches thick, but is not common. It is sometimes found forming small hills, but is always cracked, and so separated by irregular divisions, that a solid piece, more than 4 inches thick, can seldom be procured. The varieties it forms are—semi-transparent, rose, smoky, fat, milk, saccharine, wax; but of all these, milk quartz most commonly occurs. Is found as veins, contorted, vertical and horizontal, both in the ferraceous series and in the beds of the schistose series; but though the veins are sometimes of considerable width, (tabular veins) yet they are always separated into cracked prismatic pieces, with the irregular surfaces exactly answering to each other, (i. e. in sites.)

Granular Quartz Rock.

Formed of an aggregation of small crystals of white quartz, with a small quantity of black mica, forming an imperfect lamination, and the whole cohering rather loosely,

or not, of a very firm structure. It is very rare, and forms a small hill near Arnagherry, west of Salem, not far from the banks of the Cavery. A similar rock is called quartz rock by Bakewell, and classed as mica schist, and as primary sandstone by Macculloch.

Limestone.

This is not a correct name for this rock; but as limestone of any kind is very rare in Southern India, as a formation (excluding kunkur of course) among the primary rocks, it will do very well for the present, while no distinctions by definition are required. It is properly a perfect granite ; of a firm, solid, durable structure; and possessing a perfect cuboidal cleavage, and might serve as a building material. It is a binary granite, formed of quartz and of carbonate of lime in acicular crystals, confusedly aggregated. The lustre is a beautiful pearly white, and so perfectly resembles binary granite, that I was only induced to try it with an acid, in consequence of a marked peculiarity in the appearance of the crystals, which I am unable to define. It occurs in blocks at the southern end of the Tally Mally, in the southern extremity of the Salem district, close to the Cavery. I have not seen it in sites. Ainslie seems to allude to this rock, but does not mention where it is found. I have not met with a definition of any similar limestone by European petrologists. This rock is readily disintegrated by muriatic acid, leaving the crystalline grains of quartz separated.

Wacké,

is properly applied to a soft earthy rock of the Trap family, or a basalt; but as I cast aside all such theoretic distinctions, I apply the term to a similar mineral occuring extensively in my schistose series in Southern India, and which seems to form the subsoil from which the earth of some of the most fertile tracts is derived. Its fracture is sometimes even,

and sometimes irregular, according to its hardness. In hardness, it is intermediate between dried earth and that of clay-stone. In colour—red, when ferruginous; whitish, when magnesian; reddish brown, when hornblendic. Is sometimes tuffaceous. Forms the matrix of the magnesia formation of Salem, and then contains magnesia. Becomes silicious, and graduates into clay-stone when in contact with quartz rock. Is commonly intersected into rhomboidal masses by joints like trap. Is sometimes cretaceous, which is not extraordinary, as trap is also generally associated with kunkar.

Magnesite,

or more properly, the magnesia formation of Salem, is a far-famed locality: it does not *form* hills, as is asserted in some European publications, though it is sometimes found *in* hills. At Salem it occurs as an extensive series of dykes, injected veins, and reticulated veins, through other rocks. Capt. Newbold has published an account of this formation, and had I any hope of being able to visit the locality, and give up a few weeks to its examination, I would not now have noticed it. Unfortunately, while in the district, my official duties prevented more than a few morning visits. I am unable to state the extent of the formation, but believe it cannot be less than 25 square miles. It is white, hard, and compact. Lens shews no granular structure. Hardness: variable, from the toughness of a trap rock to nearly as soft as chalk. Fracture: generally conchoidal, sometimes earthy. The hardest kinds do not effervesce with acids, but the softer do. The wacké which forms its matrix, is slightly indurated when in contact with the thickest dykes. It shews all the signs of igneous action, injections, and squeezings, &c.; and is frequently very much contorted. Asbestiform minerals abound in association with it; and chromate of iron and stalactitic iron ore are found embedded in the dykes. In

this meagre account of an interesting locality, I have suppressed all remarks, except what I am certain of: it is several years since I have been able to visit the place.*

Potstone Steatite.

is common among the hills of the Salem series, and is commonly used for writing pencils in slates by the native lower men. It does not form, however, any extensive beds, except near Shivagunaly, north-west of Salem, where it is quarried to make cooking vessels for the inhabitants, who prize it much. I have, however, never been able to visit the locality.

* The magnesite of Southern India was first sought for and made known by Dr. MacLeod, now Inspector General of the Native Medical Service. Dr. MacLeod considered its importance as an element in cements which the property of hardening under water is required, and also recommended its use in medicine as a substitute for the artificially prepared carbonate of magnesia, which it equals in purity. The difficulty of reducing so hard a mineral to a sufficiently fine powder by any known mechanical means, is the only obstacle to the use of this mineral for the purposes adverted to. Dr. MacLeod himself, and many years afterwards Lieut. Armstrong and others, transmitted large samples of the mineral to England with a view of having it tried there in chemical manufactures, but other sources of magnesia nearer home, particularly from sea-water, were found upon the trials to be cheaper. (See vol. i. p. 38.) Recently a machine used in the Laboratory of the Honorable Company's Dispensary, Calcutta, for the manufacture of Epsom salts. (See vol. v. p. 42), but receiving no encouragement the object was abandoned.—Ed.

Note.—As an appendix to the above excellent paper, we beg to insert the following list of Minerals in the Mysore territory, furnished to the Committee for investigation of the Mineral Resources of India, by Mr. Gibbons, Madras Medical Service. The Minerals enumerated have been forwarded to the Committee, and form a part of its collection.—Ed.

From Major General M. CUBBON, *Commissioner for the Government of the Territories of the Rajah of Mysore,*

To the Secretary to the Government of India, Foreign Department, Fort William, dated Bangalore, 16th October, 1844.

SIR,—With reference to a letter addressed to me on the 25th January 1841, at the desire of Lord Auckland, by Mr. Assistant Surgeon McClelland, Secretary to the Committee for the investigation of the Mineral Resources of India, I have the honor to acquaint you, for the information of the Right Honorable the Governor General of India in Council, that I have despatched to Calcutta, viâ Madras, a cabinet of mineral specimens, collected by Mr. Assistant Surgeon W. Gilchrist, attached to the Public Cattle Department of the Madras Government, situated at Hoonsoor within this territory.

2. The accompanying copy of Mr. Gilchrist's list of the minerals forwarded in the cabinet, includes several specimens of the Chromate of iron, about which I was particularly desired to obtain information.

3. The package has been forwarded to your official address.

I have the honor to be, Sir,
Your most obedient servant,
M. CUBBON, *Commissioner.*

Bangalore, 16th October, 1844.

A.

1. Quartz rock, (White.)
2. Quartz rock, (Smoke grey.)
3. Granular quartz.
4. Crystallized quartz, (on Chert.)
5. Granular quartz, (Agglutinated.)
6. Silicified wood, (From Pondicherry.)
6. Silex pebble, (From desert of Suez.)
7. Silex and magnesia.
8. Flinty slate.
9. Flinty slate, (Variety.)
10. Flinty slate, (Decomposing.)
11. Chert.
12. Chert, (Variety.)
13. Chert, (Variety.)
14. Chert,
15. Chert, (Decomposed.)

16. Chert,
(With specular iron ore.)
17. Prase,
18. Quartz and prase.
19. Semiopal.
20. Jade.

B.

21. Mica,
(White.)
22. Mica,
(Black.)
23. Mica,
(Slate.)
24. Talc.
25. Talc,
(Passing into pot-stone.)
26. Talc,
(Passing into pot-stone.)
27. Pot-stone,
(With talc.)
28. Pot-stone,
(With chlorite.)
29. Pot-stone.
30. Pot-stone,
(Passing into asbestos.)
31. Asbestos.
32. Pot-stone,
(Variety.)
33. Pot-stone,
(Passing into hornblende.)
34. Hornblende.
35. Hornblende,
(Slate.)
36. Hornblende,
(Slate.)
37. Pot-stone,
(Passing into actinolite.)
38. Actinolite.
39. Actinolite,
(Slate.)
40. Compacted actinolite.

C.

41. Chlorite.
42. Chlorite,
(Slate.)
43. Earthy chlorite.
44. Crystalline chlorite.
45. Felspar.
46. Flesh-colored felspar.
47. Compact felspar.
48. Felspar porphyry.
49. Felspar porphyry,
(With talc.)
50. Glassy felspar.
51. Felspar,
(Decomposing.)
52. Foliated felspar.
53. Albite.
54. Albite,
(With hornblende.)
55. Albite and quartz.
56. Magnesite.
57. Magnesite,
(Passing into semiopal.)
58. Clay slate.
59. Clay slate.
60. Clay slate.

D.

61. Kunkur,
(Mamillary.)
62. Magnesia and limestone,
(With hornblende.)
63. Shell limestone,
(From Western Coast.)

64. Magnesia and limestone,
(Conglomerate.)
65. Magnesia and limestone,
(With quartz.)
66. Magnesia and limestone,
(With hornblende.)
67. Granular limestone.
68. Limestone,
(With chlorite and garnets.)
69. Coralline limestone,
(Western Coast.)
70. Magnesia and limestone,
(Water-worn appearance.)
71. Limestone tufa.
72. Limestone,
(With chlorite decomposing.)
73. Kunkur,
(Common.)
74. Silicious tufa.
75. Silicious tufa,
(Variety.)
76. Magnesite,
(Passing into semiopal.)
77. Silicious pot-stone.
78. Silicious pot-stone,
(Decomposing.)
79. Quartz,
(Passing into semiopal.)
80. Kaolin.

E.

81. Granite,
(Quartz, felspar, and black mica. The rock of which the large statue at Shrogoonah Bellagolah consists.)
82. Granite,
(Talc, felspar and quartz.)
83. Granite,
(Chiefly crystallized felspar.)
84. Granite,
(Felspar, attenolite, and quartz.)
85. Granite,
(Chiefly of quartz.)
86. Granite,
(Felspar and decomposed garnets.)
87. Granitic porphyry,
(Felspar, rose quartz, (Nn. Dn.) and hornblende.)
88. Granite,
(Red and white felspar and chlorite.)
89. Granite,
(Garnets, felspar, and quartz.)
90. Protogine,
(Chlorite, hornblende, and red felspar.)
91. Protogine,
(Chlorite, quartz, and felspar.)
92. Pegmatite,
(White felspar and quartz.)
93. Granite.
(Chlorite, hornblende, felspar and quartz.)
94. Graphite granite.
95. Graphite granite.
96. Granite,
(Rose quartz, white quartz, and a little felspar.)

97. Granite,
(Granular quartz, granular felspar, and a little hornblende.)
98. Granite,
(Foliated structure, quartz, felspar and black talc.)
99. Granite,
(Granular felspar, quartz, and a little black talc.)
100. Granite,
(Granular quartz, hornblende, and a little felspar.)

F.

101. Granite,
(Passing into hornblende rock, foliated felspar, talc and quartz.)
102. Granite,
(Crystallized hornblende and felspar.)
103. Granite,
(Augite, adularia and very little felspar.)
104. Granite,
(Felspar and light-colored hornblende.)
105. Granite,
(Chiefly hornblende, with a little felspar.)
106. Granite,
(White felspar, talc, and hornblende.)
107. Granite,
(Chiefly large crystallized hornblende, a little felspar, and a little quartz.)
108. Granite,
(Passing into hornblende rock.)
109. Granite,
(Passing into hornblende rock, consisting of compact felspar with hornblende, and a few garnets.)
110. Hornblende rock.
111. Granite,
(Fine crystallized hornblende, felspar, and garnets.)
112. Granite,
(No. 111, decomposing.)
113. Hornblende rock.
114. Hornblende rock,
(With garnets.)
115. Augite.
116. Concentric hornblende.
117. Hornblende rock,
(Decomposing on one side.)
118. Foliated hornblende rock.
119. Augite rock.
120. Light green hornblende,
(Crystallized.)

G.

121. Crystallized hornblende,
(With a little chlorite.)
122. Crystallized augite,
(With a little chlorite.)
123. Crystallized augite,
(Felspar decomposing, and quartz.)
124. Hornblende rock,
(Hornblende quartz and felspar.)

125. Hornblende augite rock,
(With vein of felspar and quartz.)
126. Hornblende slate.
127. Hornblende rock,
(Consisting of compact and crystallized hornblende.)
128. Augite rock.
129. Granular hornblende rock.
130. Hornblende rock,
(Passing into pot-stone.)
131. Basalt.
132. Hornblende rock.
133. Basalt,
(Decomposing into lithomargic earth.)
134. Basalt.
135. Hornblende porphyry.
136. Hornblende porphyry,
(Decomposing on one side.)
137. Augite rock,
(Nearly compact.)
138. Light green hornblende,
(Nearly compact.)
139. Augite rock,
(Nearly compact.)
140. Augite rock,
(Nearly compact, rhomboidal structure.)

H.

141. Concentric hornblende rock.
142. Augite rock,
(With adularia.)
143. Hornblende rock,
(Decomposing outside.)
144. Syenite.
145. Augite rock,
(Granular structure.)
146. Lithomargic earth,
(The debris of basalt.)
147. Augite rock.
148. Syenite.
149. Augite,
(Coarsely crystallized.)
150. Silicious pot-stone,
(With crystallized needles of tourmaline.)
151. Basaltic porphyry,
(From Nagpore.)
152. Felspar porphyry,
(Paste felspar, embedding with crystals of felspar, and green-colored crystals of green tourmaline.)
(Seringapatam.)
153. Felspar porphyry,
(Containing foliated crystals of red felspar.)
154. Granular augite or hornblende,
(Decomposing.)
155. Laterite,
(Western Coast.)
156. Laterite,
(Western Coast.)
157. Laterite,
(Northern division.)
158. Laterite,
(Western Coast.)

159. Laterite,
(Consisting of granular quartz, and specular iron ore.)
160. Laterite,
(Specular iron ore, and quartz.)

I.

161. Sandstone,
(British.)
162. Green sandstone,
(British.)
163. Iron sandstone,
(Western Coast.)
164. Sulphureous clay,
(Western Coast.)
165. Coal, (British.)
166. Iron sandstone,
(Western Coast.)
167. Iron sandstone,
(Coarse granite. Western Coast.)
168. Iron ore,
(In chert.)
169. Iron sandstone.
170. Stalactitic iron ore,
(Northern division.)
171. Iron glance.
172. Radiated iron ore,
(Western Coast.)
173. Iron ore,
(Western Coast.)
174. Magnetic iron ore,
(Rhomboidal structure.)
175. Magnetic iron ore,
(Course granular.)
176. Specular iron ore.
177. Chromate of iron,
(Coarse grain.)
178. Chromate of iron,
(Fine grain.)
179. Chromate of iron,
(With granular hornblende.)
180. Glance iron ore,
(Cellular structure.)

J.

181. Garnets.
182. Obsidian.
183. Lydian stone.
184. Porphyrytic Lydian stone.
185. Bottle-green hornblende,
(With chromate of iron.)
186. Silicious clay-stone.
187. Friable sandstone.
188. Sandstone,
(English.)
189. Very coarse grained iron ore.
190. Augite, rock,
(Augite adularia and felspar.)
191. Adularia,
(Compact augite with foliated adularia.
192. Supposed to be granular quartz,
(Colored green with chromate of iron.)
193. Granite,
(Consisting of augite, felspar and quartz.)
194. Clay slate,
(British.)

195. Granular talc.
196. Felspar,
(Passing into kaolin.)
197. Granite,
(Consisting of felspar, quartz, black talc, and tiemolite.)
198. Pegmatite.
199. Augite,
(Nearly compact.)
200. Foliated hornblende.

K.

201. Lithomargic earth,
(The debris of basalt.)
202. Lithomargic earth,
(The debris of hornblende rock.)
203. Granite,
(Seringapatam.)
204. Granite,
(Quartz and hornblende.)
205. Granite,
(Quartz, somewhat striated hornblende, felspar.)
206. Granite,
(Quartz, felspar, and black mica.)
207. Granite,
(Felspar, quartz and black talc.)
208. Granite,
(Felspar, quartz and talc.)
209. Granite,
(Felspar with a little quartz, and a little talc.)
210. Granite,
(Felspar, rose quartz, and hornblende.)
211. Granite,
(Hornblende granite.)
212. Hornblende rock,
(With a large portion of iron ore.)
213. Hornblende,
(Passing into chlorite.)
214. Granite,
(Hornblende granite; variety.)
215. Granite,
(Hornblende granite; variety.)
216. Pumice stone,
(Straits of Malacca.)
217. Ochre.