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ART. I.—*On the Villages and Towns named Hazar and Hazor in the Scriptures, with the Identification of the Hazor of Kedar.*

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THE Hebrew words חצר HAZAR and חצור HAZOR, literally signifying an "enclosure," a "court," a "pasturage," and a "village," are used as the names of various towns and villages which have often been overlooked, confounded, and misplaced by writers on biblical geography and prophecy.

HAZEROTH was one of the stations of the Israelites in the wilderness. (Num. xi. 35; xii. 16; xxxiii. 17, 18.) It was doubtless situated in the valley of *el-Hadhar*, north of Mount Sinai.*

A HAZAR-*Addar* and HAZAR-*Enan* are spoken of in connection with the borders of the Holy Land. (Num. xxxiv. 4, 10.) The Canaanitish Avim are represented as dwelling in HAZERIM. (Deut. ii. 23.) In the apportionments of their land which fell to the tribes of Judah and Simeon we find several Hazors, mentioned in the following connections:—"And it [the south border of Judah] passed along [from Kadesh-barnea] to HEZRON, and went up to *Adar*," [probably the HAZOR-*Addar* of Num. *ut sup.*] (Josh. xv. 3.) "And the uttermost cities of the tribe of the children of Judah, toward the coast of Edom

* See "Lands of the Bible," Vol. I. pp. 256—260.

southward, were Kabzeel, and Eder, and Jagur, and Kinah, and Dimonah, and Adadah, and Kedesh, and HAZOR, and Ithnan, Ziph, and Telem, and Bealoth, and HAZOR-*Hadattah* [the "new Hazor," erroneously given in our English version as two different places], and Kerioth, and *Hezron*, which is HAZOR,* Amam, and Shema, and Moladah, and HAZAR-*Gaddah* [village of the kid], and Heshmon, and Beth-palet, and HAZAR-*Shual* [the village of the jackal], and Beersheba," etc. (Josh. xv. 21—28.) "And they [the children of Simeon accommodated in the tribe of Judah] had in their inheritance Beersheba, Sheba, and Moladah, and HAZAR-*Shual*, [already mentioned,] and Balah, and Azem, and Altolad, and Bethul, and Hormah, and Ziklag, and Beth-marcaboth, and HAZAR-*Susah* [the village of the horse]." (Josh. xix. 2—5.) "And they [the descendants of Simeon] dwelt at Beersheba, and Moladah, and HAZAR-*Shual* ..... and at Beth-marcaboth, and HAZAR-*Susim* [the village of horses, given before in the singular form]..... These were their cities unto the reign of David." (1 Chron. iv. 28—31.) None of these Hazars, so far as I know, have been identified in modern times, though the sites of some of the contiguous towns have been seen or visited by late travellers. This, however, is a matter of comparatively little consequence, as they are not associated with any historical events or prophetical descriptions of much consequence. HAZOR-*Gaddah* was probably near *Engedi*, the fountain of the kid.† The designation of HAZOR-*Susah* or *Susim*, proves the existence of the horse in the South of Canaan before the Israelites entered it under Joshua, a circumstance which is often overlooked. This animal was very scarce in the country till the time of Solomon. The Jewish kings were forbidden to multiply to themselves horses, probably to keep them, in their religious separation, from dependence on foreign countries, their own rough and hilly province not being in general suitable for rearing that quadruped.

A HAZOR, belonging to the tribe of Benjamin, is simply mentioned in Neh. xi. 33. It was probably not far from Bethel, and was perhaps identical with, or not far from, *Baal*-HAZOR, near Ephraim, at which Absalom's sheep-shearers were employed. (2 Sam. xiii. 23.)

HAZAR-*Hatticon*, (or the middle Hazor or village,) by the coast of Hauran, and HAZOR-*Enan*, by the border of Damascus, are mentioned by Ezekiel (xlvii. 16, 17,) in connection with the boundaries of the restored Holy Land.

* Mentioned also in Josh. xv. 3.

† Jerome and Eusebius say of *Gadda*, "Est autem hodieque villa in extremis finibus Doromæ contra orientem, imminens Mari Mortuo.—Eclog. de Loc. Heb.

A more important place than those now referred to was the HAZOR of King Jabin, the capital of all the kingdoms adjoining the upper lake of the Jordan, which was taken and destroyed by Joshua, (Josh. xi. 1—13, &c.); which afterwards partially recovered its strength, and under another king of the name of Jabin, oppressed the Israelites, and sent out against them its armies under Sisera, when they were overcome by Deborah and Barak, its king being at the same time destroyed, (Jud. iv. 1—24; 1 Sam. xii. 9); which was rebuilt, or enlarged, by Solomon, (1 Kings ix. 15); and which was taken by the Assyrians, on their invasion of Canaan under Tiglath-Pileser, (2 Kings xv. 29). This strong and fenced city fell to the lot of the tribe of Naphtali, on the division of the land among the tribes of Israel. It is thus mentioned in the enumeration of their fenced cities, seemingly made from South to North :—"Ziddim, Zer, and Hammath [the warm baths near Tiberias], Rakkath [Tiberias],* and Chinnereth, and Adamah, and Ramah, and HAZOR, and Kedesh, [now Kades,] and Edrei, and *En*-HAZOR, [the well of HAZOR,] and Iron [or Ijon]," &c. (Josh. xix. 35, 36). In the notice of the Assyrian conquests, it is thus given in an enumeration, probably proceeding from North to South :—"In the days of Pekah, king of Israel, came Tiglath-Pileser king of Assyria, and took Ijon, and Abel-beth-maachah, and Janoah, and Kedesh, and HAZOR, and Gilead, and Galilee, all the land of Naphtali, and carried them captive to Assyria." (2 Kings xv. 29.) It would appear that this Hazor lay to the South of Kedesh Naphtali, which is on the heights overlooking the waters of Merom, now called the Lake Huleh. Josephus (Antiq. v. 5, 1,) says that Hazor was situated above this lake, to which he gives the name Semechonitis (*αὕτη δὲ ὑπερκεῖται τῆς Σεμεχωνίτιδος λίμνης*). Eusebius and Jerome only allude to its situation as in the tribe of Naphtali.†

There is still another HAZOR mentioned in the Scriptures, and that in an important portion of the prophecies of Jeremiah :—

"CONCERNING KEDAR, AND CONCERNING THE KINGDOMS OF HAZOR, WHICH NEBUCHADREZZAR KING OF BABYLON SHALL SMITE, THUS SAITH THE LORD :—

Arise ye, go up to Kedar, and spoil the men of the East.
Their tents and their flocks shall they take away :
They shall take to themselves their curtains, and all their vessels and their camels ;
And they shall cry to them, Fear is on every side.
Flee, get you far off, dwell deep, O ye inhabitants of HAZOR, saith the Lord ;

* Talmud. Cod. Megill. fol. 5, col. 2 ; "Lands of the Bible," Vol. II. p. 117.

† Sub. voc. *Asor* :—"Asor, in tribu Nephtalim, quam rex Assyriorum populasse scribitur."—Heron. Ecloga de Loc. Heb.

For Nebuchadrezzar king of Babylon hath taken counsel against you,
And hath conceived a purpose against you.
Arise, get you up unto the wealthy nation that dwelleth without care, saith the Lord,
Which have neither gates nor bars, which dwell alone;
And their camels shall be a booty,
And the multitude of their cattle a spoil;
And I will scatter unto all winds them that are in the utmost corners,
And I will bring their calamity from all sides thereof, saith the Lord,
And HAZOR shall be a dwelling for dragons, and a desolation for ever:
There shall no man abide there, nor any son of man dwell in it."

(Jeremiah xlix. 28—33.)

HAZOR is evidently mentioned here as the *capital of Kedar*, in the same way as in the context Heshbon and Ai are spoken of as principal cities of Moab, and Bozrah as the capital of Edom. It is doomed by the prophet, not as an actual possession of the Israelites, such as Hazor in the neighbourhood of Kadesh Naphtali was, but as in a distant and hostile nation, that of *Kedar*, analogous in this respect to Edom, and Moab, and Elam, introduced to our notice in the same course of prophecy. It is represented as a secluded place, in the "East," and "in the utmost corners," the wealth of the dependencies of which principally consisted in flocks, and herds of camels, and in tents, and their equipages. It is obviously such a place as is not to be sought in a rough hilly country, where the latter description of animal would be found nearly or wholly useless. I request the members of our Society to mark these circumstances at the commencement of our inquiries as to its locality.

Dr. Keith, in the thirty-sixth edition of his admirable work on the "Evidence of the Truth of the Christian Religion, derived from the literal Fulfilment of Prophecy," says, with reference to the passage of Jeremiah now referred to:—"In the previous editions of this treatise, the author could not adduce any illustration of this prediction, after having long sought in vain for any recognition or identification of the city itself, either by historians or travellers, except the vague, and therefore unsatisfactory notice by Burckhardt, who had heard of but not seen 'the ruins of a city called Hazouri.'" He then goes on to identify the Hazor of Jeremiah with that of Jabin, repeating its history to the time of Solomon, and thus proceeds:—"'At the end of an hour and a half,' east by south from Paneas, on the route to Damascus, says Burckhardt, 'we came to *Ain-el-Hazouri*, a spring, with the tomb of Sheikh Othman-el-Hazouri, just over it; to the north of it one hour are the ruins of a city called *Hazouri*. The mountain here is overgrown with oaks, but contains good pasturage.'" "The name Hazouri,"

Dr. Keith adds, " is well known at Paneas : it designates the ruins ; Ain Hazour, the fountain of Hazour ; and Djebel-Hazour, the hill of Hazor. The ruins are not, as stated to Burckhardt, an hour's distance from the spring, but comparatively near it, on the opposite side of a grove of noble oaks..... The name remains, but the city is no more ; and literally, as the word of the Lord revealed the existing fact, though long unknown in other lands, *no man abides there, nor does a son of man dwell in it.*"*

In this supposed identification, the excellent and learned author of the most popular work which has yet been published on the subject of which it treats, falls into three errors of considerable magnitude.

1. The "*Hazour*" of the flanks of Jebel Heish, above the castle of Banias, to which he here refers, cannot possibly be *Hazor*, the capital of Jabin. This site is quite separated from the possessions of the tribe of Naphtali, in which that town, as we have seen, was situated. It is east of the territory formerly belonging to the Sidonians, and ultimately taken possession of by the tribe of Dan. It lies to the east of the Jordan, in the territories which, in the Land of Promise, we know were allotted to the tribes of Reuben and Gad, and the half tribe of Manasseh.

2. The *Hazor of Jabin* is not the *Hazor mentioned by Jeremiah*, which, as we have already seen, is connected with *Kedar and Arabia*.

3. The *Hazor of Jebel Heish*, also, has no geographical connexion with *Kedar and Arabia*, from which it is quite remote. In its lofty position, among the roughnesses of the mountains, it is perhaps one of the last places which could be thought of as the capital of a country abounding with camels.†

Dr. Eadie, a countryman of Dr. Keith, in his convenient Biblical Encyclopædia lately published, has avoided confounding the Hazor

* Keith on the Evidence of Prophecy, pp. 150—153.

† Since this paper was laid before the Society, the Journal of the Royal Asiatic Society, Vol. XII. Part 2, has been received in India. At page 359, I find the following statement in the late Capt. Newbold's paper " On the Country between Tyre and Sidon and the Jordan" :—" My friend the Rev. Mr. Thomson, of Beirút, suggested to me the examination of Hunin as the site of the great Hazor, so celebrated in the days of Joshua, and subsequently. I am, however, inclined to think that Hazor lay further East, and that its site is pointed out by a mound in the valley of the Jordan, between Hasbeiya and Banias, called by the Arabs Tel Gházor." Mr. Thomson may be correct in his conjecture about the identity of Húnin and the Hazor of Jabin ; but as there is no similarity in the name, and several ancient sites of Naphtali in this district remain yet undiscovered, there is yet no certainty about the matter. Captain Newbold has overlooked the fact that the Arabic correspondent of Hazor is *Hadhor*, and not *Gházor*.

mentioned by Jeremiah with that of Jabin. "There is a remarkable prophecy," he says, "respecting a Hazor in Jer. xlix. 28—33. The connection shows it to have been in Arabia, and the whole scope of the prophecy denotes a place of great importance. It is, however, blotted out, though some have conjectured that it is another name for Petra."

So many places mentioned in Scripture, which have for ages disappeared from the view of the civilized world, have been lately brought to notice, that we have not despaired of the recovery of even this HAZOR. Before hazarding an opinion, however, on its situation, we have to seek for the district of KEDAR itself, with which, as we have seen, it is associated by Jeremiah.

The country of KEDAR derived its name from Kedar the son of Ishmael. (Gen. xxv. 13.) In several passages of the sacred Scriptures it is connected with Arabia. (Isaiah xxi. 13—16 ; Ezek. xxvii. 21.) Its people are alluded to as dwelling in tents, and, according to some interpreters, with the sons of Kedemeh, settled in the "East,"* as in the passage we have introduced from Jeremiah. (Song i. 5 ; Ps. cxx. 5.) Pliny couples its people, the Cedrei, with the Nabatai,† the descendants of Nebaioth, the eldest brother of Kedar. The Chaldæan paraphrast identifies these people (Ezek. xxvii. 21), and he translates the "flocks of *Kedar*" (Is. lx. 7) the "flocks of the Arabs."‡ Jerome, in his comment on Isaiah, says that Kedar was "an inhabited region beyond Arabia of the Saracens" ; and in his Loc. Heb. that it was in the "wilderness of the Saracens." Eusebius and Jerome, in the Ecloga, or Onomasticon, place this wilderness of the Saracens "beyond Arabia to the South," "opposite the coast of the Red Sea." Theodoretus, commenting on Psalm cxix., says: "Kedar was the second son of Ishmael, and his posterity dwell to this day not far distant from Babylon." Suidas in his Lexicon makes the same remark, adding that Kedar is a place of obscurity, for in Hebrew it denotes what is dark.

It appears to me that according to these authorities Kedar, dis-

* Bochart thus writes:—"Jacobus ὁ μακαρίτης, affinis meus, quem honoris causâ nomino, hunc nodum ita conatur exsolvere in notis ad Genesin noudum editis: *Noæ posteritas ab Armeniæ montibus progressa fuerat in eam regionem quæ postea dicta est* קדם *Kedem a Kedmâ novissimo Ismaelis filio.* Gen. xxv. 15. *Secundus Ismaelis filius est Kedar. Hos duos fratres vicinas habuisse sedes colligimus ex Jerem.* xlix. 28. *Ascendite Kedar ut vastentur filii Kedem. Postea vero cum inquit Moses,* Gen. xi. 2, *egrederentur ex Kedemo invenerunt vallem in terra Senaaris. Sic locum hunc interpretandum censemus."*—Phaleg. i. 7.

† Plin. lib. v. cap. 22.

‡ Reland Palest. p. 96.

tinctively so called, is to be sought in the Eastern portion of that part of Arabia, according to the ancients, which is now called the Syrian desert, or in the country contiguous to that wilderness; and the question arises, Is there any Hazor whose position and other circumstances suit the description of Jeremiah to be found in that region of the world? That the Hazor of Jeremiah,—if without authority we extend the name Kedar to the Arabian peninsula,—could not be in the south of Arabia, will afterwards appear.

To the question now proposed I venture to reply in the affimative. In a remarkable oasis of the desert and alluvial plains between the Tigris and the Euphrates, lying to the S. W. of Mosul, there is a town, the Arabic name of which حضر or الحضر,—*Hadhar*, or *el-Hadhar*, given by the Arabic geographer Edrisi,—is the exact correspondent of the Hebrew חצר HAZAR or HAZOR. He speaks of this place as an "agreeable town on the banks of the Tirthar."* This place, though its coincidence with the Hazor of Jeremiah has not yet been noticed, has been identified by Major Rennell and others as the *Hatra* of Ammianus Marcellinus, (lib. 25, cap. 8,) the *Atra* of Dion Cassius, (lib. 24,) and the *Hatris* of the Peutingerian tables.

This place was visited a few years ago by Dr. Ross, of the Bombay Medical Service, whose interesting memoir of it is published in the Journal of the Royal Geographical Society, and afterwards by Mr. W. F. Ainsworth, who has given a full and interesting description of it in his "Travels and Researches in Asia Minor, Mesopotamia, Chaldea, and Armenia." From the narrative of the last-mentioned gentleman, I take the liberty of introducing one or two important passages explanatory of its position and present appearances.

The following is a notice of the journey of Mr. Ainsworth and his party to *Hadhar*, from Kalah Sherkat:—"At Kalah Sherkat it was my intention to quit the river's banks, and penetrate the wilderness to Al-Hadhar, guided by the compass and Mr. Ross's map, for neither the Khawas nor the Arabs knew aught about the position of the ruins. On leaving Kalah Sherkat, we kept a little to the South of Wadi-el-Mehcih, in which there was now no running water.....We travelled at a quick pace over a continuous prairie of grasses and flowering plants, and, crossing the Ain-el-Thaleb, having still a little stagnant water, we arrived at a ridge of rocks which rose above the surrounding country. From a mound, upon which were a few graves, we obtained a comprehensive view of that part of Mesopotamia which extended to the West, but without being able to distinguish the valley of the Thar-

* Geog. d'Edrisi, par Jaubert, p. 147.

thar, a brook which traverses this part of Mesopotamia, or the ruins of Al-Hadhar.....The sharp sight of the Bedwin Haji Ali was in favour of some mounds which were visible in the extreme distance to the South of West; so, having much confidence in his acquaintance with the appearance that ruins would present on the desert at such a distance, we followed these indications, but, as it turned out, fallaciously. After two hours and a quarter's quick travelling, still over prairies and undulating country, we came to the supposed ruins, which turned out to be bare hills of sandstone, the Southern termination of a low ridge.....Changing our route, we started to the North-West, in which direction we arrived, after an hour and a quarter's ride, at a valley bounded in places by rock terraces of gypsum, which indicated a wadi and a winter torrent, or actual water. To our joy, we found the Tharthar flowing along the bottom of this vale, but only from fifteen to twenty feet in width, instead of the fifty we had been led to expect; and to our great comfort the waters were very potable. The stream, though narrow, was deep, generally from five to seven feet, and hence with difficulty fordable: on its banks were a few reeds and scattered bushes of tamarisk. We proceeded up the stream, in a direction North-West, in search of a ford, which we found after one hour's slow and irregular journey, and we lost half an hour refreshing ourselves with a bath. We afterwards followed the right bank of the stream, being unwilling, as evening was coming on, to separate ourselves, unless we actually saw Al-Hadhar, from the water so necessary for ourselves and our horses.....We deemed it best to keep on up the river, but to travel a little inwards on the heights. This plan was attended with perfect success; and we had ridden only one hour and a half, when we perceived through the misty rain mounds still to the North-West, which we felt convinced were the sought-for ruins. Mr. Rassam and myself hurried on, but soon afterwards, perceiving a flock of sheep in the distance, we became aware of the presence of Arabs, who could be no other than the Shammar; so we waited for our friends, and rode all together into the kind of hollow in which Al-Hadhar is situated. Here we perceived the tents of the Bedwins extending far and wide within the ruins, and without the walls to the South-West. The ruins themselves presented a magnificent appearance, and the distance at which the tall bastions appeared to rise, as if by enchantment, out of the wilderness, filled us with wonder and surprise, no doubt in great part due not only to the splendour of the ruins, but also to the strange place where the traveller meets with them—'*in medià solitudine*,' as Ammianus so briefly, but so correctly expresses it."

The ruins of Hadhar, Mr. Ainsworth goes on to inform us, present the remains of a palace and temple, "surpassing, in extent and perfection, the arch of Chosroes at Ctesiphon, the residence of the Kings of Persia, of the Arsacidan dynasty."*

"It consisted," he continues, "of a series of vaulted chambers, or halls, of different sizes, all opening to the East, or towards the rising sun and planets, and regularly succeeding one another from north to south, and was divided into two parts by a wall; while in front was another row of edifices, guard-houses, &c. &c., at the southern end of which was a great hall, with an ornamented vault and tall columns, similar to what is observed in the chief edifice. The whole of these buildings were enclosed within a wall about 1360 yards square, which left a considerable space open in front, and this open square was in the exact centre of the town, which is nearly a perfect circle, surrounded by a rampart, about 3 miles 180 yards in circumference. Portions of the curtain, which was 10 feet 3 inches in width, still remain on this rampart; and there are also the ruins of thirty-two bastions, placed at unequal intervals. The space occupied by the town still contains the ruins of tombs, and other edifices, and is everywhere covered by mounds of ruined buildings. There is also a spring, and a channel for water, not straight, but tortuous, which crosses the town; and there were apparently four gates, having straight roads leading from them to the central edifice. Every stone, not only in the chief building, but in the walls and bastions, and other public monuments, when not defaced by time, is marked with a character, which is, for the most part, either a Chaldaic letter or numeral.....The southerly hall, which is small, has externally every stone in the arch sculptured in high relief, with a human bust, some of which have very singular curling bag-wigs, or, more probably, a peculiar mode of dressing hair, which we know to be common in Persian sculptures, but those, I believe, only of a modern date, or more particularly of the time of the Sassanian dynasty.† The second hall is of greater dimensions, and the figures on the arch were those of angels, or females, apparently in the air, with feet crossed, and robes flying loose; while in the interior, on both sides of the hall, were three square pilasters, surmounted by full round faces, in high relief, and executed with considerable fidelity and spirit. While the style of these sculptures appears to be pretty nearly uniform, it is impossible not to recognise costumes differing much from one

* Travels in Asia Minor, &c. vol. ii. pp. 159—162.

† But the bag-wigs, as they are here called, have also been found in the ancient Assyrian ruins near Mosul.

another. Indeed, it requires but little imagination to figure to oneself in these sculptures the representations of the successive powers who ruled the City of the Desert. The simple turban-like headdress represents the Chaldean ; the bearded physiognomy and scattered hair, the Persian satrap ; the laurel-leaved band, supporting eagles' wings, the Roman ; while the binding round the head, like a double fold of rope, as it is also described by Mr. Ross, appears the original of the present Arab head-dress.....It may be advanced against this view of the subject, that if the building is all of one style, this style must also be carried through all its details, and that we cannot expect that any of the decorations can be illustrative of different periods ; but there is no reason why, if the Parthians or Persians borrowed their style from the Romans, they still might not have introduced their own sculpture, as at Persepolis ; or, if the Romans built the great monument of Al-Hadhar, they might equally have been influenced by a conquered people to introduce, as well as letters, forms sacred to their religion, or gratifying to their pride and to their national reminiscences. On the face of the wall of this great hall, besides the signs before mentioned, are two inscriptions, one in Chaldaic, the other in Arabic, both cut in the stones, but which run along from one to another, and are evidently more modern than the building.....The Arabic inscription was copied and translated by Mr. Rassam ; its purport is as follows :—'Mesud Ibn Maudud Ibn Tamanki, the just king, protector of religion, and defender of the faith, in humble service, and seeking mercy from his Lord, caused this to be repaired in the year of the Hejira 586.' (A. D. 1190.) This evidences the fact that Al-Hadhar was an inhabited town in the time of the Ata Beys of Mosul, for Azzud-din Mesud Ibn Maudud reigned there from A. D. 1180 to 1193 ; yet it is mentioned as deserted at the period of the retreat of Julian's army. With the assistance of lights, we examined the subterranean rooms connected with the first great hall, but did not find anything of interest. In the rear of the same great hall is another apartment, surrounded by a lofty vaulted passage. From its beautifully ornamented doorway, and complete seclusion from the other parts of the edifice, it may be conjectured to have been a religious sanctuary. Over the doorway is the most beautifully sculptured relief in the whole building ; it represents griffins supporting heads, human and others, and in the centre is the head of Apollo, or Mithra, supported by eagles, with scrolls in their mouths ; beneath is some beautifully-sculptured foliage : it is evidently of Roman execution.....At the first small hall of the Northern division, the sculptures over the arch of the entrance are among the most perfect

of the out-of-door sculptures. They appear to be alternations of male and female heads, the first having the peculiar head-dress previously noticed, while the latter present a remarkable similarity to the present style of dress in Western Europe. Some of the ladies have dresses like corsets, terminating in a point. Most of them wear tiaras of jewels; some have necklaces; and the bust is neatly and only partially displayed. The hair falls on the shoulders of some in a profusion of ringlets; in others is trimmed up in large curls, and again in some puffed out behind, as was once the case at the French court. On the wall is also the sculpture of a monstrous animal. The walls were measured, in all their details of bastions, &c., and were found to be 5460 yards round. .....Within the circuit of the walls were many ruins of doubtful character.....Some of these buildings are square, and they are of different sizes. One, ornamented with pillars, had two interior vaulted chambers, with an outer vaulted hall, and a stair leading to the top, as if to sleep upon it, as is the custom at Mosul and Baghdad. The openings to let in light are more like loopholes than windows, but this may have been for coolness, and from want of glass, as is observed in the cottages of the peasants in the East. A large square building, with one vaulted chamber, which appears to have been a small temple, or mausoleum, occurs on theNorthern side. It is built upon a handsome basement, with a projecting but simple cornice. I ought not to omit to mention that the pear-shaped cavities common in Syria are also met with amid the ruins here."*

Mr. Ainsworth has collected together some of the most important historical notices of this long-overlooked city of the desert. He says: "It is evident, from the character of the greater number of the letters and signs inscribed on the hewn stones, that the original builders were Chaldeans or Chaldees.....It is further evident that in the course of the changes which befel all the great powers in the East, that this city was ruled by Armenians, by Persians, and by Romans. According to Dion Cassius, by Xiphilinus, Trajan, after his descent of the Tigris and Euphrates, and having proclaimed Parthamaspates king at Ctesiphon, entered *Arabia*, against Atra, but want of water and provisions, with great heats, drove him away. In the time of Arsaces (Ardawan), Septimius Severus, who also returned by the Tigris from Ctesiphon, besieged this city, upon which occasion his machines were burnt by the 'Greek fire,' which appears to have been the bitumen so abundant in the neighbourhood. His men also were slain; and for want of provisions, and after twenty days' siege, the Roman emperor was forced to

* Travels in Asia Minor, &c. vol. ii. pp. 163—172.

retreat. Thus did this remarkable city, from the peculiarity of its position in the midst of a treeless desert, with one well of water and the brackish brook of the Tharthar flowing by, superadded to the skill, science, and determination of its inhabitants, successfully resist the all-conquering arms of the Romans. This period of the history of Hatra is succeeded by another interval of impenetrable obscurity. No sculpture nor monuments of any kind indicate the existence of a Christian community within its walls, which is the more remarkable as Nisibin became the seat of a patriarch, and Al Hadhar was in the centre of a newly-converted and eminently Christian people."*

Dr. Layard, in his great work on "Nineveh and its Remains," gives a brief account of a journey which he paid to Hadhar. The following is the interesting notice which he takes of the locality itself:—

"A dark thunder cloud rose behind the time-worn ruins of Al-Hather as we approached them. The sun, still throwing its rays upon the walls and palace, lighted up the yellow stones until they shined like gold.† Mr. Ross and myself, accompanied by an Arab, urged our horses onwards, that we might escape the coming storm; but it burst upon us in its fury ere we reached the palace. The lightning played through the vast buildings, the thunder re-echoed through its deserted halls, and the hail compelled us to rein up our horses, and turn our backs to the tempest. It was a fit moment to enter such ruins as these. They rose in solitary grandeur in the midst of a desert, 'in *medid solitudine positæ*,' as they stood fifteen centuries before, when described by the Roman historian. On my previous visit the first view I obtained of Al-Hather was perhaps no less striking..... At that time within the walls were the tents of some Shammar Arabs, but now as we crossed the confused heaps of fragments, forming a circle round the city, we saw that the place was tenantless. Flocks on a neighbouring rising ground showed, however, that Arabs were not distant. We pitched our tents in the great court-yard in front of the palace, and near the entrance to the inner inclosure. During the three days we remained amongst the ruins I had ample time to take accurate measurements, and to make plans of the various buildings still partly standing within the walls.....Suffice it to mention that the walls of the city, flanked by numerous towers, form almost a complete circle, in the

* Travels in Asia Minor, &c., vol. ii. pp. 172—174.

† The rich golden tint of the lime-stone, of which the great monuments of Syria are built, is known to every traveller in that country. The ruins of Al-Hather have the same bright colour: they look as if they had been steeped in the sunbeams.

centre of which rises the palace, an edifice of great magnificence, solidly constructed of squared stones, and elaborately sculptured with figures and ornaments. It dates probably from the reign of one of the Sassanian kings of Persia, certainly not prior to the Arsacian dynasty, *although the city itself was, I have little doubt, founded at a very early period.* The marks upon all the stones, which appear to be either a builder's sign, or to have reference to some religious observance, are found in most of the buildings of Sassanian origin in Persia, Babylonia, and Susiana."*

It will be seen from this notice, that Dr. Layard agrees with Mr. Ainsworth in ascribing a very high antiquity to this city, though he considers its most important architectural remains to be those of the Sasanidan Persian dynasty, the epoch of which was from A. D. 202 to the middle of the 6th century after Christ. Considering how early the parts of the world,—including even the deserts,—in which it is situated were peopled, we have no difficulty in supposing that it had come to its maturity long before the days of Jeremiah, about six hundred years before Christ; and that as an independent power, or as an ally of some other state, it had placed, or was about to place, itself in an attitude of hostility to the Israelites, either in their own land, or by the interruption of their commerce,—to facilitate which Solomon had built, or rebuilt, the neighbouring, and, it is to be noticed, analogous, Tadmor in the wilderness,—or by the distress of their families during the exile, so as thus to call forth the doom of the inspired prophet. Its situation is placed in Arabia by Greek and Roman writers, as is well shown in the subjoined note by Reimar, applied to the notice taken of it by Dion Cassius.†

* Layard's Nineveh, Vol. I. pp. 108—110. Dr. L. says in a note, "Many of these marks are given in Mr. Ainsworth's Memoir in the Journal of the Royal Geographical Society. They are not letters of any one particular alphabet, but they are signs of all kinds. I discovered similar marks at Bisutun, Isphahan, Shuster, and other places in Persia where Sassanian buildings appear to have existed."

† Ἐς τὴν Ἀραβίαν ἦλθε, κ. τ. λ. Arabiam intelligo quæ erat inter Euphratem et Tigrim posita. Sic infra p. 854. D. Severus in transitu per Mesopotamiam Atra aggreditur, ubi Dio tamen eam urbem Arabibus tribuit. p. 855. B. D. *Stephanus Byz.* ex Arriani lib. xvii. Parthicorum: Ἄτραι πόλις μεταξὺ Εὐφράτου καὶ Τίγρητος. Rursus autem in Λιβαναὶ, ex eodem Arriano: πόλις Συρίας ταῖς Ἄτραις γειτνιαζούσης. Sic et Abgarus Edessa regulus τῶν Ἀραβίων vocatur. Erat ergo Atra urbs Arabiæ, qua se ultra Euphratem in Mesopotamiam porrigebat, quam Arabiam Mesopotamia seu Syria describit, etiam *Xenophon* de Exp. Cyri, p. 255, velut desertam. *Herodianus* in Severo III. 9, 6. Atra refert ad εὐδαίμονα Ἀραβίαν confundens, credo, cum Ἄγρα Arabiæ Felicis,

This perfectly agrees with the indications to which we have already referred connected with KEDAR, the position of which is spoken of either definitely in connection with the Eastern desert, or indefinitely, as in "Arabia." It suits, in a striking manner, the exigencies of the passage in Jeremiah, as far as the pastoral wealth of *Hazor* in cattle and camels is concerned; for even at this day the Nomadic Arabs, particularly the Hadadin and Shamar, are abundant in its neighbourhood, with property of this character, as the nature of the country would indicate some similar wandering tribes must have probably been from time immemorial. Situated in a tolerably fertile oasis, and surrounded by deserts on all sides, its people would of old, comparatively speaking, "dwell without care," and, in many places, "have neither gates nor bars," but "dwell alone." It was within the reach of Nebuchadnezzar, the appointed instrument of its punishment and its complete destruction, as far as its people who had called down the divine vengeance are concerned, which can scarcely be said to be the case with any city of Kedar, if the country be located, as some would have it, contrary to all historical and geographical evidence, in the more remote or southern districts of Arabia. These circumstances, combined with the identity of its Arabic name, *Hadhar*, and the similarity of its Syro-Chaldaic name, *Hatra*, with the Scripture HAZOR, warrant us, I submit, to come to the conclusion that the site of the HAZOR of KEDAR, so long amissing, has now been found. The desolations of the locality, and its want of a settled population for many ages, form an ultimate state for the prophetic epoch corresponding with the language of Jeremiah:—

"And Hazor shall be a dwelling for dragons, and a desolation for ever,
There shall no man abide there, nor any son of man dwell in it."

On the extent of this prophetic epoch it is not necessary to say anything in this place.

quam Ælius Gallus oppugnaverat, teste *Strabone* XVI. p. 781. Certe, etiam si ultra Euphratem excurrisset Severus, tamen longe a Felici Arabia aberat, pedemque potius in Desertam tulisset. Hic apud Dionem scriptum quidem erat τοῖς Ἀγαρηνοῖς sed librariorum, puto, confusione, ex literis nata. Nam Γ et Τ sæpissime a librariis permutari multis exemplis constat, et observarit *Salmasius* ad Solin. p. 498. *b*. F. Dio sane, seu Xiphilinus eandem se dicit urbem designare quam Severus frustra oppugnavit, cujus muri partem diruit Soli dicatam, qua Atra rectius infra vocatur.—Dion. Cass. Hist. Roman. p. 1144, not. 190.

ART. II.—*Observations on the Grammatical Structure of the Vernacular Languages of India.* By the Rev. J. STEVENSON, D. D.

No. 4.—THE PRONOUN.

Read August 1851.

THE pronoun is said to be "a word used in place of a noun"; it may be questioned, however, whether words can perform their duties by deputy, and whether pronouns do nothing more than supply the place of nouns. Without such words, "designating the persons to whom and of whom we speak," we should very soon become unintelligible; and even the rudest barbarians have found such words essential for their unartificial vehicles of communication.

The pronouns, like the numerals of the vernacular languages of India, may be pretty definitely distributed, according to their origin, into the two great classes of Northern and Southern families; those of the former being mere corruptions of the Sanscrit, and those of the latter of a peculiar type, more allied to the Turanian than to the Sanscrit. The Singhalese is here also to be classed with the Northern family.

The pronoun of the first person singular offers connections which carry us over all the European and Asiatic continents. The Northern family is connected with the Sanscrit, and the languages of the centre and North West of Asia, and the whole of Europe. The Southern is allied to the languages of Arabia and Syria, on the one hand, and on the other with the Chinese family.

Each of these, again, is divided into two subdivisions, which, however, seem rather to have been the result of accident than of any deep-seated analogies. The following tables will illustrate these positions:—

I.—Connections of the North-Indian Family.

1st.—Words for *I*, connected with *Aham*, the Sanscrit Nominative:—

Sanscrit.	Persian of the Behistun Inscriptions.	Pehlavi.	Gujaráthi.	Cashmerian.	Sclavonian.	Yeniseian* (in Siberia).	Spanish.	Greek and Latin.	Portuguese.	Danish.	French.	German.	Dutch.	English.
Aham	Adam	Afum	Hun	Boh	As	Ya	Yo	Ego	Eu	Ei	Je	Ich	Ik	I

2nd.—Words for *I*, connected with the Sanscrit Accusative *Má*:—

Modern Persian.	Singhalese.	Hindi.	Maráthi.	Bengáli.	Uriya.	French.	Italian.	Celtic.	Scindian.
Man	Mama	Main	Mí	Múi	Mú	Moi	Mi	Mi	Mán

II.—Connections of the South-Indian Family.

1st.—Connections of the Ancient Canarese *A'n*:—

													Central Indian Hill Tribes.‡		
Ancient Canarese.	Ancient Tamil.	Modern Tamil.	Modern Canarese.	Telugu.	Kurgi.	Todava.	Tuluva.	Tetenge,† in Assam.	Lar, in Scinde.	Chaldee & Arabic.	Hebrew.	Syriac	Uráon.	Rajamahali.	Gondi.
A'n	Yán	Nán	Nánu	Nenu	Nán	A'n	En	Ne	Awn	Ana	Ani	Eno	Enan	En	Mani

2nd.—Connections of the Malyálim Nyán:—

Malyálim.	Tibetan.	Kamschatkan.*	Burmese.	Arracanese.	Hákot and Khot, in Assam.†	Malapa,† in Assam.	Chinese.	Singhbum Kol.‡	Sontal Hill Tribe.‡	Mundala Hill Tribe.‡
Nyún	Nga	Ganny	Nga	Nga	Ngá	Ngai	Ngo	Aing	Inge	Ing

* The words thus marked are taken from Klaproth's "Asia Polyglotta."

† The words thus marked are from a valuable paper in the Calcutta Asiatic Society's Journal, by Mr. Robertson.

‡ The words of the Hill Tribes are from Mr. Hodgson's Collections.

From this table it appears—

1st, That the ancient aboriginal pronoun of the first person singular has been lost out of the Northern family nearly altogether, and corruptions of the Sanscrit substituted. One solitary connection between the ancient Canarese and a Scindian dialect remains to attest any relation between the Northern and Southern families.

2nd, That the old pronoun in a modified form still keeps its place in the dialects of several of the Hill tribes.

3rd, That it has a connection on the one hand with the Syro-Arabic family, and on the other with the Tibetan and Chinese.

In taking a survey of the other pronouns, similar but less striking coincidences occur. The Twam of the Sanscrit in the softened forms of tu, tu*n*, tue*n*, &c., pervades the Northern family, and the *Ni* of the Tamil the Southern and Hill tribes, as the following table will show.

Forms of the singular of the pronoun of the 2nd person :—

Tamil.	Malyalim.	Telugu.	Canarese.	Kurgi.	Todava.	Uráon.	Rajamáhali.
Ni	Ni	Nivu	Ninu	Nin	Ni	Nin	Nin

In reference to the pronoun of the 3rd person, we may remark that wah or wo of the Hindí comes nearer the awan of the Tamil, and some other Southern languages, as well as the (هُو) hu of the Arabic, the kho of the Tibetan, and the (و and ول) o and ol of the Turkish, than the (स :) sa*h* of the Sanscrit.

One of the striking peculiarities of the Indian pronouns is the class of honorific pronouns, which pervades them all more or less.

In the Southern family, including the Singhalese, and in the Bengáli and Uriya of the Northern family, we have a regular singular form, honorific form, and plural form, for the personal pronouns. In the rest of the Northern family, one word, the *A'p* of the Hindí, *A'pun* of the Marathi, &c. stands for them all. These words, indeed, are translated *self*, yet they are not used like our word *self*, with other personal pronouns, but as a substitute for them, and usually to denote honor or respect, and cannot be translated by any one English word. They are often used where we would say *Your Majesty*, *Your Honor*, &c. The भवान *Bhaván* of the Sanscrit is used much in the same way, but it seems easier to derive the word (आपन) *Apan*, the original in the vernaculars, from the Tamil Avan, by the common change of *v* into *p*, than from any other source. This system of using honorific pronouns connects the Indian languages with the Tibetan, Chinese, Japanese, Indo-Chinese languages, and the dialects of the Central Indian Hill tribes, especially of the Sontals.

There is a most singular idiom mentioned in the Tamil, Malayálim, Telugu, Maráthi, and Gujaráthi grammars, as pervading all those languages, and I strongly suspect not confined to them. It is a double pronoun, of the first person plural, the one form taking in the whole of the persons present, and the other only one party, if there be more parties than one. In these tongues the common plural is used to designate the plurality of a party, and the honorific pronoun to include the whole assembly. Thus, the Tamil Nánggal means *we* of the one party as opposed to you of the other, while the honorific *Nám* takes in all parties present. In the Gujarathi, *Hame* is we of the one party, and *Apane* is we including the whole company ; and so of the others above mentioned. A rather laughable instance of the danger of neglecting this distinction, (a mistake so frequently made by foreigners,) I once witnessed in a European, who was addressing a company of natives in their own language. He, while uttering some truths which he meant to apply to mankind in general, used the wrong *we*. A native immediately retorted, " True, that is *your* character ; but *ours* is very different." This characteristic, be it noticed, we have traced by these five languages in one continuous line from Cape Comorin to the Indus ; and it is not likely such a singular idiom could have got into all these tongues by accident, or have been borrowed from one by the others in modern times ; and it is not a Sanscrit idiom.

Another singular coincidence between the Tamil and Gujarathi exists in the use of the particle A' (आ) as a demonstrative pronoun. This particle is also used in the same sense in some other of the Southern tongues, and connected with it in other Northern languages, we may reckon the Maráthi Há, hí, he*n* ; the Singhalese and Bengáli E ; the Scindian He ; the Panjabi Eh, and even the Hindostáni Yih.

In the Northern family, relative pronouns generally follow the rule of the Sanscrit, and are but corruptions of the Sanscrit (यः) Ya*h*. This pronoun would more accurately be translated by *whoever*, or in Latin by *quicunque*, than by *who* and *qui*, or in other connections by *what*. In the Southern tongues, again, there is no relative, and its want is usually made up by the participial termination. Even in the Northern family this is allowable ; and, moreover, the relative is rarely supplied in familiar discourse, while the demonstrative pronoun, which is sometimes called a co-relative, must never be omitted, whether the relative be used or not. A common Hindu would rather say *Chori kiyí wuhi hai*, than *Jo chori*, &c. although the latter be the form generally used in books, and by the learned. No one, however, would

use such a phrase as the following : " The man who was here yesterday is come again to-day." The demonstrative pronoun *he*, which we omit before " is come," is essential to a Hindu; while the *who*, which is essential to us, is indifferent to him.

The cases of pronouns are formed much in the same way as those of nouns, as will be seen from the example we give below of the declension of the pronoun of the second person. There is, however, one striking connection between the Northern and Southern families, which comes out chiefly in the pronouns. It is the relation that subsists between the *re* of the genitive in the Hindí and several of the other languages, and *rhe* in the Malyálim. This latter is evidently the original, as the harsh *rh* used does not belong to the Sanscrit, or to any of the Northern tongues. The Northern form, then, is evidently a softening of the original Southern syllable. It may be worth while, also, in passing, to notice the coincidences pointed out before between the termination of the dative in so many of the Southern and Northern families, and those of the accusative in a few of them; all of which are entirely independent of any Sanscrit influence.

I think, then, we have traced in several instances a thread of connection, though often but a slender one, running through the Northern and Southern families, and showing the influence on all, more or less, of an ancient aboriginal tongue, entirely different from the language of the Brahmans.

As illustrations of the subject in hand, the two following tables, the former showing the inflexions of the pronoun of the second person in some of the hill-tribe dialects, and the second the same in the languages of the plains, will be found worthy of attention. The two first are from Hodgson's papers, and the three last from Robinson's, in the Journal of the Asiatic Society of Bengal.

PRONOUN OF THE 2ND PERSON IN THE DIALECTS OF THE HILL-TRIBES.

SINGULAR.

	Nom.	*Gen.*	*Dat.*	*Acc.*	*Ins.*	*Loc.*
Bodo	Nang	Nang-ni	-no	-kho	-jang	-now
Dhimal	Ná	Náng-ko	Neng	Neng	Nang-dong	Náng-ta
Garo	Náá	Nangni	-na	-kho	-chi	-o
Káchári	Nang	-ni	-no	-kho	-jang	-niáo
Miri	No	Nogke	-kepe	Nom	-koki	-lo

PLURAL.

Bodo	Nangchur	-ni	-no	-kho	-jong	-noa
Dhimal	Nyel	Ningko	-eng	-eng	-dong	-ta
Garo	Nasimong	-ni	-na	-kho	-chi	-o
Káchári	Nangsur	-ni	-no	-kho	-nijang	-niúo
Miri	Nólu	-g	-kepe	Nolum	-koki	-lo

Inflexions of the Pronoun of the Second Person.

Inflexions of the Singular Number.

	Sanscrit.	*Hindi.*	*Panjábi.*	*Gujaráthi.*	*Maráthi.*	*Singhalese.*	*Scindian.*	*Bengáli.*	*Uriya.*	*Telinga.*	*Canarese.*	*Támil.*	*Malyálim.*
NOMINATIVE—	Tvam	Tun	Tun	Tún	Tún	To	Tun	Túi	Tú	Nivu	Ninu	Niya	Ni
GENITIVE—	Tava *or* Te	Tere	Tere	Tahárun	Tuzhen	Tage	Tojo	Tora	Tora	Niyokka	Ninna	Unadu	Ninrhe*
DATIVE—	Tubhyam	Tujhko	Tainún	Tane	Tula	Tata	Tokhe	Tore	Tote	Niku	Ninage	Unaka	Nannikka
ACCUSATIVE—	Tvám	Tujhe	Tainúm	Tane	Tula-te	Ta	Tokhe	Toke	Tote	Ninna	Ninnanu	Unanai	Ninne
INSTRUMENTAL—	Tvayá	Tune	Taina	Tue	Tvá		To	Tote	Tore	Nicheta	Ninninda	Unnál	Ninnál
LOCATIVE—	Tvayi									Nilo	Ninnil	Unnanil	Ninnalli

Inflexions of the Plural.

NOMINATIVE—	Yuyam	Tum	Túsin	Tame	Tumhi	Topi	Tahin	Tomará	Tumbhamáni	Miru	Nivu	Ningal	Ningngal
GENITIVE—	Yushmákum	Tumáre	Tuhádá	Tamárún	Tumatsen	Tope	Tahan	Tomádigera	Tumbhamáningkara	Miyokka	Nimma	Unggal	Ningngíate
DATIVE—	Yushmábhyam	Tumko	Tuhánúm	Tamne	Tumhálá	Topata	Tahánkhe	Tomadigere	——————ku	Miku	Nimage	Unggalaku	Ningnga/kku
ACCUSATIVE—	Yushmán	Tumhe	Tuhánúm	Tamne	Tumhás	Topa	Tahankhe	Tomádigke	——————ku	Mimmu	Nimanna	Unggalai	Ningnga/e
INSTRUMENTAL—	Yushmabhi/i	Tumne	Tusin	Tamoe	Tumhin		Tahán	Tomádigete	——————re	Micheta	Niminda	Ungga/ál	Ningngíát
LOCATIVE—	Yusmásu									Milo	Nimalli	Unggalil	Ningnga/il

* Generally pronounced *Ninde*.

ART. III.—*Memoir on the Geology of the South-East Coast of Arabia.* By H. J. CARTER, Esq., Bombay Medical Service, formerly Surgeon of the H. C. Surveying Brig "Palinurus."

Presented October 1851.

THE matter contained in this "Memoir" was chiefly collected during the late Surveys of the South-east Coast of Arabia, by Captain Sanders* and Lieut. Grieve, I. N.; much has been contributed by Lieut. Grieve, who latterly had sole charge of the Survey, through specimens and information of parts which I had not an opportunity of examining; and the geology of the Curiyah Muriyah Islands is extracted from the late Dr. Hulton's interesting account of them, taken during the time they were surveyed by Capt. Haines, I. N., now Political Agent at Aden.

Previous to entering on the subject of this "Memoir," I shall premise a few general remarks on the outline of the coasts about to come before us more in detail: this will be followed by a running geological description of them, made more particular where they were actually examined; and, finally, a short review of all the facts which have been brought forward.

Although I have only mentioned the South-east Coast of Arabia, I shall begin from the Straits of the Persian Gulf, follow the South-eastern Coast and its islands to the Straits of Bāb el Mandeb, and then, crossing over to Berbera, pursue the African Coast from this point, with its islands, to Socotra. I have not much to offer of the former or latter coasts, but what little I have will, I think, be found interesting, in connection with the South-east Coast of Arabia.

Beginning, then, from Ras Măssăndăm, which is the name of the western promontory of the Straits of the Persian Gulf: the mountains which form this have been fretted into innumerable irregularities, and rapidly rise from 400 feet, which is the height of the small island called Măssăndăm, at the extremity of the Cape, to 2000, then 3000, and

* It is but due to state, to the memory of this able surveyor and excellent officer, who died at sea near Malta on the 14th August last, that I received the greatest kindness from him during the time I had the good fortune to be under his command.

subsequently, as they progress in a semi-circular direction, south-eastward, to 6000 feet above the level of the sea, which they are at a point some miles inland opposite Mäskat; leaving in their course a comparatively flat country between their lower hills and the sea, which is called Bātănă. This flat country extends to within fourteen miles of Mäskat, after which the land, which is raised up into a confusion of ridges and hills, with scarped precipices, presents an irregular sea-cliff on to the neighbourhood of the Devil's Gap; and inland a succession of elevations, which end in the ridge just mentioned. This ridge, which is about forty miles from the sea opposite Mäskat, is, as before stated, about 6000 feet high, and goes by the name of Jibal Fällah. Proceeding southwards, it gradually approaches the coast, and terminates at the Devil's Gap, of which it forms the northern boundary: it is there 6228 feet high.* The Devil's Gap is the outlet of a great valley, which ramifies up among the mountains of Oman. From its southern boundary another ridge arises, which attains a height of 4400 feet† within eight miles of the sea, and descends to the latter in two or three precipitous cliffs. This ridge is continued on south-eastwards, to terminate in Jibal Jallān, which is about 3900 feet high,‡ and about twenty miles inland from the south-eastern coast: it is the southern extremity of the great mountainous chain of Eastern Arabia. From its eastern side a group of mountains extend towards Ras el Hăd, or the eastern extremity of Arabia, to which we shall come presently, and its subsidence in the other directions will be mentioned by-and-bye.

The eastern extremity of Arabia, commonly called Ras el Hăd, is truncated, and presents a coast facing due east, about twenty miles in extent. This is accompanied by a sea-cliff about one hundred feet high, which is about the general level of the land here.

Turning this extremity to the south-west, we get no more sea-cliff for a great distance, and after passing opposite the termination of the great chain to which I have alluded, the land soon subsides to a general level of from 50 to 100 feet above that of the sea, without any mountains interiorly, or towards the south-west, but presenting a continuity of low undulating hills, of a sandy-looking aspect, and a light brown colour, as far as the eye can reach. This continues on to opposite the island of Masira, where the mainland sinks to the level of the sea, the only place on the coast where this occurs unbacked by mountains.

The island of Masira, which is opposite this port, is rocky and mountainous, and in its highest part not more than 600 feet above the level of the sea.

* Chart; Lieut. Grieve. † Idem. ‡ Idem.

After Masira, the mainland begins to rise again, and a sea-cliff first commences at a Cape called Ras Kăbret, in 19° 57′ N. lat. and 57° 48′ E. long. The land, however, on the western side of the bay, called Ghobat Hăshish, which is a little to the north of Ras Kăbret, is 80 feet above the sea,* and goes on increasing in height, until it attains an altitude of 480 feet† at Ras Markās, which is close to Ras Jăzirăh. On account of the coast here running north and south for 100 miles, and therefore cutting its general direction, which is N. E. and S. W., at an angle of 45°, we not only see that the land rises towards the S. W., but that it rises also towards the south.

From Ras Jăzirăh onwards, the coast gradually increases in height to 800 feet, which it is about the centre of Curiyah Muriyah Bay; and in its first part is, from its height and whiteness, very similar to the cliffs between the North Foreland and Beachy Head. But as we approach the south-western horn of Curiyah Muriyah Bay, its outline and horizontality become disturbed, and suddenly it attains a height of 4000 feet, which it preserves, more or less, on to the Yaffai mountains, at the Straits of Bāb el Mandeb.

Opposite Curiyah Muriyah Bay are five small islands, which in point of size are hardly more than the tops of so many mountains. They are about twenty miles off shore, and the largest and highest, which is Hăllăniyah, has a point 1645 feet above the level of the sea. There are also two or three still smaller opposite Hisn Ghorab, about sixty miles south-west of Makalla.

The chief features of the land between Curiyah Muriyah Bay and the Straits of Bāb el Mandeb are, that here and there it is more or less tabular in its outline; more or less broken into mountainous peaks; more or less interrupted by ravines; five times by great valleys; and once (in the Bay of El Kămmăr) by an intervening tract of low land forty to fifty miles in breadth, which, running S. W. and N. E., seems to cause a natural division into two parts of the mountainous ridges of which this elevated tract is composed. Throughout, this high land is more or less scarped upon the sea or the maritime plain, which latter is seldom more than ten miles in breadth.

Its color is for the most part white, particularly where it is weather-worn, and here and there black or brown, where it is confronted by, or mixed with, rocks of an igneous origin.

Having thus given a brief outline of a part of the North-east and the South-east Coasts of Arabia, let us now proceed to the composition of their rocks.

* Lieut. Grieve. † Idem.

Returning to Ras Mässändäm, which, as before stated, is the western promontory of the Straits of the Persian Gulf, and the northern extremity of the chain of mountains which extends along the North-eastern Coast of Arabia from the Cape just mentioned to the neighbourhood of Ras el Häd, we find this promontory, taken generally, to be mountainous, and fretted out into innumerable irregularities, which have given rise to the formation of as many coves, creeks, inlets, islands, islets, and rocks. Ras Mässändäm, the extremity of an island by the same name, is 400 feet high, and the next portion of the Cape is about 1500 feet, and but a few miles further inland these mountains rise to 3000 feet. At first sight they no doubt appear like black basalt, from their color, and hence have been described as such by Captains Wellsted and Whitelock, and have always been considered igneous rocks. Pliny calls them the Eblætian mountains, probably from the Arabic *iblis*, the devil; but latterly this promontory and its islands have been inspected by Lieut. Constable, of the Indian Navy, who has kindly shown me rock specimens from them, which prove that they are all composed, not of black basalt, as before suspected, but of jet black and dark black grey limestone, interstratified and veined with white and pinkish brown calc-spar. The jet black limestone is of a fine compact structure, and breaks with a smooth conchoidal fracture, like lithographic limestone, but the lighter colored varieties are more coarse, and break with a rough fracture. The calc-spar, which is in strata of eight to ten feet thick, is columnar, or vertical, in its crystallization, and traversed horizontally by wavy lines, like that from Gibraltar: some of it is of a dazzling whiteness, and of a massive saccharoid crystalline structure. I was informed by Lieut. Constable that the whole of these mountains here are of a similar composition, and that they are horizontally stratified, the strata in some places being thinner and more schistose than in others.

Proceeding southwards, this chain of mountains, as I have already stated, curves inland, and leaves a low country in front of it, called Bätänä, which is without sea-cliff, on to a point fourteen miles north of Mäskat. It is from this point that my own observations commence. To the north of it, as far as the eye can reach from an elevation of 600 feet, nothing is seen but a low shore, shelving up very gradually to the mountains inland, each shelf presenting a scarped surface, possessing a chalky appearance, which gives a general whiteness to the whole district, and from which I inferred that it was but a continuation of the same limestone formation as that of the sea-cliff on which I was standing when I made these remarks.

This limestone formation, as it occurs in the vicinity of Mäskat, I

have already described in our Journal;* but for the sake of not breaking the continuity of the present description, I will repeat a paragraph or two of it here, leaving the reader to go to the paper itself for further information on the subject, which it would be as well that he should do at once, if possible, as he will there find, in the geological description of the neighbourhood of Mäskat, an account of the limestone formation in this locality, and a description of the different igneous rocks which have come to the earth's surface in this part of Arabia, all more or less typical of what we shall hereafter frequently meet with on the south-eastern coast.

In summing up the few observations contained in the paper to which I have alluded, it is stated, p. 125,

"That the limestone formation, limiting the group of igneous rocks at Mäskat, both north and south, commences (from below upwards) with a deposit of the same kind of pebbles (viz. coarse and fine-grained diorites, basalts, petrosilex and quartzites), lying in both places on the fundamental rock of the locality; passing into a sandy grit; then into a silico-calcareous deposit; then presenting the remains of marine animals, (small ostreiform Gryphæa,) these increasing in number with the calcareous material (chiefly consisting of minute and small Foraminifera); the increasing purity of the limestone, interrupted in each instance by a pink-colored deposit, that at Ras Ghissa (south of Mäskat) chiefly consisting of the remains of small Foraminifera, and that of the formation at Darzit (north of Mäskat) of a thin series of gypseous, marly, and arenaceous strata; then a compact yellowish or fawn-colored limestone (presenting a variety of shells and corals), terminating the series at both places, and almost entirely composed of the accumulated remains of polythalamous animals."

The following are the fossils which I found in this formation, and which I shall insert here, as they are not mentioned in the paper to which I have referred:—

FORAMINIFERA.

Nummularia.— *N. obtusa.* Sow. (Pl. xxiv. fig. 14, Grant's Geol. Cutch. Geol. Trans. Vol. VI. 4to.) *Loc.* Mäskat. *Obs.*—The specimen containing these nummulites was brought to me by the late Capt. Newbold, who saw a bed of them in the limestone formation at Mäskat. I cannot say from what part of the series it came, but the fact is sufficient to prove that this formation, if not the whole, is a part of the "Nummulitic Series."

* Vol. III. No. xiii. p. 118.

Operculina, d'Orb.— *Species?* Test white, porcelainic, sub-circular, equilateral. The largest about $\frac{1}{4}$ inch in diameter. Consisting of three whorls, each whorl thickened on the external edge; spire irregular, chambers numerous, increasing regularly from a central cell projecting on both sides; the divisions of the chambers distinct externally. *Loc.* Mäskat. *Obs.*—This species abounds in the silico-calcareous sandy part of the formation of Mäskat, just before the latter passes into compact limestone. It is now, even, common on the South-east Coast of Arabia, and exists in a large bed, mixed with fine sand, in twenty-five fathoms of water, opposite the village of Takah. Other fossilized species of Operculina occur with it at Mäskat, even so low down as the grit where the first organic remains begin to appear.

ECHINODERMATA.

Spatangus.— *Species?* Subovate. Length $1\frac{4}{10}$ inch, breadth $1\frac{2}{10}$ inch, thickness $\frac{9}{10}$ inch. Notched anteriorly, truncated and overhanging posteriorly, with the vent in the upper part, from which a ridge extends on to the genital pores. Ambulacra four, sunk in grooves, slightly truncated, the two posterior shorter than the two anterior ones. Base sub-carinated in the centre, mouth bilabiate, near the margin. *Loc.* Mäskat. *Obs.*—From the pink stratum which abounds with the Operculina above mentioned.

ZOOPHYTA.

Caryophillia.— *C. cornigera?* Lam. *Loc.* Mäskat. *Obs.*—This species is very like *C. Anthophyllum*, (Lam. et Ellis, Tab. 29,) but has rounded extremities and contracted stellæ at the ends of them.

Agarica, Meandrina, Astrea, and Scyphia (Goldf.).

CONCHIFERA.

Gryphæa.— *Species?* (Cast of lower valve, imperfect.) Length $1\frac{6}{10}$ inch, breadth $1\frac{3}{10}$ inch. Deeply carinated; irregular, wavy, or lobed towards the circumference, and expanded, particularly towards the right side. *Loc.* Lower sandy part of aqueous strata, Mäskat.

——— 2d *Species?* (Lower valve, incomplete.) Length $1\frac{3}{10}$ inch, breadth $\frac{3}{4}$ inch. Deeply carinated, expanded, plane towards the circumference; smooth externally, presenting concentric striæ; uncinated, like *O. Uncinata* Desh. (Coq. For. Envir. de Paris, Tome 1, Tab. 18, Figs. 7—11.) *Loc.* Mäskat. *Obs.*—This and the foregoing species abound together, and are more or less ostreiform.

GASTEROPODA.

Natica.— *Species?* (Cast, incomplete.) About 2 inches long. First and second whorls depressed. *Loc.* Mäskat. *Obs.*—Imbedded in a

yellow calcareous stratum, or granular deposit, consisting of minute Foraminifera.

The limestone forming the upper part of this formation, north of Măskat, is much more pure and compact than any that I arrived at in tracing the strata from below upwards on the south side of this town; and, from the distance of the top of the formation from the fundamental rock in the former situation being much greater than in the latter, I am inclined to think that the section I took on the south side of Măskat was incomplete, and that the upper compact strata had there disappeared.

From the sandy nature of the deposits in which the small Foraminifera abound in this formation, and the sandy base of the genuine specimen of nummulitic rock which the late Captain Newbold found at Măskat, as well as from the loose silico-calcareous or calcareous sand in which all the nummulites I have ever seen, from Egypt, Sindh, and Cutch, have been imbedded, I am of opinion that this is the part of the Nummulitic Series in which their remains are to be sought, and not so much in the compact and purer limestone above, where I had always fancied they were to be found; and when, in connection with this, I consider that the bed of Operculina already mentioned, opposite Takah, which contains the largest living specimens of Foraminifera I have met with, is mixed with fine sand, and that I have always observed their tests to be more numerous in sandy bottoms than in more subtle and plastic deposits, I am not so surprised that these delicate shells should not occur in the finer material of which the compact limestone of the Nummulitic Series is more or less composed, and where I had expected most to find them.

Passing on from the commencement of the sea-cliff at the end of the plain of Bātănă, to the town of Măskat, we soon step from the limestone formation, here all at once raised to 600 feet above the sea, on to the bed of igneous rocks, in the midst of which Măskat is situated.

These are spread over an area of about ten miles long, and three miles broad, and are chiefly composed of serpentine, which is limited on the coast, and inland by a yellow-colored limestone formation, (the one just mentioned). Their ridges and summits are sharp and peaked, and seldom exceed 400 feet in height, and their sides and valleys soilless and barren.

"The serpentine is for the most part of a dark brown colour, and interspersed with small laminated crystals of diallage *chatoyante*. When taken from a depth, it is tough, and not easily broken; but on

the surface crumbles and breaks into rectangular fragments, the sides of which are more or less coated with green and variegated serpentine, steatite, or calcareous spar. In some parts it is of a light brown color, and earthy, while in others it is darker, more compact, and more waxy or crystalline. It is exactly the same as that of the Lizard Point, in Cornwall."

Here I must correct a misapplication of terms; the "serpentine," following Brongniart's "Classification et Caractères Minéralogiques des Roches,"* should have been termed "euphotide." It presents the same varieties as that of St. Kevern, and the Lizard, in Cornwall, viz. Euphotide felspathique, and E. ophiteux (Bt.), that is, a rock composed of compact felspar, with isolated crystals of diallage, more or less serpentiniferous, just as diorite (Bt.), with which we shall presently see it is connected, is composed of two ingredients, viz. felspar and hornblende.

The northern extremity of these igneous rocks is composed of diorite, and the limestone formation rests upon it, while between the diorite and the euphotide is a bed of green steatitic clay, out of which oil jars, water jars, &c. are manufactured.

Passing over these igneous rocks to the limestone cape called Ras Ghissa, which limits them to the south of Măskat, we follow the coast from this point on to the cape called Ras el Hăd, at the eastern extremity of Arabia, and of this part I know nothing further than what I have frequently seen from the sea, and what Lieut. Grieve, who surveyed it, has kindly communicated to me.

From Ras Ghissa the limestone formation is continued on for thirty or more miles in an extremely broken condition, being raised in ridges one after another, having their white fractured surfaces towards the north-east, and their original surfaces sloping in the opposite direction; consequently the sea-cliff which faces them is also extremely irregular. After the distance mentioned, the formation loses its ridge-like character, and passes into round and isolated hills, and the great inland ridge approaches the sea to form the northern boundary of the Devil's Gap, which, as before stated, is 6223 feet above its level. There is here a break, and no cliff for a few miles, until the ridge, which forms the opposite or southern boundary of the opening of the valley, commences, and this, attaining a height of 4400 feet not above eight miles from the sea, presents, as may be conceived, an immense mural surface in this direction.

From the summit of the ridge here, which is called Jibal Jābăr, the

* See Dict. des Sciences Naturelles, Art. "Roches."

land descends to the sea in two or three gigantic cliffs, and is thus scarped the whole way to the town of Soor, where the coast line, turning still more to the east, leaves the scarped ridge to pursue its course southwards, and terminate in the mountains of Jallān. Lieut. Grieve states (Priv. MS.) that "the Jibal Beni Jābăr rise abruptly from the sea to a height of about 3000 feet," near a deep narrow valley called Wadi Shāb, about thirty miles N. W. by W. of Ras el Hăd. Specimens from this valley show that this mountainous ridge is composed of limestone, like that of the other parts of the coast. Its scarped bared surface presents a horizontal stratification, and a general light brick-red color, which is the prevailing tint of the limestone formation throughout the whole coast of Southern Arabia, and arises from the presence of more or less red argillaceous earth, which is found in the cavities of the rock, and about the organic remains. When the rock weathers down to these cavities, the earth becomes liberated, and, spreading over the white limestone, gives it the tint mentioned. In some parts it has entered into the composition of the rock itself, which then is of a cream color. Opposite the scarped surface of Jibal Jābăr there are no soundings half a mile off shore, and this is invariably the case on this and the south-eastern coast, where the land rises abruptly from the sea. Wherever it is highest the soundings are deepest, and *vice versâ*.

From the town of Soor to Ras el Hăd, the coast presents a sea-cliff of about 70 feet high, with land rising in shore to 200 feet, but sinking gradually towards the eastward to the level of the sea, which it attains at Ras el Hăd; also several great irregularities along the coast, which have evidently been occasioned by subterraneous influence.

Lieutenant Grieve mentions a singular pit on the top of the cliffs two miles east of Soor, which is 80 yards in diameter, and 60 feet deep; and it is only a few months since that an earthquake took place near Soor, which shook down several houses there. After this pit, come two other similar, but much more extensive depressions, viz. the Khors or Lagoons of Jărāmah and Hăjar. The former, entering by a narrow channel from the sea, is three miles long and two broad, with sides of 50 to 70 feet high, and water ten fathoms deep, making in all a depth of 110 to 130 feet below the level of the surrounding land. Khor Hăjar, which follows this, is not more than half the size, and much more shallow, but of the same kind of depression.

Rock-specimens from the top of the cliffs about two miles from Soor, near the great pit, which were kindly sent me by Lieutenant Grieve, show that they are composed of a fine white saccharoid limestone, which

has undergone minute fracture, and has had its fissures filled up again by a red colored cement, probably of the same composition as the parent rock. Such a brecciated state is frequently seen on the south-eastern coast, and in all probability has been caused by the shock of some subterraneous explosion or upheaval. At the same time, I have noticed that such rocks are more or less magnesian: the one just mentioned, on a rough analysis, yields about 12.18 per cent. of magnesia, and hardly effervesces at all with acids before it is pulverized. Its Sp. Gr. is 2.72. The specimens from the lower strata of the same cliffs show that they have not been fractured in the same manner, though of the same composition and structure. I think I have also noticed on this coast that the upper strata are those which are most comminutely fractured, while the lower ones are less so, or have escaped it altogether.

The rock-specimens from the sides of Khor Jărāmah are of a coarser structure; and when we arrive at Khor Hăjar, where the cliffs sink to the level of the sea, and are lost under the sand of the plain, there we find them composed of a limestone conglomerate, consisting of pebbles of the older formations, and shells, cemented together by a red calcareous sand, in which there are minute particles of ingneous rocks. In some parts, this cement exists as a rock by itself, without the grosser portions, and appears to belong to a loose miliolitic formation, which we shall find by-and-bye to prevail on the south-eastern coast.

At Ras el Hăd, which is a sandy cape, we have a plain of two or three miles square, connected on its western side with the Khor last mentioned, and on its eastern side forming the northern point of that short piece of coast which, running north and south for twenty miles, terminates the eastern extremity of Arabia. This short eastern face presents a uniform limestone cliff 100 feet high, and of a light yellowish color, with horizontal strata. Specimens from it show that it is composed above of a compact yellow limestone, breaking with a sub-conchoidal, uneven fracture, almost identical with that from the cliffs of Kurachi opposite; also of strata of the same kind of material and structure, containing abundance of small Foraminifera; and a stratum of whitish saccharoid limestone, like that mentioned at the base of the cliffs two miles east of Soor; while another specimen from these cliffs shows that there is a stratum of the kind last alluded to, which contains a considerable quantity of hyaline quartz, in minute grains, indeed an arenaceous limestone; it resembles the fine silico-calcareous strata of the limestone formation at Măskat.

Turning Ras el Khubba, which is the south point of this short piece of coast, we come upon the South-east Coast of Arabia, and lose all sea-

cliff for upwards of 180 miles. The coast now generally runs N. E. and S. W., and presents nothing but a sandy shore for the distance I have mentioned, and which I will now more particularly describe.

The first thing worthy of notice on proceeding along this coast is a little cape called Ras Rues, which consists of a few hillocks about twelve feet high; this is about three miles from Ras el Khubba. These hillocks are composed of a recent conglomerate, the grosser parts of which are held together by a dirty-looking silico-calcareous sea-sand, and though exceedingly insignificant in appearance, nevertheless they are interesting in a geological point of view, inasmuch as they contain pebbles of all the rocks probably in the neighbourhood. These pebbles consist of diorites, basalt, quartzite, jasper, and portions of the older limestone formation, all smoothly rounded by attrition.

After leaving this cape, and passing along the coast, we arrive opposite the mountains of Jallān, which I have already stated to be the termination southward of the great chain on this side of Arabia. They are about twenty miles inland from the south-east coast, and the highest is about 3900 feet above the sea. On every side, viz. towards Ras el Hăd on the east, and the desert of Akhāf on the west, as well as towards the south-eastern coast, they, like other mountainous terminations, subside more or less gradually, and more or less irregularly, to the general level of the surrounding country. This, towards Ras el Hăd, or the eastern extremity of Arabia, is in coin-shaped mountains, which offer beautiful scarps for the geologist, and are easy of access; towards the south, in low conical or dome-shaped hills of a brown sandy aspect, mixed with dark peaks, probably of igneous matter, such as we shall see a little further on; while towards the west the subsidence is more gradual and regular, to hills of about 200 feet high. Mr. Cole, of the Indian Navy, who travelled from Laskhara, a town on the coast just here, to Măskat, along the western side of these mountains, kindly sent me specimens from the hills near Bădiyah, which town is in the same parallel of latitude as the highest of the Jallān mountains. These specimens show that the same kind of black limestone exists there as that which Lieut. Constable showed me from Ras Măssăndăm; also pieces of fine compact grey lithographic limestone; and of fine argillaceous slate, of blue and black colors. Hence we may infer that the black limestone forms part of the mountains of Oman, both north and south, but whether continuous or isolated remains for future observation to determine.

Some distance after the subsidence of the mountainous chain has taken place towards the eastern extremity of Arabia, and the land in

this direction has assumed a general level of from one to two hundred feet above the sea, two mountains, close together, and of equal height, being about 855 feet above the plain, make their appearance. These, which are called Jibal Säffān, are close to the cliff of the eastern extremity of Arabia, and of course isolated for some distance from any other mountains. They are, therefore, very remarkable, from their situation, and being coin-shaped, presenting their fractured surfaces towards the west; they also form a fine section, which is easily attainable, so far as it goes, of the strata at this point; the sea-cliff, as I have before stated, being only 100 feet high.

From Ras Rues onward we have no cliff, and nothing on the land remarkable, beyond the low, brown, sandy-looking hills, and isolated dark peaks, dispersed here and there among them, until we arrive at a place called Ras Jibsh, which only differs from the rest of the coast in presenting a few of these dark peaks, which are arranged in a ridge-like form about 100 feet high, made more evident by their being a little above the surrounding country. There are now no longer any mountains to be seen inland, and nothing more than a monotonous extent of brown sandy-looking mounds, from 50 to 100 feet above the level of the sea, as far as the eye can reach in every direction.

The dark igneous peaks which form the cape called Ras Jibsh are probably only a repetition of what we have before seen among the sandy hills, and they are composed of euphotide and diorite, as those at Mäskat. The diorite, however, presents larger crystals of hornblende, which occurs here in a diversity of forms: sometimes it seems replaced by the diallage of the dark euphotide, or by bronzite or hypersthene; while the felspar sometimes passes into labradorite, of a blueish grey color, and presenting minute parallel lines or striæ, which traverse the plane of cleavage. One part of this ridge is composed of a very marked rock, consisting of moderately-sized crystals of black hornblende and grey felspar, in equal proportions, among which is disseminated a small quantity of a beautiful grass-green hornblende: it is not improbable that the black hornblende itself is but a deeper tint of this color.

There is also, close to these igneous rocks, but much lower than the tops of them, a mound of dull red jasper, undergoing fragmental disintegration: this is probably a chertified condition of some aqueous strata, which have been brought up with the igneous rocks.

The immediate neighbourhood consists of the hills I have mentioned, probably limestone, more or less obscured by drift-sand.

Inside the ridge of rocks is a small bay, which now only offers a safe landing for boats, but which is said to have formerly extended a long

way further inland behind the ridge mentioned, where there still exists a dry lagoonal depression, about two miles square, and 12 feet above the level of the sea. There is also, on the inner side of the ridge, a modern deposit, the upper margin of which is between 20 and 30 feet above the level of the sea. I have already mentioned one at Ras el Hăd, which is raised at least 12 feet above the level of the sea, also a littoral conglomerate at Ras Rues, the upper part of which is about 12 feet above the sea; and here we have a similar deposit, raised 30 feet above it. This kind of formation we shall find frequently on this coast.

From Ras Jibsh south-westwards, the coast presents a still more desolate aspect, if possible, than it did to the eastward of this cape: not a dark mound now appears to vary the color of the land, close to the sea, or as far as the eye can reach interiorly; but as we approach Ras Abu Ashrin, which is in 20° 58′ N. lat., and 58° 44′ E. long., the light brown color of the land ceases, and is succeeded by a tract of white dome-shaped sand-hills, from one to two hundred feet above the level of the sea. These extend inland as far as the eye can reach, and are scarped upon the sea, where their structure is satisfactorily seen. None of these scarps, which correspond to the hills forming part of the line of coast, are I think more than a hundred feet high. The formation consists of a sandy, granular rock, which, when minutely examined, is found to be chiefly composed of calcareous grains, with a small quantity of hyaline quartz, and dark particles, probably hornblende, from the igneous rocks. The latter character is deserving of notice, because, as no dark particles of this kind appear in the older limestone, they serve as a distinguishing mark for this formation when it approaches the latter in appearance. So uniform is it in its granular structure that there is hardly a fossil larger than the grains of which it is composed to be seen throughout the whole deposit. It is more or less stratified, and, though loose in structure, is sufficiently compact to form a good building stone. The thickness of this formation cannot be further ascertained than that which can be learnt from its scarped parts, which at the utmost do not exceed 100 feet. It is so loose on the surface that the upper and exposed part has become disintegrated for some depth, and, assisted by irregular upheavals, the original formation has probably thus been transformed into the dome-shaped mounds which it now presents. In some parts the sand is so subtle that it yields to the lightest weight, while in others it is so caked that it will bear that of a man. At a little distance it has the appearance of mounds of snow. Can these be the "winding sands" which are alluded to in the Khoran

among which the tribe of Ad are said to have perished? There can be no doubt that they form the south-eastern part of the Desert of Akhāf, and not far from the borders of it where this tribe is said to have settled; and could the gulf of sand at the western extremity of this desert, in which Baron Wrede found a plummet sink to the length of the line attached to it, viz. 360 feet, be the disintegrated sand of this formation, filling some volcanic depression there? There is no doubt that this deposit forms the lowest part of the seaward boundary of the Desert of Akhāf, and it may do so throughout; and that the desert itself extends at first a little inland, and then to the westward, to within 300 miles of the Red Sea, and about 150 miles from the south-eastern coast, where the "Sand-gulf" mentioned is said to be situated. The desert itself is also said to be impassable, and nothing would render it more so than an extension of such sand-hills as those in the neighbourhood of Ras Abu Ashrin.

When subjected to a chemico-microscopic analysis, if it may be so termed, the calcareous particles of which this deposit is composed are found to be nothing more than the remains of minute Foraminifera, the tests of which, having become partially dissolved and re-crystallized, have cemented the whole together; but this having taken place without interfering with the form of their internal cavities, and the latter being filled with the mineral called by Dr. Mantell moluskite (yellow silicate of iron?) allows of the latter being dissolved out by a weak acid, and the origin of the calcareous grains thus ascertained: not only this, but the extreme faithfulness with which the internal cavities are represented admits also of their species being determined.

I have been thus particular in describing this deposit, because we shall find it so widely spread along this coast; and not only here, but extending to the peninsula called Khattyawar, on the coast of India, from whence it is imported into Bombay in considerable quantity, for building and flooring stone; and supplies much the same place that the freestone from Portland does on the southern coast of England. I shall henceforth apply the terms miliolite or miliolitic to this deposit.

At Ras Abu Ashrin the coast sinks nearly to the level of the sea, and continues so for thirty-nine miles, or on to the bay called Ghobat Hāshish, where the same kind of white sand-hills are again met with. I do not think this flat portion extends very far inland before it is stopped by the tract of sand-hills mentioned: indeed I could see that it does not, from the high land of Masira opposite; nevertheless it is the lowest part of the South-eastern Coast of Arabia, unbacked by mountains; and the island of Masira, to which we will now pass over, lies opposite it, about ten miles distant.

Masira is thirty-five miles long, and varies from four to nine broad, and a chain of mountains runs longitudinally through it, which sends off spurs to the principal capes. This chain is chiefly composed of igneous rocks, and its highest mountain, which is in the northern half of the island, is not more than 600 feet above the level of the sea; while hardly any in the southern half of the island exceed 300 feet. Here and there tracts of limestone present themselves, but these are of small extent, and chiefly raised up upon peaks of the igneous rocks. Besides the main chain, which through its spurs and ramifications extends nearly all over the island, leaving only here and there, on its inner side, some sandy plains, there are other small ridges and rocks, which run more or less round the margin of the island, and others in the southern part of the channel, between Masira and the main land, which make their appearance in reefs and small rocky islets.

To the igneous rocks and the limestone there may be added a modern formation, composed of sea-sand, in which are imbedded shells, corals, and pieces of the older rocks. Let us now turn our attention to a more particular description of these formations.

The igneous rocks are chiefly composed of euphotide and diorite, such as we have before seen at Ras Jibsh and Mȧskat, but, in addition to these, there are more or less homogeneous green and black diorites, also basaltic rocks, more or less scoriaceous, or cellular, and amygdaloidal trap, the cavities of which are filled with calc-spar.

The euphotide is seen as usual in conjunction with its companion the diorite, though not, I think, so plentiful. They form the main chain and principal masses in the island. This, which is the older diorite, contains large crystals of hornblende, as at Jibsh, but of a greater variety of colors, such as green, brown, deep dark red, and black, sometimes in equal quantity with the compact felspar, at others preponderating. At the northern extremity of the island, the diorite is of a newer kind, and from its fine structure, homogeneous appearance, and black color, almost resembles basalt: it is here 200 feet above the level of the sea; it forms the islets, too, and is seen in many parts, but as a less plentiful rock. The fine green diorites, and the trap, also form low round hills, of considerable extent, and the cellular and phonolitic basalt much higher hills, with loose portions on their sides, the whole weathering smooth, and of a dark red brown color.

The accessory minerals which I met with were epidote, with calc-spar, and micaceous iron ore, tremolite, hornblende of different colors, and diallage, with its varieties, also copper. The latter mineral exists in many parts of the island, chiefly, I think, among the fine-grained

green earthy diorites, and low trap hills. I found it in the form of malachite, disseminated and in veins, in the parent rock, and following veins of hyaline quartz which traversed it. In many parts it has been worked, as the excavations and remains of slags and smelting-places in various parts indicate, but the weather-worn state of those I saw would make the time at which they were worked very remote. I have given a short account of these copper veins in this Journal (Vol. II. No ix. p. 400).

From the igneous rocks, let us go to the tracts of limestone. These are of small extent, and for the most part raised on the tops of the older igneous rocks. Beginning at the northernmost end of the island, we find a tract commencing just inside the group of black dioritic rocks which forms this extremity, and from thence extending longitudinally along it for about five miles, making the central ridge or highest elevation of this narrow part of the island. It is scarped towards the west, and slopes into the sand of the sea shore on the eastern side, at the same time that it rises towards the south-west, so that the dip of its strata is towards the east, and that of its strike north-east. For a long way the ridge or upper line of the scarp is not more than 30 or 40 feet above the level of the sea, but at its southern extremity it rises suddenly to about 100 feet. Here it presents a trifid rent, giving rise to three great fissures, which run in different directions towards the sea on each side of the island, respectively. The thickness of the scarps here is from 60 to 80 feet, and their geological section is as follows:—

The upper part of compact limestone, of a whitish yellow colour, cleavable, but breaking with a rough fracture. This is more or less filled with the remains of shells and corals, and extends downwards for 40 feet. It then passes into ten feet of coarse, loose, sandy, silico-calcareous limestone, of a yellow colour, containing numerous shells, and then 10 feet more of the same deposit, traversed by veins of gypsum, after which follows a coarse arenaceous yellow limestone, more or less shelly, which is lost beneath the bottom of the fissure.

Returning to the inner shore of the island, by one of these fissures, I passed, after issuing from it, between the scarp of the limestone ridge on my right hand and the igneous rocks of the island on my left, while the part over which I walked was composed of loose gritty earth of bright red and yellow colours, which seemed to be the finer parts of a jaspidean conglomerate that lay beneath. This conglomerate I thought might be an altered and lower deposit of the limestone formation, which would then make the section of it correspond with that at Mäskat.

The pebbles of this conglomerate have been so changed by the heat to which they have been exposed, that it is impossible to say what they were originally. In it, also, are disseminated here and there small quantities of malachite, which is the case in the silicious conglomerate of the limestone formation that rests upon the diorite at the village of Darzit, north of Măskat.

The second tract of limestone we come to, proceeding south-westward, is raised on the top of the main chain of dioritic rocks, in the centre of the northern half of the island. Its surface, which is horizontal, is 400 feet above the level of the sea, and its form very conspicuous from a distance, on account of its horizontality, and the contrast of its light yellow colour with the dark rocks around and beneath it. This tract is of an irregular shape, and about two miles long, by a quarter of a mile broad, and its longest diameter is parallel with the longitudinal axis of the island. The southern extremity of its upper surface or plateau, which is attenuated, and not more than 50 feet wide, is undermined on each side for upwards of 15 feet, which leaves only a support of about 20 feet wide in the centre; other parts on this side of the plateau are similarly worn, while there is nothing of the kind on the other sides. This leads one to infer that these excavations were effected by the waves when this limestone tract might have been rising from the sea. The fact also of their being only on the south-western extremity strengthens this, from the north-eastern part being sheltered by the coast, and the opposite side being directly exposed to the south-west monsoon. The surface of this plateau, which is perfectly horizontal, and the strata of the whole mass parallel to it, is bestrewed with the casts of bivalve shells (Conchacea) in the same manner as the hills about Hydrabad in Sindh, and among these, the casts of large species of the genus *Lucina* are by far the most prevalent in both localities. The following is a geological section of this tract:—

Beginning from above downwards, we have a compact limestone, of a whitish colour, cleavable, and breaking with a rough fracture: this is more or less filled with shells and microscopic Foraminifera, and extends downwards for 100 feet. Then follows a coarse yellow limestone, more or less sandy, which chiefly presents the remains of corals, and occupies about 50 feet; after which comes about 50 feet of loose yellow silico-calcareous sand, and red and green arenaceous clays: the upper two-thirds, consisting of the former, are traversed by veins of gypsum, in all its common crystalline forms; and the latter, consisting of the clays mentioned, forms the base of the series, and rests upon the diorite. I did not perceive a conglomerate here to bear out my inference respect-

ing its existence at the base of the last tract, which is not exposed. The only fossils obtained were the following:—

Corbula ?— *Species ?* (Cast.) Trigonal, inequilateral, inequivalve. Breadth 4¼ inches, height 3½ inches, depth 1$\frac{3}{10}$ inches. Thick posteriorly; compressed anteriorly. *Loc.* Masira, from the surface of the plateau.

Spondylus.— *Species ?* (Cast.) Subovate, inequilateral. Breadth 1$\frac{7}{10}$ inch, height 1½ inch, and depth $\frac{9}{10}$ inch. Striæ numerous, close together, and thin, the largest bearing small spines. *Loc.* Masira, from the second tract of limestone.

Although I could perceive traces of numberless fossils in this limestone, the only ones that I saw weathered out were the bivales on the plateau, and the one last mentioned.

Adjoining this tract of limestone are two others, which are only separated from it by a deep ravine: they are a little less in size, and slope towards the east with the tops of the igneous rocks on which they are supported. I had not time to visit them.

The next tract I shall describe is by far the most interesting of all, on account of its fossils. Proceeding south-westwards, we come to this about two miles from the plateau. But it is not similarly situated as to height, for its base is barely raised above the level of the sea, from which it is about a mile inland, among the igneous rocks. Like the southwest extremity of the first tract, this has also been raised by a force applied from below, here in the centre of the mass, which has produced a radiated fracture of the whole, and thrown its parts widely asunder, so as to expose a floor beneath, now half a mile or more in diameter. This floor happens to consist of a stratum of small nummulites, which reveals the nature of the limestone tracts hitherto examined, and establishes the existence of the Nummulitic Series on this part of the South-eastern Coast of Arabia.

The limestone, which rises about 100 feet above this floor, is of the same kind as that already described, and the fossils obtained from the inclosed area, which presents a vast variety, are as follows:—

FORAMINIFERA.

Nummulina.— 1st *Species ?* Circular, slightly convex on both sides, thin at the edge. Breadth $\frac{2}{10}$ inch, thickness $\frac{1}{10}$ inch. Horizontal or wavy; surfaces smooth, sloping gradually towards the circumference; presenting when polished a reticulated structure. Splits into halves, and shows a spire, consisting of a great number of whorls, which are divided into small chambers; the whole becoming more dense towards the centre. *Loc.* Masira.

Nummulina.— 2nd *Species?* Orbicular, doubly convex; Breadth $\frac{2}{12}$ inch, and thickness $\frac{2}{12}$ inch. Surfaces smooth, sloping suddenly to a thin circumference; presenting a reticulated structure, like the foregoing species. Splits in halves horizontally, and exposes a spire, consisting of a great number of whorls, divided into small chambers, the whole structure becoming more dense towards the centre. *Loc.* Masira. *Obs.*—The entire stratum was nearly made up of this and the foregoing species.

ECHINODERMATA.

Spatangus.— 1st *Species?* Conical. Length 6¼ inches, breadth 5½ inches, and height 5 inches. Ambulacra four, not depressed, spreading from the centre of the summit of the test, and extending nearly to the margin; grooved anteriorly in the place of the fifth ambulacrum. Genital pores four. Mouth bilabiate, between the centre and anterior extremity. Base oval; carinated in the centre, from the mouth backwards, and covered with small tubercles; bordered on each side by a longitudinal area of smooth polygonal plates. Vent terminal supra marginal. *Loc.* Masira. *Obs.*—The remains of this large fossil were very numerous, and partly filled with the nummulites mentioned.

——— 2nd *Species?* (Incomplete.) Length 2 inches, breadth 1½ inch. Ambulacra five, petaloid, situated in deep furrows, spreading from a point nearer the anal than the oral extremity; the posterior two shortest. *Loc.* Masira.

Cidaris.— *Species?* (A portion only of the test, bearing two big tubercles.) The largest $\frac{7}{12}$ inch in diameter at the base, surrounded by a ring of small tubercles, but none within the circle. *Loc.* Masira.

CRUSTACEA.

Cancer.— *Species?* Carapace sub-elliptical; Diameter 5¼ inches transversely, 4 inches antero-posteriorly. Spiniferous laterally; spines five in number, alternately bifid, extending from the orbits backwards; orbits 2¼ inches apart. Pinchers large, expanded, equal in size, concave on the interior surface, and bordered on the posterior edge by eight tubercles; tail consisting of six segments. *Loc.* Masira.

CONCHIFERA.

Tubicola.— *Species?* (See a description of the tube among the fossils from Hammar el Nafur, further on.) *Obs.*—They abound among the nummulites in Masira, and are very common in Sindh.

The deposit in which these fossils were imbedded bears little trace of them when not weather-worn or disintegrated, so that this might partly account for my having passed them over in the other limestone tracts. Here they abounded all ready to my hand, but being alone

when I fell in with them, and the sun having set, I could not examine the place so much as I wished, nor bring away so many fossils as I desired, and the next day we removed to a station several miles distant; so that I had not an opportunity of returning to this really garden of fossils, much to my regret.

The last unmentioned tract of limestone in this island is that which forms two mountains 500 feet high, at its south-western extremity. It is a narrow portion, about a mile long, and raised, as usual, on peaks of the diorite. There were no loose fossils about it, and the character of the limestone I have already described. Its base is buried in the debris of the superincumbent mass.

All these tracts are doubtless parts of the same limestone formation, which was once continuous over the island of Masira, but has since been broken up by the eruption of its igneous rocks, and more or less carried away by the action of the waves, during the time that the island has been gradually rising from the bottom of the sea to its present position. The presence of the bed of nummulites, too, in one portion of it, shows also that the whole belong to the Nummulitic Series.

Having now described the two principal formations in the island of Masira, viz. igneous and aqueous, let us turn our attention for a few minutes, before returning to the main land again, to the more modern formations to which I have alluded. These are two in number, one of which, perhaps the latest of the two, is seen in the north-eastern part of the island, where it is about 12 feet thick, and raised about 40 feet above the level of the sea, about a mile from it. It is scarped on its seaward side, and runs parallel to the north-eastern extremity of the island, which is truncated, and on the other side thins off upon the rocks on which it is supported. It is composed of shells, and pieces of coral, from which the animal matter has disappeared, and portions more or less rounded of the limestone and igneous rocks of the locality, all of which are slightly held together by sea-sand, consisting of minute grains of the same kind of material. It lies between the two groups of igneous rocks which form the two angles of this truncated extremity of the island, and is firmly adherent to their sides.

The other formation, which is but a finer deposit of the last mentioned, and perhaps a little older, is considerably elevated above the sea. It may be seen close to the village of Gyren, on the inner side of the south-western half of the island. It only differs from the miliolite of the opposite coast in containing more particles from the igneous rocks, and is raised on the top of some greenstone peaks, about 200 feet above the level of the sea.

Before concluding my remarks on Masira, I should mention that in the north-east half of the island, a little inland of Ras Jazirăh, there is a small low mound of aqueous strata, projecting from the plain of igneous rocks which exists there. These strata, which have been rendered jaspidean by heat, are in a vertical position, and composed of an extremely fine flinty material of a red or flesh colour, probably originally a fine clay. They are undergoing fragmental disintegration, and the pieces very much resemble leelite. To what formation this belongs I cannot say, but probably not to the limestone formation of Masira, for that rests on the igneous rocks in which this appears to be enveloped. I have mentioned the existence of a similar mound, and similarly situated, at Ras Jibsh.

Returning to the main land, to the bay called Ghobat Hashish, which is opposite the south-western extremity of Masira, and to which we have already brought on the low land behind this island, and the sand-hills from Ras Abu Ashrin, we find the compact limestone again appearing from beneath the miliolite. This is seen on the western side of the bay, where it is about 80 feet high, after which it rises gradually on to Ras Jazirăh, about 100 miles distant, where it is about 480 feet above the level of the sea; and the direction of this part of the coast, being due south, as I have before stated, shows also that the strata gradually rise in this direction, as well as to the south-west, which we shall see presently.

For the specimens and information I possess of this part of the coast I am indebted to the kindness of Lieut. Grieve, who surveyed it in 1847.

Rock-specimens from the west side of the bay of Hashish, and from Ras Sărāb, about twenty-five miles south of it, show that the limestone formation which here emerges from beneath the sand-hills, consists of a fine compact rock, some of which is magnesian, heavy, and of a grey color.

Next comes the little island called Hammar el Nafur, which is about twenty-five miles south of Ras Sărāb, and of all the information which Lieut. Grieve has communicated to me, that from this little island and another cape next to it, called Ras Kariat, with their specimens, are by far the most interesting and important. It is extremely fortunate that this little island should exist just here, at the commencement of the rise of the cliff, which we shall find by-and-bye carried up 4000 feet above the level of the sea far beyond our reach; for from its form and position, together with the cape mentioned, we obtain an unmistakeable geological section of the cliff for 320 feet down from its summit, which is the height of Hammar el Nafur.

This island is about 400 yards long by 300 broad, and its summit, though flat, is split in all directions. Rock-specimens from it show that it is composed of compact white limestone, and concretionary flints above, the former breaking with a more or less smooth fracture. This is stated to extend down 150 feet, and to present no loose fossils. Then comes 50 feet of white earthy or gritty calcareous deposit, more or less mixed with argillaceous matter, of a greenish white color, in which there are many fossils; and the rest is stated to be greenish white clay, without any; the bottom of the sea everywhere in the neighbourhood being composed of the latter material.

This clay, just stated to be of a greenish-white colour, is meagre to the touch when dry; breaks with an irregular rough fracture; receives a polish when scraped with the nail; does not adhere to the tongue; does not effervesce with acids; does not mix readily with water, but, when once rubbed up with it, remains for many days suspended in it, in an impalpable powder. Before the blow-pipe it dries up, becomes red and porous, and then passes into a black slag. When in combination with more or less calcareous material, it forms an excellent soap.

Having described this clay, I will now add a list of the fossils which Lieutenant Grieve sent me, and with them include those which came from Ras Kariat, nearly opposite, since the strata and fossils of both places are said to be exactly the same, and the specimens confirm this. They are as follows:—

FORAMINIFERA.

Nummulina.— *Species?* Circular, compressed, terminating at the circumference in a thin edge. Breadth $\frac{2}{17}$ inch, thickness $\frac{1}{30}$ inch; surfaces smooth, without any marking; presenting a spire internally, with many whorls, divided into small chambers. *Loc.* Hammar el Nafur and Ras Kariat, in the gritty calcareous deposit below the compact limestone.

Orbilolites?— (Impressions only). 1st *Species?* Oval. Length $\frac{8}{17}$ inch, breadth $\frac{6}{17}$ inch.—2nd *Species?* Circular. Diameter $\frac{4}{17}$ inch. *Loc. idem. Obs.*—Found in the marl passing from the gritty calcareous deposit into the clay.

ECHINODERMATA.

Echinocyamus.— *E. pyriformis* Ag. mihi. (Tab. 22, figs. 19—24, et *Echinoneus placenta* Goldf. Tab. 42, fig. 12.) Sub-pentagonal. Oval. Length $\frac{3}{14}$ inch, breadth $\frac{2}{14}$, height $\frac{1}{14}$. Subtruncated anteriorly, pointed posteriorly; mouth central; vent inferior, and situated a little distance from the margin. *Loc. idem.*

Echinocyamus.— *E. siculus* Ag. mihi. Oval, depressed. Length $\frac{5}{12}$ inch, breadth $\frac{7}{12}$ inch, height $\frac{2}{12}$ inch. Mouth and vent the same as in the foregoing species; ambulacra five, petaloid, not depressed. *Loc.* Hammar el Nafur and Ras Kariat. *Obs.*—This, and the foregoing species, are numerous in the earthy deposit below the compact limestone, together with the nummulites, which, on the other hand, are scanty, judging from the specimens of the deposit sent to me, but they are probably more numerous in other parts.

Clypeaster.— *Species?* Sub-pentagonal. Length $2\frac{6}{12}$ inches, breadth $2\frac{3}{12}$ inches, height $1\frac{5}{12}$ inch. Summit sub-central, anterior; ambulacra five, petaloid, in furrows, each enclosing a raised area; genital pores four; none posteriorly, mouth sub-central, depressed, surrounded by five tubercles, or projections, with a groove between each, presenting ambulacral pores; vent sub-marginal. *Loc.* Ras Kariat.

CONCHIFERA.

Tubicola.— *Species?* Tube only. Circular. Diameter $\frac{1}{2}$ to 1 inch; slightly increasing downwards. Straight or slightly crooked; sometimes bent at an obtuse angle; length unknown. Wall of tube from the thinness of a wafer to $\frac{1}{12}$ inch; composed of concentric layers, smooth and round internally; uneven, and presenting transverse striæ or rugæ externally. Filled with the material in which they are imbedded. *Loc.* Hammar el Nafur, Ras Kariat, Masira.

Teredo Navalis.— *Species?* Tube, sub-circular. Diameter above $\frac{1}{4}$ inch, increasing slightly downwards to a point, where it suddenly dilates; sub-flexuous; length of specimen $2\frac{1}{2}$ inches, real length unknown. Divided internally above by a transverse septum, which ends below where the tube dilates, (probably close to the animal,) in the two compartments becoming separate syphons, which are in contact in the middle, and entirely separated from the rest of the tube. Wall of tube $\frac{1}{12}$ inch thick; external surface uneven; irregular; striæ arranged longitudinally, and becoming circular where the tube suddenly expands. *Loc.* Hammar el Nafur and Ras Kariat. *Obs.*—The first of these tubes abounds in the earthy limestone or marly deposit with the nummulites, both here and in the island of Masira. They are also very common in Sindh. A specimen of one is figured in Pl. xxi. fig. 1 of Grant's Geology of Cutch, (loc. cit.) where it has been provisionally called "*Serpula? recta*" by Mr. Sowerby.

CONCHACEA.

Lucina.— *Species?* (Cast, imperfect.) Circular, compressed, equivalve, presenting little tubercles in circular depressions on both sides, which

appear to be impressions of the mantle. Breadth about 2 $\frac{5}{10}$ inches, and length 2 $\frac{5}{10}$ inches. *Loc.* Hammar el Nafur. *Obs.*—This is a facsimile of one of the species of Lucina found commonly about the hills at Hydrabad in Sindh, and like those on the surface of the plateau in Masira. It is a characteristic fossil of the upper part of this series, from which therefore it most probably came in the island of Hammar el Nafur.

GASTEROPODA.

Natica.— *Species?* (Cast, imperfect.) Breadth 4½ inches, and length 3½ inches. *Loc.* Hammar el Nafur and Ras Kariat. *Obs.*—There are several imperfect casts of large Naticæ from the softer limestone of these localities. In Sindh, also, such casts are found, composed almost entirely of large nummulites, together with minute and small Foraminifera. They, therefore, in the absence of the larger nummulites, here serve to establish the nature of the deposit in which they are found; throughout which the shells of Conchifera and Gasteropoda would seem to have entirely disappeared, as in most other parts of the Nummulitic Series with which I am acquainted.

Before proceeding further, it is worth while to compare the strata of the island of Hammar el Nafur and Ras Kariat, on the main land, with a section of the nummulitic strata forming the range of hills at Sukkur, in Sindh. This section was kindly sent me by Dr. Malcolmson, of the Bombay Medical Service, who states in his letter as follows:—"I have been over the Sukkur range of hills to their termination at Daji Kot. There is but little diversity in the whole range, which in no place exceeds 400 feet in height. The whole is one mass of nummulitic limestone, more or less disintegrating. It is, however, strange that the upper strata are in many places *very compact, and contain but few fossils, but are very plentifully interspersed with flints;* some of the flints contained large nummulites. The escarpment of the whole range faces the west. The strata are perfectly horizontal. Some of the limestone is of a cream colour, and forms a good building stone, which wears well, and does not seem to suffer from atmospheric exposure. About twelve miles from Sukkur I found a bed of clay *underlying* the nummulitic limestone, filled with the impressions *only* of shells. [This clay, of which Dr. Malcolmson sent me a specimen, is of the same kind as that at Hammar el Nafur.] The hill is here 250 feet high, and composed entirely, in the lower part, of nummulites, overlaid by compact limestone, containing flints. I traced the out-cropping of the clay for about half a mile."

Here, then, we have nearly the same strata as at the island of Hammar el Nafur and Ras Kariat, and that too about the same height, viz. 400 feet, composed of *compact limestone* above, then *nummulites* in a *loose disintegrating (gritty ?)* deposit below, and afterwards *clay*.

It is important to establish the exact nature of this series at Hammar el Nafur and Ras Kariat, for the reasons I have before stated, viz. that as the cliff rises towards the south-west we shall soon find these strata elevated beyond our reach, so that when we come to the height of 4000 feet we shall have to assume that they still form the summit there, from their existence at Hammar el Nafur and Ras Kariat; unless we can prove this by the presence of the nummulites themselves, or some other allied fossil. The disintegration of the deposit in which the great mass of nummulites are imbedded I have generally observed to be the case in all the specimens I have seen from Egypt, Sindh, and Cutch. I have not yet seen a compact hard limestone charged with nummulites.

Passing back to the coast opposite the island of Hammar el Nafur, Lieut. Grieve states this to be "low, and to present a range of small dark peaks, rising gradually from the beach." These are probably the tops of low igneous rocks, which we might expect to be near, from the break in the cliff, and the upheaval of Hammar el Nafur opposite it.

The next place from which I have specimens is Ras Kariat, already mentioned. This cape is nine miles south of the island of Hammar el Nafur, and about forty north of Ras Jazirăh. From this point the cliff, which is 280 feet high, and has hitherto been in detatched portions, is extended on continuously to within a few miles of Ras Jazirăh. The upper part of it, like that of Hammar el Nafur, is composed of compact white limestone with concretionary flints, passing below into an earthy gritty one, thence into a marly deposit, and lastly clay. The fossils are the same as those of Hammar el Nafur, and have been described under the list from that island. I received also large portions of radiated and columnar crystallized carbonate of lime, pointed at the circumference, translucent, and of a greenish white colour; they are crossed by transparent wavy lines, as if they had been formed by successive additions, and appear to come from the earthy limestone near the green clay; also specimens of gypsum, of which some of the tubes of the Tubicolæ were made up. The occurrence of gypsum here should not be forgotten, for it exists in the same position at Masira and Măskat, viz. below the compact limestone.

From Ras Kariat the cliff, as before stated, extends on uninterruptedly to within a few miles of Ras Jazirăh, or a little beyond Ras Markas, which is nine miles from the former cape, where they are 480

feet above the level of the sea. Rock-specimens from this show that the base is composed of a pinkish, compact, sub-saccharoid, magnesian limestone, which slowly effervesces with acids; also a rock of the same kind, but filled with the cavities of small shells, viz. Cardium and Cerithium, containing selenite. The Cardium is oblique, inequilateral. Length $\frac{1}{4}$ inch, and breadth $\frac{2}{7}$ inch. We shall find a rock almost identical with this occurring at Makalla, about 600 miles S. W. of it; the proximity, however, of igneous rocks, which we shall find in both localities, have probably influenced this resemblance, more than the continuity of the stratum.

Lastly, we come to Ras Jazirâh, the end of this portion of the coast, which now suddenly returns, from running N. and S., to its general direction, viz. N. E. and S. W.; and here we have another eruption of igneous rocks. This is confined to the cape, and its immediate neighbourhood, but it presents as complete a picture of such a disturbance as can well be witnessed. The continuity of the cliff, which on either side is uniform, and horizontal as far as the eye can reach, is here entirely broken up by the igneous rocks, and the detached portions of its strata thrown into all kinds of positions, and weathered into all kinds of shapes; while the dark rock appears between or below them, or in separate peaks, among the general wreck. Where the white strata overlie the igneous rock, they are discoloured for some distance, red and black: this would seem to be the passage into the former, just as we saw it in the base of the plateau at Masira, where these coloured strata are composed of red and dark green clays; for the limestone here probably rests on dioritic rocks, as at Masira, and the rupture has been caused probably by their subsequent elevation, and by the effusion, perhaps about the same time, of more igneous matter. Specimens from the island which joins the cape at low water, and from which it takes its name, show that it is formed of a rock belonging to the euphotide and diorite before mentioned, and of which probably the igneous rocks on shore are principally composed. These specimens consist of brown compact felspar, in which there is an equal quantity of sparkling laminated black hornblende, in small crystals; and on the plane surfaces of the specimens an ophiolitic or nephritic deposit, like that seen about the euphotide hitherto met with. On either side of this eruption the cliffs, as before stated, are continuous, and their strata horizontal, as far as the eye can reach, but their whiteness, which hitherto has made them look so much like those on the south-east coast of England, seems here to cease, and to give place to a light yellow tint.

From Ras Jazirâh the cliff is continued on, with the exception of a

break here and there, (where it falls back and gives place to a sandy plain in front,) to Ras Shaherbataht, and Ras Gharau, which capes are within a few miles of each other. Here the cliff is 800 feet above the level of the sea, and has been gradually rising to this since leaving Ras Jazirăh, a distance of 110 miles. Capt. Haines states that the upper strata here are composed of limestone, below which come "chalk" and flints.* As we approach this cape, we observe that the cliffs begin to present large caverns, which appear to have been solely excavated by the waves; they are very similar to those seen on the Bill of Portland. I could not help thinking that in this way most of the great caverns which we shall by-and-bye see in the mountains have been formed, and which now serve for the habitations of most of the Bedouins who live on the high land of Southern Arabia. At Ras Shaherbataht the same kind of uniformity and continuity of cliff meets the eye on either side, as at Ras Jazirăh, only that it is nearly twice the height; but as we approach the centre of Kuriyah Muriyah Bay a totally different aspect presents itself: here we observe at Ras Shuamiyah, which is about 135 miles from Ras Jazirăh, another and much more extended outbreak of igneous rocks than at the latter point. The cape called Ras Shuamiyah is formed by a dark black-looking igneous rock, and on either side of it black dykes irregularly extend up through the white strata, in some places raising them and running along between them, and in others attaining the summit and flowing along the surface above the cliff, the uniformity of which may well be conceived to have become totally destroyed by this eruption. In some parts it is raised higher than we have hitherto seen it, in others more depressed, while the land interiorly appears to have participated in this, if not in a former more general disturbance; and a few miles further south-west, its irregularities still increasing, brings us to the high land before mentioned, which is 4000 feet above the level of the sea, with the white cliff we have been passing at the upper part of it. This is the eastern limit of the elevated tract of Southern Arabia, and the western limit, on the coast, of the low land or Desert of Akhāf. The south-western part of Kuriyah Muriyah Bay is bordered by the former, which, breaking down towards the extremity of the horn, ends in a granite mountain, 1200 feet high, which forms the cape itself, and is called Ras Nus.

The appearance of this granite mountain probably explains the grand and sudden upheaval of the coast here. It is the first granite we have met with, but we shall soon find that we have come to an immense tract of it, which not only extends along the coast south-westward for several miles,

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but also eastwards, where it forms the greater part of the Kuriyah Muriyah islands, to which we will now direct our attention.

They are five in number, neither of which is more than twenty-five miles from the coast; and the farthest apart are not more than thirty-five miles from each other, while they are all in the same parallel of latitude. The largest, called Hăllăniyah, is about seven and a half miles long, and about three and a half broad. The next in size is Soda, which is about three miles long, and two broad. Haski and Jibliyah are each about a mile square, and Gharzaut is hardly more than a large rock.

Hăllăniyah is composed of about one-sixth limestone, and the rest of igneous rocks. The limestone occupies the northern part, and forms a cape 1645 feet above the level of the sea; its colour generally is a light yellow to the water's edge, and its strata, though tilted up and displaced where they are in contact with the igneous rocks, are undisturbed at the cape, any further than is caused by their elevation of about fifteen degrees towards the north. The late Dr. Hulton, from whose description of these islands* the following remarks have been extracted, states:—

"About the centre of the island [Hăllăniyah] the hills rise into a cluster of pointed spires, the highest of which was computed by trigonometrical measurement at 1510 feet above the level of the sea; and from these, similar hills run in all directions, preserving in most cases the form of interrupted ridges. At the eastern [northern ?] extreme, the land assumes a different state; a perpendicular headland, 1645 feet in height, boldly projects into the ocean, and for some distance to the westward appears a continued mass of table-land, accidentally heaved up, as it were, at the end of the island. With the exception of this high land the rest of the island is chiefly composed of granite, varying somewhat in its structure, and the proportion of its fundamental ingredients, upon which also depends a variety in its colours. The most interesting feature of the granite is the manner in which most of its ridges are surmounted by a dark-coloured rock, allied in its characters to those of the trap order, more especially to greenstone. [The latter is our diorite, and the dark-coloured rock probably euphotide, which we have before seen to accompany it.] This is found passing through the body of the hills in the form of dykes. The same rock is seen abundantly in the form of veins and seams, traversing the granite in all directions. It would appear as though by some powerful internal impulse this substance had been injected into fissures in the granite, produced by the same violent action. To a person viewing it

* Trans. Bombay Geograph. Soc. 1839-40, p. 189.

from a moderate distance, the distribution gives rise to an appearance of an unusually dark shade running along the summits of the hills, as most of our party at first fancied. These dykes and seams do not follow any general rule in regard to their direction, but are entirely influenced in this respect by the disposition of the granite, which follows no particular course. They vary from a fine vein of a few inches to a stratum of eighteen or twenty feet in breadth. In mineral composition, too, they differ no less materially. Most of it I have stated to resemble greenstone, in the compactness and simplicity of its structure, and hornblende appears to be the predominant ingredient; but by the intermixture of felspar in greater or less quantity, rocks of a very different nature result, still occupying the same relative situation. In some places the felspar is disseminated in the form of distinct crystals, communicating a porphyritic structure; in others quartz is abundantly intermingled, giving it more of a granitic aspect. In the latter there is a tendency in the compound to diffuse itself more extensively through the granite bed, losing its character as a stratum, and entering largely into the formation of the hill itself. In fact, it appears to undergo, by this accession of felspar and quartz, a regular transition to granite itself, and merely differs, as far as the eye can judge, in colour, which, from the presence of hornblende as a subordinate mineral, becomes of a dark speckled hue. . . . . In both this and the prevailing kind of granite, mica, if not altogether wanting, is a very scarce ingredient, and is found chiefly in the light-coloured veins of granite intersecting the granite mountains." There can be no doubt, I think, that this is an altered state of the euphotide already described: the author knew greenstone (diorite); he also knew granite, and trap; and there is no other "dark coloured rock," that I saw, in this part of Arabia, "allied" to greenstone, but "euphotide."*

"The eastern end [northern ?] of the island is that which attains the highest point of elevation, and is composed of a secondary limestone pretty regularly stratified towards the sea. It contains in its substance a few fossil shells, but is not remarkable for anything further than its proximity to the granite, its greater elevation above the sea, and its

* In my "Geological Observations on the Igneous Rocks of Muskat, &c.," (see this Jl. Vol. III. No. xiii. p. 128,) I have stated that Dr. Hulton had not mentioned either euphotide or diorite in his account of the Kuriyah Muriyah Islands, nor did I see any of these rocks at Marbat. But I had not then begun to put together this paper, and therefore had neither read Dr. Hulton's account, nor looked over my specimens from Marbat, with such attention as I have done since, which will account for any discrepancies that may appear in this and the paper alluded to regarding the rocks of these two localities.

insulated situation. It is nowhere interscctcd by veins of either granite or greenstone."

I know nothing myself more of this island than that which I have stated previous to quoting Dr. Hulton's description, and have nothing to remark further respecting it than that I would direct attention to the depth of the limestone strata here, which we shall find useful by-and-bye in determining its real depth throughout the neighbouring coast.

The small rocky island of Gharzaut, which is a little N. N. E. of Hăllăniyah, and 200 feet high, is composed "exclusively of granite of a reddish colour, and a fine crystalline structure."

Soda, which is six miles west of Hăllăniyah, presents a peak 1310 feet above the level of the sea. The composition of the hills is granitic, with the same distribution of dark-coloured strata as that noticed on Hăllăniyah, though not quite so conspicuous. "The granite on the eastern end, and on the central part, is of a dark grey colour, with extensive veins of a light colour, traversing it in various directions. That on the western end is a mixture of red and grey granite, in varying proportions, the red preponderating in most localities, and of a fine texture, similar to that of Rodondo [Gharzaut]."

The geological structure of Jibliyah, the highest point of which is about 500 feet, is stated to be "essentially primitive, but with a greater variety in the appearance of the rocks than we found at Hăllăniyah. The outer detached rocks are of similar composition, being formed of a species of dark-coloured granite, in which hornblende appears to enter largely. The island itself is composed of porphyritic syenite, the colours of some specimens affording a rich and diversified appearance."

Haski, the most western of all these islands, and the nearest the shore, presents in its highest peaks an altitude of about 400 feet. "In its geological characters, too, it is nearly similar [to Jibliyah], though the reddish-coloured granite, which is common in Soda, is here found to constitute the greater portion of the island, the remainder being composed of a species of variegated granite and porphyry."

Thus we see that these islands are, with the exception of Hăllăniyah, all composed of igneous rocks, and that, too, chiefly of granite; and we also see that they are all nearly in the same parallel of latitude as the village of Hasek, which is only nine miles north of Ras Nus, the south-western extremity of Kuriyah Muriyah Bay, and which itself, as before stated, is also formed of a granite mountain. Further, if we look at Captain Haines's beautiful chart of Kuriyah Muriyah Bay, we shall not find a sounding of 50 fathoms north of this little chain of islands

and a line extending from them to Hasek, that is between them and the main land to the north, while immediately south of them and this line the soundings sink to 145 fathoms, and no bottom, showing that there is a great depression on this side, which we also learn by the soundings to be continued westward to Ras Nus, and along the coast as far as Marbat, where the granitic tract ends.

Returning again to the shore, we find ourselves opposite a very different coast to that we have just passed: one now of 4000 feet instead of 800 feet above the level of the sea; and commencing from Ras Nus, where we left off, which is the seaward point of demarcation between the low and high land, we find the granitic tract on shore to commence here, (though at sea it begins much farther eastwards, as we have seen in the Kuriyah Muriyah islands,) and to extend on to Ras Marbat, a distance of forty miles, where it ends. At first it is narrow, and runs along the base of the broken-down table-land, but the latter, soon falling back, gives place to an expansion of it into a low field of igneous rocks, which is about ten miles wide, and terminates at the cape mentioned. This field, which is backed by the precipitous declivity of the table-land, presents an almost uninterrupted uniformity in its lowness, except at one point, near the sea, where an isolated pyramidal mountain of the main land remains, as a type of what once existed over the whole area. This mountain or pyramid, called Jibal Jinjări, which is 1300 feet high, is stated by Captain Haines to present chalk and gypsum in its composition; and so far it is interesting, because we know that these two substances exist in a fixed part of the upper strata of the white limestone series, from what we have seen at the island of Hammar el Nafur and Ras Kariat, where it is only 320 feet above the level of the sea, and from their presence in similar situations in other parts. By chalk here is meant a soft white earthy limestone, or gritty calcareous deposit; there is no genuine chalk on this coast that I have met with, though the former is a close approach to it, and, in the absence of the latter for comparison, might easily pass for chalk.

In the immediate vicinity of Ras Nus the limestone strata, capping the detached and broken-down masses of the table-land, (which in this way here reaches the sea,) are much and variously inclined, while a similar disturbance is evinced by the older igneous rocks of the low plain which follows, from the variety of coloured dykes with which they are veined. I explored about a dozen square miles of these rocks near Marbat, and also ascended the precipice of the table-land at this point, the particulars of which will now occupy our attention.

The igneous rocks, as before stated, terminate at Ras Marbat in a low plain, which shelters a little bay and village of the same name on its inner side, that is between it and the main land. This plain is about four miles square, and 30 feet above the level of the sea in its centre, from which it gradually slopes on all its free sides to the sea. It is more or less wavy, and here and there interrupted in its continuity by irregular fissures running to the sea, and by projections a few feet above the surface of the granite rocks of which it is composed, while at the bottom of the bay is a group of granite hills, about 100 feet high.

The igneous rocks of this plain and its neighbourhood consist of red and grey granite, red protogine granite with black hornblende sparcely mixed with the chlorite, syenite, euphotide, and coarse and fine-grained diorites, green chlorite brecciated with fine compact brown limestone, and cemented together with calcareous matter; to these may be added gneiss, which appears in vertical strata in the midst of the groups of red and grey granite rocks projecting from the plain.

The red protogine granite appears to be the most abundant; and the grey granite the oldest in appearance, though the line of demarcation between the two is by no means evident, for they seem, so far as I saw, to pass into each other.

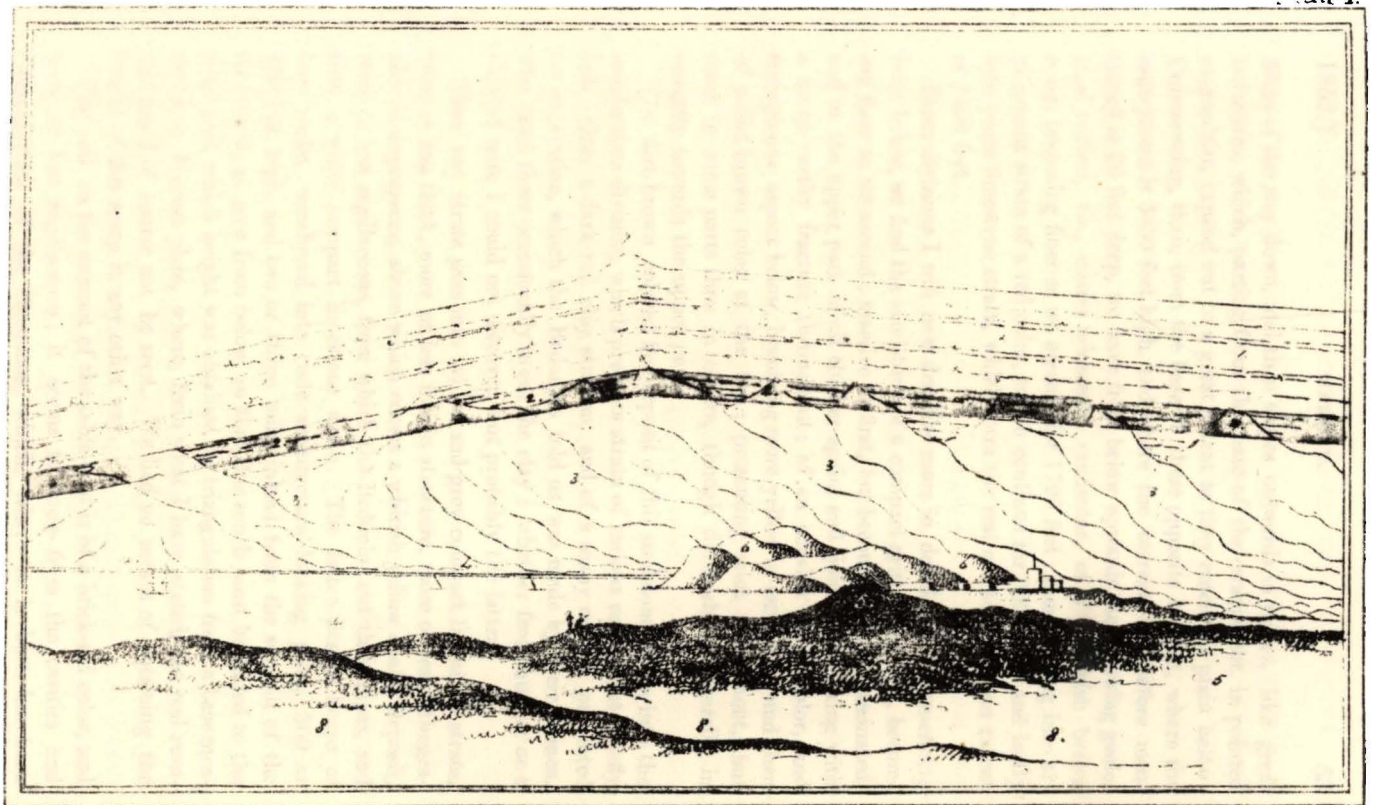
The granite hills on the inner side of the plain at the bottom of the bay have been thrown up through fine compact brown limestone strata, which forms a part of them, and from its effervescing so slowly with acids, and its heaviness, is probably more or less magnesian. It also, when minutely examined, presents laminæ of mica, which in some way or other have been transported into it.

I did not see the rich red granite, grey syenite, euphotide, diorites, nor chlorite breccia *in situ*, and therefore only infer their existence here from having picked up pieces of them in different parts of the plain; but there can be hardly any doubt of the fact, for I do not see how they could have come there otherwise.

With these few observations on the igneous tract, which is about ten miles broad, let us pass across to the base of the scarp of the table-land; and, fortunately for our examination of this, there is a dry bed of a great torrent, which empties itself into the Bay of Marbat on the inner side of the granite hills, and which, running along the base of the declivity for two or three miles, completely separates it from the igneous rocks, and exposes its strata unobscured by debris for several feet below the surface of the immediate neighbourhood.

The precipitous face of this table-land here is scarped for about two-

Plate I.



T.O Conybeare del.

H.C. lith.

MARBAT.

1. White Limestone Strata. 2. Argillaceous Strata. 3. Variegated Sandstone

7. Marbat Peak 3400 fe. 8. Granite Plain.

4. Dark Brown Limestone. 5. Millolite Deposit. 6 Granite Hills.

fifths of the way down, and then slopes outwards in ridges, like great buttresses, which, parting from the base of the escarpment, in pointed extremities, expand out to a great extent as they reach the plain below. Commencing, then, from the base of these opposite Marbat, where the escarpment is 3400 feet high, and where the torrent bed before mentioned is 20 feet deep, we have from below upwards the following geological section, viz., coarse micaceous sandstone, of a yellowish brown color, becoming finer as we ascend, for 1700 feet; then passing into argillaceous strata of a red color, which continue for 300 feet; and lastly into white limestone strata, which form the rest of the series, an extent of 1400 feet.

These divisions I will now describe more in detail, and commencing from below, we find the sandstone of a compact gritty structure, becoming finer as we ascend; massive at first, but becoming thinly laminated, and in the upper part of all thicker again, and jointed; breaking with a rough earthy fracture throughout; of an ochrish brown color, and ferruginous aspect below, becoming more yellow in ascending, and then of a dirt-brown color at the top; presenting mica throughout, but more in some parts than in others, though diminishing generally in quantity towards the upper part.

The dirt-brown colored fine deposit of this sandstone passes into the argillaceous division, which presents strata of various colors, but chiefly red. One, a dark red clay stratum, and of a soapy nature, presented an excavation, which the Bedouins told us was made by their women, who came there occasionally to eat the clay; whether from hunger or a vitiated taste I could not discover, but probably the latter.

These red strata pass into white and grey compact limestone strata, more or less thick, more or less fine in structure, more or less lithographic in appearance, above which comes a whitish yellow chalky deposit, more or less argillaceous, from which the Bedouins cut their pipes, and then a white compact limestone again. The latter lies in heaps of bare rocks, weathered into rude architectural-looking piles, 300 or 400 feet high, and two or three miles inland from the summit of the table-land, as seen from below, so that this much must be added to the 3400 feet, which height was obtained by triangulation from a base measured on Marbat plain, where, from what I have stated, the real summit could of course not be seen. We had no means of obtaining the height of this scarp in any other way.

The soil on the summit of the table-land is of a brick-red color, and more or less argillaceous; it seems to come from the cavities and disintegration of the limestone, which, where it is bare, has been

weathered into sharp undulating ridges, as it is on some parts of the coast, where the sea is washing it away without making any deposit.

The following are the fossils which were obtained from these limestone strata:—

FORAMINIFERA.

Alveolina, (D'Orbigny.)— *Species?* Ovo-spheroidal or melanoid; long diameter $\frac{6}{16}$ inch, short diameter $\frac{4}{16}$ inch. Sulcated longitudinally, in sigmoid lines, which extend from apex to apex, marking the divisions of the chambers, which present transverse parallel striæ, dividing them into compartments. *Loc.* Marbat, from the summit of the formation inland downwards to an unknown extent. *Obs.*—This fossil varies in size below the measurement given. It is a characteristic fossil, and occurs also in great abundance in lower Sindh, near Tatta, where it is well known by the name of "Tomra," and forms the sacred strings of beads worn round the neck by Hindu devotees, and others of that religion. It differs from *Fascicolites* (Parkinson) *elliptica*, Sow. (Grant's Geol. Cutch, pl. xxiv. fig. 17), which on the other hand abounds in the hills of Hydrabad, in being more spheroidal, and exceeds a little in size the largest of those I met with at Marbat.

Operculina, (D'Orbigny.)— *Species?* Discoidal, nautiloid, very thin. Width $\frac{1}{16}$ inch. Surface presenting four whorls, divided into many chambers, which are reflected, and increase regularly from the first to the last cell. *Loc.* White limestone, Marbat. *Obs.*—This little fossil frequently accompanies the foregoing.

Orbitolites.— *Species?* Circular, concave, extremely thin in the centre, abruptly expanding into a thickened rim at the circumference. Breadth 1 inch, thickness at the rim $\frac{1}{16}$ inch. Surfaces smooth, presenting a series of concentric rings, alternately raised and depressed. Internally composed of minute cells, arranged in concentric circles, which are multiplied vertically to four or five tiers deep, as they extend from the centre to the circumference. *Loc.* Marbat. *Obs.*—This fossil, which is not present in the specimens I possess from the summit of the white limestone strata, varies in size below the measurement given. It is a characteristic fossil, and the species and specimens increase in number as we approach the coloured division, where whole strata are composed of them, as we shall see hereafter. The Alveolina and Operculina above described are also found in company with this large Orbitolite. It belongs to d'Orbigny's genus Cyclolina, (Foram. Fos. du Bas. Tert. Vienne, p. 139, Tab. xxi. figs. 22—25,) and its structure has been beautifully figured by Carpenter, (Quart. Jl. Geol. Soc. Vol. VI. pl. vii. fig. 24.) It also occurs in great

abundance in the Hala Mountains, near the Buran River, in Sindh, together with the spheroidal Alveolina called "Tomra" above mentioned, and an Operculina. All three appear to agree with the three as they are found together in Arabia as to size and outward appearance, but the internal structure of the first and last slightly differs. The cells appear larger in the Sindh Orbitolite, and the whorls more numerous in the Sindh Operculina.

Corbis ?— *Species ?* (Shell, imperfect.) Breadth $3\frac{9}{10}$ inches, length $3\frac{4}{10}$ inches. Cancellated; resembling *Corbis pectunculus.* (Lamarck et Tab. 13, fig. 3—6 Paris Basin Deshayes.) *Loc.* Marbat. *Obs.*— Found in a small block of fine white compact limestone, with individuals of the foregoing fossils.

Inoceramus ?— *Species ?* (Specimen imperfect.) Shell thin, suborbicular. Length $2\frac{1}{4}$ inches, breadth 2 inches. Inequilateral, striated concentrically, cardinal edge of upper valve straight. *Loc.* Marbat. *Obs.*—Found in the block of limestone just mentioned.

GASTEROPODA.

Pileolus.— *Species ?* (Specimen imperfect.) Shell thin, suborbicular, subspiral, involute, with an ill-defined apex. Length $2\frac{1}{4}$ inches, breadth $1\frac{3}{4}$ inch, and thickness $\frac{3}{4}$ inch. *Loc.* Marbat. *Obs.*—Found together with the foregoing fossils. Species of this genus are very common in Sindh, and almost all that I have seen, which, like the present, are chiefly reduced to their casts, have been more or less filled with *Fasciolites elliptica,* and the spheroidal Alveolina before mentioned. They range from one to four inches long, with a proportionate height, and the border of the columella is denticulated.

Carinaria ?— *Species ?* Conical, reflected. Length $+\frac{1}{7}$ inch, breadth at the base $\frac{4}{10}$ inch, slightly compressed laterally, striated horizontally, with a ridge or raphe in front. *Loc.* Marbat. *Obs.*—Found with the foregoing fossils.

Trochus.— *Species ?* (Cast, imperfect.) Height about 4 inches, and breadth at the base 4 inches. Spire consisting of nine or ten whorls. *Loc.* Marbat. Found with the foregoing fossils.

Buccinum.— *Species ?* (Cast, imperfect.) Length $2\frac{3}{4}$ inches, breadth $1\frac{1}{2}$ inch. *Loc.* Marbat. *Obs.*—Found with the foregoing fossils, which were also accompanied by casts of olives, but too imperfect for description.

From the colored agillaceous strata I obtained nothing but a rock-specimen of limestone of a lead blue color, almost entirely composed of small orbitolites, but I did not preserve it, not knowing at the time from whence it came.

Nor did I see anything in the micaceous sandstone worth noting, except a tesselated arrangement of a stratum in the lower part, over which the path passed, leading from Marbat to the base of the table-land. It is on the short plain here which extends outwards from the base of the latter to the border of the torrent bed, and is raised about 30 feet above the level of the sea. At first I thought this was the tiled surface of a floor belonging to some old building, but a few moments' reflection and observation convinced me that it was the cracked surface of the stratum, which must have been formed at the time of its deposit. The cracks had been an inch wide, and had been filled up with a dark ferruginous sand, which contrasted strongly in color with the white coarse-grained quartziferous sand of the stratum generally, and therefore of those parts which it surrounded. This ferruginous deposit or cement had cracked again in its centre, and so the whole of the divisions had become more or less loose and separable. They are of course of various sizes, and of all kinds of polygonal shapes, and about three inches thick: the ferruginous sand not only coats their sides, but their lower surfaces as well, and it is probably owing to the presence of the iron that this remarkable feature has been preserved. It shows us plainly that this part in particular of the sandstone must have been deposited at the level of the sea, where the tide now and then overflowed it (for no cracking could take place under the sea), and that too before the 4000 feet of strata now above it were deposited; and, as the uppermost stratum of the latter contains the remains of animals which must have been deposited in the sea, these cracks farther show that this portion of the sandstone must have gone down at least 4000 feet since they were formed, and have returned to a position higher than that even in which it was first deposited. I took particular care to ascertain the correctness of this by observations made on the spot, and brought away some of the loosened divisions for closer examination; and the total absence of calcareous material in them, connected with their containing particles of mica, and being of the same composition as the sandstone in which they are found, at once places beyond doubt the possibility of their being a subsequent formation. Neither can these divisions, or the sandstone in which they exist, be confounded with any other above it, because there is no other of the kind; and if it had been a portion of the same sandstone disintegrated and re-deposited, it must have contained more or less particles of carbonate of lime, from the detritus of the older rocks, and the sea in which it was re-deposited; for every formation which has taken place subsequently to, above or alongside this sandstone, does contain more or less calcareous material.

I had not time to examine these sandstone strata much, or probably I might have met with some fossils in them.

Having, then, seen the igneous tract at Marbat, and traced the strata of the table-land to its summit, let us now return for a few moments to the granite plain, where we shall find a modern formation, well worthy of our attention, and which we shall have to trace on for some distance, and indentify with similar ones which we have passed, for it will be some way before we can again get a section of the table-land; and in the mean time we must occupy ourselves with the no less important deposits which lie along its base.

Capping the plain of Marbat, the highest part of which I have before stated is about 30 feet above the level of the sea, is a granular deposit, composed chiefly of particles of carbonate of lime, with which are mixed more or less grains of quartz and hornblende, from the igneous rocks on which it reposes. It is about a yard in thickness, and extends in all directions over the plain to within a mile of the sea. It contains a great number of organic remains, consisting chiefly of casts of small Conchacea. This indeed is the fossil character of the deposit. The houses at Marbat are built with it, and some of the headstones of the graves there are made from slabs of it, which will show that it is of considerable consistence. It fills the inland extremities and crevices of the fissures, which I have stated to extend through this plain to the sea, and there contains very large shells; and adherent to the side of the group of granite hills at the bottom of the bay is a large mass of it, the upper part of which is 30 feet above the level of the sea. Here it presents a vast quantity of corals, with gigantic shells of Hippopus, Ostrea, &c. All these shells have lost their animal matter, and are more or less friable and pulverulent. This formation in its more subtle material closely corresponds with the miliolitic deposit at Ras Abu Ashrin, and when we have proceeded a little onwards from the igneous rocks, we shall find its composition and appearance to be almost identical with it, while at Marbat it more resembles that part of the miliolitic deposit which we have seen resting on the dioritic rocks, near the village of Gyren, in the island of Masira.

Between this formation and the water's edge is a coarser deposit, which overlaps the former, and is composed of rounded gravel from the granite rocks, held together by a whiter matrix than that of the first deposit; and, still nearer the sea, a third, still more white, and apparently more recent, the upper surface of which is about 12 feet above the level of high-water mark.

The fossils obtained from this and the foregoing deposits were:—

Lucina ?— (Cast.) Breadth 1 inch, height 1 inch. *Loc.* Marbat, in the miliolitic deposit lying on the granite plain. *Obs.*—There were many other bivalves present, smaller than this, but none so numerous.

Venus.— *V. puerpera vel corbis* (Lam.) mihi. (Specimen imperfect.) Breadth 3 inches, height 3 inches. Cancellated, the lines projecting a a little at their points of decussation. *Loc.* Marbat, in the deposit between the latter and the water's edge.

Ostrea.— *Species?* Inferior valve oval. Length 8 inches, breadth 5 inches. Deep, patulent; muscular impression sub-central, lateral; straight posteriorly, convex anteriorly. Impression of hinge concave rhomboidal, wavy, terminated by a straight border anteriorly, and by an ill-defined one posteriorly. Margin crenulated for a short distance on each side the hinge; afterwards simple, wavy. Upper valve thin anteriorly, thickened posteriorly, with a deep angular longitudinal groove in the centre. *Loc.* Marbat, from the miliolitic deposit at the end of a fissure in the granite plain.

I should also mention another formation here, which is seen on the inner side of the group of granite hills next the base of the table-land. It forms part of a deposit prior to the miliolitic on the granite plain, and is better seen a little further on, for here it only peeps above the sand close to the sea at the part I have mentioned. It consists of a coarse cellular limestone, in which are sparsely scattered rounded portions of hyaline quartz, and particles of other minerals from the igneous rocks, together with a few remnants of small fossilized shells. Its color, which is of a dark brown, like that of moist brown sugar, as well as its appearance, at once characterizes it among the other deposits, and not less so the extreme craggedness into which it wears by the action of the waves. . It is sometimes saccharoid, and generally effervesces slowly with acids.

Having described this rock, let us now proceed along the coast; and, leaving the granite hills of Marbat, we cross the bed of the torrent mentioned to the base of the table-land, following which for four miles over a narrow plain between it and the beach, partly obscured by drift-sand, we at length arrive at an abrupt elevation of this plain to 100 feet above the level of the sea, and presenting a sea-cliff of the same height. This cliff is continued on, broken through here and there by a torrent bed, to the village of Takah, about twelve miles distant. Four miles west of Marbat I examined it, and afterwards a rock, called the island of Guena, which is of the same height, close to it, and the geological section of both, from above downwards, is as follows:—

First, five feet of a granular calcareous sandy deposit, like the

miliolite mentioned, in which are imbedded rounded pebbles of the older limestone. Then a narrow stratum of compact, coarse, shelly, impure limestone, of a light whitish color, resting on a little thicker stratum of dark brown limestone, of the kind stated to exist behind the granite hills at Marbat, which, in its turn again, reposes on a compact white limestone, breaking with a conchoidal fracture, and an even surface. The brown limestone here is more saccharoid in its structure than at Marbat, and contains a little magnesia; in its upper part is sparingly scattered small rounded quartz gravel, from the igneous rocks, and below it presents white spots, which are but large pebbles of compact limestone, from the older formation, now almost indistinguishably blended with it.

When we approach the end of this sea-cliff, which is at Takah, we might expect, as it appears to be all of the same height, to find the same strata again, but instead of this we find a complete absence of them, and in their place an entirely different limestone, which extends to the summit of the cliff. This limestone, which is more or less earthy, and of a white pinkish color, is richly charged with Orbitoides of the following description :—

Orbitoides.— 1st *Species?* Flat, circular, compresed, more or less wavy. Breadth $\frac{6}{10}$ inch, thickness in the centre $\frac{1}{10}$ inch. Gradually sloping to a thin circumference. External surfaces tuberculated towards the middle? Presenting a horizontal plane of rectangular chambers, passing through the centre, with laminiform cells on both sides. *Loc.* cliff at Takah.

——— 2nd *Species?* Circular, doubly convex, terminating in a rim of unequal breadth. Convexities sub-central. Breadth $\frac{4}{10}$ inch, thickness $\frac{2}{10}$ inch. External surfaces tubercled over the convexities. Internally presenting a horizontal line of chambers, passing though the centre, from which white lines of laminiform cells radiate to the circumference. *Loc. idem.*

——— 3rd *Species?* A little larger than the foregoing, but with the rim turned up, like that of a hat. *Loc. idem.*

——— 4th *Species?* The same kind, but one side only presenting the hemispherical elevation. *Loc. idem.*

Operculina.— *Species?* Sub-elliptical, very thin. Length $\frac{3}{10}$ inch, breadth $\frac{5}{10}$ inch. Consisting of two whorls. Chambers apparent externally, long, narrow, and much reflected, increasing in length suddenly after the first whorl. Externally presenting minute tubercles, disposed over the commencement of the whorls, and then following the lines of the chambers. *Loc.* cliff at Takah.

Obs.—The second species is *Lycophris dispansus*, which abounds at Lukput, in Cutch. (Grant's Geol. Cutch. pl. xxiv. fig. 16. Geol. Trans. vol. vi. 4to.) What I have described as several species may be after all but varieties of one animal, for they appear to assume all kinds of shapes. They abound in Sindh, and one extraordinary form of them there resembles two convexo-concave disks, joined together by their convexities. The first species is not improbably a nummulite, as both *Lycophris dispansus* and large nummulites occur together in Cutch, and appear to pass into each other, while my description is chiefly taken from sections and half exposed specimens imbedded in the parent rock. Dr. Carpenter, who has given some beautiful sections of Orbitoides in the Quart. Jour. Geol. Soc. vol. vi. Plates 4—8, considers, page 36, these fossils to be allied "rather to the nummulites than to the orbitolites," and in his concluding paragraph states: "The Foraminiferous character of Orbitoides appears further to be indicated by the presence, in all the species I have examined by sections taken though the centre, of the large globular cavity (fig. 35, a), resembling that which is stated by M. D'Orbigny and Mr. Williamson to be the ordinary form of the first segment of the Foraminifera, whatever may be the form which the compound structure may subsequently present."

The character, however, on which I would place most reliance, in pronouncing these fossils to belong to Foraminifera, is the spiral arrangement of the central plane of cells, which I think not quite so satisfactorily shown not to be the case in fig. 31 of the sections to which I have referred, wherein Dr. Carpenter states, p. 32, the cells may be seen "arranged in regular concentric rows," as one could wish. No doubt it is very difficult to hit upon the centre of this plane in specimens where it is very thin, but until I can do this myself, or see that it has been done by others, I shall not be satisfied that Orbitoides are without this character, which the imperceptible gradations of nummulites into them would *à priori* lead one so strongly to suspect.

Whatever the structure of these fossils may be, or however numerous their varieties and species, their presence at Takah, not far from the centre of the South-east Coast of Arabia, is sufficient proof of the existence of the Nummulitic Series here; though I am ignorant of the exact position in the series which these fossils occupy. Hence we must regard the cliff at Takah, which has only an elevation of 90 feet above the level of the sea, as a part of this formation, and, moreover, we must regard it as a part of the compact white limestone, breaking with a conchoidal fracture, on which some miles back in this cliff we saw the dark brown limestone reposing. The end of the cliff at Takah, that is the part

under consideration, has undergone much disturbance, and, though low, has fallen forward in great square blocks, which present a large quantity of corals in their composition, while the rents in the plain between the base of the table-land, here transformed into mountains, and the sea, a distance of about two miles, bear ample testimony of the distorting forces to which this locality has been subjected. It is opposite Takah, as before stated, that the bed of recent Operculina exists, in twenty-five fathoms water, with a fine sandy bottom, which are identical with that species which forms whole strata almost, in the Nummulitic Series at Mäskat. Hundreds of them came up on the grease of the sounding-lead at each throw, and for several miles in extent, when this part of the coast was surveyed.

At Takah, as just mentioned, the sea-cliff ends, and the maritime plain between the base of the high land and the sea sinks from 100 to about 10 feet above the latter; it also expands westward from this point, for the mountains recede, and give place to a flat area, twenty-two miles long, and from ten to fifteen miles deep in the centre: this is called Dofar, and is the most fertile district on the coast. Over this plain is spread a continuation of the miliolitic deposit, which we have seen topping the plain at Marbat, and the low cliff just passed, but it is more uniform in its composition, and more free from dark particles of the igneous rocks; hence it closely resembles the miliolite at Ras Abu Ashrin. On it are the remains of several towns, one of which, called El Bälăd, I have described.* They were built of this freestone, and they contain a vast number of columns, ornamented in arabesque, which have nearly lost their figured surfaces where exposed to the weather. This deposit seems to average about 10 or 12 feet in depth. In many parts of it there are extensive cracks, or *khors* as they are locally called, some close to the beach, which are always full to the brim of fresh water; that, for instance, at El Bälăd, is more than two miles long, and in one part about 100 yards broad, and flows over the beach, though no stream can be seen running into it. It is the presence of these *khors*, and the looseness of the soil, which renders Dofar so fertile, in comparison with the rest of the coast.

Passing along the cord, or sea shore of this half-moon-shaped plain, we at length arrive at its opposite or western extremity, where the high land, as at Takah, comes out again to within nearly the same distance of the sea; we also find this end of the plain elevated again to about the same height as at Takah, and consequently a sea-cliff

* Journal Royal Geograph. Soc. Vol. VI. Trans. Bombay Geograph. Soc. Vol. VII.

in front of it, which presents a similar geological section to that examined four miles west of Marbat; commencing from below upwards, it is as follows:—

At high-water-mark, or a little lower, is a white compact limestone, of a fine structure, and breaking with a conchoidal fracture, on which rests the dark brown limestone first seen beside the granite hills at Marbat, close to the sea; this is ten and a half feet thick here, and presents, in its upper part, a stratum, two and half feet thick, of large rounded pebbles; these pebbles are of compact white limestone, and are from the older formations. On them lies a bed of large oysters, one and a half feet thick, and with these the color of the limestone changes from dark brown to a greenish reddish dirty white; it also now becomes shelly, and presents radiated masses of columnar coral, with a great number of casts of smallish bivalve shells (Conchacea et Ostrea); further it is rendered more or less impure, and derives its reddish color from the presence of red argillaceous earth, disseminated here and there throughout the whole mass; this stratum, including the bed of oysters, is seven and a half feet thick. Next above it comes seven feet of still more impure limestone, composed chiefly of small rounded gravel from the older limestone, mixed with an increased quantity of red argillaceous earth, which gives the whole stratum a red color. And on it again comes twenty feet of white shelly limestone, similar to that first described. This forms the section of the cliff, and against the upper part of the dark brown limestone and lower white shelly limestone rests the miliolitic deposit of Dofar, six or eight feet above high-water-mark, filling many holes in the former, which have been made by lithodomous animals, and containing oysters of the same kind as those of a bed close by. Walking inland from the cliff, however, for about a mile, we come to fifty feet of limestone gravel, and pieces of flint, imbedded in red argillaceous earth, similar to that mentioned, and this is capped again by five feet of limestone pebbles and flints of a large kind, with less red earth. These deposits add to the thickness of the section, but will be found by-and-bye to depend probably on local causes.

Hence we see that here, about the centre of the South-east Coast of Arabia, we not only have the miliolite, but we have, in addition, another littoral deposit, viz. the compact brown limestone, with the whiter shelly limestone above it, making in all about fifty feet in thickness of a deposit totally different from, and lying inferior to the miliolite; and that it rests on a compact limestone, belonging to the older formation, must be inferred from the presence of the nummulites? and orbitoides in the cliff at Takah, on which a few miles back the brown lime-

stone is seen to repose, but this will become more evident as we proceed.

I have stated that the mountains advance towards the coast here, but the coast-line also turns here from running east and west, to south, and then south-east, a little way before it resumes its original direction; that is it is reflected to form a little bay here, called the Bay of Resut; and hence the maritime lowland, which is narrowed at this end of Dofar, is widened again, not in this instance by the mountains receding from the shore, but by an advancement of the lowland upon the sea, and with this advancement the lowland also is bordered externally by a ridge, which in one part is 700 feet high, and scarped upon the sea throughout. Thus, then, we have a valley between the sea-cliff of this ridge and the mountains; a small promontory formed by the end of the ridge, called Ras Resut, and inside it the bay mentioned of the same name. Now into this bay we have the opening of a torrent bed a mile wide, coming not only from the valley itself, but from among the mountains, and the section of the cliff just given is taken from the inner corner of the opening of this torrent bed upon the sea. This, then, accounts for the additional strata of red earth, flints, and pebbles, before mentioned, and which we did not see in the section taken four miles west of Marbat, where the cliff is within two miles of the base of the mountains, and on a straight part of the coast, far removed from the influence of any great torrent deposit. We therefore must not include in this littoral deposit this 50 feet of red earth, pebbles, &c., because it is evidently a local accumulation.

Passing across the sandy beach which lies in front, and in the dry weather closes the mouth of this torrent bed, we arrive at its opposite or external corner, which is close to the base of the ridge mentioned, and that of the small promontory which shelters the bay. This corner, like the other, presents a low cliff, consisting of little more than the dark brown limestone we saw on the other side, and which, running along the base of the promontory parallel to the sea, and scarped upon it for about eight feet, is washed by the waves into that extreme cragginess so characteristic of the stratum in other parts. This deposit rises no higher, while the height of the promontory is two or three hundred feet above the sea at its base, and two hundred at its extremity. Here, then, we have compact white limestone rising up to form the ridge of the promontory, while we have the dark brown limestone remaining in a horizontal line at its base. Nothing, therefore, can be more plain than that this white compact limestone, which we have seen all along underlying the dark brown limestone, is a part of another series, and the presence of

the nummulites? and orbitoides at Takah, as before stated, shows that this is the Nummulitic Series.

Hence there are here, nearly in the centre of the South-east Coast of Arabia, two distinct littoral formations, later than the white limestone strata forming the tops of the mountains; and as this part of the coast, in which they are so evidently seen, is also circumscribed by natural limits, I will briefly recapitulate what I have stated respecting it, before proceding further.

We have just seen that there are two bays here, which look towards each other, the one called Marbat, the other Resut; and they are separated by forty miles of coast, running E. and W., which is straight, and backed by the table-land the whole way. At Marbat we have seen a plain of igneous rocks, and the precipitous face of the table-land, which lies behind them; and in the bottom of the bay we have seen a dark brown compact limestone formation peeping above the sand close to the sea on the inner side of the granite hills, at the base of the table-land; a miliolitic deposit capping the granitic plain, and a still more modern deposit towards its circumference. We have also seen, four miles west of Marbat, the cliff of the maritime plain there, narrow, raised 100 feet above the sea, and presenting a dark brown, rough limestone, resting on a compact white one breaking with a conchoidal fracture; above the brown limestone, a stratum of a lighter color, but still compact, and then five feet of the miliolite, with rolled limestone pebbles of the older formation. Following this cliff for a certain distance, we have found the compact white limestone at the base rising to 90 feet high at Takah, and denuded of the other strata, but giving us decided evidence of its nummulitic character, by the presence of nummulites? and orbitoides. Then we have the miliolitic deposit spreading out over the district of Dofar; and at Resut the dark brown limestone again forming part of the sea-cliff, and resting, as before, on the compact white limestone, which, in the outer half of the bay, rises from below it to form the upper part of the promontory of Resut. Above the dark brown limestone here also we have an impure white compact limestone, as in the cliffs between Marbat and Takah; and adhering to the side of the cliff, which is partly formed by these two in the Bay of Resut, a portion of the miliolitic deposit. Thus we have the same kind of littoral deposits throughout the straight part of this portion of the coast, and the same at the bays of Resut and Marbat, but with this difference, that the fundamental rock of the former is limestone, and that of the latter granite. There is an entire absence of igneous rocks at Resut, whereas at Marbat there are hardly anything else.

From Ras Resut, which at its extremity is about 200 feet high, a sea-cliff is continued on for twenty-three miles, to the base of the great promontory called Ras Sejär, which is formed by the advancement of the mountainous tract upon the sea. This cliff I had not an opportunity of examining much, as it is perpendicular, and rises directly out of the water. What I did observe, however, is interesting.

I have just stated that there is an entire absence of igneous rocks at Resut, but, though this is the case, they are not far distant, one would think, for not only the limestone of the cape is shivered into atoms, and rendered pink by heat, but six miles further on the base of the cliff is similarly fractured where it is 700 feet high. This point is called Ras Hammar, and is the maximum altitude of the cliff. Ras Hammar is composed of compact white limestone above, and of the comminutely fractured limestone mentioned below, but I am ignorant of what lies between, further than that the whole is white calcareous strata, and that among these there are some of a marly cretaceous nature, from which the Bedouins cut their pipes, similar to that at Marbat. The brecciated limestone, for such it is, from the crevices having been filled up by a cement, and that too of the same material, is of a dense compact fine structure, lithographic, but breaking with a splintery fracture, heavy and hard, and of a light grey color. By a rough analysis, it contains from 12 to 15 per cent. of magnesia. Its specific gravity is 3.3. It scarcely effervesces with acids until pulverized, and its great weight and hardness appear to be owing to the presence of silex.

In this limestone is a cavern, similar to those which abound in the mountains, and one of which I visited near Takah. Its base is just above high-water-mark, and its roof is about 30 feet high, and hung with stalactites, not of magnesian limestone, but of sulphate of lime. From the face of the cliff presenting innumerable excavations of lithodomous animals, on a parallel with the upper part of the roof, and the brecciated state of the limestone, it is probable that this cavern commenced with the latter, and was subsequently washed out by the waves, while the cliff was rising from the sea. That which I visited, near Takah, is in the mountains, and I have given a description of it in this Journal.* It was inhabited, and is about 150 feet span and 50 feet high, (not yards, as stated from oversight in the description to which I have referred,) and 30 yards deep. Its roof is also smoothed, and hung with thick stalactites : another cavern, of equal dimensions, close by, had fallen in. We saw some from the vessel in the elevated scarps of the mountains in different localities, which, judging from the size

* Vol. III. No. xiv. p. 253.

they appeared at the distance we were from them, must be of enormous dimensions. They form the principal habitations of the Bedouins of these parts, and descend from father to son as hereditary property.

From Ras Hammar we pass along the remaining part of this cliff to the base of Ras Sejăr, which it joins after a distance of twenty-five miles from Ras Resut ; diminishing gradually in height after Ras Hammar, until it arrives at this point. Ras Sejăr is the largest and highest promontory on this coast : it is an advancement upon the sea of the great mountainous tract which from this point south-westwards, for a distance of sixty miles, presents no maritime plain whatever, but descends directly to the sea in long slopes or in precipitous steps. The ridge of the promontory has been computed by trigonometrical measurement to be 3380 feet above the level of the sea, and the bluff at its extremity 2770 feet. The eastern side is scarped perpendicularly for 800 feet, and the strata, which are composed of white and grey limestone, are disposed horizontally. At one part of the talus of this cliff is a little island, on which exists the dark brown limestone and miliolitic deposits seen in Dofar, but the latter is much finer in structure. After this I did not recognise the brown limestone, though doubtlessly it or its representative exists here and there throughout this coast.

The south-eastern side of Ras Sejăr, which is parallel with the coast, and its south-western extremity, the highest point of the cape, present an almost vertical scarp, in which the strata are seen to dip towards the north-east; while on the south-western side, the same horizontality is seen which we observed on the eastern side, but with a scarp rising by high precipices and narrow shelves to the ridge of the promontory, which I have before stated to be 3380 feet above the level of the sea. At the point where the coast line turns from running N. E. and S. W. to about N. W., for a short distance, is the great bluff of Ras Sejăr, and the following is its geological section, from below upwards :—

The first 25 feet above the sea is composed of a fine-grained micaceous sandstone or quartzite, of a blueish grey color, thinly stratified, and breaking with a rough fracture across the planes of stratification. It is weathered into holes indicative of the presence of organic remains, and in some parts is veined with white quartz. There is hardly any difference, except in color, between it and the upper part of the micaceous sandstone at Marbat. On this rests 175 feet of variegated argillaceous strata, principally of a red color, containing many fossils,

and above all again the white limestone strata, which, deducting the thickness of the sandstone and colored deposit from the total height of the bluff, amounts to 2570 feet.

Having on the base of this section measured with my eye, as carefully as I could, the height of the lower projection of the bluff above the sea, for I had no means of obtaining it in any other way, I find, when I come to multiply this on the outlines of the bluff, which I made at different distances, that the latter does not amount to more than 1950 feet above the sea, which is 820 feet less than it was computed to be by trigonometrical measurement: possibly, and not improbably, from the place where the base was measured, the angle was taken from a point much higher than the summit of the real bluff. The height of the limestone bluff at the island of Hăllăniyah being 1645 feet, and the estimated thickness of the limestone at Marbat about 1800 feet, together with the trigonometrical measurement of the scarp of the next promontory we shall come to, which is limestone from the water's edge to its summit, being 1900 feet, seems also to indicate, from the thickness of the limestone at these places, that my measurement of the bluff at Ras Sejăr is more correct than that obtained by triangulation, but probably from the reason above mentioned.

I collected no fossils from Ras Sejăr, beyond some small imperfect specimens of the genus Turritella? from the colored strata.

It is to the blue grey sandstone of this promontory that the late Capt. Newbold alluded when hinting at the origin of the quartzite pebbles in the conglomerate underlying the nummulitic strata at Măskat, and resting on the euphotide and diorite of that locality.* A little further in from the extremity of Ras Sejăr on the south-west side, where the precipitous part of the promontory is much higher than at the cape, this sandstone is also raised to 300 feet above the level of the sea; and my impression is that here, as well as at Marbat, its strata are not parallel with those immediately overlying them, but dip towards the north; still I am far from being certain that this is the case.

As on the other parts of the coast, so on the lower part of Ras Sejăr, there is a thick line of the miliolitic deposit, adhering to the side of the cliff, 150 to 200 feet above the level of the sea. On the south-western side of the promontory I think I also saw it again, reaching down to the water, for there are dwellings excavated there in a yellowish white deposit, which can only be this or micaceous sandstone, and it is not likely to be the latter, from its hardness and dark color. At all events, it exists again at Rakot, a little village at the mouth of a

* This Journal, Vol. III. Part ii. p. 27.

ravine-like valley, seven miles to the westward of Ras Sejär. Here it is of considerable height and thickness, and of a finer structure than any on the coast. While I was knocking off some specimens, the Bedouins who were with me asked me if I wanted any *khat*, which means "white writing chalk," because, if I did, it was to be found in the upper part of Ras Sejär. From this it would appear that the chalky stratum we have met with here and there from the island of Hammar el Nafur onwards also exists on the top of this cape.

Between the last named village and a town called Damkot, some miles further on, are more dwellings, close to the sea, at the bottom of the slope of the high land. These also appear to be cut out of the miliolitic deposit: the place is called Jädäb. The high land also presents a more extended tabular outline here than hitherto met with, and continues to do so on to the neighbourhood of Damkot, forty-five miles from Ras Sejär, where it becomes broken, and thrown up into mountainous peaks again, the summits of which are about 3000 feet above the sea. This form of the coast continues on for some distance, viz. to the opening of a valley called Shagot, where the coast-line turns to the south, and the scarped mountainous ridge, here precepitous upon the sea, pursues its original course south-west, under the name of the Fattak range. A lowland shore, therefore, commences at this point, which, as the coast trends southward, is continued on till it meets the lower hills of a mountainous ridge called the Fartak range, a distance of forty miles. Between these two points, viz. the Fattak and the Fartak ranges, it extends inland or south-westward as far as the eye can reach, and is the only part of this coast where the mountain ridges which face the south-east appear to be separated by any great interval. The sea-cliff of this lowland varies with the height of the lowland itself, but seldom reaches 100 feet. I had an opportunity of examining it about its centre, where its cliff is 60 feet high, and the following is the section from above downwards :—

First six feet of a coarse sub-cellular limestone, breaking with a rough fracture, and of a light brown color, resembling in structure the dark brown limestone of Resut. This becomes mottled with red about its lower part, and passes into a red argillaceous chalky deposit, which at the water's edge becomes of a greenish white color, uniform in its dark appearance and structure, and of a moderate hardness. Here also, 15 feet above high-water-mark, is a line of the miliolitic deposit, adhering to the side of the cliff, and composed of the calcareous sandy material before noticed, in which are imbedded a number of shells.

There is a pebbly beach at this place, composed of rounded pieces

of more or less compact limestone, and concretionary flints ; also here and there a large piece of extremely fine limestone, of a lithographic structure, from one to three feet in diameter, probably the altered remains of fossillized madrepore. I saw no pebbles or traces of igneous rocks here ; indeed this part of the coast seems to have undergone less disturbance than any other, although the line of miliolitic deposit shows that, like the rest, it is experiencing gradual elevation.

The cliff of which this is a section is more or less continuous from this point on to the lower hills of the Fartak range, which commences in an angle close to the sea. One side of it runs inland and south-westwards, which is the grand direction of the range, and the other southwards, to end in the cape called Ras Fartak. This angle is about fourteen miles from the cape. Here the strata of the lowland cliff also become elevated, broken up, and confused, and this confusion extends to within six miles of the cape, where the irregularity ceases, and the uppermost stratum of the white limestone series can be seen emerging from the water, and pursuing its course to the top of the escarpment, which is 1900 feet above the level of the sea, after which it assumes a horizontal direction, and continues on to the summit of the cape : in this way stratum after stratum of this cliff may be seen rising from beneath the water, until the lowest runs almost parallel with it ; so that no better place could be visited than this for examining deliberately and without interruption the strata of which this great limestone formation is composed. I had only an opportunity of visiting one part of it, and this was where the strata had become horizontal, and where a portion of the face of the cliff, having fallen off, enabled me to obtain from the talus thus formed a knowledge of a good extent of the lower part of it. It consists of more or less compact, more or less cavernous, and more or less saccharoid white limestone, which again is more or less mottled, or rather veined with dark brown saccharoid magnesian limestone. I saw no traces of fossils in it, except a few minute species of Foraminifera, of the genus Alveolina (d'Orbigny). In one part the rock is entirely saccharoid, sparkling, uniform in structure, and of a grey color, in fact dolomitic, and on a rough analysis yields 16.4 per cent. of magnesia, with a specific gravity of 3.07. It is an interesting fact, bearing, perhaps, upon the formation of dolomite, that the dark veined portions here are of magnesian limestone, effervescing feebly with acids, while the whiter portions bubble up as usual when touched with them.

As we approach this extremity of the Fartak range, which forms the cape called Ras Fartak, and which is also the south-western limit of

the great bay of El Kammar, a reddish tint makes its appearance at the base of the cliff, close to the water, and on turning the corner we observe, by the truncated end of the cape, that this is the commencement of the argillaceous strata, which, rising towards the west at an angle of 45°, reach an altitude of from 1000 to 1200 feet on the opposite side of the cape. The base of the cape, I should state, is much in advance of the upper portion, and this advanced part consists of the series mentioned, to the geological section of which let us now turn our attention, having considered that of the white limestone strata which lie above and behind it, on the eastern side of the cape. Commencing from the summit of this advanced portion, and proceeding downwards, (though this section was obtained by following the base of the cape from east to west, and noting the strata as they emerge successively from the sea,) we have at first 300 feet of fine compact limestone, of a light violet color, breaking with a smooth conchoidal fracture, and containing small Orbitolites, and other fossils. Then a wide stratum (say 50 feet thick) of a red argillaceous limestone, presenting the same kind of fossils, but more numerous, with Echinodermata. Next follows 20 feet of greenish yellow argillo-calcareous strata, splitting into thin laminæ, on which are seen the remains of a few minute bivalve shells, and marks similar to those made on mud by small crabs and annelides. After this comes 10 feet of a red, ferruginous-looking, argillaceous limestone, and, following it, a stratum of a blueish grey argillo-calcareous siliceous shale, exhibiting, where exposed to the atmosphere, a jointed structure, and thick laminæ. This is suceceded by 30 feet of blue marl, compact above, and soft below, in which are remains of Echinodermata, Ostracea of the genus Exogyra, and pyrites. Next comes 300 feet of impure limestone, compact, and of a pinkish grey color, the lowest hundred feet of which (the only part I examined) is almost wholly composed of small Orbitolites, with the remains of a few small Echinodermata. This is the last stratum towards the west which emerges from the sea : it is opposite the little village of Khaisêt. After this, the remaining part of the extremity of the cape is confronted by a narrow sandy beach, from beneath and behind which the colored strata continue to rise in the same manner as from the sea, to the extent of 500 feet in thickness : this 500 feet is composed of impure limestone, compact, and of a dark red color, and ferruginous aspect ; fossiliferous, and abounding in large cavities and fissures, which appear to have been caused by some subterranean force, for the rock has been shattered throughout, and cemented together again by its own material. Among the more thinly stratified deposits of the upper part

of these colored strata are bands of brighter colors, which have not been mentioned: these consist of much the same kind of material as that with which they are in contact, or form a part, and give to the whole a variegated appearance when near, but, when viewed at a distance, are lost in the prevailing red color of this series.

The following are the fossils which I gathered from these strata here and at Ras Sharwên, the next large cape, which is sixty miles further west, but a part of the same formation:—

ZOOPHYTA.

Astrea.— *A. textilis.* Goldf. (Tab. 23, fig 3.) mihi. Hemispheric, covered with conical projections, which are more prominent in the upper part than towards the base; and marked with striæ, which radiate from their summits. Horizontal diameter $\frac{6}{17}$ inch. *Loc.* Ras Fartak, from the pinkish grey limestone.

Orbitolites.— 1st *Species?* Conical, obtuse, excavated. Breadth $\frac{2}{17}$ inch, height $\frac{1}{17}$ inch. External surface presenting striæ in concentric rings; internal surface presenting striæ radiating from the centre to the circumference. Structure solid, composed of minute cells. *Loc.* Ras Fartak, chiefly in the pinkish grey limestone.

———— 2nd *Species?* Conical, acute, deeply excavated. Breadth $\frac{1}{8}$ inch, height $\frac{1}{17}$ inch. External surface presenting striæ in concentric rings. Structure solid, composed of minute cells. *Loc. idem.*

———— 3rd *Species?* Flat, circular, wavy, thick; diminishing in thickness towards the circumference. Breadth $\frac{3}{17}$ inch, thickness $\frac{1}{17}$ inch. *Loc. idem.*

———— 4th *Species?* Discoidal, flat, and extremely thin. Breadth $\frac{2}{17}$ inch. External surface presenting striæ in concentric rings. *Loc.* Upper red stratum, Ras Fartak.

ECHINODERMATA.

Spatangus.— 1st *Species?* (Spec. imperfect.) Oval. Length nearly $1\frac{1}{4}$ inch, breadth anteriorly $1\frac{1}{2}$ inch. Truncated posteriorly, slightly grooved anteriorly, ridged posteriorly. Ambulacra five, sub-petaloid, all the same length, in deep furrows. Vent sub-dorsal. Base impecfect. *Loc.* Ras Sharwên.

———— 2nd *Species?* Thick, round, heart-shaped. Length $1\frac{3}{4}$ inch, breadth anteriorly $1\frac{6}{17}$ inch, and height 1 inch. Grooved antero-dorsally. Ambulacra five, two anterior shortest. Buccal orifice sub-terminal, simple. Base not carinated. Vent sub-dorsal. Genital pores four. *Loc. idem. Obs.*—There is another specimen similar to this, and from the same locality, $1\frac{1}{2}$ inch long.

Spatangus.— 3rd *Species ?* Thick, round, heart-shaped, like the foregoing, but much smaller. Length $\frac{1}{10}$ inch, breadth anteriorly $\frac{9}{10}$ inch, and height $\frac{6}{10}$ inch. *Loc. idem.*

Discoidea, (Gr.)— 1st *Species ?* Sub-pentagonal, excavated. Breadth 2 inches, height 1 inch. Ambulacra extending to the buccal orifice, which is median. Vent sub-marginal, pear-shaped, convex posteriorly. Genital pores five. *Loc.* Ras Sharwên.

——— 2nd *Species ?* Conical, circular, elongated towards the apex, which is acute. Breadth $1\frac{7}{10}$ inch, height $\frac{8}{10}$ inch. Ambulacra, buccal orifice, vent, and genital pores the same as in the foregoing. *Loc. idem.*

——— 3rd *Species ?* Sub-pentagonal, conical. Breadth $1\frac{1}{2}$ inch, height $\frac{8}{10}$ inch. Buccal orifice, vent, &c. the same as in the foregoing species. *Loc. idem.*

——— 4th *Species ?* Sub-pentagonal, convex. Breadth $1\frac{4}{10}$ inch, height $\frac{5}{10}$ inch. Buccal orifice, vent, &c. the same as in the foregoing species. *Loc. idem.*

——— 5th *Species ?* Conical. Breadth $1\frac{1}{2}$ inch, height $\frac{8}{10}$ inch. Vent sub-marginal, longitudinal, pointed at each extremity. Buccal orifice, pores, &c. as in the foregoing species. *Loc. idem.*

——— 6th *Species ?* Circular, convex. Breadth $1\frac{4}{10}$ inch, height $\frac{5}{10}$ inch. Buccal orifice, vent, genital pores, &c. the same as in the last. *Loc. idem.*

——— 7th *Species ?* Circular, depressed. Breadth $1\frac{4}{10}$ inch, height $\frac{5}{10}$ inch. Buccal orifice, vent, genital pores &c. the same as in the two last species. *Loc. idem.*

Pygaster, (Ag.)— *Species ?* (Specimen imperfect.) Small, circular, thick, convex. Breadth $\frac{7}{10}$ inch, height $\frac{8}{10}$ inch. Slightly excavated. Ambulacra five, narrow, extending to the buccal orifice, each presenting a double row of small tubercles. Inter-ambulacral spaces furnished with a double row of large tubercles, each tubercle sunk within an elevated ring, and the latter bordered on both sides by a small circle of tubercles. Buccal orifice median. Vent pear-shaped, margino-dorsal, longitudinal, round posteriorly. Genital pores five. *Loc.* Ras Fartak.

Echinus.— 1st *Species ?* Circular, depressed, slightly excavated. Breadth $1\frac{4}{10}$ inch, height $\frac{5}{10}$ inch. Tubercles small throughout. Ambulacra narrow, and extending to the buccal orifice, which is median; their extremities widely separated at the vent, which is medio-dorsal. *Loc. idem.*

——— 2nd *Species ?* (Spec. imperfect.) Hemispheric, circular. Breadth $1\frac{1}{10}$ inch, height $\frac{1}{10}$ inch. Tubercles small throughout. Am-

bulacra five, rather broad, bordered by four lines, or two double series of pores, extending to the buccal orifice, which is median; their extremities widely separated at the vent, which is medio-dorsal. *Loc. idem.*

Diadema, (Gr.)— 1st *Species?* Circular, depressed, slightly excavated. Breadth 1½ inch, height ½ inch. Tubercles small, perforated. Ambulacra bordered on each side by four lines of pores, extending to the buccal orifice, which is large and median; their extremities widely separated at the vent, which is medio-dorsal. Vent broken. *Loc. idem.*

———— 2nd *Species?* Circular, depressed, slightly excavated. Breadth 1¼ inch, height $\frac{6}{10}$ inch. Tubercles large, perforated, almost all of the same size, sub-equidistant, and in vertical lines. Ambulacra bordered by two lines of pores, sinuous, extending to the buccal orifice, which is large and median, and widely separated at the vent, which is medio-dorsal. Vent broken. *Loc. idem.*

Salenia, (Gr. et Ag.)— 1st *Species?* Circular, thick, convex. Breadth 1 $\frac{1}{10}$ inch, height $\frac{8}{10}$ inch. Two vertical lines of large tubercles in each inter-ambulacral space, four tubercles in each line, imperforate. *Loc. idem.* Found in the pinkish grey limestone.

———— 2nd *Species?* Circular, thick, convex. Breadth $\frac{8}{10}$ inch, height ½ inch. Two vertical lines of large tubercles in each ambulacral space, four tubercles in each line. *Loc. idem. Obs.*—The only difference which I can distinguish between these two specimens, excepting in size, is, that the plate resting on the dorsal extremity of the ambulacral space is concave in the centre in the latter species, and pointed in the former one. For a further description of Salenia, see Mongraphies d'Echinodermes, par Louis Agassiz, 1838; and for the genital plates of these two species see Tab. 1, figs. 1 and 22, respectively. The specimens above noticed are much worn and imperfect.

———— 3rd *Species?* Smaller than the foregoing, circular, compressed. Breadth $\frac{6}{10}$ inch, height $\frac{4}{10}$ inch. Three large tubercles in each line. Resembles the last specimen described in the form of its genital plates. *Loc. idem.*

CONCHIFERA.

Tubicola.— *Species?* Tube cordiform, or subcircular, simple; smooth internally, crenulated externally; dilating gradually from a small orifice to $\frac{6}{10}$ inch in diameter, and then expanding suddenly. Wall composed of successive additions, imbricated; internally presenting minute parallel longitudinal lines, running throughout. *Loc.* Ras Fartak, in the dark red ferruginous limestone. *Obs.*—A transverse section of the dilated part

gives a deep crenulated margin, presenting angular costæ and circular intervals, within which are several layers of the same form, (10—12), and white lines rading from the internal margin, which is even, to the circumference. These are the lines which appear longitudinally on the inner side of the tube. Tubes 3 to 4 inches long.

Isocardium.— 1st *Species?* (Cast.) Breadth $2\frac{2}{10}$ inches, height $2\frac{1}{2}$ inches, and depth $2\frac{1}{10}$ inches. Umbos $\frac{2}{10}$ inch apart. *Loc.* Ras Sharwên.

———— 2nd *Species?* (Cast.) Breadth $1\frac{1}{2}$ inch, depth $1\frac{1}{4}$ inch, height a little greater than the breadth. Presenting thin striæ on the surface. *Loc. idem.*

———— 3rd *Species?* (Cast.) Breadth $1\frac{2}{10}$ inch, depth 1 inch. Smooth. *Loc. idem.*

———— 4th *Species?* (Cast.) Breadth $\frac{8}{10}$ inch, height $\frac{8}{10}$ inch. *Loc. idem.*

Cardium.— *Species?* (Cast.) Breadth $\frac{8}{10}$ inch, height $\frac{8}{10}$ inch. Costæ few, and wide apart. *Loc. idem.*

Pecten quinquicostata, Sow.— mihi. (Inferior valve?) Breadth $\frac{2}{10}$ inch, height $\frac{6}{10}$ inch, depth $\frac{1}{10}$ inch. Margin hexangular; costæ prominent, formed by three narrow ridges, and the intervals by three broader ones. *Loc. idem.*

———— 2nd *Species?* (Inferior valve). Breadth $\frac{7}{10}$ inch, height $\frac{2}{10}$ inch, and depth $\frac{1}{10}$ inch. Margin hexangular; penticostate, a single wide ridge forming the prominent ribs, and two smaller ones occupying the intervals. *Loc. idem.*

———— 3rd *Species?* (Inferior valve.) Shell deep. Breadth 1 inch, and height $1\frac{3}{4}$ inch. Margin sub-hexangular, sub-quinquicostate, costæ narrow, regular. *Loc. idem.*

Ostrea.— *Species?* (Lower valve, imperfect.) Ovato-acuminated. Plicated, plaits radiating from an indistinct sharp umbo; striated concentrically, striæ lamellose, and imbricated towards the border, the latter crenulated. Length $3\frac{1}{2}$ inches, breadth $1\frac{1}{2}$ inch. *Loc. idem.*

Exogyra.— *E. flabellata*, Goldf. (Tab. 87, Fig. 6.) mihi. *Loc.* Fartak. *Obs.*—These abound in the blue marly stratum, and are of various sizes. The largest found is $2\frac{3}{4}$ inches long, and $2\frac{1}{4}$ broad, and the smallest 1 inch long, and of proportionate breadth.

GASTEROPODA.

Solarium.— *Species?* Breadth $\frac{1}{10}$ inch. *Loc.* Ras Fartak, in the deep red ferruginous limestone.

Turritella.— 1st *Species?* Slender. Length $1\frac{1}{4}$ inch. Whorls 12,

10—11 costæ in each whorl. *Loc.* Ras Fartak, red ferruginous limestone.

Turritella.— 2nd *Species?* Slender. Length 1¼ inch. Whorls 18—20, three costæ in each whorl. *Loc. idem.*

Ammonites.— *Species?* A small portion of the whorl, ¼ inch wide; just enough to show that the suture is sinuous. *Loc.* Ras Sharwên.

Thus we see that the advanced or lower half of Ras Fartak is composed of marls, clays, sandy shales, and impure limestone strata, containing the above fossils, and of a variety of colors, but principally red, terminating above in violet-colored and almost white limestone. We have also seen, when facing this cape, that the strata of the range, of which it is the extremity, dip from west to east, and that the uppermost of the red or colored series, which is not more than 200 feet above the level of the sea on the east, is 1000—1200 feet above it on the west side of the cape. Passing on to the white limestone behind and above these strata, we find the latter denuded for some distance in from their upper edge, both on their southern and western sides, and not continuous with the white strata, as at Ras Sejâr, and at Marbat. This denudation of the upper part of the colored strata, and position of the white limestone series, I could not understand, until, from my sketches of the cape on different sides, I perceived that the strata, both white and red, of the range, dipped not only towards the east, but towards the north. We have already seen them at the extremity of the cape dipping from west to east. Hence, when we come to connect the inclination of all these strata with the existence of an argillaceous deposit about their centre, we cannot be surprised to find that the upper half has slid towards the north-east, and left the whole of the lower or colored strata in advance, which is the case; and this not only accounts for our not seeing the red strata at the bottom of the great scarp which faces the eastern side of the range, towards the Bay of El Kammar, but also for the presence of the sub-range of mountains which exists on its western side.

Difficult as it would have been to have joined these two series with the absence of the micaceous sandstone, and to have accounted for their relative position at this point, without having seen the inclination of the strata, yet the existence of Orbitolites in the white limestone at Marbat, and their abundance throughout the colored strata here, is sufficient to connect the two; and if any further proof be necessary, the finding of a piece of blue limestone at Marbat, almost entirely composed of small Orbitolites, and identical with the pinkish grey limestone of the same kind here, at once identifies the colored strata of both places, and establishes the position of the colored strata of Ras Fartak.

It is remarkable here, however, that the colored strata should be so expanded, and that the micaceous sandstone should not appear.

Thus we see that there are 1900 feet of white limestone strata in the cliff on the eastern side of the Fartak range, and from 1000 to 1200 feet of colored strata forming the advanced part of the cape, and that of the western side of the range. The additional height, therefore, of the main ridge, which has been computed by triangulation to be 2500 feet above the sea, must be accounted for by the inclination of the strata; for although the base of the white limestone is about the level of the sea on its eastern side, it must neverthless, from the dip of the strata in this direction, be elevated for some hundreds of feet above the sea, where it rests on the colored strata on the western side of the range.

Before leaving Ras Fartak, I should state that the pinkish grey limestone, which is filled with small Orbitolites, and which rises from the sea just opposite the little village of Khaisêt, is perforated by the holes of lithodomous animals 30 feet above the level of the sea, and adherent to its side at the same height is a band of the miliolitic deposit mentioned, containing shells, which are in a white pulverulent state, and pieces of the adjoining rocks. This deposit, though not very compact, is sufficiently tenacious to form a building stone, of which the little tower now in ruins on the top of this limestone, which forms a conical hill here, was composed.

From Ras Fartak south-westwards, the coast line forms an obtuse angle with that just passed, and for some distance presents no cliff, but a low sandy shore, reaching back to that part of the Fartak range which I have before stated to run south-west. This sandy shore, which reaches inland for about six miles, continues along the coast for twenty-five miles, when it is limited by a tract of low rocky limestone mountains, which extend outwards from the range just mentioned. I should here state that the mountainous tract of this part of the coast, commencing with the Fartak range, is continuous on to the Yaffai mountains, at Bāb el Mandeb, with the exception of three great valleys, which here and there open upon the sea. The point which limits this low shore is called Ras Darjah; it is about 300 feet high, and composed of limestone. The following is a brief description of the cliff close to it, from above downwards, viz. pink, grey, white, and yellow compact limestone, in parallel strata from three to twelve feet thick, with here and there large round concretionary flints, peeling off in concentric layers. Some of the strata are friable, loose, and gritty, not unlike those at Hammar el Nafur and Ras Kariat, 432 miles off, and in like manner also contain a great number of small Echinodermata of the following kinds:—

Echinocyamus Annonii, Mirian, mihi. (Tab. 27, figs. 37—40. Ag. Mon. d'Echinodermes.) Length $\frac{1}{14}$ inch, breadth $\frac{1}{17}$ inch, and thickness $\frac{1}{27}$ inch. Vent a little distance from the margin. *Loc.* Ras Darjah.

E. alpinus, Ag., mihi. (Tab. 27, figs. 41—43. Loc. cit.) Length $\frac{1}{17}$ inch, breadth $\frac{1}{27}$ inch, and thickness $\frac{1}{27}$ inch. *Loc. idem.*

Obs.—Of this fossil Agassiz states, p. 135: "Mais ce qui rend surtout cette espèce intéressante, c'est son gisement. Je n'en connais que deux exemplaires qui font partie du Musée de Berne; ils ont été recueillis dans la chaîne des Alpes Suisses, à Burgenberg, près Stanz (canton d'Unterwalden), dans une sorte de conglomérat fossilifère noir appartenant au terrain crétacé, et contenant une quantité de fossils triturés, entre autres une grande nummulite." This remark is not less interesting here, where we find these little fossils in a similar deposit to that which exists at Hammar el Nafur and Ras Kariat, and which contains the same kind of fossils and nummulites; from which we might infer, if I am right in the identification of the species, that the cliff at Ras Darjah is formed of the upper part of the white limestone series, and that the loose and gritty part is identical with that in which similar Echinodermata, with nummulites, are found at Hammar el Nafur and Ras Kariat.

This group of rocks, and the sea-cliff which they present, do not extend far from Ras Darjah before they diminish in height, and become covered with a plain of yellow sand, of four or five miles in extent. The sand appears to be nothing more than a disintegrated part of the miliolitic deposit before mentioned, which here has been raised on the tops of the rocks, on which it was deposited, and, like that at Ras Abu Ashrin, has become loose on the surface, and now forms a smooth uneven tract, which, in its irregularities, correspond to those of the harder rocks beneath. It presents a sea-scarp of about 30 to 40 feet high, and ends at the little plain of Kashn; after crossing which we arrive at the mountainous tract again, which now advances to form the cape called Ras Sharwên.

This cape consists of a long narrow mountain, of a wedge-like shape, sloping towards the point, and presenting on its upper end two pinnacles; it is about two miles long, and scarped on both sides, as well as at the extremity; the latter at its lowest point is about 200 feet above the level of the sea, and the pinnacles about 1800 feet. Its longitudinal direction is about east and west, so that its inner face is opposite the main land, and it shelters a little bay inside it, which is called the Bay of Kashn. This mountain is composed of colored strata, identical with those which form the advanced part of Ras Fartak, and in like manner seems to have been denuded of the white limestone; but what has become of

the latter the land above water does not indicate; no doubt this wedge-shaped mountain was covered by it, as the next mountain to it inland presents the white limestone *in situ*. I might here content myself with referring the reader to the description of the colored strata at Ras Fartak, for those of Ras Sharwên, as I have placed the list of fossils from both places after the former, but it will be more satisfactory, perhaps, to give the observations which were made on the spot respecting their composition.

About a quarter of a mile inside the cape, where we landed, the upper part, which is not very high here, is composed of fine compact limestone, of a white or light grey color, presenting small Orbitolites, and a few remains of Echinodermata. This, after some distance down, passes into a violet, and then red colored argillaceous limestone, containing a great number of the same kind of fossils, together with bivalve and univalve shells; after which comes a yellow stratum, with blue and red bands intermixed, and then a blue deposit, almost entirely composed of small Orbitolites, like the pinkish grey limestone at Ras Fartak. The whole of these colored strata contain more or less argillaceous matter and siliceous sand. A little further in, where the red colored ferruginous strata emerge from the water, the same shattered appearance of the limestone is seen as at Ras Fartak, with calc-spar coating, and more or less filling its cavities.

Here, too, on the inner side of the cape, as on the pinkish grey limestone at Fartak, is seen a band of the miliolitic deposit adhering to the scarp 40 feet above the level of the sea, and containing in some parts, as at Fartak, large shells, and portions of the adjoining rock; while between it and the sea there is, as at other places, an interval of some yards, where it either never existed, or has been washed off by the waves.

Having finished with the inner side of Ras Sharwên, let us now go to the outer side of the cape, and here, too, a mile or two west of the latter, the red strata are again seen, but in the utmost confusion. This is owing to a mass of black scoriaceous basalt, which has forced itself up among them; and although it has not managed to reach the surface, yet, from being in the sea-cliff, a good lateral view is seen of it. It is about 300 or 400 yards long, and about 200 feet high. I had hunted in vain for a disturbing agent of this kind at Ras Fartak, and on the inner side of Ras Sharwên, but could see nothing *in situ* at either, though, from the presence of pebbles of black basalt about the base of the latter, I was led to infer that it could not be far distant.

This is the first place where we have seen an igneous rock since leaving

Marbat plain, a distance of 200 miles, and the first time we have met with black basalt on the coast; but we shall soon see that we have come to the commencement of a series of vents, which have poured forth large tracts of this igneous rock.

As we saw a raised sandy plain of the miliolitic deposit covering the low rocks east of Kashn, so we have a similar one west of Sharwên. It is coarser in structure than the miliolite of Ras Abu Ashrin, but otherwise almost identical with it. It begins close to the western side of the black basalt, which indeed it partly covers, and extends a short distance inland, and about ten miles along the sea, where it presents a cliff about 100 feet high. As before stated, it is raised, and, though smooth on the surface, takes the form of the harder and older rocks which lie beneath, while the presence of particles of basalt in it would seem to indicate that it has been formed since the eruption of that rock.

Leaving Ras Sharwên, and this tract of sand, the limestone formation continues to rise abruptly from the sea for twenty miles, when it falls back, and leaves a narrow strip of maritime plain, which is continued all the way to Ras Makalla, a distance of 140 miles, backed from one end to the other by the raised tract of limestone mentioned,—sometimes in the shape of mountains, at others in that of long portions of tableland; while extending along this narrow plain is the series of basaltic effusions to which I have alluded.

These commence immediately west of the opening of the great valley called Wadi Masilah, and about twenty miles from the beginning of the maritime plain, or forty miles from Ras Sharwên. They are three in number, and are called by the Arabs the "harieq," or "burnt place," from a superstition that they mark the sites of seven pagan cities, which were burnt down by the Imam Ali at the commencement of the Mahomedan Æra. They form the most remarkable objects of the kind on this coast, and are continued on to a little beyond the village of Raidah, a distance of forty-five miles from their commencement. The striking features of them are their intense black color, their flatness, and horizontal extent, defined borders, and the contrast they form with the white color of the plain, and that of the limestone mountains behind them. Each tract presents one or more cones in the centre, which do not appear to be more than 200 feet above the basaltic plain immediately surrounding them.

The first cone is about four miles from Saihut, or about 50 miles west of Ras Sharwên, and the tract of basalt which surrounds it has extended nearly to Wadi Masilah on the east, and joins the following tract on the west.

The next cone is opposite the opening of the valley called Wadi Shikawi, about nine miles from the last, and about three miles inland: its tract extends westward to Raidah, a distance of about eighteen miles, and eastward joins that of the foregoing, as already mentioned. I examined a part of this tract opposite the valley of Shikawi, where it extends into the sea, and its highest part, not including the cone, did not appear to be more than 30 feet above the level of the sea. The whole of the maritime plain here is covered with large and small boulders of black and grey basalt, more or less compact, more or less scoriaceous, breaking with a rough coarse fracture, and presenting olivine in its cavities. Some pebbles which I picked up on the beach were composed of fine compact basalt, in which distinct crystals of pinkish white felspar were imbedded. All the boulders were weathered smooth, and more or less round.

The third tract begins west of Raidah, and here the maritime plain, being raised from two to three hundred feet above the level of the sea, the basalt has not only overflowed it, but found its way into the watercourses, and appears in black rocks at their openings on the beach, contrasting strongly with the whiteness of the low limestone cliffs on each side of them. There are five cones in the centre of this effusion, which are all higher I think than either of those mentioned.

Here also the maritime plain widens out to an extent of fifteen miles between the base of the high land and the sea, and, being raised, presents a cliff which at the cape called Ras Bu Gashwa is 300 feet high, but diminishes gradually on either side for a few miles, until it subsides to the level of the beach. There are several portions of this part of the plain raised in isolated mounds 700 or 800 feet high, and the whole seems to have undergone much disturbance from subterranean causes: the district is called Hammam, from the number of hot spings here. I had not an opportunity of going on shore, so I can say nothing of the sea-cliff further than that above it is red, in the middle white, and below yellow; but we shall find it again at Makalla, and perhaps may be able to infer its geological character from the composition of the cliff at that place.

I have before stated that this maritime plain ends at Ras Makalla, to which we now arrive, and on turning which we observe that it consists of a ridge of igneous rocks, supporting limestone. This ridge presents an irregular scarp of two and a half miles in extent on its western side, and on its eastern side limits the maritime plain we have just left.

When we examine it from within outwards, that is from its base to

its extremity, we find that it is made up successively of granite, limestone, and green serpentiniferous diorite.

The granite forms the base of the cape, and is a part of a group of igneous rocks which extend a little further inland. It appears here in the form of a mountain capped with limestone, the summit of which is 1300 feet above the level of the sea ; that of the granite appears to be about 1000 feet. It is of a dark grey color, and uniform fine structure, and, from its amphibolitic admixture and freshness, seems more allied to syenite or diorite than old grey granite. Be this as it may, it is dyked with the green earthy diorite of the locality, and, suddenly sinking towards the cape, disappears in low peaks beneath the limestone, while the latter then forms the ridge for some distance, and is about 600 feet high. After this follows the green diorite in round topped hills, which compose the outer third of the cape, still diminishing in height, and supporting an isolated portion of the limestone between them, a little distance from the extremity. The diorite presents an earthy base of a greenish color, with crystals of dark green hornblende scattered through it ; it is richly serpentiniferous, and sometimes appears like green euphotide. Where it forms a breccia with the calcareous material of the loccality, an amorphous thin layer of calc-spar, with grass green serpentine, exists between the two; indeed the serpentine appears to tinge the former.

The limestone strata, which appear to be between 300 and 400 feet thick, are, in the immediate vicinity of the granite, fractured throughout, and united again by their own material, so that all appearance of continuity in their stratification has been destroyed; but in the cliff which they present in the central third of the cape, and which is about 250 feet high, they are entire, and composed as follows, viz. above of compact cellular limestone, of a pink color, presenting in one part a stratum filled with the moulds of small shells, in which there is more or less crytallized gypsum. This part also effervesces slowly with acids, and is identical, as before stated, with the same kind of limestone sent me by Lieut. Grieve from Ras Markas, near Ras Jazirăh, that is as far as structure and mineralogical characters are concerned. Beneath this compact pink limestone comes a more siliceous one, filled with large cavities, which are lined with hyaline quartz and calcedony. Then follows a white stratum of more or less impure siliciferous limestone, and beneath this a dark red-colored deposit, chiefly composed of fine siliceous sand, which rests on the granite.

Though there are no separate fossils here, the upper strata abound in traces of them, and in some parts they are almost entirely composed of

small Foraminifera, allied to Nummulina. In another part of the limestone formation here, close to the granite rocks, but not in contact with them, or forming part of the ridge of the cape, small Foraminifera also abound, as at Măskat, and particularly the Operculina of that locality. I did not see any nummulites, but I think it will hereafter be found that they are not more a character of the Nummulitic Series than the abundance of small Foraminifera which exist in the limestone strata belonging to it, and indeed of which many are, with the addition of microscopic species, almost entirely composed.

Besides this limestone, we have here again the miliolitic deposit, forming in one part a bank 30 feet above the level of the sea, and in another adhering to the upper part of the scarp of the limestone cliff, extending to the cape from 60 to 100 feet above the level of the sea; while we have blocks of it on the shore on the inner side of Makalla, which have fallen down from the limestone on the top of the granite, 1300 feet above the level of the sea, slightly changed in structure, but still easily recognizable, and of a delicate color, like that of the pink or cream colored limestone in the same situation. The coarseness of the structure of these deposits at their three different heights, and the shells, pieces of coral, and parts of the old limestone rock which they contain, together with their modern appearance generally, indicate that they all belong to the same formation; but there is one difference, independent of the changes produced by heat, in the pieces which have fallen from the limestone on the top of the granite, viz. that it does not, like the other two, present portions of the green diorite. Thus it must have been raised up with the other limestone rocks before the eruption of the diorite took place, or all traces of particles of the latter must have been subsequently effaced. Still this does not interfere with the fact that this formation, which we have hitherto seen raised only 150 feet above the sea, viz. at Ras Sejăr, is here in one part 30, in another from 60 to 100, and in a third 1300 feet above its level, and in the last place so changed in color, that however young it may be considered to be, it must have preceded the eruption of the granite, and the elevation of the limestone on which it rests.

About three miles inland, north-east of Makalla, just at the outskirts of the group of igneous rocks which are continued into the formation of the cape, and among the lower hills of the great limestone tract, is a spring, from which the inhabitants of Makalla obtain their supply of water. This issues from a ravine situated among the lower limestone mountains of the table-land, which are fractured and fissured in all directions, and cemented together again by their own substance, except in some

places, where there are holes and caverns which have not been so filled up, and are more or less filled with water, both in the sides of, and leading into the interior of the mountains. The water of the spring mentioned is somewhat above the temperature of the air, but without taste or smell: in its course along the ravine it passes through sand, which has more or less accumulated on its sides, and in this sand is a quantity of botryodal magnesian limestone. The spheroids are of different sizes, up to an inch in diameter, which is the measurement of the largest obtained. They are of a coarse structure, formed of concentric layers, and present a rough arenaceous exterior. Some appear as if they had been formed in halves, from the two hemispheres not having been applied to each other in complete apposition. They are more or less adherent, and seem as if they were formed in the sand of the stream in which they were found.

Among the igneous rocks at Makalla exists a porphyry, with a dark red base, and large tabular crystals and nodules, of greenish felspar; also epidote with calc-spar, as at Masira. Mica prevails in some parts, and various other earthy minerals, which are generally found in company with such rocks.

Leaving Makalla, and proceeding south-westwards along the coast for about six miles, we meet with no sea-cliff whatever, but a sandy shore, with scattered hills interiorly, and then sub-ranges of mountains; behind which, and towering above all, is the brink of the table-land, here about 6000 feet above the level of the sea.

At Ras Brum, however, which is at the termination of this sandy shore, and which is opposite Ras Makalla, as the coast runs, igneous rocks again make their appearance, and from thence are continued on to Ras el 'Assidah, a distance of about fifty miles, after which they subside gradually in dark peaks, scattered here and there among the sand-hills of the coast.

This tract of igneous rocks fringes the shore for the distance mentioned, and is continued inland for two or three successive ranges, mixed more or less with limestone, to the base of the table-land, here fifteen miles from the sea. From their brown color and peaked appearance they closely resemble the granite of Makalla; and about Ras Brum, before stated to be opposite Ras Makalla, is the same kind of green-colored rock as that forming the outer third of the latter cape, viz. green diorite: at Ras Brum also it is in round-topped low hills like those of Ras Makalla, and separates the brown peaked mountains behind, which are 1000 feet high from the sea. In all probability these rocks are but a repetition of those forming Ras Makalla, but at Makalla my actual exami-

nations cease, and I can only now state that which I have seen of this part of the coast while sailing leisurely up and down it two or three times, and from the sketches I then made of it.

I have observed that these rocks are more or less mixed up with limestone,—the limestone no doubt through which they have been forced,—so that here and there white ridges appear among the dark brown rocks, and occasionally come to the sea, as at Ras Rättle, which is a conspicuous white mass of limestone five miles east of Ras el' Assidah. The islands, too, off Hisn Ghorab, a little east of Ras Rättle, viz. Hällani, Jibus, and Baragah, are all of white limestone. Jibus, which is perhaps the largest, is five miles off shore, hardly a mile long, and about 300 feet high.

A little west of Ras Brum there is a long low level piece of pink or red-colored strata, bordering on the sea, and presenting a cliff similar to that of the raised part of the maritime plain at Ras Bu Gashwa ; it is probably an undisturbed part of the same formation.

The dark mound on shore, called Hisn Ghorab, famous for bearing the longest Hamyaritic inscription that has been met with, is stated (Wellsted's Trav. in Arab. vol. ii. p. 423) to be composed of a dark greyish compact limestone, 500 feet high ; and in further proof of the general elevation of this coast, which from what I have stated must now, however, be pretty apparent, it is also mentioned that "The action of the sea might be plainly seen [at the foot of this mound] in the cavities and hollows exhibited by a ridge of rocks now some distance from the water, but which evidently at some not very remote period must have been covered by it."

Between Ras el 'Assidah and Aden, the coast is almost wholly unknown to me, except from a distance ; there is no sea-cliff there, and not much on the maritime plain to interrupt the view from the sea to the base of the mountains after leaving the neighbourhood of Ras el 'Assidah. About sixty miles north-east of Aden the high land advances to within a few hundred yards of the shore, and affords a grand view from its rapid and almost uninterrupted descent from three, four, and six thousand feet to the plain below. The sea, too, just here, is vastly deep, and admits of close approach to the shore without danger.

Not more than twenty-five miles on from this, the seaward boundary of the mountains recedes from the direction of the coast, and stretching over to the Straits of Bāb el Mandeb, ends in the south-western extremity of the great elevated tract of Southern Arabia, while the coast, continuing on in its original course some miles further, before it takes a similar turn, leaves a triangular plain, at the apex of which is

the town of Aden, situated in the crater of an extinguished volcano, the sides of which reach about 1700 feet above the level of the sea. This crater opens towards the east, and presents a tail of peaks, ridges, and low cones, in the opposite direction, the whole of which amount to about six miles in extent.

I had not an opportunity of examining much of this mass of volcanic rocks, but I could see that they were principally composed of basalt, pierced with dykes of the same material, in a more compact state. The external side of the crater is more or less scarped, and separated from the high peaks and ridges which flow from it, and in this scarped portion may be seen lines of horizontal stratification: also some distance up the side of the slope which descends towards Back Bay may be seen a a small series of strata, consisting of pisolitic peperino, cemented together with glassy crystallized gypsum, and from the manner in which the pieces of pumice, basalt, and obsidian of which it is composed are arranged, together with the fact of the cement being sulphate of lime, leaves no doubt that it was deposited in the sea, and afterwards raised to its present position; at one part it is at least 200 feet above the level of the sea, though it descends to the water's edge in another. The stratification of the walls of the crater, which is very high up, would also lead us to the conclusion that the greater part of this igneous mass has been poured out under the sea, and has been gradually raised to its present height.

Through the kindness of Dr. Malcolmson, whose name I have already had occasion to mention, and who resided at Aden for some time, I am in possession of specimens of all the rocks and minerals which this gentleman after a long search was enabled to collect; and, having been permitted to inspect his valuable assortment when at Aden, I am enabled to state that the igneous rocks of this peninsula consist of basalt in almost all its forms, compact, black, grey, peridotic; rough, cellular, scoriaceous, variolitic; tephrine, with small crystals of glassy felspar, which forms some of the high peaks in the interior of the crater; leucostine, which forms part of the lavigenous effusions in the north-west part of the peninsula, where the last vents of the volcano appear to have existed; pumite and stigmite, simple, variolitic, and pisolitic, which form small deposits in various parts of the general mass, and semiopal and calcedonies, which abound in the island of Sira, opposite the opening of the crater.* To these may be added brown carbonate of lime, in columnar stratified crystalline deposits, with transverse wavy lines;

* For the characters of the rocks here mentioned see Brongniart's classification, Art. "Roches," Dict. des Scien. Natur.

massive and fibrous gypsum ; and fluor spar, in minute crystals of an amethystine color, on the surface of calcedonies.

The recent littoral deposit here, as elsewhere on this coast, appears in several parts of the north-west part of the peninsula, raised fifteen or more feet above the level of the sea.

About four miles west of Aden there is another group of volcanic rocks, said to be partly composed of granite, and their peaked forms would indicate this; it is about the same size as Aden. Last of all on this coast comes the small dark group, probably also of igneous origin, which forms the eastern promontory of the Straits of Bāb el Mandeb.

Having thus come to the termination of the South-east Coast of Arabia, let us now pass over to the African Coast ; and, commencing from Berbera, which bears nearly due south of Aden, see if the rocks extending from this part eastward to Socotra have any resemblance to those on the coast we have just left.

Personally I know nothing of this coast, but Lieutenant Grieve, who surveyed a good part of it between Berbera and Guardafui, kindly collected specimens for me from the principal headlands between Berbera and Ras Sārai, and from all the islands excepting Socotra.

From these, and the observations which accompanied them, it appears that the top of the bluff at Syara, which is 300 feet high, and about eighteen miles east of Berbera, is composed of a coarse heavy sub-saccharoid magnesian limestone, effervescing very feebly with acids, and of a reddish color, and ferruginous aspect ; while the base is composed of the same kind of rock, but of a greyish brown color : both are without any appearance of fossils.

The top of a hill on the coast seven miles further on is composed of a fine compact limestone, of a yellowish white color, breaking with a smooth conchoidal fracture.

That of Hamarah bluff, which is 500 feet high, and twelve miles further on, of a fine compact sub-cellular limestone, of a cream color, mottled with spots of red and white, with frosted cavities of calc-spar ; also effervescing slowly with acids.

The top of Ras Khanzir, about 200 feet high, and seven miles further, of a fine compact limestone, of a yellowish color, like that of the hill on the coast seven miles from Syara. Some portions appear, from their veined structure, and opaque appearance, to have been exposed to volcanic influence. There is another portion from this cape, too, which, from its open structure and fossiliferous composition, is evidently of a later formation, and resembles much the modern deposit at Makalla. It has in like manner been exposed to heat, and its cavities and

fossils are more or less soldered together by an amorphous white crytallization of carbonate of lime.

The next specimen is from the hills near Ras Shalla, fifty miles further on. This is a compact limestone, of a pinkish color, and uniform structure, breaking with an even granular fracture.

Hais Bluff, 500 feet high, and fifteen miles further on, affords a compact heavy limestone, of a granular sparkling structure, and a greyish brown color. It is highly magnesian, scarcely effervesces with acids, and closely resembles that of the base of the white limestone cliff on the east side of the Fartak range. Hais Island, close to this bluff, is 300 feet high, and composed of a sparkling, black green amphibolite, fissile, laminated, and very much resembling gneiss, but serpentiniferous at the joints, and closely allied to the sparkling hornblende rock of Ras Jazirăh, on the South-east Coast of Arabia.

Meyt or Burnt Island, about twenty-six miles further on, and seven miles off shore, yields a pegmatite in composition, but not graphic in structure, and a compact limestone of a fine uniform saccharoid structure, and grey color, effervescing feebly with acids. This yields by a rough analysis 15.32 per cent. of magnesia, and its specific gravity is 2.775 : it is a dolomite.

In the Museum of the Bombay Asiatic Society are specimens of limestone from Mărriyah, two hundred miles further east, and forty-five miles west of Guardafui. They were presented by Lieut. Cruttenden, of the Indian Navy, and are of a cream color, and compact fine structure, identical with the limestone on the top of the granite peaks at Makalla.

From this place we pass on to the islands between Cape Guardafui and Socotra, the first of which is Abd el Kuri, from which Lieut. Grieve sent me specimens, as well as from the islands called Kal Farun, and "The Brothers," situated between it and Socotra.

The summit of Abd ul Kuri is 1600 feet high, and composed of a fine white compact limestone, breaking with a smooth conchoidal fracture, dry, and opaque, as if it had been exposed to heat ; and the lower hills, which are from 200 to 400 feet high, yield grey and red granite ; fine and coarse-grained diorite, composed of black hornblende and whitish semi-transparent felspar, ophiolitic diorite, and euphotide ; indeed all the kinds of igneous rocks that we have seen on the Arabian coast north of Marbat.

There is also a coarse, compact, sub-cellular, and sub-saccharoid limestone, of a light cream color, which comes from the higher parts of this island ; it probably overlies the igneous rocks, and owes its color to the

action of heat; otherwise in structure it is just like the upper stratum of the low cliff in the Bay of El Kammar, and the dark brown limestone of the shores of Dofar.

The island of Kal Farun, fifteen miles north of Abd el Kuri, seems to be entirely composed of sulphate of lime. One specimen, coming from a height of 400 feet, is massive, compact, sub-saccharoid, and of a brown color; the other, which comes from high-water-mark, is earthy, white, and contains moulds of small shells, with particles of igneous rocks.

Turning to "The Brothers," which lie between Abd el Kuri and Socotra, we find the largest, or westernmost of these two islands, to present pink granite rocks, 1000 feet high, with limestone above them, reaching in all to 1600 feet; also diorite, as at Abd el Kuri; and a white compact limestone conglomerate, raised 300 feet high. The latter consists of small rounded gravel, shells, and corals, which have been firmly cemented together, and more or less opalized, probably by heat; while the same kind of conglomerate, with a few particles of igneous rocks, exists at high-water-mark in the easternmost island, still possessing its original loose, dull, and recently-formed appearance.

Of Socotra I know nothing more than can be gleaned from the late Captain Wellsted's account of this island, (Jour. Roy. Geograph. Soc. vol. v. 1835.) In the vicinity of Tamarinda, a town situated towards the centre of the northern coast of the island, there are granite mountains, 5000 feet high by measurement. "Connected with the granite range, and extending form north to south, a lower range is found, averaging in height about 1900 feet, and composed of a compact cream-colored primitive [?] limestone. From this the hills diverge in short ranges to the sea-shore, their outline being mostly smooth, with table summits and rounded sides, except those nearest the sea, which mostly present a steep wall. The whole of the hills in the western part of the island are similar in their appearance, elevation, and construction."

In the neighbourhood of Goobet Koorma the limestone appeared to be borne up upon the granite, and the line of junction between the two was seen 3000 feet above the place where Captain Wellsted stood.

Syenite, porphyry, and trap, were seen in different parts of the island, and the soil of the mountains is clayey, stiff, and of a red color.

Returning to the Somali coast, it is stated, that after a short but variable distance in-shore, the land from Berbera to Cape Guardafui is raised to a height averaging between four and seven thousand feet, and attaining its maximum elevation midway between these two places. It is composed of limestone, and the specimens I have seen from it have been more or

less fine and compact in structure, and of grey and white colors, similar in every respect to the limestone of the elevated tract on the South-east Coast of Arabia; while the cream-colored limestone in like manner seems to come from the tops of the lower hills, where it is probably in closer proximity with the igneous rocks.

Thus we see that the same kind of igneous rocks, and the same kind of limestones, exist on this part of the coast of Africa and its adjoining islands, as are found on the South-eastern Coast of Arabia and its adjoining islands; the same kinds of magnesian limestone, and a modern formation, corresponding to our miliolitic deposit.

There is also a spheroidal concretion of magnesian limestone, about the size of a walnut, which Lieutenant Grieve sent me from the coast of Africa, similar in every respect to that which has already been described as existing in the course of the hot spring near Makalla.

This concludes all that I have to offer on the geology of the North-east Coast of Arabia without the Persian Gulf, the South-east Coast and its adjoining islands, and the Somali or North-eastern Coast of Africa and its adjoining islands. Let us now briefly review what has been stated respecting the South-east Coast of Arabia.

The first thing that strikes us here is the continuity of the white limestone formation, which we may reasonably infer to be the same from one end to the other, a distance of 1125 miles; secondly, the eruption of igneous rocks along the great line of fracture, or fault, which forms the coast; and, lastly, the elevation of the land from four to six thousand feet above the level of the sea, which has brought into view other formations, lying beneath the white limestone.

Turning our attention first to the igneous rocks, we find that they comprise all the principal kinds, and probably most of the varieties, included under this denomination; and that by far the greater part of them are hypogene, (Lyell,) the rest volcanic. The presence of gneissic strata in the granite at Marbat also shows that some of this rock is at least secondary; and being mixed up with limestone in the same neighbourhood, identical but for the changes which such formations undergo when similarly situated, with some of the white limestone series above, further shows that there is granite here, which may be of still later date even than that enveloping the gneiss. The gneiss itself *in situ* I did not see.

We have also witnessed the dioritic and euphotide rocks, which prevail on the north-eastern third of the coast, enveloping jaspideous strata at Masira and Ras Jibsh; at the same time we have seen nummulitic
7 strata resting on them at Mäskat and Masira, but in no instance have

we observed either the granite or the dioritic rocks overlying the white limestone series; while on the south-western third of the coast we have seen a chain of volcanic vents up to Aden, inclusive, pierced through everything, and an issue of black basalt and other volcanic rocks from them, which have overflowed the maritime plain in different places to a great extent. What the nature of the igneous rock may be at Ras Shuamiyah I know not, having only seen it from the sea.

Lastly, we have observed that the original localities of eruption of igneous rocks on this coast appear to have been the principal ones of the subsequent eruptions, with the exception of the volcanic rocks, which have come to the earth's surface, where the older igneous rocks do not appear.

Let us now go to the aqueous formations, and these we may separate into three *Groups*, viz., 1st, the strata of which the highest scarps are composed; 2nd, those of the compact littoral deposit on the shores of Dofar; and, 3rd, the loose, or miliolitic deposit.

1*st Group*.—This admits of three divisions.

The first or uppermost includes the white limestone series, which extends from the summit of the table-land to the commencement of the colored argillaceous strata. This consists, from above downwards, of compact white limestone, more or less composed of the remains of minute and small Foraminifera, with here and there concretionary flints, ex. gr. Mäskat, Masira, Hammar el Nafur, Ras Kariat, and Ras Shaherbataht; and that the flints also occur in the summit of the table-land above Marbat may be inferred from their presence in the talus beneath, separate, or combined with pieces of the limestone in which they were imbedded; also generally throughout this coast, from their presence at Resut, the beach in the Bay of El Kammar, and the cliff at Ras Darjah. Below, this passes into a soft white limestone, and then into a gritty loose chalky or sandy deposit, becoming more or less argillaceous towards its lower part, at Mäskat, Masira, Hammar el Nafur, and Ras Kariat, where it presents nummulites; also at Ras Shaherbataht, Jibal Jinjäri, Marbat, and Ras Hammar, (the argillaceous pipe-strata,) and Ras Sejär, (the *khat* or chalk on the summit of the cape,) where the existence of nummulites has not been determined. Then follows a deposit of clay of a greenish white color, at Hammar el Nafur and Ras Kariat; also at Masira, where it is colored dark green and red, while at Mäskat it is replaced by a siliceous sandy conglomerate. (Mäskat is included here for the sake of comparison.)

Here, then, we have a distinct, though little series, passing from pure calcareous material above to pure clay below, with siliceous matter between; and in this series we have at Mäskat, Masira, Hammar el

Nafur, and Ras Kariat, the presence of nummulites; while the existence of the so-called chalky stratum and flints in the more elevated and inaccessible parts of this coast would lead us to infer that the same little series existed there also, though as yet it has not been explored for nummulites. The presence also of nummulites (?) and orbitoides in the cliff at Takah, which is but an unraised portion of the great limestone formation, further favors the inference; and with this evidence of the existence of this little series on the high land of Southern Arabia we must be content until further observation can prove it more satisfactorily.

The presence of the clay here, too, not only serves to mark a subdivision in the white limestone series, but also seems to point out the time in its formation when the dioritic and euphotide rocks were erupted, as well as the origin of the clay itself; for from the strata in which the nummulites are imbedded having been deposited after the eruption of these rocks, as seen at Mäskat and Masira, and also after the deposit of the clay, as seen in the white limestone series at Hammar el Nafur and Ras Kariat, taken in connection with the change in the nature of the sediment in the latter, just preceding the appearance of the nummulites, it is plain that an eruption did take place about this time, affording the material of which the clay is composed, for had this not been the case the formation of the white limestone strata would have gone on uninterruptedly to the pure deposit above the nummulites. Hence we also see that this may actually be the case in places to which the material composing the clay might not have extended, and there the nummulites alone, or their allied fossils, must mark the upper division of the white limestone series. That this eruption was that of the dioritic and euphotide rocks may also be reasonably inferred from the nummulites overlying the latter, as well as the clay of the white limestone strata; and from their having been deposited in both places, just about the time the disturbance had become quieted, the remains of marine animals had begun to accumulate, and the siliceous material was beginning to disappear. The depth of this little series, overlying both the limestone strata and the igneous rocks, also seems to correspond, and this led to my remarking in my observations on the igneous rocks of Mäskat, (loc. cit. p. 126,) that the Nummulitic Series appeared much thinner at Mäskat than in many parts of the South-east Coast of Arabia. Let us now see whether there is anything to make us think that this is a fact, and that the great mass of white limestone strata, upwards of 1500 feet thick, which underlies the clay there, is but a continuation of the Nummulitic Series.

I have stated, p. 42, that impressions of Orbitolites exist in the marl

which passes into this clay at Hammar el Nafur and Ras Kariat; also that a spheroidal Alveolina in company with large Orbitolites and an Operculina abounds in the white limestone series at Marbat, and that this is exactly the case in a part of the Nummulitic Series (?) in the Hala range of mountains, near the Buran River, in Lower Sindh. Lieutenant Grieve also sent me specimens of white limestone from the summit of the table-land at Marbat, which contain numbers of Alveolina. Now the presence in this marl of Orbitolites which we have seen to increase, and that of the specimens of Alveolina with Foraminiferous tests generally which we have seen to decrease in number as we descend the white limestone series, seems to point out, that where these fossils commence to appear and the latter is most numerous, is the passage from the nummulitiferous strata into the inferior sub-division of the white limestone series, or orbitolitiferous strata; more properly termed perhaps alveolitiferous strata, for, plentiful as we have seen specimens of Alveolina in the white limestone strata at Marbat, they are probably much more plentiful in it in other parts of the coast, since they are so abundant in a part of the Nummulitic Series in Lower Sindh that there whole strata almost are made up of them, while in Arabia we have also seen them exist from the summit of the table-land (at Marbat) to the base of the white limestone cliff (at Fartak), though probably largest and most abundant between the two; at the same time we have observed the Orbitolites to reach their maximum density in the colored argillaceous series, which therefore more particularly deserves the term of orbitolitiferous strata. But, call these strata what we will, the point in question here is whether or not the whole of the white limestone belongs to the Nummulitic Series, and this must be left for future exploration to determine: all that can be deduced from the previous observations is, that the same kinds of fossils are to be found together in the talus of the great limestone scarp at Marbat as are found in the nummulitic limestone of Lower Sindh, and that the presence of Orbitolites with them seems to point out that they come from strata below the green clay, and therefore from the lower division of the white limestone series. I regret that I cannot state more of this sub-division than that the strata of which it is composed chiefly consist of fine white compact limestone, breaking with a smooth conchoidal fracture, more or less lithographic in structure, and of different shades of white and grey colors; it is generally scarped and inaccessible. At Fartak, we have seen that the lowermost of these strata are more or less magnesian, and in some parts dolomitic; but this, which we have frequently observed in this series on other parts of the coast, seems to be owing to local causes.

We now arrive at the second division of the *Group*, which comprises the colored argillaceous series, and this we have estimated at 300 feet at Marbat, 175 feet at Ras Sejär, and 1000—1200 feet at Ras Fartak.* We have also observed it to consist of red, blue, green, and yellow argillaceous strata, sandy shales, and impure limestones, in which a red color is most predominant; and to contain, in addition to Orbitolites, throughout, but most numerous in the lower part, species of Echinodermata, Isocardium, Pecten, Exogyra, Ostrea and Ammonites, probably all of the cretaceous age: hence, if we consider the whole of the foregoing division as belonging to the Nummulitic Series, or Lower Eocene, this division must here be considered as the upper member of the Cretaceous period.

The third and last division of this group is the micaceous sandstone, of which we have seen so little that all that can be stated is that it is of great thickness, and, though laminated in some places, is for the most part massive throughout. As before observed, it fines upwards as it passes into the argillaceous division, and becomes coarser towards the bottom, where the gritty particles of which it is chiefly composed are evident to the naked eye. At Marbat it is mostly of a ferruginous yellow ochreous color, and at Ras Sejär its upper part, which is the only portion of it exposed, is of a light greenish blue color, and veined with white quartz.

2nd Group.

We now come to the *2nd Group*, which we have seen best developed between Marbat and Resut. It consists of two kinds of limestone, both of which are more or less coarse and compact; the upper one is also more or less impure, shelly, and of a reddish white color, and the under one of a dark brown color, containing here and there pebbles of the older limestone formation, and particles of igneous rocks. Both together do not occupy a thickness of more than 50 feet at the utmost, and no part of this little group that I saw is raised more than 100 feet above the level of the sea. It rests on the compact limestone of the Nummulitic Series, and is chiefly characterized by the dark brown color of the lower stratum, and its extreme cragginess where exposed to the action of the waves.

We must be content with the mineralogical characters alone of this *Group* for its separation from the others, since the few fossils obtained

* Almost all the heights and thicknesses given, with the exception of those stated to have been computed by trigonometrical measurement, have been assumed, or obtained in a rough way, for as these observations formed no part of the survey, the means of making them accurately were of course very limited.

from it are too imperfect to be of any service in this respect. From the *1st Group* it is easily distinguished by its superposition, and the presence of pebbles of the older limestone; and from the *3rd Group* it is distinguished by its compactness, and the thoroughly fossilized state of its organic remains, together with its inferior position. My impression is that it belongs to the Older Pliocene age.

3rd Group.

Lastly comes the *3rd Group*, or miliolitic deposit, which is chiefly characterized by its loose structure. In its purest state, as at Ras Abu Ashrin, that is where it is not mixed with coarse littoral debris of shells, or aqueous or igneous rocks, we have seen it to be composed of minute grains of calcareous matter, with which is mixed a small quantity of hyaline quartz; the former being nothing more than the tests of microscopic Foraminifera, loosely cemented together by a partial dissolution and re-crystallization of the external parts of their shells. The purity and whiteness of this deposit is of course in proportion to the distance it has been formed from the shore, or the neighbourhood of coarse loose material; hence, in addition to the locality mentioned, it is very pure in the plain of Dofar, on the western side of Ras Sejăr, and in the sandy plains on each side the port of Kashn, while in most other parts we have seen it mixed with large shells, pieces of coral, and rocks of the neighbourhood. Perhaps 100 feet is about its average thickness. It exists at various degrees of elevation, from 15 to 150 feet high, throughout the coast, and the fact of its having been raised up at one place, viz. on Jibal Ghara, at Makalla, to the height of 1300 feet, seems to point out that it does not belong to the *Recent* deposits, though probably to the Post Pliocene formations. At Resut it is found filling the lithodomous excavations in the coarse shelly limestone of the *2nd Group*, and there also it contains oyster shells of the same species as those of a recent bed close by. At Marbat, where it fills the fissures of the granite plain, it contains a number of shells and corals, many of which are very large, Hippopus, Ostrea, &c. One species of the latter is perhaps the largest known: it exceeds in size *Ostrea latissima*, (Desh.) We have also seen that it is not only met with throughout this coast, but that it extends to the peninsula of Kattyawar, in India, from whence it is imported at Bombay for building stone; and from forming the lower part of the Desert of Akhāf, opposite Masira, it may perhaps be continued into the heart of Arabia. It is also this deposit which, from its modern appearance, and elevation above the sea at different places, forces upon our attention the gradual elevation of the whole coast; not less so, however, than the *recent* deposit itself, which, though less

striking, may be seen in many parts above high-water-mark; but these limited elevations sink into insignificance when considered with the extent of elevation and depression which the cracked sandstone at Marbat proves this coast to have already undergone.

From the foregoing data, then, and in the absence of more extended and precise information, we obtain the following table of the aqueous strata on the South-east Coast of Arabia:—

POST-PLIOCENE ? *Miliolitic Deposit*, 100 feet ?	Loose granular deposit of white calcareous particles, chiefly consisting of the remains of microscopic Foraminifera; with which is mixed a variable quantity of colored siliceous particles of igneous rocks, and, in some places, shells, corals, and rounded pebbles of the neighbouring formations, far exceeding in proportion the finer material; shells and corals more or less loosely imbedded in the latter, and retaining, for the most part, their original whiteness and structure.
OLDER PLIOCENE ? 50 feet ?	Coarse, compact, whitish limestone, more or less mixed with red argillaceous earth, containing shells and corals, resting on a brown compact limestone, imbedding pebbles of the older calcareous formations, and rounded gravel of igneous rocks in the locality; shells and corals more or less consolidated with the rock, and for the most part deprived of their original whiteness and structure.
LOWER EOCENE ? 2000 feet ?	*Upper Division.*—Consisting of fine compact white limestone, with concretionary flints, the former more or less composed of the remains of small and microscopic Foraminifera; a soft calcareous limestone or grit, with Nummulites; and a stratum of greenish white marl and clay, with impressions of Orbitolites. *Lower Division.*—Fine compact limestone strata, more or less lithographic in structure, of different shades of grey and white, containing large Orbitolites and Foraminifera of the genus Alveolina, together with fossils of the Nummulitic Series.
CRETACEOUS PERIOD. 1000 feet ?	Argillaceous strata, composed of impure limestones, clays, and shales, of different colors, principally red, richly charged with small Orbitolites, and containing Echinodermata of the genera Discoidea, Pygaster, Diadema, and Salenia; Pecten,* Ostrea, *Exogyra flabellata*, &c. and Ammonites.
1700 feet ?	Compact micaceous sandstone.

* For "*Pecten quinquecostatus*, Sow. mihi," p. 74, read "Pecten.—1st *Species*?" and, in the same paragraph, for "three broader ones" read "two broader ones."

Such is a faint outline of the Geology of the South-east Coast of Arabia; the few fossils collected from whence will, I trust, sooner or later reach the Geological Society of London, where they will meet with that attention which they deserve. I have given some of their characters here for local reference, but we must look for more useful and authentic descriptions of them from a higher source.

ART. IV.—*Observations on three Copperplate Charters, granted respectively* A. D. 933, A. D. 1261, *and* A. D. 1391, *with Fac-similes, Transcripts, and Translations.* By MAJOR GEORGE LEGRAND JACOB.

Communicated by Government.

No. 1, *of* A. D. 933.—This records the grant, in the Shálivâhan year 855, by a Sovereign of the Yadu race, Govindráj, of the village Lohagrám, in the district of Rámpur,* to Keshava Dikshit, son of a Bráhman fellow-student. The language is pure Sanskrit, but inflated with gigantic hyperbole, puerile conceits, and far-fetched metaphors, containing little matter to compensate the labor of digging out the meaning.

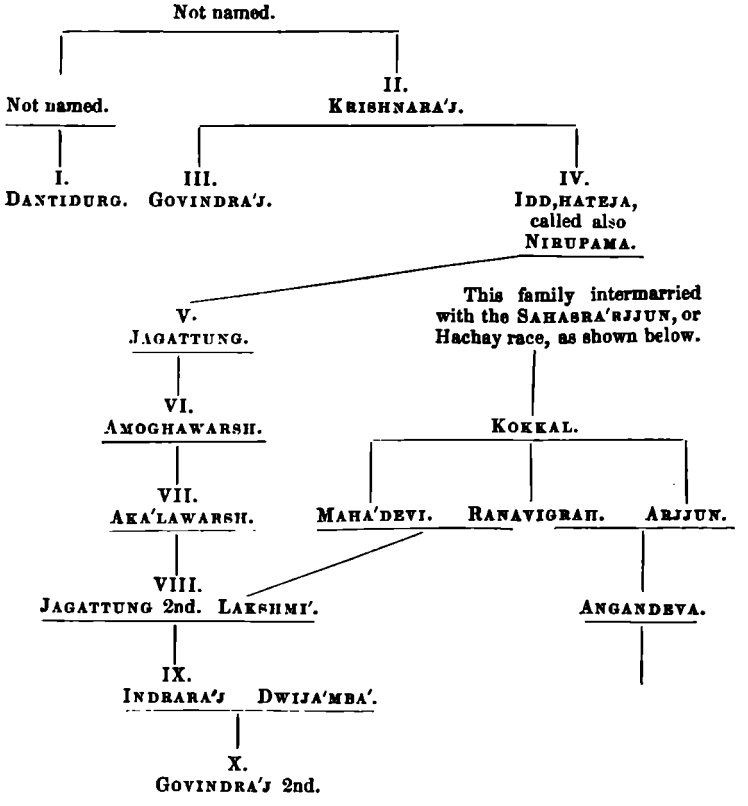
The plates belong to a Bráhman family, residing near Sánglí, but to what quarter the grant may pertain I know not. The seven places recorded may help to fix this: 1st, Lohagrám, the village given away; 2nd, Rámpur, the "Táluká," the four villages bounding the grant, viz:—

Ghodégrám,
Vajulí,
Vinchaviharabh,
Sonnahí,

and lastly, Púndawarddhan, the birth-place of the grantee. From a passage alluding to the Ganges and Jamná as "watering his kingdom," the Yadu sovereignty at this era must have been more extensive than is generally supposed.

The following genealogical tree is gathered from the plates, and it will serve to clear up doubts left by previous inscriptions. It differs little from Bál Gángádhar Shástrí's attempt to reconcile his and Mr. Wathen's notices published in the Transactions of the Bombay Branch Rl. As. Society, No. V. April 1843, page 213. The Roman figures give the order of succession:—

* Called Rámpúri Sapta shat, or Rámpur of the seven hundred (villages probably).



Donor of the grant is called also Suwarnawarsh, and Wallab,h Narendra Deva.

The senior name of the race, second in succession to the Gadí, is described as having overthrown the Chalukyas, the reigning tribe celebrated in the Nerur plates.* Supposing the ten reigns to average fifteen years, which, as the fourth Ráj was a first cousin to the first, will be nearer the mark than the higher average generally assumed, this would give the year A. D. 783 as the period of the overthrow of the Chalukyá dynasty by the Yadu.

No. 2, *of* A. D. 1261.—This inscription shows the Chalukyas again in the ascendant, and reigning at "Kalyán," Kanudeva the King.† His Minister, Keshava Mahájaní, bestows the village Tereovatak, the modern Terwan, in the Rajapur taluka, on certain Bráhmans and

* See Vol. VI. of the Society's Journal, pp. 203, *seq.*

† Boasting also four other high-sounding names.

the deity Vimaleshwar, the latter said still to enjoy his portion. The Sanskrit is not grammatical; the character approaches much nearer to the modern type: the inscription is probably the same of which an imperfect copy and translation are given in Vol. V. Rl. As. Soc. Journal, page 177.

No. 3, *of* A. D. 1391 is an interesting relic of the Bíjánagar dynasty, founded, according to Ferishta, in A. D. 1344, by Bilál Deu, Raja of the Carnatic, who named it after his son Bíjá.* I regret not having Wilks to refer to. Hamilton, quoting him and other authorities, dates the commencement of this city A. D. 1336, and completion A. D. 1343, by "Aka Huryhur and Burra Huryhur, and their Minister the learned Mádhava Acharya." This inscription gives only the following genealogy:—

ACH YU'T, married to Shrí.

|

BUKKARA'J.

|

HARIHAR.

The first named is not spoken of as a sovereign, but the second is. The discrepancy between all three—Ferishta, Hamilton, and the plates—remains to be cleared up, but there would evidently seem an error in attributing the foundation of Vijaya to the parties named; for, supposing another and previous Haribar, there would scarcely have been another and powerful Mádhawa: this person is celebrated in Sanskrit writings as the Minister of the Bukkáná race, which, supposing him to retain office under the son, agrees with this genealogy. His different names, according to the Shástrí, who is my authority on this point, are Mádhava Acharya, and Chatur Vedáchárya. Later in life he forsook mundane affairs, turned Sunyásí, and received the name of Vidyáranya.† This inscription, alluding to Vijaya, says that Bukkaráj here lived as an Indra, defying all his enemies; and as no mention is made of Achyut's deeds or residence, the inference is that Bukkaráj was the first of the race who established himself in power in this quarter. Haribar is described as ruling over the whole of the Indian peninsula that is washed by the ocean, and it seems doubtful whether supremacy to the Indus be not claimed. His Prime Minister, the aforesaid Mádhava, whom he invested with the sovereignty of Jayantipúr,

* Properly Vijayanagar, the City of Victory, called in this inscription Wijayá only.

† His works are said to be, Adhikarana Vijayá-Mala, Kála Madhawa, Paráshara Mádhava, and several others much prized.

conquered Goa from the Turushkas (Turks), and re-established there the worship of the ancient idols, which they had uprooted. This victorious personage, before transferring control over the Goa country to another Minister, named Narahari, granted to the parties named in the plates the village of Kuchchar, called also Mádhavapur: this village, the modern Kochré, is not many miles from the present Goa frontier, Sawánt Wadí.

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16*th November* 1849.

No. I.

PLATE DATED SHA'LIWAHANA SHAK 855, A. D. 933.

Free Translation, but as close to the Sanskrit as the language will admit of.

The melodious Sámved songs, in which Saraswatí* takes delight, sung by Brahmá, pleased with the creation of the universe, continue in honor. From the moon, that swan sitting on the lotus of the cerulean lake, surrounded by a numerous train of star-like lotuses—that silvery parasol of the great king Kám,† whose unrivalled sway prevails throughout the creation—that milky ocean in beauty—that silvery mountain in resplendence—that ivory comb of the Goddess‡ who rules over the Eastern quarter—that mansion of universal beauty, there sprung a race whence issued forth on earth an ocean-like branch of Yadus, the abode of riches and fame, the theatre of policy, prosperity, and deep meditation, beneficent, and renowned for protecting the poor. In this cloudless heaven rose Dantidurg, skilled in arts,‖ to whom his host of enemies were submissive as the starry spheres to the moon, the abundant and extensive rays of whose fame, like those of the moon's white light, filled all quarters.§ His illustrious son-like paternal uncle, Krishna Ráj, having ascended the heroes' ancient, Meru's crest-like throne, dispelled the dark and insolent Chalukya race, and sent forth as the sun does when first rising over the mountain tops, the light of his power over other kings,¶ and diffused his glory throughout the world. His son, Govindráj, born at Indubimbashilátal, orna-

* The Indian muse. † The Hindú Cupid. ‡ Untranslatable.

‖ Here is an untranslatable play upon words, founded on the double meaning of the adjective *kalawana*, "possessed of digits," and "possessed of arts," the former applicable to the moon and the latter to the king.

§ Also "gratified the hearts of mankind."

¶ The play upon the word आज्ञ *atta*, signifying both "light" and "command," admits of no exact translation in English.

mented by a mark caused by the smoke of his burning enemies, came after him. He was succeeded by his illustrious younger brother, Idd,hateja, also called Nirupam, who had a heroic and philanthropic heart, and whose dread made the progeny of his numerous enemies to tremble, and whose sway-tracing signet (Mudra) reached to the seas, hence known by the name of Samudra (with signet), which they still bear.* He was followed by his son Jagattung, whose rivals, bereft of their authority, had become as sapless and impotent as the withered breasts of old women. His son Amoghawarsh, who succeeded him, was of incomparable power.† His spotless fame so wide, that, filling up the whole universe, and finding no outlet, it ultimately overflowed in the form of water into the deep ocean of the world. Of him was born king Akálawarsh, to whom experienced shieldsmen, terrified by his prowess, instantly surrendered, throwing down their swords and bucklers. Mahádeví, an ornament of the Sahasrárjjun race,‡ the daughter of Kokkal, became his queen. Their son, king Jagattung, resembling Dharm (Ajatashatru) by having no enemies, but glorious for prowess, like Bhímasen and Arjjun,‖ was married to Lakshmí,§ the daughter of Kokkal's son Ranuvigraha, who was able to withstand his rival kings, deep, and holding, like the ocean, precious things. From the king Jagattung arose Lakshmí's son,¶ like the sun from the Udayachal,** glorious, flourishing, called another sun amongst the kings, and who truly deserved in this world the name of Indraráj,†† being one entitled to continual homage,‡‡ exterminating all iniquitous kings and their adherents by the thunderbolt of his prowess.‖‖ Dwijámbá (who like

* Here is a play on the word *Samudra*, signifying "seas" in one sense, and "with signet (or power)" in the other.

† A few words following are unintelligible.

‡ Afterwards also called Hachayá.

‖ Dharm, Bhímasen, and Arjjun, are the first three of the brothers called the "five Pándavas."

§ The metaphor is constructed by comparing this princess to Lakshmí, the wife of Vishnu, the goddess of wealth, and also the first of the fourteen precious things produced by the ocean, when it was churned by the gods and giants.

¶ The play upon the words *Lakshmyáh nandanah* signifies as above given in one sense, and "supporter of splendour" in the other.

** The name of the mountain behind which the heavenly bodies are supposed to rise.

†† The metaphor is constructed by comparing this king with Indra, the chief deity (quite a Jupiter Tonans), supposed to have punished the flying mountains by scorching up their wings with his thunderbolts.

‡‡ The play upon the term *Animisha-darshana-yogyah* signifies as given above in one sense, and "fit for the visits of the divinities" in the other.

‖‖ Here is another play upon the term *sthiti-chalita-sakala-bhúbhritpakshach-*

Lakshmí from the ocean, or like Párwatí from the Himálayás, the lord of the mountains, was born from Angandeva, very strong in force, the son of Arjjun, who became by his virtues the senior son of the aforementioned Kokkal, who was a descendant of the Haihaya race that broke down the pride of Ráwan) became Queen of Indraráj. Their son Govindráj, who surpassed Kám in beauty, who never committed wicked deeds, although with full opportunity, who never dishonored the elders, nor brought disgrace on himself by perpetrating evil actions, such as going with a brother's wife, &c., nor ever acted the coward's part by assuming derangement to cloak misdeeds, who signalized himself in the world as adventurous only in charity and war, became the next king. He poured forth bounties like rain upon his people, so that he at last was said to have inundated the whole creation with gold. The earth, finding herself rid of her wicked rulers at the height of his triumph over the world, commenced to dance for joy, raising, as if to gesticulate, her hands, the flapping banners of supremacy.* The sun and moon also, knowing that this victorious king does not bear with any insolent and inimical ruler,† became terrified, and submissively ran like heralds before him. Princes and authorities bowed themselves down before his ever-victorious palace, shining with his lustre, having its external gateway lofty, and shaped like the moon. Has it actually happened that the Ganges and Yamuná have poured themselves into and watered his kingdom because of its superiority over all others in virtue and genius? While this victorious king has been peaceably reigning, his virtuous kingdom has been freed from all enemies, and the expression "Vimána," an evil character, is understood only as a celestial vehicle,‡ to the truth of which parrots even bear testimony. The soot of the numerous fumes, rising from the fire of his great valour in battle, produced another heaven of azure clouds, in which the rays reflected whilst brandishing the glittering swords, are the flashes of lightning and the pearls‖ that drop in breaking the temples of the stubborn and hostile elephants, shine like the stars. His fame so pervades and saturates the universe, that the moon, the milky

ched-á-bhimukta-bhuja-wajrah, signifying as given above in one sense, and also "hurling out of his hand a thunderbolt to deprive all the flying mountains of their wings."

* Páli, called also Padhi, in some of the previously-translated plates.

† The words *Param mandaládhípam*, signifying as above, and also "other lord of circle (disk or system)," such as the sun and moon, a raja in his darbár, &c.; hence the allusion to the sun and moon lost in the translation.

‡ An untranslatable play upon the double meaning of the word *Vimána*.

‖ This metaphor is founded on the popular belief of the elephant's forehead containing a pearl.

ocean, and the thousand-headed snake, are the produce of its superfluity. It is no wonder that enemies succumbed to his authority when he desired to search out and exterminate all such,* for even the conscious lotus,† being terrified, but knowing its concealment under water still more dangerous, implored mercy, as it were, by offering Lakshmí to him out of its bud.‡ *The Pandanus odoratissimus* took, as if through fear, shelter in a valley, under a mist of its own odoriferous particles, scattered by the wind; but the jack-tree‖ and cane§ saved their lives by becoming vassals, and standing at the doors¶ of his palace. The king by his beauty rivalling that of Kám, has become another Nityakandarp,** thus deriding Mahádeva's third fiery eye, for having in vain burned up and made Kám "Anitya Kandarpa."†† He has been so richly blessed with energy, nursed by counsel and valour, the other two constituents of royal strength, that he thought little of even Indra's happiness. He, a second Brahmá amidst the Chánakyas,‡‡ a Naráyan,‖‖ on account of his being devoted to the welfare of the world, subjugated by his unparalleled valour, became also a Trinetra,§§ living as it were within the inimical breasts¶¶ that he had himself torn open with his plough. This blessed king of kings (independent, and ever most desirous of maintaining his supremacy, called Suwarnawarsh, and also for universal popularity Wallab,h Narendra Deva, *** constantly meditating on the feet of the prosperous and independent Nityawarshadeva, and a great teacher and a king of kings) orders all ministers, mánkarís,††† rulers of kingdoms and countries, principal

* Here is an untranslatable play upon the double meaning of the word *Kantaka*, which means "thorns" as well as "enemies."

† A particular species of red lotus, having thorns.

‡ Here is a play upon the word *kosha*, which means "a bud," and also "treasury"; Lakshmí dwells in both the lotus-bud and treasury.

‖ The jack-tree, though itself not thorny, bears a fruit covered with prickles.

§ Porters and mace-bearers generally stand with their canes at the doors, hence the allusion.

¶ Door frames are generally of jack-wood.

** That is, "everlasting or imperishable Kám."

†† That is "transitory or perishable Kám."

‡‡ May be perhaps the descendants of Chánakhya, the name of a sage, now applied to a man of prudence.

‖‖ That is, Vishnu.

§§ The Three-eyed, a title of Mahádeva.

¶¶ One of Shiva's epithets is *Smashanawási*, or "dweller in cemetery," hence this far-fetched metaphor.

*** This, signifying "the darling of kings," is the king's sixth epithet.

††† The persons entitled to certain honors and presents rendered at courts, councils, festivals, village-assemblies, &c.

villagers, respectable men, and all who are tenacious of their dignity. Be it well known unto you that the king, who with a view of promoting his own and his parents' virtue and fame by a long continuance of his capital, shielded by wise counsellers, even restores bygone grants to gods and Bráhmans, and who daily issues by hundreds innumerable edicts of village-grants, on Thursday, while the moon is in the mansion Púrwabhádrapada, the 15th of Shráwan [July, August], in the Samvatsar of Vijaya 855 years having passed of that era, has given in Inám, till the sun and moon endure, formally pouring water* from the hand, the village Lohagrám in Rámpurisaptashat, with all the trees thereon, exempt from payment of grain or gold,† and from the ingress of the military, to Keshava Dikshit, son of his fellow-student Dámodar Bhatta, born in the city of Pudawardhan, a descendant of Kaushik and a Kánwa‡ sectary. The undisputed boundaries of the village so granted as never to be coveted back, are Ghodégrám on the east; Wajulí village on the south; Vinchaviharabh village on the west; and Sonanhí village on the north. No one should ever interfere with Keshava Dikshit, or his posterity, whilst they are cultivating or enjoying, or suffering the village to be cultivated or enjoyed. Future kings, either of my own or other lineage, who may know that wealth is as transient as the waves undulated by a hurricane, life as the summer clouds, and also that preserving an assignment of land is more meritorious than granting it, which is their common duty, should duly observe and protect this our grant. Rám has said "To give land, and thus build a bridge, to pass, as it were, over an ocean of sin, is a duty, common to rulers. But O! you future kings, to protect this bridge of charity from time to time is the repeated solicitation of your suppliant Rámchandra." It is also said that he who gives land abides sixty thousand years in heaven, but a resumer and an abettor in its resumption are doomed to pass the same number of years in hell. He who takes back land given either by himself or others, becomes a worm, and rots along with his ancestors in his own hell; charity given by a single handful,‖ or resumption of what is given, destroys the merit of all former donations. He that gives land dwells myriads of years in the heaven of Bramhá. Be there blessings throughout the creation. Be our salutation to Shiva.

* A practice observed at the time of making a donation, to intimate relinquishment of right over it.

† A few words following are unintelligible.

‡ A particular section of the Yajurved.

‖ Giving with a double handful is held meritorious by the Shástras.

No. II.

Translation of Plate, dated Shaka, 1182, a. d. 1261.

1182 years having passed of the blessed Shálivan era, Raudra being the current year, Saturday, the 7th of the fortnight of the waning moon of Paush (December, January).

He who has been honored with the title of the five great words, as Ráy, Dharaní, Waráharáy, Batkáraripuráy, Sáhus Malha, and Shrí Kánvadeva Ráy, residing in the best city of Kalyán, a descendant of a Kárn* in the Kaliyug, a sun causing the bud of the lotus-like Chálukya race to bloom, whose flag carries the golden boar, the ocean of truth,† a fulminating cage for sheltering refugees, a devout worshipper of Maheshwar,‡ lord of the empire gained by propitiating Mahádeva by devotion, a black bee sucking the mellifluous lotus-like feet of Shrí Kedárdeva, since the time of the accession to the throne of Kánvadeva, Keshava, surnamed Mahájani, has been the Minister. This noble statesman, who is pious, prudent, skilled in arts, whose advice is the head ornament of all great councillors, during the merit-giving time of the sun's entrance into Capricorn, has devoutly and spiritual-mindedly assigned the village of Terawátak,‖ which he had obtained by the favor of the Rájá, with trees, and other usually grant-accompanying things, together with all its produce, with power to punish crimes and correct morals within its boundaries, to Keshava Prabhu, of the Bháradwáj lineage, who is to supervise the eight sacerdotal duties,§ and to the following deity and other nineteen Bráhmans, pouring water on their hands, and issuing this edict to Goi Raul, son of Jálhun Rául. The land called Rhát Síwár,¶ enjoyed by the Shúdras, is assigned to the deity Vimaleshwar, and the land lying near the temple, to Mádhava Deva, of the Bháradwáj lineage, for the daily worship of, and offerings to the Deity. The remaining Bráhmans are,—3, Nágde Kramait, of the Bhárgava lineage; 4, Vithal Paishás, of the Káshyap race; 5,

* The name of the half brother to the Pándavas, famed for munificence.

† Or "a mine of precious truth."

‡ Mahádeva.

‖ Now called Terwan, near Rájápur Táluká, Vejedrug.

§ 1, sacrifices, &c; 2, consecration of gods, wells, gardens, &c. &c.; 3, the ceremonies closing and concluding long religious observances; 4, predicting eclipses, interpreting them, telling auspicious seasons for undertaking any work; 5, consulting the religious code of laws and institutes, and prescribing therefrom penances, &c.; 6, preaching the Puráns; 7, administering justice; 8, supervision of the religion of the country.

¶ Bhat Síwár.

Vithal Paishás, of the Bhárgava lineage; 6, Ukal Paishás, of the Bháradwáj lineage, on whom is bestowed the Bramhatara; 7, Govind Bhat, of the Gárgya lineage; 8, Somde Bhat, of the Atri lineage; 9, Somde Kramait, of the Vasishth lineage; 10, Keshava Bhat, of the Vasishth lineage; 11, Mádhava Bhat, of the Káshyap lineage; 12, Wasudeva Bhat, of the Mudugal lineage; 13, Paduman Bhat, of the Vásishth lineage; 14, Mádhava Bhat, of the Gárgya lineage; 15, Achyut Bhat, of the Atri lineage; 16, Wáman Bhat, of the Káshyap lineage; 17, Náráyan Bhat, of the Bháradwáj lineage; 18, Náráyan Thákur, of the Bháradwáj lineage (on whom the office of a Chaudharí, and of a protector of the village is bestowed); 19, Harideva Bhat, of the Bháradwáj lineage; 20, Tikal Bhat, of the Bhárgava race. Four orchards, called Karhátak, are assigned to the holy purpose of permanently supporting the Math,* which is provided with culinary copper vessels, and situated near the temple. Kings, descended either from the present or other ruling race of this country, must so piously preserve this village grant, as to become enjoyers themselves too of beatitude. Many kings, as Sagar and others, made land-grants, but whosoever is the lord of the land, to him belongs the merit of preservation thereof. The resumer of land given either by himself or others, passing sixty thousand years as a worm in hell, is born a wretched Chandál. He that seizes one tola of gold, or a cow, or a bit of land, even of a finger's breadth, is doomed to remain in hell till the annihilation of the elements. It is recorded that no poison should be named equal to the seizure of Bráhmanical property; for the former destroys merely the one that takes it, but the latter also one's posterity. To all future rulers, either of my or other race, who will preserve this my grant, I bow down. This is written by Govind, the auspicious Maheshwarí.

* The nearest word for this is perhaps "convent."

No. III.

Translation of Charter, dated Shaka, 1313, A. D. 1391.

Be our salutation to Mahádeva, over whom waves as a chowrie the lofty head-kissing moon, who is like the Múlastambha* for the erection of the universe. Be glory to the boar Vishnu, who came into existence of his own will, and on whose tusk the globe of the earth looks beautiful as a lotus flower on its tube-like pedicle. The gold mountain Meru rests elegantly on the flower-like globe as the pericarp of the lotus. Bhárat (India) and the other continental divisions form the petals of the globe. The seven mountains Kuláchal, &c. that surround the pericarp (Meru) are the stamens, which add to the beauty of this flower. India is one of the petals. In its southern half is situate the country of Karnátak, through which flows the well known and great river thereof, Tungabhadrá. Even its sacred banks are so efficacious as to burn up a forest of sins. On one of the banks is the place of the great god Virúpáksha.† This place is supposed to have the same degree of sacredness as the Ganges. In its vicinity stands the fortified and impregnable capital city Vijayá, where the females have lotus petal-like long eyes, and possess such exquisite beauty as to resuscitate and rouse up even Kám, burnt up by Mahádeva.‡ As a divine incarnation, in the family of Yadu, Bukkaráj‖ was born of Shrí, wife of Achyut. He was dreadful in war; he defied all his enemies, and lived here as an Indra (god of gods). His son Harihar,§ powerful as Indra, went forth to conquer the world. He is worthy of the name, for his name and virtues are the same as those of Vishnu and Shiva. He, whilst ruling the religion formed by the northern bank¶ of a river, heard of but not seen,** the Eastern sea, Ráma's pool, and the Western sea, the great Kings of all the world fall at his feet. By his order his

* The name of a particular stone column, carved, and its capital with various grotesque figures, erected before the undertaking of any structure.

† Now called Hampivirupáksha.

‡ The Indian Cupid, of whom it is related that one day when attempting to subdue Mahádeva, while absorbed in meditation, he was burnt up by the god's third fiery eye.

‖ Also called Bukkana.

§ Vishnu and Shiva.

¶ The original appears to include the river.

** Perhaps the river Indus, or Attak, which the Hindus are prohibited by their religious code to cross.

Prime Minister Mádhava* began to rule Jayantipur, the effects of whose sound policy are so admirable that his enemies, while living, enjoy not a moment's rest. His name resounds in every quarter. He, at the head of a large army, set out, with an intention of subduing countries. A capital, surrounded by a sea, in the Konkan, and bearing the name Goa, was environed by an ocean of his forces. This heroic Minister banished all the numerous Turashkas† infesting the country, and set up again Saptakotishwar, and the other ancient idols that had been rooted up and thrown away by them. But Harihar, there consulting with his Ministers, concluded that his empire would be of short duration if the Prime Minister were not in his own territory. He therefore recalled the Minister, and bestowed on him the throne of Jayantipur, of which he was now the anointed ruler. Another Minister, Narahari, a descendant of Attreya, and the son, by Amlika, of Bramharas, a Bráhman, well versed in the Vedas and Shástras, was sent out to Goapur in his room. Narahari's younger brother, Bháskar, is well known. Narahari, a king-like personage, reared up by the rain of ambrosial satisfaction, derived from the favor of benign knowledge, as it were a Shankar‡ and thus becoming a Kalpataru‖ to all the learned of his age. Fame, a bride, previous to her wedding with the Minister, presented the renown of all his enemies as the offering of Lahya (parched rice) to the sacred fire of his prowess: she sat on the marriage slab,§ then stepped upon the seven continents, and proceeded to the heavens, as if to visit and receive personally a blessing from Vasishtha's wife Arundhatí.¶ The happy and wealthy Mádhavaráj, the chief of great ministers, and the guide of spiritual worshippers, says: "On Wednesday, during the time of the solar eclipse, when charitable deeds are highly meritorious, in the month of Vaishákha (April and May) of the Shálivan current year Prajápati 1313, A. D. 1391, I assign, with the pouring of water into which gold has been dropped, as a religious endowment, the village

* The Hindu author who wrote a commentary on the Vedas and works on the laws and institutes of Manu, on theology, astronomy, physic, and other subjects, which are extant, and held in great estimation.

† The Pandit asserts that a tribe of Mahomedans, who had established themselves at Goa, were so called. The flesh-eating Turashkas are mentioned in a plate found near Attok, assigned to about the eighth century, in the collection published in Vol. VI. Rl. As. Soc. Journal, the word being translated "Turks."

‡ Name of Mahádeva, implying good doer.

‖ A fabulous tree, nourished by ambrosia, which yields whatever may be desired.

§ Or the crest of a mountain.

¶ A goddess of chastity. This metaphor is throughout founded on the practice of Vivahahoma, a ceremony essential at all weddings.

Kuchchár, called also Mádhavapur, in the country of the same name, Kuchchár, in twenty-five allotments, to twenty-four Bráhmans, who are well versed in the Vedas and Shástras. Their names and lineage are as follows: Two of the allotments, the first and twenty-fifth, are given to Damodar Bhat, son of Anant Bhat, a descendant of Bháradwáj; the latter is granted to him as supervisor over the other Bráhmans. 2nd, to the grandson of Mahádeva Bhat, and the son of Anant Bhat, a descendant of Vasishtha. 3rd, to Wasudeva Bhat, son of Narasinha Bhat, a descendant of Attreya. 4th, to Khán Bhat, son of Anant Bhat, a descendant of Bháradwáj. 5th, to Dámodar Bhat, son of Wasudeva Bhat, a descendant of Attreya. 6th, to Mahádeva Bhat, son of Naram Bhat, a descendant of Attreya. 7th, to Wáman Bhat, son of Mahádeva, a descendant of Jamadagni. 8th, to Rhám Bhat, son of Dámodar Bhat, a descendant of Attreya. 9th, to Kán Bhat, son of Anant Bhat, a descendant of Bháradwáj. 10th, to Paumnideva Bhat, son of Vithal Bhat, a descendant of Jamadagni Watsa. 11th, to Anant Bhat, son of Mahádeva Bhat, a descendant of Kutsa. 12th, to Anant Bhat, son of Keshava Bhat, a descendant of Jamadagni. 13th, to Janárdan Bhat, son of Govind Bhat, a descendant of Attreya. 14th, to Vishnu Bhat, son of Rámkrishna Bhat, a descendant of Jamadagni. 15th, to Hari Bhat, son of Dámodar, a descendant of Attreya. 16th, to Govind Bhat, son of Mandeshi, a descendant of Kaushik. 17th, to Wásudeva Bhat, son of Vithal Bhat, a descendant of Jamadagni. 18th, to Paumnideva Bhat, son of Govind Bhat, a descendant of Kaushik. 19th, to Mahádeva Bhat, son of Hari Bhat, a descendant of Jamadagni Vatsa. 20th, to Tán Bhat, son of Náráyan Bhat, a descendant of Vasishth. 21st, to Bhatam Bhat, son of Mahádeva Bhat, a descendant of Jamadagni Vatsa. 22nd, to Vithal Bhat, son of Námdeva Bhat, a descendant of Bháradwáj. 23rd, to Mahádeva Bhat, son of Wámdeva Bhat, a descendant of Bháradwáj. 24th, to Keshava Bhat, son of Govind Bhat, a descendant of Vasishtha.

The boundaries of the so-granted village Kuchchár, hence called Mádhavapur, are as follows: Pát lies to the East of it; a Banian tree and a stone, situate on the summit of the intervening hill, form the Eastern boundary line. Mhápan lies to the south; a salt marsh, by the name of Paragati,* in the jungle, forms the Southern boundary-line, from which runs Westward the dam of a smaller marsh: near this is a ravine† on the breach of the sea; the sea lies exactly to the West.

* Now called Paragalwi.

† Also ditch, pit, deep hole, chasm.

Paraulya* lies to the North; the Paulot† and the creek beneath it, that runs to the sea, form the Northern boundary line. The grant of this village, with all its appendages, trees, water, treasure, if found, and everything thereon, is made by the consent of the king, his ministers, the chief men of the village, exempt from all sorts of taxation and oppression, to the above mentioned Bráhmans, who may undisturbedly enjoy it. To preserve what has been granted, a common duty incumbent on all kings, is like a bridge for their safety, over an ocean of sins. O you monarchs! preserve this bridge at all times, is the constant prayer of your supplicant Rámachandra. He who removes what is granted, either by himself or others, is doomed to pass sixty thousand years as a worm in hell.

* Now called Parule or Parole.

† We have no good English word for this useful term, signifying the line of any ridge or portion of land from which the water turns in opposite directions.

श्रीतातुगासाद्ब्रह्मदायस्यायेकावंद्रङ्कूंकमस्यादनः यस्यदायादः पूर्व्वतः प्योत
ग्रामः दक्षिणतः वंकुल्किमाग्रामः पश्चिमतः विचंदिहनकामाग्रामः उत्तरतः
साकहीमाग्रामः एवंचतुराघाट विसुद्धंलोहग्रामंकेसवदीक्षितस्यकमतः क
र्षयतादुंडतोप्रजयतावामकेविद्यायातः कार्यः मद्दामित्याक्षोलितजलतंबात
त्रलमेसूर्यसरदुविद्युमंजीवितंसामांश्चदूमिदामपालमदवाबुद्धिः नामा
भिरुयतिदिवसमदंलेद्वीयमस्मद्वंश्यदायः समकुमंतवाः पृतिपालनीयश्च ।।उक्तं
रनामदद्वेण ।।सामान्योयंधर्मासेतुर्नृपाणंकालेकालेपालनी
योरुवद्भिः सर्व्वानेवंरामविभः पार्थिवेंद्रान्भूयोभूयो याचते
नामरुद्रः ।।षष्टिंवर्षसहस्राणिस्वर्गेतिष्ठतिभूमिदः ।आच्छेत्तावानुमं
ताचतान्येवनरकेवसेत् ।।स्वदत्तांपरदत्तांवायोहरेतवसुंधरां
स्वविष्ठायांकृमिर्भूत्वापितृभिस्सहपच्यते ।।तस्यादत्तांनवाजन्मयद्भूमियद्दुंतग्रहं
त्यक्तोरिसहस्राणिकल्पकोटिशतानिच ।नरंसद्ब्रह्महत्यैव
कंभिदानंदरातियः ।।निवसन्सुस्वर्गेउगतः ।।ॐनमः शिवाय ।

Table explanatory of the Plate Characters (S.S. 5^{8} 5^{9} 5^{5}) A.D. 933.

Modern Balbodh Letters.	Corresponding English Letters.	Plate Characters. Diff.t forms of the same letters.	Modern Ballod Letters.	Corresponding English Letters.	Plate Characters. Diff.t forms of the same letters.	English Vowels or Vowels to which they are equivalent in sound.	Arabian Vowel marks.	Plate Vowel marks. Diff.t forms of the same marks.
अ	*a*		ट	*ta*				
आ	*a'*		ठ	*tha*				
इ	*i*		ड	*da*				
ई	*i'*		ढ	*dha*				
उ	*u*		ण	*na*				
ऊ	*u'*		त	*ta*		*a*	—	—
ऋ	*ri*		थ	*tha*		*á*	⌐	⌐
ॠ	*ri'*		द	*da*				
ऌ	*li*		ध	*dha*		*i*	⌒	⌒
ॡ	*li'*		न	*na*				
ए	*e*		प	*pa*		*í*	⌐	⌐
ऐ	*ai*		फ	*pha*		*u*	⊃	⊃
ओ	*o*		ब	*ba*				
औ	*au*		भ	*bha*		*ú*	⊃	⊃
अं	*am*		म	*ma*				
अः	*ah*		य	*ya*		*e*	⌒	⌒
क	*ka*		र	*ra*		*ai*	⌒	⌒
ख	*kha*		ल	*la*				
ग	*ga*		व	*va*		*o*	⌒	⌒
घ	*gha*		श	*sha*		*au*	⌒	⌒
ङ	*ṅa*		ष	*sha*				
च	*cha*		स	*sa*			÷	÷
छ	*chha*		ह	*ha*				
ज	*ja*		क्ष	*kisha*		*ah*	— :	— ०
झ	*jha*		त्र	*jña*				
ञ	*ña*							

※ Viz. in Italic, *n* is used to represent the sound of the Anooswar, when followed by any of the letters after म *ma*.

.... Dotted letter indicates that its exact form is somewhat doubtful.

✕ Letters thus marked are different from any to be found in Prinsep's Tables.

Most of the unmarked letters resemble those of the Kutila inscription Table (A.D. 992.).

Transcript of Charter, dated Shaka 855, A. D. 933.

[*The asterisk * denotes the end of each line in the plates.*]

ॐ जयति प्रथमः सर्व्वं निष्पत्ति मुदितात्मनः सरस्वती यतानंदा मधुरास्याम मी
तयः । तारा वराह * वंशा हतमनम सरस्यिग्मी राजवंसा । येलोक्यैकाधिप
त्य स्थित मदन महाराज सुहात यशात् * लावण्य क्षीरसिंधो सु तिरजतनिरे
हिम पूर्णतपसा । इ मःसोमादयं यस्त्रिभुवन कमलावास * सौधा दुपेतः । तस्मादि
यः कुलस्टं भवनं मस्थिमः क्रीडास्पदं स्थितिमवहीं मभीरतानां * वायप्रसन प
रो पालन लब्धकीर्त्ति र्व्वंशोवभुव भुवि विभुनिभोयदूनां । परिणतपर मंडलः क
ला * याम प्रवितत वरलयग्रोमु पूरितामः । प्रमघरस्व इ मति दुर्गराजो यदुकु
ल विमलवियत्यथोदिया * य । तस्मात्य नृपतेः पितृव्य उदयो श्रीवीरसिंहासनं मे
रो : शृंगमिवाधिरुह्य रविवहि * कृष्णराजस्ततः । ध्वस्तोद्वृत्त चलुक्यवंशतिमिरः
प्रत्यीभूतां मस्तके न्यस्ताद्ः सकलं * अमतप्रवितते लोकामी राज्यांतवान् । तस्मा द्गो
विन्दराजो भूविन्दु विमर्वरिमलातले यस्मारि * स्रो पयूसो । कः प्रमस्तिरिवलक्ष
मो । तस्याभवद्भ वन पालन वीरबुद्धि रद्भुतमच कुल संतति रिद्धतेजाः । * राजानुजो
निरुपमा परनामधेयो यस्य द्दर्यांवुधि रपि प्रथितः समुद्रः । तदनुज मत्तुंगो जगो
परि * चत निजसकल मंडलाभोगाः अततेयावन वनिता जन कुचसदृशा यस्य
वैरि नृपः तस्मा था * मोघवर्षो भव द तुलबलो येन कोपादपूर्व्वं मुपालुक्याभुपवा
घै व्वं नितरतियमःप्रीणितो विंग * वह्मा । वैरि चांडो दुरांत र्व्वं वि वपरितसे व
प्रलब्धा वलामं तोयधा आस्ति मुख समरय निचितं तस्य * मतुंगसिंधो । तस्मा द
कालवर्षो नृपति रभुचत्कराक्रमचक्रै : सयः समंडलाग्रं खेटकमपि * तैः परित्य
क्तं । सहवाज्जु नवंशस्य भुषणं कोक्कलात्मजा । तस्मा भवन मायादेवी जगत्तुंग *

ततोजनि । अंमीरावनिपे मे मृत प्रतिपक्ष रक्षणक्षमतः कोकल्लस्य सुतस्य विषय क

कपेलक्ष्मीः च * मुग्धा । सा आया जायताजातमचो तस्य मनोभुजः भीमसेना
र्ज्जुनो पाल् यशो गुणण श्रालिनः । * तव जनगु मोद्यधरणीधरतः प्रताप
कलितात्मा सकम्मा मंदन उदितो अमोघविजयो राजमार्त्तण्डः । क्षिति
च * जितसकल भूभृत्पक्षच्छेदाभिमुक्त भुज वंशः अनिमिष दर्शनयोग्यो यः स
त्यमिवेंद्रराजइति । यतस्मिन्दशकंठ * दर्प्प दलने श्रीचैदयानां कुल कोश
कः प्रतीपादितोस्य च गुणजेष्ठो र्ज्जुनोभूत्सुतः तत्पूर्वो मम्मणदेव इत्यति च *
स सत्याविजामवामव त्यद्यो वांबुनिधे रमेव चिमवन्नाम्नः क्षमा भृत्प्रभोः । श्रीमद्र
नरेंद्रात्तस्यां सूनुरभुद्भूपतिर्हि * जांबाया गोविन्दराजनामा कामाधीक रूप
साम्दर्यः । सामर्थ्ये सति निन्दितां प्रविहिता नैवाग्रजेक्रूरता बन्धुः स्त्री *
गमनादिभिः कुचरितै रावर्ज्जितं नायशः ।शौचाशौचपराङ्मुखं नच भिया पैशाच्यमं
गीकृतंत्या * गेना समसाचसे ग्रच भुवने यस्मादसौ कोभवत् । वर्षम् सुवर्णवर्षः प्र
मुतवर्षोपि कनक धा * राभिः जगदखिलमेक काचनमय मकरो दितिजर्नेःच
क्र । यद्धि दिग्विजया वसरे सति प्रस * भ संभ्रम भावन एवभुः । सपदि च्युति
पाली महाध्वजो गूलकराय्यकुनाथ विवर्ज्जिता । सचते च मंडलाधिपं प * रे गे
यो भ्युदयी समुद्रतं । इतिज्ञतभीया धिया यतो रविचन्द्रा वपि यस्य धावते । अ
वन तपरमंडले * चर्र सत्वविजयप्रभिवेग्रसोभितं समस्तो मकरतोरणं चिरं नि
ज तेज सति यस्य राजते ।सद * ते समताच्च धीमयं नपरेषा सविग्राहिणी ।
यदनिदित राजमदिरं मन् मंगा यमुना च सेवते * यस्मिन्राजनि सैराज्य
निर्ज्जितारि वितन्वति विमान स्थिति रित्यासी स्वभोगेषुक्रवाचनं । यस्यो द्दाम
प्रता * पानल वहल शिखा कज्जलं नीलमेघा वोस्फूर्ज्जत् खड्गधारा स्फुरण वि
सरणा न्येव विद्युद्विलासाः * दुर्वारारीभकुंभ स्थल दलनगल न्मौ क्तिकान्येव ता
रा श्चंद्र क्षीराब्धि शेषामृतभुवनयशो राशिनिर्ष्यंदितानि । *

यस्मिं न्कंठ कमोधमो त्युकमनघ्नं भाजनालैर्भृ ये वान्यग्नं नपयस्तु कोग्रवसति लक्ष्मीः
कृतोपायनं के * मक्षा पवनेाल सत्रि जरजः पुंजांधकारोदरे भूमवर्भैपमसेन येव
जलयाद्दार्थो त्म मुर्ध्ने स्थितं । यश्च समु * पचमित चरनयमदघने यिचिता नित्य

कन्दर्प्पैकरूप सौंदर्यदर्प्यः श्री नित्यकन्दर्प्पः प्रभु मंत्र शक्ति पर्वृचि * तोत्साह शक्ति
समाक्षिप्त सतमुखमुख मृणालक चतुर्मुखः । प्रथितैक विक्रमाक्रांत वसुधरा चितकर
ण प * रायणः श्रीविक्रांत नारायणः । सकर कलीतदेतिचलद्दलित विपक्ष व
क्षस्थल क्षेत्रः श्रीनृपतितृणेत्रः । * समभवत्तस्य परमभट्टारक महाराजाधिरा
जा परमेश्वर श्रीमन्नित्यवर्षदेव पादानुध्यात परमभट्टार * क महाराजाधिराजा
परमेश्वर श्रीमत्सुवर्ण्ण वर्षदेव पृथ्वीवल्लभ श्रीमद्वल्लभनरेंद्रदेवः कुशली सर्व्वानेव * य
तार्थंह त्यमानकान् राष्ट्रपति विषयपति ग्रामकूट महत्तरयुक्त कोप युक्तकाधिका *
रिकान् समादिशत्यस्तु वः संविदितं यथा मान्यखेटराजधानी स्थिरतरां वस्थानेन
माता . पित्रो रात्मनश्च पुण्य यशोभिवृद्धये पुर्व्वं लुप्तानपि देवभोगाग्रहारान् प्र
तिपालय * ता प्रतिदिनं च निरवधिनमस्यग्रामग्रासनानि शतसः प्रयाच्छता श
कनृप कालातीतसंवत्सर * शते ष्वष्टसु पंचपंचाशदधिके ष्वकतोपि संवत्सराणां
८५५ प्रवर्तमान विजयसंवत्सरांतर्ज्जे * त श्रावण पौर्ण्णमास्यां वारे गुरोः पूर्व्वाभ
द्रपदानक्षत्रे प्रथमकरोद्‘कातिसर्म्मेण । पुडव * ह्रंम नगर विनिर्म्मतकौशिक
गोत्र वाजिकाण्व सब्रह्मचारी दामोदरभट्टसुताय * केशवदीक्षिताय रामपुरी स
प्तशतांतर्म्मत लोहग्रामः सवृक्षमालाकुलः स * धान्य हिरण्यादेयः सदण्ड दोष
दशापराध सभूतोपात्त प्रत्ययः आवाट भट प्रवेश *

शताप्तरायो ब्रह्मदाय न्यायना चंद्रार्क्कमसमोद्गतः यस्य चाघाटाः पूर्व्वतः घो
डे * ग्रामः दक्षिणतः वजुल्लोनामाग्रामः पश्चिमतः विंचविचरभनामाग्रामः
उत्तरतः * सोमलीनामाग्रामः एवं चतुराघाटविशुद्धं लोहग्रामं केशवदीक्षित
स्य कृषतः क * र्षयतो भुंजतो भोजयतो वानकेचिद्व्याघातः कार्यः मतदागिम्या
न्देाशित जललतरंग त * रलमैश्वर्यं शरदभ्र विभ्रमं जीवितं सामान्यं च भूमी
दान फलमवगच्छद्भिः रागा * मिनृपतिभि रस्मद्वंश्यैः र्न्यायमस्मद्धर्म्म दायः सनुम
न्तव्यः प्रतिपालनीयश्च । उक्तं * च रामभद्रेण । सामान्योयं धर्म्मसेतु नृपाणां का
लेकाले पालनी * यो भवद्भिः सर्व्वानेवभाविनः पार्थिवेंद्रान् भूयोभूयोयाचते *
रामभद्रः । षष्टीवर्ष सहस्राणी स्वर्ग्गे तिष्टति भूमिदः । आच्छेत्ताचानुम * न्ताचा

मान्येव नरके वसेत् । स्वदत्तां परदत्तां वा यो हरेत वसुंधरां * स्वविष्ठायां कृमि
भूत्वा पितृभिस्सह पच्यते । प्रसुत्यासं प्रदानेन द * तस्माद्धरनेनच । अस्मप्रभु
तिपदत्तं तत्सर्व्वं निष्फलं भवेत् । क * यकोटी सहस्राणि कल्पकोटि शतानि
च । तिवसेद्नन्दनो लोा * के भुमिदानं ददातियः । शिवलोक सर्व्वसुखतः ।
ओंनमः शिवाय *

Facsimile with Transcript of Charter dated, Shaka, 1182 A. D. 1261.

स्व स्ति श्री श क १९८२ व र्षे मे द्र सं व त्स र । पु ष्य ब दि

स प्त मि श नि दि ने । अ द्ये ह स म धि ग त पं च म हा श ब्द

म हा म ं ड ले श्व र । क ल्या ण पु र व रा धी श्व र । क लि यु ग

क र्णा न्व य प्र सू त । चा लु क्य कु ल क म ल क लि का वि का स

भा स्क र सु व र्ण व रा ह लां छ न ध्व ज स त्य र त्ना क र । श र णा ग

त व ज्र पं ज र । म हा मा हे श्व र । म हे श्व र दे व च र ण प्र सा द ना रा

ध नो प चा रा द वा प्त प र म रा ज्ये श्व र । श्री के दा र दे व प द

पं क ज भ्र म र । रा य ध र णी व रा ह रा य । ब ट का र रि पु रा य

सा ह स म ल्ल श्री कां व दे व रा य रि ज य रा ज्यो दे । त

द्रव्यभावचालनसमर्थे। भावाचनि पुण्। सागसाय विवायबतुग।
द्र व्य भा र चा ल न स म र्थे । भा वा च नि पु ण् । सा ग सा र वि वा र्य चतु र
सकलकलाकुशल। महामात्यमंत्रचूडामणि। श्रीकेशवमहा
स क ल क ला कु श ल । म हा मा त्य मं त्र चू डा म णि । श्री के श व म हा
जनिना। श्रीकोवट्टवाय।पसाट्टलबू।तिचवाटकनाम।चेयो
ज नि ना । श्री को प ट्ट वा य । प सा ट्ट ल बू । ति च वा ट क ना म । चे यो
यग्रामः।उत्तरायणसंक्रांतिपर्वणि।परमयानक्या।महाधा।
ग्रा मः । उ त्त रा य ण सं क्रां ति प र्व णि । प र म या न क्या । म हा धा ।
मिंकेणभूलासद्विकमालाकुलसोपरिकर। दुदुदोषमा
मिं के ण भू ला स द्वि क मा ला कु ल सो प रि क र । दु दु दो ष मा
र्गणसहितचतुःसीमापर्यंतं। निधिनिक्षेपसहितः विंशति
र्ग ण स हि त च तुः सी मा प र्यं तं । नि धि नि क्षे प स हि तः विं श ति
विप्रसहितायभावद्वकुलोत्पन्नाय अष्टभोगसहित
वि प्र स हि ता य भा व द्व कु लो त्प न्ना य अ ष्ट भो ग स हि त
केशवप्रभावं। दास्तादकनप्रदत्तः। तदर्थशासनं प्रय
के श व प्र भा वं । दा स्ता द के न प्र द त्तः । त द र्थ शा स नं प्र य
क्ति।तेषामेतानिनामानि।फाटसीवसंबंधिनीरू
क्ति । ते षा मे ता नि ना मा नि । फा ट सी वा र सं बं धि नी रू
ट्रप्रकापकीविनीसमग्र।भूमिविमलेश्वरदेवस्य।तथा
ट्र प्र का प की वि नी स म ग्र । भू मि वि म ले श्व र दे व स्य । त था

Plate IV. (3.)

देवस्य संनिधौ या भूमि। सा। भारद्वाज गोत्रस्य। माधव देवस्य। गं
धर्भूपति वेद्यार्थ। भार्गव गोत्र नागदेक मैत। काश्यप गोत्र विठ
ल पैशास। भार्गव गोत्र विठल पैशास। भारद्वाज गोत्र। उक
ल पैशास। ब्रह्मचस हित। गार्ग्य गोत्र गो दृ दभट। अत्रि गो
त्र सोमदेभट। वासिष्ठ गोत्र सोमदेकमेत। वाशिष्ठ गोत्र के
शवभट काश्यप गोत्र। माधवभट। मुदुगल गोत्र। वासुदेवभट
वासिष्ठ गोत्र पदुमणभट। गार्ग्य गोत्र माधवभट। अत्रि गो
त्र अच्युतभट। काश्यप गोत्र वामनभट। भारद्वाज गोत्र ना
रणभट। भारद्वाज गोत्र नारण ठाकुरस्य चौधिरिक। सा
ग्रामप्रतिपालकः। भारद्वाज गोत्र हरिदेवभट। भार्गव गोत्र
तिकलभट। एव मेतानि ना मानि देवसंनिधौ। तां

Plate IV. (4).

बृभाअनपूर्वं.क। राश्वतमतं धर्मकार्यार्थकहाटकबाटिका।
चवारिअकस. ख्याजाल्हणराउलसुतगो इराउलस्यदातबंयामो
यमात्रानयसंभूतराज्ञा अपरेणबाधार्मिकेणभूत्वापालनीयं। य
थादाशैयभाकुपालकोविभविषति। बहुभिर्वसुधादत्ताराजभिःसगरा
दिभिः। यस्ययस्ययदाभूमिस्तस्यतस्यतदाफलं। स्वदत्तांपरदत्तांवायो
हरेतवसुंधरां। षष्ठिर्वर्षसहस्राणिविष्ठायांजायतेक्रिमिः। क्रिमि
योनिशतानिगत्वाचांडालेषुभिजायते। हिरण्यमेकंगामेकंभूम्याम
प्येकमंगुलं। हरंनरकमायातियावदाहूतसंप्लवं। नविषंविषमि
त्याहुर्ब्रह्मस्वंविषमुच्यते। विषमेकाकिनंहंतिब्रह्मस्वंपुत्रपौत्रि
कं। महंदुराजातःपरपंशजातःपापादपेतमनसोभुविभारभूताः। ये
पालयंतिममधर्ममिदंहिसर्वेतेभ्योमयाविरचितांजलिमूर्ध्निरे
षा॥ श्रीगोविंदेनलिलिखाते। श्रीमंगलमाहे श्री [illegible] ५

TRANSCRIPT OF CHARTER, DATED SHAKA 1313, A. D. 1391.

[The Facsimile of this Plate was not obtained.]

श्री महागणाधिपतये नमः । अविघ्नमस्तु । नमस्तुंगशिरश्चुंबी चंद्रचाम
रचारवे । त्रैलोक्य नगरारंभमूलस्तंभाय शंभवे । लीलाक्रोडः स जयति हरिः कं
दलक्ष्मी दुधय दंष्ट्राग्रे भासेननमिवभू मंडलं तडीभाति । यस्य सर्वक्षितिधरपतिः
कर्णिकावर्णपंक्तेः पद्मश्रेणी कुलशिखरीणः केसराणां प्रसारः । तस्मिन्भारत वर्षेद
क्षिणदले देशोस्ति कर्णाटका सम्मध्ये सरिदुत्तमा विजयते सातुंगभद्राभिधा । य
त्तीरे दुरिताटवीपुनर्वसे देवो विरूपाक्ष इत्याख्यो संततमंतरेण सुमनः चोतस्तोमी
चिंतनं । तस्योपकंठे विजयाभिधाना चाद्युत्वा राजति राजधानी । यस्यां विरू
पाक्षकटाक्ष दम्भ मुच्चीयवंतिस्म रमुत्वलाक्ष्यः । वंशे यदो रभिनवाभ्युदयाच्युतस्य श्री
संगमाद्वजनि संगरसंगभीमः । श्रीबुक्कराज इति विश्रुत प्रथुरेष तामध्यतिष्ठद्व
मध्यमलोकपालः । अथ भुवंभवनाभिमः सुतं हरिहरोद्दीप्तपराक्रमम् । जगदि
नः समजीजनदादरा त्खचतुरं चतुरं पुरिमेखलाम् । आकर्ण्यस्य हरिहरोत
स्तटा द्यापूर्वपाथोनिधे राहेतो वर्णि चिराद्भवति सत्यापश्चिमांबोनिधेः । स्थाने
स्मिन्गुणनां मभिहरिहरो राजाधिराजादिभी राजोर्वीपति नैश्चिमाचितपदा भो
जे महीवल्लभे । तस्याज्ञया माधवमंत्रिवर्यः प्रशासयंती पुरराज्य मुत्तम् । यस्यं च
मक्त्या वपुषस्त्वंतोयरातयाः स्वाह्वामयो भर्जते । आम्नातविश्रांतयशाः समंचो
दिशो जिनोपुर्नवता बलेन । गोवाभिधां कोंकणराजधानीं मन्येगमन्ये वणद
र्णवेन । प्रतिष्ठितां सवतुरक्ष्यसंधानुत्याय्यदोष्णा भुवनैकवीरः । उन्मूलिता
मा मकरोत्प्रतिष्ठां श्री सप्तनाथादिसुधा भुजां यः । तस्मिन्नृते क्षोतितले सति
कीर्तिशेषं सम्यग्विभि र्हरिहरो नृपतिर्विचार्य । गोवापुरे नृहरिमंत्रिण माद्देण
राज्ये पदेसमभिषिच्य पुरोजयंत्याः । आश्वन्यन्वयवारि धावुद्भव कवांविका म
र्भतः साक्षाद्ब्रह्माभिधद्विजवरा ध्यो भास्करस्याग्रजः । विद्यार्णकर समकृपा
मृ तरसासारेण संवर्द्धितो विद्वत्कल्प महीरुहो नरहरिः क्षोणीपति श्री
सते । कृत्वा सप्तपदानि सप्तसु महाद्वीपेषु भूभृच्छिला मास्थायाच विमुच्य गा
यवयो लानप्रतापानले । प्रत्यक्षेण विलोकितुं दोषमपि प्राप्ता तथार्यचति नित्यं
कीर्तिवधूः सदा नरहरि क्ष्मार्प वृणीते वरम् । स्वस्ति श्री शके नवोदशाधिक त्रिशतो
तरसत्त्वे गते वर्तमान प्रजापति संवत्सरे वैशाखमासे कृष्णपक्षे अमावास्यायां
सौम्यदिने सूर्योपराग पुण्यकाले स्वस्ति श्रीमत्सप्त मंत्रीश्वर उपनिषन्मार्ग प्रवर्तका
चार्यः श्री मन्माधवराजः कुचरविषय वर्तिनं कुचरनामानं ग्रामं माधवपुरमिति
प्रद्योतनामधेयं सर्वमान्यमग्रहारं कृत्वा पंचविंशति वृत्ति कल्पनामा कल्पय वृत्ता

ध्ययनसंपन्नेभ्यः चतुर्विंशति ब्राह्मणेभ्यः सहिरण्योदकदान द्वारापुर्वकं ते ग्रामं संप्रद द्दति प्रदत्तं धर्मशासनं तेषां ब्राह्मणानां गोत्रनाम विवरणम् ॥ भारद्वाज गोत्र स्य ऋक् आत्राधायिनः अनंतभट्ट पुत्र दामोदरभटस्य वृतिरेका १ वासीष्ट गो त्रस्य ऋक् महादेव पुत्रानंतभट पुत्रस्य वृतीरेका २ आत्रेय गोत्रस्य ऋक्॰ नार सीहभट पुत्र वासुदेवभटस्य वृतिरेका ३ भारद्वाज गोत्रस्य ऋक्॰ अनंतभट पुत्र दामोदरकानभटस्य वृतिरेका ४ आत्रेय गोत्रस्य ऋक॰ वासुदेवभट पुत्र दा मोदरभटस्य वृतिरेका ५ आत्रेय गोत्रस्य ऋक्॰ नारभट पुत्र महादेवभटस्य वृतिरेका ६ आमदग्न्य गोत्रस्य ऋक्॰ महादेव पुत्र रामनभटस्य वृतिरे का ७ आत्रेय गोत्रस्य ऋक॰ दामोदरभट पुत्र रामभटस्य वृतिरेका ८ भारद्वाज गोत्रस्य ऋक्॰ अनंतभट्ट पुत्र कानभटस्य वृतिरेका ९ आमदग्न्य वत्सगोत्रस्य ऋ क्॰ विठलभट पुत्र पौन्नोदवभटस्य वृतिरेका १० कुत्सगोत्रस्य ऋक्॰ महादेवभ ट पुत्रानंतभटस्य वृतिरेका ११ आमदग्न्य गोत्रस्य ऋक्॰ केशवभट पुत्रानंतभटस्य वृ तिरेका १२ आत्रेय गोत्रस्य ऋक्॰ गोविंदभट पुत्र जनार्दनभटस्य वृतिरेका १३ आमदग्न्य गोत्रस्य ऋक्॰ रामकृष्ण पुत्र विष्णुभटस्य वृतिरेका १४ आत्रेय गो त्रस्य ऋक्॰ दामोदरभट पुत्र हरीभटस्य वृतिरेका १५ कौशिक गोत्रस्य ऋक्॰ मांदे श्री पुत्र गोविंदभटस्य वृतिरेका १६ आमदग्न्य गोत्रस्य ऋक्॰ विठलभट पुत्र वा सुदेवभटस्य वृतिरेका १७ कौशिक गोत्रस्य ऋक्॰ गोविंदभट पुत्रस्य पौन्निदेवभटस्य वृतिरेका १८ आमदग्न्य वत्सगोत्रस्य ऋक्॰ हरीभट पुत्र महादेव भटस्य वृतिरेका १९ वासीष्ट गोत्रस्य ऋक्॰ नारायणभटपुत्र नानभटस्य वृतिरेका २० आमदग्न्यव त्स गोत्रस्य ऋक्॰ महादेवभटपुत्र भटंभटस्य वृतिरेका २१ भारद्वाज गोत्रस्य ऋक्॰ नामदेव भट पुत्र विठलभटस्य वृतिरेका २२ भारद्वाजगोत्रस्य ऋक्॰ दामदेवभट पुत्र महादेवभटस्य वृतिरेका २३ वासीष्ट गोत्रस्य ऋक्॰ गोविंदभट पुत्र केशवभटस्य वृ तिरेका २४ भारद्वाज गोत्रस्य ऋक्॰ अनंतभट पुत्र दामोदरभटस्य पुनर्मध्यानजैः अन्यादत्ता वृतिरेका २५ एवं पंचविंशति वृतयाः कुचरीनामधेयस्येदानीं कृत माधव पुराभिधंतस्या ग्रहारस्य चतुः सीमाविवरणं ॥ पुर्वस्यां दिशी पाटग्रामस्य सी म्नो पर्वत शिरसि वटवृक्ष पाषाणः ॥ दक्षिणस्यां दिशी म्हापण ग्रामस्य सीम्नि अरे णमध्यतपर गालोती क्षारोक्षेत्रां तर्मतं कृत्वामतप्रभृति पश्चिम दिग्नुखारोप्रकारं समीपतः समुद्रवेलायां ऋदग्च ॥ पश्चोमस्यां दिशी समुद्रः ॥ उत्तरस्या दिशी परी त्य ग्रामस्यसीम्नि प्रवाहादधः समुद्रपर्यंतो क्षारोदकनदीच ॥ एवं चतुः सीमात र्मतं माधवपुरा ग्रहारं सहिरण्योदकदानधारापुर्वकं सर्वनमस्यसर्ववाधा विव र्जितं नीधो निक्षेप जल पाषाण सिद्धिसहितं चतुर्विंशति ब्राह्मणाः सुखेन भुंजी रन् ॥ सामान्योयं धर्मसेतुर्नृपाणां काले काले पालनीयो भवद्भीः सर्वानेता न् भाविनः पार्थिवेंद्रान्भूयो भूयो याचते रामचंद्रः सदतां परदतां वायो फलेत वसुन्धराम् ॥ षष्टीवर्ष सहस्राणी विष्ठांया जायतेकृमीः॥ श्री शुभमस्तु॥.

ART. V.—*A Comparative Vocabulary of the Non-Sanscrit Vocables of the Vernacular Languages of India.* By the Rev. J. STEVENSON, D. D.

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PART I.

Philology and Ethnology are two branches of knowledge, which, though seemingly independent, are yet intimately connected, and throw mutual light on one another. No sojourner in India can have paid any attention to the physiognomy of the higher and lower orders of natives without being struck with the remarkable difference that exists in the shape of the head, the build of the body, and the colour of the skin, between the higher and lower castes, into which the Hindú population is divided. The high forehead, the stout build, and the light copper colour of the Brahmans, and other castes allied to them, appear in strong contrast with the somewhat low and wide heads, slight make, and dark bronze of the low castes. Every one feels, on contemplating these characteristic marks, that he has been brought in contact with two distinct races of the human family. It is usually found that difference of language characterizes difference of race, and therefore in the present instance we should expect a difference in the speech of these two classes of the inhabitants of India. In all nations, even where the higher and lower orders are of the same race, such differences do indeed exist, as in England; and, on the other hand, where the races are totally distinct, as in the West Indies, the same language is usually spoken by both; yet in the last mentioned instance there are usually to be found traces of the ancient tongue of the subject people, mingled with the newly-adopted language of their masters. It is this ancient language of the subject race in India that we are endeavouring to trace through the different spoken dialects, by means of this Comparative Vocabulary.

The spoken languages of all the nations of India Proper, including Ceylon and the adjacent islands, are mixtures in various proportions of the Sanscrit, the original language of the Brahmans, and another language of a different family, of which we find the most copious remains in the dialects of the hill tribes, and in the Canarese and Tamil languages. There has indeed been introduced, in later times, a multitude of terms of Arabic and Persian origin by the Mahomedan conquerors of India, relating to government, law, and new phases of civilization, which now enter more or less into all the vernacular tongues. The interest of this part of the Indian languages to the philologist and ethnologist is not however so great as to induce us to enter upon it, nor does it present any difficulties to any one moderately versed in Urdú. The same remark also applies in a great measure to the Sanscrit element in the Indian languages. I was rather surprised at first, when examining the Bengáli, Támil, Malayálim, and Singhalese dictionaries, to find one half of them occupied with the explanation of the very same Sanscrit words with which I was already familiar from meeting them in the Hindí, Maráthi, Gujaráthi, and other allied tongues. After collecting materials to some extent for a comparative list of Sanscrit derivations in the different vernaculars, I abandoned the work from the perception that in the almost perfect sameness of the adopted words there was nothing to compare, except a few terminations and euphonic changes, which ten words could illustrate as well as ten thousand. I found that as in the Italian, Portuguese, Spanish, French, and English, the Latin element common to all is derived from the Roman language in a peculiar stage of its development, so it was with the Indian vernaculars in reference to the Sanscrit. I may illustrate my meaning thus: the term for *a water-spring* is not derived in the European vernacular tongues directly from *fons*, but through the mediæval *fontana*, a word now found in the Italian, giving rise to the French *fontaine*, and English *fountain;* and in the same way *certain* comes from *certus*, following with many other words a form which first in the decline of classic literature showed itself in proper names, as Domitianus from Domitius, and Justinianus from Justus, and then, from a fancied superiority of sound, was forced upon common substantives and adjectives. The Sanscrit of the Indian vernacular tongues also is the Sanscrit of a certain age—of an age when the language had been brought out of the simplicity and barbarism of the Vedic period nearly into the state that it exists in the classic literature of the Brahmans. What is most singular is that in the language of Ceylon

these words are the same as in the languages of continental India. In Ceylon the Sanscrit element undoubtedly owes its origin to the Pali introduced by the Buddhist priesthood; nor is this Pali anything but a modified Sanscrit, differing not more from the Brahmanical tongue than the present Romaic from classic Greek. According to the most accurate researches of Mr. Turnour, as corrected by himself, Buddhism was introduced into Ceylon about the commencement of our era. We have little reason to believe that with the exception of the Vedic hymns, any portion of the Brahmanical literature extends beyond that period, but on the contrary, that much of it was composed after the decline of Buddhism. However this may be, the Sanscrit language since the beginning of our era can have undergone no important variations. It ceased before that period generally to be a spoken language, and was thus removed from the influence of the usual sources of change. The encouragement given by the Buddhists to the vernacular tongues tended to throw it a good deal into the shade, and left its cultivation to the more rigid ritualists. There is one change, however, which the Sanscrit has undergone, which we must notice, as it bears particularly on the subject we have in hand: it is the introduction into it of words from the vernacular languages of India. The question is, What words are Sanscrit?—Is every word found in a Sanscrit book or dictionary radically Sanscrit? This is a question of no easy solution. If on the one side we are obliged to take every word any Brahman has used in writing Sanscrit as belonging strictly to that tongue, then we must canonize as classical Latin all the Gallicisms and Germanisms of the writers of the middle ages. On the other hand, if we reject any portion, there is danger of our reasoning in a circle, and setting up our own fancies as the standard of truth. If we may reject what we like, and retain what we like, our conclusions become useless for any philological or ethnological purposes.

It is then a principle of language that the same men do not invent numerous terms to express the same idea. Ask any one acquainted with Latin what word in that tongue stands for *water*, he will without the least hesitation answer *aqua;* and if the corresponding Greek is demanded he will reply ὕδωρ; if the Persian, آب (âb); if the Hindustani, पानी (páni); if Bengáli, জল (jöl); if Canarese, ನೀರ (níru); and so on in reference to other languages, giving only one word. True, in English we might use *fluid*, or *liquid*, instead of *water*, and *aqueous fluid* would be an exact counterpart expression; but every one at a glance perceives that these are either epithets, or derivatives from ano-

ther language. *Aqua vitæ, alcohol, spirits, barley bree,* are all used to denote the same liquid, but one of these words is taken from the Latin, another from the Arabic, and a third from the Scotch, and there is but one pure English term among the four. It is thus we judge of the numerous words used in the Arabic and Sanscrit to express the same idea; they are either mere epithets, or foreign or provincial words, adopted into the language. The Brahmans scattered through all the different provinces of Hindostan must have learned the languages of the tribes to whom they acted the part of astrologers and spiritual guides, and no doubt adopted many of the words of the languages of the tribes among whom they resided, and introduced them into the sacred tongue. In accordance with these principles, then, we would, if asked what was the old and radical Sanscrit word for water, say it was आपः (ápa*h*). जल (Jala) is an old Indian word used as the chief provincial term in Bengal, Orissa, and Ceylon to this day, to denote the substance in question. नीर (Nira) is Canarese, and pervades most of the languages of the South as well as that of the Todas, the primitive inhabitants of the Nilgherry Hills. उदक (Udaka) means strictly only a liquid; thus the author of the commentary on the Kalpa Sutra, in mentioning what things were most remarkable in their class, cites nectar as chief among liquids, उदकेषु अमृतं. Again सलिलं from its derivation, may be rendered a fluid. Try in the same way to derive the three first mentioned words from any radical ideal: आपः we are told comes from आप, to obtain, जल from जल, to hide or encompass, and नीर from नी, to obtain. The Brahmans ought to be ashamed of such absurdities. If the idea of water is to be derived from hiding or obtaining, we need no more stickle about the stories contained in the Purans. Such derivations and such transformations are equally probable. These are primitive words, and cannot be derived from verbal roots; and all except the first must have been introduced into the language by provincial writers, and then adopted by lexicographers.

In the present state of philological inquiries in India, however, I shall not be able to derive much advantage from the principle here laid down. Thoroughly convinced of its soundness as I am, if I were to make much use of it, it might seem as if it were introduced merely to serve a purpose. I shall not omit Sanscrit words that I decidedly think borrowed from the vernaculars, but the Sanscrit will also in these instances be given, and the reader left to form his own judgment. In reference to the Sanscrit portion of the vernacular languages of India, it is a singular fact that it is purer among the inhabitants of Malabar and

Mysore than among those of Bengal and Upper India. The reason of this can be easily given, though it be not at first obvious. In Upper India, Bengal, and Gujarath, nine-tenths of the language is a corrupted Sanscrit. The Brahmans and higher classes there more easily fall into the prevailing pronunciation of Sanscrit words, whereas in the South the Sanscrit vocables, being rarely used by any except Brahmans or well-educated persons, the primitive forms, though with the notable exception of the dropping of the proper marks of the genders of nouns, have been more carefully preserved. We may notice also that the Bengáli and Maráthi are strongly inclined to the use of the long *á* (আ) instead of the short (অ). They are the Doric dialects of India. The Singhalese has almost as much Sanscrit as the Hindustani, more at least considerably than the Támil and Canarese, confirming the tradition that derives the Buddhist colony from Orissa. These two last mentioned tongues retain most of what I deem the speech of the aboriginal Indians.

In reference to the order in which the following vocables are arranged, I have put the Canarese first, as containing the greatest number of words not Sanscrit, if I may judge from the dictionary which I have, viz. Garrett's Abridgement of Reeves. For the Támil words I use Rottler, for the Singhalese Clough, the Malayálim Bailey, the Bengáli Ram Comal Sen, the Maráthi Molesworth, the Gujaráthi Nowrojee Furdoonjee, the Hindí Thompson and Taylor, the Telinga Campbell, the Oriya Sutton, the Sindhí Stack. The last two and the Bengáli are English and Indian, the others have the words in the Indian tongue arranged alphabetically, as in Wilson's Sanscrit dictionary, of which I use the second, and of the other works the first editions. For the harsh *r* of the Southern languages I use in Devanagari ऱ, in English *rr*; for the last letter in the word Támil in Devanagari ழ, in English *zh*. The Canarese, Telinga, and Maráthi languages often require ज to be pronounced, not *j*, but *z*, or *dz*, and the Támil and Malayálim have a peculiar *n*. There are rules for these, however, which those acquainted with those languages know how to apply, and I have not thought it needful to mark these changes of sound. The peculiar vowel of the Singhalese I have written অ্য and *æ*.

Before proceeding to the catalogue of aboriginal words we may exhibit a specimen of the transformations the Sanscrit undergoes when adopted into the vernacular tongues. Besides the forms here given, it is not unusual to meet with the pure Sanscrit word as well as the corruption in some of the dialects. The pure word will be heard from

the mouth of Brahmans, or be found written in the higher orders of compositions, while the corrupted form will be that used by the common people.

It is no uncommon thing, also, for the pure word to occur in certain senses, and the corrupted in certain others, thus enriching the language. For example करम् is a word that applies in some of the vernaculars to religious, or irreligious acts, while its corruption, काम, means any common work or employment; in the same way as *rite*, in English, is "the prescribed manner of conducting religious services," while *fashion* and *custom* are used of things trivial and common.

CORRUPTIONS OF SANSCRIT WORDS IN THE VERNACULAR LANGUAGES.

Sanscrit.	*Páli and Mágadhi.*	*Hindi.*	*Sindhi.*	*Gujaráthi.*	*Maráthi.*	*Bengáli.*	*Uriya.*	*Singhalese.*	*Telinga.*	*Canarese.*	*Malayálim.*	*Támil.*	*Miscellaneous.*	*English & Latin.*
अक्षि	अक्षि	आख	अखि	आख	अक्षि	....	अखि	अक	....	अक्षि	अक्षम्	अक्षि	*Punjábi*, ákh	the eye,
akshi	akhi	ákh	akhi	ákh	akshi	.....	akhi	aka	.....	akki	akshaṁ	aki		oculus
कर्म्म	कम्म	काम	कमु	काम	काम	कर्म्म	करम	करण	कर्मम्मु	कर्म	कर्म्मम्	करुमम्	*Tibetan*, karma	an act,
karmma	kamma	kám	kamu	kám	kám	karmma	karm	karana	karmamu	karma	karmmam	karumam		actus
एक	एक	एक	हिकु	एक	येक	एक	एक	एक	ओक	एकम्	एकम्	एगम्	*Persian*, yak یک	one,
eka	ek	ek	hiku	ek	yek	ek	ek	ekka	oka	ekam	ekam	egam		unus
द्वि, द्वय	दुवे	दो	ब	बे	दोन	दुए	दुए	देकयि	द्विकमु	द्वयि	द्विकम्	तुवि	*Latin*, duo	two,
dvi or dvaya	duve	do	ba	be	don	dui	dui	dekayi	dvikamu	dvayi	dvikam	tuvi	*English*, two	duo
													Cashmerian, zuh	
षष	छ	छ	छ	छ	साहा	छय	....	छयथि	षडमु	षट्	षट्	सदु	*Latin*, sex	six,
shush	chha	chha	chha	chha	sáhá	chhaya	.....	hayayi	shatamu	shat	shat	sadu	*English* six	sex
													Cashmerian, shah	
हस्तिन	हत्थि	हाथी	हाथी	हाथी	हत्ती	हाती	हाती	अथतु	हस्ति	..	हस्ति	अत्ती		elephant,
hastin	hatthi	háthi	háthi	háthi	hatti	háti	háti	etu	hasti	....	hasti	atti		elephas

N. B.—It is particularly to be noticed that with a few trivial exceptions the words given in the first nine columns are those of most common use for the idea expressed, while in the last four the words given are uncommon, and only employed in composition, or used by Brahmans.

A COMPARATIVE

Of the Non-Sanscrit Primitives of the chief

No.	CANARESE.	TA'MIL.	MALAYA'LIM.	TELINGA.
1	ಆ á That, *Illud*	அ, அவ a, av That, *Illud*	അ á That, *Illud*	ఆ అ á a That, *Illud*
2	ಅಕಟವಿಕಟ Akaṭavikaṭa Confused Involutus	அகடு Agadu Deceit Fraus	....	అకటవికటము Akaṭavikaṭamu Topsy turvy Reversus
3	ಅಕ್ಕ Akka An elder sister Soror major natu	அக்கை Akkai An elder sister Soror major natu	....	అక్క Akka An elder sister Soror major natu
4	ಅಕ್ಕರ, ಅಕ್ಕರ್ತಿ Akkara, akkarti Love Amor	அகடு Agadu The inside Pars interna	அകതാര് Akatár The heart Mens	అక్కు, అకటిక Akku, akatika The breast, mercy Pectus, misericordia
5	ಅಕ್ಕು, ಆಗು Akku, águ To be, to become Esse, fieri	ஆகாது A'gradu To be, to become Esse, fieri	അകുന്നു Akunnu To be, to become Esse, fieri	అవు Avu To become Fieri
6	ಆಕಳು A'kaḷu A cow Vacca	கர்ரவை Karravai A milch cow Vacca lactaria	കർറപ്പി—കുന്നു Karrappi kunnu To give milk Lac præbere	కళ్ళి Kaḷḷi The milk bush Euphorbia tirucalli

No. 1.—The long and short vowels being frequently interchanged, the words will in this Vocubulary be usually found arranged according to the sound, without considering the length of the vowel, though care has been taken not to confound the two together in writing. Instead of அவ in the Tamil, அ only is written before a consonant, but the consonant is doubled. To this list might be added the Scindian and Tibetan ڇو, the Bengáli ওঁ, the Turkish او, Persian او, Slavonian *on*, Burmese *ho*; and from the hill tribes the Dhimal *u*, and Garo *oa*. In writing the Hindustáni and Maráthi in English characters, *w* is sometimes used as the substitute of व, when that suits the pronunciation much better.

No. 2.—The Latin terms are not here or elsewhere always exact synonymes, but sometimes further explain the idea given partially in the English. The root here is probably the Canarese interjection of surprise, ಅಕಟ, *akata*.

No. 3.—The Sanscrit अक्का means *a mother*. It is an uncommon word, and probably taken from the Maráthi अक्का, which, especially when coupled with बाबो, or बाई, the cor-

VOCABULARY

Vernacular Languages of India.

SINGHALESE.	MARA'THI'.	GUJARA'THI'.	HINDI'.
අර් ඔ	ह	आ	वो
Ar ú	Há	á	Wó
That, *Illud*	This, *Iste*	This, *Istud*	That, *Illud*
අකටවිකට	अकटविकट	.....	.....
Akaṭavikaṭa	Akaṭvikaṭ	.....	.....
Foolish pranks	Disorderly	.....	.....
Tripudia	Indigestus	.....	.....
අක්කා	अका	.....	.....
Akká	Aká	.....	.....
An elder sister	Elder sister	.....	.....
Soror major natu	O soror major natu	.....	.....
අරටුව	आवड	.....	.....
Araṭuva	A'waḍ	.....	.....
The heart	Love	.....	.....
Pars interna	Desiderium	.....	.....
.....	आव	.....	.....
.....	A'va	.....	.....
.....	Show, power	.....	.....
.....	Pompa, vis	.....	.....
කලකුමඩව	कळप	.....	S कलाप
Kalkumaḍva	Kaḷap	.....	Kaláp
A herd, a company	A herd, a flock	.....	An assemblage
Agmen	Boum, &c. agmen	.....	Conventus

ruption of आर्या, means any elderly female. The Toda of the Neilgherries is *okena*, and the Tulu of the Malabar Coast *akke*, and the Tungusian, according to Klaproth, *oki*, for an elder sister. Among the Assamese tribes the Bhotia is *azhim*, the Changlo *ano*, the Garo *abi*, and the Keshári *anobai*. The Tamil is no doubt also connected with the Tibetan *achhe*, and a truly aboriginal word.

No. 4.—This word has many words allied to it in the Southern tongues, but I cannot trace it in the Northern family further than the Maráthi.

No. 5.—The remark made on the last word is even more applicable to this.

No. 6.—The Hindi word here given is pure Sanscrit. The trace of connection with the Southern family commences in the Maráthi. The word in Hindi and Sanscrit applies to other kinds of collections, but never to those of cattle, where थूथ, or a corruption of it, is generally used. It would seem, then, that the Maráthas have adopted and corrupted the Sanscrit word, giving it also a new sense, derived partly from the ancient Indian, and partly from the Brahmanical tongue.

No.	CANARESE.	TA'MIL.	MALAYA'LIM.	TELINGA.
7	ಅಗಚು Agachu To press down Comprimere	ಕಸಕ್ಕು-ಗ್ರಾದು Kasanggu-grradu To be squeezed compremi	....	గచ్చుపిచ్చు Gachchupichchagu To be disordered Inconditum esse
	ಅಗಡು Agadu Fierce, untamed Ferox	ಅಗಡಿ Agadí A deceiver Fraudulentus	....	అగడు Agadu An accusation Criminatio
8	ಅಗಲ Agala Broad Latum	ಅಗಲಮ್ Agalum Breadth Latitudo	ಅಕಲಮ್ Akalam Breadth Latitudo	అగలు Agalu To burst asunder Rumpere
9	ಅಗಲು, ಅಗಳಿ Agalu, agali To dig, a trench Fodere, fossa	ಅಗಳಿ ; ಅಗಿಳ್ Agazhi, agil A fort trench Arcis fossa	....	అగడు Agadu A trench, a moat Fossa
10	ಅಜ್ಜ Ajja Grandfather Avus	ಅತನ್ Atan Father Pater	ಅಚ್ಛನ Achchhan Father Pater	అవ్వ Avva A grandmother Avia
11	ಅಂಚೆ Anche A relay, the post Statio, veredorum statio	ಅಸೈ-ದಲ್ Asaidal Motion, walking Ambulatio	ಅಂಚಲ್ Anchal The post Cursores publici	అంచె Anche A relay, the post Statio, tabellarius

N. B. The Hindi अकड़ना, *to be cramped or shrivelled up, to strut*, &c.; the Canarese ಅಕ್ಕಸಿಸು, *to contract, as the muscles of the stomach, from hunger*, and all the allied words in the other languages, are derived, it is conceived, from अकर्षण, *pulling, drawing*, &c., and are therefore here omitted. It is possible, indeed, that they may have had an independent origin in the ancient Indian vernacular tongue, but at any rate they are too closely allied in form and sense with the Sanscrit to find a place in this Vocabulary.

No. 8.—The Maráthi अगदो may I think be derived from the Canarese word for broad. It is a very common word, with a negative for *by no means*, and some have mistaken this for the meaning of the simple word. The Tamil of this No. is marked as if it were Sanscrit, whether supposed to be derived from अगाध, or from what other word I can only conjecture. There is no probability in such a derivation; ध cannot pass into ळ.

No. 9.—The Maráthi term here forms a curious instance of the meeting of the two dialectic waves. अगळ, as used for *a bar*, is a corruption of the Sanscrit अर्गल, but as used for *a small pit*, a meaning quite unknown to the Sanscrit, comes from the Canarese ಅಗಳು, *to dig*. But see further on this point in No. 22.

SINGHALESE.	MARA'THI'.	GUJARA'THI'.	HINDI'.
.....	गचका, गच	गच	गचपच
.....	Gachka, gach	Gach	Gachpach
.....	A jolt, tightly	Tightly	Stuffed together
.....	Concussio, strictim	Arctè	Compressum
.....	अगडबगड	अगडबगड	अगडबगड
.....	Agaḍbagaḍ	Agaḍbagaḍ	Agaḍbagaḍ
.....	Jabber, trifles	Trash, trifling	Jabber, trifles
.....	Garrulitas	Nugæ	Nugæ
.....	अगदी	.....	.....
.....	Agadi	.....	.....
.....	In all its extent	.....	.....
.....	Prorsus.	.....	.....
अगल	अगळ,	.....	.....
Agala	Agaḷ	.....	.....
A ditch, a trench	The little pit at marbles, &c.	....	.....
Fossa	Puteolus	.....	.....
आता	आजा	.....	आजा
A'tá	A'dzá	.....	A'já
A paternal grandfather	A grandfather	.....	A paternal grandfather
Avus paternus	Avus paternus	.....	Avus
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

N. B. Probably अड्डे, *a shop*, is a corruption of अड्डण ; and अडवडे, *assessment on land*, is from *Sans.* अक्षत, *dry grain* ; and many of the following words from *Sans.* अच्छ *pure*, whence also the Hindi अच्छा *good*. अडु is a corruption of अक्ष, *a mould, an axle-tree*, and has the same meaning, and probably, when used as a verb in the same sense, *paying unjustly, suffering loss*, &c. it is from the same word in the sense of *a die for playing with at dice*. The words for *types, printing*, &c. in the Southern tongues come chiefly from अक्ष, as in the Northern—they are probably derived from क्षप, *to pound*, giving us छाप &c.

No. 10.—The Burmese अत्से *(atse), an ancestor of the seventh degree upwards*, may here be added.

No. 11.—Probably the Sanscrit roots अच and अञ्च, have received the sense of *to go* from the Tamil, the root, which is properly अञ्च. In the Tamil we have a large number of derivative words from this root, but I have not found one in the Sanscrit. The compilers of the Dhatu-manjari then, I feel confident, have in this instance, as in many others, given meanings to the roots which they have not in the pure Sanscrit.

No.	CANARESE.	TA'MIL.	MALAYA'LIM.	TELINGA.
12	अञ्चु Anchu To fear Timere	अचम, अञ्जल् Acham, anjal Fear Timor	अचम् Achcham Fear Metus	अञ्चेना Anchena An estimate Census
13	अटकु, अटतटि Ataku, atatati Hinderance, obstacle Impedimentum	अटि Ati Delay, hinderance Mora, impedimentum	अटेप्प Ateppa Obstacle Impedimentum	अटकावु Atakávu Prevention Obstructio
14	अडसट्टु Adasattu A conjecture Ariolatio	अडङ्गल्ल Adanggala A contract for work Pactio	अटङ्कल् Atangkal An estimate Æstimatio	अट Ata It is reported Aiunt
15	अट्टु Attu To abate, to be boiled dry Desiccari	अड्ङ-क्कादु Adang-krradu To abate, to sink down Diminui, residere	अटङ्ङुन्नु Atangngunnu To be humbled, to abate Deprimi, reprimi	अडगु Adanggu To be depressed Deprimi
16	अटवणे Athavane Remembrance Recordatio	....	अटयाळम् Atayálam A sign, a token Signum, nota	अडियालमु Adiyálamu A sign, a token Signum, nota
17	अडगु Adagu To be hidden Abdi, lateri	अडकम् Adakam Concealing, sepulture Occultatio, sepultura	अटक्किक्कुन्नु Atakkik-kunnu To cover, to conceal Tegere, celare	अड्डु, Addu That which conceals, a cover Celator, tegmen
18	अडयु ; अड्ड- Adayu, adda- To have, bye- Habere, sub-	अडै-ग्रदु Adai-grradu To have, to be near Habere, propinquum esse	अटुत्त Atutta Near, belonging to proximè, illi pertinens	....

No. 12.—But for the Telinga, which joins the form of the Southern family with the meaning of the Northern, which have derived the word from the Persian آزمایش I should not have ventured to trace here any connection. Yet as آزآیش is also used in Persian, the Tamil and Persian roots are to all intents the same, and the radical ideas of trying and fearing are not irreconcileable.

No. 13.—The meaning in all the languages except the Singhalese is indentical. The word अटक, or अटकाव in this sense is to be found also in the Panjábi, Scindian, Uriya and Bengáli languages. This root must be carefully distinguished from the Sanscrit root अट, *to move, surpass*, &c., whence अट्ट *an upper room or attic*, and some other words, which also enter into the vernacular languages, are derived. It is also to be distinguished from the next No., the root of which is in the Telinga a verbal particle अट, *it is reported*, and therefore I have, for the connection, brought forward the Canarese word out of its

SINGHALESE.	MARA'THI'.	GUJARA'THI'.	HINDI.
.....	अजमास	अजमाश	P अजमाईश
.....	Adzamás	Azmáesh	Azmáish
.....	Estimate, conjecture	Trial	Trial, proof
.....	Æstimatio	Experimentum	Probatio
අටුව	अट, अटक	अटक. अटकाव	अटक, अटकाव
Aṭṭuva	Aṭ, aṭak	Aṭak, aṭakáva	Aṭak, aṭákava
A glutinous substance	Obstruction, hinderance	Obstruction	Stop, hinderance
Aliquid glutinosum	Impedimentum	Impedimentum	Cessatio, obstructio
.....	अटकळ	अटकलो	अटकल
.....	Aṭakaḷ	Aṭakalo	Aṭakal
.....	Conjecture, guess	Conjecture	Conjecture, estimate
.....	Conjectatio	Ariolatio	Conjectatio
අඩුවෙනවා	अटणे	.....	.....
Aḍuvenavá	Aṭṇe	.....	.....
To decrease	To be dried up	.....	.....
Diminui	Desiccari	.....	.....
අඩයාළම	अठवण	.....	.....
Aḍayálama	Aṭhavaṇ	.....	.....
A brand, a mark	Remembrance	.....	.....
Nota, signum	Recordatio	.....	.....
අඩය	आड	आड	आड
Aḍaya	A'ḍ	A'ḍ	A'ḍ
A prop, a stopper	A well, shelter, cover, protection	Protection, shelter	Shelter, concealment
Adminiculum, obturamentum	Puteus, munimen	Munimen, refugium	Asylum, abditum
අඩුත	अड—*In composition*	आड—*In comp.*	.....
Aḍutta	Aḍ-	A'ḍ-	.....
Belonging to	Bye-, spare	Less	.....
Alicui pertinens	Sub-, extra	Minor	.....

place. The Telinga word, however, is derived from अण, *to speak*, and in the Dhatumanjari we have the meaning *to sound* given to this root, though not one of the Sanscrit derivatives has any connection with sound. Here again I suspect the author to have had the vernaculars in his eye.

No. 15.—Here the Hindi अटना follows entirely the Sanscrit sense of the root, and means *to be filled up*, a sense also found in some of the other tongues occasionally.

No. 17.—This is one of the instances that beautifully illustrate the necessity of studying the Southern languages to be able to see the derivation and full force of the words in the Northern. The same root appears also in the Panjábi अड्डला (aḍṭalá) *shelter*, which is also Hindi, the Scindian अड (aḍ), and the Bengáli आडाल (àḍàla) in the same sense.

No. 18.—The अड here, in some of the languages, corresponds to the ऊन of the Sanscrit, which in others has taken its place.

No.	CANARESE.	TA'MIL.	MALAYA'LIM.	TELINGA.
19	ಅಡವು, Aḍavu A deposit, a pawn Pignus	அடகு. Aḍagu A pawn, a pledge Pignus	അടമാനം Aṭamánam A pledge Pignus	అడ్డి, Aḍḍí A deposit Depositum
20	ಅಡಲು, Aḍalu To tremble, to fear Tremere, pavere	அடி Aḍi A stroke, a blow Ictus	അടി, Aṭi A blow, a stripe Ictus, plaga	అడలు, Aḍalu Fear, terror Timor, pavor
21	ಅಡಿ, Aḍi A foot, the bottom Pes, solum	அடி, Aḍi The foot, foundation Pes, fundamentum	അടി, Aṭi The foot, a footstep Pes, vestigium	అడుగు, Aḍugu A foot, a footstep Pes, vestigium
22	ಅಡ್ಡ, Aḍḍa Anything in a cross direction Ecquid transversum	அடம், அடனை Aṭam, aṭanai Across Transversè	അടുക്ക, Aṭukka A row, a layer Series	అడ్డము, Aḍḍamu Anything transverse Ecquid transversum

No. 20.—The Hindi डर here is probably derived from the Sanscrit द्र. The Southern influence then is confined to the change of द् to ड.

No. 21.—This number also traces an uncommon word in the Northern tongues to its source in the Southern. The Bengáli is the same as the Hindi, and the Scindian has अडि for *spurring*.

No. 22.—This is a truly aboriginal root, which runs through most of the Indian Vernaculars. The Scindian has for *transverse* आडो (áḍo), the Bengáli एडो (eḍo), the Uriya आड (aḍa).

N. B. I am not quite sure of the Malayálim here, but as the Canarese ಅಡ್ಡ ಚೌಕ *(adda-chouka) oblong*, is probably from this root, I think it should be admitted. What if the Sanscrit अर्गल *(argala)* a wooden bolt, of which no even plausible derivation can be given from Sanscrit roots, be a mere corruption of the Canarese ಅಡ್ಡಕೋಲು, (aḍḍakolu)

SINGHALESE.	MARA'THI'.	GUJARA'THI'.	HINDI'.
.....	अडत,	आडत,	अडथत,
.....	Aḍat	A'ḍat	Aḍhat
.....	Mercantile agency	Agency, brokerage	Agency, commission
.....	Negotiorum procuratio	Procuratio	Procuratio
.....	डरकणे,	डर,	डर,
.....	Ḍarkaṇe	Ḍar	Ḍar
.....	To roar, to rave	Fear, dread	Fear
.....	Rugire, insanire	Timor, pavor	Timor
अडिय,	एड,	एडो, एड	एडि, एड
Aḍiya	Eḍ	Eḍí, Eḍ	Eḍi, Eḍ
A foot, bottom	A spurring with the heel	The heel, spurring	The heel, spurring
Pes, solum	Calce stimulare	Calx, stimulatio	Calx, calce stimulatio
हरहव,	आडवा,	आडो,	आडा,
Harahava	A'ḍava	Aḍo	Aḍá
Crosswise	Transverse, adverse	Cross, crooked	Transverse, oblique
Transversè	Transversus, adversus	Transversus, flexus	Transversus, obliquus

a cross-bar of a door, derived from अड्ड? If it should turn out that many words have been admitted into the Sanscrit which are derived from the vernacular languages of Southern India, it will account for the prevalence of words, apparently Sanscrit, used among classes of the population where Brahmanical influence has scarcely been felt. When we remember, too, that Sankar Achárya, the great champion of modern Hinduism, was born in the Canarese country, this supposition appears the less improbable. In the present instance the word ಕುಲು in Canarese means "*that piece of wood which projects from the inner edge of the leaf of a door, fitting into a socket, and serving the purpose of hinges.*" Now, the radical idea of the word when used as a verb, as given in the dictionary, is that of falling down; and the cross-bar in question is actually let fall down into its place inside of a bent piece of wood, or iron, fixed in the door, projecting upwards, and retaining it in its place.

ART. VI.—*Note on the Rock-Inscriptions in the Island of Salsette.* By the REV. J. STEVENSON, D.D.

Presented December 1851.

THE Cave Commission having obtained, by way of experiment, from Mr. Wilson, Paris-plaster Castes of the Inscriptions found on the rocks at Salsette, four of which are in Pali and one in Sanscrit, I have been examining the Pali ones, and here give the following transcript in Devanágari, and attempt at translation of two of them. They seem to contain nothing of peculiar interest, yet, when the whole of the Inscriptions on our rocks shall have been carefully examined, an interest may be reflected on those which seem at present wholly unimportant. For the sake, then, of future antiquarians, it is best to omit nothing, but to endeavour to render all of them generally intelligible as far as possible.

The first then is as follows* :—

सेपारोगाणगम ससमोक्षपसक सपोढी देयधम

Translating this into Sanscrit it will stand thus:

सेपारोगार्णोगमस्य समोक्षप्रसक्तस्य तडदाथधर्मः

A Tank, the charitable gift of him who, devoted to Intellect, has crossed over the Waters of Affliction.

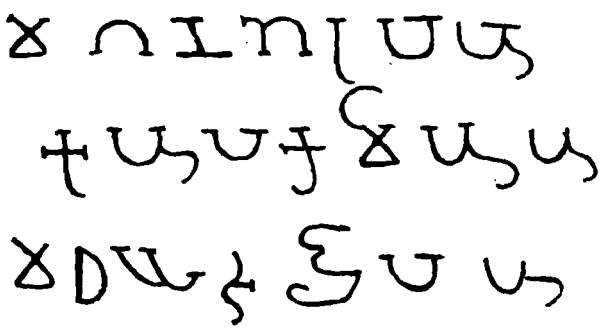
In this rendering I have translated all the words, but perhaps *Samkshaprasakta*—"Devoted to Intellect" is a proper name, and not an epithet. The word पोढी is attended with much difficulty. A word very like it in the Junír Inscriptions, copied by Colonel Sykes, by Prinsep (Journal As. Soc. Bengal, Vol VI., p. 1044) is made पढी, a word which he derives from a rare Sanscrit term पड्ः *water*. Before I noticed this, however, I had arrived at the reading I have given, and on examining the inscription anew, I found that I could not change it. Almost in despair about what to make of this word, I turned up the Maráthee Dictionary, rather to be able to feel satisfied that I could

Plate V. to be read from right to left, as in the process of lithographing it has been reversed.

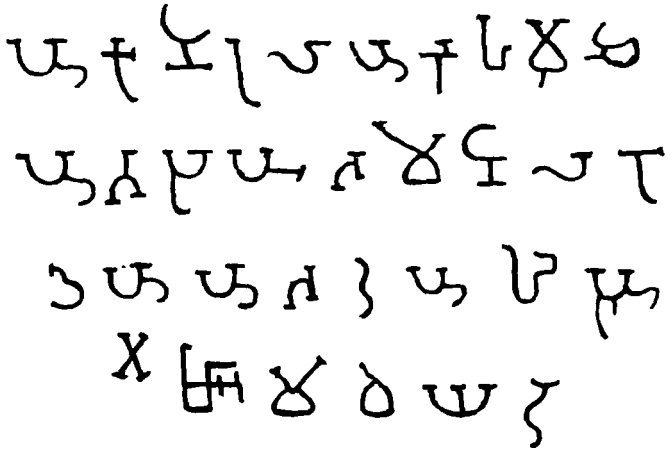
* For the Facsimile, see Pl. V. No. 1.

Fac similes of Rock-Inscriptions in the Island of Salsette.

N° 1.



N° 2.



arrive at no satisfactory conclusion, than from any hope of finding a clue to a word I had never heard used, when I found both पोंडी and पोंडा. It is the sense given to the latter, however, that of "a receptacle for water," which suits our context, and this, I have no doubt, is the meaning of the term here, as the Inscription is over a tank.

In reference to the word देय there is no doubt of the reading, but it is interchanged with द्य in other Inscriptions, so that it may be taken here as द्य—"compassion," an attribute of the Buddhist religion, as it is also of the Jain, since no offering can be presented to a superior being that gives pain to any animal. The reason of such a designation is not very evident at present, but must have been striking enough when the Brahmans, following the ritual of the Vedas, were in the frequent habit of offering horses, and other animals, even the sacred cow, to their gods. I am rather of opinion still, however, that here it is to be taken in the sense of दाय, as दान, which means the same thing, is to this day often coupled with धर्म by the Maráthas, in the way that देय is here. I think we shall find as we proceed in examining these Inscriptions that we must look more to the provincial dialects of the different localities than we are often inclined to do, and less to the Sanscrit.

The second Inscription* is—

खेमलकस चेरणिकस रोहणिमितसपुतसस सुलासदतस सोटा देयधम

In Sanscrit,

क्षेम लक्षस्य चैरण्यकस्य रोहिणिमित्रस्यपुत्रस्य सुलासदत्तस्य स्वस्तिक दायधर्मः

The charitable gift of a Svastika Temple by Súlasadata, son of Rohanimita, the goldsmith, whose eye is directed to prosperity.

In this Inscription there is not much difficulty. The first word in the original, and last in the English, may be read so as to mean "who is fated to prosperity," for लक means a "forehead" in Sanscrit, but I prefer changing it into the more common word लक्ष, which the analogy of the languages does not forbid. Rohinimitra is a name of Chandra, the deified Moon. In the Concan it is customary to drop the short र् in the middle of words, and so it happens in this word. The only difficult word is सोटा, of which the reading can hardly be doubtful. I have taken it as synonymous with Svastika, a particular kind of temple. The figure Svastika, which immediately follows the Inscription, seems to indicate as much, although it is of frequent occurrence in Inscriptions, and much stress cannot be laid upon it.

* For the Facsimile, see Pl. V. No. 2.

The word *Svastika* itself implies rest and comfort of body and mind. सोट in Maráthi, among other things, means "a causeway, or paved road, made up a steep ascent." I shall have to see, by a minute personal inspection, whether the Inscription is connected with a temple, or near such a road, before I decide finally between the two.

ART. VII.—*Extracts from the Proceedings of the Society for the Year* 1850-51.

MEMBERS ELECTED.

FROM 19TH DECEMBER 1850 TO 25TH NOVEMBER 1851.

Lieut. Col. Blood. Captain M. Taylor.
A. Rimington, Esq. J. N. Rose, Esq.
Major Delhoste.

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———Reasons for returning the Gold Medal of the Geographical Society of France, and for withdrawing from its Membership, in a letter to M. De la Roquette	———
BUDHIVARDHAK HINDU SABHA, in Guzerati....	Gungadass Kesscndass.
CASSELS (W. R.), Eidolon, or the Course of a Soul, and other Poems.	C. Peel, Esq.
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	Donors.
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———(P. M.), Monthly Statements of the External Commerce of the Presidency of Bombay, from December 1850 to August 1851	———
DICTIONNAIRE DE L'ACADEMIE FRANÇAISE, Revu, Corrigé, et Augmenté, 2 Vols.	Hon'ble J. P. Willoughby.
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DYER (G.), History of the University and Colleges of Cambridge	Hon'ble J. P. Willoughby.
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GRAMMAR of the Panjabi Language	Sir H. M. Elliot, K. C. B.
JOURNAL of the Indian Archipelago and Eastern Asia, Nos. 9 to 12 of Vol. VI. for 1850, and Nos. 1 to 8 of Vol. V. 1851	The Editors.
———Nos. 9 to 12 of Vol. IV. for 1850, and Nos. 1 to 4, 6 and 8 for 1851	Govt. of Bombay.
KHALID (U. F. M.), The Soorah, a Dictionary of Arabic Words explained in Persian	J. S. Law, Esq.
MACKAY (C. F.), Western World, or Travels in the United States in 1846-47	The Author.
MAP of Cutchee and the North Western Frontier of Sindh, including the Murree and Boogtee Hills	Hon'ble J. P. Willoughby.
MAP of Borneo	Govt. of Bombay.
MCCLELLAND (J.), Report of the Geological Survey of India for the Season of 1848-49.	The Author.

	Donors.
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Maury (Lieut. M. T.), Wind and Current Charts	The Author.
Nowrozji Furdonji, Tareekh-i-Zurtoshtee, or Discussion on the Era of Zurtosht, or Zoroaster, the Prophet of the Parsees	The Author.
Observations made at the Magnetical and Meteorological Observatory at Hobart Town, in Van Dieman's Land, under the Superintendence of Lieut. Col. E. Sabyne	Govt. of Bombay.
Observations made at the Magnetical and Meteorological Observatory of Bombay, for the year 1847, under the Superintendence of C. W. Montriou, Commander I. N.	———
Perry (Sir E., Kt.), Letter to Lord Campbell, Lord Chief Justice of England, on Reform in the Common Law, with a letter to the Government of India on the same subject	The Author.
Prinsep (J.), Modification of the Sanskrit Alphabet, from 543 B. C. to 1200 A. D.	———
Radicals of the Sanskrit Language	Hon'ble J. P. Willoughby.
Report of the Elphinstone Institution for the year 1850	The Principal.
Report of the Civil Cases determined in the Court of Sudder Dewanee Adawlut for 1848-49, compiled by A. F. Bellasis, Esq., B.C.S.	Govt. of Bombay.
———of the Bombay Engineers, for the Official Year 1848-49	———
———of the Board of Education, for the year 1849, No. VIII.	———
———of the Grant Medical College, Session Fifth, 1851	Dr. Morehead.
———of the Dekhan Vernacular Translation Society	The Society.
———of Crime and Police Administration of the Zillahs subject to the Bombay Presidency	Govt. of Bombay.

	DONORS.
RIG-VEDA-SANHITA, the Sacred Hymns of the Brahmans, together with the Commentary of Syanacharya, Vol. I., edited by Dr. Max Müller.	Hon. the Court of Directors.
SOCIETY, Royal Astronomical, Proceedings, No. 8 of Vol. X. for June 1850; Nos. 1 and 2 of Vol. XI. for 1850; Nos. 3, 4, 5, and 8 Vol. XI. for 1851.....	The Society.
——————Memoirs, Vol. XIX., for 1849-1850.....	———
———American Oriental, Journal of, No. 4, Vol. I.....	———
———Ceylon Branch of Royal Asiatic, Journal of, for November 1851.....	———
——————Monthly Notices of, from November 1849 to June 1850, Vol. X	———
———NATURAL PHENOMENA. Translated into Maráthi by Govindji Narayn.....	Dec. Vernac. Soc.
SYKES (Lieut. Col.), Mortality and chief Diseases of the Troops under the Madras Government, European and Native, from the years 1842 to 1846, inclusive.....	The Author.
WAENEN (C. V.), Sententi Ali Ebn Ali Talebi Arabice et Latine, annotationibus illustravit. Vol. I. 4to.....	Hon'ble J. P. Willoughby.
WEBER (Dr. A.), Indische Studien, Beitrage fur die kunde des Indischen Alterthums.....	German Oriental Society.
WIGHT (W.), Icones Plantarum Indiæ Orientalis, or Figures of Indian Plants, Part I. Vol. V.	Govt. of Bombay.
WILSON (Revd. Dr.), Idiomatical Exercises, illustrative of the Phraseology and Structure of the English and Maráthi languages.	The Author.
ZEITSCHRIFT der Deutschen Morgenlandischen Gesellschalft. Vierter Band. 1st III. and IV., Heft of 1850, and II. Heft of 1851.....	German Oriental Society.

TO THE MUSEUM.

	DONORS.
Antelope Cervicapra (male), skin of white variety.	Capt. G. G. Malet.
Bombyx Paphia, with eggs and cocoon, from Sawunt Warree	Major LeG. Jacob.
Birds' Skins, from the Neilgherry Hills. Genera Temnurus, Dicrurus, and Oriolus	Capt. Montriou.
Birds' Skins, from the Forests of Cannanore	J. S. Law, Esq.
Boats, Native Models of, in use on the River Indus: No. 1, Jamptee; No. 2, Zoruck; No. 3, Doondee. Built in the Flotilla-yard at Kotree	Govt. of Bombay.
Bones, Teeth, &c., with Matrix, from a Conglomerate discovered by Dr. Wilson, about two miles from Gogha, on the road to Rajcote	Rev. Dr. Wilson.
Bos Frontalis (male and female), skulls of	Major LeG. Jacob.
Cephelopoda, Gasteropoda, Conchifera, Echinoderma, Zoophyta, and Foraminifera, a collection of fossil remains of, from Lower Scinde.	H. J. Carter, Esq.
Coin, Silver, (one,) called *Shurree Khuree*	H. B. Frere, Esq.
Crystalline Sulphur, from the Island of Ormuz	Lt. C. G. Constable.
Encrustation, specimens of, which takes place between the tubes in the boilers of Steam-vessels plying in the Indian Ocean	J. Ritchie, Esq.
Eschara and Balanus, specimens of, taken from the keel of one of the Peninsular and Oriental Company's Steamers	———
Geological Specimens, collection of, from the Rocks of the South Concan	N. A. Dalzell, Esq.
Gypsum, from the Persian Gulf	Capt. J. Estridge.
Ibex, Horns and Skull of, killed near Kalilah Hill, in the vicinity of Bushire	Capt. Montriou.
Images, Heathen, (four,) sculptured in Trap, from Bajalcote and Oogurgole, in the Purutghur Talooka, and Purutkul, in the Hoogoond Talooka	W. E. Frere, Esq.
Lion, Lioness, and Wild Ass, skulls of, from Kattyawar	Capt. E. E. Malet.
Limestone, black, and white Calc-spar, from Ras Massandam	Lt. C.G. Constable.

	DONORS.
Marble, white, from Kattyawar.....	Capt. H. Aston.
Minerals, collection of, from the neighbourhood of Malligaum.....	Lt. A. Aytoun.
Otis Houbara, and Gallus Sonneratii, skins of...	Major LeG. Jacob.
Pholadine Tubes, casts of, from the Sandstone near Kurrachee.....	Dr. Don.
Shells, from a raised beach in the Island of Kishim.....	Lt. C.G. Constable.
Trap from Salsette, and from the Tunnel of Sattara.....	Capt. J. Estridge.
Zeolites and Calc-spar, from the Trap-rock of Baboola Tank.....	G. Buist, Esq.

ORIGINAL COMMUNICATIONS.

	COMMUNICATED BY
Bradley, (Dr. H.,) Rock-cut Caves of Aurungabad.—14*th August* 1851. *(a)*.....	General Fraser.
Carter, (H. J., Esq.,) Geographical Description of certain parts of the South-east Coast of Arabia, to which is appended a short Essay on the Comparative Geography of the whole of this Coast.—20*th March* 1851. *(b)*.....	The Author.
———Memoir on the Geology of the South-east Coast of Arabia.—9*th October* 1851. *(c)*..	————
Gibson, (Dr. A.,) Notice of a Hot Sulphureous Spring at the Lukkee Pass, and of a Saline Spring under the Fort of Kal-Droog, in the Mahim Talooka, with specimens of their waters respectively.—22*nd May* 1851. *(d)*.	————
Jacob, (Major LeG.,) Facsimiles, with Interlinear Balbodh Transcripts, and English Translations, of three Copper-plates, connected by a Ring and Seal (Buddh). The Plates are ten and a half inches broad, and half an inch thick, and were obtained from a Jain in Kharepatan, a Town on the river Viziadurg.	

(a) To appear in the General Abstract of the Cave-temple Commission.
(b) See last No. of Jl. p. 224. *(c)* This No. p. 21.
(d) See this Art. Proceed. Offic. Lit. and Sc.

	COMMUNICATED BY
The Inscriptions are dated Shak 910, equivalent to A. D. 988.—*20th March* 1851. *(a)*.	The Author.
Stevenson, (Revd. J., D.D.,) Observations on the Grammatical Structure of the Vernacular Languages of India, No. 3, The Adjective.—*20th February* 1851. *(b)*.....	————
————————Ditto ditto No. 4, The Pronoun.—*14th August* 1851. *(c)*....	————
Taylor, (Captain M.,) Further Information on the Kistvaens, Cromlechs, Cairns, &c., near Ferosabad, on the Bhima, also Sketches of the Groups at Rajan Koloor, Jewarjee, and Yemmee Good.—*20th March* 1851. *(d)*..	————
Twemlow, (Col.,) Notices on certain Ancient Caves and Structural Buildings near Aurungabad.—*20th March* 1851. *(e)*.....	Govt. of Bombay.

PROCEEDINGS, OFFICIAL, LITERARY, AND SCIENTIFIC.

The Government letter No. 106, in reply to the Society's letter No. 183, dated 14th December last, respecting a further search for Cave-temples and monuments of antiquity, &c. in the territories under the Bombay Government, and the employment of an artist to illustrate those of Elephanta, authorises the Society to advertise in the *Government Gazette* the offer of rewards of from Rs. 25 to Rs. 100 for information respecting any set of Caves hitherto undescribed, the reward to be proportioned to the value and importance of the discovery; also sanctions, at the request of the Society, rewards of Rs. 100 and Rs. 20 respectively to the parties who brought to notice the Excavations of Kuda and Khondana, and those in the Garodi Hill.

The proposition for reducing the Subscription of Subscribers from Rs. 100 to Rs. 50 was then brought forward, and, after a lengthened discussion, lost, under Art. XVIII. of the Society's Regulations, which requires a majority of two-thirds of the Members present to decide any question for which they may not provide.—*23rd January* 1851.

(a) To be inserted in next No. *(b)* See last No. p. 196.
(c) This No. p. 15. *(d)* Returned at the Author's request for additions.
(e) To appear in the General Abstract of the Cave-temple Commission.

Some beautiful specimens of Calc-spar and Selenite were laid on the table, which had been obtained during the evcavation of a well in the centre of the Native town. These had been formed in the cavities of trap rock. They were sent for the inspection of the Society by Dr. Buist, accompanied by a letter, containing a section of the well from which they had been taken. Dr. Buist observes, that it would be a great help to obtaining a knowledge of the Geology of Bombay, and a great advantage to geological science generally, if the Government and the Board of Conservancy would call for geological sections of all excavations and tunnelling executed under their orders.—*20th February* 1851.

With reference to Government letter No. 966, dated 6th instant, and its accompaniments, consisting of a copy of a letter from H. B. E. Frere, Esq., Commissioner in Scinde, and one also from Captain A. B. Rathborne, forwarding a metallic cup, with silver and copper coins, dug up at Hyderabad, it was resolved that the whole should be delivered over to the Revd. Dr. Wilson, for examination.

It was moved by the Hon'ble J. P. Willoughby, President of the Society, and seconded by Major G. LeGrand Jacob, that a subscription be again opened for reprinting in England, in an 8vo. form, with the plates, on thin paper, the three volumes of the Transactions of the Society; and that the Members of the Society be invited to enter their names as subscribers for one or two copies; these volumes, better known as the "Transactions of the Literary Society of Bombay," being out of print, and in much request. The motion was carried, and the Secretary requested to act accordingly.

Dr. Wilson directed the attention of the Society to a critical edition of the whole of the Zend Writings, at present preparing by one of its Honorary Members, Professor N. L. Westergaard, of Copenhagen, who a few years ago had visited this country and Persia, for the express purpose of prosecuting Oriental research, and had gained the respect and affection of all who had an opportunity of making his acquaintance on that occasion. In forming his text, this learned gentleman, according to the prospectus issued by him, had secured the use of the Zend Manuscripts in the libraries of Copenhagen, Paris, London, and Oxford; those belonging to MM. Burnouf and Wilson, and those acquired by himself in his journeys in the East. His work is to appear in three volumes, of which the first is to contain the text of all the Zend writings; the second, a comparative Grammar of the two dialects in which it has been ascertained they are composed, and a complete Con-

cordance of the Zendavesta; and the third, a new translation in English of the Zend text. Dr. Wilson added that he considered Mr. Westergaard's researches in the Zend literature of the highest interest and importance. Mr. Westergaard, on returning his manuscripts to him, had said, "I hope that the shape of my types will meet with your approbation. They are cut according to the oldest existing manuscripts. I have promised, in the French announcement, to give a Grammar of the two dialects of the Zend language. It is not difficult to distinguish between them, especially aided by the oldest manuscripts, as the difference is very strong, and observed not only in the use of different words, or different forms of the same word, but even in the grammatical structure. As the Zend language must be referred to the Eastern parts of Iran, I hazard resting, among other facts, on the authority of Straled about the difference of the dialects of Bactriana and Sogdiana, to assign to our two dialects the names of Bactrian and Sogdian, in such a way that I should call with the name of Sogdian that dialect in which the greater part of the Yacshna is composed, as it is evidently more rude and unpolished than that of the other parts of the Zendavesta." Of the differences in the dialects here referred to, Mr. Westergaard in his communication had furnished many examples. He had also submitted to Dr. Wilson his scheme for re-adjusting the Zend alphabet, founded on a comparison of it with the Sanskrit and Greek alphabets; and had promised to notice in other letters (the substance of which Dr. W. would be happy to communicate to the Society) the general results of his researches.

With reference to the communication made by Dr. Wilson in behalf of Professor Westergaard, it was moved by the Hon'ble Mr. Willoughby, seconded by Major LeGrand Jacob, and unanimously resolved, that the Society subscribe for five copies of Mr. Westergaard's forthcoming work, in token of the interest which they feel in his important researches, and their pleasing remembrance of his visit to India.

The Revd. Dr. Stevenson, Vice-President, moved, on behalf of the Cave-temple Commission, "That the attention of the Society having often been drawn to the subject of the inscriptions engraved on the rocks and in the Caves of Western India, and more especially lately in a paper by our associate Sir Erskine Perry, the Government be applied to for the purpose of appointing an Agent to copy accurately and take impressions of all these inscriptions, under the superintendence of the Cave-temple Commission." This proposition was adopted by the Meeting.

A letter was read from Dr. Buist, containing a geological section of

a well sunk at Cochin, on the sea shore, under the directions of General Cullen. The excavations had been carried to the depth of 40 feet, and the strata passed through were successively, from above downwards,—1, ferruginous clay; 2, a variety of laterite, or new red sandstone? 3, lithomargic clay; 4, blue clay; 5, lignite; 6, sandy clay; 7, calcareous clay, or marl; 8, compact dolomite limestone, with organic remains. Dr. Buist considers this "variety of laterite" not to be a part of the laterite formation, but to be a bed of red indurated sand, corresponding to the littoral concrete of Bombay; and therefore that the lignite, copalite, &c. found next it, does not, as before supposed, lie under the laterite, but, probably, as General Cullen suggests, under "new red sandstone?"—*20th March* 1851.

A letter dated 17th March 1851 was read from Sir Henry Elliot, Secretary to the Government of India, with the Governor General, forwarding copy of one in which the Most Noble the Governor General has been pleased to direct that Dr. Flemming should be instructed to furnish a series of specimens, illustrative of the mineral resources of the Punjab, to the Asiatic Societies of Calcutta and Bombay.

The Government letter No. 1520, dated 12th ultimo, forwards the following copy of one (No. 14 of 1851) from Captain Meadows Taylor, of the Nizam's Service :—

No. 14 of 1851.

From Captain Commandant M. TAYLOR,
On special duty, Shorapoor,

To C. J. ERSKINE, Esq.,
Deputy Secretary to Government, Bombay.

Sir,—I have the honor to acknowledge the receipt of your letter of the 9th ultimo, No. 136, together with the copy of Dr. Wilson's Memoir on the Cave-temples of Western India which accompanied it.

2. I beg you to do me the favor to communicate the expression of my sincere thanks to the Right Hon'ble the Governor in Council, for his courtesy in transmitting to me this interesting memoir; and I have only to regret that there are no Cave-temples in the district under my authority to afford me the opportunity of obeying his Lordship's wishes.

3. The most curious remains I have found in this district are those which appear to be Druidical, or Scythic-Druidical, and which, whether as Cromlechs, Kistvaens, Cairns, or Barrows, have the closest resem-

blance to European Druidical remains. On this subject, I have recently written to Dr. Wilson an account of such discoveries as I have been able to make in the Shorapoor district, and included with them an account of some similar remains at a village in the Kanakagheree districts, near the Toombudra, which was visited at my request by a friend, the Revd. G. Keis, of the German Mission.

4. It is known that these remains exist in large numbers on the Neilgherries, and in regard to which a valuable and interesting paper by Captain Congreve, of the Madras Artillery, appeared in the "Madras Journal of Literature and Science," No. 32, and they have also been noticed in some parts of Mysore. I have no knowledge of their extending northwards further than the Bheema in this district; but as they extend to the Toombudra to the South, it is desirable, perhaps, to endeavour to trace them further, and I would recommend that the Collectors of Dharwar, Belgaum, and Sholapoor, the Officers of the Revenue Survey, if any, in those districts, the Political Agent in the Southern Mahratta Country, and the Commissioner of Sattara, be requested to institute inquiries as to the existence of any similar remains in their several jurisdictions, and to examine their contents.

5. I will not enter upon a detailed description of these remains, having so recently written to Dr. Wilson on the subject for the Asiatic Society, but it may be fitting to mention that I find them of four kinds—

1st, *Cromlechs.*—Erections consisting of three large slabs of stone set edgeways in the earth, with one large slab as a covering: one side, usually the South, is open. These erections vary much in size; the largest slabs I have seen are about 12 feet long, 8 to 10 feet broad, and 1½ thick. They do not contain any remains.

2nd, *Kistvaens, or closed Cromlechs.*—These are similar to the others, only that all four sides are closed; and usually in the South slab, about the middle, is a round hole, from 6 to 9 inches in diameter. These contain earthen vessels filled with earth, calcined human bones and ashes, mixed with charcoal.

3rd, *Cairns.*—Circles of stones, double and single, surrounding small *tumuli:* when opened to a depth of 8 to 12 or 14 feet, stone chests, composed of slabs of stones, are found, containing skeletons, accompanied by remains of spear-heads, and other weapons, earthen vessels, &c. In others, larger vessels, containing human bones and ashes, with charcoal, similar to the kistvaens, and no stone chests.

4th, *Barrows.*—These are larger than cairns, and consist usually of several cairns, or one large one, surrounded by others, as at Shapoor.

6. The vessels in these cairns &c. are all of the same character,—strong earthenware, with a bright red glaze; some have a black glazing also, some are half red and half black. It is worthy of remark that vessels of the same colour are found in these remains in Europe, and on the Neilgherries.

7. I have written privately on this subject to Bellary, and to a friend in the Mysore Commission, whose district adjoins Bellary, and shall hereafter do myself the pleasure to communicate any discoveries which may be made.

8. As the subject is of considerable antiquarian interest, in consequence of the coincidence of these remains and those of Europe, I trust I may be excused for directing such particular attention to them; but it is very desirable that they should be traced as far as possible, with a view to define the boundaries of the expeditions in India of this probably nomadic tribe.

9. It would also be curious to trace whether any of these remains exist in Cutch, Guzerat, or Khandeish, as well as in the Northern part of the Dekhan. Notice might also be given of the subject in Scinde, and if remains exist there, they might possibly be traced onwards, though this is a mere hypothesis.

10. The only other objects of antiquity in the Shorapoor district are the inscriptions in old Canarese which exist at Sirwal, Yeoor, Kembhavee, and other places where ancient Singum temples exist. I have understood that these have already been included in the collections of Mr. Walter Elliott, of Madras, and I have referred to him for information: should they have escaped him, I shall do myself the honor of transmitting them to the Society.

I have, &c.,

(Signed) MEADOWS TAYLOR, Captain,
On special duty, Shorapoor.

Shorapoor Districts, Camp Jourghee,
27th February 1851.

The Secretary stated that a subscription list had been opened, according to the request of the Society, for reprinting the "Transactions of the Literary Society of Bombay" in an 8vo. form, which Messrs. Longman and Co. had agreed to do if one hundred subscribers at Rs. 20 each could be obtained, and that sixty-four copies had already been subscribed for. The Society then requested that non-resident Members should also be invited to subscribe, and the community generally.

Major LeGrand Jacob moved for discussion at the next Meeting,

—"That measures be taken by the Society for the recovery, if possible, of the Inscriptions alleged to have been removed from the Temples of the Sun and of Somnath, in the Guzerat Peninsula, by communication to the parent Society, by notice in the papers, and in other suitable modes." Major Jacob stated that as the local tradition was prevalent that the slabs containing the Sais Inscriptions were taken from the temple by gentlemen, they might probably be now deposited in some public or private Museum, and every year that passes without endeavouring to regain them only adds to the risk of again connecting them with the history of the country.—*24th April* 1851.

The following letter from the Hon'ble J. P. Willoughby, Esq., late President of the Society, tendering his resignation, was read :—

"To H. J. CARTER, Esq., Secy. B. B. R. A. S.

"SIR,—In consequence of my approaching return to Europe, I beg that you will do me the favor of intimating to the Society my resignation of the office of President, and at the same time express to the Society the deep and warm interest I shall always feel in its prosperity, and in the success of its endeavours for the advancement of literature and science in India.

"I have the honor to be, &c.

"*Bombay, 25th April* 1851." (Signed) "J. P. WILLOUGHBY.

The Revd. Dr. Wilson, Honorary President of the Society, seconded by W. E. Frere, Esq., then proposed the following Resolution :—

"That the Society, on accepting the resignation of its President, the Hon'ble J. P. Willoughby, Esq., beg to express to him their best thanks for the ability and courtesy with which he has uniformly discharged the duties of the chair; the valuable assistance he has so frequently rendered the Society; and the great interest which, during many years, he has taken in its various proceedings."

This resolution was carried unanimously, and the Secretary requested to communicate the same to Mr. Willoughby by the following mail.

The letters Nos. 1808 and 1830 of 1851, from J. G. Lumsden, Esq., Secretary to Government, General Department,—the former sanctioning the employment of Mr. Fallon, Portrait Painter, &c. for twelve months, to illustrate the Caves of Elephanta, and the latter requesting the Society to propose some one to copy and take impressions of the Cave-temple and other ancient Inscriptions throughout the Presidency,

having been acted upon by the Cave-temple Commission, the Secretary stated that Mr. Fallon had already been engaged a month at Elephanta in the way mentioned, and that a party had been proposed by the Commission to Government for copying the Inscriptions, &c.

Letter No. 1832 of 1851, from J. G. Lumsden, Esq., forwards copy of a letter No. 4, idem, from Captain Kittoe, (Architect, Benares College, and Archæological Engineer, Bengal,) to the address of Government, in reply to one received from the latter with a copy of Dr. Wilson's "Memoir" on the Cave-temples, &c.; also a printed copy of some articles written by Captain Kittoe on the Caves of Gya, and other Antiquities of the province of Behar; together with an Address to the President and Members of the Bombay Branch of the Royal Asiatic Society, from Captain Kittoe, respecting the necessity for all engaged in archæological research to communicate regularly with each other, and to interchange copies of Inscriptions as well as drawings, particularly of Idols and of architectural features, as well as notes on the same.

The address, after having been read to the Society, was directed to be handed over to the Cave-temple Commission; and a copy of each No. of the Society's Journal, as it is published, to be forwarded to Captain Kittoe, that he might be informed of what the Society is doing in this respect.

The Secretary having stated, with reference to reprinting the three volumes of the Literary Society's Transactions, that there were subscribers for 65 copies, was requested to invite the non-resident Members to join in the subscription, and the community generally;—100 subscribers at Rs. 20 each being required to make up the cost of the reprint.

A letter was read from Mr. Fallon, dated Elephanta, 19th ultimo, calling the Society's attention to the flooding of a part of the Caves which will follow the late removal of earth from the Eastern side, and which will render the Caves most unhealthy during the fair season; also suggesting that it might be easily avoided by cutting a trench from the part where the water will collect to the declivity of the rock.

The Secretary was requested to forward a copy of Mr. Fallon's letter to Government, stating the desirableness that these Caves, already so notoriously malarious, should be rendered as healthy as possible, not only for the sake of enabling Mr. Fallon to complete his illustrations of them, but for the sake also of people who may hereafter visit them as a matter of curiosity.

The following alterations in the Society's Rules, proposed by Captain French, seconded by Captain H. Barr, were submitted for discussion at the next meeting:—

1st. That in lieu of the words "One hundred Rupees" and "Thirty Rupees" in Article XXI. of the Rules, "Rs. 50 and 12" be inserted, as the Annual Subscription of resident and non-resident Members respectively in future.

2nd. That the above shall not affect the present Members of the Society in the current year, but be applicable solely to the new Members, and all Members for the year 1852.

3rd. That in consideration of the present wants of the Society, and the anticipated increase to its Members, should the first proposition be carried, an Assistant Secretary, on a salary of 100 Rs. per mensem, be sanctioned, he however always being an Ordinary Member of the Society.

Dr. Gibson's communication (p. 140) was then read. The hot springs at the Lukkee Pass, in Scinde, are stated to issue from limestone: they are sulphureous, and the degree of their temperature varies.

That at Kal-Droog, in the Northern Concan, flows from the trap; its temperature is 130°, and taste strongly saline. With the exception of this one, Dr. Gibson has not met with any springs from Kandeish and Surat southward to Rajpoor, impregnated with saline matter; but has heard of one in the vicinity of the last mentioned, viz., at Vehlolee, near Dysar, in the Bassein talook, which he recommends visiting. The Vaziriabhoy spring is not saline. He also alludes to the intermittent cold springs "at Rajapoor, in the Southern Concan; and to a hot spring at Rajapoor, in the low valley which encloses the river; the former are situated on the slope of an adjacent hill, and are stated to be only active during part of the year; they are also said to burst out from May to July, and to continue running from three to four months.—*22nd May* 1851.

Election of President.

The Hon'ble Sir Erskine Perry, Knight, Chief Justice of Bombay, having been proposed by the Revd. Dr. Wilson, Honorary President, seconded by Roderick Mackenzie, Esq., was unanimously chosen to fill the vacant office of President, caused by the departure to Europe of the Hon'ble J. P. Willoughby, Esq.

It was resolved that a deputation, consisting of the Revd. Dr. Wilson, Professor Harkness, and the Secretary, should wait upon Sir Erskine Perry, to request his Lordship to do the Society the honor to accept its Presidentship.—*12th June* 1851.

The Hon'ble Sir Erskine Perry, having accepted the office of President, expressed his thanks to the Society for his election.

Captain French brought forward his propositions for reducing the Subscriptions of resident and non-resident Members, recorded in the Minutes of last Meeting, which were not carried, 19 having voted for, and 23 against them.

Professor Harkness, seconded by Captain Estridge, proposed, for consideration at the next meeting,—"That no question once disposed of by a vote shall be again brought forward for discussion within twelve months."—17*th July* 1851.

Professor Harkness brought forward his motion, recorded in the Minutes of the last Meeting, and A. Malet, Esq., seconded by the Rev. Dr. Wilson, Honorary President, moved as an amendment—

"That no alteration in the Rules of the Society be made, except at an Anniversary Meeting, or at a Special Meeting, by a majority of the resident Members."

Professor Harkness then withdrew his motion in favor of the amendment, which, having been put to the Society, was carried by nearly all present.

A. Malet, Esq., moved for consideration at the Anniversary Meeting:—

"That Subscribers be admitted under direction of the Committee of Management at Rs. 24 per annum, paid half-yearly in advance, which shall entitle them to read in the Society's Library, and to take out one work at a time, but not to have works circulated to them.

"Should the work consist of more than three volumes, or should a larger number of books be required by the Subscriber, the Committee of Management to have the discretionary power of complying with their request."

Captain French intimated his intention to move at the next meeting—

"That a printed Catalogue of the works added to the library, with the cost of each, (if purchased,) since the last Annual Meeting, be yearly laid on the table, and a copy sent to every Member, resident and non-resident."

On the application of Dr. Wilson, the Society agreed to present to the University of Leipzig, through Dr. Grant, who lately visited Bom-

bay, one of the remaining copies of the lithographed edition of the Vendidad and Liturgical works of the Parsís, with the Gujarátí translation of Framjee Aspandiarji. The learned establishment at this place, Dr. W. stated, had been overlooked, when copies of these works were formerly sent to Europe; and it is entitled to the courtesy of a presentation copy, not only from its own importance, but from the research of its present Sanskrit Professor Brockhaus, who has lately published an edition of the Vendidad, &c. in the Roman character, with a valuable index, illustrative of the present state of the philological investigation of the Zend language.

Dr. Wilson also stated that an opportunity having offered itself of directly forwarding a complete copy of the Society's Journal to the Society of German Orientalists, it had been embraced. The Society approved of what had been done in this matter, as it regularly receives the Zeitschrift of the German Society on its publication, and directed its own Journal to be regularly forwarded in exchange in future.

The Secretary stated, with reference to the subscription list for reprinting the "three volumes of the Transactions of the Literary Society of Bombay," that 77 copies had been subscribed for, and requested that the reprint might now be ordered in octavo, &c. &c. as proposed by the Hon'ble J. P. Willoughby, Esq., at the Society's Meeting held on the 20th March last.

With reference to the letter from Government, No. 3261 of 1851, forwarding a number of lithographed copies of Captain Taylor's letter, bearing date 27th February last, on the remains of Cairns, Cromlechs, and Kistvaens, in the Shorapoor Districts, and the desirableness of ascertain ng if similar remains were to be found in other parts of this Presidency, it was resolved that copies should be handed over to the Cave-temple Committee, for distribution in such a manner as would render Captain Taylor's object most likely to be attained.

Dr. Bradley's paper (p. 140) on Rock-cut Caves of Aurungabad was also handed over to the Cave-temple Committee, for their forthcoming report.—*14th August* 1851.

The Hon'ble the President, seconded by Captain French, proposed the following resolution, viz:—"That as no division took place on Mr. Malet's motion, which was carried at the last Meeting, there is no evidence on the Minutes to show that it was decided by two-thirds of the Members then present, and therefore the resolution adopting the
1 1 motion is void under Art. XVIII. of the Society's Regulations."

The Revd. Dr. Wilson, Honorary President, seconded by Captain Forbes, then moved as an amendment :—"That it is competent to this Meeting to declare that the majority in favor of Mr. Malet's motion, which was carried at the last Meeting, consisted of two-thirds of the Members then present."

The amendment was submitted, and lost by a small minority, and the original motion carried by the casting vote of the President, six having voted for, and six against it.

The Hon'ble the President, seconded by Captain Forbes, intimated his intention to move at the next Meeting,—"That it be referred to a Select Committee to consider whether any change can be made without injury to the Society in reducing the Annual Subscription, in order to make it more accessible to scholars, and to promote the further investigation of Oriental Arts and Sciences."

It was also proposed by the Hon'ble the President, seconded by the Revd. Dr. Wilson, "That a Special Committee, composed of the Revd. Dr. Stevenson, Captain French, H. Conybeare, Esq., and the Secretary, be appointed, to report on the present state of the Society's Museum, and the arrangements that might be made for extending its utility." Agreed to.

Proposed by the Revd. Dr. Wilson, seconded by Dr. Don,—"That Dr. Leith, Professor Harkness, and the Secretary, be appointed to receive the books ordered for the Malcolmson Testimonial, and to carry into effect the remaining part of the Society's resolution respecting them." Agreed to.

The letter from Dr. Buist having been read, forwarding copy of one dated 10th March 1851, from M. F. Maury, Esq., intimating that a box had been sent to Smith, Elder and Co., containing, among other things, the following presents to the Bombay Asiatic Society from the National Observatory at Washington, viz.—1 vol. Astronomical Observations, and a complete set of Charts, as far as published, the Secretary was requested to acknowledge the intimation, with the Society's best thanks, and to present a complete set of the Society's Journal in return to the National Observatory of Washington, taking advantage of Dr. Buist's kind offer to forward the parcel free of charge.

The letter from Captain Eckford, submitting a plan for the illustration of the monuments of antiquity in Western India, in accordance with the views of the Hon'ble the Court of Directors, was handed over for the consideration of the Cave-temple Committee.

Dr. Wilson, referring to a letter addressed to him by Assistant

Surgeon F. Broughton, dated Kolapore, the 25th ultimo, mentioned that several ancient excavations and temples had lately been discovered by that gentleman, which would be duly brought to notice in the next Memoir of the Cave Commission.—*11th September* 1851.

Dr. Wilson read an extract of a letter to his address from Professor Westergaard, of Copenhagen, dated the 21st July last, thanking the Society for its subscription to his critical edition of the Zend writings; intimating his publication of an edition of the Pehlivi Bundehesh, and his presentation to the Society of a copy; and expressing his opinion, founded on a critical examination of the so-called Pehlivi writings, that they are not in any Sasanian language, but merely in a dialect (probably the Kirmanian) of the modern Persian, disguised by the use of an imperfect alphabet, often now mis-read by the Parsís, the Shemitic words introduced into it being merely corrupted Arabic. Dr. Wilson, after illustrating Mr. Westergaard's theory of the Pehlivi by a few examples, expressed his entire concurrence in it, and stated that it accorded with suspicions which he had now for some time entertained.

The Government letter No. 3837, forwarding a copy of one from H. B. E. Frere, Esq., to the Government, with a communication respecting the remains of Cromlechs, Cairns, Barrows, &c. in Seinde, by Captain Preedy, Collector of Kurrachee, was handed over to the Cave-temple Committee.

In accordance with the request of the Society at last Meeting, the Committee then appointed to look into the state of the Museum, &c. had assembled, but had not been able to procure all the estimates necessary to accompany their report, of which that part alone was complete which had reference to alterations necessary to protect the present specimens from being destroyed by the dust. This having been read, the Society sanctioned the disbursement necessary to defray the expense of these alterations.

Captain French's motion respecting the printing of a list of the works annually purchased by the Society, recorded in the Minutes of the Meeting before last, was unanimously carried.

The Hon'ble the President's motion, proposed at the last Meeting, respecting the reduction of the annual Subscription, was also carried, with the exception of the words "the Committee" being substituted for "a Select Committee," 14 having voted for, and 4 against this amendment.

A. Malet, Esq., C. S., then moved the following Resolutions:—

1st. "That at a Meeting of the Society the perusal by the Secretary of the Proceedings of the previous Meeting is solely for the purpose of verifying the correctness of the Secretary's record." This was unanimously carried.

2nd. "That it is not competent to a Meeting to decide on the validity of the Proceedings of a former Meeting, in the absence of the notice of intended discussion required by Art. XVIII. of the Rules."

To this Dr. Stevenson, Vice-President, seconded by Captain French, moved as an amendment—"That this question be referred for the opinion of the Committee of Management." The amendment was carried, 12 having voted for and 4 against it.

3rd. "That the Resolution of the last Meeting, by which, without the notice of discussion required by Art. XVIII. of the Rules, a Resolution of the previous Meeting was annulled, be rescinded."

To this also Dr. Stevenson, seconded by Captain French, proposed the foregoing amendment.

The Revd. Dr. Wilson then moved, "That in addition the Committee be further requested to ascertain and report upon the facts connected with the voting for the resolution referred to in the latter part of Mr. Malet's third motion." This was submitted to the Meeting, and lost, 6 having voted for, and 9 against it.

Dr. Stevenson's amendment in its original state was then put and carried unanimously.—*9th October* 1851.

Government letter No. 4049 of 1851, forwarding a copy of further communications from the Commissioner of Scinde, descriptive of certain ancient remains in that province, was handed over to the Cave-temple Commission.

With reference to Government letter No. 4004, offering to place the returns of the last Census at the disposal of the Society, the Secretary was requested to acknowledge the same with the Society's best thanks, and to state that they will be very acceptable; for, although not deemed trustworthy, as stated by the Government, they might prove useful in pointing out the practical difficulties with which Captain Baynes had to contend, and which led to their incorrectness, and thereby perhaps suggest some more effectual method of taking the Census of Bombay on a future occasion.

The report of the Committee of Management was read, respecting the possibility of reducing the Society's Subscription, &c. without injury to

the Society. The Committee had gone deeply into the subject, and considered that it was impossible. There would be a great annual deficit with the reduced Subscription, which must be supplied by reduction in the establishment, and in the purchase of books, or by the addition of many more new Members to the Society than could be anticipated; at the same time the Committee considered that the resources of the Library and Museum might, under proper restrictions, be placed freely and gratuitously at the service of persons engaged in literary or scientific pursuits, and that it might be as well to increase the powers of Members in this respect, and to allow the Committee to give access to anything under their charge.

The rest of the Report, which is lengthy, and accompanied by financial calculations, was received.

Captain French, seconded by the Revd. Dr. Stevenson, then proposed for discussion at the next Monthly Meeting :—

"That the Subscription is not intended to exclude learned students, natives of Bombay, who find it inconvenient to pay the full Subscription, from joining the Society as resident Members, and that it be referred to the Committee to devise some feasible scheme for that end."

Dunjeebhoy Framjee, Esq., Member, having laid before the Society for its approval a specimen of a Zend Dictionary in the English language, read the following Prospectus concerning it:—

"I have the pleasure to lay before the Socicty a specimen of a Zend Dictionary in the English language, which I have been engaged in preparing for several years, and I hope you will approve of it; and I beg leave to request the Members of the Society to suggest to me any improvement that may occur to them in regard to the execution of the work.

"It is intended to supply a desideratum greatly felt by the Parsís both of India and their mother country, Persia, for more than two thousand years, and to some extent by the Continental Orientalists.

"I have undertaken to publish the work in the English language as well as in the Guzerati, at the request of a few of my learned European friends, who are willing to promote the general interests of Oriental literature.

"A specimen of this work in the Guzerati language was kindly first inspected by our learned Honorary President, the Revd. Dr. Wilson, by direction of the Bombay Government, and I am indebted to him for expressing his desire that I should make an English version of the work, a suggestion which I considered it right to adopt.

"This work will be published in the two languages in two separate volumes, viz., volume 1st in English, and volume 2nd in Guzerati, with the original Zend words, with their respective transcriptions, and significations, and parts of speech.

"In this work upwards of a thousand notes will be interspersed, with philological and etymological explanations, for the purpose of a comparison of my humble opinion with those of the Parsí Priests and Continental Orientalists.

"For specimens of these notes I beg to refer you to the papers now laid before you.

"At the commencement of this work is a comparative table of the Zend Alphabet with those of the Persian, Pehlivi, Hebrew, Cuneiform Sanskrit, Guzerati, Greek, and Roman languages, in which their articulation is pointed out in their respective classes.

"Plate second contains a comparison of the Zend Orthography, according to the different systems of sixteen Asiatic and European Orientalists.

"Part 1st. Preliminary Discourse on the origin and authenticity of the Zend language and Zend Avesta.

"Part 2nd. Observations and Dissertations on the Zend Orthography.

"Part 3rd. Rudiments of the Zend Grammar.

"Part 4th. Table of the Zend Alphabets, according to the different Ravayats, and other manuscripts, &c.

"Part 5th. General remarks on the manuscripts and printed works of the Zend Avesta, &c. &c.

"Part 6th. The Pehlivi Alphabets, published with observations on the Lapidary, Cursive, and Numismatic, according to the different forms of their alphabets, to assist Pehlivian Scholars to decipher any of the Pehlivi writings of Tablets, Manuscripts, and Coins."

A letter was read from Dr. Crawford, descriptive of a large meteor which he had seen from the deck of the Steam-frigate "Zenobia," on the 7th September last, at 8 P. M., in Lat. 12° N. and Long. 46° 11′ 30″ E. It first appeared 40° above the horizon, bearing E. and S., and then pursued a horizontal course northward, vanishing at a point bearing NE. by E.—13*th November* 1851.

ANNIVERSARY MEETING.

MONDAY, 24TH NOVEMBER 1851.

THE Minutes of the last Meeting having been read and confirmed, the following Gentlemen were elected for the Committee of Management, Museum Committee, and Auditors for the ensuing year, viz :—

Committee of Management.

S. S. Dickinson, Esq.	Professor J. Patton, M.A.
Henry Young, Esq.	A. H. Leith, Esq.
Lieut. Col. J. Holland.	Revd. P. Anderson, M.A.
William Howard, Esq.	Professor Harkness, M.A.
J. Smith, Esq.	J. Don, Esq., M.D.

Museum Committee.

A. H. Leith, Esq.	Professor J. Harkness, M.A.
J. Smith, Esq.	Professor J. Patton, M.A.
H. Conybeare, Esq.	H. J. Carter, Esq.

Auditors.

A. Spens, Esq.	Captain J. G. Forbes.

Election of Vice-President.

Arthur Malet, Esq., Chief Secretary to Government, proposed by the Revd. Dr. Wilson, Honorary President, seconded by P. W. LeGeyt, Esq., Vice-President, was chosen to fill the vacancy among the Vice-Presidents, vacated by the late Colonel G. R. Jervis, of the Bombay Engineers.

The Motion of Mr. Malet, recorded in the Minutes of the Society's Monthly Meeting held on the 14th August last, was put as amended in the following form, seconded by the Revd. Dr. Wilson, viz :—

" That the Committee be requested to take into their consideration the expediency or otherwise of the formation of a class of Associate Members, who may enjoy its literary fellowship, and a restricted use of the Library, at a reduced rate of subscription, but without any interference with the Management of the Society by its constituent Members." This was unanimously carried.

A list of the works ordered for the " MALCOLMSON TESTIMONIAL" was laid before the Meeting. They are to be lettered on the backs

"BOMBAY ASIATIC SOCIETY," and "MALCOLMSON TESTIMONIAL," and stamped inside with the same, and will be placed in an appropriate part of the Library, headed also "MALCOLMSON TESTIMONIAL."

The following have been received :—

WORKS ON GENERAL NATURAL HISTORY.

	Vols.
NATURALISTS' LIBRARY. Edited by Sir W. Jardine, Bart.	40
DICTIONNAIRE UNIVERSEL D'HISTOIRE NATURELLE, with Atlas. 8vo. Edited by C. D'Orbigny.	16
ANNALES DES SCIENCES NATURELLES. 1re Série. 8vo..	30
——— Table Générale Alphabetique de	1
——— 2me Série, Tomes 40 in 20. ..	20
——— 3me Série, Tomes 26 in 14, up to 1850...	14

WORKS ON BOTANY.

Filices.

HOOKER, (W. J.,) and GREVILLE, (R. K.,) Icones Filicum. Folio .. 2

Algæ.

AGARDH, (C. A.,) Icones Algarum Europœarum. 8vo. 1
HASSALL, (A. H.,) History of the Fresh Water Algæ, &c. 8vo... .. 2

WORKS ON ZOOLOGY.

Zoophyta.

LAMOUROUX, (J. V. F.,) Histoire des Polypiers Coralligènes Flexibles. 8vo. 1
LAMOUROUX, (J.,) Exposition Méthodique des Genres de l'Ordre des Polypiers. 4to. 1
ELLIS, (J.,) Natural History of many Curious and Uncommon Zoophytes. 4to. 1
ELLIS, (J.,) Natural History of the Corallines, and other Marine Productions. 4to... 1

Acalepha.

LESSON, (R. P.,) Histoire Naturelle des Zoophytes Acalèphes. 8vo. .. 1

Entozoa.

BLANCHARD, (M.,) Les Intestinaux (Le Règne Animal, distribué d'après son Organization, par Cuvier, Ed. par une réunion, &c.) 8vo. .. 1

Infusoria.

DUJARDIN, (M. F.,) Histoire Naturelle des Zoophytes Infusoires, with Atlas. 8vo... 2

Crustacea.

EDWARDS, (M.,) Les Crustacés (Le Règne, &c. &c.), with Atlas. 8vo. .. 2

Insecta.

	Vols.
Fabricii, (J. C.,) Entomologia Systamatica, with Supplement. 8vo. ..	6
Fabricii, (J. C.,) Mantissa Insectorum. 8vo.	2
Donovan, (E.,) Natural History of the Insects of India. New Ed. by Westwood. 4to.	2
Drury, (D.,) Illustrations of Exotic Entomology. 4to.	3
Horsfield, (T.,) Descriptive Catalogue of the Insects in the Museum of the East India Company. Parts 1 & 2. 4to.	1
Pfeiffer, (L.,) Monographia Heliciorum Viventium. 8vo.	2

Mollusca.

Nyst, (P. H.,) Description des Coquilles et des Polypiers Fossiles des Terrains Tertiares de la Belgique, with Atlas. 4to.	2
Agassiz, (L.,) Monographie des Coquilles Tertiares réputés identiques avec les Espèces Vivantes. 4to.	1

Cephalopoda.

Ferussac et D'Orbigny, (A.,) Histoire Naturelle Générale et Particulière des Céphalopodes Acétabulifères, Vivantes et Fossiles, with Atlas. Folio.	2

Pisces.

Cuvier, (Le Baron,) et Valenciennes, (M. A.,) Histoire Naturelle des Poissons. 8vo..	22

Reptilia.

Dumeril et Bibron, Erpétologie Générale, ou Histoire Naturelle complète des Reptiles..	7

Aves.

Gray, (G. R.,) The Genera of Birds. Folio.	3
Latham, (J.,) A General History of Birds, with Index. 4to. 10 vols. in 6..	6

The Secretary having represented that more cases were required in the Society's Museum for the preservation of Specimens which are now lying exposed and loose about the Museum, as well as for the reception of others which might hereafter be presented, it was unanimously resolved that cases, of a similar construction to those in the centre, be placed round the walls of the Museum, for the purpose mentioned.

GEOLOGICAL MAP OF THE ISLAND OF BOMBAY.

Scale of one inch to 1200 yards.

1 Mile 2 Miles 3 Miles.

Beach
Clay
Dyke 4th. Effusion
Volcanic Breccia
Amygdaloid
Basalto-Dioritic Tract
Fresh water Formation
2d Effusion
3d.
4th

Diagram.

Riva Fort
Dyke
Sion
Black Jaspideous Pk.
Anto's Hill
Wadala
Black Jaspid. Pk
Sewree
Dr Buist's House
Jackariya's Bund
Kandlee Battery
Dharavee
Matoonga
Nagaum
Parel Tank
Parel
Lowjee Castle
Chinchpoogly Hill
Tank Bunder
Gowrdevi
Mazagon
Mazagon Hill
Newrajee Hill & Quarry
Carnac Bunder
Cross Id.
Black Jaspid. Rock?
Mahim
Spilite Pk
The Flats
Byculla
Babooleh Tank
The Fort
Native Town
Grant Road
Phipp's Oasis
Sindu Para
Worlee
Basaltic Cols.
Coal
Sluices
Love Grove
Mama Hajanee
Mahaluximee
Girgaon
Malabar Hill
Malabar Point
Basaltic Columns
COLABA
Light House

Site of Bombay as it was.

Site of Bombay as it now is.

Transverse Section of the Island of Bombay from a Point 500 yds. N. of the Sluices to one 500 yds. N. of Jakariyah's Bunder.

M.G.C.