JOURNAL

OF THE

CEYLON BRANCH

OF THE

ROYAL ASIATIC SOCIETY,

1897.

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VOLUME XV.

No. 48.

EDITED BY THE HONORARY SECRETARY.

The design of the Society is to institute and promote inquiries into the History, Religions, Languages, Literature, Arts, and Social Condition of the present and former Inhabitants of the Island, with its Geology and Mineralogy, its Climate and Meteorology, its Botany and Zoology.

COLOMBO:

H. C. COTTLE, ACTING GOVERNMENT PRINTER, CEYLON.

1898.

ERRATA.

Vol. XIV., No. 47, 1896, p. 257, *for* "decade" *read* "millenium."

Vol. XV., No. 48, 1897 :—The colouring key of "Plan of *Sigiri-gala*" (summit) has been transposed. Area, 1895, is correctly bordered in mauve on the "Plan," and Area, 1897, pale pink.

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JOURNAL

OF THE

ROYAL ASIATIC SOCIETY,

CEYLON BRANCH.

COUNCIL MEETING.

Colombo Museum, January 18, 1897.

Present :

Mr. Staniforth Green, Vice-President, in the Chair.

Mr. J. Ferguson. | Mr. P. Freüdenberg.
Mr. C. M. Fernando. | Mr. E. S. W. Senáthi Rájá.

Mr. J. Harward and Mr. G. A. Joseph, Honorary Secretaries.

Business.

1. Read and confirmed Minutes of Meeting of Council held on December 3, 1896.

2. Laid on the table a communication from the Lord Bishop of Colombo regarding an application by the Rev. J. F. X. Alvarez for permission to remove books from the Society's Library.

Resolved,—That the matter be left for the Secretaries to deal with : the Council being of opinion that the Rev. Mr. Alvarez should join the Society if he wishes to take books out of its Library ; but that, if he only desires to consult some one work, it may be issued to him.

3. Laid on the table a letter from the Hon. the Colonial Secretary covering a letter from the Secretary of the Geographical Society, Lisbon, regarding exchanges of Ceylon specimens, &c.

Resolved,—That the Government be informed that the carrying on of exchanges, as suggested, does not fall within the scope of the Society.

4. Laid on the table draft Annual Report of the Council for 1896.

On the motion of Mr. Ferguson, seconded by Mr. Fernando, it was resolved that the Report be adopted.

5. Resolved,—That Mr. Stanley Bois be asked to kindly audit the Society's accounts, and, failing him, that Mr. E. Booth be asked.

6. Considered question of nominating Office-Bearers for 1896.

Mr. P. Freüdenberg and Mr. F. M. Mackwood retire from the Council by seniority, and Messrs. H. F. Tomalin and P. Rámanáthan by reason of least attendance, under Rule 16.

Resolved,—That Messrs. Freüdenberg and Mackwood be re-elected; that Messrs. Rámanáthan and Tomalin be deemed to have retired from the Council; and that in their places Messrs. J. P. Lewis and F. H. de Vos be nominated; further, that the vacancy caused by Dr. H. Trimen's death be filled by Mr. A. Haly, Director of the Colombo Museum.

Resolved,—That the following Office-Bearers be nominated for 1897, viz.:—

President.—The Right Rev. the Lord Bishop of Colombo.

Vice-Presidents.—The Hon. Mr. Justice Lawrie and Mr. Staniforth Green.

Council.

Hon. P. Coomáraswámy.
Mr. J. Ferguson.
Mr. C. M. Fernando.
Mr. P. Freüdenberg.
Mr. A. Haly.
Mr. J. P. Lewis.
Mr. F. M. Mackwood.
Mr. F. H. Price.
Mr. W. P. Ranasinha.
Mr. E. S. W. Senáthi Rájá.
Dr. W. G. Vandort.
Mr. F. H. de Vos.

Honorary Treasurer.—Mr. F. C. Roles.

Honorary Secretaries.

Mr. H. C. P. Bell, C.C.S.; Mr. J. Harward, M.A.; Mr. G. A. Joseph.

7. Resolved,—That the Annual General Meeting be held on Saturday, February 6, 1897, and the following be the business:—

(1) To read the Council's Annual Report for 1896.

(2) To elect Office-Bearers for 1897.

8. Laid on the table five Papers on "Ceylon Industries," by Mr. C. Perera Ekanáyaka.

(i.) "Sinhalese Folklore: *Batala* Cultivation."
(ii.) "Paddy Cultivation."
(iii.) "Mat, Hat, and Bag Making."
(iv.) "Lace Making."
(v.) "Cabook Cutting."

Resolved,—That the Papers be referred to Messrs. C. M. Fernando and G. A. Joseph for their opinions.

ANNUAL GENERAL MEETING.

Colombo Museum, February 6, 1897.

Present:

The Hon. Mr. Justice Lawrie, Vice-President, in the Chair.

Mr. P. Freüdenberg.
Dr. L. Pinto.
Mr. Lewis Walker.
Rev. F. H. de Winton.

Mr. J. Harward and Mr. G. A. Joseph, Honorary Secretaries.

Visitors: five gentlemen.

Business.

1. Read and confirmed Minutes of General Meeting held on January 9, 1897.

2. Mr. HARWARD read the following—

ANNUAL REPORT FOR 1896.

The Council of the Ceylon Branch of the Royal Asiatic Society have the honour to lay before this Meeting their Annual Report for the year 1896.

MEETINGS.

Six General Meetings of this Society have been held during the year,* at which the following Papers were read and discussed, viz.:—

(1) "Legislation in Ceylon in the early portion of the Nineteenth Century," by H. White, C.C.S.
(2) "On a Curious Nematoid Parasite from the Stomach of a Ceylon Insect (*Mantis religiosa*)," by O. Collett, F.R.M.S.
(3) "How the last King of Kandy was captured by the British," by T. B. Pohath.
(4) "Ancient Cities and Temples in the Kurunégala District: II.—Ridí Viháré," by F. H. Modder.
(5) "The Inauguration of the King in Ancient Ceylon," by C. M. Fernando, B.A., LL.B.Cantab., M.R.A.S.Eng.
(6) "Ancient Cities and Temples in the Kurunégala District: III.—Panduwas Nuwara," by F. H. Modder.
(7) "Robert Knox's Sinhalese Vocabulary," by D. W. Ferguson.
(8) "Place Names of the Vanni," by J. P. Lewis, M.A., C.C.S.
(9) "Reland on Malay, Sinhalese, and Tamil," by J. P. Lewis, M.A., C.C.S.
(10) "Note on the Fortifications of Yápahuwa," by J. Harward, M.A.Oxon.

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* General Meeting, January 9, 1897, at which Paper (11) was read, is included in the Part for 1896, for convenience.

(11) "Interim Report on the Operations of the Archæological Survey at Sígiriya (Second Season), 1896," by H. C. P. Bell, C.C.S., Archæological Commissioner.

MEMBERS.

During the past year ten new Members were elected, viz., C. Muttiah; Dr. J. S. Johnpulle; Coomáraswámy Srikánta; C. Namasivagam; D. J. Arsecularatne; L. Walker, M.A.; G. W. Bibile; E. S. D. Tillekeratne; J. E. D. Silva; and G. C. Trask.

Five Members resigned, viz., G. Grenier; C. O. Mackwood; H. Nevill, C.C.S.; Hon. F. R. Saunders, C.M.G., C.C.S.; and A. Thomson.

The following names of Members were removed from the roll for not comforming to No. 30 of the Society's Rules, viz.:—J. D. Casinader, F. W. de Silva, W. H. Dias, N. A. W. Jayawardena, N. Mendis, A. H. Monarasiṅha, R. O. S. Morgan, and S. Visuvalingapillai.

The Hon. L. F. Lee has rejoined the Society as a Life Member.

Mr. A. Haly, the Director of the Colombo Museum, was elected an Honorary Member in recognition of services rendered by him, and in virtue of his official position as Director of the Colombo Museum.

By the death of Dr. H. Trimen the Society has lost one of its most distinguished Members. Dr. Trimen was born in London in 1843 and educated at King's College. He studied medicine, and in 1865 graduated M.B., but he never practised his profession. In 1867 he was appointed Lecturer on Botany at St. Mary's Hospital, and in 1869 entered the Botanical Department of the British Museum as a Senior Assistant. He remained in the Museum till 1879, when he accepted the post of Director of the Royal Botanic Gardens, Ceylon. His first published work appeared in the *Phytologist* in 1862. In 1869, conjointly with Mr. W. T. Thiselton-Dyer, the present Director of the Kew Gardens, he brought out a work on the "Flora of Middlesex," which still holds a position in the first rank among county "Floras." In 1866 Dr. Trimen discovered *Wolffa arrhiza* at Staines, the first locality recorded for it in England. In 1870 he joined Dr. B. Seeman in editing the Journal of Botany, and was sole editor from 1872 to 1879. In 1880 he associated himself with Professor Bently in the publication of an illustrated work in four volumes on "Medicinal Plants." Dr. Trimen's great work is his "Handbook to the Flora of Ceylon," three volumes of which have been published, while the fourth and last has been left unfinished. To the *Encyclopædia Britannica* he contributed a Paper on Grasses. Dr. Trimen was a Fellow of the Linnæan Society, and in 1883 was elected a Fellow of the Royal Society. He joined this Society in 1880, and was for several years a Member of Council. He always took an active interest in the Society's affairs and contributed the following valuable Papers to its Journal:—

(i.) "A Systematic Catalogue of the Flowering Plants and Ferns Indigenous to, or growing wild in, Ceylon, with the Vernacular names and with reference to Thwaites' *Enumeratio*;" published in Journal, Vol. IX., No. 30, 1885.

(ii.) "Remarks on the Composition, Geographical Affinities, and Origin of the Ceylon Flora;" published in Journal, Vol. IX., No. 31, 1885.

(iii.) "Note on the Botany of Riṭi-gala;" published in Journal, Vol. XI., No. 31, 1889.

Library.

The additions to the Library during the year numbered 278 volumes. The acquisitions are chiefly exchanges received from other Societies. The Library is indebted for donations to the following:—The Government of Bengal, the Secretary of State in Council for India, United States Department of Agriculture, the Ceylon Government, the Director of Public Instruction, the Government of India, the Government of Bombay, the Government of Punjab, Calcutta Sanskrit College, the Government of Madras, Harward University, the Government of Queensland, the Government of North-West Provinces and Oudh, and to Messrs. D. W. Ferguson, G. A. Joseph, and Dr. H. Trimen.

Additional shelf accommodation has been provided, by which the books have been rendered more accessible and the congested state of the Library relieved to some extent. Some of the books stored away in cupboards can now be conveniently consulted. The want of space for books, referred to in previous Reports, is still a most pressing question, and seriously interferes with the proper administration and development of the Library. No adequate remedy for this state of things can be expected until additional space has been procured by the long-delayed extension of the Museum building.

Journals.

One number of the Society's Journal has been published during the year (Vol. XIV., No. 46, 1895), which contains, in addition to the Proceedings of the Council and General Meetings, the following Papers:—

(i.) "Gleanings from Ancient Tamil Literature," by the Hon. P. Coomáraswámy.

(ii.) "King Seṇkuṭṭuvan of the Chera Dynasty," by the Hon. P. Coomáraswámy.

(iii.) "Interim Report on the Operations of the Archæological Survey at Sígiriya in 1895," by H. C. P. Bell, C.C.S., Archæological Commissioner.

(iv.) "A Sketch of the Early History of the Ceylon Branch of the Royal Asiatic Society," by the Lord Bishop of Colombo, President.

The Journal for 1896 is ready, and an advance copy is laid on the table.

Archæology.

The Archæological Commissioner favours the Council with the following synopsis of the work done by the Archæological Survey in 1896:—

General.

The Archæological Vote for last year was Rs. 35,000—covering Salaries of the whole staff, Transport, Labour, and Miscellaneous charges (grants to other Provinces, photography, epigraphical work, &c.).

With this sum the Archæological Commissioner was enabled to push on operations at Sígiriya (Central Province) vigorously for a second season, and to further continue the hunt for ancient sites and inscriptions in the North-Central Province.

But at Anurádhapura itself steady advance in excavating the vast ruin-strewn area still untouched has unfortunately been again retarded

by limited means. In November and December—wet months best suited for digging—all excavation had to be suspended from sheer want of money.

Similarly, in the epigraphical branch, beyond adding considerably to the already large stock of inscriptions copied, and suitable for publication, the Archæological Commissioner found himself powerless to start the issue of that most desirable work—a standard "*Epigraphia Zeylanica*."

Sigiriya.

The Archæological Commissioner's "Interim Report on the Operations of the Archæological Survey at Sígiriya (Second Season), 1896," has recently been read at a General Meeting of this Society.

At Sígiriya some four months' work has resulted in decided progress. Almost the entire site of the ancient *nuwara*, or city, has been swept of undergrowth and carefully surveyed. On the summit of the Rock fully half of the interesting citadel (with its terraces, stairs, walls, tanks, &c.) is now laid bare, and its general plan well disclosed.

Below, the difficulty of gaining access into the two fresco "pockets," in the west scarp overhanging the "gallery," has been finally surmounted; and of the twenty-two frescoes left on *Sígiri-gala*, six have already been accurately copied in oils by Mr. D. A. L. Perera, Head Draughtsman, Archæological Survey.

Work is about to re-commence at Sígiriya for the third season.

Kégalla District.

In 1895 a grant of Rs. 500 was sanctioned by Government for the restoration of the basement of that unique ruin *Berendi Kóvil*, near Avisáwélla. Last year, a further sum of Rs. 600 was allowed for rebuilding the ornamental wall of the terrace on which the shrine stands.

The Assistant Government Agent, Kégalla, reports that the work has been most effectively carried out, from first to last, by Mr. Mayes, District Engineer.

Anurádhapura.

(*a*) *Thúpáráma.*—The whole of the buildings within the outer boundary have now been excavated, and the quadrangular wall line exposed along its full extent. The ruined site immediately west of the Dágaba (sometimes termed "Mihindu's Tomb," and partially excavated by Mr. J. G. Smither twenty years ago) has been dug up, afresh, and more fully. The *pirivena*, outhouses, &c., are being followed, in order to ascertain, as far as possible, the complete original plan of the Thúpáráma Monastery premises. Further, the sloping bank of *débris* which hid the other half (not excavated in 1895) of the high wall encircling the raised *maluwa*, or platform, of Thúpáráma Dágaba, was completely removed. The appearance of this most picturesque *stúpa* has thereby been greatly enhanced.

(*b*) *Mulla-gala Ruins.*—A party was detached to excavate a small block of ruins, lying in thick jungle, half way between the Jaffna road and the Malwatu-oya, and some three miles out of the town. This little monastery, complete in itself, is evidently very ancient. The style of the buildings—not more than half a dozen in all—recalls those at Riti-gala in plain simplicity of stonework. The *pilima-gé* (image-house) at the back was strikingly perched on a rocky knoll, mounted by three or four flights of steps.

(*c*) *Puliyaṇkulam Monastery.*—The same party next commenced excavating the extensive monastery bordering the Jaffna road at the junction with "MacBride's Deviation." So far, only three of the four shrines of the inner enclosure, and two or three buildings outside, have been finished. This monastery, though larger, so closely resembles "Vijayáráma" that it probably belongs to the same period.

(*d*) *Eláḷa Sohona.*—The examination of the tree-covered hillock, popularly known as "Eláḷa's Tomb," situated a few hundred yards south of the sacred Bó-tree, and adjoining the Kurunégala road, has at last been undertaken. The identification of this site is one of the chief problems connected with the ancient city remaining to be solved.

Two broad trenches are being run into the circular mound on the east and north sides. As soon as the plinth of the structure is reached the two gangs will turn respectively north and eastwards until they meet. Subsequent action must depened on the experience gained at this quadrant.

Circuit Work.

August and September were devoted to the thorough exploration of the Vilachchiya Kóralé, the wildest part of the North-Central Province. The greater portion of this huge Kóralé is virtually *terra incognita* and quite uninhabited, save when overrun during the dry season by gangs of Moors from the west coast, illicitly bent on the wholesale extermination of game. Magnificent tanks, such as *Mahá*, and *Kuḍa*, *Vilachchiya*, long breached and abandoned, testify to the ancient prosperity of this part of the Island, now cursed by want of water. Archæologically, the Vilachchiya Kóralé is comparatively barren; though more antiquities will undoubtedly come to light when this neglected division becomes once more peopled.

Leaving the Puttaḷam road on the 24th of August, and moving with baggage-coolies, the expedition traversed the almost unknown *Gal-gé Waṇṇi*, *Moragalla Waṇṇi*, *Vil Pattuwa* ("lake district"), *Vilachchi Waṇṇi*, and the *Pichchampattu Tulána*, emerging finally at the Maṉṉár road—having struck but one village in the five weeks' march between August 31 and October 4!

The interminable *kaṭu-pat*, or thorn jungles, the narrow tracks in hot, deep sand, and the exceeding scarcity of water, rendered this circuit the most trying yet accomplished by the Archæological Survey.

Three or four days were given to *Tantri-malai*—by far the most interesting site in the Vilachchiya Kóralé. The beautifully carved colossal images of Buddha (seated and prone), rock-hewn as at the Gal-viháré, Polonnaruwa, were freed of jungle, and the *débris* partially excavated.

A varied and extensive set of photographs were secured during the tour.

With this circuit the Archæological Survey has completed—a few places worthy of a second visit excepted—the exploration of all the seventeen Kóralés forming "Nuwarakaláwiya" (*i.e.*, the whole of the vast North-Central Province, Tammankaḍuwa excluded), or an extent of country covering approximately 3,000 square miles.

Tammankaḍuwa will be examined in 1897.

Epigraphical.

Drs. Goldsmidt and Müller record five or six inscriptions in all from the Vilachchiya Kóralé. These were re-copied and photographed where possible ; and several other hitherto unnoticed rock and pillar inscriptions added to the list.

OFFICERS.

His Excellency the Governor has accepted the office of Patron of the Society. Mr. F. Lewis was appointed in September Acting Honorary Treasurer in place of Mr. F. C. Roles, who left for Europe. Messrs. F. H. Price and C. M. Fernando were elected Members of Council in place of Messrs. J. P. Lewis and A. P. Green, who retired from the Council under Rule 16.

FINANCES.

The following is a statement of the income and expenditure of the Society for 1896 :—

Receipts.			Rs. c.	Rs. c.
Balance, General Account		...	...	125 38
Entrance Fees	...	...	...	52 50
			Rs. c.	
Members' Subscriptions,	1891	...	10 50	
Do.	1892	...	21 0	
Do.	1893	...	84 0	
Do.	1894	...	257 25	
Do.	1895	...	357 0	
Do.	1896	...	1,371 50	
Do.	1897	...	5 25	
			———	2,106 50
Life Members	...	...	...	140 50
			Total ...	2,424 88

Expenditure.				Rs. c.
Printing ...	...	...	...	587 68
Charges ...	...	...	...	872 92
Books ...	...	...	...	6 0
Conversazione account, closing items		...	...	42 46
				1,509 6
Balance (Bank of Madras)		...	...	915 82
			Total ...	2,424 88

Examined and found correct :
E. BOOTH.

F. LEWIS,
Acting Honorary Treasurer.

3. Rev. F. H. DE WINTON moved the adoption of the Annual Report. The document, he said, spoke for itself of the good work done during the year, as an advance copy of the Journal, laid on the table that evening, further testified to.

Dr. PINTO seconded, and the Report was adopted.

THE OFFICE-BEARERS.

4. The CHAIRMAN then read the following list of gentlemen nominated by the Council of the Society as Office-Bearers for 1897. On the proposition of Mr. L. Walker, seconded by Dr. Pinto, the list was accepted unanimously.

President.

The Right Rev. the Lord Bishop of Colombo.

Vice-Presidents.

The Hon. Mr. Justice Lawrie ; Mr. Staniforth Green.

Council.

Hon. P. Coomáraswámy.
Mr. J. Ferguson.
Mr. C. M. Fernando.
Mr. P. Freüdenberg.
Mr. A. Haly.
Mr. J. P. Lewis.
Mr. F. M. Mackwood.
Mr. F. H. Price.
Mr. W. P. Ranasinha.
Mr. E. S. W. Senáthi Rájá.
Dr. W. G. Vandort.
Mr. F. H. de Vos.

Honorary Treasurer.

Mr. F. C. Roles.

Honorary Secretaries.

Mr. H. C. P. Bell, C.C.S.; Mr. J. Harward, M.A.; Mr. G. A. Joseph.

VOTE OF THANKS.

5. Mr. P. FREUDENBERG proposed a vote of thanks to the Chair, which was cordially passed.

6. In response Mr. JUSTICE LAWRIE remarked that there had been an omission on his part, which he regretted—that was to thank the Honorary Secretaries for their valuable services to the Society during the past year. He was sure that those services were fully recognized by them all.

7. The Meeting then terminated.

COUNCIL MEETING.

Colombo Museum, March 18, 1897.

Present :

The Lord Bishop of Colombo, President, in the Chair.

Mr. P. Freüdenberg. | Mr. S. Green.

Mr. A. Haly.

Mr. J. Harward and Mr. G. A. Joseph, Honorary Secretaries.

Business.

1. Read and confirmed Minutes of Meeting of Council held on January 18, 1897.

2. Resolved,—That the following Candidate for admission into the Society as a Resident Member be elected, viz. :—

G. C. Lee : nominated by { S. G. Lee. / J. Ferguson.

3. Laid on the table a letter from Mr. F. Lewis, tendering his resignation as Acting Honorary Treasurer.

Resolved,—That the thanks of the Council be accorded to Mr. Lewis for his services as Acting Honorary Treasurer.

4. Laid on the table a letter from Mr. P. Freüdenberg soliciting exchange of Publications with the Anthropological Society of Berlin.

Resolved,—That the Society do exchange Publications with the Anthropological Society of Berlin.

5. Laid on the table Circular No. 11 of January 19, containing five Papers on "The Industries of Ceylon," by Mr. Charles Perera Ekanáyaka ; referred to Messrs. C. M. Fernando and G. A. Joseph for report.

Resolved, in view of the remarks on the Circular by the gentlemen to whom the Papers were referred, that they be not accepted, but that the writer be thanked for forwarding them to the Society.

6. Laid on the table a Paper entitled "A Geological Sketch of the North-Western Province," by Mr. F. H. Modder.

Resolved,—That the Paper be accepted, and that it be referred to Messrs. A. Haly and P. Freüdenberg for any remarks they may have to offer.

7. Laid on the table a Paper entitled "Ancient Cities and Temples in the Kurunégala District : IV.—Dambadeniya, by Mr. F. H. Modder.

Resolved,—That the Paper be referred to the Lord Bishop of Colombo for his opinion.

COUNCIL MEETING.

Colombo Museum, May 12, 1897.

Present :

The Lord Bishop of Colombo, President, in the Chair.

Mr. J. Ferguson. | Mr. A. Haly.

Mr. F. C. Roles, Honorary Treasurer.

Business.

1. In the absence of the regular Secretaries Mr. Roles was elected Secretary *pro tem.*

2. Read and confirmed Minutes of Council Meeting held on March 18, 1897.

3. Laid on the table Mr. Modder's Paper entitled "A Geological and Mineralogical Sketch of the North-Western Province," with the report thereon by Messrs. Freüdenberg and Haly, together with a letter from Mr. Modder.

Resolved,—That the Paper be read at a General Meeting of the Society, as amended according to the suggestions offered by the gentlemen to whom it had been referred.

4. Laid on the table a Paper entitled "Contributions to Ceylon Malacology," by Mr. Oliver Collett, F.R.M.S.

Resolved,—That in view of the note attached to the Paper by Mr. Haly, the Paper be accepted and read at a General Meeting of the Society.

5. Resolved,—That a General Meeting be held on the 22nd instant, provided that the Secretaries find the day convenient; otherwise, that the Meeting be postponed to the 29th instant, and that the business be the reading of the following Papers :—

(1) "A Geological and Mineralogical Sketch of the North-Western Province," by Mr. F. H. Modder,
(2) "Contributions to Ceylon Malacology," by Mr. Oliver Collett.
(3) "Ancient Cities and Temples in the Kurunégala District: IV.—Dambadeniya," by Mr. F. H. Modder.

GENERAL MEETING.

Colombo Museum, May 29, 1897.

Present :

The Lord Bishop of Colombo, President, in the Chair.

Mr. C. M. Fernando. | Mr. A. Haly.

Mr. F. C. Roles, Honorary Treasurer.
Mr. J. Harward and Mr. G. A. Joseph, Honorary Secretaries.

Visitors : one lady and three gentlemen.

Business.

1. Read and confirmed Minutes of Annual General Meeting held on February 6, 1897.

2. Mr. A. Haly read the following Paper :—

CONTRIBUTIONS TO CEYLON MALACOLOGY.*

(1) The Terrestrial Mollusca of Ambagamuwa.

By O. COLLETT, F.R.M.S., Cor. Member of the Malacological Society of London, &c.

THE following observations are offered on a collection of Mollusca made during the last two years in the district of Ambagamuwa (Central Province).

This district is situated in the heart of the wet region of the Island. It ranges from 2,000 ft. to 4,000 ft. in altitude, and has an average annual rainfall of 190 in.

The extent of my researches has been limited, owing to the nature of my professional duties.

This Paper, therefore, is only to be looked upon as a preliminary account of the inquiry. I hope in time to bring out a complete list of the land-shells that are to be found in this district, giving, in as many instances as possible, particulars of the habits, instincts, times of breeding, &c., of the different species. In the difficult task of identifying the species here enumerated, I have received much kind assistance from Dr. F. Jousseaume, the celebrated Zoologist of Paris, to whom I take this opportunity of expressing my grateful thanks. I have also derived much useful information from the Paper which Dr. F. Jousseaume has written on Ceylon shells,† and which is quite indispensable to collectors.

FAM. HELICIDÆ.

1.—*Helix (Fruticicola) similaris*, Fér.

This species is abundant in the district, and appears to be widely distributed. It occurs in thick scrub and *lantana*,

* To illustrate the Paper two cases of land shells were exhibited, containing the shells described by Mr. Collett, and presented by him to the Colombo Museum.

† Mollusques recueillis à Ceylon par M. E. Simon, et revision générale des especes terrestres et flurio-lacustres de cette Ile. (Mémoires de la Société Zoologique de France, 1894, pp. 264–330.)

and also upon stone walls, especially where the masonry is new. The shells are very variable in colour and markings, some being pure white, while others are dark reddish-brown. In some instances they are unicolorous; but as a rule they are banded with a single line, which is much darker than the general colouring of the shell. The animal, which is gray and white, gives a speckled appearance to the semi-transparent shell. It is oviparous in April–September. The eggs are of about the size of grains of sago, globular in shape, bluish-white, and calcareous.

2.—*Helix acuducta*, Benson.

I have found a few specimens of this distinctly Indian form in Ambagamuwa. It has not previously been recorded from Ceylon. It occurs in low thickets and dense scrub in damp localities. Young specimens are not rare, but full-grown shells are seldom seen—probably the animals are much preyed upon by birds. Hitherto regarded as a Nilgherries species (*Conchologia Indica*, pl. 1., f. 5).

3.—*Hemiplecta hyphasma*, Pfr.

This pretty little species is abundant among ferns and grass, and on mossy banks, throughout the district. It has a semi-transparent shell, through which the black and white markings of the animal are visible.

4.—*H. cingalensis*, Bens.

I have taken a few specimens of this species from beneath the bark of a decaying tree in a clearing—kindly identified by Dr. Jousseaume. I have never found a mature shell. It appears to be rare in this district.

5.—*H. chenui*, Pfr.

This species is fairly common throughout the district. It closely resembles the South India form *H. chenui* (*Conchologia Indica*, pl. xxv., f. 1), with which it is in all probability identical. The animal is dirty white, marked with longitudinal gray bands; it is very slimy, and makes a peculiar squeaking noise, like a beetle, when molested. It is oviparous

in May–August. The eggs are 8 mm. long and 4 mm. in width. They are oval, pointed at the ends, and carinated longitudinally; they are pure white in colour and quite soft (uncalcified).

Habitat amongst decaying vegetation. Young animals are of a brick-red colour, visible through their translucent shells.

6.—*H. ceylanica*, Pfr.

This species is abundant in Lower Ambagamuwa, but it is not found in the upper part of the district.

Habitat among fallen leaves in damp shady localities; 2,000 ft.

7.—*H. semidecussata*, Pfr.

I have found this species fairly common throughout the district. It occurs among fallen leaves in forest and scrub, and is much preyed upon by birds, with whom it appears to be a favourite food. I have occasionally come across a sacrificial stone in the jungle surrounded by heaps of broken shells. When alive the animal, which is mottled black and white, gives a handsome "checked" appearance to the reddish-brown translucent shell. The body whorl of young specimens is acutely angular.

According to the *Conchologia Indica* this is essentially identical with the Mauritian species.

8.—*Ernstia aspirans*, Blanf.

This species usually appears in very wet weather. I have then often found it on the trunks of orange trees in bungalow gardens. Height 3·33 mm., diameter 3 mm.

9.—*Microcystis suavis*, Jouss.

This species occurs sparingly here. The animal, when alive, gives a dark olive tint to the transparent shell.

Habitat among ferns and moss in shady localities. Height 2·50 mm., diameter 4 mm.

10.—*M. Thwaitesii*, Pfr.

I have only found a few of this species in the district. One of them Dr. Jousseaume describes as an unusually large and

beautiful specimen. It has the same habitat as the last species.

Height 3·50 mm., diameter 6 mm. (largest specimen).

11.—*Macrochlamys partita*, Pfr.

This is one of our commonest species. It is rather variable in size and in depth of colour. The animal, which is black and white, is dimly visible through the shell.

Habitat amongst leaf mould around the roots of plants.

12.—*M. politissima*, Pfr.

This species is fairly common throughout the district, but perfect specimens are scarce on account of the brittle nature of the shells. The animal, which can only partially retreat into its shell, is bluish-black with dark gray tentacula.

Habitat among thickets and scrub in ravines and swampy places.

13.—*M. carneola*, Pfr.

I have taken one specimen only of this species from among ferns in a swamp (3,000 ft.).

14.—*Corilla erronea*, Albers.

This species is fairly common throughout the district. The shells are very variable in size, shape, and colouration, some specimens being almost black. The animal is dirty white, its dorsal surface dusted with grayish granules.

Habitat in heavy forest among fallen leaves.

15.—*C. fryæ*, Gude.

This is very similar to the last species. Mr. Gude has made a new species of it on account of a slightly different arrangement of the parietal folds of the armature. (See *Science Gossip*, 1896, vol. III., p. 89. Dr. Jousseaume calls it a large variety of *C. erronea*, and I think he is correct.)

16.—*C. Beddomeæ*, Hanley.

This species is not common here. The shells found in Ambagamuwa appear to be a good deal smaller than those found at a lower elevation, where they are more plentiful.

Habitat in heavy forest beneath fallen leaves. Ambagamuwa specimens measure: height 4 mm., diameter 15 mm.

17.—*Plectopylis clathrata*, Pfr.

This species is fairly abundant. The shells are much smaller than the type figured in the *Conchologia Indica*. The animal is pale brownish-red, visible through the translucent shell.

Habitat on the under side of decaying leaves in forest. Dimensions: height 2·20 mm., diameter 5 mm.

18.—*Acavella Waltoni*, Jouss. (*Helix Waltoni*, Reeve.)

This is one of the commonest species in the district. The shells are very variable in size and colouration, some of them being extremely handsome. The Ambagamuwa specimens are, as a rule, smaller than those found at lower elevations.

The animal is inky black, with dark bluish-gray tentacula. It is oviparous in April–September. The eggs have white calcareous shells, usually measuring 21 mm. in length and 12·50 mm. in width. They are deposited singly, in leaf mould, around the roots of trees in forest. The embryonic shells, which are thin and almost transparent, are beautifully variegated.

Habitat in forest undergrowth and under fallen leaves.

19.—*Acavus superba*, Pfr.

This species is represented in Ambagamuwa by a beautiful variety (var. *roseolabiata*), which is figured in the *Conchologia Indica* as *Helix superba*.

Nevill has, however, pointed out that this is in reality quite distinct from Pfeiffer's type, although the difference does not appear to have been noticed by Mr. Hanley.*

Perfect specimens of this form are seldom seen. They invariably, when old, become coated with a slimy lichenous growth, which gradually destroys the bright colouring of the shells. This is doubtless a protection against birds and other

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* Journal, R. A. S., Bengal, 1881, No. III., p. 134.

enemies, as it renders the shells scarcely distinguishable, at first sight, from knotty excrescences on the trunks of the trees upon which they live.

The animal is of a light chocolate colour, with large and prominent tentacula. The upper surface of the foot is coarsely tuberculated. It is oviparous in April-September. The eggs, which have yellowish-white, oblong, calcareous shells, are usually 22 mm. long and 13·60 mm. in breadth. Young specimens are particularly handsome, their shells being variegated with white markings, which however become obliterated as the shells increase in size.

Habitat, on the trunks of trees in damp shady localities. Seldom seen above 3,500 ft.

FAM. ACHATININÆ.

20.—*Glessula inornata*, Pfr.

This species is abundant in the district. The animal is yellowish-white, and emits a peculiar acrid smell when molested—probably protective. It is oviparous in April-August. I have taken specimens in those months containing eight to ten young shells with the first three whorls already formed. They lie close together, in a chain, within the second largest whorl of the parent shell, through which they are dimly visible.

Habitat in forest, beneath decaying leaves. A filmy epiphragm closes the aperture of the shell in the dry season.

21.—*G. niteus*, Gray.

One or two specimens, taken in the lower part of the district, have been identified by Dr. Jousseaume as an opaque variety of this species.

22.—*G. parabilis*, Benson.

I have only one specimen, found in the lower part of the district (2,000 ft.).

23.—*Opeas gracilis*, Hutt.

Very common under logs and stones throughout the district. It appears to be widely distributed.

FAM. BULIMINÆ.

24.—*Phengus intermedius*, Pfr.

Bulimus (Beddomea) intermedius, Pfr.

This species, as figured in *Conchologia Indica* (pl. xxi., figs. 6-8), is somewhat common in Ambagamuwa. Dr. Jousseaume has remarked that the figures given in the *Conchologia Indica* appear to belong to two different species (*Proc. Zool. France*, 1894, p. 295). In reality, however, they are identical, the species being very variable in size and contour. The shells have a beautiful glossy appearance as a rule, but I have taken specimens (alive) with the enamel entirely worn away. The animal is of a rich emerald green, with yellow tentacles and foot. It is visible through the semi-transparent shell.

Habitat amongst foliage in forest, 3,000 to 4,000 ft. It is sometimes found feeding on coffee and tea plants.

Obs.—G. Nevill, writing in 1881, after the publication of the *Conchologia Indica*, mentions this species as follows :—

Sub-genus Beddomea, G. Nevill.

(Hand list, 1878, p. 127, type *Bul. ceylanicus*, Pfr.)

The animal of the type species of this very distinct and well-marked group was described by E. L. Layard (*Annual Magazine*, 1853) as of a brilliant green colour, visible through the shell ; it feeds on the coffee plant. (*J. A. S., Bengal*, No. III., p. 134.)

This description is true of *B. intermedius* but not of *B. ceylanicus* (see *Conchologia Indica*, pl. xxi., fig. 2 ; and pl. cxlviii., fig. 9). The latter is a low-country species, having a much thicker shell with brilliantly coloured markings, while *B. intermedius* is always white.

25.—*Phengus Simoni*, Jouss.

This species is not so common as the last. It is, as Dr. Jousseaume has pointed out, distinct from *B. albizonatus* of Reeve, by its smaller size and by the absence of the white band at the angle of the shell. It is, moreover, much less sharply keeled, and the shell is thicker and more blue in colour. Habitat in forest, on the leaves of trees.

FAM. CYCLOSTOMINÆ.

26.—*Pterocyclos Cumingii*, Pfr.

I have a few specimens from Lower Ambagamuwa, but the species does not occur in the upper part of the district.

Habitat in decaying vegetation, 2,000 ft.

27.—*Aulopoma helicinum*, Chemn.

This species is common throughout the district. The outer whorl of the operculum is flexible and retractile, and does not always overlap the peristome of the shell, as some observers have stated.

Habitat in thick scrub, *lantana*, &c., among fallen leaves.

28.—*Cyclophorus annulatus*, Troschel.

This species is common throughout the district. The shells taken in the lower part of the district are as a rule larger than those found above an altitude of 3,000 ft.

I have one large specimen, taken alive, with the two first (central) whorls of the shell absent. Young specimens are striated in the line of growth by short bristly ridges of the epidermis.

Habitat in forest and scrub, beneath fallen leaves.

29.—*C. Bairdii*, Pfr.

I have found this species fairly abundant among fallen leaves in heavy forest.

Young shells are coated with an olive-brown velvety epidermis, which disappears on full-grown specimens.

30.—*C. ceylanicus*, Pfr.

This species is common in Lower Ambagamuwa, but does not occur in the upper part of the district. It is a low-country species.

31.—*C. Jerdoni*, Benson.

This is very near the last species. I have one specimen from the lower part of the district.

32.—*C. cratera*, Benson.

This species is not common here. I have found a few specimens among fallen leaves in forest, 3,000 ft.

33.—*C. subplicatus*, Beddome.

This is a rare species, especially in the upper part of the district.

The figure given in the *Conchologia Indica* is misleading and not at all like Col. Beddome's type. (See *Proc. Zool. Soc.*, 1875, p. 442.)

Young specimens are coated with a greenish-brown velvety epidermis.

Habitat in heavy forest, beneath fallen leaves.

34.—*C. Layardi*, H. Adams.

I have found a few specimens of this beneath fallen leaves in forest, 3,600 ft. It is not common here.

35.—*Leptopoma orophilum*, Benson.

This species is fairly abundant in thick scrub, *lantana*, &c., and amongst undergrowth in forest. The animal is dark yellow, with yellowish-brown tentacula (2). It is frequently attacked by the larva of a carabid beetle, which, having killed the animal, completes its metamorphosis within the shell.* I have also found exuvia of this larva, but less frequently, in the shells of *Glessula* and *Cataulus*.

36.—*Jerdonia ceylanica*, Beddome.

This species is scarce in Ambagamuwa. I have found a few specimens in forest undergrowth. The epidermis of the shell, which contains the colouring, is easily destroyed, so that perfect specimens are not often seen.

FAM. MEGALOSTOMINÆ.

37.—*Cataulus Blanfordi*, Dohrn.

This species is fairly common throughout the district. The shells are rather variable in size and colour and in the thickness of the margin of the peristome. The animal is greenish-brown, with orange-coloured tentacula, at the base of which the eyes are situated.

* Mr. E. Ernest Green, who kindly examined the insect for me, was unable to identify the species. I have not secured specimens of the imago yet.

The operculum of this, and of the other species of the genus, consists of a flat horny disc separable into many plates. These plates increase in number as the animal grows older. The operculum of young specimens consists of a single film, thin and transparent.

Habitat in heavy forest, beneath decaying leaves.

38.—*C. Nietneri*, Nevill.

This species is not common in Ambagamuwa. It is the most aberrant species of its genus, and is itself very variable in size and contour.

It is gregarious, being sometimes found in numbers of a dozen specimens; but it is extremely local, and only occurs in certain favoured localities, which are sometimes only a few square yards in area. The animal is very dark green, visible through the straw-coloured shell, to which it gives a very pretty appearance.

Habitat in low brushwood and among ferns in swampy places. The figure given of this species in the *Conchologia Indica* is poor and misleading.

List of identified Mollusca from Ambagamuwa.

1. Helix similaris ... Fér.
2. H. acuducta ... Bens.
3. H. hyphasma ... Pfr.
4. H. cingalensis ... Bens.
5. H. chenui ... Pfr.
6. H. ceylanica ... Pfr.
7. H. semidecussata ... Pfr.
8. E. aspirans ... Blanf.
9. M. suavis ... Jouss.
10. M. Thwaitesii ... Pfr.
11. M. partita ... Pfr.
12. M. politissima ... Pfr.
13. M. carneola ... Pfr.
14. C. erronea ... Albers.
15. C. fryæ ... Gude.
16. C. Beddomeæ ... Hanley.
17. P. clathratula ... Pfr.
18. A. Waltoni ... Rve.
19. A. superba ... Pfr.
20. Glessula inornata Pfr.
21. G. niteus ... Gray.
22. G. parabilis ... Bens.
23. Opeas gracilis ... Hutt.
24. Bulimus intermedius Pfr.
25. Phengus Simoni ... Jouss.
26. Ptercyclos Cumingii Pfr.
27. Aulopoma helicinum Chemn
28. Cyclophorus annulatus ... Trosch.
29. C. Bairdii ... Pfr.
30. C. ceylanicus ... Pfr.
31. C. Jerdoni ... Bens.
32. C. cratera ... Bens.
33. C. subplicatus ... Bedd.
34. C. Layardi ... H.Adams
35. Leptopoma orophilum ... Bens.
36. Jerdonia ceylanica Bedd.
37. Cataulus Blanfordi Dohrn.
38. C. Nietneri ... Nevill.

I have placed specimens of almost all of the above in the collection of the Colombo Museum.

3. The PRESIDENT said that the Paper was of the kind that the Society was anxious to receive, and it was evidently the result of much careful research in a direction in which practically nothing had been written.

4. Mr. HALY said he had on the previous day come across an appropriate passage in Wallace's "Natural Selection" (1891, p. 90), which he would read, instead of making any comments of his own on the Paper before them. Wallace wrote :—"Although such a store of interesting facts has been already accumulated, the subject we have been discussing is one of which comparatively little is really known. The natural history of the tropics has never yet been studied on the spot with a full appreciation of what to observe. The varied ways in which the colouring and form of animals serve for their protection, their strange disguises as mineral or vegetable substances, their wonderful mimicry of other beings, offer an almost unworked and inexhaustible field for the Zoologist, and will assuredly throw much light on the laws and conditions which have resulted in the wonderful variety of colour, shade, and marking which constitute one of the most pleasing characteristics of the animal world, but the immediate cause of which it has hitherto been most difficult to explain." Mr. HALY added that he trusted they would have more Papers of this sort, not only from Mr. Collett, but from other gentlemen interested in the Natural History of Ceylon.

5. Mr. C. M. FERNANDO then read the following Paper :—

ANCIENT CITIES AND TEMPLES IN THE KURUNEGALA DISTRICT.

By F. H. Modder.

IV.—Dambadeṇiya.

Dambadeṇiya, in Dambadeṇiya Uḍukaha Kóralé West, of the Dambabeṇiya Hatpattu, is, according to the latest Itinerary, only 17·95 miles from Kurunégala on the road thence to Negombo, although Casie Chitty gives the distance as "about 27 miles south of Kurunégala and 56 east of Colombo."*

* *Ceylon Gazetteer*, p. 84. The *Máhawaṇsa* (Wijesinha's translation) says :—"And in the vast space which extended from the city of Jambuddon to the city of Sirivaḍḍhana, the length and breadth whereof was about eight yojanas and one usabha, (the highway was) made even like the face of a drum, and was covered throughout with sand, exceeding fine and soft." Dr. Coplestone has conclusively pointed out that "*eight* yojanas" is a misreading, the word in the original being *half*. This discovery has resulted in establishing beyond all question that the graphic description in chapter LXXXV. does not apply, as it had all this time been considered to, to Kandy, but to a city the exact site of which has not yet with any degree of certainty been traced out and identified, not far from Dambadeṇiya. Dr. Coplestone (on the authority of Mr. D. M. de Z. Wickremasinha) identifies "the auspicious and prosperous city" with Nambambaraya, 6 miles from Dambadeṇiya (*Journ. C.B.R.A.S.*, No. 43, pp. 206-15). But Mr. H. Parker is of opinion that it existed in what is now a tract of dense jungle on the right bank of the Deḍuru-oya in the Waṇṇi Hatpattu. He has in his possession an ola manuscript, which gives the boundaries of the lands attached to the city : and he has received vague accounts of bricks and pillars having been seen in the forest by hunters, there being no inhabitants in the neighbourhood. At Nambambaraya, on the contrary, there is not the slightest vestige of any remains to justify the identification (*Cey. Lit. Reg.*, vol. VI., p. 396). The correct identification of Siriwardhanapura will ever be looked forward to with considerable interest, it having been demonstrated beyond all doubt that the "mountain capital" is out of the running.

Derivation and Ancient Boundary Limits.

The "boundary book," called "*Śri Laka Kaḍayuru*," or "the divisions of Laṇká," records the following particulars under the head of "Dambadeṇi Raṭa" :—

At Rávaṇa's time here was a *damba* branch watch-hut from the *damba* tree that marks Dambadiva (Damba atu paela). During the eras of Kakusanda, Kónágama, Káksheyapa, and Gautama the name was unchanged. As ancient priests sat on the top of those rocks—as the ancient Nighanda and Nighendi had a controversy there—and planted *damba* branches there, it was called Jambudhroni Nagara. On the east, damming the oya, there is the village Aetugal piyassa. East of that is the Nánu rock carved with the elephant's foot-mark. Three yoduns off that is Morugama-piyassa, a niyangama. East of that, near the great mountain, is the clump of *mora* trees, and there is a stone post with an ox-hoof mark. On the north-east is the Maha Tal Ruk Saldigama, and in the midst of an atala-gala a deodonu mark (rainbow mark). On the south is Pera Mahat Páya. Where all the people of Laṇká were fed with gruel, a city, a gawa in extent, existed, called the great Batgama, and this village had no bounds ; the tank east of it was Mi-waewa. Between east and north-east are the *mi* gardens and a stone image, and a carved staff (ketu saera mitiyak), and a yamaya and a sword, carved in the middle of seven stone rails (gal raen satak). Where a former king impaled an enemy, the village was called Tubu-ulala.* There are thirty-six marks. The centre is a tank, and there is a staff and (tal waetiya) fan-carved stone. On the north there is the rock, where milk used to be boiled by the Bamunugama. There is a Malava Pora carved stone kept upon a knotted *kumbuk* tree. In the midst of the Dikwaella a king stabbed a king, and the (sword) tip fell off : there is a village called Kadumuna† (sword tip). That village has twelve gal raen, carved with a sword. Where the *damba* branch formerly fell, at Denipota, a stone was placed, carved with the rainbow (deodunna) and sáma saera (? sáma arrow). On the north-west side of Dambadeṇiya is the oya and Nánu rock. 10,000 villages are in this. In those villages is a mul kaeṭemak (? inscription), at three corners an atala-gala carved with sword and shield (kadu palandu). The people here are all liars, and the women learn the high sciences.‡

Founding and Description of the City.

Dambadeṇiya was once a royal residence and the capital of the Maya division, albeit now an insignificant village.

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* Modern Tumbulla.—M.

† Modern Kavudumuna.—M.

‡ *Tapbrobanian*, vol. II., pt. III., p. 60. [The whole passage from the *Kaḍaim-pota* needs retranslation.—B., *Hon. Sec.*]

In consequence of its ancient importance and renown, a Hatpattu and two Kóralés are called after it.

The city of Dambadeṇiya, or Jambudoṇi, was founded in 1236 A.D. by King Vijaya Báhu III., who was of the lineage of King Ṣri Saṇga Bo. During the usurpation of Mágha the country was in a state of disturbance, and Vijaya Báhu, having remained in concealment for some time, gained sovereignty over all the Wanni country; and having collected an army of Siṇhalese went forth and dispersed the Tamils and delivered the beautiful country of Maya from the enemy.*

And on the highest top of the Jambuḍoni mountain he built a pleasant city with walls and gates of great beauty; and the wise and valiant lord of the land dwelt there in ease and comfort, and governed the kingdom.*

The "*Dambadeṇi Asna*," which is a historical account of the ancient city, gives the following descriptive particulars:—

Without the walls [of the temple] were built watch-houses [guard-rooms] and the royal stores. Several tanks were also constructed, and a rampart was also built round the city, of which the following are the streets: *Agampadi Vidiya*, "Mercenaries' street;" *Parivari Vidiya*, "Attendants' street"; *Setti Vidiya*, "Merchants' or Chetties' street." The Magistrate, the Military Officers, and other chiefs of the different parts of the city dwelt in it, together with 24,000 Siṇhalese soldiers paid by the Royal Treasury; 900 sculptors; 800 potters; the priesthood with the *Sangarája;* 900 elephant-keepers, including the keepers of the state-elephant; and 890 horsekeepers, who belonged to the city. Exclusive of their houses, there were 75,000 houses of the potters and 75,000 wells within the city wall.

Not a vestige of the city remains. On *Maligá-kanda*, more particularly described hereafter, it is said stood the royal palace, of which, however, not a trace is to be found.

The Temples and other Buildings.

King Vijaya Báhu built an Áráma and called it after his own name—*Vijayasundara Áráma*—and dedicated it to the priesthood. It is mentioned with due praise in the

* *Maháwaṇsa*, LXXXI., 16 (p. 272).

"*Rájaratnákaraya*" that the king established a school in every village and charged the priests who superintended them to take nothing from the pupils for their trouble.

He reigned four years, and was succeeded by his son Parákrama Báhu III., who was crowned, according to the "*Dambadeṇi Asna*," at Dambadeṇiya during the sowing festival in the year 1824 of the Buddhist era, under the name of Sarvajña Paṇḍita Parákrama Báhu. He adorned the city and—

Brought forth the Tooth-relic from the Billa mountain (Beligala) with great pomp and ceremony unto the noble city of Jambudoṇi. And he caused a Tooth-relic house of great beauty to be built nigh unto the palace, at great cost, seeing that he had a great desire to worship the relic whenever he thought thereof, even during the three periods of the day. And he raised a costly altar in the midst thereof and covered it with a cloth of great value, and caused a receptacle for the Tooth-relic to be cut out of a precious stone of great size; and to cover it he made a large casket of exceeding great beauty of precious gems of divers colours: and a second casket of great brightness made he of five thousand *nikkhas* of gold to cover this; and a third of twenty-five thousand *nikkhas* of silver to cover the last.*

According to the "*Dambadeṇi Asna*" the rock of Dambadeṇi, on which the King Mánabarana failed to erect any conspicuous building, was cleared of jungle, and on it was built a temple for the Tooth-relic, 22 cubits in height with three stories, and surrounded by a wall 80 cubits high.

And after he had caused the city to be decorated, commencing from the Relic-house, he held the great feast of the Tooth-relic with great honours.*..... And after the lord of the land offered unto the Tooth-relic the sixty-four royal ornaments, including his crown and his bracelets and such like † ..... Round about the vihára *Siri Vijayasundara*, that the king his father had built, he raised lofty walls and gates, and repaired and renewed the three-storied Relic-house. There also he set the Tooth-relic of the great sage on a high and costly throne.‡

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* *Maháwaṇsa* (English translation), LXXXII., 7–15 (pp. 276-7). The greater portion of this chapter is taken up with an account of the exhibition of the Tooth-relic miracle.

† *Ibid*, LXXXII., 50 (p. 279).

‡ *Ibid*, LXXXV., p. 291. Among the regulations of the temple was that "every day an offering was made of 100,000 flowers, and every day of a different kind." (Upham's *Rájaratnákaraya*, p. 103.)

The king also—

Built round about the city many monasteries for the whole Order in common (*Saṅgharáma*), that were fit places for the abode of the eight great elders of the eight establishments and for learned and thoughtful elders who dwelt in villages and in the forests. And these were buildings of great breadth, and were adorned with many mansions composed of open halls in great number, with ponds of divers kinds, and covered walks surrounded by gardens of fruits and flowers that served as retreats both by day and night.*

He also brought elders learned in the scriptures from India, and the books that were necessary for them. The "*Bhaysujja Maňjusá*"—a Páli work—was composed about this time by the learned and benevolent elder, the chief of the monks of the *Pañcha Pariveṇa*.

The king "caused the priests of Laṇká to be taught in all the branches of religion, and logic, and grammar, and all the other sciences, and made learned men of many priests."† He adorned the royal palace like the palace of the chief gods, and decorated the city befittingly like unto the city of the gods.

On the murder of Vijaya Báhu IV. by his treacherous general Mitta, Bhuwaneka Báhu I., who had fled to Yápahuwa, was brought from that city and anointed king at Dambadeṇiya, where he took up his abode. After some years he removed his seat of government to Yápahuwa.

The "*Dambadeṇi Asna*," after giving a rambling account of the city, describes graphically the war between Paṇḍita Parákrama Báhu and the Tamils, and the hand-to-hand combat between the king and "Tamaliṇgomu," in which the former came off victorious.

The kings who reigned at Dambadeṇiya appear to have encouraged the cultivation of useful arts and sciences amongst their subjects, and possessed a large collection of valuable books of medicine in their public library.

The Modern Temple Library.

In this connection it may not be uninteresting to note the state of the modern library. Mr. D. M. de Z. Wickremasinha,

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* *Maháwaṇsa*, LXXXIV., 18–20 (p. 284). † *Ibid*, 27 (p. 285).

Assistant Librarian of the Museum (now employed in the British Museum), visited the library in 1889 and reported as follows :—

Before making inquiries for the manuscripts we went about the temple premises inspecting the several buildings, accompanied by the Chief Priest, who acted as our guide. Whilst walking about we talked of the history of Dambadeṇiya, and especially of the famous scholar who flourished there of old. In this way we gradually directed the conversation to the several ancient libraries of Ceylon, such as that founded by Parákrama Báhu, and to manuscripts in general. By the time we returned to the temple we had obtained permission from the Chief Priest to examine the library with the object of borrowing such manuscripts as we might wish to have copied.

There was no catalogue of the manuscripts, nor any sign of arrangement. These were in three different places : some in an almirah in a room on the ground-floor, some scattered on a table in another room near by, and others in a dirty old box in a loft, where they were allowed to rot. The Chief Priest told us that there had been another box full of manuscripts, which had been destroyed by white ants. I warned him that that would be the fate of the rest of the books if better care was not taken of them.*

After going through the collection of books some were borrowed for the Museum Library, among them "*Kalundá-paṭuna*" (Siṇhalese verse), a legend connected with the accession of Paṇḍita Parákrama Báhu III. of Dambadeṇiya.

The information given in this little poem, as well as in the *Rájavaliya*, discovered by me in the Waṇṇi District, and in the *Maháwaṇsa*, will, I think, settle the vexed question as to the site of the ancient *Siriwardhanapura* founded byPaṇḍita Parákrama Báhu III. in the thirteenth century. These works show that Upham, Pridham, Knighton, Tennent, and others who followed them are more or less wrong in ascribing the founding of the modern Kandy to King Paṇḍita Parákrama Báhu III.*

Approach to, and Description of, Temple Premises.

The temple is approached by a *máwata* which branches off from near the ambalam to the left. A quarter of a mile along

* Administration Reports, Colombo Museum, 1889, p. I 18. See as to *Siriwardhanapura* the foot-note at the commencement of this Paper. Dr. Copleston was materially assisted in arriving at the conclusions therein referred to by Mr. Wickremasinha's researches.

it brings you to the entrance to the temple precincts, which are surrounded by a wall built of rock stones, roughly hewn. The door frame is composed of rock and the clumsy and unwieldy shutter of wood. On the temple grounds, to the right, is a dágaba, which is roofed over with tiles, and on the left is the viháré, with a little upstair, which leads into the chamber in which the Tooth-relic is said to have been kept. The temple is a small one, and, with the exception of the rock pillars and ornaments, seems, like the dágaba, to be of modern construction, the former probably having been built with the remains and in the site of the ancient edifice. In the front of the temple there is another entrance similar to the one just mentioned, which leads in the direction of *Maligá-kanda*, and was no doubt used by the kings of old in repairing thither for devotion. On the right of the entrance stands an old bó-tree, which is enclosed in the form of a square by a low stone wall, the space between the tree and the wall being filled in with sand. Offerings are made on a stone table, which is reached by a short flight of steps. The pansala stands outside the temple wall, and bears all the appearance of a modern structure. In February, 1892, a *bana-gé* was being erected by some Moratuwa carpenter, close to the pansala, in the modern style.

Rocky Hills and Legends.

Pridham and Casie Chitty agree to the very letter in their description of the situation of Dambadeṇiya :—

> It stands in a very picturesque valley, which is terminated by ranges of lofty naked hills, rising perpendicularly in a variety of peaked forms.*

Hardy remarks :—

> Above the city is a rock about 400 ft. high, nearly inaccessible, standing alone like the house of some giant. The folk-lore of the neighbourhood presents many curious legends.†

Maligá-kaṇda lies to the south-east of the temple, and on it, it is said, stood the palatial residence of King Paṇḍita

* *Pridham*, vol. II., p. 648 ; *Casie Chitty*, p. 84.

† *Jubilee Memorials of the Wesleyan Mission*, 1814–16.

Parákrama Báhu. There is some vegetation on the rock, as well as two ponds built with cut stones. There is no beaten track leading up to the hill, but any villager can guide the visitor to its summit. Before arriving at the top of the hill there are to be seen remains of a wall built between the boulders of granite. Past this wall there are some stone steps which lead to the spot, where there is an indication of a "*patirippuwa*" having once stood. Here, sitting on his royal chair, the king held an audience with his people. Before you come to the site of the "*patirippuwa*" a small tank is past. The whole hill is overgrown with jungle, and it is with the utmost difficulty that one is able to climb it. From the summit a splendid view of the surrounding country is obtained, with *Kat-gala* and *Waduwá-gala* in the near distance. It is said that the offerings to the king were placed on *Kat-gala*, and were viewed by him from the top of *Maligá-kanda*. Between the two boulders there is a cleft, with marks to be seen on either flank of the rock to fit in a cross-beam, from which, tradition says, convicted criminals were hurled down and killed.

Waduwá-gala stands to the north of the above-described hill, and on the right of the high road. It is a cylindrical boulder with the top and bottom overgrown with grass and brushwood. It derives its name from the circumstance that a convict carpenter, who was imprisoned on it, made his escape by cutting steps in the rock. These steps are yet to be seen, and by them access to the summit is gained. The steps begin about ten fathoms from the base of the hill, and in order to get at them a ladder is required, and is easily procurable, made by the villagers at a moment's notice of rough timber, lashed together with jungle rope. Tradition has it that the wife of the carpenter secreted a chisel and a mallet in the *bat-mulla*, *i.e.*, the boiled rice that is bound up in the spathe of the arecanut, and is the usual manner in which a meal is carried by a native going on a journey away from home and kindred, or conveyed to him to his working

place, by his wife or child. The steps were cut overnight and during the small hours, when—

> The varlets they were all asleep
> And none was there to see,

the escape was effected. The carpenter fled to the village *Waduwáwa*, which is said to derive its name from the fact of his taking refuge there; but alas! he was overtaken, seized, and decapitated. There is a large tank on the summit, into which it is said criminals were hurled.

Kat-gala lies between the above two hills on the left of the road. It is a bare, elongated boulder, and runs north to south. It is so called owing to its having been the halting-place of the pingo-bearers, who deposited their loads on it on their way to the king's reception at this city, when it was a royal residence.

Coins.

Davy says :—

> An antique gold coin, called a Dambadiṇia rhatra, was found in the neighbourhood of Dambadiṇia in the Seven Korles, which was probably struck there when it was a place of royal residence.* This coin exactly resembles in size and appearance the Dambadiṇia chally..... The chally is a copper coin, of which two kinds are to be met with—Dutch challies, which are common; and the Dambadiṇia challies, which are scarce. The characters on this ancient coin resemble more hieroglyphics than letters; the natives are ignorant of their meaning, which has not yet been ascertained.†

Prinsep, in a note on this and other coins sent to him for report by Sir Wilmot Horton, identified it with that found by Colonel Mackenzie at Dipaldinna, which he held to be identical with Dambadeṇiya, adding that Davy did not seem to have comprehended either the devices or the characters on this coin, for he had reversed, in the engraving in his book, the side bearing the inscription. Casie Chitty "rejects the claims of the Singhalese to a Singhalese origin of these coins," and conjectures that they may possibly be of

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* Hardy observes : "There are coins found in various places in the Island that are said to have been minted here in the twelfth century." (*Jubilee Memorials of the Wesleyan Mission*, 1814–64, p. 134.)

† *An Account of the Interior of Ceylon*, pp. 245–6.

Tamil origin, and been struck by King Eláḷa "in commemoration of his splendid conquests in Ceylon."*

British Reminiscences.

In the campaign of 1803, Dambadeṇiya played no unimportant part as a post of defence of the British. The troops under the immediate command of Major-General Macdowall, on their march to Kandy, encamped at Dambadeṇiya on February 11, "all well and in high spirits." Cordiner gives the following particulars :—

The encampment was formed upon a hill on which paddee was growing, and the prospects around it were highly picturesque and delightful. On each side below the camp were pleasant vallies, terminated by ranges of mountains. Owing to a deficiency of supplies, chiefly attributed to the death of Mr. Hamilton, Collector of the Province of Colombo, the army was obliged to halt at this place for four days. A small fort was erected, and a detachment of one hundred men left in it under the command of Ensign Grant. The troops continued to enjoy good health, although the nature of the climate did not seem salutary. The heat during the day was intense and oppressive, and the cold and heavy dews during the night were no less unpleasant, Fahrenheit's thermometer often ranging in the course of twenty-four hours from 60° to 100°.

In a store-house at Dambadenia were found eight hundred parrahs of paddee, fifty of salt, and as many of oil, said to belong to the First Adigar.

On the 25th, "Captain Buchan, of the Ceylon Infantry, marched with a strong party to convey coolies laden with provisions from Dambadenia. None of the natives ventured to approach the capital ; and it was not without difficulty and danger that foraging parties obtained now and then small supplies ; they were often fired upon from unseen quarters, and a few men were daily wounded."

On the suggestion that "His Excellency's performing a tour in the Seven Corales might have a good effect in quieting the apprehensions of the natives and increasing their confidence in the protection which had been promised them by the British Government, the Governor Mr. North, accompanied by Mr. Robert Arbuthnot, Chief Secretary of Government, Mr. Jonville, Surveyor-General, and his personal staff, set out on this journey" on April 28.

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* *Journal, R.A.S.C.B.*, vol. I., p. 85. [The *massa*, figured upside down by Dr. Davy, belongs to Queen Lílávati (Śri Rája Lílávati), 1208–12 A.D. *circa*. For the best account of these coins see *Rhys Davids* "On the Ancient Coins and Measures of Ceylon" (Internat. Num. Orient., 1877), pp. 25–33.—B., *Hon. Sec.*]

He arrived at Dambadenia, the principal station in the fruitful Province of the Seven Corales, on the 1st of May. Spacious bungaloes had been prepared for the reception of him and his suite, and temporary barracks were erected for the soldiers who formed his escort. The same day the principal headmen of the neighbourhood waited upon him, declared their satisfaction with the change of government which had taken place, and promised obedience and fidelity to our most gracious Sovereign.

On the 3rd of May, Pelime Palawve, the Chief Adigar, waited on the Governor, with whom he held a long conference, and fully agreed to the terms which had been drawn up in Kandy by General Macdowall and the Second Adigar. Mr. Arbuthnot returned the visit of Pelime Palawve the next day, and tendered to him three copies of the Convention, which he signed and sealed.

Colonel Barbut, who commanded at Candy, having received notice of the intended conference at Dambadenia, embraced the opportunity of paying his respects to Mr. North, and repaired thither escorted by three hundred men of the Malay regiment.....

The Adigar, during his interview with the Governor, was observed to tremble, which circumstance was at that time attributed to fear; but it has since been proved that he then meditated to make Mr. North a prisoner, and was only deterred from the attempt by the force of his escort, and the unexpected arrival of the strong detachment of Malays under Colonel Barbut.

On May 4 "the headmen of the Pale-pattoos, or southern division of the Seven Corales," and those of the "Dolos-pattoo, the northern division of the Province," waited on His Excellency "with expressions of fidelity to the crown of Great Britain and of attachment to his person and government."

At the same time that Candy was taken, the fort of Dambadenia was in a state of blockade. It was a small redoubt, slightly constructed of fascines and earth, and garrisoned by fourteen convalescents of the 19th regiment on their way to Colombo, and twenty-two invalid Malays, commanded by Ensign John Grant of that corps. He was repeatedly summoned by the Candians, headed by the Second Adigar, to give up the post. They sent in a flag of truce every day for upwards of a week; offered him a supply of coolies to carry off the sick, and solemnly declared that they would allow the detachment to march out unmolested, with their arms, and whatever else they chose to take with them. Ensign Grant, though in a feeble state of health, almost incapable of walking, would listen to none of their proposals. He strengthened the shelter of his fortification with bags of rice and stores of provision, and sustained almost an incessant fire from a mob of several thousand Candians for ten days. His men lay sheltered behind a breastwork, and only took an occasional aim at the enemy, when they came very near.

The detachment under Ensign Smellie, which left Colombo on the 26th of June, afforded the small garrison of Dambadenia a seasonable relief on the 30th of the same month.

On the 2nd of July, a reinforcement of one hundred men was sent from Colombo to assist in accomplishing the evacuation of that post. This party was commanded by Captain Robert Blackall of His Majesty's 51st Regiment, who reached Dambadenia in three days, and after destroying in one night a large quantity of stores and provisions in that depôt, completely succeeded in bringing off the garrison.*

Site of the British Fort.

Pridham, Casie Chitty, and other writers refer to the fort as having stood on a hill. According to the information gathered on the spot, this could not be so; it must have stood some distance from *Máligakanda* on a plot of rising ground, approached by a path, which forms the boundary limit between the villages Dambadeṇiya and Muttugala, and branches off to the left of the high road. After going along the path about a quarter of a mile, you turn to the right and you come upon the site overgrown with jungle. There are signs of a moat, which it is said surrounded the fort. The villagers say that the ground here abounds in ruins, and that in its vicinity they could not dig deeper than a foot owing to the rocky foundation and *débris*, probably of the fort, which they came across.

Service Tenure.

Dambadeṇiya is subject to services to the Dalada Máligáwa of Kandy. The following list, which sets out the various *pangu*, extent of high and low land appertaining thereto, the nature of the services, and the amount of commutation, was prepared by the writer from materials kindly placed at his disposal by Appuhami Lekama of Dambadeṇiya :—

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* *Cordiner*, vol. II., pp., 175-219.—In connection with the remarkably brave and determined manner in which Ensign Grant held the fort, it may be mentioned that the natives assert, but unfortunately can give no particulars, that a certain officer in defending this post was shot down, whereupon his wife, with wonderful courage, filled in the breach and assumed command, and held out till succour arrived.

Pangu.	Fields.	Gardens.	Chenas.	Commuted value of Services.
	A. P. K.	A. P. K.	A. P. K.*	Rs. c.
Mapa Mudiyanselage Gamwasam	5 1 6	5 0 2	6 3 9†	73 5
Do. Ottu ...	3 2 1	—	—	46 65
Jayakodi Gamwasam ...	4 0 1	5 0 0	19 1 1	36 50
Do. ...	1 0 0	—	—	11 60
Koralagamwasam	6 1 9	2 2 3	15 2 5	92 15
	(Meadow 1 p.)			
Dasunakke Gamwasam ...	5 1 2	1 2 8	4 2 1	68 5
Do. ..	1 0 0	—	—	12 0
Alutgamwasam	3 2 5	0 3 1	—	63 10
Ganegoda Kerawel	3 1 8	0 3 6	0 1 0	19 60
Do ...	3 1 5	2 2 5	5 3 7	37 35
Liyanapatirennehelage Kerewel	3 2 0	3 0 0	3 3 9	47 30
Kumarapatirennehalage do. ...	3 0 0	6 2 4	7 3 0	37 35
Balasuriya Achchilage do. ...	1 2 3	0 2 1	0 3 7	25 70
Mellavalanage Kerewel ...	2 1 0	0 3 0	0 3 0	31 55
Muddiyanselage do. ...	4 0 0	2 0 5	11 1 0	48 95
Wickremeachchilage Kerewel ...	1 3 0	0 3 5	0 1 6	22 40
Madinage	—	1 0 0	0 2 0	0 75‡
Henainge§	4 3 0	0 1 7	0 1 7	41 50
Navan‖	—	—	0 —	1 80
Halagama (Hali people)¶ ...	0 2 5	0 0 5	0 0 8	0 45
Nekeṭdureyalage Uliyan** ...	1 2 5	0 2 3	0 2 5	16 18
Nekeṭi††	2 3 9	2 0 5	4 3 9	1 25

* A. = amuna; P. = pela; K. = kuruni; 10 k. = 1 p.; 4 p. = 1 a.; 1 a. of paddy land = 2 acres; 1 a. of high land = 40 acres.

Services.

† This pangu pays £1. 8*s.* to the Máligáwa; to the Undiyarala, Vidáné, and Lekama Rs. 5 per annum; to the Diyawadana Nillema every year 3 baskets of fish (*hal messo*), one basket of dried prawns, two baskets of dried fish, two baskets of green peas, two baskets of (*tala*) gingelly seed, one basket of vegetables, altogether ten baskets, 8 seers of cocoanut oil. These presents should be taken by the *alligakareyo*, accompanied by the Lekama and other attendants, to Kandy. The ground share of the fields, Dematagahakumbura, 1 p.; Nidhanamulla, 1 p.; Gorokgahamulla, 1 p.; Divulgahamulla, 1 p.; Kadurugahamulla, 1 p.; Angadenegewela 1 am.; Dunamadala, 1 am.; Palleshavana, 1 am. When the Vidáné visits the village the tenants of the pangu should accommodate him, and two men should be sent to the perahera, in failure of which the pangu should pay a fine of Rs. 5 and 8 pence.

‡ Durava's or Toddy-drawers' pangu, the holders whereof have to pay two ridis, and for gardens for *tuttus*; and for all 1*s.* 6*d.*, equal to commuted allowance 75 cents.

§ To pay three ridis yearly, one seer oil, one pingo per diem, provisions; whenever a messenger arrives in the village ceiling should be put up, piruwata cloth should be given, that is, a clean cloth supplied for use during the stay of the messenger in the village, and whenever he goes for a bath, a bath towel or cloth should be given.

‖ Blacksmiths, to pay yearly 15 *tuttus*, to supply three arecanut cutters and three katupihi (knives).

¶ To pay yearly ten *tuttus*, give a taduppuwa lensuwa—a handkerchief woven by them.

** To take yearly a pingo load of oil to Kandy; whenever a messenger arrives from Kandy at this village to put up an "atuge" (water-closet), to supply him with water and firewood, to prepare hot water; and whenever the Lekama or Vidáné proceeds to Kandy to accompany him.

†† To give yearly two ridis and four handkerchiefs woven by them; and whenever a messenger arrives at the village on duty to give him a handkerchief.

Population.

In the Census of 1871, the total population of the following villages was given as :—

	Houses.	Families.	Males.	Females.	Persons.
Dambadeṇiya Mapagedara Marawita	83 ...	83 ...	281 ...	257 =	538

In subsequent decades the following figures were obtained by the Census :—

Year.		Houses.	Families.	Males.	Females.	Persons.
1881	Dambadeṇiya	57 ...	57 ...	143 ...	134 =	277
1891	do.	87 ...	87 ...	263 ...	206 =	469

Buddhist Temporalities.

Under the Buddhist Temporalities Ordinance, No. 3 of 1889, section 4, and by Proclamation in the *Gazette* of November 15, 1889, Dambadeṇiya was constituted a district, consisting of four hatpattus, viz., Dambadeṇiya, Weuda, Katugampola, and Dewamedi. Dambadeṇi, as well as the other districts, Yapahuwa and Chilaw, formerly belonged to the Central Province, with a central working committee at Kandy. Subsequently the North-Western Province was formed into a separate Province under the Ordinance, unconnected with the Central, but the division into districts remains the same. The *Gazette* of January 27, 1893, published a list of trustees for the North-Western Province. An amended list was published in the *Gazette* of October 12, 1894, according to which 93 trustees were appointed for Dambadeṇi, 111 for Dewamedi, 95 for Weuda, and 120 for Katugampola. Let us hope that the accumulated wisdom of this multitude of counsellors will help towards the satisfactory working of the Ordinance, which, it is to be regretted, has not been productive of the best results, at least in the North-Western Province.

6. The CHAIRMAN remarked that it was interesting to note that the royal capitals of Ceylon, like the one under discussion, remained as capitals only for a very short period : therefore it was somewhat difficult to place implicit reliance on the details of its grandeur, described in the *Maháwaṇsa*, the writer of which might have, like a

good courtier, drawn from imagination the elaborate details of a most magnificent city. He had visited the place himself and failed to discover anything like the ruins of so important a town. As to the identity of *Siriwardhanapura*, about which reference had been made in the Paper, it was probable, as its name implied, that it was applied to more than one royal capital, and thus it may have been applied to Kandy itself.

7. The Meeting terminated with votes of thanks to the writers of the Papers and to the Chair.

COUNCIL MEETING.

Colombo Museum, July 27, 1897.

Present :

Mr. Staniforth Green, Vice-President, in the Chair.

Hon. Mr. P. Coomáraswámy. | Mr. C. M. Fernando.
Mr. J. Ferguson. | Mr. W. P. Raṇasiṇha.

Mr. F. C. Roles, Honorary Treasurer.

Mr. J. Harward and Mr. G. A. Joseph, Honorary Secretaries.

Business.

1. Read and confirmed Minutes of Council Meeting held on May 12, 1897.

2. Resolved,—That the following Candidate for admission into the Society as a Resident Member be elected, viz. :—

Mr. H. B. Preston : nominated by { Mr. O. Collett. / Mr. A. Haly.

3. Laid on the table a letter from the American Museum of Natural History proposing an exchange of publications.

Resolved,—That, as the publications of the American Museum of Natural History more properly suit the Colombo Museum, the letter be referred to the Museum Committee, and the American Museum of Natural History be notified accordingly.

4. The Honorary Treasurer submitted a letter from the Honorary Secretary, Mr. H. C. P. Bell, C.C.S., regarding Life-Membership.

Resolved,—That the Council regrets it has no power to modify the existing Rules regarding Life-Membership, but will readly recommend that Mr. Bell be elected an Honorary Member of the Society in consideration of the valuable services rendered by him to the Society during a period of sixteen years and upwards.

5. Laid on the table a Paper by Mr. A. Haly, entitled "Some Illustrations from the Fauna of Ceylon of Wallace's theory of Natural Selection."

Resolved,—That the Paper be accepted, and that it be printed and read at a General Meeting.

6. Resolved,—That a General Meeting of the Society be held on the first Saturday in September, and that the following Papers be read :—

(1) "A Geological and Mineralogical Sketch of the North-Western Province," by Mr. F. H. Modder.

(2) "Some Illustrations from the Fauna of Ceylon of Wallace's theory of Natural Selection," by Mr. A. Haly.

7. Considered the advisability of purchasing a typewriter.

Resolved,—That the matter do stand over.

GENERAL MEETING.

Colombo Museum, September 4, 1897.

Present :

Mr. O. Collett.	Mr. G. C. Lee.
Mr. M. Cochran.	Surg.-Capt. Manders.
Rev. J. H. de Winton.	Dr. L. Pinto.
Mr. J. Ferguson.	Mr. F. C. Roles.
Mr. A. Haly.	Mr. L. Walker.

Mr. J. Harward and Mr. G. A. Joseph, Honorary Secretaries.

Visitors : two ladies and five gentlemen.

Business.

1. Mr. HALY took the Chair during the reading of the first Paper, vacating it in favour of Mr. Ferguson.

2. Read and confirmed Minutes of General Meeting held on May 29, 1897.

3. Mr. HARWARD read the following Paper :—

A GEOLOGICAL AND MINERALOGICAL SKETCH OF THE NORTH-WESTERN PROVINCE, CEYLON.

By F. H. Modder.

Prefatory Note.

An eminent authority has observed that "the sciences of geology and mineralogy, &c., in all their branches are but imperfectly understood by the natives." He might with more truth and less modesty have said they were lamentably ignorant of these useful sciences. "Notwithstanding Ceylon is the depository of such an extensive variety of specimens, their attention seems never to have extended beyond the valuable gems and the mineral ores. As to a thousand other subjects, both on the surface of the earth and hidden in the substrata of nature, so interesting to men of science, they have allowed them an almost undisturbed repose, never having exerted themselves either to quarry out a knowledge of their latent properties, or ascertain their intrinsic worth."*

The difficulty of prosecuting the investigation of these important and useful branches of science cannot be better summed up than in the words of Professor Fletcher, though his remarks have special reference only to terrestrial mineral products :—

> It is practically, or rather economically, possible to obtain a direct knowledge of only those mineral products of the earth itself which are situated within a mile or so beneath its surface ; that is to say, within a crust having a thickness which is only one-four thousandth part of the earth's radius ; but the detailed investigation of even this limited amount of matter is far too vast for one individual or one science.

* Quoted by Pridham in a footnote.

In favouring me with a copy of his "Guide Book to the Minerals in the British Museum* (which has been of immense use and service to me), the distinguished author, whose kind sympathy with me in my undertaking I cannot adequately express my gratitude for, wrote to me :—

> I am afraid you will find it difficult to do very much in the examination of your rocks at Ceylon, unless you are provided with a petrological microscope and have the skill and patience and time for the preparation of thin sections for examination by that instrument—

and added with an amount of grim humour :—

> People like yourself, with scientific tastes, can do very useful work in these countries, which are practically inaccessible to those who, like myself, are chained down in these remote regions.

Conscious of the manifold shortcomings in this Paper—the result of desultory work undertaken during the leisure which a busy professional life has stintingly bestowed on me—I should hesitate to submit it to this Society, but that my object is to invite the attention and to excite the interest of the authorities, the capitalist, as well as of the student of Nature, to the rich and unlimited field of scientific research which the vast undeveloped geological and mineral resources of the Island afford.

INTRODUCTORY.

Ceylon has not been geologically surveyed. Davy (1821) made the first real attempt at describing the geology of the Island, but his personal observations were chiefly confined to the interior.† Bennett's work (1843) contains a slight reference ;‡ while Macvicar's comments§ and Gardner's sketch‖ (1847) clearly show that beyond a general survey, these scientists had not the opportunity of diving

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* "An Introduction to the Study of Rocks," by L. Fletcher, M.A., F.R.S., Keeper of Minerals in the British Museum ; formerly Fellow of University College and Millard Lecturer at Trinity College, Oxford. 1896.

† "An Account of the Interior of Ceylon and its Inhabitants." 2 vols. London, 1821.

‡ "Ceylon and its Capabilities," by J. W. Bennett. London, 1843.

§ A Paper originally read before the Royal Physical Society of Edinburgh, by the Rev. J. G. Macvicar, D.D.

‖ Appendix to Lee's Translation of Rebeiro.

deep into the subject. Gygax's labours (1848-49) were mainly directed to the examination and report of the mineral resources of the Sabaragamuwa District.* Pridham (1849) adopted the convenient process of "boiling down" the results obtained by previous writers, and has with characteristic significance seldom condescended to acknowledge the source of his information.† Kelaart's excellent "Notes on the Geology of Ceylon" (1850) have special reference to the laterite formation of the Island and the fluatile deposit of Nuwara Eliya.‡ Baker's remarks (1855) apply almost exclusively to the Nuwara Eliya District.§ Tennent‖ (1860) and a host of other writers have either bodily adopted the theories, or more frequently based their conclusions on the investigations of the authors who preceded them, particularly with regard to the alleged discovery "of anthracite, in close proximity to rich veins of plumbago," which did not require much labour on the part of the late Mr. A. M. Ferguson to prove and establish beyond the shade of a shadow of doubt to be "as mythical as Sinbad the Sailor and his gems."¶ The late John F. Campbell of Islay (1876), who was eminently qualified to prosecute the subject from a scientific point of view, was unfortunately prevented by the shortness of his stay in Ceylon from devoting the necessary time and attention to it which the importance of the inquiry demanded.** However, his views, such as they

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* Journal, C.B.R.A.S., No. 3, 1847–48, pp. 1–5.

† "An Historical, Political, and Statistical Account of Ceylon and its Dependencies," by Charles Pridham. 2 vols. London, 1849.

‡ Journal, C.B.R.A.S., 1849–50, p. 210 *et seq.*

§ "Eight Years in Ceylon," by Sir Samuel Baker.

‖ "Ceylon: an Account of the Island, Physical, Historical, and Topographical, &c." 2 vols. 1860.

¶ "Plumbago: with special reference to the position occupied by the Mineral in the Commerce of Ceylon; and the question discussed of the alleged existence in the Island of the allied substance Anthracite," by A. M. Ferguson, Esq., C.M.G.—Journal, C.B.R.A.S., vol. IX., part. II., No. 31, 1885.

** "My Circular Notes," by J. F. Campbell, with Appendix on "The Period of Polar Glaciation." 2 vols. London, 1876.

are, are interesting so far as this Province goes, considering that it has hitherto received very little, if any, notice at all from a geological standpoint. Dixon (1881) spent no inconsiderable portion of his leisure in geological and mineralogical researches, but his investigations throw very little light on this Province.* Several local writers have written fugitive papers, dealing more or less with certain portions of the Island. But none of these authors and writers have explored the interior of any of the plumbago mines in this Province—the shaft of one of which alone has penetrated 1,500 feet into the bowels of the earth. These deep-sunk pits have thrown open large and important sections of strata, from which much knowledge can be gathered of our Island crust, hitherto locked up in the sealed book of Nature.

The testimony is conflicting with regard to the actual dimensions of the Island as it existed in "the dark abysm of time," when, according to the *Rámáyana*, the oldest epic in the world, Rámá proceeded to Laṇká with a mighty army, waged a protracted war with Ravana, laid seige to his capital, and carried back in triumph the ravished Sítá, the beautiful queen of the vanquisher, from the jungle fastness, where she remained imprisoned for many a weary year; and it is a moot point whether the ocean now rolls over once fertile and populous lands, and whether this partial subsidence of the Island caused its severance from the mainland of India, of which it formed part. Avoiding all discussion as to whether our beautiful isle has diminished into its present size by the gradual encroachments of the usurping sea,—

> When were the winds
> Let slip with such a warrant to destroy ?
> When did the waves so haughtily overleap
> Their ancient barriers ?

it is sufficient to state that changes in the relative position of sea and land are said to have occurred on the maritime

* Journal, C.B.R.A.S., vol. VII., No. 23, 1881, p. 12.

portions of this Province, and they seem to receive support from this tradition :—

In the time of the famed Queen Allirasani, the Gulf of Kalpitiya had no opening to the northward, but communicated with the sea by a channel running in the line of the present Chilaw canal ; that the queen above named used to proceed from Kudremalai to Akkarai pattu by land ; and that a great flood came, buried her palace under the waves, and bursting through a neck of land, converted the lake into a gulf, which form it still retains.*

Lord Valentia, in 1804, testified to the appearance presented by the "singular" island Navakarre,† which showed every sign of having been formerly covered by the sea. In travelling from Puttalam to Arippo, His Lordship drew the conclusion that the bank forming the outer boundary of the lagoon was formerly part of the ocean. The lagoon, he thought, would soon be filled up, and the sea itself removed to a still greater distance.‡

The opinions of Lord Valentia, Macvicar, Gardner, and Kelaart all favour the hope that the whole of Ceylon, particularly the western coast, would gradually rise above the sea level, and that consequently the time, geologically speaking, is not far distant when the Island will again become united with the Continent of India.

Rocks.

The oldest rocks in the North-Western Province, like the rest of the mountain system of the Island, belong mainly to the Archæan or pre-Cambrian age. The prevailing rock is gneiss of a crystalline nature, with no inconsiderable veins of quartz, felspar, mica, and hornblende. This Province forms part of the plain which surrounds the mountain district, and Campbell has likened it to a sea of rolling gneiss with waves on the strike north and south. The dip is

* Journal, C.B.R.A.S., No. 6, 1853.

† Akkarapattoo, one of the divisions of the District of Puttalam, improperly denominated in the maps Navacarre.—Casie Chitty's "Gazetteer," p. 4.

‡ Mavor's "Collection of Travels," vol. XXVIII., pp. 136–38.

nearly vertical in general. Yet all the outlines are rounded curves. The stone breaks naturally along this curved surface and shells off in thick layers. Distant hills on the same strike are broken to westward. The gigantic bosses which stud the plain rise conspicuously, "so detached from the original chain and so rounded by the action of the atmosphere, aided by their concentric lamellation, that, but for their prodigious dimensions, they might be regarded as boulders."* Chief among these cylindrical masses is the "elephant rock" at Kurunégala, where the gneiss is much contorted. The bare gneiss weathers into angular sand and wears into chemical and mechanical "pot holes." The stream which flows out of "the king's bath," a round basin on the elephant rock, is wearing smaller "pot holes" below.

The plain ends with a white sandy beach, in which the rocks are battered. Rocks in the plain have the same forms as rocks in the surf and at sea. If the sea-bottom were raised, asserts Campbell, it would be an extension of the lowlands of Ceylon. From the steamers while approaching and leaving the Island, he says, he saw the usual marks of erosion by streams on the hills and of marine erosion in the plains and in the surf. The low grounds he took for remarkable examples of marine denudation. "Ceylon, at the end of Asia, is exposed in all directions, save one, to the full sweep of the waves of the Southern Ocean. The surf rolls constantly in over a shelving bottom. At the sea-margin and thence to the hills the shelving surface cuts indifferently through the folds in the gneiss."† The folding of the gneiss is by lateral horizontal pressure from east and west, nearly parallel to the Equator.

The rocks, plains, and hills of Ceylon may easily be mistaken for glacial work, but Campbell, who travelled nearly 600 miles in the Island, found no mark or sign of glaciation whatsoever. After careful study he believed them

* Tennent's "Ceylon," vol. I., pp. 16, 17.

† The Period of Polar Glaciation: Appendix to "My Circular Notes," by J. F. Campbell, vol. II., p. 285 *et seq.*

to be the work of the Indian Ocean, aided by a tropical sun and tropical rains.

Supposed Fossil Marks.—Ibbágala, or "tortoise rock," at Kurunégala, was thought to be of interest from a palæontological point of view, and the details of the supposed discovery of fossil marks were thus stated :—

> Some of these appear to be the footprints of hogs, others those of some feline beasts of prey. The impression of the paws as well as the toes are so well and distinctly marked and continued along whole tracks as not to be mistaken or confounded with any ripple marks or other irregularities produced by the denudation of its surface. Though Ibbágala appears to belong to the class of primitive or plutonic rocks, it appears that there must have been a subsequent super-imposition of sedimentary formations, which, while in a soft state, received the impressions that were rendered permanent by the consolidation or crystallization of their particles. The whole structure of the rock appears to the eye to be composed of hornblende, mica, and felspar, with traces of an impure carbonate of lime.*

The subject was brought up before the Ceylon Branch of the Royal Asiatic Society by Mr. A. O. Brodie, of Puttalam, and Lieutenant Henderson, of the Ceylon Rifle Regiment, both of whom wrote papers ventilating their views, but unfortunately these papers are lost to the world,† and the only particulars available are referred to in the minutes of a special meeting held on March 23, 1850.

In an interesting Paper as to the origin of laterite formation in the Island, Dr. Kelaart wrote in connection with the point at issue—

> This subject is now engaging the attention of the Geological Society of London, their notice being attracted to it by the so-called footprints on the gneissic rock at Kurunégala, which I have not yet had an opportunity of examining.

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* "Young Ceylon," vol. I., No. 2, March, 1850, p. 49 : Topography of Kornegalle, by T. A. P.

† A careful reference to the transactions, as well as a diligent search by the Honorary Secretary among the papers of the Ceylon Branch of the Royal Asiatic Society, failed to discover these papers. Finally, an application by the writer to the Secretary of the Geological Society, London, to which institution, it was said, the original papers were forwarded, was equally fruitless, and elicited the reply from Mr. L. Belifante, Assistant Secretary : "I can find no trace of the papers to which you refer."

And added in a footnote :—

Since this Paper was written I have examined the rock and found it to be laminated granite, and the marks merely the effects of weathering.*

A verdict which the writer is able to concur in after careful personal verification. It is impossible to conceive how these marks on the most exposed part of the surface of the rock could have been mistaken for those of fossils, the more so when it is considered that no such marks, even if real, could have withstood the ravages and the potent effects of weathering and chemical decomposition, which would have obliterated them altogether. As pointed out by Campbell, "to a given depth the gneiss is daily heated to 100° or more. At night it cools. Expansion and contraction produce something like cleavage on a crackle cup. Mechanical and chemical action of rain and air makes the surface crumble."† As an appropriate conclusion to this subject—so brimful of interest to geologists—I would quote the words of Dr. William King, late of the Geological Survey of India, brother of Mr. Ælian Armstrong King, Government Agent of the North-Western Province :—

It is difficult to tell why there are no fossils in your metamorphic rocks. There may have been very little life at the time of their formation, and that of the lowest forms, and these may have been obliterated by metamorphism or so altered that nothing but the result of their chemical decomposition now remains, *e.g.*, this graphite. I do not think age would have anything to do with the obliteration of vegetable structure, if it ever existed ; metamorphism (which includes a tremendous lot of forces, chemical and otherwise) is quite sufficient.‡

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* Appendix of Proceedings of Meeting, Journal, C.B.R.A.S., No. 5, 1849–50, pp. 336, 337.

† "My Circular Notes," vol. II., pp. 186, 187.

‡ Letter of Dr. King to the late Mr. A. M. Ferguson : appendix to his Monograph on Plumbago, Journal, C.B.R.A.S., No. 3 , 1885. Dr. Kelaart writes : "The limestone in which the Ceylon fossils are imbedded is of a very compact and pure form. In one hand specimen we observed a fossil phalange about an inch in length, apparently of a large Saurian reptile. This unique specimen is now in the Museum of the Asiatic Society of Ceylon."—*Prodromus Faunæ Zeylanicæ*, p. x.

Gneiss being the prevailing rock and close at hand is much used for building and other purposes. From a remote period it has been worked into pillars and posts, lintels and doorways for temples and palaces, while the images, in their various shapes and forms to be found in the viháres in the Province, have nearly all been carved out of the same material. Bailey, in his graphic description of the perforated window at Yapahuwa, regretted that such exquisite workmanship as had been lavished on it should not have been expended on more refined material, for instance, the magnesian limestone, which is so abundant in the Province, than on such rough and coarse stuff as gneiss. It must be noted, however, that though the effects of storm and sunshine of six centuries and more have done their worst to the ruins of temple and palace which have been exposed to their influences, yet such ruins as are yet to be seen, for instance, the perforated window of Yapahuwa, show how well they have withstood the ravages of time and weather. Gneiss is also largely used for metalling roads, and a "pocket" on the side of the Kurunégala rock, near the Galabandáré shrine, from which the stone is being quarried, affords an excellent section of gneissic rock with its various interpolating veins of quartz, &c.

Quartz in large veins as well as in extensive imbedded masses is of common occurrence. Several of such outcrops are to be met with on the Kurunégala railway line.

Dolomite, or crystalline magnesian limestone, which overlies the gneiss, occurs in various parts of the Province. A bed of it has been found to run through the Kurunégala District in a somewhat parallel direction, striking generally N.W. by N. to N., and having various dips from 10° to 40°. Dixon, after indicating two outcrops in the Island, the first near Balangoda and at Hunuwala, the second through Dolosbáge and Maskeliya, traced the third under the Great Western, at Great Western estate, to be continuous to N.N.W. with Wattegedara and Medakumbura, and probably also with the beds at Gampola and Kurunégala. In illustration of a

Paper on "The Rocks and Minerals of Ceylon," he exhibited specimens of dolomite with pyrites and other crystals, and dolomite, large, yellow, free crystals obtained from the Kurunégala District.*

Magnesian limestone is to be met with in abundance, chiefly at Hunugalkadulla (so called after the occurrence of this rock, which is known to the natives as *Hunugal*, or limestone, in such profusion at this village) and Wellowa in the Kurunégala District, and is worked for economical purposes.

The following analyses by Cochran show the composition of the purer forms of crystalline limestone and magnesian limestone or dolomite :—

Composition.	Crystalline Limestone.		Dolomite.	
	per cent.	per cent.	per cent.	per cent.
Calcium carbonate ...	93·79	97·00	50·16	74·52
Magnesian carbonate ...	2·51	1·77	26·00	19·33
Carbonate of iron ...	·68	·23	—	—
Phosphate of lime ...	·15			
Alkalies	·20			
Organic matter and moisture ...	·47			
Silica	2·20	1·00	—	—
Oxide of iron and alumina ...	—	—	3·66	·35
Alkalies and traces of phosphoric acid... ...	—	—	·18	·20
Insoluble silicious matter ...	—	—	19·88	5·35
Moisture	—	—	·12	·25
	100·00	100·00	100·00	100·00

Recent formations are confined to the sea coast which forms the western boundary of the Province. These formations owe their origin mainly to the deposits which the currents make as they come laden with alluvial matter collected along the Coromandel Coast, while in addition to this, as has already been pointed out, the land has been slowly rising from the sea, and terraces abounding in marine shells imbedded in agglutinated sand occur in situations far

* Journal, C.B.R.A.S., 1880, p. 43.

above high water mark, and so the low sandy plains of Puttaḷam and Chilaw have been proportionally extended.

Brodie writes :—

> All along the sea coast there are a series of horizontal beds of *sandstone*, never elevated more than a few feet above the present water level. The rock itself varies in structure and contains numerous enclosed shells and coral limes, apparently identical with species existing in the neighbouring island. The shells in many cases retain the enamel, and are in all respects as if they had just been washed into the sea. At Karativu, fourteen miles to the north, there are various strata of *calcareous* rock, some friable as marl, some highly indurated.*

From Chilaw southwards, exposed during the prevalence of the north-east monsoon, is a *breccia* in process of formation from the agglutination of coral fragments and shells mixed with sand. "Further north at Mádampé, between Chilaw and Negombo," says Tennent, "the shells of the pearl oysters and other bivalves are turned up by the plough more than ten miles from the sea."† Again, "at various points of the western coast, between the island of Mannar and Karativu, the natives, in addition to fishing for chank shells (*Turbenella vapa*) in the sea, dig them up in large quantities from beneath the soil on the adjacent shores, in which they are deeply imbedded."‡

Mr. Haly, the Director of the Colombo Museum, explored the coast opposite Karativu as far as Kudramalai point and collected interesting specimens of the formation, duplicates of which he sent to Berlin with a short account of the coast. The writer has been at some pains to obtain a copy of this account, as well as of the report thereon, which was solicited from the Berlin authorities, but without success. The specimens were—

(1) A kind of laterite, of which fragments that had fallen in the sea became hardened and acquired a polish, showing

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* Journal, C.B.R.A.S., No. 6, 1853.

† Tennent's "Ceylon," vol. I., p. 12.

‡ *Ibid*, p. 20

the constituents of the rock clearly ; (2) fragments of the upper part of some lofty limestone cliffs most peculiarly weathered—the cliffs looking like coarse sandstone, but the application of acid revealing their true character ; (3) fossil shells, all of the same species, from the base of these cliffs ; (4) specimens of the limestone as it crops up through the beach ; (5) specimens of the raised beach a few feet above sea level—a conglomerate of recent shells and corals ; (6) specimens of shells from the forest soil resting on this raised beach, which is in some parts more than 10 ft. in thickness and full of shells of the same species as are now living on the surface ; (7) specimens of the same soil hardened by the action of the sea and again worn by exposure to the atmosphere ; pottery and recent fresh-water shells sculptured out in the most delicate manner by the gradual wearing away of the hardened earth ; numerous specimens of recent marine shells found in the lower part of the forest soil, and quantities of shells mixed with pottery, showing that a pearl fishery existed here in very ancient times.

The decomposition of Gneiss and its Products.—Although our rocks are destitute of the interest which the presence of fossils would undoubtedly impart to their study, yet the absence of these organic remains is in a way compensated for by the deeply interesting study afforded by that great geological feature of the Island—gneiss, with the various new forms arising from its disintegration. It is no doubt a matter of difficulty for one to comprehend how large mountain masses of hard gneissic rock could change so completely into laterite or moulder away into kaolin and lithomargic clays and finally assume the form of soil. To account for this wonderful transition and mutation under mechanical and chemical influences, we may here inquire into the main constituents of our chief rock, which comprise, according to "Jamieson's Journal," the most common forms of the following minerals :—

	Felspar.	Mica.	Hornblende.
Silica ...	66·75	48·00	42·00
Alumina ...	17·50	34·25	12·00
Lime ...	1·05	—	11·00
Potash ...	12·00	8·75	A trace
Magnesia ...	—	—	2·25
Oxide of iron ...	·75	·50	·25
Oxide of manganese	—	·50	·25
Water ...	—	—	·75
	98·25	96·00	98·25

Quartz consists of nearly pure silica, with a trace, however, of alumina acid, sometimes of iron.

None of the varieties which Kelaart classifies laterite or "cabook" into, namely, (1) *Laterite* properly so called, and distinguished as *Quartzose;* (2) *Lithomargic Laterite;* (3) *Detrital;* or (4) *Laterite Gravel*, is to be found in the Province in any shape whatsoever.

Clays.

Lithomarge, which takes its place, is of frequent occurrence. According to Kelaart it is—

A sectile clayey substance of variegated colours. It is chiefly formed of a decomposed felspar and hornblende, whitish when the former prevails, and yellow or reddish when hornblende predominates in the rock from which it is derived, owing to the larger proportion of oxide of iron which the latter mineral contains.*

From the list of mineral constituents which enter into the composition of gneiss, it will be seen that felspar and mica contain the largest amount of alumina, the principal ingredient in the formation of clay. In rocks in which felspar and hornblende predominate the clay formed is much variegated. Pure felspar forms kaolin. It is not, as is popularly thought, the "*kiri-meṭi*" of the natives. *Kiri-meṭi*, literally "milk clay," is a species of potters' clay, and is largely used for pottery. A yellow species of it is used for washing walls. On the other hand, "*makul*" is the

* Journal, C.B.R.A.S., vol. II., No. 5, pp. 210, 211.

purest form of clay to be found in the Province, and is identical with kaolin or Chinese clay. It is found in abundance at Polgahawela, Alawwa, and Wẹ́uda, in the Kurunẹ́gala District, and is commonly used in place of lime for whitewashing the laths and rafters and ceilings of houses. Lime does not adhere so firmly, and even when carefully put on drops away in flakes after a time. Makul sticks fast, and it is much easier to wash a roof or ceiling with it than with chunam, which often drops into the eye and causes much inconvenience.

Potters' clay is an abundant substance, but there is a great difference in the nature and quality of it, found in various localities.

Brick clay of a superior kind is met with at Malpiṭiya, three miles from Kurunẹ́gala on the road to Polgahawela. The brick fields here supplied a large proportion of the bricks to the railway for the construction of bridges, culverts, &c., and Mr. Waring, the Chief Resident Engineer of Railways, considered the material as good as, if not superior to, that supplied by the metropolis. As pointed out by Mr. Cochran, the quality of brick clay may be regarded as superior according as its composition approximates to that of kaolin.

A stratum of very *brackish clay* underlies nearly the whole of the Puttaḷam District and part of the Demala hatpattu. The brackish stratum was probably the bed of a large lagoon, similar to the Puttaḷam lake. In the Puttaḷam District it is near the surface, in the Demala pattu it is at some depth. Fresh water is found only in the generally shallow surface formations locally known as *villus;* once the clay is pierced through the water is brackish, which, however acceptable to deer, sheep, and other animals, is not fit for human consumption.

Mr. J. G. Drieberg, the District Engineer of Puttaḷam, sent me in February, 1897, some specimens of this clay, and wrote that it—

was found 42 ft. below ground level in a consolidated stratum. The pieces sent you were cut out with a penknife, so tough is the material. A cross-section of the surface, as it appeared in the rock-cutting, presented a smooth surface with a varying tint. The effect was pretty in the extreme. The rock was dug at Wannattivillu, 12 miles from Puttaḷam on the North road to Mannár. The soil above the clay as sent is ordinary black clay, anything but tenacious, and presenting a remarkable contrast to the former. The different layers are sharply defined. The rock itself is situated on the upper high water level of a *villu*. *Villus* are (as no doubt you are aware) natural depressions, generally circular, with mildly shelving banks and fringed with tall forest trees. A bit out of my district, in a place called Kokari, there is a succession of *villus*—quite a chain of them, five in number. The first *villu* is an enormous sheet of water, and saltish. Tradition says that there is an underground channel connecting it with the sea. The next *villu* is called "nalla-tanni-kulam," and the water is pure and sweet.

Casie Chitty, writing of "Quiparawa, a small lake on the east side of Kattakadoo," in the Puttaḷam District, says :—

The bottom is a *blue clay*, and a person once jumping into it, and coming out covered with this mud up to the knees, obtained for it the name of "*Blue Boots*," by which it is now universally known among Europeans.*

Soil.

The soil of this Province may be generally described as consisting of the results of "the disintegration of the gneiss, detritus from the hills, alluvium carried down the rivers, and marine deposits gradually collected on the shore."

The greater portion of the soil of the maritime districts of Chilaw and Puttaḷam is a silicious sand, in which the principal ingredients are quartz in the shape of sand or gravel, decomposed felspar in the shape of clay, with more or less oxide of iron. Dr. Davy found this soil to consist of 98·5 silicious sand. Here and there are to be found interspersed black paddy-field earth, potters' clay, or recent marl. Where granite rocks exist a reddish loam occurs, and on the margin of rivers and lakes a rich black mould, well adapted for paddy cultivation, is met with. Deep silt

* "Ceylon Gazetteer," p. 199.

occurs along the shores of the sea and of creeks. In some places a retentive clay exists, and is used in the manufacture of bricks and tiles.

PEATY DEPOSITS.

The only carbonaceous formations, apart from plumbago, which is dealt with under the head of "Minerals," are the peaty deposits in the Kurunẹ́gala District.

The tanks in the Kurunẹ́gala District, chiefly those at Kurunẹ́gala, Wenaruwẹwa, and Tittawela, are covered with floating masses of vegetation of varying sizes and from 2 to 6 ft. in thickness, which are interesting from a geological point of view. It is believed that this is the only provincial division in the Island in which they occur. A large portion of the surface, nearly a fourth of the Kurunẹ́gala tank, which is about 104 acres in extent, is covered with this floating vegetation, about 6 ft. in depth in some places and of greater depth in other places, possibly identical with what is known in Ireland as the "old widow's tow." This mass is a veritable eyesore, and completely takes away from the effect, both from a picturesque as well as a sanitary point of view, of what has not been inappropriately termed "the lungs of the town." Various schemes have been at different times proposed and tried for getting rid of this mass and many attempts made to remove it, but with very little success.

The floating mass may be divided into three parts. The first is a compact mass, and supports a growth of tank vegetation. The second consists of fibrous roots only, and forms the connecting link between the crust or the first part and the third, which is composed of slushy matter, the vegetable substance being more decomposed, to which it is attached. There is water between this part and the bottom of the tank, with which it is apparently unconnected. The crust is composed of fibrous roots, stems, and partly decayed leaves of grasses and sedges and a variety of aquatic plants. When cut vertically the peat appears stratified with each year's growth, and is evidently the result of many years'

accumulation. Professor Morris, the Assistant Director of the Royal Gardens at Kew, when Assistant Director of the Royal Botanical Gardens at Pérádeniya, on a visit to Kurunégala in 1878 on the orders of the Ceylon Government, could not identify the most important plant which enters largely into the floating mass, as it was not sufficiently grown to enable him to do so. He identified among the grasses *Panicum myurus*, *Panicum interruptum*, and members of the *Carex* and *Cyperus* families. The matted growth of these are mixed with *Ceratophyllum*, *Polygonum*, *Zimnophila*, *Marsila*, and *Utricularia*. During the dry weather most of the grasses and sedges wither, and their dead leaves accumulating around the floating stems, at times 20 to 30 ft. long, serve to increase periodically the size of the mass and to gather around them the fine mud and other deposits brought in by the rains.*

Dr. Morris found the residual ashes obtained by burning the peat rich in potash and other salts, and, mixed with soil he thought they ought to prove a useful manure for estates and gardens. Mr. Drieberg, the Superintendent of the Agricultural School, Colombo, to whom the writer forwarded three cases of specimens, reported as follows :—

Specimen of case No. 1 contained 6 per cent.
Specimen of case No. 2 contained 13 per cent.
Specimen of case No. 3 contained 10 per cent.

Mr. Drieberg observed that, unless in the neighbourhood of the deposits, there was no special value to be attached to peat as an organic manure for mixing with poor soils, or the ash got from it on account of the potash and other mineral ingredients it contains; it had no great advantage over ordinary organic refuse on the one hand or wood ashes on the other.

* The chief characteristics exhibited by a section of workable peat moss, and referred to by Professor James Geikie, F.R.S., in a Paper "On the Buried Forests and Peat Mosses of Scotland, and the Changes of Climate which they indicate" (Trans. R. S. Edin., vol. XXIV., 1867), are strikingly identical with the above description.

The peat to be met with in this Province is of recent origin—old peat deposits, some of which date back to the glacial period, apparently do not occur in the Island—and the conditions which favour its formation locally are restricted to limited areas. "The question therefore," says Mr. Drieberg, in reply to the writer's inquiry, "as to the availability of peat for fuel purposes practically does not affect us, but there are other economic uses for which such local and limited supplies of peat—if, indeed, it would be wise to encourage its formation—may be available. Owing to its absorbent properties, it is a useful medium for absorbing liquid manure, &c. Peat moss litter, as exported from Germany, is in fact largely used in England in byres and stakes, while it is also a very effective deodorizer."*

Dr. H. M. Fernando, the Government Analyst, Colombo, to whom a sample of the Kurunégala tank water was sent for analysis by the writer in December, 1896, in kindly furnishing the following report, added in a note :—

The tank water is highly impregnated with vegetable matter, and should be looked upon with great suspicion, especially in a fever district.

Colour, slight yellow. Smell, fœtid. Taste, unpleasant. Sediment, slight sediment containing infusoria and protozoa. Chloride grains per gallon, ·3 grain. Nitrates, trace. Saline ammonia, parts per million ·01. Albumenoid ammonia, parts pe. . .lion ·24.

Remarks.—This sample contains a large proportion of organic matter, probably of vegetable origin. Unfit for drinking purposes.

METALS.

We know little or nothing of the metaliferous nature of our rocks, for beyond the investigations of Gygax in 1847, which were confined to the hill district south of Adam's Peak, and his report, which scarcely enlarged the knowledge previously possessed by us on the subject, no examination has been made of the veins and deposits of our rocks.

* For a full description of the "Peaty Deposits in the Kurunégala Lake," and the steps taken to remove them, see an article by the writer in the "Ceylon Agricultural Magazine," 1896.

Gold.—However slight may be the proof afforded by such names as Randenigama, Randeniya, Rangalapola, Rangama, Ranmutugala, Rantetikanda, Rantetiyáwa, &c., which are said to derive their origin from the existence of auriferous ores in these places, and the doubtful testimony furnished by "*Wadula-pot*," which relate in glowing terms of fabulous wealth and countless treasures buried deep in the bowels of the earth seldom accessible to man (!), the theory that gold is an unknown quantity in the Island has been falsified by explorations in this Province. Davy in his work made the unqualified averment that the precious metals were not to be found in Ceylon. Commenting on this statement, "it is amusing," says Sir Samuel Baker, "to see the positive assertions of a clever man upset by a few uneducated sailors."* In March, 1854, seven discharged seamen from the "Faithful" and the "Martin Luther," namely, Henry Temple, William King, Charles Langley, James Mabley, John Wilson, John Philips, and William Bradley, with experience of gold-digging in California and Australia, touched at Colombo and made a trip towards Kandy by the old road. When about half way it struck them, from the appearance of the rocks in the uneven bed of the Mahá-oya, that gold must exist in the sands. They had no geological reasons for this opinion, but the river happened to be very like those in California in which they had been accustomed to find gold. They accordingly set to work with a tin pan to wash the sand, and, as Baker exultingly records, "to the astonishment of every one in Ceylon, and to the confusion of Dr. Davy's opinions, they actually discovered gold!" The scene of the operations, called "Bradley's Diggings" after the original discoverer, lay at Giriulla, 25 miles from Kurunégala, in a sudden bend of the Mahá-oya from a south-westerly to a north-westerly course. In the centre of the bed stood an island composed of "diluvial" deposits of smooth gneiss, quartz boulders, sand, and gravel, cemented

* "Eight Years in Ceylon," second edition, p. 49.

together by a reddish clay. The natives said that this island formed part of the mainland, whence it was severed by the heavy floods of 1838. The pit from which the seamen washed the deposit was in the upper part of the island, which divided the stream into two parts during the monsoon. The deposit was from 2 to 3 ft. deep to the solid rock bottom, 300 ft. long, and 70 ft. broad. The gold was distributed throughout the island, but was more abundant in the rock crevices. The specimen submitted for examination to Dr. Ellery, according to his report—

> weighed 7½ grains, and consisted of small pieces of yellowish quartz, a black powder resembling coarse emery, and several scales of yellow metallic-looking substance. The application of a magnetic ore separated about one-third of the black powder, which consisted of magnetic ore. One-half of the residue was acted upon by boiling in nitric acid without effect; the addition of muriatic acid dissolved the metal, yielding a golden yellow solution. This, on the addition of the subjoined tests, afforded the following results :—
>
> No. 1.—Chloride of tin gave a copious deep purple precipitate.
>
> No. 2.—Solution of sulphate of iron, a dark-brown looking precipitate of metallic gold.
>
> No. 3.—A very weak solution of tincture of opium gave a bright yellow transparent fluid.

Dr. Ellery was of opinion, from the appearance of the specimen and from the result of the chemical examination, that it certainly contained gold.

The discovery of gold created a regular *furore*. Crowds of enterprising speculators and inquisitive visitors rushed daily to the diggings for purposes of prospecting for gold or witnessing the operations. Thereupon Government, with more haste than discretion, issued a notice that the Superintendent of Police (Macartney) had received instructions

> "not to allow any persons to dig, excavate, or to carry on any mining operations under whatever name or pretext, with the exception of the seven individuals already engaged with the cognizance of Government, and of any other that may hereafter be especially licensed for that purpose."

Four days afterward, to wit, on the 17th of March, 1854, a second Government Proclamation was published, informing

the public that the Governor (Sir George Anderson) was pleased to appoint T. C. Power, Esq., Assistant Government Agent of Kurunégala, to be "Special Commissioner for the issue of licenses to dig, search for, and remove gold on any land belonging to the Crown." A fee of ten shillings was to be charged for every such license, which was to remain in force for one month from the date of issue. These notifications were manifestly too premature, and no wonder that not one single license was applied for!

In addition to the Gold Commissioner and the Superintendent of Police, a *posse* of the local constabulary and a section of the Ceylon Rifles were stationed at the "diggings," which, from being the undisturbed haunt of the alligator, at once rose from its primeval solitude into a busy and "fashionable watering-place!" A piece of gold was produced before Mr. Power by a headman, who reported to have found it at Dambadeniya, eight miles above the "diggings." Dr. Ellery pronounced the gold to be without alloy.

The quantity produced at the "diggings" was, however, small, but the diggers were sanguine of success, and were making preparations for working on a more extensive scale, when a combination of adverse circumstances, chief among them being violent thunderstorms, floods, and jungle fever, conspired towards the abandonment of the enterprise. Curiously enough the neighbourhood of the "diggings" was the spot where Davy closed his series of journeyings in the interior, one of the results of which, he declared with a show of scientific authority, was, that no gold existed in Ceylon!

In 1881 Mr. A. C. Dixon—

"met with gold in scattered grains, free by natural causes from its matrix, in the alluvium of the Deduru-oya beyond Kurunégala. The particles were exceedingly small, and other metallic matters were not uncommon. This must have come from the quartz reef further up the hills."*

* "Gold in Ceylon," Journal, C.B.R.A.S., 1881.

In the same year the late S. Jayatilleke, Mudaliyár, of Kurunégala, submitted for analysis some interesting specimens of quartz and plumbago streaked with auriferous-looking substances found in that district. The streak of green glittering matter in the plumbago was reported to be *copper*, while the quartz was freely mixed with pyrites, but of a very promising character, and in one instance Mr. Dixon thought it must be auriferous.*

Mica mistaken for Gold Dust.—Col. Campbell records the following interesting discovery in the Kurunégala District, but the particulars are too vague to identify the spot :—

> After nearly an hour spent in search of it [the fairy well] I at last came to an open space of fine green sward close to the bank of the river, which was there delightfully shaded by some tall trees, in the midst of which was a circle of about seven or eight feet in diameter, entirely covered with a brightly shining foliated substance of a red and yellow hue ; and in the very middle of it, to my surprise and delight, I saw a beautiful diminutive *jet d'eau*, throwing up water of the same bright, shining colour, fully three or four inches above the surface, and which fell as it were in a circle of little sparkling drops. I stood for some minutes really enchanted with the beauty of the extraordinary fairy well, the water of which seemed full of gold particles. I therefore set to work and strained out a small quantity of them, pouring the water through my handkerchief, when to my increased delight they looked "for all the world" like real gold dust.

Campbell filled a quart bottle with some of the "golden" water and despatched it with a very small quantity of the dust to Dr. Farrell, the Deputy Inspector of Hospitals, whose opinion was that it was "only the very finest specimen of mica he had ever met with."†

All that has been said and written about the existence of gold in the Province and the results of explorations hitherto made point to but one conclusion, that though gold is to be found, it is not to be met with in sufficiently paying quantities so as to encourage the capitalist to embark on the venture.

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* Ferguson's "All about Gold, Gems, and Pearls," second edition, p. 179.

† "Excursions, Adventures, and Field Sports in Ceylon," vol. II., pp. 114, 115.

Silver.—Tradition says that when King Dutugęmunu was engaged in constructing some important public works he ran short of funds, and in order to avoid his labourers who were clamouring for their wages, he fled into the jungle. Here he chanced upon a vein of silver, which supplied him with ample means to satisfy his pecuniary wants. In grateful remembrance of the miraculously opportune and fortuitous discovery, he is said to have built over the site of the vein what is known as "Ridi Viháré"—the silver temple—eleven miles from Kurunęgala, and endowed it with extensive property. The "*Kaḍaim-pota*" records that in the Déwamędiraṭa—the country so called from its situation between two rivers, the Dęduru and Mi oyas, and corresponding in some measure to the modern Déwamędi-hat-pattu of the Kurunęgala District, which, however, owing to its altered boundaries does not embrace the whole of the division included by these rivers—there is silver to be found in a cave.

Iron exists in different forms, and is pretty generally distributed. It is chiefly met with in the following species: Iron pyrites, hematite, and bog-iron. "The only ore heard of," says Brodie, writing of the Puttaḷam and Chilaw Districts, "is bog-iron, procured in considerable quantities a few miles to the south of Chilaw and smelted by the natives, who, it appears, observed its reproduction."*

Casie Chitty observes that Yágam pattu "abounds in iron ore, and derives its name from that circumstance."†

There are numerous caves and vast caverns in the Crown forest known as Penirendawa in the Chilaw District, from which the natives assert iron was dug out in the olden days. These abandoned recesses afford a secure rendezvous to runaway criminals, who take shelter in them to evade justice. In October, 1896, these caves were searched as likely places for the Chilaw murderers who had escaped from jail, but without success, the stay of the fugitives there having been very short.

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* Journal, C.B.R.A.S., No. 6, 1853. † "Ceylon Gazetteer," p. 223.

As testified by Tennent, "remains of ancient furnaces are met with in all directions similar to those still in use amongst the natives. The Siṇhalese obtain the ore without the trouble of mining: seeking a spot where the soil has been loosened by the rains, they break off a sufficient quantity, which in less than three hours they convert into iron by the simplest possible means. None of their furnaces are capable of smelting more than twenty pounds of ore, and yet this quantity yields from seven to ten pounds of good metal."* Since, however, the imported article is so cheap and certainly superior to that locally obtained, smelting may be considered as an operation which is numbered with the past.

MINERALS.

Plumbago is the only mineral of commercial value and importance. It is found principally in the Kurunégala District. As a medicinal ingredient plumbago takes a prominent place in the Siṇhalese pharmacopœia, and in the ceramic art it was used largely for glazing purposes, from which we may argue that it was known to the natives for a long time past; but from a commercial standpoint plumbago mining may be considered as of comparatively recent origin, having been started early in the "seventies" in the Kurunégala District.†

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* "Ceylon," vol. I., p. 30.

† Col. Colebrooke, one of the Commissioners of Ceylon affairs, stated in his report in 1829 that provision had been made for the delivery of cinnamon and blacklead in the Kandyan Provinces (which included the Seven Kóralés or Kurunégala District) at fixed rates; but reference to the "Ceylon Calendars" shows no mention of plumbago in the Island till 1831. It assumed importance as an article of commerce in 1834. Mr. Parsons, Government Agent of the North-Western Province, wrote in 1870: "The question of plumbago-digging is one of great importance, and anxiously looked forward to by the residents as well as those who desire to dig for it. The delay in the matter is greatly to be regretted. It was brought to notice many months ago and, I believe, referred to the Queen's Advocate, but no decision has yet been arrived at."—*Administration Reports, 1870.* Plumbago is spoken of in 1875 as having been found at Mipiṭiya, about 18 miles from Kurunégala, as if the discovery had been made recently.—*Administration Reports, North-Western Province, 1875.*

The chief seat of the industry lies within a radius of about six miles between the road from Kurunégala to Dambulla and the Mátalé range of hills. The plumbago-producing villages are Paragoḍa, Madurágoḍa, Uḍattápola, Mípiṭiya, Rágedara, Uḍakendawela, and Doḍangaslanda. Plumbago was reported to have been discovered on the road to Negombo, south-west of Kurunégala, and at Naramana, on the road to Balalla, 18 miles north of Kurunégala. The "Blue Book" for 1892 gives Nalaulla and Nakkawatta in addition to the above villages. Operations are carried on here on a small scale.*

The following is a list prepared at the Kurunégala Kachcheri of some of the pits, with the locality in which they lie, and name of owner :—

Paragoḍa, in Máduré Kóralé.

Súriyagaha-patala	...	N. D. P. Silva
Bógaha-patala ...	...	Do.
Kękunagaha-patala	...	Do,
Haba-patala ...	...	D. G. Attygalle, Muhandiram

Madurágoḍa, in Ihalawisideké Kóralé.

Raṭamiris-hena-patala	...	N. D. P. Silva and others
Tepugolla-patala	...	Do.
Raṭamiris-hena	...	Do.
Kęṭagalagaha-patala	...	Do.
Koḍigaha-patala	...	J. Clovis de Silva
Kahaṭagaha-patala	...	D. C. G. Attygalle, Muhandiram
Rukattanagaha-patala	...	Do.
Silvat-hena-patala	...	L. Mendis and others
Tibbotu-hena-patala	...	J. de Mel
Galkanuwagawa-hena	...	Do.

Udattápola.

Wéwęlhena-patala	...	N. D. P. Silva

* For an account by the writer of the working of the mines in the Kurunégala District, see article in the "Ceylon Literary Register," new series, vol. II., reproduced from the *Ceylon Observer*. An Ordinance has since been passed on the supervision of mines, &c.

Mipitiya.

Mígahamulahena-patala	...	N. D. P. Silva
Raṭagorokgaha-patala	...	Do.
Miniran-patala	...	Attygalle Muhandiram
Miniran-kanda-patala	...	The Crown
Midella-hena ...	...	Jacob de Mel

Udakendawela.

Hurigolla-hena-patala	...	L. Mendis and others
Dambagolla-patala	...	Jacob de Mel
Dambagolla-patala	...	L. Mendis and others
Demaṭagolla-patala	...	Jobsz and others
Demaṭagolla-patala	...	Jacob de Mel

Seekers after plumbago are guided by no better indication than the surface soil or pieces of the mineral cropping up through the fissures of the rock. Here is just the case where a Government geologist might afford valuable aid in developing a most important industry, and be able to point out with much confidence to undeveloped Crown lands likely to prove of great value for their beds of plumbago, while his advice to private proprietors might save much time and money in trial pits, surface diggings, and generally useless and vain exploration.

The usual mode of setting to work when there are signs, which to the knowing ones prognosticate a find of plumbago sooner or later, is to drive a shaft (*miniran patala*), say 12 ft. by 6 ft., until the mineral is reached, failing which galleries are run (*doná kẹpima*) till a vein is found, and the vein is followed downwards and horizontally so long as it is possible to contend with the flow of water in the mine. Operations are then stopped and galleries driven, and this goes on while the lamps burn ; but the moment the lamps are extinguished by the gases collected in the galleries, working in that part is suspended and resumed upwards, the abandoned portions being re-filled with the *débris* from the mine. In other cases, instead of sinking a shaft a large open cutting is made, in which the vein is followed and galleries run as occasion may require. Slightly improved methods have from time to time been employed, but the old order of things

remains, the pit owners being painfully conservative. When rock is encountered in the course of excavation it is blasted by means of dynamite. It is in the blasting operations that most of the accidents occur, chiefly through carelessness. The report, by the way, caused by the explosion, sounds at the mouth of the pits at Rágedara like that produced by a cracker, but at Gokarella, which is two miles thence, and perhaps on a level with the bottom of the pits, the full effect of it is heard.

Plumbago does not occur in even or regular beds, but varies in thickness, both vertically and horizontally. It may occasionally be more than a fathom thick, but thinning out very often to a few inches in all directions. Very good plumbago is often found near the surface, but as a general rule the lower the digging operations go the better the quality and the larger the quantity of mineral.

The principal pits are at a distance of between 12 to 16 miles north-east of Kurunégala on a small range of hills known as Mípitiya-kanda, about three miles long and about a mile to the west of the Nevugala range, 3,000 to 4,000 ft. high, and almost parallel to it. The major axis of the Mípitiya range runs, as in the case of the Mátalé hills, north and south. The pits are being worked at Mípitiya, which is at the southern end, and at Rágedara, at the northern end of the range. Paragoda and Madurágoda lie about ten miles farther south, and are approached from Wéuda, eleven miles from Kurunégala on the road to Kandy.

The general strike of the veins or bed of plumbago in the Mípitiya range is east and west, nearly vertical in position. The general direction of the "underlie" in the Rágedara beds is south-east and in the Mípitiya beds north.

The late Mr. A. M. Ferguson writes :—

> The Rágedara hill seems to be permeated in its whole extent by generally horizontal veins of the richest plumbago, associated with snow white crystalline to semi-opaque quartz, the latter occasionally showing specks of garnet and bands of soapstone.

When His Royal Highness the Prince of Wales was in Colombo in 1870, Mr. De Mel exhibited from Kurunégala what was supposed to be the largest mass of pure plumbago ever shown in this or any other country, its weight being only 14 lb. short of 6 cwt. For this unique specimen a sum of £50 was offered. It was subsequently sent to the United States, and is understood to have been placed in the Philadelphia Exhibition and finally in an American Museum. As regards the generality of pits, Mr. Ferguson estimated—

the extraneous matter in the shape of heart and rock brought to the pit's mouth as equal to a half, about 10 or 15 per cent. being the proportion carried to Colombo and separated from the ore in the plumbago yards. The estimate of Mr. W. P. Fernando, an experienced plumbago merchant, of foreign matter brought to Colombo is 5 per cent. for pieces of quartz round which plumbago adheres and 2½ per cent. for minute fragments of silica, iron, &c., mixed with smaller pieces and dust.

Plumbago occurs in various different forms. Dana enumerates—

(*a*) Foliated.
(*b*) Columnar and sometimes radiated.
(*c*) Scaly, massive, and slaty.
(*d*) Granular massive.
(*e*) Earthy, amorphous, without metallic lustre, except in the streak.
(*f*) In radiated concretions.

Commercially plumbago is divided into (1) lumps, (2) chips, and (3) dust; and distributed into three classes: (1) foliated, laminated; (2) hard, short-grained, and dull-looking; (3) slaty, hard and stony, with about 30 per cent. of clay in it, termed by the natives "bora."

Again, it is distinguished, for trading purposes, into various qualities, such as—

(1) X: best.
(2) X b: second best.
(3) B.
(4) B E.
(5) E.
(6) S I O.

Bison, Palm, Cobra, Manx } These are private marks.

In the following analyses by Mr. C. Mene, reproduced by

Cochran from Dana's "Mineralogy," Ceylon plumbago does not appear to the best advantage, being in all probability not represented by a very good local sample :—

	Specific Gravity.	Carbon.	Volatile Matter.	Ash.
Ural, Mt. Alibert ...	2·1759	94·03	0·72	5·25
Cumberland, England ...	2·3455	91·55	1·10	7·35
Mugran, Bohemia ...	2·1197	91·05	4·10	4·85
Zaptan, Lower Austria ...	2·2179	90·63	2·20	7·17
Savarbock, Bohemia ...	2·3438	88·05	1·05	10·90
Fagerita, Sweden ...	2·1092	87·65	1·55	10·80
Cumberland	2·5857	84·38	2·62	13·00
Passan, Bavaria ...	2·3032	81·08	7·30	11·62
Buckingham, Canada ...	2·2863	78·48	1·82	19·70
Cumberland	2·4092	78·10	6·10	15·80
Ceara, Brazil	2·3865	77·15	2·55	20·30
Passan, Bavaria ...	2·3108	73·65	4·20	22·15
Madagascar	2·4085	70·69	5·18	24·13
Ceylon	2·2659	68·30	5·20	26·50
Pissie, Nantes-Alpes ...	2·4572	59·67	3·20	37·13

	Composition of 100 Parts of Ash.				
	Silica.	Alumina.	Oxide of Iron.	Magnesia and Lime.	Alkalies and loss.
Ural, Mt. Alibert ...	64·2	24·7	10·0	0·8	0·3
Cumberland, England ...	52·5	28·3	12·0	6·0	1·2
Mugran, Bohemia ...	61·8	28·5	8·0	0·7	1·0
Zaptan, Lower Austria...	55·0	30·0	14·3	—	0·7
Savarbock, Bohemia ...	62·0	28·5	6·3	1·5	1·7
Fagerita, Sweden ...	58·6	31·5	7·2	0·5	2·2
Buckingham, Canada ...	65·0	25·1	6·2	0·5	1·2
Cumberland ...	62·0	25·0	10·0	2·6	0·4
Passan, Bavaria ...	53·7	35·6	6·8	1·7	2·2
Cumberland ...	58·5	30·5	7·5	3·5	—
Ceara, Brazil ...	79·0	11·7	7·8	1·5	—
Passan, Bavaria ...	69·5	21·1	5·5	2·0	1·9
Madagascar ...	59·6	31·8	6·8	1·2	0·6
Ceylon	50·3	41·5	8·2	—	—
Pissie, Nantes-Alpes ...	68·7	20·8	8·1	1·5	0·9

The following analyses of Canadian and Ceylon graphites, reproduced from the "Mineral Resources of the United States," by Mr. J. A. Walker, and quoted by Mr. Ferguson

in his monograph on "Plumbago," do full justice to the Ceylon mineral, and the analyses may be regarded as representative of the best qualities of lump plumbago in both cases :—

	Specific Gravity.	Volatile Matter.	Carbon.	Ash.
		Per cent.	Per cent.	Per cent.
Canada, Buckingham : vein graphite ; variety foliated ...	2·2689	0·178	99·675	0·147
Canada, Buckingham : vein graphite ; variety columnar ...	2·2679	0·594	97·626	1·780
Canada, Grenville : vein graphite ; variety foliated ...	2·2714	0·109	99·815	0·070
Canada, Grenville : vein graphite ; variety columnar ...	2·2659	0·108	99·757	0·135
Ceylon : vein graphite ; variety columnar	2·2671	0·158	99·792	0·050
Ceylon : vein graphite ; variety foliated	2·2664	0·108	99·679	0·213
Ceylon : vein graphite ; variety columnar	2·2546	0·900	98·817	0·283
Ceylon : vein graphite ; variety foliated	2·2484	0·301	99·284	0·415

The following analyses* by Cochran of Ceylon plumbago dust show the total percentage of graphite and of sulphur, the latter being regarded as an objectionable impurity :—

	1	2	3	4	5	6	7
Carbon, per cent. ...	99·3	99·00	98·05	98·00	97·08	95·03	95·09
Sulphur, per cent.	trace	trace	0·02	0·06	0·09	0·59	0·83
		8	9	10	11	12	13
Carbon, per cent. ...		91·35	90·05	88·06	88·06	88·75	87·04
Sulphur, per cent. ...		0·75	0·02	0·19	0·38	0·72	0·75

* "Manual of Chemical Analysis," p. 262. Mr. Ph. Freudenberg writes : "Cochran's analyses were made of plumbago *dust*, as he calls it, inasmuch as we, for instance, grind the lumps to powder before sending them to Mr. Cochran to ensure evenness of sample ; but no 'dust' in the commercial sense contains carbon up to 90 per cent."

The following analyses of dust plumbago, also by Cochran, in which the carbon is estimated by the loss of weight when the mineral is burned in oxygen gas, show an inferiority in the samples in point of percentage of carbon to those already quoted :—

	Per cent.			
Loss on ignition in air ...	3·1	2·2	3·5	1·8
Ash	22·4	22·6	28·4	16·2
Graphitic carbon ...	74·5	74·8	68·1	82·0
	100·0	100·0	100·0	100·0
Sulphur	0·17	0·07	0·22	0·45

The following analyses made by Cochran of plumbago dust exhibit the percentage of iron as well as the other ingredients :—

Loss on ignition in air	1·7	1·00	1·5	2·10	0·95	1·35	1·5
Ash	6·0	5·00	17·8	7·60	7·00	8·60	17·8
Graphitic carbon ...	92·3	94·00	80·7	90·30	92·05	90·05	80·7
	100·0	100·00	100·0	100·00	100·00	100·00	100·0
Iron	0·22	0·74	1·01	1·08	1·340	2·33	2·66
Sulphur ...	0·05	0·01	trace	0·77	·014	0·49	0·51

Mr. Ph. Freudenberg adds the following analyses :—

Loss on ignition in air	2·65	1·90	0·90	2·45	3·87
Ash	12·00	7·80	4·80	34·00	10·00
Graphitic carbon ...	85·35	90·30	94·30	63·55	86·13
	100·00	100·00	100·00	100·00	100·00
Iron... ...	3·52	2·45	0·47	4·56	5·17
Sulphur ...	0·32	2·22	0·24	0·09	3·98

The following interesting analysis by Walker shows the various uses to which plumbago is put :—

Purposes for which used.	Sources of Supply.*	Per cent.
Crucibles and refractory articles, as stoppers and nozzles	Ceylon, American ...	35·00
Stove polish	Ceylon, American, German ...	32·00
Lubricating graphite ...	American, Ceylon ...	10·00
Graphite greases ...	American	6·00
Foundry facings, &c. ...	Ceylon, American, German ...	8·00
Pencil leads	American and German ...	3·00
Graphite packing ...	Ceylon, American ...	3·00
Polish shot and powder ...	Ceylon, American ...	2·00
Electrotyping ...	American, Ceylon ...	0·25
Paint	American	0·05
Miscellaneous : piano action, photographers', gilders', and hatters' use, electrical supplies	American, Ceylon ...	0·25
		100·00

Considering the fact that nearly three-fourths of Ceylon plumbago, whose average shipments may be safely put down at 12,000 tons per annum, and which carries the palm for superiority among all known varieties of graphite in the world, is directly shipped to Great Britain, Germany, and the United States, and principally used by the great factories at Battersea and Jersey City; and in view of the circumstance that a large proportion so exported is contributed by the Kurunégala District—we cannot but contemplate with the deepest interest the important part which our chief mineral product, or rather the only mineral product of any commercial value, plays in the multitudinous manufactures of the world.

It would doubtless make the hairs of our semi-nude toiling miner stand on end like "the quills of the fretful

* Mr. Ph. Freudenberg notes : "Sources of supply ought to have Germany and Austria added in every instance, and for pencil lead Russia ought to be given."

porcupine," if, when he brings up to the surface a ton of plumbago, he could realize the manifold uses towards which he unwittingly contributes by the fruits of his perilous labour in the dark depths of the earth. In the exhaustive list of uses already quoted, "*kaḷu-miniran*" forms the chief constituent, and though coming nearer home, its identity may be concealed under the thin guise of such sentimental names as "Servant's Friend," "Prize Medal Lustre," or "Halse's Roman Lustre," without it "the most elaborate kitchen range would soon become unsightly, the trim parlour grate blush with rust, and the cottager's 'wee bit ingle' would leave off 'blinkin bonnily.'"*

For these reasons well may we "lay the flattering unction to our soul" that the Kurunẹ́gala District—

> forms the main source of supply of an article so useful in the industries and elegancies of life, the appliances of peace and war, and the pursuits of the artist and literary man, not only to countries in the Eastern Hemisphere, but to the regions of the Far Western World.†

Minerals associated with Plumbago. — An interesting report on specimens of plumbago, quartz, and iron pyrites from a mine at Rágedara was made by Mr. A. Murray of the Public Works Department, and will be found as an Appendix to Mr. Ferguson's "Monograph on Plumbago."

Of the minerals dug out of plumbago mines, there are a number which doubtless have some value, but with which the natives have no acquaintance, and consequently they are sometimes thrown away. Amongst these minerals may be enumerated *pyrrhotite*,‡ from which the nickel of commerce

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* American paper.

† Ferguson's "Plumbago," &c., p. 237.

‡ Mr. C. E. Ferdinands, of Kurunẹ́gala, who has a share in the Hurigolla and other mines, sent a specimen of this mineral to his London agents, who reported that iron pyrites were used to make sulphuric acid, but at that time, nine years ago, they had no commercial value. The specific gravity of this ore is almost the same as that of gold. It does not dissolve in nitro-hydrochloric acid. It was put to the test.

is extracted, but whether it is nickeliferous in Ceylon it is difficult to say. *Steatite* or soapstone, which, if it occurs in masses, might be worked into ornaments, plates, cups, and saucers as in Bengal. *Magnetite (feroso-feno oxide)*, showing strong polarity, and which may perhaps be found to be a richer ore of iron than the "black sea sand" of the coast, which experts thought some five and twenty years ago could not be remuneratively worked. *Chalcopyrite*, containing such rare elements as columbian or niobium and yttrium, zirconium, mica, gold, and numberless other minerals.

If these metals and minerals which are found in association with plumbago occur to any appreciable or rather workable extent, how many valuable additions might we not have to our local arts and manufactures, and even to our exports; and may be, some day we shall hear of metallurgical operations in the Island, and of gold, nickel, and manganese and iron being extracted from their ores!

GEMS.

Beyond the garnets and amethysts* which are common in the gneiss, cinnamon stone, which is properly a variety of the former, rock crystal, and tourmaline, and a number of others of no great value, this Province is sadly deficient in gems.

SALTS.

Nitre Caves. — Davy enumerates the following places in this Province in which saltpetre is produced and in which it has been manufactured. The names are said to be—

not those of the nitre caves themselves, which are generally nameless, but of the nearest inhabited places, which are in many instances several miles remote, most of the caves being situated in the wildest and most deserted parts of the country :—

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* Davy found "very beautiful specimens of this mineral in the alluvium derived from the decomposition of gneiss and granitic rock in Saffragam and the Seven Korles"—Page 20.

1. Werengodde.
2. Medellenewa.
3. Paremakande (Parama-kanda),* all three in the Demoole-pattu (Demaḷa pattu).
4. Giribawah (Giribáwa), in the Mahamedde-pattu (now Mí-oyen Egoḍa kóralé).
5. Maha-kelle.
6. Galgiriawah (Galgiriyáwa).†
7. Kadooroo-wuwa (Kaduruwewa), all three in Hatalispahay kóralé (now Hatalispahe kóralé east).
8. Kadigaway (Kadigawa), in Magoole kóralé (now Magul Meḍagandahé kóralé west).
9. Ressiroowey (Rasséruwa), in Naganpahay kóralé (now Hatalispahé kóralé east).

Judging from four nitre caves that I have visited and from the specimens of rocks of several more that I have examined, I believe that they are all very similar ; and that the rocks in which they occur in every case contain at least felspar and carbonate of lime ; from the decomposition of the former of which the alkaline base of the salt is generally derived, and by the peculiar influence of the latter on the oxygen and azote of the atmosphere the acid principle is generated. I have never been able to detect saltpetre, excepting superficially, where air could have access ; never unaccompanied by nitrate of lime or magnesia ; in no rock, not containing lime or felspar ; that the richness of the rock in general has been proportional to the abundance and intimate mixture of these two ingredients.‡

Of the Puttaḷam and Chilaw Districts, Brodie observes :—

Nitre used at one time to be procured from various caves. One of these I visited, and have reason to believe that the salt was not formed naturally, but it was obtained artificially from the dung of countless bats which have their abode in the grotto.§

The process of preparing the salt is thus detailed :—

When the salt occurred, impregnating the surface of the rock, the surface was chipped off with small strong axes, and the chippings by pounding were reduced to the state of a powder. This powder, or the loose fine earth, which in most of the caves contained the saline

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* Casie Chitty confirms the statement, and says that at the base of the hill Parama-kanda there is a cave from which the natives formerly obtained saltpetre.—"Ceylon Gazetteer," p. 183.

† In Nikawagampaha kóralé, Hiriyála hatpattu.

‡ "Ceylon," pp. 31–32.

§ Journal, C.B.R.A.S., No. 6, 1853.

impregnation, was well mixed with an equal quantity of wood ash.* The mixture was thrown on a filter formed of matting and washed with cold water. The washings of the earth were collected in an earthen vessel, and evaporated at a boiling temperature till concentrated to that degree that a drop let fall on a leaf became a soft solid. The concentrated solution was set aside, and when it had crystallized the whole was put on a filter of mat. The mother-lye that passed through, still rich in saltpetre, was added to a fresh weak solution, to be evaporated again ; and the crystals after having been examined and freed from any other crystals of a different form were either immediately dried, or, if not sufficiently pure, re-dissolved and crystallized afresh. The operations just described were generally carried on at the nitre caves. In the Province of Seven Kóralés, besides extracting the salt at the caves, the workmen brought a quantity of the earth to their houses, where, keeping it under a shed protected from the wind and rain, without any addition excepting a little wood-ash, they obtained from it, every third year, a fresh quantity of salt. After twenty-one years, or seven repetitions of the operation, the earth was considered unfit for further use, and was thrown away.†

Davy says that since the British occupation the manufacture was stopped, and thereafter, on account of political motives, prohibited.

Salt (chloride of sodium) is procured in large quantities in the Puttaḷam District by solar evaporation, and, indeed, forms the chief source of its revenue. The greater portion of it is obtained by means of artificial pans, and the manufacture is carried on exclusively in Puttaḷam proper, Nachchikali, and Karativu. It is spontaneously formed near Kalpiṭiya during the dry season, at Chilaw, and generally along the sea coast. Salt used to be manufactured—

in the vicinity of the Mundle lake, viz., Odepankarre, Pulichakolem, and Keriankally ; the attempt to prepare it near Chilaw has always failed. * * * The quantity produced is about 50,000 bushels.

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* Such a quantity must appear very large ; but I do not believe it is more than is required to decompose the whole of the nitrate of lime that accompanies the saltpetre. The proportion of alkali in the ash of large trees in Ceylon, which are usually burnt for the purpose in question, is very small : in one specimen that I examined I found only three and a half per cent. of carbonate of potash ; carbonate of lime was the principal ingredient.

† Davy's "Ceylon," pp. 265–267.

The average quantity sold to retailers annually is about 10,000 bushels, which yield a revenue of £1,333. 6*s*. 8*d*. The average cost of every bushel to Government is about 6½*d*., whilst it is retailed at the uniform rate of 2*s*. 6*d*. per bushel. The entire operation is left to private enterprise, with only a Government supervision to prevent any contraband trade.*

The salt collected in the North-Western Province varies in colour from pure white to dull gray or reddish, according to the impurities contained in it ; it appears in the form of a confused crystalline mass, consisting of hollow quadrilateral pyramids with graduated surfaces (*pied de mouche*) and of cubes. The large grained salt is generally preferred, as it does not absorb moisture from the atmosphere so rapidly as that which is in smaller crystals. It is to be observed that the former is obtained in the first crop, the latter in those which succeed ; and no one can feel astonished that these latter should prove impure, when it is remembered that all except the first crops are procured from a mixture of sea water with the previously obtained residuary solution of various limes and magnesia salts. The natives have observed the difference in appearance of the various salts procured at the different crops, but do not seem to be aware that a most impure article is obtained by mixing all together.†

When the Dutch held sway in the Island the manufacture of salt was left in the hands of the natives, who were, however, bound to give a certain portion of the produce to the various officials under the name of *mésai uppu* or "table salt." The price at that time varied from three to four-eighths of a penny per bushel. Under the English rule the manufacture is a Government monopoly. Although it is left to private parties they are prohibited from selling or using it. Government use to buy the salt at the fixed rate of 2⅛*d*. per bushel from the purchaser and sell it at 2*s*. 8*d*. per bushel. The present rates are 19 cents per cwt., and the Crown in its turn disposes of it at the rate of Rs. 2·36 per cwt.

The *modus operandi* adopted in the manufacture is as simple as it is unique. Unlike the natural *lewayas* in the Hambantota District, the salt pans have to be prepared artificially after the manner of paddy fields. The ground,

* "Notes on the Topography of Chilaw," by T. F. Garvin, Colonial Medical Service, *Ceylon Miscellany*, March, 1854, p. 307.

† Journal, C.B.R.A.S., No. 3, 1847–48, p. 112.

which is below the level of the sea, is beaten down and levelled and partitioned off into numerous beds (*uppu-patti*) by means of low dams. A portion of the *kalap-puwa* or bay is "bunded" off into a reservoir (*kachchu-patti*), in which the water undergoes a preparatory process by evaporation. Brodie gives the average size of a reservoir as 40 or 50 ft. square, that of a bed 15 to 20 ft. in length by 8 to 12 ft. in breadth ; but no particular attention is paid to this. Water from the reservoir is then introduced into the pan by means of a canal (*allei*), and by smaller canals (*pérallei*) into the various beds till crystallization occurs. Fresh quantities are from time to time let in as the crystallization goes on till the necessary depth of salt is formed.

The process commences in June and usually lasts till September. The salt is then collected and placed in heaps, and ultimately conveyed to the *kottus* or huts in which it is stored till handed over to, weighed, and received by the Government authorities into their stores. The construction of these stores has been the subject of much discussion and anxious thought and consideration. During the time of Brodie they were "in some instances formed of cadjans, sometimes of masonry, and sometimes altogether of timber, and of these latter some were placed over pits four or five feet in depth, while others were raised on dwarf pillars to prevent injuries from water. The cadjan stores require constant repair and are seldom quite water-tight ; the mortar of the masonry ones soon becomes disintegrated by the action of the salt, the timber stores over pits were found inconvenient and damp, those on pillars unnecessarily expensive, it being observed that white ants do not attack timber saturated with salt ; plain wooden structures placed on somewhat elevated sites appear therefore the most suitable, and will probably be universally adopted."*

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* Journal, C.B.R.A.S., No. 3, 1847–48, p. 109.

The wastage caused by salt being stored in buildings such as these, none of which had the necessary qualification of being air-tight, was greatly diminished, if not altogether done away with, by the contrivance of a form of store suggested in 1886 by Dr. Modder of the Civil Medical Department, then stationed at Puttaḷam, namely, a vaulted store opening at one end only, and made as nearly air-tight as possible.*

The system in vogue is very crude and primitive, and is capable of much improvement. As pointed out by Brodie, *inter alia* :—

> The beds are formed either in a black silt or mud, or else, as at Sinne Natchecally, in a nearly pure sand ; either of these substances is very easily disturbed and rendered uneven, which calls for renewed levelling and drying ; were artificial beds of some more solid impervious substance formed, there would be less leakage of water and less labour would be requisite ; even firmly beaten clay might prove useful, but has never been tried by the natives, and this owing to a belief that in such pans the water would evaporate very much more slowly ; to me this appears to prove that at present there is a very considerable waste by filtration into the soil. Again, owing to a feeling of petty parsimony, the salt when placed in heaps is in the majority of cases left quite unprotected, and thus becomes not only coated, but also mixed with sand and other impurities ; the kottoos are also by no means so impervious as would be desirable. * * * *
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> Lastly, it may be observed that the many valuable salts contained in the ley after the deposit has been formed are either quite lost, or are obtained intermingled with the wished-for product, which is consequently found to be exceedingly liable to deliquescence ; but probably the extraction of these would prove too complicated a process to be conducted by the natives.†

Considering the importance of the manufacture and the large returns it yields to Government, it is to be regretted that no person with a special scientific training should have yet been appointed to supervise the work and introduce improved methods such as are above indicated.

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* "Administration Report of the North-Western Province (Puttaḷam District)," p. 57 A.

† "On the Manufacture of Salt by Solar Evaporation, with special reference to the methods adopted in the Chilaw and Puttalam Districts of Ceylon," by A. O. Brodie. Journal, C.B.R.A.S., No. 3, 1847–48, p. 105.

Epsom Salt ?—At Uppu-kulam, fifteen miles north-west of Puttalam, the natives affirm that a very bitter kind of salt (Epsom ?) is to be procured, but the statement has not been verified.*

Medicinal Springs.—No medicinal or thermal springs are known in the Province. Davy writes :—

> In the Seven Kóralés the water of Yapahove (Yápahuwa) is said to effect cures in certain diseases ; but a specimen of this water, for which I was indebted to the Rev. G. Bissett, did not contain anything in its composition to confirm such a character.†

4. Mr. J. FERGUSON took the Chair.

5. Mr. FERGUSON remarked on the great industry and research which Mr. Modder's Paper showed, and on the interest with which all the many scattered essays, monographs, and compilations on the local Geology and Mineralogy are sure to be regarded by the officer who may take charge of the coming systematic Geological Survey of Ceylon. As regards plumbago mines, it is very interesting to know that the Sinhalese, with their simple appliances, had sunk pits so deep as 1,500 ft. He, the speaker, had been down a Ballaarat gold mine thirty years ago, between 3,000 and 4,000 ft. deep; but these miners had the advantage of all engineering appliances. As regards *laterite*, it was a fact that some members of the Indian Geological Survey had recognized a laterite as old as the volcanic period, and as a formation distinct from gneiss, the most prevalent rock in India and Ceylon. Their Ceylon laterite, or cabook, however, is generally regarded as in a constant course of decay from the older rock ; but curiously enough, a Colombo merchant (Mr. C. F. Alexander) twenty years ago read a Paper before the Geological Society of Edinburgh to demonstrate that Ceylon laterite was volcanic in its origin. Mr. Modder's account of the formation around Chilaw and Mádampé would partly account for the richness of the soil well-known as one of the finest cocoanut-growing districts in the Island. As regards the reference to gold and other valuable metals, the expectation shared by Sir Samuel Baker, among others, was that a proper examination of the rocks in our higher divisions would lead to the discovery of gold-yielding quartz, as well as possibly to the matrix of some of our precious gems. But since Sir Samuel's last visit to the Island, when he had had the honour of a long conversation with him on the subject, they had had the railway carried right across their mountain system through many deep cuttings, and a large number of rock tunnels, but

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* Journal, C.B.R.A.S., No. 6, 1853.

† Davy's "Ceylon," p. 48.

with no discovery of precious metals or stones. In conclusion he would remark on the statement by Mr. Modder that the Dutch left the manufacture and distribution of salt to the natives, who apparently sold it at a much lower price than at present prevailed. This would seem to upset the monopoly argument—that salt is more cheaply and regularly distributed to all parts of the Island than it could be if left to private enterprise.

6. Mr. HALY remarked with reference to the railway cuttings and the absence of gold, that Mr. Waring had told him that he had never before, in a wide experience of rock cutting, had to do with more ordinary road metal than in blasting through the many Úva railway tunnels ; but he (Mr. Haly) had seen around Badulla town quartz boulders marked after a fashion which reminded him very much of a specimen of rich Australian gold-bearing quartz, which he had seen in the British Museum. He thought the Badulla quartz well worth testing.

7. Mr. FERGUSON remarked that though the Úva natives were well known to have smelted iron and to be keen about metals, yet he had no recollection of Siṅhalese names in Úva indicating gold, as they had on the Kandy side in Raṅgalla, Ramboḍa, Ruwanwęlla, &c. Dr. Davy, too, had made his observations around Badulla and Namunukula-kanda : still it would certainly be well to follow up Mr. Haly's hint.

8. Mr. HALY read the following Paper :—

SOME ILLUSTRATIONS FROM THE FAUNA OF CEYLON OF WALLACE'S THEORY OF NATURAL SELECTION.

By A. HALY, Director of the Colombo Museum.

LORD SALISBURY, in his address to the British Association at Oxford in 1894, said :—

> In Natural Selection what is to supply the breeder's place ? There would be nothing but mere chance to secure that the advantageously varied bridegroom at one end of the wood should meet the bride, who, by happy contingency, had been advantageously varied in the same direction at the same time at the other end of the wood. It would be a mere chance if they ever knew of each other's existence. A still more unlikely chance that they should resist on both sides all temptation to a less advantageous alliance. But, unless they did so, the new breed would never even begin, let alone the question of its perpetuation after it had begun.

Last September Professor E. B. Poulton pointed out in his address to the Zoological Section of the British Association at Liverpool that—

> the theory of Natural Selction, as held by Darwin and Wallace, was misconceived by Lord Salisbury, and that the minute differences which separate individuals are more important than Lord Salisbury's advantageously varied bridge and bridegroom.

I cannot imagine that Lord Salisbury can have ever seriously studied Wallace on Darwinism, in which the great Professor so nobly fights for the all-sufficiency of Natural Selection as the originator of species—a work bristling with instances of what I may call "Wallacian Woods." A wood filled with a species of little bird, the individuals of which vary so much on the north and south sides that a naturalist, knowing only individuals from the extreme north

and south confines, would describe them as separate species; whereas if he took a walk through the wood and collected individuals from all parts, he would find that there was every gradation between the extreme forms. Let us now suppose that some change comes over the environment, so that all the varieties in the centre of the wood become extinct, then the north and south varieties become species. I consider this ought to be called "Wallace's theory." He propounded it simultaneously with Darwin, who, as we all know, became dissatisfied with its sufficiency; and since his day all kinds of modifications of the theory have been proposed, Wallace alone standing firmly by the original idea.

When standing on a coral reef one is astonished at the extraordinary divergences under simultaneous conditions. On the sandy floors of the shallow sunlit pools we find sea-cucumbers, starfish, various kinds of molluscs, beautiful annelids, whilst darting through the water numerous brilliantly coloured fish of widely different families are seen swimming about. There is no apparent struggle for life: all seems peace and harmony, an abundant supply of well ærated water is furnished by the breakers outside, whilst the coral polyps themselves, and an abundance of minute life in the water and the sand, supplemented no doubt by the eggs or very young forms of the different inhabitants, furnish food for all; only the brilliantly coloured little crabs seek refuge in the interstices of the coral, or attach sponges or weeds to their shells until they become indistinguishable from their surroundings. It is curious that the best protected and best armed group should be the most retiring. This probably arises from the periodical casting of the shell, which leaves their soft bodies the favourite prey of their own species—at least this is known to be the case with the lobster. How could these great divergences ever have arisen? There seems no point of vantage from which Natural Selection could commence its operations.

But let us look more closely into the subject. The reef probably abounds with money cowries. I exhibit a tray of these shells, all collected on the same spot. Any one seeing the shells separately would consider the best defined forms true species, but I have seen many thousands of the animals alive, and there is not the slightest difference between their inhabitants; perhaps some anatomist might show a constant difference of arrangement in the teeth of those that live in the smooth barred shells and those of the depressed knobly ones, but even then I should be disposed to dispute their specific difference, for if the shells are capable of so much variation, why not the arrangements of the teeth on the lingual ribbon?

In a tray on the table are exhibited the two extreme forms known as *Cypræa annulus*, Linn., and *C. moneta*, Linn., and the connecting links. The depressed triangular forms have both bars and annuli, and seem to have a tendency to assume the smoother form of annulus, sometimes retaining the bar and sometimes retaining only the yellow ring. In some instances the bars are ill-defined and become mere black blotches. This is an example of a "Wallacian wood" on a most gigantic scale, as these shells are found throughout the Australian Pacific and Indian Pacific oceans, or, as it has been aptly termed, the Great Ocean.

Another identical example is found in *Oliva mora*. I exhibit a tray of examples taken on the beach of Weligam bay, and seven varieties are figured in the *Conchologia Indica*, the animals found in these varied shells being to all appearance identical. Their range is the same as that of *C. moneta* and *C. annulus*. I consider this tendency to extreme variation as much a specific character as any other, as different species seem to exhibit it in every kind of combination with other characters.

In the above-mentioned shells we find the same varieties mixed together over an enormous area, and under very different climatic conditions. What their bathymetrical

range may be I cannot discover, but I imagine them to be a purely littoral species, and they all crawl freely out of water. The temperature of the surface water over this vast area seems to vary from about 63° F. in its northern and southern limits to 86° off Ceylon.

In a common fresh water shell found over a great part of India and all the low-country of Ceylon we find the same mixture of varieties over a large area, and under very different climatic conditions, as in the marine species. So great are the varieties that it has been described as *Paludomus acutus*, *modecella*, *spiralis*, *spurcus*, *lotusus*, *parvus*, *palustris*, and *obesus*, which, according to Blandford, are all synonyms of *Paludomus tanjoriencis*, Gmelin. These different varieties can in some localities be collected within the space of a few yards.

The genus *Tanalia* is restricted to the hills of the Central Province, and to the forest-clothed country of the south and south-west—less than half the area of the entire Island. Its twenty-four species have been referred by Mr. Blandford to *Tanalia aculeata*, Gmelin, and he says that "in the Kelani-ganga between Kitulgala and Yatiyantota he has collected *T. tennentii*, *T. picta*, and *T. undulata*, with intermediate varieties. Here we have an example of the same mixture of varieties, only over an extremely limited area in closely allied conditions of climate."

This form of a "Wallacian wood" is extremely common in Ceylon. One of the most remarkable examples of it is *Plotheia decrescens*, Walker, a tray of which is exhibited. It is almost impossible to find two of these moths alike. This extraordinary variability is the more remarkable in this case as we have another peculiar species, *P. strigfera*, which also appears to be very variable. Other instances occur in the frogs and the reptiles, and I consider that even in our monkeys (*Semnopithecus cephalopterus*, Zimmer, and *Semnopithecus ursinus*, Kelaart) we have merely varieties with a strong tendency to produce a white variety, which is well

illustrated in our monkey-case upstairs. We have now seen two types of the "Wallacian wood": one in which extreme variability is found in every locality over a vast area, and a second in which it occurs in a very restricted area.

Another form of "Wallacian wood" is that in which we have great variety over a vast area, but the varieties do not intermingle, and each being confined within certain geographical limits is classified as a distinct species. Professor Wallace has illustrated this so beautifully in his *Island Life* and other works that I need not dwell further upon it.

Another form of "Wallacian wood" is that in which well-defined species in a very limited area are mingled with well-defined species covering large areas. A good example of this is seen in our pretty little Munias. We have a species peculiar to Ceylon, *Uroloncha Kelaarti*. We share another with Southern India, *U. striata*. From this *U. semistriata* of the Nicobars and *U. fumigata* of the Andamans both differ slightly, being thus reckoned as species peculiar to these islands. Our other two species, *U. malabarica* and *U. punctulata*, range over the whole continent of India, ascending the Himalayas up to about 5,000 ft.

Another form of distribution, the opposite extreme to that of the money cowry, is exemplified by our common sparrow, in which a form is constant over a very large area, or varies but very slightly. The Colombo sparrow undoubtedly varies slightly from the London sparrow, but not sufficiently, according to Messrs. Sharpe and Oates, to make them distinct species.

Finally, we have what may be termed "sports," variations of very rare occurrence, of which I exhibit two examples: one is a sport of the common *Batocera rubus* from the Morawak kóralé, presented by Mr. Deslandes. This has been described by Mr. Gahan of the British Museum as *B. polli*. Another example is from Rambukkana, a female *Gongylodes gongylodes*, presented by Mr. T. S. Dawson.

At first sight it looks like a different species, but close inspection shows that it is merely a common form emphasized.

In a Paper I had the honour to read before this Society on the varieties of *Testudo elegans*, I remarked that I could see nothing in these varieties for natural selection to select from : the different individuals crawl about on the open plains in the midday sun, and we cannot imagine that one form of colouration or sculpture can be of more advantage than another. Here I fell into an error of the same kind as Lord Salisbury's; if I read my Wallace right, these variations under the present conditions are of no advantage : it is only when the conditions change that natural selection comes into play.

Let us take the case of the money cowry. Supposing the conditions of the Red Sea and of the Japanese seas change, so that in the one only *C. moneta* survives and in the other only *C. annulus ;* then we should certainly call them distinct species ; or, supposing that the conditions of the Great Ocean were so changed that none of the varieties except the banded ones could survive, then we should have a single constant species over the whole area.

If we imagine the conditions to keep constant, then this banded species will tend to vary again ; on the contrary, if the conditions continue to change in such a way that the species can slowly adapt itself to such changes, we have a case like that quoted by Romanes, in which transmutations of a water snail of the genus *Planorbis* can be traced through a long geological period in an ancient lake basin in Wurtemburg.

That such cases really occur in Nature there can be no reasonable doubt. Our species of Munias are an excellent example of such a case, and this could be multiplied by hundreds ; and of course if we allow that species can arise from varieties in this way, there is not the slightest difficulty in granting that genera, families, orders, and classes may

have arisen in the same manner. In fact, these divisions are mere categories of human thought, and have no existence in nature.

The plæontologists are rapidly filling up the gaps between the higher groups, and for the evidence of the embryologists I must refer you to Romanes on "The Darwinian Theory."

I cannot, however, agree with the late Professor Romanes that we can rest content with this theory because it is demonstrated, although not proved as a scientific fact; nor that when the theory has been raised to such a level of probability it stands on the same basis as the fully ascertained facts of science. We cannot absolutely say from whence the varieties of our money cowries have come, or what their future history will be, but if you take up the "Nautical Almanac" you can see every eclipse of Jupiter's moons given to the fraction of a second, three years hence; and if an astronomer chose to take the necessary trouble he could give you a Jupiter moon-eclipse time table for any number of years past or any number of years to come. No such evidence as this, Professor Romanes said, can ever possibly be given for any form of the Darwinian theory; but I prefer the dictum of the great Physiologist Claude Bernard, "that we have no right to put any bounds to the possibilities of human discoveries."

It is for this reason that I have brought the foregoing examples of "Wallacian woods," as they occur in Ceylon, before the Society. I confess Wallace's theory seems to me perfectly satisfactory, and sufficient to account for the origin of the countless forms of animals and plants now inhabiting the earth. But if this theory is true, these useless variations must be accompanied by other changes—a principle known as the "correlation of growth"—before they can form true physiological species, that is to say, species incapable of interbreeding.

Now, in such a case as the money cowry it is surely in the power of anatomists to show whether the variations of the

shell are attended with variations in the other parts of the animal or not?

In the genus *Plotheia*, surely careful collecting and breeding of the larvæ would show whether the different species interbreed or not, and by collecting the Munias of the Andamans and Nicobars, and attempting to interbreed them together, or with our Ceylon species, similar facts might be ascertained.

When I first became acquainted with Darwin's "Origin of Species" I lived in a house surrounded with large grounds, with several hothouses, where the cultivation of domestic varieties of plants was an object lesson on Darwin's works, and no more thorough convert to Darwinism than myself ever existed; but when I came to study in the British Museum and saw species from all parts of the world, the theory seemed to me by no means satisfactory, and when in Ceylon I saw our extraordinarily varied *Phasmidæ*, all living side by side in the same woods under precisely similar conditions of life, I ceased to have any faith in Natural Selection as the true cause for the origin of species.

My error arose from the idea that variations must be useful, whereas we cannot attach any idea of utility to the variations which I have exhibited to-night. It is only when the slowly changing environment gives a better chance of survival to one or more of these varieties over the other that Natural Selection comes into play.

I do not know exactly what interpretation to place on Professor Wallace's dictum, that "only useful variations are preserved." If this applies to the whole animal, of course in the long run this must be the case: only the fittest survive —but if to particular structures, it seems to me to run counter to the theory.

In tracing the supposed line of descent, the preservation of useless or merely ornamental characters seems to me to afford a most important guide.

The hour-glass shaped mark on the backs of our frogs is an interesting instance. This cannot add to their power of concealment or benefit them in any way that we can see; as a fact, in *Rhacophorus maculatus*, Gray, it is of very rare occurrence, it is specific in *R. cruciger*, Blyth, and *R. eques*, Günther. In *R. micro tympanum*, Günther, we have a modified form of it, described in a very different way by Dr. Boulenger, but evidently merely a modification.

The common form from which these species have been derived no doubt possessed this character. The occurrence of peculiar markings in many species of those groups which we call genera is very common, and frequently enables us at once to refer the species before us to its proper place.

The interest of these local varieties consists in their study bringing us to the beginning of things. Good work is being done by many naturalists in careful observations and measurements, like the Papers, for instance, by Mr. H. Thompson on the common English shore crab, in the Proceedings of the Royal Society, October, 1896, and my principal object has been to show what advantages we possess in Ceylon for following the subject up.

Considering the millions of ancestors any living specimen must have had, the wonder is that species breed so true. Where the variation is very small—for I doubt if a case could be proved in the whole animal kingdom where there is none—it arises in a great degree from the perfection of adaptation to its environment obtained by the species. We have such instances in cockroaches, rats, sparrows, and other semi-parasites of man, who are able to follow him in almost any climate, and under almost all conditions which he is able to live in himself. We see the same thing in some birds of very wide geographical distribution.

The great opposition that Darwinism received at first was owing to the belief that his doctrine implied the descent of man from the monkey: the real reading of course being that man and the existing monkeys have branched off from

some common ancestor, we are not descendants of either the gorilla or the chimpanzee, nor can we look on any existing species as our ancestors.

In the same way the money cowry can never give rise to a fish, reptile, bird, or mammal. It has long passed the point from which the molluscous branch started, or that from which bivalves or univalves, cowries, and olives arose. But its varieties, supposing it has not attained the highest point possible of development along its own line, will, with changing environment, give rise to new species, new genera, new families, then to groups which if we were immortal we should recognize as mollusca, and after to groups of which we can form no conception. This of course is a mere hypothesis as regards *C. annulis*, but the Paleontologists are daily proving more and more clearly that it is no hypothesis for the animals of the past.

The race of man has existed for so short a time that he speaks of the hills as everlasting. Geologists tell a very different tale, beautifully condensed by Tennyson :—

> O earth, what changes hast thou seen !
>
> ❊ ❊ ❊ ❊
>
> The hills are shadows, and they flow
> From form to form, and nothing stands ;
> They melt like mist, the solid lands,
> Like clouds they shape themselves and go.

9. Mr. FERGUSON said the Paper just read was to him full of interest and instruction. Last September he was present in Professor Poulton's section of the British Association, when there was a battle-royal between Darwinians and anti-Darwinians ; but the latter—only one or two—got very much worsted. He remembered many years ago hearing a lecture from a young naturalist (now a well-known Professor), in which he went so far as to remark on the spots on the camelopard as the consequence of its habit of standing under trees in its African home, the shade gradually causing the spots, in contrast with the bright sunshine on the rest of the body ! He did not think the grave Professor of the present day would repeat such far-fetched suggestions of his youth. Meantime, he for one would be obliged if Mr. Haly—out of consideration to the rudimentary knowledge which most of them who had only dipped into the writings of Darwin, Wallace, and Romanes, possessed—could in a few words

define the different, and differing, views of the two former eminent men, and how far Professor Romanes had successfully criticized them.

10. Mr. HALY, in reply, gave a brief summary of Wallace's theory of "Natural Selection," which was adopted by Darwin at first as sufficient to account for the "Origin of Species," but afterwards modified by the addition of a special cause, "Sexual Selection." Wallace had never swerved from the view he originally adopted, which he (Mr. Haly) considered perfectly satisfactory and sufficient to account for nearly all their zoological riddles. Romanes, Weissman, and others had offered criticisms, new theories, &c., but none that had specially affected Wallace's position.

11. Mr. O. COLLETT then moved a vote of thanks to the writers of the Papers. This was seconded by Mr. P. RADLEY and carried.

12. Rev. F. H. DE WINTON moved a vote of thanks to the Chairman, remarking on the instructive character of the Papers read and the interesting remarks which had followed. Mr. ROLES, in seconding, extended the vote to include Mr. Haly, who had occupied the Chair during the reading of the first Paper. Carried.

COUNCIL MEETING.

Colombo Museum, October 21, 1897.

Present:

The Lord Bishop of Colombo, President, in the Chair.
The Hon. Mr. A. C. Lawrie, Vice-President.
Hon. Mr. P. Coomáraswamy. | Mr. C. M. Fernando.
Mr. G. A. Joseph, Honorary Secretary.

Business.

1. Read and confirmed Minutes of Meeting of Council held on July 27, 1897.

2. Resolved,—That the following Candidates for admission into the Society as Resident Members be recommended for election :—

Mr. J. E. Addyman : nominated by	Mr. A. Haly. Mr. G. A. Joseph.
Mr. J. W. Small, F.C.S. : nominated by	Mr. H. H. Cameron. Hon. Mr. P. Coomáraswamy.
Mr. N. Balasubramanyan, M.A. : nominated by	Mr. F. H. de Vos. Mr. F. W. M. Karunaratna.

3. Laid on the table a letter from Mr. Harward, tendering his resignation as Honorary Secretary of the Society.

Mr. Joseph stated that there was no necessity to elect any one to fill Mr. Harward's place during his temporary absence.

Resolved,—That Mr. Harward's name do remain on the list of Office-Bearers.

4. Laid on the table a Paper entitled "The Kitul Palm," by Mr. T. B. Pohath.

Resolved,—That it be referred to Messrs. C. M. Fernando and G. A. Joseph, for their opinions.

5. Laid on the table a letter from the American Museum of Natural History regarding an exchange of publications, which had been referred to the Director of the Museum.

Resolved,—That the Institution be informed that the Council regret they cannot see their way to arrange an exchange of publications; and that reference was made to the Colombo Museum, but that that Institution also is not disposed to exchange.

6. Laid on the table a letter from Mr. H. C. P. Bell, C.C.S., regarding his election as an Honorary Member.

Resolved,—To recommend that Mr. Bell be appointed an Honorary Member of the Society, in recognition of the valuable services rendered by him for a period of seventeen years; and that his name be brought before the next Annual General Meeting for election.

7. Resolved,—That a General Meeting be held in December, at which Mr. Bell's "Interim Report on the Operations of the Archæological Survey at Sígiriya, 1897," be read; and that His Excellency the Governor, Patron of the Society, be invited to preside on the occasion.

COUNCIL MEETING.

Colombo Museum, December 8, 1897.

Present:

The Lord Bishop of Colombo, President, in the Chair.
Mr. C. M. Fernando. | Mr. P. Freüdenberg.
Dr. W. G. Vandort.
Mr. G. A. Joseph, Honorary Secretary.

Business.

1. Read and confirmed Minutes of Meeting of Council held on October 21, 1897.

2. Laid on the table a Paper entitled "Aids to the Identification of Birds recorded from Ceylon," by Mr. A. Haly.

Resolved,—That it be referred to Mr. Staniforth Green and Bishop Copleston, for their opinions.

3. Laid on the table a Paper entitled "Don Jeronimo da Azevedo, Governor of Ceylon, 1594–1611 A.D.," by Mr. A. E. Buultjens.

Resolved,—That it be referred to Mr. P. Freüdenberg and Dr. W. G. Vandort, for their opinions.

4. Laid on the table Circular No. 119, containing a Paper by Mr. T. B. Pohath, entitled "The Kitul Palm": referred to Messrs. C. M. Fernando and G. A. Joseph, for their opinions.

Resolved,—That, in view of the opinions expressed by the gentlemen to whom the Paper was referred, Mr. Pohath be thanked for offering it, but be informed that the Paper is not considered suitable for the Journal of the Society.

5. Considered the question of holding the next General Meeting of the Society at the Colombo Public Hall. It was pointed out that the Reading Room at the Museum (usually allotted to the Society for its Meetings) would not permit of the due exhibition of the numerous paintings, plans, drawings, &c., illustrative of Mr. Bell's Paper.

Resolved,—That the Colombo Public Hall be engaged for the Meeting.

GENERAL MEETING.

Public Hall, Colombo, December 22, 1897.

Present :

Sir J. West Ridgeway, Governor, Patron, in the Chair.

The Lord Bishop of Colombo, President.

Mr. W. N. S. Aserappa.
Hon. Mr. A. Bailey.
Mr. F. W. Bois.
Mr. H. G. Bois.
Mr. E. Booth.
Mr. W. de Livera.
Dr. W. A. de Silva.
Dr. W. H. de Silva.
Rev. F. H. de Winton.
Mr. W. E. Davidson.
Mr. Chapman Dias.
Mr. J. Ferguson.
Mr. C. M. Fernando.
Dr. H. M. Fernando.
Mr. P. Freüdenberg.
Sir John J. Grinlinton.
Mr. J. A. Henderson.
Hon. Mr. L. F. Lee.
Dr. Muttukumaru.
Mr. S. C. Obeysekera.
Mr. J. G. L. Ohlmus.
Dr. L. Pinto.
Mr. Tudor Rajapaksa.
Mr. G. C. Trask.
Dr. J. L. Vanderstraaten.
Dr. W. G. Vandort.
Mr. H. Van Cuylenburg.
Mr. E. Wackrill.

Mr. F. C. Roles, Honorary Treasurer.
Mr. H. C. P. Bell and Mr. G. A. Joseph, Honorary Secretaries.
Visitors : seventy-five ladies and one hundred and twenty-five gentlemen.

Business.

1. BISHOP COPLESTON : With Your Excellency's leave, I would propose, as President of the Society, that we take the Minutes of last Meeting as read on this occasion, and proceed as soon as possible to the principal purpose of the Meeting.

The Minutes were accordingly taken as read.

2. H. E. THE GOVERNOR : I call upon Mr. Bell to read the Paper fixed for to-night.

3. Mr. H. C. P. BELL, in rising, remarked that, as the majority of the audience had probably never visited Sígiriya, it might be well to preface his Paperby a brief Introduction descriptive of the ancient Rock Fortress.

INTERIM REPORT ON THE OPERATIONS OF THE ARCHÆOLOGICAL SURVEY AT SIGIRIYA, 1897.*

By H. C. P. BELL, C.C.S., Archæological Commissioner.

INTRODUCTION.†

SÍGIRI ROCK is situated in the Central Province, some twelve miles north-east of Dambulla and a score or so almost due west of Polonnaruwa.

Sir Emerson Tennent says of it :—

> Sígiri is the only example in Ceylon of those solitary acclivities which form so remarkable a feature in the tableland of the Dekkan, starting abruptly from the plain with scarped and perpendicular sides, and converted by the Indians into strongholds, accessible only by precipitous pathways, or steps hewn in the solid rock. This gigantic cylindrical rock starts upward to a height prodigious in comparison with its section at any point. Its scarped walls are nearly perpendicular, and in some places they overhang their base. The formation of this singular cliff can only be ascribed to its upheaval by a subterranean force so circumscribed in action that its effects were confined within a very few yards, yet so irresistible as to have shot aloft this prodigious pencil of stone to the height of nearly 400 ft.

Above the plain in which it stands this huge oval mass of gneiss rock rises to a height of about 600 ft. For about half its height it is masked by terraces and *débris*, covered with forest and *mána* grass, and the upper portion is, without the help of ladders, entirely inaccessible from its overhanging its base nearly the whole way round.

Along the western and northern faces of *Sígiri-gala* ran a gallery—one of the most extraordinary engineering feats of the ancient world—at the level where the Rock has the smallest diameter ; so that while it stands upon that portion

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* In illustration were exhibited plans, drawings, photographs, &c., as well as the whole set of *facsimile* copies in oils of the Frescoes.

† See the Papers on "*Sígiri*" in Journal. R. A. S., vols. VII. and VIII. (N. S), by Messrs. Rhys Davids and Blakesley.

which projects below, it is at the same time protected by the part which overhangs it. The outer side of this gallery was formed by a brick wall tapering to the top. Ledges sunk in the Rock received the wall, and at a certain height transverse blocks of a quartzose stone were laid across from the wall to the Rock so as to form a pavement. The wall had a coating of hard white plaster, much of which retains a high polish to the present time.

About a hundred yards of this gallery still stand almost perfect; but from the present iron ladders on the north side of the Rock to the point where the gallery once reached its summit on the north-east, the structure has completely vanished. Grooves and oblong "catches" cut in the Rock show where it was formerly sustained.

Until the fixing of the iron ladders and railing in 1895 the ascent to the summit of *Sigiri-gala* was attended with extreme risk; and had been accomplished by less than a dozen Europeans.

Some of the natural concavities of the Rock scarp have been further scooped—on its west cliff above the gallery—into caves or "pockets"; and in two or three of these remains of painting may yet be seen. The "pockets" are now inaccessible without elaborate preparations.

The south-west foot of the Rock is washed by a picturesque tank—at the present day of limited area, but anciently very extensive, with a substantial "bund" that joined the neighbouring rock, *Mápá-gala*, and extended southwards for several miles.

To east and west of the Rock are rectangular areas—terraces of earthwork held up by massive stone revetments—which, together with the Rock itself, cover nearly 300 acres and constitute the site of "*Sigiri-nuwará*." The outer line of defence was formed by an immense embankment surrounded for much of its circuit by a *diyágalak*, or moat.

Inside the western area of the ancient city are the remains of three or four lesser moated enclosures, and of

countless boulders, whose sides, where overhanging, formed rough cave shelters, whilst their tops were crowned with buildings, &c.

As a fortress "*Sígiri-nuwara*" must have been impregnable at the period: its defenders could have been forced into surrender only by starvation or treachery.

It was here, in the fifth century A.D., that for eighteen years Kásyapa I., the parricide, lived (as the *Maháwaṇsa* quaintly puts it) "in fear of the world to come and of Moggallána," and ultimately met the just retribution of his crime.*

Sígiriya was subsequently handed over to the Buddhist priesthood as a monastic establishment. But for centuries the Rock has been entirely abandoned, though a small Buddhist temple is kept up at *Pidurágala*, a hill situated one mile to the north.

PREAMBLE.

The third season's work of the Archæological Survey at Sígiriya commenced on February 6 last.

It had been found necessary, after two years' wear, to construct new leaf and thatch "lines" for the coolies. For this purpose an overseer with a limited gang preceded the main body by six weeks.

Besides clearing a fresh site on higher ground at a more convenient distance from the tank, and putting up four blocks of rooms, this advance force was engaged in rendering passable the road from Inamalawa (greatly damaged in places by the exceptionally heavy north-east monsoon of 1896),—in re-cutting approaches to the Rock, washed away nearly everywhere,—and in freeing the summit of the thick growth of *mána* grass,† tall weeds, and scrub that annually cover the surface with aggravating persistency.

LABOUR FORCE.

News of the ample and more salubrious housing provided this year soon augmented the respectable strength, 110

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* *Maháwaṇsa*, XXXIX.

† *Andropogon Zeylanicus.*

hands, which began work in February, by a steady influx of recruits from Anurádhapura and other places. Above all, the higher rate of pay known to rule at Sígiriya acted as the chief incentive, whereby the Archæological Survey "mill" was kept constantly supplied with a never-failing stock of living "grist."

A score or more of Siṇhalese drawn from the surrounding villages—double the number that volunteered for work on the Rock in 1896—also sought employment, and proved willing and competent "basket-men."

As before, I supervised operations personally, from the start until we broke camp on May 25.

WEATHER.

Comparatively little rain fell at Sígiriya during the first six months of this year. The rain-gauge register (continued after my departure by the Head Draughtsman) gives a daily average of only ·12 in. for the six and a half months between February 1 and July 10. The highest record for twenty-four hours did not exceed 1·53; but that fell "plump" in an hour and a half.

At the beginning of May—later than usual—the wind veered round to the south-west,—the annual warning that the time remaining for unrestricted work on the top of *Sígiri-gala* is limited to a few days. The tearing strength of this "*yal-hulaṇga*," when fully developed, as it sweeps across the lone, exposed Rock, can only be realized by actual experience.

HEALTH.

Thanks to the continuance—unlike previous seasons—of unusually fine weather, almost every week marked "a clean bill of health."

Two mild cases of measles caused me anxiety for a while. The patients were at once segregated, and luckily no fresh cases occurred. Had infection spread, that insensate panic which renders the ordinary Tamil cooly, or Siṇhalese *goiyá*, deaf to reason in the face of any epidemic would have led,

in all probability, to wholesale desertions, and perhaps necessitated the total abandonment of further operations for the year.

Fever, and simple abrasions incidental to earthwork—from neglect not infrequently degenerating into ugly sores—kept a small proportion of hands in the "lines" now and again; but only two men left, temporarily, to be cured at the Dambulla hospital.

The climate of Sígiriya has usually proved bracing to coolies, the majority of whom live for two-thirds of the year in the jungle-bound chenas and low-lying lands about Anurádhapura. Month by month they "put on flesh," despite the unspeakable heat which an eight-hours' spell of work upon the bare Rock involves; and return, after the four months' absence, robust and sleek, with a stock of health that enables them to battle the better against the insidious malaria of the North-Central Province.

Again, this year no accident of any sort happened—good fortune, for which I cannot be too thankful.

No amount of precautions avails against the mad recklessness of the Tamil cooly let loose on *Sígiri-gala*. He becomes for the nonce a veritable "indiarubber idiot on the spree," risking life airily a dozen times a day.

When it is remembered that in the past three seasons at least 20,000* persons have climbed to the top of Sígiri Rock, have spent hours at work on its limited surface and steep slopes, with a sheer fall all round of 300 to 400 ft., yet that every man, woman, and child has descended in safety,—no one will grudge me the satisfaction I feel at a record smirched by not a single casualty.

Summary of Work.

After a couple of years' experience it is fair to expect that operations at a given site and by practically the same hands, should proceed smoothly and apace.

And so it has been at Sígiriya. The past season's work

* Say, eighty coolies daily for three seasons of three months; or, 80 by 3 by 3 by 30 = 21,600.

has proved successful even beyond expectation. No hitch occurred: all went well from first to last; and, as the result, the heavy task provisionally mapped out at the start was accomplished fully.

The work got through in the four months may be conveniently classed as in former Reports, under—

(1) Exploration and Survey of *Sígiri-nuwara.*
(2) Excavations.
(3) Miscellaneous.
(4) Copying the Frescoes.

Succinctly—the "*Mápá-gala*" Rocks to the south of *Sígiri-gala*, and the bunds to its east, have been freed of jungle and explored; the survey of the wide area once occupied by the ancient city completed; the western and north-western portions of the Rock's summit dug up (bringing to a close the excavation of the citadel); ascent to the top of *Sígiri-gala* made doubly safe; and, above all (for the speedy reproduction of these unique paintings, yearly dwindling, had become of much moment), the whole of the sixteen frescoes remaining untouched in 1896 have been copied in oils by Mr. D. A. L. Perera, Head Draughtsman of the Archæological Survey.

(1) EXPLORATION AND SURVEY OF SÍGIRI-NUWARA.

As usual, it was not until the end of April that the Sinhalese villagers of the Inamalawa Kóralé cared to leave their paddy fields and seek work in clearing the forest undergrowth and low jungle, which covered parts of the ancient city not opened out in 1895 and 1896.*

This year the two low bunds which run eastwards from the Rock roughly parallel for more than a mile, were followed until lost in higher ground. Their object is open to doubt: perhaps they helped to retain in this direction the water of "*Mahá Sígiri-vewa*," the huge tank that served the city in former days. Its chief bund, uniting *Sígiri-gala* with

* On the "Rough Plan of *Sígiri-nuwara*" accompanying this Report the extent cleared in 1895 is coloured dark green,—in 1896, a lighter shade,—in 1897, pale green.

Mápá-gala, trended thence in a south-westerly direction for a league or more. The "*vil bemma*," or outer rampart, of the city to the east of the Rock was also traced, cleared, and mapped,* as well as the lesser rocks, boulders, &c., on that side.

Further, the forest brushwood has been thinned out for a quarter of a mile or so west of the modern village of Sígiriya, immediately south of the paddy fields and minor road from Inamalawa. Within this area, besides a flattish outcrop of rock, lie the "*Mápá-gala*" rocks—twin hummocks joined on to the great Sígiri Rock by the short bund of the present insignificant tank, and split in two by a narrow gorge. The close connection of these subsidiary rocks with *Sígiri-gala* was (as anticipated in my last Report) at once apparent as soon as the underwood and grass had been cut and burnt.

Upon, and about, the two main rocks and the numerous boulders and levelled interspaces off their slopes, are traces of walls and cross-walls in stone, with here and there a brick-strewn site. A single cave on the east side is still utilized by the villagers for a humble *dewálé*.

Near *Mápá-gala* we fortunately lighted on an inscribed pillar, albeit in pieces, of interest historically; for it prolongs considerably the period up to which it is certain that Sígiriya continued the site of a monastic establishment.

Upon the death of Kásyapa I. and the fall of his citadel in the fifth century, his younger brother and conqueror, Moggallána, gave, according to the *Maháwaṇsa*—†

> The Daḷha and the Dáṭhá-Koṇḍañña Viháres at the Síhagiri Rock to the Ságalika and Dhammaruchi brethren ; and having converted the fortress itself into a viháré he gave it to Mahánáma,‡ the elder of the Díghasanda Viháré.

Moggallána's son, "the famous Kumára Dhátuséna," says the same chronicle, "made improvements to the viháré that his father had built."§

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* At present under chena encroachment, which is engaging the attention of the Assistant Government Agent, Mátalé.

† *Maháwaṇsa*, XXXIX., 41, 42. § *Maháwaṇsa*, XLI., 1, 2.

‡ His great-uncle, the author of the first 36 chapters of the *Maháwaṇsa*.

Henceforth Sígiriya drops altogether out of the *Mahá-wańsa* record, save for a passing allusion to the murder there of King Sańgha Tisa and his son about 608 A.D.

Too broken and weathered to permit of much of the contents being read, the stone has yielded the name of the royal grantor, "*Siri Sang Bo*," who, from the form of the Siṇhalese characters, should be Sena II., so that the existence of a Buddhist temple at Sígiriya as late at least as the beginning of the tenth century is now assured.

(2) EXCAVATIONS.

In pursuance of the plan of work decided on last year (viz., to complete the digging of the Rock citadel before commencing to break ground at its base and elsewhere), the whole force was concentrated on the effort to finally round off, if possible, the excavation of the summit.

The accompanying "Plan of the summit of *Sigiri-gala*, 1895–1897," explains, by varied colouring, the direction and extent of our annual advance in digging. As pointed out in my first Report—

> The general fall of the ground is from west to east and, less abruptly, from north to south,—doubtless following the slope of the living rock below. This natural declivity was evidently turned to account in the adaptation of the ground for the terraces and buildings which once occupied it. The terraces along the high ground bordering the west edge and stretching inwards to about the axis of the hill fall away very gradually from north to south, as do those from the central *pokuṇa*, or pond, to the south and east verge of the Rock. The steepest bank runs longitudinally south from the north end of the Rock, marking the high ground off from the low-level area. The only high bank lying east and west adjoins the Rock's north-east edge.*

We started in 1895 at the north-east corner, and keeping to the foot of the high ground on the west, worked our way slowly—and, from total ignorance of what to expect, somewhat clumsily—down to the brink of the *pokuṇa*.

Last year (1896), strengthened in numbers as well as by the valuable experience gained, far more digging was done, and that cleaner withal.

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* C. A. S. Journal, vol. XIV., No. 46, 1895, p. 49.

Leaving the cleaning out of the *pokuṇa*, as most sheltered from the wind, for the last week of the season's work, we pushed past it, skirting the Rock's east edge, and so on southwards, until the entire low-level area lying between the pond and the southernmost verge of the Rock, besides a small slice of the higher section, was completely excavated.*

This season, as a glance at the "Plan" will show, we had—to drop for a moment into colloquialism—"our work fully cut out," if "the high-level area, which, broadly speaking, occupies the western half of the summit," was to be laid bare before the south-west gale fell on us.

It is the more pleasing, therefore, to be able to record that (with the exception of a terrace some 70 ft. or so down the west scarp) the task has been thoroughly mastered.

As far as concerns the citadel that once crowned Sígiri Rock—*finis coronat opus*. It is open to any one now to ascend the Rock with ease and safety, and to follow out on its summit (slopes excluded) the complete plan of a marvellous structure 1,400 years old, yet in outline virtually as perfect as when first laid out.

I said in 1896 that we hoped "to uncover next year (*i.e.*, 1897) on the higher level the chief rooms, for they would naturally be built in the most commanding position." Nor have we been disappointed.

Starting at half a dozen points, where a step or two barely showing above the *débris* indicated the probable ascent from the lower to the higher area, and trenching onwards up successive flights of stairs—a score in all, more or less—and along retaining walls, the several parties, working simultaneously from north, south, and east, joined hands ultimately in the large upper apartments situated towards the north-west corner of the Rock.

The rooms, courtyards, &c., stretch the whole length of the ridge, in gently ascending tiers, from the small chamber directly above the Rock cistern at the south to the penultimate, and uppermost, room near the north end.

* C. A. S. Journal, vol. XIV., No. 47, 1896, p. 249.

All are oblong, and all—or nearly all—the chambers had corridors completely round them. Many passages, &c., were paved throughout with quartz slabs; though much of this choice pavement has been displaced by the wash of centuries, or from being deliberately put to other use by Buddhist monks, when the fortune of war found them located in the "marble halls" of royalty. To this latter accident is also probably due the sorry internal alterations which some of the rooms seem to have undergone,—division and subdivision,—until the original configuration is past tracing with certainty.

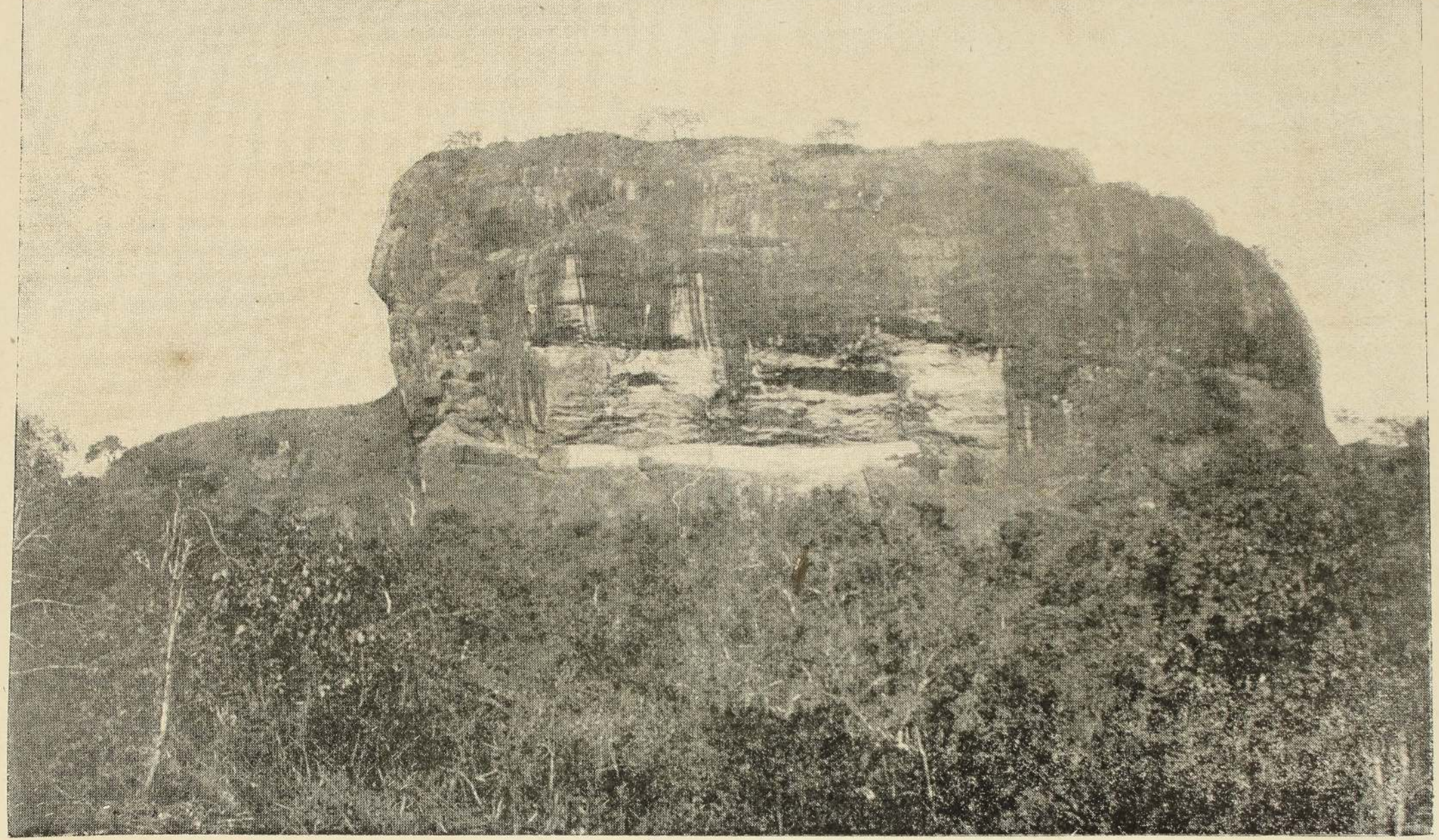
So, too, as regards surface decoration—stucco mouldings, ornament, and the like, that Kásyapa's royal stronghold would hardly lack—a few stray fragments, turned up by the spade, are the sole traces left to us by the "sons of Buddha," inured to simplest surroundings and averse to permit worldly attractions to break in upon the austerity of daily life.

On clearing the tangled *mána* grass and low jungle off the west edge of the Rock a surprise awaited us. It became for the first time evident that the whole side of the slope—here more prolonged than on the other faces—had been grooved deeply to hold the foundations of a lower reach of rooms and passages, and drain the summit speedily of the heaviest rainfall.

The boldness of conception and pre-eminent skill which enabled these old architects to make even the steepest slopes of *Sígiri-gala* subservient to their will, led them to annex profitably every inch of possible foothold. The exterior wall of the citadel, which wholly engirdled the Rock (except on the south-west), was built everywhere several feet—indeed for a great part of the circuit some yards—below the flat summit, and must have risen majestically all round from the very brink of the precipice.

Nay more: at one point it positively descended the sheer side of the Rock to a lower reach.

Two-thirds of the height up the west cliff, towards its northern end, is a ledge of the main Rock nearly 50 yards



Skeen & Co., Photo-zinco. **SÍGIRI-GALA** (*West View*). *Arch. Survey photo.*

in length by 10 broad,—from below it looks a mere streak marked by a little vegetation,—which terminates in two cramped caves, or rock "pockets."*

The obvious suitability of these, and the similar, but higher placed, pair of caves at the southern extremity of the Rock, for "watches" over the country from south to north-west, cannot fail to strike any one studying the capabilities of *Sígiri-gala* as a rock fortress. To that purpose these primitive "belvederes"—if I may so term them—must have been applied when the citadel was threatened: whilst in times of peace they would signal messages broadcast to the city spread out below.

At present, the only means of reaching this barely accessible break in the western cliff is by a rope let down the long slope from the summit as far as the vertical rock wall, with a straight drop thence of 15 ft. on to the ledge.

Too late in the season we succeeded in getting a jungle-stick ladder into position at the bottom of the slope, and commenced to excavate the *débris* covering stairs that lead down to the small look-out caves. But the south-west gale caught us with the work half finished, and its completion has to stand over for next year.

Time enough to guide the inquirer step by step on paper through the length and breadth of this wondrous structure when a full Report, illustrated by detailed plans of corridors, stairs, rooms, &c., numbered *seriatim*, can make such circumambulation intelligible. For the present a flying sketch (so to speak) of the citadel, as it stands exhumed, may suffice to give *a general idea of its complex, yet harmonious, ground plan.*

Climbing the iron ladders at the point where the gallery once zigzagged up the north face of the Rock—first west, then east—the rock-cut grooves (from which all vestiges of masonry have long since disappeared) run up to the summit at an easy gradient.

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* See Plate, "*Sígiri-gala* (West face)."

Mount the topmost flight of steps of the erstwhile "gallery" still in position ; and note the view.

Directly in front, looking south from the vantage ground of the east to west cross bank, stretched below as far as the central *pokuṇa*, is so much of the lower area as lies between the Rock's north and east edges and the high ridge that occupies the western half of the summit. Most here is comparatively level—the only level portion of any extent in a citadel where terraced arrangement was inevitable from the irregular conformation of the Rock's surface. This area was seemingly allotted to courtyards, passages, and side rooms. Half-way a winding staircase of three or four flights of steps—the longest on the Rock, and pierced at its head through tall flanking walls—shows the means of direct communication with the upper area to the west. At the side of these stairs is the magnificently carved "*gal-ásanaya*," or granite throne, discovered in 1895.

On the left, skirting the east edge of the Rock, was a range of minor rooms and passages, doubtless communicating with an outermost corridor, which almost encircled the citadel. This series of side chambers was continued on to near the south end of the Rock, interrupted only at the pond, where extra rooms, &c., intervene.

As I had occasion to note in last year's Report :—

> That part of the ancient citadel lying south of the pond, and east of the high-level strip, was laid out in a series of cross-terraces, east and west, varying in width—and falling away southwards. From the *pokuṇa* to the foot of the last staircase at the extreme south are seven or eight distinct terraces..... The centre is taken up with an open courtyard and passages leading to the pond, and round it, on either side, by stairs and intermediate landings—all admirably planned to suit the physical conditions, and displaying great ingenuity in turning to full account the limited space and surface inequalities of the Rock's summit.*

More than one of these terraces has been curtailed and hideously disfigured by *single-brick walls* of later construction—"patched up into a smoothness and smugness"

* C. A. S. Journal, vol. XIV., No. 47, 1896, p. 251.

Ruskin forcibly pronounces "more tragic than uttermost ruin."

The lowest staircase—at the south-west corner of the Rock—descends with a right angle return to the "watch-cave" in the perpendicular crag on this side. The southernmost terrace, to the east of these stairs, was clearly dedicated to Cloacina.

Of the higher level half of the summit I have already spoken, as containing a succession of apartments, rising in tiers northwards.

The backbone, as it were, of the citadel is found in the paved way, with steps descending ever and anon, that was carried along its axis from end to end, hugging the retaining wall of the upper ridge, and winding with its angles, but for the most part running straight as an arrow. From this "spinal column" branch off, east and west, staircase "ribs," which would render communication between all parts of the citadel easy and rapid; whilst each section was equally well served, by the cunningly designed interconnection of its own component divisions, through a maze of minor passages and stairs.

No less perfectly planned was the *water supply*. The rock-hewn *pokuṇa*, nearly 30 yards square, centrally situated and accessible from every side, would suffice, when replenished yearly by the north-east monsoon rains, for ordinary requirements during the ensuing dry months. For drinking water resort was had, in all probability, to two at least of the three smaller cisterns close to the Rock's north, south-west, and south-east edges.

A word or two regarding the *architectural construction* of the citadel.

Further lengthening of the deep longitudinal trench, begun last year from the extreme southern verge, confirms the impression that the foundations were throughout the low-level area, in general, of that form of stonework known as "irregular horizontal," and run down to the rock core. Upon this rested brick walls, vertical or in batter, plain or moulded, according to position and purpose, but all alike coated thickly

with a tough plaster, white and polished, that has resisted the damp in places to this day. The massiveness of many of these walls bespeaks considerable height originally, despite the fact that the brickwork was almost dry-laid and indifferently bonded crosswise. But in "make" these ancient bricks—some a cubit in length—shame most of our modern outturn, being as well burnt as they are sharp and close.

Of the system of *roofing* we know nothing beyond the certainty that it was timbered throughout and flat-tiled, in the style familiar among the Anurádhapura ruins.

A marked feature of the ground plan is the *erratic location of steps*. As often as not, they are pushed aside from the centre of the rooms into which they lead, and relegated to all sorts of odd corners. This vagary was no doubt forced upon the architects by the unconformable surface of the rock, which had to be reckoned with everywhere.

But noteworthy, above all, is the *complete absence of monolith pillars and stone-carved doorways*, the most salient characteristic of ancient structures in the Island. Whilst quartzous steps and flagstones were lavishly employed to enhance the beauty of this peerless citadel, not one fragment of column, door-frame, or window-sash in *stone* has come to light on *Sígiri-gala*. Above the floor all was of brick or wood. As for gneiss, with the sole exception of the noble throne above mentioned—like silver in the days of Solomon—"it was nothing accounted of," and finds no place in Kásyapa's citadel.

Little wonder that the glory of a structure, towering to heaven on the dizzy heights of *Sígiri-gala*, "white as snow" within and without, should call forth irresistably the unalloyed admiration of the old chronicler, not given to spare its master-hand, King Kásyapa, "that wicked ruler of men." "He built there," so it is written, "a lovely palace splendid to behold, like unto a second Álakamandá, and lived there like (its lord) Kuvéra."*

* *Maháwaṇsa*, XXXIX., p. 5.

How little comparatively now remains to attest the ancient beauty and grandeur of *Sígiri-nuwara*, the parricide's stronghold :—

> Those golden pallaces, those gorgeous halles,
> With fourniture superfluouslie faire ;
> Those statelie courts, those sky-encountring walls,
> Evanish all like vapours in the aire.

MISCELLANEOUS.

Of extra work carried out this year—apart from the copying of the frescoes, which will be presently dealt with—the most important was the improvement, obviously called for, in the means of ascent to the Rock's summit.

The two stout iron ladders put up by the Public Works Department in 1894–95, which land the climber at the bottom of the grooved slope (the track of the "gallery" long since washed away), need only light hand-rails and flat iron below the rungs to further simplify ascent. Not so the low single rail carried up the slope to the top of the Rock from the head of the ladders. This makeshift hand-hold was distinctly unsafe—as easy to slip under as trip over—and each season I have had to take the precaution of supplementing it with a close-tied fence of jungle sticks. I, therefore, took upon myself this year the responsibility of making, once for all, a "Union Jack" fence in iron. Additional standards have been sunk into the rock, a higher rail run through them, and diagonal bars fixed across each span.

"Síha-giri Rock, that was hard for men to climb,"—as the *Maháwaṇsa* puts it,—may for the future be ascended in perfect safety by the most timid.

Mr. Perera being fully occupied in painting the frescoes until early in July, the drawing in detail of walls, stairs, &c., excavated since 1896 will be resumed and completed next season.

A hundred *photographs* and upwards were added to the lengthy series of views of Sígiriya commenced in 1895. It is intended to make this series exhaustive, in order that

it may still be possible to study the architecture of every portion of the citadel, even when, as is inevitable, much now standing shall have yielded to the "tooth of time and razure of oblivion."

As in past seasons, few "finds" of special interest were dug up. From the quantity of heavy iron nails, bolts, clamps, &c., brought to light, it is clear that the doors were massy, and strongly bound.

A handsome Greek-pattern vase, or cruse, blue-enamelled, is the chief piece of ancient pottery yet yielded by the excavations.*

COPYING THE FRESCOES.

The whole set of the unique frescoes of Sígiriya has at length been faithfully reproduced on canvas, and in a manner worthy of the original paintings.

The Government and the public owe this happy result to the singular talent, unflagging patience, and real courage of one man—Mr. D. A. L. Perera, ex-student of St. Benedict's Institute, and now Head Draughtsman of the Archæological Survey. Altogether, from first to last, in 1896 and this year, Mr. Perera spent nineteen weary weeks—practically five months—in the cheerless "pocket" caves of *Sígiri-gala* working on day after day from morning to evening—exposed latterly to the driving force of the south-west wind, and sorely tried at times by inflammation of the eyes and attacks of fever—before the final touch could be put to the last of the twenty-two paintings.

To glance back for a moment at the gradual steps leading up to this full fruition of hopes, which in 1895 seemed faint indeed.

The frescoes, in their inaccessible isolation high above the "gallery" that clings to the Rock, well sheltered by the beetling crag, have naturally attracted the notice of every visitor to Sígiriya. Tennent, Rhys Davids, Blakesley, each in turn specially alludes to them.

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* Exhibited at the Meeting.—*Hon. Sec.*

But it was left for Sir A. H. Gordon, when Governor of Ceylon, to initiate *practical* action for the securing of copies of the paintings.

At the desire of His Excellency the Governor, Mr. A. Murray (aided by Mr. F. G. Pigott, both of the Public Works Department) undertook in 1889 the uninviting task of reaching the frescoes; and, surmounting all difficulties, climbed into the larger, or more southerly ('B'), of the two rock "pockets" in which the only well-preserved paintings still exist.

In a short paper communicated to "*Black and White*" in 1891,* Mr. Murray thus describes the method then adopted for the ascent:—

> Holes were jumped into the rock face, one above the other, as the timber staging was carried up, and iron jumpers driven home and secured with cement. To these the staging was lashed and rendered secure. Once the chamber was reached a hemp rope ladder with wooden rungs was made fast to stout iron stanchions sunk into the floor of the chamber itself and made as rigid as possible by attachment to the staging. The erection of the staging was by no means an easy matter ..... It was found that the floor of the "pocket" was at too steep an angle to admit of any one sitting, much less standing. Iron stanchions were therefore let into the floor, and a strong trestle, or framework, made secure to them. On this was placed a platform, from which the work of copying the frescoes was carried out. The frescoes being painted on the roof and upper sections of the sides of the chamber, the staging, as erected, made it only possible to copy them by lying at full length on back or side.†

Even so—cramped in position, hampered by the harsh June gale, and limited in time to a week—Mr. Murray brought away copies, done in *coloured chalks*, of thirteen (all he could reach) of the seventeen frescoes in "pocket" 'B.' I may be permitted to repeat here what I said last year:—

> As an heroic first attempt to reproduce the frescoes, carried out under *conditions which rendered full success hopelessly impossible*,

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* No. 1891: reprinted in the *Ceylon Literary Register*, 1891, vol. II., p. 85.

† A large sectional drawing hung in the Public Hall showed (to left) the method of ascent employed by Mr. Murray in 1889, and (to right) that adopted by the Archæological Survey in 1896-97.—*Hon. Sec.*

Mr. Murray's efforts are beyond praise..... That under circumstances more favourable *the Archæological Survey has been enabled to obtain, for the first time, actual facsimiles of the Sigiriya frescoes—just as they remain after the wear and tear of nearly fifteen centuries*—need in no degree detract from the individual merit of Mr. Murray's pioneer work.*

"'Tis not in mortals," as we know, "to command success." Mr. Murray has done more : he has deserved it. His rapidly executed, but none the less beautiful, crayon drawings adorn the Museum walls: to drag them into comparison with the *finished copies in oils* of a trained draughtsman would be as unbecoming as unjust.

In 1895—our first season—" Mr. Perera was prepared with all requisite materials for copying the fresco portraits." But it was not until the following year, after protracted correspondence, that the Public Works Department solved the difficulty of devising some inexpensive plan for making *both* the "pockets" ('A,' 'B') accessible.

Several alternative proposals culminated in a suggestion of the Provincial Engineer, Central Province, which was adopted. Mr. R. D. Ormsby designed—

A vertical wire ladder, cane-hooped, and securely fastened to iron jumpers above and stout rings below—a mode of ascent theoretically simple, but requiring a firm hold and a sure head.†

This ladder the Public Works Department could not get into position for some time after we commenced work last year. In consequence, only six *facsimile* copies of the complete series were finished in 1896.

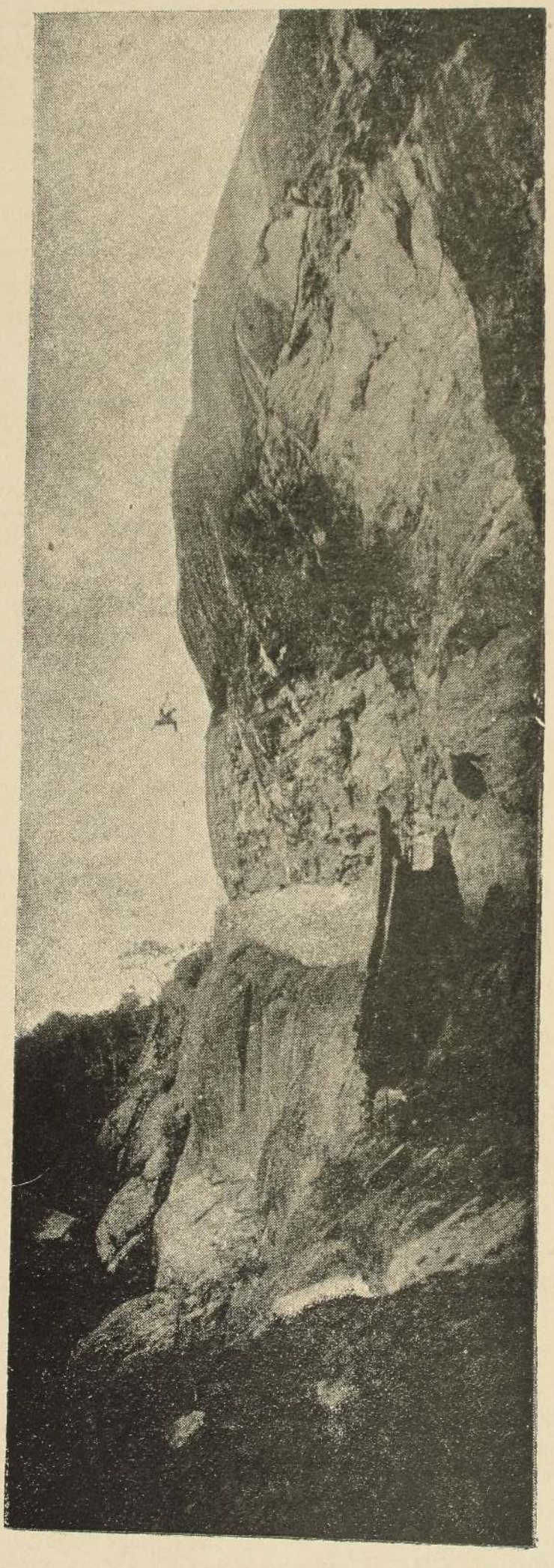
The delay was, however, turned to account profitably in a collateral direction—the securing of a comprehensive painting of the two "pockets" 'A,' 'B,' and their *frescoes as a whole*.‡

I quote from last year's Report :—

The height of the "pockets" from the ground and the gallery prevents a complete view of all the frescoes together being got from

* C. A. S. Journal, vol. XIV., No. 47, 1896, pp. 256–57. † *Id.*, p. 254.

‡ Besides the copying of the "*viyan redda*" painting, discovered in a cave under a boulder west of the Rock.



Photographing the Frescoes from mid-air.

any one point, except at such a distance that even a tele-photographic lens failed to bring them reasonably close. We therefore decided to photograph and paint the two caves from mid-air.

A 4-in. hawser was lowered to the ground from the summit over the west cliff (which here projects considerably), and a strong iron block bound to the end. Through this block a 2-in. rope was passed, and an improvised chair firmly tied on to it: the hawser was then pulled half way up the Rock scarp. Hauled up thus, one swung in the air upwards of 150 ft. above the ground, and 50 ft. clear of the cliff.*

Instantaneous photographs were tried, but with little success, owing to the strong wind and an indifferent drop-shutter.

On the other hand, after a week's "rocking" in space, Mr. Perera completed an excellent little oil painting, to scale (about $\frac{1}{32}$nd). This shows at a glance the relative position of the several figures.†

This season the same wire ladder was erected in good time. Mr. Perera set to work in February, and plodded on steadily until, first, the remaining eleven frescoes of "pocket" 'B,' and finally, the five in 'A' had been copied in every particular.

As to the wonderful fidelity with which Mr. Perera has carried through a laborious undertaking, encompassed by great difficulties, I can but reiterate the high opinion I put on record last year:—

> It is hardly going too far to assert that the copies represent the original frescoes, as they may still be seen at Sígiriya, with a faithfulness almost perfect. Not a line, not a flaw or abrasion, not a shade of colour, but has been reproduced with the minutest accuracy.‡

The wire ladder, as fixed, falls almost perpendicularly to the floor of the "gallery," within one foot of its wall, from the shoulder of the overhanging rock, 40 ft. up. From that point the rock bends inwards for 4 ft. or so to the sloping floor of the larger "pocket" 'B.' This cave is fairly roomy —38 ft. 4 in. by 11 ft. 8 in.—and more than high enough to

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* See Plate. The deep shadows were cast by the setting sun. [An enlarged drawing was on exhibition at the Meeting.—*Hon. Sec.*]

† Exhibited at the Meeting. The accompanying Plate has been lithographed from a photograph of Mr. Perera's painting.

‡ I may add that Mr. Perera's work has been examined on the spot and received unstinted praise from a succession of visitors, official and private, who have had the opportunity of comparing the copies with the original paintings on the spot.

stand in upright, except at the left, or north, end. Here the floor rises steeply on to a narrow slanting ledge, only 3 ft. 6 in. in height and but a cubit in width—the sole possible means of approach to the second, and much smaller, "pocket" 'A,' which is barely 3 ft. wide.

It was not practicable for Mr. Murray in 1889 to reach this northern cave from his trestle staging.

Last year, at the outset, I had iron standards (3 ft. 4 in. in height), with a single top rail, driven into the rock above the ladder along the edge of both "pockets" and the connecting ledge, as an essential safeguard. Without such hand-rail a slip on the smooth shelving floor would mean instant death on the rocks fifty yards below.*

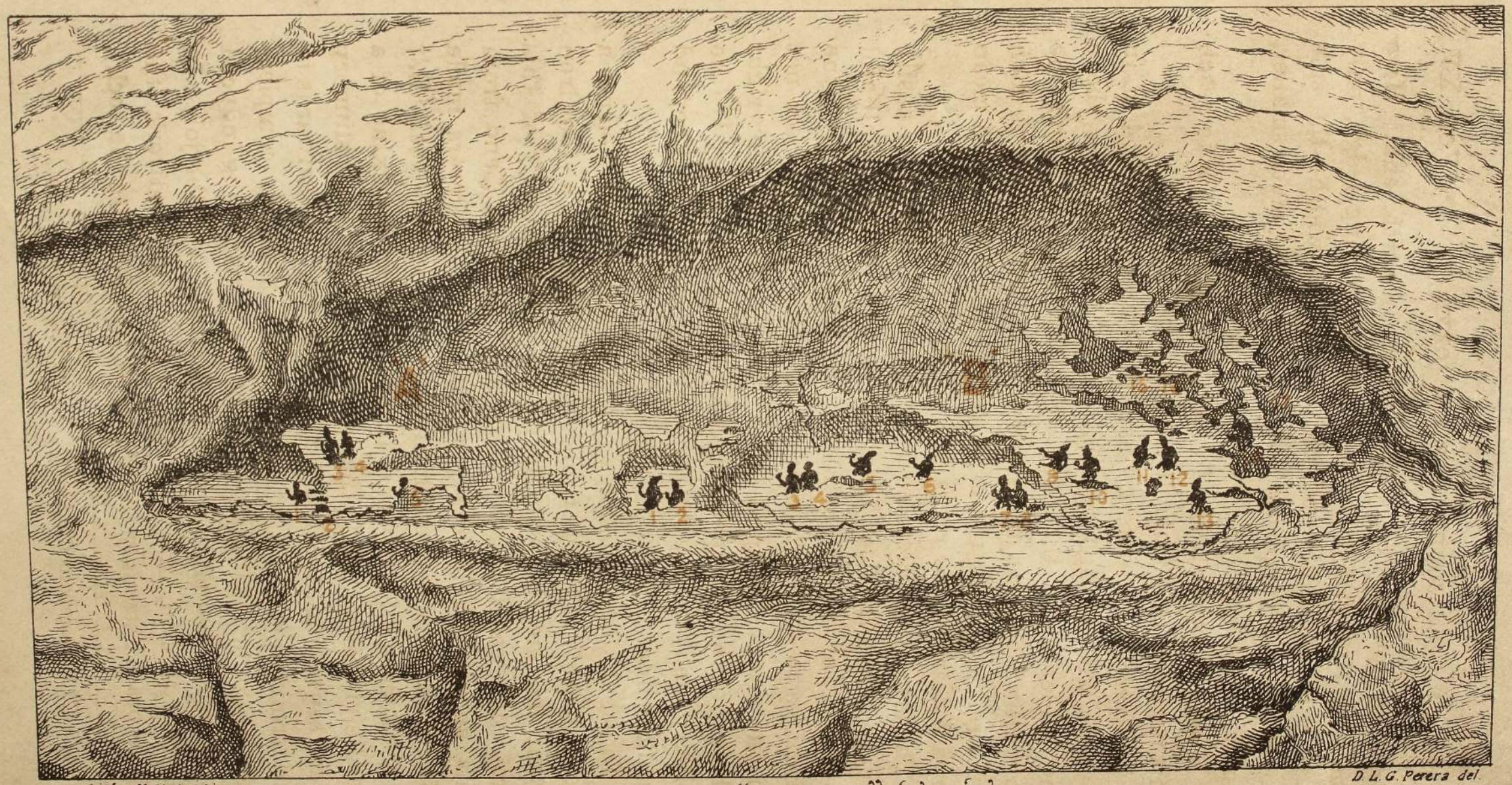
Thirteen of the frescoes in "pocket" 'B' can be easily touched from the floor, being painted on the rock wall and lower part of the oblique roof at the back of the cave—the throat, so to speak, of gaping rock jaws—but they are not on one level. No. 14 is on the wall at the south, or right "horn" of the half-moon chamber; Nos. 15, 16, and 17 (the solitary hand) well up the concave roof—and all four beyond the floor line.

To get at these paintings it was necessary to construct a "cantilever" of jungle timber, firmly lashed to a stout iron cramp let into the rock floor. To the extremity of this projection was tied a rough "cage" of sticks; and from this uncomfortable and perilous perch Mr. Perera made his copies of the last and loftiest frescoes in "pocket" 'B.'†

Even more difficulty and danger attended the fixing of a hurdle-platform outside the extremely narrow and slippery ledge separating "pocket" 'B' from 'A' and onwards to the termination of 'A.' It took fully ten days to complete this *messa*, or stick-shelf—only a few hands being induced by special remuneration to risk their lives on the job. In addition to 1-in. iron bars supporting the woodwork (the whole braced strongly to thick iron cramped into the rock),

* Photographs C. 633, 634. † Photograph C. 785.

SIGIRI-GALA



Lith: M.K. Saldin & Co

D.L.G. Perera del

FRESCOES IN "POCKETS" 'A' & 'B'

AS SEEN FROM MID-AIR

Scale, $\frac{1}{136}$ of Actual Size

the hurdle had to be further held up by a central hawser and side ropes, hauled taut round trees on the summit of the Rock nearly 300 ft. up. When finished, this improvised platform stood out from the cliff 15 ft. horizontally.*

Other "pockets" there are "scooped within the living stone," further north along the western face of the Rock and higher up still. The larger of these were also plaster-coated and painted; but the colouring has disappeared almost entirely, and it is doubtful whether the caves themselves can now be reached in any way.†

It is reasonable to conclude, from their being found in so inaccessible a spot, that the frescoes are merely the last remnants of a large number of similar paintings which covered the bare and perpendicular rock immediately above the terrace [gallery]. It is unlikely that the *only* frescoes should have been painted where they can be so hardly and so little seen; but they are found in almost the only part of the precipice protected partially from sun and rain, so that the destruction of any others that may have existed was inevitable."‡

To pass to the *frescoes* themselves.

In an "Interim Report" such as this, it is not possible to do full justice to these unique paintings. They demand special treatment in detail, and that I hope to give later.

Here I must limit myself to *a rapid general description*, drawing attention merely to certain broad features which un through the frescoes as a group.

It is usual—and convenient—to style the Sígiriya paintings "frescoes." But in reality—like their coeval and even more remarkable congeners at Ajanṭa—they have no claim to be thus honoured. Says Mr. Griffiths, when reporting to the Indian Government on the Ajanṭa paintings :—

They are not "frescoes" in the true acceptation of the term; nor do they appear to correspond to the Italian *fresco secco* (where the entire surface of the wall was first prepared for painting on and then thoroughly saturated with lime water before the painting was commenced), as the groundwork upon which the paintings were executed would hardly admit of this treatment.§

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* Photographs C. 778–82. † See Plate (*ante*), "*Sigiri-gala*, West face."

‡ Rhys Davids, in Journal, R. A. S., vol. VII., Part X., 1875, p. 193.

§ *Ind. Ant.*, vol II., 1873, p. 153.

Like the so-called "frescoes" at Ajanṭa, those of Sígiriya are strictly *paintings in tempera*, that is, the pigments used were mixed with some liquid vehicle and laid on a dry surface.

The groundwork at Ajanṭa—

Appears to be composed of cowdung, with an immixture of pulverized trap, laid on the roughish surface of the rock to a thickness varying from quarter to half inch. Over this ground was laid (the *intonaco* of) thin, smooth plaster, about the thickness of an egg-shell, upon which the painting was done.*

At Sígiriya—and to support my examination I called in the aid of the most skilled Siṇhalese "*sitiyaru*" (painters) from Nilagama, in the Mátalé District, the village upon which has devolved for centuries the hereditary "service" of renewing the paintings of the ancient cave viháres of Dambulla—an analysis of the plaster showed a groundwork of tempered earth and kaolin of a reddish brown hue and ½ in. in thickness, coated with at least two layers of white chunam, ¼ to ½ in. thick. The clay base, strengthened by the admixture of "*dahiyáva*," or paddy husk, and perhaps shreds of cocoanut fibre, was first put on by hand, the chunam coating being (as at the present day) smoothed over it with a trowel.

Only three pigments were used, *yellow*, *red*, and *green*,† though *black* seems to have been given a trial as background to one figure, No. 14 'B.' The particular shades of these colours predominating the paintings may best be realized from the modern corresponding media employed by Mr. Perera in copying them, viz., chrome yellow, yellow ochre, raw sienna, burnt sienna, raw umber, light red, Indian red, sap green, terra vert, lamp black, and flake white.

The entire omission of *blue* is very remarkable, and difficult to account for, as this colour enters freely into the sister paintings at Ajanṭa.

No one who chooses to carefully compare the Sígiriya

* *Ind. Ant.*, vol. II., 1873, p. 153.

† "I tried in vain to detect green on the Sígiri frescoes" (Rhys Davids *loc. cit.*, p. 210).

paintings with those found in the Ajanṭa caves will fail to be convinced that *artists trained in the same school, if not the very same hands, must have executed both Indian and Ceylon frescoes.* The evidence to be drawn from dress and ornament, no less than from the quaint "tricks" of pose and colouring common to both alike, for differentiating race and complexion and representing expression, is irresistible.

Mr. Griffiths' remarks on the Ajanṭa frescoes apply equally to the Sígiriya paintings. He says :—

> The artists who painted them were giants in execution. Even on the vertical sides of the walls, some of the lines which were drawn with one sweep of the brush struck me as being very wonderful ; but when I saw long, delicate curves drawn without faltering with equal precision upon the horizontal surface of a ceiling where the difficulty of execution is increased a thousandfold, it appeared to me nothing less than miraculous. One of the students when hoisted up on the scaffolding, tracing his first panel on the ceiling, naturally remarked that some of the work looked like child's work, little thinking that what seemed to him up there rough and meaningless, had been laid in by a cunning hand, so that when seen at its right distance every touch fell into its proper place.*

Mr. Griffiths continues :—

> The condition of mind in which these paintings were originated and executed must have been very similar to that which produced the early Italian paintings of the fourteenth century, as we find much that is in common. Little attention paid to the science of art—regard had more to the truthful rendering of a story than to a beautiful rendering of it ; not that they discarded beauty, but they did not make it the primary motive of representation. There is a want of aerial perspective—the parts are delicately shaded, not forced by light and shade, giving the whole a look of flatness—a quality desired in mural decoration.*

Elsewhere Mr. Griffiths dwells on the admirable drawing of heads and limbs, of ornament and dress, and specially of "the true rendering of hair—one of the most difficult things in the province of art"—praise fully borne out in the Ceylon frescoes of Sígiriya. A further marked feature of these ancient paintings is the predilection for *the three-quarter face*—a characteristic that alone separates the level of art

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* *Ind. Ant.*, vol. III., 1874, p. 26.

displayed, *toto coelo*, from the weak conventional "silhouettes" of present-day Siṇhalese artists. Of the twenty-two faces left in "pockets" 'A' and 'B' at *Sígiri-gala* only three are in profile.

In one essential particular do the figures of the Sígiriya frescoes differ from the generality of those in the paintings at Ajanṭa: the latter are usually shown at full length from head to foot; *the Ceylon figures are all cut off short at the waist* by cloud effects, no doubt to economize space—a clever device, by which—to slightly vary Milton—"more is meant than meets the eye"; whilst the pose of the head and body, coupled with the action of the hands, conventionalised yet not unnatural, unmistakably convey the meaning the artist intended.

In some of the caves at Ajanṭa "on different parts of the walls two layers of painting can be distinctly traced," and the painting is "of two or even three periods."

Two coatings of colour are not unknown to the Sígiriya frescoes. A patch of the upper layer of chunam scaled off the *green* waist-cloth of figure No. 12 in "pocket" 'B' reveals an under-coating of *crimson*. For all we know—or can know without completely wrecking the present frescoes—this may signify nothing more than that a co-temporary artist was given a free hand to bring the ladies' dresses up to the "latest Court fashions," or, perchance for some peccadillo, to put the fair penitent (as in the case of the second figure in "pocket" 'A' literally) under a cloud.

The frescoes still to be seen on the western face of *Sígiri-gala* (casual patches of colouring excepted) are found now only in the two rock chambers or "pockets" ('A,' 'B') some 15 yards above the "gallery" floor at its south end. They consist of twenty-two half-figure portraits—one and all *female*. Of these, five are in "pocket" 'A,' seventeen in the larger chamber 'B.' All have suffered more or less from nesting swallows and the clay-building mason bee, some terribly.

It is almost certain that there once existed three rows of such half-figures in "pocket" 'A' and four in 'B,' painted on the rock walls and projecting roof. Highest up in the first line remain the single hand (No. 17) and a very worn pair of figures (Nos. 15, 16); of the second row only faint traces here and there; to the third line belong frescoes Nos. 3 and 4 of 'A,' and Nos. 5, 6, 9, 10, 11, 12, and 14 of 'B'; whilst the fourth, or lowest, row is made up of Nos. 1, 2, and 5 of 'A,' and Nos. 1, 2, 3, 4, 7, 8, and 13 of 'B.'

The figures in "pocket" 'B' are above life-size; those of 'A' smaller than the ordinary human form—a divergence due to the proportionate wall-space available.

The scene intended to be pourtrayed would seem to be *a procession of the queens and princesses* of Kásyapa's court, with their attendants, on the way to worship at the Buddhist viháré at *Pidurá-gala*, the hill lying about a mile north of Sígiriya. The figures are manifestly all moving in that direction, and the flowers held in their hands by the ladies, and carried after them by servant-maids, can hardly bear any other signification. Grouping in pairs is chiefly favoured throughout: usually queen or princess followed by a lady-in-waiting of the same, or kindred, blood, or by a dark-skinned maidservant of alien race. The latter (Nos. 4, 8, 11 of 'B') are given a greenish complexion—a "badge of servitude" which clearly marks them off from the high-born dames, their mistresses, whether pale-yellow "blondes" or orange-hued "brunettes"—all three coloured types reproduced frequently at Ajanṭa.

Mr. Murray noted correctly "that the maid in each case has her bosom covered with a jacket similar to that worn by Tamil women at the present day." Of the ladies, he declares "many are nude to the waist"—an assertion for which, it must be admitted, he had, *primâ facie*, good grounds. As, however, I pointed out in my Report for last year—

> A close examination confirms the counter-supposition (highly probable on other grounds) from the known *penchant* of Oriental sculptor and painter alike in bygone days for *ultra*-diaphanous

garments—a "strange conceit" which artworks of ancient India amply illustrate.*

The Ajanṭa paintings abound in female forms apparently "clothëd on with chastity" alone, but each in reality, like old Chaucer's Venus, "koverëd wel":—

> Ryght with a subtil keverchefe of Valence ;
> There was no thicker cloth of defence.

Every queen, princess, or court lady depicted in the Sígiriya frescoes is in reality modestly clothed in a coloured *kambaya* from the waist downwards, and above, in short-sleeved jacket of finest material—"a wondrous work of thin transparent lawn," so thin, indeed, that the painter has (as with figure No. 12) occasionally contented himself by indicating it only by a touch of orange colour at the neck.

Whatever opinion be held as to scarcity of clothing, there can be but one regarding the redundancy of ornament affected equally by queen or serving-woman. Coronets, tiaras, aigrettes crown the head ; flowers and ribbons adorn the hair ; whilst ears, neck, breast, arms, and wrists are loaded with a plethora of the heaviest ornaments and jewelled gauds. Some of the gold necklaces are exceedingly chaste, and the emeralds and rubies worn so "rich and rare" that each, if real, would be worth a king's ransom.

The figures in "pocket" 'A' may have no connection with those of the larger cave, though both seem to represent the same scene painted by two different artists ; for the rendering is as commonplace in the former as in the latter it is natural and spirited.

The paintings appear to have been first *outlined in with red or black*—perhaps by an artist different from the finisher of the pictures. Be this as it may, it is certain that the second worker did not slavishly follow the original outlines—indeed, the altered left hand of figure No. 8 'B' shows that at times he used his own discretion boldly.†

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* C. A. S. Journal, vol. XIV., No. 47, 1896, p. 256.

† Mr. Murray has been *misled* by this ultimate departure from the curves as first put in, and varied, into the assertion that to the hands "have been added, in almost every case, an extra finger."

The type of features is Aryan—oval face, thick fleshy lips, but straight, almost Grecian nose and forehead. The "almond-eyes" of No. 1 'B' betoken a slight tinge of Mongolian blood.

I have styled these paintings "portraits," and, I venture to think, with reason. Unable to cast himself loose from all conventionalism, particularly in the stiff disposition of arms and hands, the artist—he, I mean, who executed the paintings in "pocket" 'B'—has imbued each figure with certain delicate traits in face, form, pose, and dress, which stamp it, *me judice*, unmistakably as an *individual likeness*. So skilfully in truth has the portrait painter worked that it appears possible not merely to gauge approximately each lady's age, but even, in great degree, "to find the mind's construction in the face."

These figures are no replicas of a flat, stereotyped image, "mute fixtures on a stuccoed wall"—degenerate art that wearies the eye at many a modern Buddhist temple in Ceylon. Here they live, they move, they have a being; all is instinct with life and spirit.

Mark the fair princess (No. 1 'B') who has purposely taken the lead in the procession with her lady-in-waiting (No. 2). That dainty head saucily tossed back surely betrays, plainer than words, full consciousness of her undoubted charms. In her own eyes the "very pink of perfection," she essays to parade as "the glass of fashion and the mould of form, the observed of all observers."

Following her demurely at some distance is a second princess (No. 3), perhaps the staid elder sister, accompanied by a dusky maid of unattractive mien, carrying a rolled ola book.

Next, come two more court attendants (Nos. 5, 6), manifestly importuning a matronly queen (No. 7) to hasten her steps. The impassiveness of the royal lady is admirably brought out by a slight, but expressive touch—the deliberate unfolding, petal by petal, of a lotus bud she holds in her hands.

Or observe the impulsive eagerness of No. 9, another lady-in-waiting, chafing at the delay and appealing to the queen immediately following (No.10), who with right hand uplifted gently checks her impetuosity.

Succeeding No. 10, attended like Nos. 3 and 7 by a servant maid bearing a tray of flowers, is a princess of seventeen or eighteen years (No. 12), who may well be Kásyapa's daughter. Excellently has the artist caught the young girl's—

> Embarrassed look of shy distress,
> And maidenly shamefacedness

on the occasion of this—not improbably her initiation into a—public Court procession.

The figure behind is perhaps her mother, the queen consort, from whose well-chiselled face "Decay's effacing fingers" have still not "swept the lines where beauty lingers."

Last of all, calm and sedate, walks the queen mother (No. 14) absorbed in silent meditation. Can we doubt that that fixed gaze and dreamy look sadly speak to "thoughts too deep for tears"—a royal husband slain at Kalá-veṇwa ; a son, his slayer, ruling, but not reigning, at Sígiriya ; to a "past" no longer "sighed for, and a future sure."

Finally, contrast the peaceful serenity of this queen dowager with the "crabbed age" of the well-nigh repulsive beldame (No. 5) of "pocket" 'A,' or the vivacity and expression of figure No. 9 'B' with the stolid blankness on the faces of the dark-hued serving maids, or slaves (Nos. 4, 8, 11)—

> So coldly sweet, so deadly fair,
> All trace of *soul* is wanting there.

One word in conclusion. *Who were the authors of these unique paintings?* Were they executed by Siṇhalese "*sitiyaru*," or by foreign artists brought over from the continent of India ?

For myself, I make no doubt that they are the *production of exotic talent* specially imported by King Kásyapa for the single object of adorning his incomparable citadel.

The case for the Siṇhalese rests, I believe, on but two

props, both unreliable : first, the casual mention of oil painting in connection with the building and decoration of Ruwanveli Dágaba by King Duṭugemunu about 80 B.C.; and secondly, the occurrence of one or two frescoes among the Ajanṭa paintings supposed to relate to Ceylon.

Could evidence be more slender? Even if the *Mahá-waṇsa* record be held unimpeachable, what was there to prevent King Duṭugemunu from securing his artists from the continent? And as to the fancied Vijayan and other frescoes—if, indeed, the scenes be accurately allocated to this Island—the story of the migration to, and conversion of, Ceylon would be the common property of all Buddhists, whether of the northern (*Mahá-yana*) or southern (*Hina-yana*) schools, and certain to find a place, with other Buddhistic legends, on the walls of the Ajanṭa caves.

On the other hand, there is the stubborn fact that nowhere else in Ceylon have similar frescoes, or other paintings rising to so high a standard of art, been yet discovered. There is nothing to equal them in the fragments left on the altars of the Anurádhapura Dágabas—on the walls of the so-called "Demaḷa-mahá-seya" at Polonnaruwa—or in the countless caves of the northern part at least of the Island. The best painting at Dambulla Viháré, barely 12 miles from Sígiriya—a shrine famed for centuries before *Sígiri-gala* was occupied as a royal citadel—is not on a par with the least successful of these frescoes.

Intercourse with Buddhist India had for some length of time prior to the middle of the fifth century been, if not close, at least free and not slight. Nine reigns earlier, during the rule of Kírtti Śrí Meghavarṇa, an Indian prince and princess had brought over the *Daḷadá*, or Tooth-relic, to be in future enshrined in Ceylon. And it was to India that Moggallána resorted for the army which finally captured his brother's stronghold at Sígiriya.

And strongest proof of all : no tradition exists that the skilled artists who executed the frescoes were Siṇhalese; nor regarding the methods whereby these paintings have

preserved their hues, despite the weathering of 1,400 years and upwards, with a freshness and brilliancy that is simply marvellous.

If the art of permanently "fixing" colours was ever indigenous to Ceylon, it is hardly reasonable to believe that it would have died out completely. In the East painters' guilds are among the oldest methods of painting, being jealously guarded and handed down from generation to generation with rigid conservatism. The Nilagama "*sitiyaru*" who closely examined them made no secret of the fact that the best modern work exposed to wind and sun, as are the Sígiriya frescoes, would not last twenty years.

Yet here still survives an imperishable monument of antiquity—painting dating back well-nigh a millenium and a half.

> Quod non imber edax, non aquilo impotens
> Possit diruere, aut innumerabilis
> Annorum series.

4. HIS EXCELLENCY THE GOVERNOR: I now invite any gentleman present to make any remarks, or ask any questions, which he may think desirable to make or ask, in order to elucidate, if necessary, the very able and lucid lecture we have just heard.

After a pause—

5. Mr. J. FERGUSON said the absence of the Acting Chief Justice, who was to have taken charge of the resolution, had entailed on him the duty of proposing a cordial vote of thanks to Mr. Bell for his interesting and instructive Paper.

Old residents, like himself, who recalled Mr. Bell's presence amongst them in Colombo, realized his (Mr. Bell's) self-denial, when in the course of duty, and in his enthusiasm for archæology, he had got banished to Anurádhapura. His labours there, year after year, under but half-hearted encouragement, were known to them all. Fortunately, greater interest and encouragement had been manifested under His Excellency's *régime*.

Now Mr. Bell had come to tell them of Sígiriya, to whose exploration he had given portions of the past three years; and, to aid in bringing home to them the marvels of that Rock Fortress, was exhibiting a brilliant display of paintings, so well executed by his Draughtsman, Mr. Perera.

He was not prepared to find Mr. Bell so firmly declaring the Sígiriya frescoes were the work of Indian rather than Sinhalese artists; but

that view had been forced on himself by the contrast between what they saw around them on the walls this evening, in the variety as well as ability of the art displayed, and that presented by any of the paintings or illustrations elsewhere in Ceylon at the present day. The art at those Buddhist temples—if art it could be called—seemed (as with temple figures and illustrations in Egypt) to be stereotyped for 2,000 years.

As regards access to the summit, Mr. Bell knew of no more than a dozen Englishmen, all told, who had climbed the Rock previous to 1895 ; while he also incidentally mentioned that 20,000 persons at least had reached the top during the past three seasons—so great was the improvement in the means of ascent.

They would hope that, under increasing encouragement, the Archæological Survey—with which Mr. Bell's name will ever be identified—would progress satisfactorily, and that Mr. Bell would have many more Papers of interest to read to them.

They had to thank His Excellency and the Government for permitting the Paper to be read before the Royal Asiatic Society.

He would now move that Mr. Bell receive a very hearty vote of thanks (*applause*).

6. Mr. C. M. FERNANDO said that the very same accident which had made Mr. Ferguson propose the motion had obliged him to second it. And taken rather suddenly, he was sorry that he was not able to say as much as he should wish about Mr. Bell's work with regard to the Archæological Survey of the Island. But this much he could say, that as a Siṉhalese he was very thankful to Mr. Bell for helping to elucidate the ancient history of the country ; and thankful to the Government of Ceylon for giving Mr. Bell the opportunity of doing so.

He might also be excused if he expressed satisfaction at those fine frescoes. Not only had the copies been done by a Siṉhalese artist, but the originals, in his opinion, had been painted by Siṉhalese themselves. Some two years ago, when Mr. Bell's work at Sígiriya first came before the Royal Asiatic Society, he (Mr. Fernando) had ventured to make the suggestion that these frescoes were drawn, not by "exotic" artists—as Mr. Bell would have them understand—but by Siṉhalese artists.

He must say he had very slender material to substantiate that suggestion. Those materials were two copies of frescoes at Ajaṇṭa, and they related to the history of Ceylon. One of them depicted the introduction of Buddhism into Ceylon by Mahindu. Another fresco depicted the bringing of the Tooth-relic into the Island. The Ajaṇṭa paintings, Mr. Bell had said, closely resembled the figures they saw before them. He, therefore, hazarded the suggestion that it was not Tamil [*sic*] artists who came to Ceylon and painted those frescoes, but Siṉhalese artists who went over to India (*laughter*). His Excellency might think that was rather a bold theory for a young man like

himself to formulate at a Meeting of that Society; but he did not think that his position had been shaken at all by anything that had been said that evening.

He was not aware of any frescoes in India which were of the same class of painting, except the frescoes at Ajanṭa; and until India could establish some other precedent, he thought he could claim the credit for the Siṇhalese themselves. Apart from that fact, he had the authority of Sir Emerson Tennent for asserting that the earliest historical mention of oil painting was in the *Maháwaṇsa*. Tennent mentioned that the Warrior King built the Ruwanveli Dágaba, and had frescoes painted on it in oil mixed with vermilion paint. The remains of those frescoes were still to be seen at the Ruwanveli Dágaba, which was built some two thousand years ago.

The use of oil painting was only forgotten, not lost, in Ceylon. At least, the method of painting in oils was there, although the skill in the art was lost. If it was argued that the paintings of the present day were not of the class of those they saw exhibited to-night, it might be said in the same way that the Siṇhalese did not build those monuments of engineering they saw in the great tanks and ruins in many parts of the Island, and that they were all built by Tamil, or "exotic," engineers; because they had not the same Siṇhalese engineers nowadays who could construct things in the same style. He asserted that the art of oil painting was known to the Siṇhalese, and that even to this day an oil was extracted in certain parts of the Island which was used for painting. The extraction of the oil was done in a very primitive fashion, but the liquid as used made a very good colour. He trusted that some day speculative gentlemen would make use of the oil, or possibly that the *Ceylon Observer* would take it up (*laughter*).

In conclusion, he expressed his great thanks to Mr. Bell, and hoped that the good work he had begun would be continued; and that in course of time, when he went to unlooked-for places, he would find still further frescoes which would release him from the impression under which he was labouring in regard to the inartistic character of the ancient Siṇhalese as regards painting.* He had much pleasure in seconding the motion.

7. His Excellency the Governor, before putting the motion, said:—My lord, ladies, and gentlemen: I now invite you by hearty acclamation to pass the vote of thanks to Mr. Bell which has been proposed and seconded. Mr. Ferguson and Mr. Fernando have evidently interpreted the feelings of this audience with the same accuracy and sympathy as Mr. Bell has the "maiden meditation" of the beautiful young ladies on the frescoes (*laughter*). [To Mr. Bell:—

* Mr Fernando subsequently reiterated his views in a letter to the *Ceylon Standard*, which called forth a reply from Mr. Bell. See Appendix.—*Hon. Sec.*

As your official chief I was rather shocked for a moment at your intimate acquaintance with the feelings of these ladies, and I began to fear a Breach of Promise case until I remembered how very much older they were than yourself (*renewed laughter*). In conveying to you the thanks of this Society, the thought occurs to me—How often have you received the thanks of this Chair; how often have you read Papers and done other useful work, and earned and received their thanks ?] However, I have no doubt Mr. Bell has been well rewarded. I can imagine, enthusiastic as he is, how pleased he has been to break away from the trammels of "red-tape" which usually surround him, and escape from cold official control ; when he finds himself in this hall of culture, in the presence of a sympathetic audience, how he must revel in delight. The icy *douche*, with which Government may occasionally quench his archæological ardour, is forgotten : he can dream, he can build magnificent castles—or shall we say dágabas—regardless of expense, knowing that he has the entire sympathy of his audience (*laughter and applause*).

Well, I will not pursue the strain ; but only repeat how much we have enjoyed the Paper which has been read, and how much we admire the effective way in which Mr. Bell has breathed life into what, in less skilful hands, would have been very dry bones (*applause*). I think this Society is to be congratulated upon having so valuable a Member, and the Government is to be congratulated on finding amongst the ranks of Civil Servants one so able, so capable, and, above all, so enthusiastic an archæologist (*applause*).

The vote was carried with hearty acclamation.

8. The Bishop of Colombo then rose and said :—It falls to me at this late hour very briefly to give expression to that which is in the minds of us all, the desire to thank Your Excellency for your presence here to-night (*hear, hear*). We have not only this duty, but also that of welcoming you on the first occasion in the capacity of Patron of this Society (*hear, hear*). We value the patronage of our Governor, and feel that your presence is not only the means of attracting a larger company than usual to our Meetings, but is evidence of the interest that clings round this special gathering.

I am very glad to think Your Excellency's presence to-day is in great measure, not merely to show your sympathy and to discharge your duty of patronage to this Branch of the Royal Asiatic Society, but also to show your approbation of him whom I shall not hesitate to call "*our* Mr. Bell" (*hear, hear*). He belongs to you, Sir, as a servant of the Government, but he belongs by extraction to the Royal Asiatic Society (*hear, hear, and laughter*). And we hope we may be able to make further requisitions on him for services like those which he has performed this evening (*hear, hear*)—services which demand such extraordinary combinations in himself and Mr. Perera. It has

been shown that they require, not only minute scientific knowledge and accuracy, but heroic efforts, which belong rather to the sphere of the athlete, or even of the aeronaut!

But while we all join in the thanks to Mr. Bell, we welcome Your Excellency's presence as an encouragement to ourselves and the Society. We are not always fortunate to have at our Meetings the results of great discoveries, or very brilliant or highly coloured scenes. We labour very often in humble corners, and in work which has its usefulness, though very little brilliancy. From time to time we read a Paper on some such subject as some particular bird, its method of making its nest, or of the way of preparing fish for stuffing, or some such practical details as promote the advance of Science. We believe that these things are useful; and probably they are the larger part of the work the Society can do. It is only on "field-days" of this kind that the Meetings of the Society are graced by a large company: and Your Excellency's presence is valuable for the encouragement it affords to us in our work. I will conclude by proposing to this company a very hearty vote of thanks to Your Excellency (*cheers*).

9. Mr. P. FREUDENBERG seconded the motion.

The vote having been received with acclamation—

10. HIS EXCELLENCY THE GOVERNOR, in reply, said:—My lord, ladies, and gentlemen: I am extremely obliged to you for the cordial reception you have given me: to you, my lord, for the very kind manner in which you have proposed this motion; to you, ladies and gentlemen, for the very kind manner in which you have received it. It is a great pleasure to me to be present to-night, and I feel that no thanks are due to me, but rather they are due from me, or they should be given to a more useful officer than the Patron—to the President, Your Lordship, who for many years has kept alive the torch of this Society (*hear, hear*). I am glad, however, of this opportunity of thanking you for the offer to me of the great honour to make me the Patron of this Society. I recognize that the position is purely honorary, a sinecure, or else I should have hesitated much before I accepted it. At a Scientific Society such as this I do not feel at all at home, though it has my sympathies; in fact, I feel like the fly in amber, who wondered how on earth he got there (*laughter*).

This Society has been independent of Government, and the Government does not grudge it that position. It is a very proud position, and I wish there were some other institutions in the Colony which could indulge in a similar position. This Society has done, and continues to do, excellent work. I am glad to see such a large number present; and I hope you are all Members of the Society, but if you are not, I trust you will be speedily. You may be independent of Government, but Government is not independent of you. Much of the scientific work undertaken by the Government of Ceylon has been due to the

insistence of this Society, especially as regards Archæology. If the Government has acted up to its responsibility as regards Archæology, it is due to the exertions of the Ceylon Asiatic Society.

I thank you very much for having received me so well, and for the honour you have conferred on me in making me a Patron to the Society. I hope I may again have the pleasure of attending your Meetings, not as Patron, but as a student sitting at your feet to receive instruction (*cheers*).

11. The proceedings then ended, but many ladies and gentlemen lingered some time to examine the copies of the frescoes painted by Mr. Perera, and the plans, drawings, photographs, &c.

APPENDIX.

The Sigiriya Frescoes.

To the EDITOR, *Ceylon Standard.*

SIR,—I HAD accepted the kind suggestion made by your contemporary, the *Ceylon Observer*, and had begun collecting materials for a Paper on oil-painting in general, both in ancient and modern Ceylon, when my attention was drawn to the remarks of two of your correspondents, and your own editorial comments on the subject. I would now point out that besides the frescoes at Polonnaruwa, there are to be found, at the present day, modern frescoes in nearly every viháré in the Island, mostly descriptive of the incidents in the many lives of Gautama Buddha.

What I understood Mr. Bell to say was that the Sígiriya frescoes were the only ones *of the kind* in the Island. In other words, that they formed a particular style of painting of their own, just as in Europe a picture of the Raphaelite schcol would differ in style from other paintings. The only frescoes of a similar style known to me are those in the Ajanṭa caves. These and the Sígiriya frescoes are co-temporaneous in date. Hence the conclusion, first put forward by me in 1895, and in which both Mr. Bell and I are agreed, that they represent the work of the same hands, or at least of the same school of artists. Taking this for granted, the question next arises as to whether this school consisted of artists from the Deccan, or of Sinhalese artists. This is the point of difference between Mr. Bell and myself.

Mr. Bell's Paper was not printed and circulated before its reading; and thus Mr. Bell's theory of "exotic" artists came as a surprise to me at the recent Meeting of the Asiatic Society. Otherwise I should have been in a position to deal more fully and exhaustively with his theory, which, after all, is a mere surmise, for he adduces no reasons in its support.

It will be admitted that, *cæteris paribus*, the credit of painting frescoes found in Ceylon must, *primâ facie*, rest with the Siṇhalese until the contrary is definitely established.

But, apart from this, I pointed to the significant fact that two of the frescoes at Ajanṭa, as pointed out by Fergusson and Manning, depict scenes from the *Mahâwaṇsa*, the ancient chronicle of Laṇkâ. In fact, the absolute fidelity to detail as regards the introduction of Buddhism, and the preaching of Mahinda, can leave no doubt as to what was meant. Hence, I argued in favour of Siṇhalese artists.

Mr. Bell made a point of the fact that the Sígiriya frescoes were the only ones of the kind in Ceylon. I replied by saying that those at Ajanṭa were just as unique as regards India ; but omitted to notice that Mr. Bell had himself stated in his Paper that all the walls of the rock cave must originally have been covered with similar frescoes, of which the existing ones formed a very small portion, and that those only have escaped the ravages of time from the fact that they lay in so sheltered a position in the "pockets" of the rock temples. Thus, from Mr. Bell's own standpoint, there is nothing to prevent the supposition that these are the only existing frescoes of many that were painted, not only in Sígiriya, but in other places as well, in the fifth century of the Christian era.

Kásyapa was a prisoner-king. Betaking himself to the Rock Fortress of Sígiriya, he lay for eighteen long years in concealment, fearful of the vengeance of his brother Moggalána, from which he only escaped by the crime of suicide. It is difficult to understand the opportunities which this prisoner-king would have had to communicate with India, and to import therefrom "exotic" artists.

The presumption of "exotic" artists would imply that painting was the only art in which the ancient Siṇhalese were lacking, great as they admittedly were in sculpture, architecture, engineering, &c.

King Duṭugĕmunu (161 B.C. to 137 B.C.), after having defeated the Tamil invader Elála, built the huge Ruwanvĕli (gold-dust) Dágaba to commemorate his victory, and the *Mahâwaṇsa* records that its walls were covered with pictures painted with "vermilion paint mixed with *tala* (gingelly) oil." On this, the first known historical mention of oil-painting, Sir Emerson Tennent bases his claim to the discovery of oil-painting on behalf of the Siṇhalese. To prove that the *Mahâwaṇsa* recorded a fact, I make the following quotation from Burrows' description of this Dágaba in the *Buried Cities of Ceylon*, p. 31 : "Many traces of the gaudy painting which formerly adorned (or disfigured) these altars may still be seen."

In the face of all these facts I may be excused if I fail to adopt Mr. Bell's theory of "exotic" artists.

Yours truly,

C. M. FERNANDO.

To the EDITOR, *Ceylon Standard*.

SIR,—SOME one has been good enough to send me a copy of your issue of the 20th instant, containing a letter by Mr. C. M. Fernando, and a short editorial paragraph, relating to the "Sígiriya Frescoes."

I note that Mr. Fernando has returned to the charge, in defence of his theory of Siṇhalese authorship for the paintings at Sígiriya.

I do not propose to enter here fully into the disputed question of their execution by native or foreign artists ; this I hope to do later

in my Archæological Report on "Sígiriya." I desire now merely to correct one or two inaccuracies into which Mr. Fernando has slipped.

It may be assumed once for all that the frescoes at Ajanṭa in India, and those on the Sígiriya Rock, were executed, if not by the same hands, at least by artists trained in the same school.

Mr. Fernando's arguments against the importation of "exotic talent" for the painting of the Sígiriya frescoes may best be quoted, and briefly touched on *seriatim* :—

(1) "*Cæteris paribus*, the credit of painting frescoes found in Ceylon must, *primâ facie*, rest with the Siṅhalese."

Granted : but "other things are" *not* "equal"; little Ceylon is not giant India ; the field of selection for competent artists is about one to sixty.

(2) "Two of the frescoes at Ajanṭa, as pointed out by Fergusson and Manning [*sic*], depict scenes from the *Maháwaṅsa*, the ancient chronicle of Laṅká."

The scenes referred to are—(*a*) the supposed landing of Vijaya in Ceylon ; and (*b*) the supposed introduction of Buddhism into the Island—given by Mrs. Speir in her *Life in Ancient India*.

As regards (*a*), Mrs. Speir rightly remarks that the picture—from the horse-worship introduced into it—illustrates "a *northern* adaptation of the story in the *Maháwaṅsa*, related in a Nepalese work of Avalókitéśwara," who saved "Siṅhala" (Vijaya) in the form of a horse. The Siṅhalese have always belonged to the *Hinayana* ("Lesser Vehicle") school of Buddhism, which knows not Avalókitéśwara, the Bodhisatva of the northern *Maháyana*, or "Greater Vehicle." Much the same comment applies to (*b*). It may equally as well have been based on Northern Buddhist works as taken from the *Maháwaṅsa* of the Southern school—if, that is, the painting has anything whatever to do with the meeting between Mahinda and King Devanampiya Tisa.

(3) "Mr. Bell made a point of the fact that the Sígiriya frescoes were the only ones of the kind in Ceylon. I replied by saying that those of Ajanṭa were just as unique as regards India."

The Ajanṭa paintings are not "unique" in the sense of the frescoes at Sígiriya. It is true that the former (as Fergusson records) "represent Buddhist legends on a scale and with a distinctness found nowhere else in India." But there are other frescoes which in beauty of execution run them very close – if, indeed, they do not surpass them ; and which prove further that the art retained its full vigour for many centuries longer on the Indian continent. I refer to the wonderful paintings to be seen at Fathpur-Sikri, near Agra, the "royal abode" of Akbar in the sixteenth century. Here, in Ceylon, we have nowhere else mural painting attaining the standard of art exhibited in the Sígiriya frescoes.

Again, had Kásyapa employed Siṅhalese *sitiyaru* to adorn the walls of his marvellous citadel, it may reasonably be inferred that the services of the ancestors of the Nilagama guild of painters would have been enlisted : yet at this day no tradition even lingers among these hereditary craftsmasters, whose work at the ancient Dambulla cave temple goes back to an earlier date than the occupation of Sígiriya as a capital. Shown the Sígiriya frescoes in the "pockets" themselves last year, these Nilagama men declared their inability to

explain the process by which the colours have been permanently "fixed," or to attempt to "restore" them in any degree.

(4) "Thus, from Mr. Bell's own standpoint, there is nothing to prevent the supposition that these are [not] the only existing frescoes of many that were painted, not only at Sígiriya but in other places as well, in the fifth century of the Christian era."

Nothing at all, as far as Sígiriya is concerned, but a great deal as regards "other places" throughout Ceylon. If I have examined one ancient cave viháré, &c., in the Central, North-Western, and North-Central Provinces, I have examined well nigh a thousand—and any painting rivalling the art displayed in the Sígiriya frescoes I have still to find. The surface painting faintly traceable on the "altars" of some of the larger dágabas of Anurádhapura, on the walls of the so-called "Demala-mahásẹ́ya" at Polonnaruwa, or in the caves of Handa-gala and Dimbula-gala, is not devoid of merit, but belongs to a lower grade of art than the frescoes of Ajanṭa and Sígiriya.

(5) Mr. Fernando harps on the allusion in the *Maháwaṇsa* to the use of "vermilion paint mixed with *tala* oil" for the ornamentation of Ruwanveli Dágaba when built by King Duṭugẹmunu (first century B.C.); and quotes Sir Emerson Tennent in support of the "claim to the discovery of oil-painting on behalf of the Siṇhalese," upon this single shred of not too reliable evidence.

Very good: let us admit, for the moment, that the honour of the discovery actually rests with the Siṇhalese,—though it really needs considerably more proof; let us go further and assume that Duṭugẹmunu did not go to the continent of India for his artists—as, for all the *Maháwaṇsa* tells us, he well may—what then? He must be a bold man that would assert that the descendants of the Siṇhalese (if Siṇhalese they were) who painted the Anurádhapura Dágaba "altars" were capable of designing, and carrying out, the life-like frescoes of Sígiriya. Moreover, as is well known, Oriental art is strongly conservative—follows slavishly stereotyped forms and methods. Is it probable—is it even possible—that the art of fresco-painting among the Siṇhalese could have risen to the high level of Sígiriya in the fifth century, and gradually degenerated into the travesty which offends the eye and excites ridicule at the modern Buddhist temples of Ceylon?

(6) "Kásyapa was a prisoner-king. Betaking himself to the Rock Fortress of Sígiriya, he lay for eighteen long years in concealment, fearful of the vengeance of his brother Moggallána, from which he only escaped by the crime of suicide. It is difficult to understand the opportunities which this prisoner-king would have had to communicate with India, and to import therefrom 'exotic' artists."

"Prisoner-king,"—presumably a sort of "ticket-of-leave" prince; allowed by the considerateness of a younger brother to have for *only* "eighteen long years" the run of the Island, provided he kept in decent "concealment." To Kásyapa's credit, be it said, he behaved exceedingly well during his period of "probation"; he committed no more murders; he did not worry Moggallána (who, by the way, appears to have found it "convenient" to cross over to India, so as not to embarrass his elder brother in the least); he merely amused himself by erecting, at vast labour and expense, a magnificent royal citadel—just to show what honest "concealment" meant. Of course, under such conditions, intercourse with India would be quite impossible.

(7) "The presumption of 'exotic' artists would imply that painting was the only art in which the ancient Siṅhalese were lacking, great as they admittedly were in sculpture, architecture, engineering," &c.

This opens up a far wider question, and one that must not be "begged." Is Mr. Fernando prepared to prove that the *Siṅhalese* were "*great*" in "sculpture, architecture, engineering," &c.? Will he favour the Asiatic Society with a Paper on "The Characteristics of the *Siṅhalese* style of Ancient Architecture, as distinct from the Buddhistic and Dravidian styles found in India"? I do not say the task is impossible; but it is not to be undertaken hastily. At present there is much ground for the supposition that *the Siṅhalese kings imported skilled artizans from the continent* to execute very many of the ancient monuments of Anurádhapura, Polonnaruwa, &c., commonly attributed to the Siṅhalese. Few are the forms of building and sculpture which cannot be easily traced to an Indian source.

Yours faithfully,

Anurádhapura, January 22, 1898. H. C. P. Bell.

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