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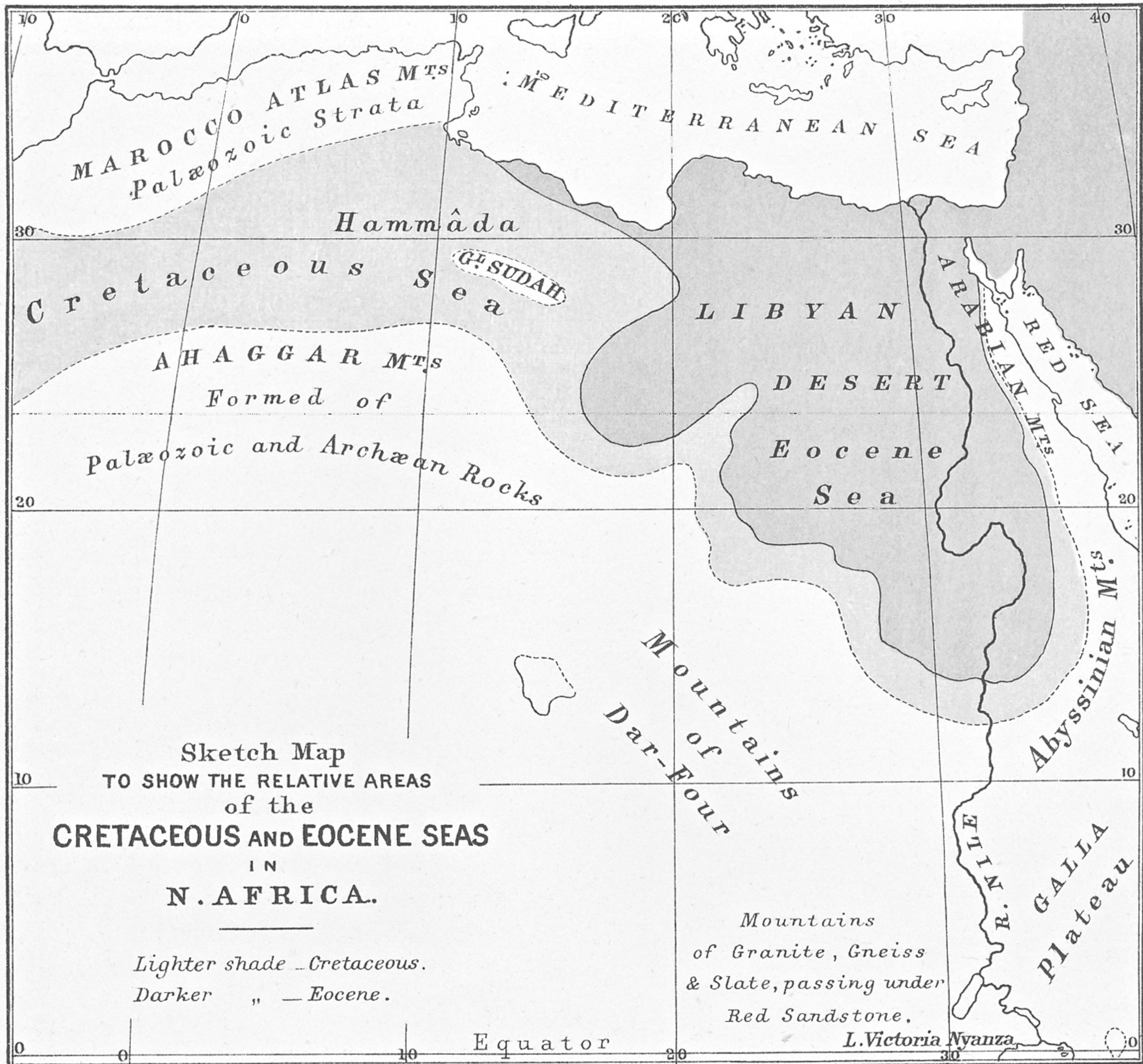
A table of contents for *Journal of the Transactions of the Victoria Institute* can be found here:

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JOURNAL OF THE TRANSACTIONS  
OF  
THE VICTORIA INSTITUTE.

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VOL. XXIV.



THE TRANSACTIONS  
OF  
The Victoria Institute,  
OR  
Philosophical Society of Great Britain.

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EDITED BY THE HONORARY SECRETARY,  
CAPTAIN FRANCIS W. H. PETRIE, F.G.S., &c.

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VOL. XXIV.



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## CONTENTS.

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	<i>Page</i>
PREFACE .....	ix
MAP TO ACCOMPANY PROFESSOR HULL'S PAPER ON EGYPT. ( <i>Frontispiece</i> )	
ANNUAL MEETING.—THE TWENTY-THIRD REPORT .....	1
SPEECHES BY SIR H. BARKLY, K.C.B., G.C.M.G., F.R.S. ; ADMIRAL SIR F. LEOPOLD McCLINTOCK, R.N., F.R.S., &c. ....	9
*ANNUAL ADDRESS ON "THE CUNEIFORM INSCRIPTIONS OF TEL EL- AMARNA." BY THE REV. A. H. SAYCE, M.A., LL.D., DEPUTY PROFESSOR OF COMPARATIVE PHILOLOGY AT OXFORD UNIVERSITY	12
SPEECHES BY THE RIGHT HON. LORD HALSBURY, P.C., LORD CHAN- CELLOR ; MONSIEUR E. NAVILLE, D. LIT., PH. D. ; THE REV. W. WRIGHT, D.D. ; SIR J. RISDON BENNETT, M.D., F.R.S. ; ADMIRAL SIR ERASMUS OMMANNEY, R.N., C.B., F.R.S., AND STAFF COMMANDER ETRICK W. CREAK, R.N., F.R.S.....	28
ORDINARY MEETING .....	32
ORDINARY MEETING .....	33
*ON THE CANAANITES. BY MAJOR C. R. CONDER, D.C.L., R.E. ....	33
DISCUSSION ON THE FOREGOING .....	66
REMARKS BY CANON ISAAC TAYLOR, LL.D. ; PROFESSOR G. W. LEITNER, D.C.L., D.O.L. ; AND MR. G. BERTIN, M.R.A.S. (BRITISH MUSEUM) .....	79
FURTHER REPLY BY THE AUTHOR .....	81
ORDINARY MEETING .....	83
*ON INSTINCT AND REASON. BY DR. C. COLLINGWOOD, M.A., B.M., M.R.C.P., F.L.S. ....	83
COMMUNICATIONS ON THE SAME BY PROFESSOR E. HULL LL.D., F.R.S., AND PROFESSOR DUNS, D.D., F.R.S.E., &c. ....	115
INTERMEDIATE MEETING .....	118

	<i>Page</i>
ORDINARY MEETING ....	119
*THE SCIENCE OF RECTITUDE AS DISTINCT FROM EXPEDIENCE. BY REV. H. J. CLARKE ....	119
INTERMEDIATE MEETING ....	140
ORDINARY MEETING ....	141
*GOD IN NATURE: SOME THEISTIC ARGUMENTS DRAWN FROM NATURAL PHENOMENA. BY PROFESSOR E. HULL, LL.D., F.R.S., DIRECTOR OF THE GEOLOGICAL SURVEY OF IRELAND ....	141
COMMUNICATION THEREON....	150
REPLY BY THE AUTHOR ....	152
*NOTE:—ON MAN'S PLACE IN NATURE ...	153
ORDINARY MEETING ....	155
*THE TENURE OF LAND IN ANCIENT TIMES, AS PRESERVED BY THE PRESENT VILLAGE COMMUNITIES IN PALESTINE. BY THE REV. JAMES NEIL, M.A. ....	155
DISCUSSION.—THE LORD HIGH CHANCELLOR'S REMARKS from the Chair ....	183
SPEECHES OF MR. FREDERIC SEEBOHM; DR. CHAPLIN; MR. W. ST. C. BOSCAWEN; MR. SAMUEL BERGHEIM; AND OTHERS ...	184
THE AUTHOR'S REPLY ....	196
INTERMEDIATE MEETING ....	204
ORDINARY MEETING ....	205
*THE BOTANY AND ENTOMOLOGY OF ICELAND. BY REV. F. A. WALKER, D.D., F.L.S. (Giving the first results of Recent Entomological investigation in Iceland.) ....	205
DISCUSSION.—REMARKS BY DR. RAE, F.R.S.; DR. HARLEY, F.R.S.; AND OTHERS ....	249
*PROFESSOR VIRCHOW'S ADDRESS ON THE LATEST RESULTS OF ANTHROPOLOGICAL RESEARCH ...	255
ORDINARY MEETING ....	267
*ON THE DISPERSAL OF PLANTS AS ILLUSTRATED BY THE FLORA OF THE KEELING OR COCOS ISLANDS. BY H. B. GUPPY, M.B.	267
DISCUSSION ....	301

	<i>Page</i>
REMARKS BY PROFESSOR T. RUPERT JONES, F.R.S., AND MR. JOHN MURRAY OF THE "CHALLENGER" EXPEDITION ...	303
THE AUTHOR'S REPLY ... ..	304
ORDINARY MEETING ... ..	306
*SKETCH OF THE GEOLOGICAL HISTORY OF EGYPT, AND THE NILE VALLEY ( <i>Illustrated</i> )....	307
DISCUSSION ... ..	333
REMARKS BY PROFESSOR T. RUPERT JONES, F.R.S., AND DR. IRVING, F.G.S. ....	333
LIST OF MEMBERS, &c.	
RULES.	
OBJECTS AND CONTENTS OF ALL THE VOLUMES OF THE JOURNAL	

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\*.\* *The Institute's object being to investigate, it must not be held to endorse the various views expressed at its meetings.*



## PREFACE.

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THE Twenty-Fourth Volume of the *Journal of the Transactions* of the VICTORIA INSTITUTE is now issued. It contains papers by the following authors:—Major CLAUDE REIGNIER CONDER, R.E., D.C.L., “On the Canaanites.” The Rev. H. J. CLARKE, “On the Science of Rectitude as Distinct from Expedience.” Dr. CUTHBERT COLLINGWOOD, M.A., B.M. Oxon., M.R.C.P., “On Instinct and Reason.” Dr. H. B. GUPPY, “On the Dispersal of Plants, as illustrated by the Flora of the Keeling or Cocos Islands,” a paper of much interest, as has been pointed out by Professor T. RUPERT JONES, F.R.S.; Mr. JOHN MURRAY (of the Challenger Expedition); and others.\* Professor EDWARD HULL, LL.D., F.R.S., two valuable papers, one entitled “God in Nature some theistic arguments drawn from Natural Phenomena”: the other “A Sketch of the Geological History of Egypt and the Nile Valley,” being a careful account of the Physical Structure and Physical History of Egypt; Professor Hull’s explorations and researches have added to our exact knowledge of one of those countries forming the background of

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\* The present volume contains the results of the Authors’ investigations up to the present time July, 1891.

Sacred history. The Rev. J. NEIL, M.A., "On Land Tenure in Ancient Times, as preserved by the present village-communities in Palestine." The discussion on this paper was opened by the Right Hon. Lord HALSBURY, the LORD HIGH CHANCELLOR, and taken part in by Mr. SAMUEL BERGHEIM; Dr. T. CHAPLIN; Mr. F. SEEBOHM; and many others. The Rev. A. H. SAYCE, M.A., LL.D., Professor of Comparative Philology in the University of Oxford, "On the Cuneiform Inscriptions of Tel el Amarna," a paper in which the author specially presented to this Institute the results of his investigation of "one of the most extraordinary and unexpected archæological discoveries of modern times": to it are appended the remarks of the Right Hon. Lord HALSBURY, the President—Sir G. GABRIEL STOKES, LL.D., V.P.R.S.; Monsieur EDOUARD NAVILLE, D.Lit., Ph.D.; Sir H. BARKLY, K.C.B., G.C.M.G., F.R.S.; Admiral Sir ERASMUS OMMANNEY, R.N., C.B., F.R.S.; Admiral Sir F. LEOPOLD MCCLINTOCK, R.N., F.R.S.; Sir J. RISDON BENNETT, M.D., F.R.S.; Staff-Commander ETRICK W. CREAK, R.N., F.R.S.; The Rev. W. WRIGHT, D.D.; and others. The Rev. F. A. WALKER, D.D., F.L.S., a paper "On the Botany and Entomology of Iceland," the advances in Science of late years having rendered necessary a fresh treatment of the subject.

As regards the paper "On the origin of Man":—Professor RUDOLPH VIRCHOW lately presided over a remarkable convention of German, Austrian and other Anthropologists, at Vienna; at this gathering he, as president, impartially reviewed the results of the researches of European Anthropologists during the last twenty years, in regard to Man and his place in Nature; and considering the many *theories* upon the subject that have been brought forward of late years, and the far-reaching and often startling arguments that have been founded thereon, it has been felt that an exact translation of the calm utterances of so impartial and careful an inves-

tigator, and one so pre-eminently distinguished among men of science, should find a place in this journal.

To all who have added to the value of the present volume, the best thanks of the Members and Associates are due.

FRANCIS W. H. PETRIE, *Capt.*,  
*Hon. Sec. and Editor.*

JOURNAL OF THE TRANSACTIONS  
OF THE  
VICTORIA INSTITUTE,  
OR  
PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.

---

ANNUAL GENERAL MEETING

HELD AT THE HOUSE OF THE SOCIETY OF ARTS,

MONDAY, 1ST JULY, 1889.

*The President,*

Sir GEORGE GABRIEL STOKES, Bart., M.A., D.C.L., P.R.S., M.P.,  
IN THE CHAIR.

CAPTAIN FRANCIS PETRIE, F.G.S., &c., Hon. Sec., read the following  
Report :—

*Progress of the Institute.*

1. In presenting the TWENTY-THIRD ANNUAL REPORT the Council has to announce that in no year since its foundation in 1865 has the Institute's practical work advanced so effectually and decidedly as during the past year. The steady support which both Members and Associates accord, and the increased number of those in the high walks of Science who co-operate with the Institute, are of the utmost value; giving solidity to the Institute, strengthening its working, and causing many who might otherwise not have joined or aided in its work to do so. The remarkably few retirements have also shown how fully all realise the desirability of making use of the present opportunities of advancing a Society the value of whose aims

are recognised by all thoughtful men. Such cordial co-operation is of inestimable value to the Institute and its objects.

2. Under the system organised by the Institute, members in the most distant parts of the world continue to contribute papers and to take part, by correspondence, in the discussion of the same.

3. It is satisfactory to note the continued progress of the "American Institute of Christian Philosophy," an independent society, founded on the lines of the Victoria Institute, whose statement of objects was adopted by it. Its founders are still members of this Institute, and among the foremost to bear testimony to the value of its work.

4. At the commencement of the present session the sale of the house in which the Institute had offices rendered it necessary to obtain new premises. The immediate action taken by the Council resulted in securing the only suitable apartments available in this part of London, and, happily, on the same terrace; although the difficulties that had to be overcome were great, yet the Council's arrangements were successful, and the change was carried out without interfering with the regularity of the meetings.

5. The following is the new list of the President and Council as elected:—

**President.**—Sir George Gabriel Stokes, Bart., D.C.L., P.R.S., M.P.

#### Vice-Presidents.

The Rt. Hon. Lord Halsbury, the Lord Chancellor.  
 Sir H. Barkly, K.C.B., G.C.M.G., F.R.S.  
 Sir J. Biddon Bennett, M.D., F.R.S.  
 Sir Joseph Fryer, M.D., K.C.S.I., F.R.S.  
 W. Forsyth, Esq., Q.C., LL.D.  
 Alexander McArthur, Esq., M.P.  
 Rev. Prebendary Robinson Thornton, D.D.

**Hon. Auditors.**—G. Crawford Harrison, Esq.; J. Allen, Esq.

#### Council.

**Hon. Treas.**—Wm. Nowell West, Esq., F.R.G.S.

Robert Baxter, Esq. (*Trustee*).  
 Sir Robert N. Fowler, Bart. (*Trustee*).  
 E. J. Morshead, Esq., H.M.C.S. (*For  
 Corresp.*).  
 Alfred V. Newton, Esq.  
 William Vanner, Esq., F.R.M.S.  
 S. D. Waddy, Esq., Q.C. M.P.  
 Alfred J. Woodhouse, Esq., M.R.I., F.R.M.S.  
 Rev. Principal Rigg, D.D.  
 H. Cadman Jones, Esq., M.A.  
 Rev. W. Arthur, M.A.  
 Rev. G. W. Weldon, M.A., M.B., F.L.S., &c.  
 Rev. Principal J. Angus, M.A., D.D.  
 J. Bateman, Esq., F.R.S., F.L.S.  
 D. Howard, Esq., F.C.S.

**Hon. Sec.**—Capt. Francis Petrie, F.G.S., &c.

Professor H. A. Nicholson, M.D., F.R.S.E.  
 Bisset Hawkins, Esq., M.D., F.R.S.  
 The Bishop of Wakefield.  
 Rev. F. W. Tremlett, D.C.L.  
 Surg.-Gen. Gordon, C.B., M.D.  
 His Excellency Dr. Gunning, F.R.S.E.  
 Rev. Principal Waes, D.D.  
 Rev. J. J. Lias, M.A.  
 General G. S. Hallowes, *Cor. Sec.*  
 Rev. A. I. McCaul, M.A.  
 Staff-Commander Creak, R.N., F.R.S., &c.  
 Rev. F. A. Walker, D.D., F.L.S.  
 T. Chaplin, Esq., M.D.  
 Admiral H. D. Grant, C.B.  
 Canon Girdlestone, D.D.

6. The Council desires to call especial attention to the need of an increase in the Library Fund. The expenses in connexion with the new arrangements for the Library, rendered necessary in consequence of the change of the Society's residence, have to be met; many new works of reference are also required.

7. The Council regrets to announce the decease of the following supporters of the Institute :—

E. Bailey, Esq., *M.*; Rev. President F.A.P. Barnard, D.C.L. (Columbia College), *M.*; J. F. La Trobe Bateman, Esq., F.R.S., F.R.S.E., *M.*; H. W. Bristow, Esq., F.R.S., &c., *M.*; Rev. W. B. Boyce, *F.A.*; Rev. J. H. Broome, M.A., *A.*; Rev. Canon F. C. Cook, M.A., *A.* (of whom the "Speaker's Commentary" and many works of high value are a lasting monument); Rev. H. McD. Courtney, M.A., *A.*; Rev. C. J. Garrard, M.A., *A.*; P. H. Gosse, Esq., F.R.S., *Foundation Member and Vice-President*; Rev. J. Harvard, *A.*; Colonel T. Hyatt, A.M., Pres. Pen. Military Academy, *M.*; Rev. Canon J. F. McCormick D.D., *M.*; Robert Moon, Esq., *M.*; Rev. Canon Sir F. A. G. Gore-Ouseley, Bart., M.A., LL.D., *A.*; the Rev. J. Leslie Porter, D.D., LL.D., President of Queen's College, Belfast, *A.*, (an early labourer in adding to our knowledge of the East, and a contributor to this Institute's Transactions); Rev. R. Salthouse, F.R.G.S., *A.*; Rev. H. Winter Sheppard, M.A. *L.M.*; Rev. T. B. Thayer, D.D., *A.*; A. Tod, Esq., J.P., *A.*

8. The following is a statement of the changes which have occurred :—

	Life		Annual	
	Members.	Associates.	Members.	Associates.
Numbers on 3rd May, 1888	56	40	331	737
Deduct Deaths .....			9	12
„ Retirements, changes, &c.			3	37
			— 12	— 49
			319	688
Joined to June 27, 1889	1	3	24	71
	57	43	343	759
	100		1102	
Total.....	1202			

Hon. Correspondents number 117. Total..... 1,319\*

### Finance.

9. The Treasurer's Balance-sheet for the year ending December 31, 1888, duly audited, shows a balance creditor of £27. 0s. 11d. The amount invested in 2½ per Cent. Consols is £1,365. 18s. 9d.

\* Founded in 1865. The total number in 1871 was 200.

The Council desire to urge the great advantage it would be were Members to remit their Subscriptions during the first half of the year, as a large proportion already do. Were this the rule with all, the whole machinery of the Institute would work with an ease that would greatly promote its success. Forms for the payment of the Subscriptions through a banker are used by a large number, and may always be had.

The importance of this matter has been specially felt this year, in which the Council's duties have been so much increased by reason of their having to seek for and prepare the new premises.

10. The arrears of subscription are as follow:—

	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Members ... ..	3	4	3	2	2	6	9
Associates ... ..	7	1	5	11	11	20	15
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	10	5	8	13	13	26	24

#### MEETINGS.

MONDAY, DECEMBER 3.—“On some of the principal Races mentioned in the Bible” (with illustrations from the Babylonian, Assyrian, and Egyptian Monuments). By Rev. H. G. TOMKINS.

MONDAY, JANUARY 7, 1869.—“On Colours in Nature.” By Rev. F. A. WALKER, D.D., F.L.S.

MONDAY, JANUARY 21.—“Investigations on the Sciences of Language and Ethnography.” By Dr. LEITNER.

MONDAY, FEBRUARY 4.—“The Factors of Evolution in Language.” By JOSEPH JOHN MURPHY, Esq. With Notes by Professor F. MAX MÜLLER, D.C.L.

MONDAY, FEBRUARY 18.—“Scientific Research and Revelation.” By C. S. WILKINSON, Esq., F.L.S., F.G.S., Pres. Royal Society of New South Wales.

MONDAY, MARCH 4.—“The Meaning and History of the Logos of Philosophy.” By Rev. H. J. CLARKE.

MONDAY, MARCH 18.—“The Dawn of Metallurgy among Primitive Races.” By Rev. J. M. MELLO, M.A., F.G.S.

MONDAY, APRIL 1.—“On the Creation Tablets.” By Prof. WARRING, Ph.D.

MONDAY, APRIL 15.—“On the Ethnology and Ancient Chronology of China.” By Surgeon-General GORDON, C.B., Hon. Physician to the Queen.

MONDAY, MAY 6.—1. “On Cuts on Bones as Evidence of Man's Existence in Remote Ages.” By Professor T. McK. HUGHES, M.A., F.G.S., Woodwardian Professor of Geology at Cambridge University; with comments by Professor RUPERT JONES, F.R.S., and others.

2. “Modern Science and Natural Religion.” By Rev. C. G. ASHWIN, M.A.

MONDAY, MAY 20.—A Paper on “The Early History of Eastern Nations and their Language.” By Major CONDER, D.C.L., R.E., late Palestine Survey (now of the Ordnance Survey); with comments by several leading Philologists.

MONDAY, JUNE 3.—*Extra Meeting*.—1. On “The Butterflies and Moths of Africa.” By W. F. KIRBY, Esq. (British Museum).

2. “Niobe, or Neferura-Urmaa,” the daughter of the King of the Hittites. By the Rev. F. A. WALKER, D.D., F.L.S.

MONDAY, JULY 1.—*Annual Meeting at the House of the Society of Arts*: Address “on the Cuneiform Inscriptions at Tel el-Amarna,” by Professor A. H. SAYCE, LL.D., Dep. Professor of Comparative Philology to the University of Oxford.

MONDAY, JULY 5.—*Second Extra Meeting, at the House of the Society of Arts*: Paper by M. EDOUARD NAVILLE, “on the Historical Results of the Excavations at Bubastis,” &c.

### *Publications.*

11. The Twenty-second volume of the *Journal of Transactions* has now been issued.\* It contains Dr. Post’s complete review of the Botanical Geography of Syria and Palestine, M. Maspero’s Analysis of the Karnac Lists, and their bearing on Ancient, and especially Sacred, History. It also contains papers and communications in regard to the latest discoveries in respect to the antiquity of man and many other important questions of science and philosophy. It is believed that the volume will be found to bear its testimony to the steady progress of the Institute’s work, and the impartial character of its investigations, which must tend to the advantage of science, and to a right interpretation of the book of Nature.

12. The Journal is still used by members and others to lecture from, and Public Libraries in various parts of the world subscribe for it. Such use of the Transactions helps to carry out the Institute’s high objects, and also to make them more generally known.†

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\* A slightly larger type has now been selected for the discussions and notes.

† *On some Uses made of the Institute by its Members*.—“Last year it was pointed out that to many Members their connexion with the Institute had proved more than a mere personal advantage to themselves; as they found that the Institute met a need felt both at home and abroad, especially in our Colonies and India, where the want of a true appreciation of the actual results of scientific inquiry has led many, especially the less informed, to credit such statements as that ‘Science and Philosophy were alike opposed to Revelation,’ and that ‘the progress of Science has given a death-blow to all belief in the truth of the Bible.’ (As one result of this, the Bible is a forbidden book in more than one Board School at home and in our Colonies.) And they had sought to make use of the Institute’s investigations to dispel such erroneous ideas as those referred to, by using the papers in the Journal as lectures, or to lecture from, in their respective



*The Special Fund.*

## 13. The Special Fund is used :

- I. To extend the Library of Reference, the completion of which is of great importance.
- II. To help in making the Institute more widely known.
- III. To publish short summaries of the Institute's more important transactions.
- IV. To print and organise the publication of the People's Edition at home and abroad.

14. The People's Edition consists of twelve papers—written by men of eminence in such a style that they may be comprehended by all—reprinted from the *Journal of Transactions*. The Edition was started by some members in the year 1873, and first attracted attention in other quarters to the importance and need of works of the kind. The papers in this edition are often accompanied by the objections and criticisms urged in discussing the subjects, many home and foreign correspondents having urged the value of including these. The papers are published in neat covers, and are sold at a nominal price (sixpence) by the Institute's organisation of bookseller agents in the United Kingdom, the United States, Australasia, Canada, and South Africa. Single copies are supplied *gratuitously*, or at cost price, to all individual lecturers against infidelity\* applying, including those of the London City Mission, the Christian Evidence Society, and similar bodies at home and abroad.

15. The proved importance of each of the objects for which the Special Fund is used is such as to make it merit wide support.

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localities, often corresponding with the Institute as to the preparation of such lectures; by reprinting portions of the Journal in foreign and Colonial journals, translating papers (in many countries); by using their influence in their respective localities to secure that local libraries and institutions should subscribe for the Journal, thus bringing its pages before a still wider circle of readers; by interesting others in its proceedings, and in many other ways which the Council trust may be even more generally adopted."

\* Namely, that infidelity which arises from a misapprehension of the true results of Philosophical and Scientific inquiry.

*Conclusion.*

16. Whilst the continuous progress of the Institute is a subject for thankfulness, the impartial observer will not fail to notice that its numbers are small, considering its now world-wide character; for there is no country in which its members are not to be found, or where the necessity for its existence is not felt, and from which, as a consequence, demands for publications or for information, on special points do not reach it. The present organisation has proved to be admirable, and it needs but an effort on the part of each of the present members and associates to increase the number of supporters, and thereby to increase the power of the Institute for good.

G. G. STOKES, *President.*

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**SPECIAL FUND IN 1888.**

	£.	s.	d.
Rev. F. W. Tremlett, D.C.L., - Collection at St. Peter's, Belsize Park, after sermons by the Bishop of Chicago and the Bishop of Ontario	19	9	4
Bisset Hawkins, Esq., M.D., F.R.S. ....	5	0	0
Right Hon. Lord Ebury .....	2	2	0
Hastings C. Dent, Esq., C.E., F.L.S. ....	1	1	0
Miss G. Harrison .....	0	10	6
Surgeon-General C. A. Gordon, M.D., C.B. ....	0	10	6
	<hr/>		
	£28 13 4		

The following Balance-sheet was then read :-

# ANNUAL BALANCE-SHEET, from 1st January to 31st December, 1888.

	RECEIPTS.	£. s. d.	£. s. d.
Balance ... ..			1 8 6
Subscriptions:—			
6 Life Members ... ..	122 17 3		
3 Life Associates ... ..	31 10 0		
		*154 7 3	
2 Members, 1884 ... ..	4 4 0		
6     "     1885 ... ..	12 12 0		
6     "     1886 ... ..	12 12 0		
15    "     1887 ... ..	31 10 0		
221   "     1888 ... ..	464 2 0		
9     "     1889 ... ..	18 18 0		
1     "     1890 ... ..	2 2 0		
27 Entrance-fees ... ..	28 7 0		
2 Associates, 1883 ... ..	2 2 0		
3     "     1884 ... ..	3 3 0		
11    "     1885 ... ..	11 11 0		
22   "     1886 ... ..	23 2 0		
51   "     1887 ... ..	53 11 0		
516   "     1888 ... ..	541 16 0		
29   "     1889 ... ..	30 9 0		
2 extra, 1890 ... ..	2 2 0		
Extra ... ..	1 19 0		
			1,244 2 0
6 Months' Div. on £1,365. 18s. 9d. New 3 p. c. Ann. ... ..	19 17 10		
6 Months' Div. on same, 2½ p. c. Consols	19 19 6		
			39 17 4
Donations to Special Fund ... ..			28 13 4
Sale of Journals, &c. ... ..			58 10 8
			£1,526 19 1

	EXPENDITURE.	£. s. d.
Printing... ..		461 11 6
Postage of Journal, &c. ... ..		166 16 9
Binding ... ..		26 9 0
Reporting ... ..		33 11 0
Stationery ... ..		42 4 9
Advertising ... ..		41 0 11
Expenses of Meetings ... ..		21 7 6
Travelling Expenses ... ..		9 2 11
Salaries for Year ... ..		140 10 0
Rent to Christmas, 1886 ... ..		160 0 0
Housekeeper ... ..		23 2 2
Coals, Gas, and Oil ... ..		10 10 9
Water Rate ... ..		3 0 0
Insurance ... ..		0 12 0
Sundry Office Expenses ... ..		5 10 0
Library, Books, Repairs, &c. ... ..		37 11 2
Management ... ..		315 0 0
Bankers' Charges ... ..		0 16 9
Subscription paid in error, returned ... ..		1 1 0
Balance, Cr. ....		27 0 11
		£1,526 19 1

We have examined the Balance-Sheet with the Books and Vouchers, and find a Balance in hand of £27. 0s. 11d.

G. CRAWFURD HARRISON, }  
JOHN ALLEN,                 } *Auditors.*

\* To be invested in 1889.

W. N. WEST, *Hon. Treas.*

[The HONORARY SECRETARY (Captain Francis Petrie, F.G.S.), first read the letters of regret from those unable to be present;—among these was one from Professor A. H. Sayce, the author of the Annual Address, expressing his great regret that private matters consequent on his father's death prevented his being present, and he had therefore deputed "one acquainted with the subject," the Rev. W. Wright, D.D. (author of *The Empire of the Hittites*), to read the Address.—He then announced that one of the Council, His Excellency Dr. R. H. Gunning, LL.D., F.R.S.E., had arrived from Rio de Janeiro, and was the bearer of a message from the Emperor of Brazil expressing His Majesty's desire to be admitted an honorary member of the Institute, the proceedings of which His Majesty highly esteemed. He concluded by pointing out the leading features of the Report, which was in the hands of all present; alluding first to its introductory paragraphs describing a more effective advance of the Institute than had taken place in any year since its foundation. After referring to the fourth paragraph in regard to the Institute's new apartments, he adverted to the sixth, speaking of the great need of a larger library fund; and finally alluded to the growing importance of the Institute's Transactions as shown in the eleventh and twelfth paragraphs and the note thereto, and the importance of each member and associate doing his part to increase the strength of the Institute by introducing new supporters.]

Sir H. BARKLY, K.C.B., G.C.M.G., F.R.S.—Mr. President, my lords, ladies, and gentlemen: In the absence of Earl Nelson, I have the honour to move the first resolution, and have great pleasure in performing that duty. It is,—“That the Report be received, and the thanks of the Members and Associates presented to the Council, Honorary Officers, and Auditors, for their efficient conduct of the business of the Victoria Institute during the year.” I think it clear from the Report that has been read that the conduct of business has been efficient, because, in the first place, the number of supporters of the Institute is continually increasing, and the sphere of its operations is being extended both in this country, in the colonies, and elsewhere. The objects of its operations I need not dwell upon because they are set out in all writings connected with the Institute, and you are well aware that they are briefly summarised in the desire to show that believers in Revealed Religion are not averse to, or afraid of, the discoveries of Modern Science, since we merely wish for fair play, and only protest against the ignoring of the truth of Scripture (cheers). The Council, no

doubt, has had arduous duties to perform,—more so than ever during the past term on account of the Institute having had suddenly to seek new apartments during the most busy time of the year. I ask you to join with me in presenting the thanks of the Members and Associates to the Council, Honorary Officers, and Auditors in the words of the resolution.

Admiral Sir F. LEOPOLD McCLINTOCK, R.N., F.R.S.—I have the honour and pleasure of seconding the resolution which has been proposed, for I am sure it is a source of gratification to us to observe the spread and prosperity of the Institute.

The PRESIDENT having put the resolution to the meeting, it was carried unanimously.

Mr. D. HOWARD, F.C.S.—Mr. President, my lords, ladies, and gentlemen: I can assure you on behalf of the Council of the Victoria Institute that we accept most gratefully the vote of thanks that has been passed to us, as being an expression that you approve of what we have done during the past year. I can assure you our labours are no sinecure. The change of premises has given us some trouble, but that is a small matter compared with the anxiety attendant on handling subjects of deep importance, and in endeavouring, in some measure, to modify or influence the current of public opinion. Might I, as I believe I have done before, briefly express the opinion of the Council that what is wanted is patience in investigation. More and more it is evident that the danger of modern thought lies in the hurry and superficiality of thought. Of real deep investigation we have no fear. There surely cannot be any need for, and we should not allow the possibility of, truth requiring to be kept in the background; but half truth,—half-understood truth,—does very often require very careful and drastic treatment. We constantly find a subject taken up and suddenly discussed, that is hardly known, even to those who have studied the history of past thought, and put forward as a satisfactory answer for the most vital problems. Take an example. Suddenly the British public took an interest in Buddhism, and a great deal was written and was said that is chiefly characterised by a total ignorance of what Buddhism is, and we welcome most heartily in this Institute the wise and powerful words on that subject which fell from the lips of perhaps the greatest master of the subject in England, in this hall. And so, on other questions, what is wanted and what we endeavour, as far as lies in us, to obtain, is that patient and quiet hearing for the real results of science,—not for the half-understood and half-

digested science which is too often supposed to be the great virtue of the nineteenth century, but for the real matured science of which we have no fear. I think we cannot look back on the history of the past without finding question after question that has been brought up as being a crucial question which would annihilate the Christian faith, and yet the Christian faith remains, and after the lapse of long centuries the old questions which were thoroughly fought out come up again in this nineteenth century; but we have no more fear of the result now than we had of the result years ago. *Magna est veritas et prevalebit!* (Cheers.)

The PRESIDENT.—My lords, ladies, and gentlemen: We have all heard with sincere regret that owing to domestic affliction Professor Sayce is not able to be with us, as he hoped to be. The Annual Address which he has prepared, and which, no doubt, those present have purposely come to hear, will in his absence be read by his friend Dr. Wright (cheers).

Rev. W. WRIGHT, D.D.—Sir George Stokes, my lords, ladies, and gentlemen: It is with considerable diffidence that I stand here for the purpose of reading Professor Sayce's Address, but it is his wish that I should do so, and his wish, made known to me, is law, because in common with others, I am under the very deepest obligations to him. I fear many will be disappointed at Professor Sayce's absence; for it is not only the subject-matter that we look for and admire in his composition, but his well-known rhetoric and delivery, which always charms irrespective of the facts with which he deals and the secrets which he,—a master explorer,—brings to light. While asking your indulgence, I have a strong confidence that I cannot altogether spoil the masterly Address placed in my hands. The title of the Address is—

*THE CUNEIFORM INSCRIPTIONS OF TEL EL-AMARNA.* By the REV. A. H. SAYCE, M.A., LL.D.,  
Deputy Professor of Comparative Philology in the  
University of Oxford.

THE winter before last, one of the most extraordinary and unexpected archæological discoveries of modern times was made in Upper Egypt. Egypt has always been the land of archæological surprises, but its last surprise is, perhaps, the greatest that it has ever afforded us. About midway between Minieh and Assiout, but on the eastern bank of the Nile, are the extensive mounds of an ancient city, now known under the name of Tel el-Amarna. They cover the remains of the capital built by Amenophis IV. or Khu-en-Aten, "the heretic king," as he is familiarly called in the histories of monumental Egypt. Alone among the Pharaohs of his country he deserted the religion and traditions of his fathers, and endeavoured to impose upon his unwilling subjects a new form of faith. Forsaking the worship of Amen of Thebes, of Ra of Heliopolis, of Ptah of Memphis, he professed himself the devoted adorer of the radiant solar disk, in which he saw the image and symbol of the Supreme Deity.

The worship of the solar disk points unmistakably to Syria. It was here that the Sun-god was the central object of worship, adored, though he may have been, under various manifestations and forms. It was here, too, that his special symbol was the solar disk, with wings issuing from either side to denote his omnipresent energy. The winged solar disk may have been originally of Babylonian invention, but it passed at an early time to the other Semitic populations of the East. We find it above the figure of a king on a monolith from Birejik, now in the British Museum, and it is specially characteristic of the monuments of the Hittites. It is true that the same symbol is occasionally met with in Egypt;—Mr. Flinders Petrie has found it on a monument of the Fifth Dynasty, and it surmounts the inscription of a king of the Eleventh Dynasty which is preserved in the Boulaq Museum. But its rarity indicates that it was borrowed from abroad, and it is not until the epoch of the Hyksos invaders, and the age when

the Asiatic wars of the Eighteenth Dynasty brought the Egyptians into contact with Syria and Mesopotamia, that we find it occupying a recognised place in Egyptian art. Like the religious ideas with which it was associated, it was an importation from Semitic Asia.

We now know that the mother of Amenophis IV. was of Asiatic birth. The conquests of Amenophis III., one of the greatest of the great monarchs of the Eighteenth Dynasty, had extended the empire of Egypt as far as the banks of the Euphrates. Here his dominions bordered on those of Tuisratta, called in the cuneiform tablets King of Mitana, a district which is described by Tiglath-pileser I. as lying on the eastern shore of the Euphrates, opposite the Hittite fortress of Carchemish.\* The Egyptians called it the land of Nahrina or the "Rivers," and included under the designation the country westward of the Euphrates as far as the streamland of the Orontes. It is the Aram Naharaim, or "Syria of the two rivers," of Scripture, and it was from thence that Chushan-rish-athaim came to oppress Israel in the days of Othniel (Judges iii. 8-10). Chushan-rish-athaim must have been a successor of the grandfather of Amenophis IV.

For awhile after his father's death, Amenophis IV. conformed outwardly to the State religion of Egypt, or, at all events, made no endeavour to suppress or supersede it. But a time came when the smouldering hostility of the king and the powerful priesthood of Thebes burst into a flame. Amenophis found it difficult, if not impossible, to remain in the capital of his fathers. Along with the other followers of the new creed, he left Thebes and built himself a new capital on the edge of the desert to the north. Here he assumed the name of Khu-en-Aten, "the glory of the solar disk," while his architects and sculptors consecrated a new and peculiar style of art to the new religion, and even the potters decorated the vases they modelled with new colours and patterns.

The archives of the empire were transferred from Thebes to the new residence of the king, and there stored in the royal palace, which stood among its gardens at the northern extremity of the city. But the existence and prosperity of Khu-en-Aten's capital were of short duration. When the king died, he left only daughters behind him, whose husbands assumed in succession the royal power. Their reigns lasted but a short time, and it is even possible that more than one of them had to share his power with another prince. At any rate, it was

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\* In one of the cuneiform tablets at Boulaq the name of the district is written Mitana-nanu.



not long before rulers and people alike returned to the old paths. The faith which Khu-en-Aten had endeavoured to introduce was left without worshippers, the Asiatic strangers whom he and his father had promoted to high offices of State were driven from power, and the new capital was deserted, never to be inhabited again. The great temple of the Solar Disk fell into decay like the royal palace, and the archives of Khu-en-Aten were buried under the ruins of the chamber wherein they had been kept. Here they remained, concealed by the friendly sand, until the *fellahin*, searching for *sebâhh*, or nitrous earth, with which to manure their fields, at last brought them to light.

I happened to arrive at Cairo shortly after the discovery was made, and as no cuneiform scholar had as yet seen the tablets, I was of course very anxious to examine them. A few had already been secured by the Boulaq Museum; the rest of those which had been brought to Cairo had passed into private hands, and had been carried away elsewhere. Owing to an unfortunate misunderstanding, I failed to see those which were in the Museum, and it was not until a little before my departure from Egypt, in April, 1888, that M. Bouriant, the Director of the French Archæological School, obtained possession of about a dozen, which he kindly allowed me to copy. M. Bouriant's tablets were all, unfortunately, more or less injured, and I sought in them in vain for an indication of date. One of them, however, contained a reference to "the conquest of Amasis" (*Kasad Amasi*), and as Egyptian history knows of only two kings of that name,—the founder of the Eighteenth Dynasty, and the contemporary of Nebuchadnezzar,—I was bound to conclude that the latter was referred to. We already knew that Egypt had been invaded by the great Chaldæan monarch; and, since the forms of the characters found upon the tablets belonged to the Babylonian and not to the Assyrian variety of cuneiform script, it appeared necessary to see in M. Bouriant's tablets relics of Nebuchadnezzar's Egyptian campaign. The Boulaq Museum already possessed three cylinders, which came from the neighbourhood of the Suez Canal, probably from Tel Defenneh or Tahpanhes, and bore the name and titles of Nebuchadnezzar.

One difficulty, however, stood in the way of ascribing the tablets of Tel el-Amarna to so late a date. On one of those belonging to M. Bouriant, the name of Gimti or Gath occurs, and it is pretty certain that Gath had ceased to exist before the sixth century B.C.

After my departure from Egypt, the question was finally cleared up. More than 160 tablets had been offered for sale

at Vienna, and eventually bought by the Museum at Berlin. Here they were examined by two young Assyriologists, Drs. Winckler and Lehmann, who soon discovered that they consisted of letters and despatches sent to Amenophis III. and his son, Amenophis IV., thus explaining how it was that they had been disinterred at Tel el-Amarna. Another collection of 82 tablets was subsequently acquired by the British Museum, and, during the past winter, the courtesy of M. Grébaud and Dr. Brugsch-Bey has afforded me every facility for copying and examining the collection in the Boulaq Museum. This includes not only the tablets which I had failed to see the preceding spring, but others also which had been afterwards obtained by M. Grébaud.

My visit to Tel el-Amarna, in January, 1889, confirmed M. Grébaud's belief that no other tablets now remain there. The collection was found together in one place, which was pointed out to me, and the discoverers have been careful not to leave a fragment behind them. It is possible, however, that a few pieces may still be in the hands of native dealers; but, substantially, the whole body of tablets is now in European hands. We know, consequently, what they have to tell us.

And the tale is indeed a wonderful one. We learn that in the fifteenth century before our era,—a century before the Exodus—active literary intercourse was going on throughout the civilised world of Western Asia, between Babylonia and Egypt and the smaller states of Palestine, of Syria, of Mesopotamia, and even of Eastern Kappadokia. And this intercourse was carried on by means of the Babylonian language, and the complicated Babylonian script. It implies that, all over the civilised East, there were libraries and schools, where the Babylonian language and literature were taught and learned. Babylonian, in fact, was as much the language of diplomacy and cultivated society as French has been in modern times, with the difference that, whereas it does not take long to learn to read French, the cuneiform syllabary required years of hard labour and attention before it could be acquired. We can now understand the meaning of the name of the Canaanitish city which stood near Hebron, and which seems to have been one of the most important of the towns of Southern Palestine. Kirjath-Sepher, or "Book-town," must have been the seat of a famous library, consisting mainly, if not altogether, as the Tel el-Amarna tablets inform us, of clay tablets inscribed with cuneiform characters. As the city also bore the name of Debir, or "Sanctuary," we may conclude that the tablets were stored in its chief temple, like the libraries of Assyria and Babylonia. It may be that they are

still lying under the soil, awaiting the day when the spade of the excavator shall restore them to the light.

The literary influence of Babylonia in the age before the Israelitish conquest of Palestine explains the occurrence of the names of Babylonian deities among the inhabitants of the West. Moses died on the summit of Mount Nebo, which received its name from the Babylonian god of literature, to whom the great temple of Borsippa was dedicated; and Sinai itself, the mountain "of Sin," testifies to a worship of the Babylonian Moon-god, Sin, amid the solitudes of the desert. Moloch, or Malik, was a Babylonian divinity like Rimmon, the Air-god, after whom more than one locality in Palestine was named, and Anat, the wife of Anu the Sky-god, gave her name to the Palestinian Anah, as well as to Anathoth, the city of "the Anat-goddesses." The resemblances that have been observed between the cosmogonies of Babylonia and Phœnicia probably admit of a similar explanation. Here, too, the religious and philosophical ideas of the people of Canaan were moulded by their Babylonian instructors. Among the tablets from Tel el-Amarna, now in the Boulaq Museum, is a legend about Namtar, the Babylonian god of destiny and plague.

It was the southward march of the Hittites from the north, the destructive wars between them and Rameses II., which wasted Palestine with fire and sword, and, finally, the Israelitish conquest of Canaan, which appear to have put an end to the old literary intercourse among the populations of Western Asia, and to have caused the Babylonian language and script to be disused and forgotten. The Hittites forced themselves like a wedge between the Semites of the East and of the West, while the Israelites destroyed the cities and culture of the Canaanites, already exhausted, as they were, by the Hittite invasion and the campaigns of the Egyptian Pharaoh. We know from the Old Testament that Kirjath-Sepher, with its library, was one of the cities smitten by Othniel, never to rise again (Joshua xv.; Judges i.). A knowledge of cuneiform writing ceased to extend westward of the Euphrates, and for a while the inhabitants of Syria had to be content with the hieroglyphs of the Hittites. But it was not long before the practical traders of Phœnicia devised a better means of recording their thoughts or registering their cargoes than the cumbrous pictorial forms which the mountaineers of the Taurus had brought with them. The characters of the Egyptian alphabet were borrowed in their hieratic form, and adapted to the needs of the borrowers. In the tenth century before our era, the Phœnician alphabet comes before us already fully formed.

Among the Tel el-Amarna tablets now in Berlin and London are some from the Babylonian king Burna-buryas, the son of Kuri-galzu, who reigned about 1430 B.C. But the larger part of them are written by persons who were in no way connected with Babylonia, and to whom therefore Babylonian was a foreign language. A considerable number are despatches from Egyptian officers in Palestine and Syria, many of whom bear Semitic names. They throw a curious and unexpected light on the inner history of the country in the age when "the Canaanite was still in the land."

In the present paper, however, I intend to confine myself to the tablets belonging to M. Bouriant and to the Boulaq Museum which I have myself examined and copied. They include some of the most important contained in the whole collection.

Those relating to Palestine first claim our attention. They bear out the evidence of the Egyptian monuments, and indicate that the cities of Palestine acknowledged the suzerainty of the Egyptian sovereign. The affairs of Phœnicia were directed by an Egyptian governor, who bears the Semitic name of Rib-Addu or Rib-Hadad, and who was assisted by Yapa-Addu and Aziru.\* Several of his despatches relate to the city of Tsumura or Simyra, the Zemar of Gen. x. 18, which he describes in one of them as "very strongly situated, like a bird whose nest is built on a precipice." At the end of the same despatch reference is made to "the King of Mitana," or Aram Naharaim, "the King of Tarkusi, and the King of the Hittites," as well as to a certain "Yankhan, the servant of the King of Yarimuta"; but the tablet is too much injured to enable us to say whether the relations of the Egyptian official to these personages were friendly or otherwise. Another letter from the same official mentions that two ships belonged to him, and adds that certain animals had been brought to him by Yapa-Addu. In a third tablet the city of Sidon seems to be named, while the tablets at Berlin speak of Tyre, Acre, and Megiddo.

The territory of the Philistines, commanding as it did the northern end of the road from Egypt into Palestine, naturally occupied the attention of the Egyptians a good deal. One of the tablets belonging to M. Bouriant, though broken at the end, is very interesting in this respect. It runs thus: "To the king my lord, speak thus: Thy servant Aruki (or Arudi)

\* The name of Rib-Addu may also be read Rip-Dadu. Yapa-Addu, or Dadu, is probably "Hadad is beautiful" (from הדד); and Aziru seems to be the Biblical אציר.

says: (at the feet of the king) seven times seven do I prostrate myself. . . . When a raid was made, Milki (Melech) of the sea-coast (marched) against the country of the king my lord, commanding the forces of the city of Gedor (*Gaturri*), the forces of the city of Gath (*Gimti*), and the forces of the city of Keilah (*Kilti*). They seized the country of the city of Rabbah (*Rubute*) dependent on the country of the king, belonging to the 'Confederates' (*khabiri*). And again he destroyed entirely the city of the land of Ururusi, the city of the god Uras, whose name (there) is Marru (Marnas), the city of the king, dependent on the locality of the men of Keilah, and twelve cities of my king." Two small tablets in the Boulaq Museum, both unfortunately broken in half, give us further information about the affairs of Southern Palestine. One of them may be translated as follows: "To the king my lord, my gods, my Sun-god, by letter I speak, even Su-arda-ka, thy servant, the dust of thy feet. At the feet of the king my lord, my gods, my Sun-god, seven times seven do I prostrate myself. The king of . . . set himself to make war. In the city of Keilah (*Kelti*) he made war against thee for the third time; a complaint was brought to myself. My city that belongs to me adhered (?) to me. Ebed-tob sent to the men of Keilah. He sent fourteen pieces of silver, and they marched against my rear, and they overran the domains of the king my lord. Keilah, my city, did Ebed-dhabba remove from my jurisdiction. The pleasure-park (?) of the king my lord, and the fortress of Baal-nathan, and the fortress of Hamor (the Amorite) he removed from his presence and his justice. Lab-api, the halting in speech, occupied the fortress of . . . ninu, and when Lab-api, along with Ebed-dhabba and [his companions] occupied the fortress of . . . ninu, the king [sent] to his servant."

Lab-api is mentioned again in the other tablet to which I have referred. What remains of it runs thus: "And, again, the city of Pir(qar), the fortress which is in front of this country, belonging to the king, I made faithful. At that time the city of Gaza (*Khazati*), belonging to the king, which is on the shore of the sea, westward of the country of the cities of Gath and Carmel (?), \* fell away to Urgi and the men of Gath. I rode in my chariot (?) for the second time, and we marched up (out of Egypt). Lab-api and the country which thou possessest [went over] for the second time to the men of Hebron, the Confederates (*khabiri*) of Milki-ar'il, and he took (their) sons as hostages (?). At the same time

\* It is doubtful whether we are to read Irmila or Kirmila.

he uttered their requests to the men of the district of Kirjath (*Qarti*), and we defended the city of Ururusi. The men of the garrison whom thou hadst left in it were collected by Khapi (Apis), my messenger. Addasi-rakan in his house in the city of Gaza [sent messengers] to the land of Egypt."

The use of the word *khabiri*, which occurs here and in the first text I have translated, seems to show that we must render it by "Hebronites" rather than as the common noun "confederates." The word may throw light on the origin of the city of Hebron, which grew up out of a confederacy of tribes worshipping at a common sanctuary, and may explain why the name is not met with on the Egyptian monuments. Kirjath is, perhaps, Kirjath-Sepher, though it may also denote Kirjath-Arba, the old name of Hebron. As for Milki-ar'il, it is formed like Melchizedek or Malchiel, and must be interpreted "Moloch is Ar'il." Ar'il, the Ariel of Isai. xxix. 1, and the "lion-like men" of the A. V. in 2 Sam. xxiii. 20, has been shown by a passage in an Egyptian papyrus to mean "hero," so that when King Mesha declares on the Moabite Stone that he carried away the אַרְלוֹם of יְרוּחַ and רוּחַ, we must understand that he carried away the consecrated "heroes" who protected the Israelitish shrines of Yahveh and Dodah.

Dodah is the same name as that which we find in the varying forms of Dodo, Dod, and David, and up to now it has not been found outside the pages of the Old Testament, though the feminine Dido proves that it was known to the Phœnicians; and the Assyrian Dadu, corresponding to the Syrian Hadad, comes from the same root. But one of the Tel el-Amarna tablets in the Boulaq Museum now informs us that Dûdu or David was a name employed among the Semites long before the age of the founder of the Empire of Israel, or even of the Exodus. The tablet is a letter addressed by Aziru to his "lord" and "father" Dûdu. We have already made the acquaintance of Aziru, who was one of the lieutenants of Rib-Addu in Phœnicia; and it is possible that the letter to his father was written from that part of the world. The middle of the tablet is injured; what is left of it runs as follows: "To Dûdu, my lord (and) father, I speak, even Aziru, thy son, thy servant; at the feet of my father I prostrate myself; unto the feet of my father may there be peace! O Dûdu, now . . . the foundations of the palace of my lord have been laid, and I have founded (them) for a temple. . . . And now, O Dûdu, my father, plant the gardens, and I will look after the daughter (of the king). [Behold], O my father and my lord, I will look after the girl. . . . I have directed the

planting (of the gardens), and have planted the trees. . . . I am the servant of the king my lord [who comes] from executing the commands of the king my lord [and] the commands of Dâdu my father; (everything) do I observe until his return home . . . he has sent a soldier, and let me come unto thee."

It is clear from the letter that Dâdu, or David, occupied a high position in the court of the Pharaoh, and, like his son, appears to have been employed in laying out the gardens attached to the palace of the Egyptian king. It is even possible that he may have been a Hebrew; at all events, the name has never yet been found in a Phœnician inscription, while we know that it was borne by Israelites. Aziru, too, is probably the Biblical Ezer.

Phœnicia seems to have been the furthest point to the north to which the direct government of Egypt extended. At any rate, the letters which came to the Egyptian monarch from Syria and Mesopotamia were sent to him by princes who called themselves his "brothers," and not by officials who were the "servants" of the king. Doubtless, many of these princes were but semi-independent, and in case of war were required to assist the Egyptian Government. One of those in most frequent correspondence with the Pharaoh was the King of Alasiya, a country which lay to the east of Arvad, in the district afterwards occupied by Homs and Hamath, though it also seems to have possessed a port on the sea-coast. The name of the country has been read "Arosha" and "Arsa" by Egyptologists; but the cuneiform texts now furnish us with its true pronunciation. A very perfectly-preserved tablet at Boulaq, containing a letter from the King of Alasiya, has a docket attached to it in Egyptian hieratic characters, which reads: "The correspondence of the prince of the country of Alasha." The letter is as follows: "To the king of Mitsri (Egypt), my lord, I speak by letter, I, the king of the country of Alasiya, thy brother. I am at peace, and unto thee may there be peace! To thy house, thy daughters, thy son,\* thy wives, thy multitudinous chariots, thy horses, and in thy land of Mitsri may there be peace! O my brother, my ambassador has carefully conveyed a costly gift for them, and has listened to thy salutation. This man is my minister, O my brother. Carefully has he conveyed to them the costly gift. My minister has not brought my ship along with them." There is another letter in the Boulaq Museum which is clearly

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\* Perhaps we may infer, from the mention of the Pharaoh's son, that the letter was addressed to Amenophis III., and not to Amenophis IV.

from the King of Alasiya, though the commencement of it is lost. Here we find: "Now I have sent [thee] as presents a sea (?) of bronze, three talents of hard bronze, the tusk of an elephant, a throne, and the hull (?) of a ship. These gifts, O my brother, this man [brings in] this ship of the king [my lord], and do thou in return send a costly gift to me carefully. [And] do thou, O my brother, [listen to] my request, and give to me the . . . which I have asked for. This man is the servant of the king [my] lord, but the carpenter with me has not finished (his work) in addition to the other presents; yet do thou, O brother, send the costly gift carefully."

The reference to the *sinnu sa biri*, or "elephant's tusk," is interesting. We know, from the Egyptian inscriptions, that Thothmes III. hunted wild elephants in the neighbourhood of Ni, near Aleppo; while, some four or five centuries later, Tiglath-pileser I. did the same in the neighbourhood of Carchemish.

The King of Alasiya was not the only foreign potentate whose letters are preserved in the Museum of Boulaq. One of the tablets in the collection begins in this way: "[To N]imutriya, the King of Egypt, [I speak] by letter, even I, [Ris-takul]la-Sin, the king of the country of Babylonia. My peace be [upon thee], and upon thy wife, thy children, [thy house], and thy chariots and horses; upon all thy [possessions] may there ever be peace!" The letter then goes on to state that the father of the writer had sent his daughter, Irtabi, to the Egyptian Pharaoh many years before, Nimutriya sending presents in return to his father. After his accession to the throne, the Babylonian prince "again sent an ambassador" to Egypt; and, six years later, the Pharaoh forwarded by his envoy Salmási, thirty manehs of gold, besides a certain amount of silver. The object of the letter is to inform the Egyptian monarch that other presents are now on their way from his brother-in-law.

Babylonia is here called Kara-Duniyas, the name by which it went in the age of the Kassite Dynasty. Another potentate who corresponded with the Egyptian kings ruled over a country the name of which is unfortunately lost, a fracture of the tablet having destroyed the characters which composed the name. The letter commences with the words: "[I am] Subbi-kuzki, the king of the country of . . . ma(?)-ti; to Khûri[ya], the [king of] Egypt, [I speak] by letter. [May] there be peace before thee, may there be peace [unto thy wife], thy children, thy house, thy soldiers, [thy] chariots, [and in] the midst of thy country may there ever be peace: O my brother, my ambassador whom I sent to thy father,



and the request which thy father made to the king, saying: 'O prince, let us take counsel together,' I did not countermand." The royal scribe then inquires why no acknowledgment has been made of the presents he has sent to Egypt, and adds that he is forwarding various other gifts, including a cup of silver five manehs in weight, and a second cup of silver three manehs in weight, as well as two other objects of silver ten manehs in weight.

The most interesting, however, of all the tablets at Boulaq is a long and well-preserved one, which is addressed by Tarkhundaras, king of the country of Arzapi, to Nimutriya, or Amenophis III., the Pharaoh of Egypt. The heading and one or two technical words are in Semitic Assyrian, but the rest of the letter is written in an unknown language. The ideographs employed in it show that the introductory greetings are the same as those found in other letters from foreign potentates to the Egyptian king, and we are thus enabled to determine the meaning of the phonetically-written words which occur in them. Thus the possessive pronoun "my" is expressed by the affix *mi*, and the pronoun "thy" by *ti*, *tim*, and perhaps *ta*, which become *tu* when suffixed to the word signifying "trees." These two pronouns offer a strange similarity to the corresponding pronouns in the Indo-European languages. *Bibbi* is "chariot," and *bibbid* "chariots," while *kalatta* seems to mean "brother." *Ganeda* is "exceedingly," and *khuman-sakh(?)*-in "may there be peace;" *sakh(?)*-an-ta being "thy peace-offering," and *khalu-garitsi* "a messenger." Now, Tarkhundaras is a Hittite name, like the names of Tarkhu-nazi and Tarkhu-lara found on the Assyrian monuments, or the name of Tarkondêmos on the now famous bilingual boss; and the name of the country over which he ruled reminds us of Rezech (2 Kings xix. 12), in North-western Mesopotamia. I am, therefore, tempted to see in the language of the letter one of the Hittite dialects which are concealed under the hieroglyphs of the Hittite texts. The purport of the letter is to describe the various presents sent by Tarkhundaras to the Pharaoh by the messenger, Irsappa, in return for the hand of the Pharaoh's daughter, who had been given to him as a wife. Among the presents sent were 20 manehs of gold and 100 shekels of lead. Mention is made in the letter of "the prince of the Hittites" (*Khatte*), who, it would appear, lived in the mountains of I-gaid.\*

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\* According to the "Travels of the Mohar" (Brugsch's translation), the land of Igad'ai bordered on the country of the Hittites to the north of Aleppo.

The Hittites are alluded to in other tablets at Boulaq. I have already spoken of the despatch of Rib-Addu, in which reference is made to the kings of Tarkusi and the Hittites, as well as to the adjoining kingdom of Mitanna or Naharaim. Another tablet of black clay, unfortunately much worn and injured, tells us that "at that time the king of the Hittites was captured in the vicinity of the country of Kutiti (and) the kings of Mittanni and Nabuma" joined in the war. A despatch now at Berlin contains an urgent request from one of the cities of Syria for help against the Hittites, whose forces were advancing southwards.

One of the facts which result most clearly from a study of the tablets is that, not only was a Semitic language the medium of literary intercourse between the Pharaoh of Egypt and his officers abroad, but that Semites held high and responsible posts in the Egyptian Court itself. Thus we find Dudu, or David, addressed by his son as "my lord," and ranking, apparently, next to the monarch; and there are letters in the Boulaq Collection written not only by officials with an Egyptian name, like Khapi or Hapi (Apis), but with such Semitic names as Rib-Addu, Samu-Addu ("Shem is Hadad") of "the city of Samkhuna," Dasru, Bu-Dadu (the Biblical Bedad), and Milkili (the Biblical Malchiel). Even the Assyrian Su-arda-ka occurs in one of them. A flood of light is thus poured upon a period of Egyptian history which is of high interest for the student of the Old Testament. In spite of the reticence of the Egyptian monuments, we can now see what was the meaning of the attempt of Amenophis IV. to supersede the ancestral religion of Egypt. The king was in all respects an Asiatic. His mother, who seems to have been a woman of strong character,—able to govern not only her son, but even her less pliable husband,—came from the region of the Euphrates, and brought with her Asiatic followers, Asiatic ideas, and an Asiatic form of faith. The Court became Semitised. The favourites and officials of the Pharaoh, his officers in the field, his correspondents abroad, bore names which showed them to be of Canaanite and even of Israelitish origin. If Joseph and his brethren had found favour among the Hyksos princes of an earlier day, their descendants were likely to find equal favour at the Court of "the heretic king."

We need not wonder, therefore, if Amenophis IV. found himself compelled to quit Thebes. The old aristocracy might have condoned his religious heresy,—they could not condone his supplanting them with foreign favourites. The rise of the 19th Dynasty marks the successful reaction of the native Egyptian against the predominance of the Semite in the

closing days of the 18th Dynasty. It was not the founder of the 18th Dynasty, but the founder of the 19th Dynasty that was "the new king who knew not Joseph." Ever since the progress of Egyptology had made it clear that Rameses II. was the Pharaoh of the oppression, it was difficult to understand how so long an interval of time as the whole period of the 18th Dynasty could lie between him and that "new king" whose rise seems to have been followed almost immediately by the servitude and oppression of the Hebrews. The tablets of Tel el-Amarna now show that the difficulty does not exist. Up to the death of Khu-en-Aten, the Semite had greater influence than the native in the land of Mizraim.

The legend under which Manetho veiled the history of the Exodus now also receives its explanation.\* Amenophis, the son of Rameses, we are told, desired to see the gods, like his predecessor, Oros, and accordingly, by the advice of the wise man Amenophis, the son of Paapis, he removed all the leprous people in Egypt, 80,000 in number, to the quarries on the east bank of the Nile. Among them was a priest of Heliopolis, Osarsiph, in whose name the sacred first syllable of *Joseph* has been replaced by the name of the Egyptian god Osiris. After a time, Amenophis retired to Ethiopia, the leprous people, who had meanwhile been transferred to the deserted city of Avaris, having revolted with the assistance of the descendants of the Hyksos, now settled in Jerusalem. For 13 years Egypt was wasted by them with fire and sword, its temples plundered, and the images of the gods destroyed; and it was not until the end of that fatal period, that Amenophis returned from Ethiopia with his son Sethos, and expelled the enemy under their leader Osarsiph, who had assumed the name of Moses. Sethos is plainly Seti II., Rameses being Rameses II., and Amenophis his son Meneptah, in whose reign, as we now know, the Exodus must have taken place. Oros, whose conduct Amenophis desired to imitate, was a king of the 18th Dynasty, and takes the place of Khu-en-Aten in the list of Manetho. In the tablets of Tel el-Amarna, Khu-en-Aten is usually called Nimkhururiya, corresponding to the prænomen hitherto read by Egyptologists, Nofer-kheperu-Ra; but, as we have seen, Subbi-kuzbi, in the letter mentioned above, gives him the abbreviated title of Khūriya, which is exactly the Oros of Manetho. It would appear, then, that the Egyptian legend has mixed together Amenophis IV., under whom the Semites and their religion became predominant in Egypt, with Meneptah, the Pharaoh of the Exodus. As Pro-

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\* Josephus, cont. Ap. i. 26-35,

fessor Erman has pointed out, Amenophis, the son of Pa-Apis, must be Amen-hotep, the son of Hapi, who erected the colossus of Memnon at Thebes during the reign of Amenophis III.

So far as the date of the Exodus is concerned, the newly-found tablets confirm the conclusions already arrived at by Egyptology, and so brilliantly verified by M. Naville's discovery of the site of Pithom. At the close of the 18th Dynasty, Palestine was still Canaanite; the Israelitish invasion had not as yet taken place, and the only foreign dominion acknowledged by its cities was that of Egypt. Between Canaan and Egypt, indeed, there was close and constant intercourse. The towns of Palestine were garrisoned by Egyptian troops, and, though its governors bore Semitic names, they were officials of the Egyptian king. Egyptian influence and supremacy extended through Syria as far as the banks of the Euphrates; the Hittite conquests in the north and the Israelitish conquests in the south had not as yet driven Egypt back into Africa, and separated the eastern and western portions of the educated world one from the other.

How highly educated this old world was we are but just beginning to learn. But we have already learnt enough to discover how important a bearing it has on the criticism of the Old Testament. It has long been tacitly assumed by the critical school that writing was not only a rare art in Palestine before the age of David, but was practically unknown. Little historical credence can be placed, it has been urged, in the earlier records of the Hebrew people, because they could not have been committed to writing until a period when the history of the past had become traditional and mythical. But this assumption can no longer be maintained. Long before the Exodus, Canaan had its libraries and its scribes, its schools and literary men. The annals of the country, it is true, were not inscribed in the letters of the Phœnician alphabet on perishable papyrus; the writing-material was the imperishable clay,—the characters those of the cuneiform syllabary. A new light is thus thrown on royal lists like that contained in Genesis xxxvi. Why should this not be an extract from the chronicles of Edom originally written in the cuneiform syllabary of Babylonia? A connexion with Babylonia is indicated by the statement that Saul came from "Rehoboth" or "the city-streets by the river" Euphrates, more especially when it is remembered that Saul, or Sawul, is the Babylonian name of the Sun-god. Though Kirjath-Sepher was destroyed by the Israelites, other cities mentioned in the Tel el-Amarna tablets, like Gaza, or Gath, or Tyre,

remained independent, and we cannot imagine that the old traditions of culture and writing were forgotten in any of them. In what is asserted by the critical school to be the oldest relic of Hebrew literature,—the Song of Deborah,—reference is made to the scribes of Zebulon “that handle the pen of the writer” (Judges v. 14), and we have now no longer any reason to interpret the words in a non-natural sense, and transform the scribe into a military commander. Only it is probable that the scribes still made use of the cuneiform syllabary, and not yet of the Phœnician alphabet.

In the hands of writers like Stade, criticism has reached the extreme point of scepticism; and, just as in early Greek history, the discoveries of Schliemann and others have obliged us to reconsider the negative judgments of twenty years ago, and to admit a substratum of truth in the old traditions, so, too, we may confidently hope that archæological discovery will, before long, enable us to reconstruct that history of Israel of which modern criticism would fain deprive us. At all events, the Tel el-Amarna tablets have overthrown the primary foundation on which much of this criticism was built, and have proved that the populations of Palestine among whom the Israelites settled, and whose culture they inherited, were as literary as the inhabitants of Egypt or Babylonia. If we are to doubt the statement that Othniel, the Kenizzite, took the city of Kirjath-Sepher and defeated the forces of the king of Aram-Naharaim, it must be for some better reason than the literary ignorance of the Hebrews and the neighbouring tribes.

It is impossible for me now to touch upon the many other points in which the tablets of Tel el-Amarna have come to the aid of the student of ancient history. Thus light is thrown upon the pronunciation of ancient Egyptian by such spellings as Nimutriya and Nimmuriya for the prænomens of Amenophis III., hitherto read Ra-mât-neb and Ra-mâ-neb; and the etymology I proposed for the name of Moses, in my Hibbert Lectures,\* has received a striking verification. I had there pointed out that the name is the exact equivalent of the Babylonian word, *Masu*, “a hero,” an epithet which I tried to show was applied to the Sun-god. Within a year after the publication of my Lectures, one of M. Bouriant’s tablets showed that my conclusions were right. In a despatch from Zinarpi to the Egyptian king, the Pharaoh is called, as usual, “the Sun-god rising from the Divine Day”; and it is then added, in a parenthesis, “whose name is Masu.” This

\* *On the Religion of the Ancient Babylonians.*

proves not only that the term "Masu" was applied to the Sun-god, but was actually used of the Egyptian Pharaoh in the century before Moses was born. It may be that later ages confounded the Semitic "Masu" with the Egyptian *mesu*, "a son," and the Hebrew "Mosheh," or Moses, with "Mes," "the Prince of Kush," in the reign of Rameses II., thus originating the legend, recorded by Josephus, of the campaign of Moses in Ethiopia; but it is impossible to believe that the great law-giver of the Hebrew nation could have continued to bear through life an Egyptian name.

But, apart from such side-lights as these upon ancient history,—apart also from the more important facts which have already resulted from an examination of the texts,—the discovery of the tablets of Tel el-Amarna has a lesson for us of momentous interest. The collection cannot be the only one of its kind. Elsewhere in Palestine and Syria, as well as in Egypt, similar collections must still be lying under the soil. Burnt clay is not injured by rain and moisture, and even the climate of Palestine will have preserved uninjured its libraries of clay. Such libraries must still be awaiting the spade of the excavator on the sites of places like Gaza or Kirjath-Sepher, or others whose remains are buried under the lofty mounds of Southern Judæa. Why should Palestine, the sacred land of our faith, remain unexcavated, while all over the rest of the ancient Oriental world the disinterrers of the past have been vying with one another with feverish activity? Why should workmen and funds be found for exhuming the buried history of early Greece, while the religious public is content with surveying the surface of the soil of Palestine? There is not much to be discovered on that surface which has survived the wreck of centuries; it is only within the kindly bosom of the earth that we shall find, hidden and preserved, the precious relics of the past. The tablets of Tel el-Amarna are an earnest that they will yet be found, if they are properly searched for; and that our children, if not ourselves, will yet know how the people of Canaan lived in the days of the Patriarchs, and how their Hebrew conquerors established themselves among them in the days when, as yet, "there was no king in Israel."

The LORD CHANCELLOR.—Mr. President, ladies, and gentlemen : I have to perform a duty on your behalf in which I have no doubt I shall have the sympathy and the approval of you all, and that is to propose that our best thanks be presented to Professor Sayce for the Annual Address now delivered ; and I have an addition to make to that resolution, but for the moment I will pause at the first part of the resolution. I suppose there is nothing more interesting in an Institution of this character than the discovery of those relics of the past to which allusion has been made ; when we remember the darkness that has surrounded the ancient history of the Egyptians, and when we look back some seventy or eighty years ago and read the history of Renourd and such Essays we feel there was some excuse for not knowing the history of Egypt ; but now the darkness has rolled away, and the result of recent discoveries is to light up a period that has hitherto been lost in darkness : but I am afraid in the exultation one feels in looking at the discovery of these buried treasures, one is apt, sometimes, to forget the deep debt of gratitude which we owe to those who have brought these things to light (cheers). It is easy to listen with deep interest to such a narrative as we have had to-night, and to the indications of a civilisation almost earlier than we dreamt of ; but I fear we do not always remember the long study and the careful labour that has been required to put the disjointed pieces together, and to elucidate the history that there lies buried, and which is being brought to light by men like Professor Sayce, and, therefore, we should endeavour to recognise the deep debt of gratitude that we owe to such men (cheers). I think we should incompletely do our duty if we did not add our thanks to those who have read papers during the session, and to Dr. Wright for reading the paper we have just heard, and when we regard such an array of consonants from which humanity almost starts back, in reading a paper of this description, we cannot but feel admiration for the way in which Dr. Wright has performed his task. I beg, therefore, to move the resolution standing in my name (cheers).

Monsieur E. NAVILLE. — Mr. President, my lords, ladies, and gentlemen : I have great pleasure in seconding the admirable resolution put forward by the Lord Chancellor of England, and I will say very few words, as English is not my native tongue. Certainly the

discovery made in Tel-el-Amarna is one of the most remarkable that has been made in Egypt in this century. We should never have expected to find that the Babylonian language would become a diplomatic language, as Professor Sayce says it was at the time of the 18th dynasty. To us, as Egyptologists, this discovery is of the greatest importance, because it shows that the conquest of the Egyptian kings lasted and had more lasting influence over the countries conquered than we thought of. We generally supposed that after the death of a king who made great conquests, such as those of Thothmes III., everything found its level; but we see that the dominion of Egypt lasted over three, four, or even five reigns in succession: and a very curious point is this, that we see old Egyptian kings of conquered states treated the natives as the governors of those states, and those natives communicated with them in the Babylonian language, which was not well known to the Egyptian kings, for on one of those tablets of Boulaq, I think it is one of the foreign kings who writes to the king of Egypt saying that he sends to him an interpreter in order that he may understand his letter more completely. But what I would like to impress on your mind is this: That even now, at this time, Egypt is still the land of the unexpected,—the land of the marvellous. I have great faith in Egyptian soil, and I think, if properly worked, it might show us and give us treasures which would be of the greatest value in contributing to our knowledge of Egyptian ancient history. I have great pleasure in seconding the resolution.

The President having put the resolution to the meeting, it was duly carried.

Reverend W. WRIGHT, D.D.—Sir George Stokes, my lords, ladies, and gentlemen: I should like to say a few words of special interest in regard to Professor Sayce. We have his Address here to-night by what we may call a miracle. In fact, the life of Professor Sayce (one of the most precious lives in the world) has been preserved to us by what I may call a miracle. He landed one morning from his boat on the Nile, and went ashore and was bitten by the deadly asp; he hurried into his boat, and with his own hand burnt the bitten part down to the bone, he then turned to the table, wrote out his will, and prepared for the worst. His people waited to see what would happen, but finding no ill ensue, they said he was under the protection of *Allah*, and they were right, and they were thankful to *Allah*, whom we call God, for preserving the life of Professor Sayce.



It is a great pleasure to know that he has brought these things to light, and one great result is this: Our wise friends, the critics, knew well that it was impossible for Moses to write the Pentateuch, for there were no means of writing the Pentateuch at that time; so they used the *argumentum ad silentium* to show that Moses could not have written it, *i.e.*, the absence of evidence as evidence. Now this Address is very far-reaching, and has turned the flank of the whole of their position, and has struck the foundation from under all their theory. It may, of course, be possible that some of Professor Sayce's deductions may require to be modified under fuller light. A man who leads will sometimes have to retrace his steps. Now, if you should hear that Professor Sayce is mistaken about some little thing, remember what I have just said. As for myself, I deserve no thanks; but to Professor Sayce we cannot return too hearty acknowledgments for his splendid Address (cheers).

Sir J. RISDON BENNETT, M.D., F.R.S.—My lords, ladies, and gentlemen, I have had conferred on me the honour of asking you to express your thanks to our esteemed and honoured President for his protection and conduct of the Institute during the past year. I need not, I am sure, say how much this Society, and society at large, is indebted to one holding his position, for the kind attention and interest that he has given and manifested in such an Institute as this. We know well how valuable his time is; but we also know how valuable his aid is; and in regard to our proceedings, as you know, he has on many occasions expressed himself in terms of approval of the influence exercised by the Institute. I will not occupy your time more than by putting the resolution, which I am sure will be carried unanimously—that a hearty vote of thanks be presented to our President for his services to this Institute during the past year (cheers).

Admiral Sir ERASMUS OMMANNEY, R.N., C.B., F.R.S.—I can add nothing to the words which have been expressed by Sir Risdon Bennett in praise of our distinguished President who now occupies the chair—a man so eminent and distinguished in science, and so conspicuous before the world. As to the researches in Egypt and the revelation of the marvellous works discovered by Professor Sayce, I can only say that they will be of great advantage to the objects with which this Institute was founded. I must add that I, in common I doubt not with all present, have derived great pleasure from what we have heard this evening (cheers).

Staff-Commander ETRICK W. CREAK, R.N., F.R.S.—Mr. President, my lords, ladies, and gentlemen: I rise to convey the vote of thanks to Sir George Stokes for his Presidency during the past year. I am sure the Institute has derived the most marked benefit from having as its President one who, like the late Sir Isaac Newton, occupies the unique position of President of the Royal Society, Lucasian Professor of Mathematics at Cambridge, and Member of Parliament (cheers).

The PRESIDENT.—I am much obliged to those who have so kindly proposed and seconded this vote of thanks, and to you all for receiving it in the way you have done. I feel, indeed, that I have by no means discharged the duties entrusted to me as I ought to have done. But I can only say that I have a great many different things to attend to, and I hope my shortcomings will be looked upon with leniency (cheers).

The members, associates, and their guests then adjourned to the Museum, where refreshments were served.

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## ORDINARY MEETING.\*

The Rev. F. A. WALKER, D.D., F.L.S., in the Chair.

The Minutes of the last Meeting were read and confirmed, and the following elections were announced :—

LIFE MEMBER :—Professor A. R. Simpson, M.D., Edinburgh.

MEMBERS :—G. Buchanan, Esq., M.D., F.R.S., London ; Rev. R. H. Conwell, D.D., United States ; R. J. Fremlin, Esq., Kent ; Professor J. B. Harrison, F.C.S., F.G.S., etc. ; Rev. S. J. Johnson, M.A., Dorset ; Colonel C. E. Hyatt, President of the Military Academy, United States ; Rev. Preb. W. A. Osborne, M.A., Middlesex ; M.-General J. A. Steel, B.S.C., London ; S. W. Sutton, Esq., M.D., India ; J. Usher, Esq., Bedfordshire.

ASSOCIATES :—The Right Rev. the Bishop of Algoma, Canada ; Sir W. Bowman, Bart., M.D., LL.D., F.R.S., Surrey ; Miss M. K. Arnold, United States ; Rev. A. R. Barton, D.D., Ireland ; J. Bellamy, Esq., Honduras ; Rev. Professor H. E. Butler, United States ; F. H. Crozier, Esq., Hants ; Miss E. Clarke, Calne ; Rev. J. Cain, India ; C. Collingwood, Esq., M.A., B.M., London ; Professor Selden J. Coffin, Ph.D., United States ; Rev. F. Clarke, London ; Rev. J. Oswald Dykes, M.A., D.D., London ; Rev. J. D. Dodgson, Australia ; Rev. H. S. Eckersley, Egypt ; Major-General W. T. F. Farewell, Bath ; A. H. Foord, Esq., F.G.S., London ; Rev. W. R. Fletcher, South Australia ; J. J. Gilgeous, Esq., Suffolk ; Rev. Professor J. F. Garrison, M.A., M.D., D.D., United States ; Rev. H. H. Halford-Adcock, M.A., London ; Rev. J. F. Heyes, M.A., F.C.S., F.R.G.S., Oxford ; Rev. J. A. Harris, B.A., Bombay ; J. T. Hutchinson, Esq., L.R.C.P., Sunderland ; Rev. J. G. Kitchen, M.A., London ; Rev. Professor W. W. Lovejoy, M.D., L.M., D.D., United States ; Rev. D. D. Maclaurin, United States ; Rev. R. H. Moreton, Portugal ; H. C. Oakshott, Esq., F.G.S., Falmouth ; C. A. W. Pownall, Esq., M.Inst.C.E. Japan ; Rev. B. Pick, Ph.D., United States ; Rev. C. R. Panter, M.A., LL.D., Ireland ; Surgeon A. C. H. Russell, United States ; Rev. W. Roberts, B.A. London ; G. Shaw, Esq., Cheshire ; Z. T. Sweeney, Esq., Constantinople ; Rev. A. A. E. Taylor, D.D., LL.D., United States ; J. E. Wakefield, Esq., London ; S. Watson, Esq., Australia ; G. L. Walker, Esq., United States ; Rev. A. R. With, M.A., London ; Professor A. V. Williams Jackson, L.H.D., Ph.D., United States.

HONORARY CORRESPONDING MEMBERS :—Count Riamo D'Hulst, Egypt ; Theodore D. Pinches, Esq., British Museum.

HONORARY LOCAL SECRETARIES :—Rev. H. Ross, Ph.D., Dallas House, Lancaster ; H. D. Blewitt, Esq., King William's Town, South Africa ; Rev. H. P. Lindsay, M.A., Liverpool ; J. S. Jowett, Esq., Brighouse.

The publication of the paper read at this meeting is delayed.

## ORDINARY MEETING.\*

The Rev. Prebendary R. THORNTON, D.D., Vice-President,  
in the Chair.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBER :—Rev. F. Wallis, M.A., Fellow and Dean of Gonville and Caius College, Cambridge.

ASSOCIATES :—General Warren Walker, R.E., Bath ; Professor H. H. Freer, M.S., M.A., United States ; Professor W. H. Norton, M.A., United States.

HON. COR. MEMBER :—Rev. A. H. Sayce, M.A., LL.D., Deputy Professor of Comparative Philology at Oxford University.

The following paper was then read by the Author :—

*ON THE CANAANITES.* By Major C. R. CONDER,  
D.C.L., R.E.

**T**HERE are two methods of critical study of the Bible, one of which is old, and the other new. The first is the literary or exegetic method, the second is the historical or comparative method. These methods are not of necessity antagonistic, but as a rule they have been separately pursued, the one mainly in the study in Europe, the other mainly in the field in the East. It is, of course, evident that the ignorant explorer may do harm rather than good. If he does not take pains to study the necessary languages, to understand the alphabets, and the hieroglyphs which he may be likely to find, to provide himself with historical, ethnological, and scientific data from the best sources, he may easily fall into errors due to enthusiasm, and retard rather than advance knowledge.

But it is equally true that the library student may arrive at false results through want of acquaintance with the East, and with the facts of archæological research. And no one

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\* May 20, 1889

who has read even a little of modern critical literature, with a knowledge of Oriental life and language, obtained by living for a time in the East, can fail to observe that this is an error into which men of great learning continually fall. The most minute research must fail to find the truth when the data relied upon are incorrect, and at the present time what is wanted in Biblical study is not new theory, but new and properly understood fact.

The basis of the comparative method was laid by the great discoveries of Layard at Nineveh, and by the decipherment of the inscriptions of Egypt and of Western Asia; yet the results, especially those of cuneiform research as carefully discussed by Schrader, only serve to carry back our independent knowledge of Hebrew history to the times of the Hebrew monarchy. This, of course, we should expect, because from the Bible itself we learn that not till long after the death of Solomon did the power of Assyria begin to extend westwards, through Phœnicia and down into Palestine.

The Egyptian records of relations with Syria trace back much earlier,—to 1600 B.C.,—but they are not in the form of annals, and the information has to be very carefully sifted out, as was first done by Chabas and Mariette, who have been followed by many other scholars.

In addition to these, the new Tel el-Amarna tablets appear to be about to give us very important new facts as to the western spread of Babylonian power in the sixteenth century B.C.

There remains a third department of research, namely, that into the monuments of Syria and Palestine, including Hebrew and Phœnician texts, and the hieroglyphics found in northern Syria and Asia Minor, to which the present paper is chiefly devoted.

As regards the Hebrew and Phœnician inscriptions, it may be noted in passing that, few as they are, their evidence is of the highest importance. From the Phœnician texts we obtain ideas as to history and mythology fully in accord with the Old Testament accounts. We get the name of Hiram, the names of some of the Canaanite gods mentioned in the Bible, and the names of months identical with those used by the Hebrews before the Captivity. This last is specially important. The old Hebrew month names (at least in some cases) were not the same used after the Captivity. The former names were apparently the same used by the Phœnicians, the latter names those used by the Assyrians. Thus when we find the old names used, we have a fair argument that the Hebrew writer

who employs them lived and wrote before the time of the Captivity.

As regards Hebrew inscriptions, we have at present only one; and of this it was my good fortune to send the first accurate copy home to England. This is the celebrated Siloam inscription, accidentally discovered in 1881. It contains no history and no personal names, but it is nevertheless evidence of the civilisation of Jerusalem as early as the time of Hezekiah; evidence of the language then used by the Hebrews; evidence that it was possible in the eighth century B.C. for the Hebrew prophets and historians to write in an alphabet exactly the same (as to sounds) as that in which the Old Testament is written, and in the same pure Hebrew tongue. It is also evidence (though this cannot here be explained in detail) that the Hebrews had long been accustomed to use this alphabet, and could write in Solomon's time, and perhaps as early as 1500 B.C.

But the subject now to be considered is even more interesting. It is the investigation of the language and customs of Palestine before the time of the Hebrew invasion under Joshua. It is the attempt to call back to life the mixed tribes of Canaan among whom Abraham wandered, and whose cities the spies from the desert found to be "walled up to heaven"; who had idols and idol-altars, which Israel destroyed, and who are represented in the Old Testament as belonging to another race, not Semitic, but akin to some of the inhabitants of Chaldea and Phœnicia.

The materials for this study are very authentic, and, though fragmentary, they are contemporary, and, rightly understood, they are conclusive. They consist—first, in the names of towns in Palestine and Syria; second, in the names of Syrian chiefs with whom the Egyptians came in contact; third, in the names of Syrian chiefs encountered by the Assyrians; fourth, in the hieroglyphic texts of Syria and Asia Minor; fifth, in the non-Semitic element in Phœnicia; sixth, in the engraved signets and amulets of Phœnicia and Asia Minor, as compared with those of Chaldea. All these materials yield important results, but only when they are treated by a comparative method, and on the basis of the supposition,—which is clearly pointed out in Genesis,—that there was in Palestine from the earliest period a non-Semitic as well as a Semitic population,—that is to say, a population speaking a language, possessing a physiognomy, a religion, and customs quite distinct from those of the group of nations called Semitic, by which we understand the Hebrews, the Arabs, and the Assyrians.

No scholar has ever supposed that the Exodus took place as early as 1600 B.C.; in fact, Brugsch and others have carried it down very much later, although their proposed date rests, I think, on the most rickety foundation. Consequently, when we treat of the Karnak lists we are treating of Palestine before Joshua, and of a population that is not Hebrew.

When we come to the time of Rameses II., we are treating, I believe, of Palestine in the days of the Judges, though Egyptologists would question this result of a special study of the chronology.

We find, then, from the Karnak lists and from the account of the victories of Rameses II. that there were two races and two languages in Palestine and in Syria. The nomenclature towards the south is mainly Semitic, towards the north it is chiefly non-Semitic. The Old Testament says the same. The children of Lot, of Esau, of Ishmael, of Keturah, remained in Syria when Israel went down into Egypt; but the sons of Heth were sons of Ham, a race distinct from that of the children of Shem.

This Semitic race in Palestine spoke a language like Hebrew, or like the Phœnician of the monuments, or the Moabite of the Moabite Stone. Their features on the monuments tell us the same, and from the town names of the Karnak lists we see that they adored the gods mentioned in the Bible as those of the Canaanites. Yet more. They adored Jehovah, and the sacred name was known at least in 900 B.C. from Nineveh to the Mediterranean, and from Hamath to Ascalon. I have been attacked for making this remark, which does not agree with Wellhausen's idea that Jehovah was a tribal God of the family of Moses; but it seems to have escaped the notice of the critic that this statement did not originate with me, but with the careful Schrader, who traces the divine name from Assyria to Philistia, and finds it in the titles of the kings of Hamath. The Old Testament certainly does not represent the family of Moses, or even of Abraham, as the only adorers of Jehovah. Balaam, from Pethor, was not a Hebrew, and in the earliest chapters of Genesis we read "then [long before Abraham] began men to call on the name of Jehovah" (Gen. iv. 26).

Leaving, however, the consideration of this Semitic population in Palestine, I wish more particularly to draw attention to the non-Semitic race in Palestine and in Syria, to whose affinities I have given much attention of late.

The northern part of the list of towns conquered by Thothmes III. in Syria contains many names which are not

Semitic, and apparently not Aryan. No one, as far as I know, has made any serious effort to translate them. Professor Sayce believed that Georgian might furnish the key, but though he has studied Georgian, as have Mr. Hyde Clarke, Mr. Bertin, and others, the Georgian vocabularies have not been found to throw any light on the subject. I have also inspected these vocabularies with the same result. Georgian is a modern language which, according to Brosset, who has written the best grammar, is a mixed language. Many of its common words are Mongolic, and its grammar is Turanian, but a great many Iranian words are mixed up in its vocabulary, just as in Turkish words from Persian and Arabic are mixed with the real old Turkic words,—as in fact is found generally in such languages as Armenian, Assyrian, and even to a small extent in Hebrew.\*

The Hittites, as represented on the monuments at Karnak, have, however, long been recognised by Dr. Birch, Mr. H. G. Tomkins, and myself, as being of Mongolian type. They wear pig-tails in some cases, and the facial lines are almost exactly those of the Kirghiz of Central Asia. This impression of their racial affinity is very generally accepted, and it follows that the Turanian languages are those in which we must look for the key to the Hittite nomenclature.

We have two ancient Turanian languages in Western Asia, the Akkadian,—with its dialect called Sumerian,—traceable back to between 2000 and 3000 B.C., and the Medic, traceable to about 500 B.C. These languages, though not the same, have the same grammar, and to a great extent the same vocabulary. Dr. Oppert has compared the Medic mainly with Turkic languages, though Ugric and Finnic languages also present, as he allows, many identities; and even in Chinese some Medic words remain almost unchanged. The Akkadian (although many words are only doubtfully deciphered) is comparable with the same living languages. About 200 words known in modern Turkish are known almost

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\* Very little is as yet known about the languages of the Caucasus even by the Russians, who are most advanced in the study. Max Müller and Dr. Isaac Taylor have classed them as Turanian. The only one with a literature is the Georgian. Notes in the Academy (July 21st and August 18th) show how little is known, but the Royal Geographical Society of Scotland (vol. iv. No. 6) has published an excellent summary of information. There are three groups of Caucasian languages:—(1) The Abaz-Circassian of the West Caucasus, including twenty dialects; (2) the Lesghian, including fifteen tribes of Daghestan; and (3) the Cartvelian, including Georgian and three other tongues. The best authority on Georgian (Brosset) points out the existence of Iranian words in the language,



unchanged in Akkadian. It is natural, therefore, to look to these two languages to help us with Hittite, and I may say that in this view I am supported by Mr. Bertin, a good Akkadian scholar; and that Mr. Pinches also believes an Akkadian-speaking people to have lived near Carchemish, in Northern Syria.

I have carefully compared together not only the Medic and Akkadian, but also the vocabularies of the oldest Turkic dialects, of the Ugric and Finnic languages, of the Etruscan and of Buriat (the oldest Mongol dialect), and Cantonese (the most archaic Chinese dialect);\* and after about two years of such study, I find that the nomenclature of the Hittites is most easily explained on a Turkic-Ugric basis. It is that of a language akin to Akkadian and Medic, and chiefly illustrated by the Turkic dialects of ancient Bactria,—the very region where already, in the second century A.D., we find the Khitai noticed by Ptolemy as an important tribe. These Khitai, of whose language Mr. Howarth has collected the remains, and who became famous under Prester John, and gave their name to Cathay, were a Mongolic people, and their vocabulary contains words which occur also in Akkadian.

I would here give a list of some of the more remarkable translations of the town names in Syria, as known in 1600 B.C. These begin at No. 120, Karnak lists, and go down to No. 282, but out of these some may be Semitic, and a good many are mutilated.

The list has been investigated by Rev. H. G. Tomkins geographically, and the ordinary transliteration is here followed:—

No. 120, *Pil-tau* (now Baldeh) from *pil*, “hill” and *ta*, “mountain” or “high.” The first is widely spread and

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\* The following list of books may be useful to other students, as they are easily obtainable. I have read them all.

F. Lenormant, *La Magie chez les Chaldéens.*

E. de Chossat, *Répertoire Sumérien.*

O. Böhlingk, *Über die Sprache der Jakuten.*

H. Vambéry, *Wörterbuch der Turko-Tartarischen Sprachen.*

O. Donner, *Vergleichendes Wörterbuch der Finnisch Ugrischen Sprachen.*

G. Bertin, *Languages of the Cuneiform Inscriptions.*

J. Oppert, *Le Peuple et la Langue des Mèdes.*

J. Chalmers, *English and Cantonese Dictionary.*

M. Brosset, *Eléments de la Langue Géorgienne.*

M. A. Castren, *Versuch einer Burjatischen Sprachlehre.*

I. Taylor, *Etruscan Researches.*

I must also express my thanks to Dr. Isaac Taylor for advising me in the choice of the Finnic, Tartar, and Mongolian vocabularies.

occurs in the Etruscan *falæ* and common Ugric and Mongol *pel*, *pal*, *boldek* for "hill." The second is a common suffix to mountain names, as *ta*, *ti*, *to*.

No. 121, *Aai* (now *Kefr Aya*), "the mound" or "house." Akkadian *E*, Medic *E*, Susian *Ua*, Turkic *ev*, "house."

No. 125, *Turmanna* (now Turmanin) from the common Turkic *tur*, "abode," and *man*, "an elder" (Akkadian *man*, "king") with the suffix *na*, "of," for the genitive (as in so many Turanian languages), "the chief's camp."

No. 134, *Aara* probably "river" (Akkadian *ari*, "to flow"), as in the Jacut *üräk*, "stream," and Hungarian *ar*, "flood."

No. 140, *Kharka*,\* "the mountain", as in the Medic *kurkha*, Lap. *kor*, Akkadian *kur*, Cheremiss *korok*.

No. 146, *Aunpili*, "mountain town", from *un* (Akkadian *unu*), "a town"; Turkic *in*, *unneh*; "dwelling," and *pil*, "hill" (see above No. 120) with the adjective ending *i*.

No. 148, *Aunuka*, "the great city"; compare the last and the Akkadian *unug*, "city."†

No. 153, *Suka*, probably from *suk*, a swamp or pool in Akkadian; the Buriat Mongol preserves it as *sokoi*, "a morass."

No. 155, *Sutekh-bek*.‡ The first word in the name of the god Sutekh, and this, like Nos. 125, 146, gives an indication of grammar, the genitive preceding. *Bek* is probably a word for "fortress" or "shrine." It is known in the form *bukti*; in the Malamir texts, and in the Uigur we find *bekük*, "fortress," from the root which in Turkish occurs as *pek*, "strong," and in Mongolian as *bökö*. Probably also the town *Mabog*, in Syria, may mean "shrine" (or fortress) of Ma,—the earth goddess Maia, from Ma, "earth."

No. 158, *Ninuren anata*. This should be a crucial case of translation. *Nin* is a well-known word for "chief" in Akkadian, and also for "lady." The gender is not distinguished. In Turkic language we have *nene*, "mother" (the Akkadian *nana*). There are many towns in Asia Minor, of which the names end in *anda* or *anata* (Akkadian *anda*, "on high"), from *an* (Turkic *on*), "high," and *ta*, the locative suffix in Akkadian, and in the Turkic and Mongolian languages. *Uren* appears to

\* Otherwise read *Khalukka*, i.e., "the great city."

† Apparently *Un-uk*, "great town," from *un* as above, and *uk* (compare Mongol *ije*), "great."

‡ According to Chabas this should be read *set*, but he also compares *Suduk*, the Phœnician mythical hero (*Voyage d'un Égyptien*, p. 315).

be the Chagataish *urun* or *orun* for a "seat," "throne," "place" (Akkadian *ur*, "foundation"). *Ana* appears to mean "high," as in Akkadian. *Ta* is the suffix, which often stands for a case, such as the dative or locative. Thus we obtain "chief's seat on the height," probably from some city on a height.

No. 169, *Aurnir*, probably from *ur uru*, "city," as in Akkadian, and *nir*, "chief," as in Akkadian, or perhaps *aul nir* from *aul*, a "village" or settlement,—a well-known Tartar word.

No. 170, *Khata aai* "House of Khata," perhaps of Hittites.

No. 184, *Anau benu*. No. 226, *Ata bana*. No. 248, *Shesh ban*. In these names *ban* cannot be a Semitic word, because it would then precede the nouns by which it is qualified. It is probably the Turanian word for a "shrine" or "abode," which is found also in the Etruscan *Phanu*—whence *fanum* and "fane." The words *Anau Ata* and *Shesh* appear to be names of deities. *Anna*, "the sky god," and *Ata*, a well-known Phrygian deity (*Atys*).

No. 185, *Khatuma*. Probably "abode of Hittites"; *Ma* meaning "home" or "region."

No. 212, *Gainab* probably from *gan*, "Enclosure" (Turkish *jan* "wall") and *ab*, "abode," as in Akkadian and in some Turkic dialects.

No. 219, *Naapi*, probably from *nap* for "light" or "deity," known in Akkadian and Medic, and in the Hungarian *nap* for the sun.

No. 228, *Atakar*. *Kar* is a well-known Turanian word for "town," and *Ata* may refer either to the god *Ata* or to the Turkic word *Ata* for a "chief" or "father," which probably explains the god's name. It occurs in the Akkadian *adda* or *ad* for "father."

No. 270, *Karchemish* is sometimes rendered "fortress of Chemosh," which would be a Semitic construction. The Egyptian is *Karka-masha*, in which the second word seems to have the adjective termination. The first is perhaps the Turanian *kerek* for "fortress," and *masha* may be connected with the word *mas* "soldiers," or *bas*, "chief."

No. 280, *Padra* or *Pederi*, the Biblical Pethor (in Assyrian annals mentioned as being called *Pitru* by the people of the West) perhaps from *bat*, "to surround," whence the Akkadian *bat*, "fortress," Uigur *but*, "castle." The latter part would be from *ir*, *ür* Turkic and Ugric for "stream," "river," in the adjectival form. Pethor was a town beside a river, and would thus mean "water fort."

No. 284, *Nepiriuriu*. This is a remarkable word (see No. 219, *Naapi*). *Nap*, for "deity," is common to Akkadian, Medic, and Susian, and occurs apparently in the genitive as *napir*, "divine," at Malamir, as also in Susian *napiruri*, "divine." Taking the final *u* to be the Turkic *üi*, "abode," as in Altaic (Akkadian *E*, Susian *ua*) we find that the word means "divine abode."

No. 286, *Atatama*. The first element as before, Nos. 226, 228. *Tama* is a word still much in use in Central Asia, meaning a covered building. It applies to the bazaars of Tashkent, for instance. It seems to be Aryan as well as Turkic and connected with the Sanskrit *dama* for "building" (cf. the Latin *domus*). In Akkadian also *tami* occurs for some kind of building. The name *Atatama* seems therefore to mean "chief's house" or House of Ata,—the Syrian deity,—see Nos. 226, 228 and 281 (*Aat liten*).

No. 296, *Papab* . . . This is a curious, mutilated name, evidently not Semitic. *Ab* means "abode" (see No. 212). *Pap* is the familiar "papa," which in Turkish means a father, but which was the name of a deity. The Phrygians worshipped *Papa*, the Scythians called *Jupiter Papæus*, the Etruscans had a god called *Puphluns* (*luns* meaning "god"), and the name of the Akkadian deity, *Pap Sukal*, is perhaps connected, as is possibly the Cyprian *Paphos*. *Papab* would then mean "abode of the father god." Compare No. 253, *Papaa*, "house of *Papa*" (Akkadian and Medic *E*, "house").

No. 311, *Khalbu* (Aleppo). The first part may mean either "city," as in the Medic and Susian *khal*, or "great" (Akkadian *gal*, Susian *khal*, Turkish *jahin*). *Bu* would seem to mean a lake or swamp, or may simply mean "high," "great," as in Turkic. The neighbourhood of Aleppo, especially to the west, is remarkable for its lakes and marshes.

No. 312, *Piauner*. This is a strange word, perhaps to be compared with the Turkic *pinar* for a "spring."

No. 318, *Aaripenekha* or *Aalipenekha*. This may be Semitic, "city of the Phœnicians." The word *Fenekh*, for the Phœnicians, which occurs in Egyptian texts, does not, however, appear to be itself Semitic, and is perhaps to be regarded as coming from the Turanian root *pin*, "to settle," with the personal affix *kh*, the *Fenekh* being the "settlers." Taken as Turanian, *Aaripenekha* still means Phœnician city, the first word (*eri* or *uru* in Akkadian) being of Turanian origin, and the second having the adjective ending in *a*.

No. 347, *Tamākur*. Perhaps "mountain of the building,"

from *kur*, "mountain," which occurs in Akkadian and is widely spread, and *tama* (see No. 286).

These are only selections showing how the names in Northern Syria, which yield no meaning as Semitic words, may be analysed by aid of ancient and modern Turkic languages. I may remark in passing that the same key often unlocks the old classic nomenclature of Asia Minor, when not translatable by aid of Greek. Thus the "speech of Lycaonia," mentioned by St. Paul, was probably only a dialect of the same language spoken by the Hittites.

From these geographical lists we recover, I believe, the following Hittite words:—

<i>Pil</i> or <i>Pal</i> , "hill."	<i>Ari</i> , "river."
<i>Ai</i> , "mound" or "house."	<i>Buk</i> , "shrine" or "fort."
<i>Ban</i> , "shrine."	<i>Tuk</i> , "building."
<i>Tur</i> , "camp."	<i>Tar</i> , "river" or "valley."
<i>Ab</i> , "house," "abode."	<i>Tep</i> , "hill."*
<i>Zakar</i> , "monument."	<i>Khal</i> , "town" (or "great")
<i>Khar</i> , "high."	<i>Gan</i> , "enclosure."
<i>Kar</i> , "fortress."	<i>Nin</i> , "chief" (or "lady.")
<i>Aun</i> , "city."	<i>Ser</i> , "height."
<i>Aul</i> or <i>Aur</i> , "town" or "camp."	<i>Tama</i> , "building."
<i>Kur</i> , "mountain."	<i>Shar</i> , "wood."
<i>Tsat</i> , "mountain."	<i>Mur</i> , "town."†
<i>Nat</i> , "mountain."?	<i>Ta</i> , "height."
<i>Ma</i> , "earth," "home."	<i>Pap</i> , "father."
<i>Ata</i> , "chief" or "father."	<i>Ler</i> or <i>Lel</i> , "chief."‡
<i>Khat</i> , "Hittite."	<i>Kep</i> , ? "hill."
<i>Nir</i> , "ruler."	<i>Suk</i> , "swamp."
<i>Sak</i> , "top," "head." §	<i>Shaua</i> , "stream."?
<i>Su</i> , "stream."	<i>Ret</i> (? <i>Lat</i> ) "hill"?
<i>Akar</i> , "field."	<i>Bu</i> ?, "lake," "pool" (or "high.")
<i>Nap</i> , "sun," "god."	<i>Bet</i> , "fortress."
<i>Kat</i> , "house," "place." ¶	<i>Tsen</i> ? "plain," "desert."

\* No. 187, *Tep-kenna*, "hill enclosed."

† In Mongolian we have *muren*, "river," probably the Turkic *ur*, "to flow," Khitan *murru*.

‡ Akkadian *lala* ("dominateur," Lenormant), Hunnic *luli*, still used in India for a village chief. The Etruscan *lar*, "chief."

§ In No. 156, Amarsaki ("round top").

|| No. 264, *Akar-Shaua*. Akkadian and Etruscan *Aker*.

¶ In No. 249, *Katasha*. Medic *Kat*, "place." The word is also Aryan for cot, cottage, &c., unless this be Semitic (for *Kadesh*).

We have also the genitive *na*, the adjective *a* and *i*, and the dative or locative *ta*, while the grammatical structure of the names is that of the Turanian languages. More than forty Hittite words are thus, I believe, recoverable from town names.

We may next turn to the names of the Hittite chiefs known to the Egyptians, which are to be analysed, I believe, as follows, taking the names from Chabas' list, which shows the original hieroglyphics:—

(1) *Tartesepeu* contains the well-known word *esebu*, "chief," as in Akkadian, preceded by *tar-t*. *Tar* or *tur* is a Turkic word for chief, and the *t* may be a case ending. It frequently is incorporated in names of the present class.

(2) *Peis* appears to be the Turkic *bis* or *pis*, for a leader or chief, which is perhaps the Akkadian *pis*, rendered "hero."

(3) *Kalbatus* gives us an adjective, prefixed as usual in the Turkic languages, namely, *khal*, *kal* or *gal*, "great"; also known in Akkadian (*gal*) and in Susian (*khal*). *Batus* is apparently the Turkic *batis* for a prince or chief. The adjective in living Turanian speech precedes the noun in most languages. In Medic and Akkadian it usually follows, but in the older of these tongues,—the Akkadian,—there are exceptions (see Lenormant, *Magic*, p. 285), just as in Medic and Akkadian there are certainly two positions for the genitive.

(4) *Samaritas*. The ending *tas* appears to be connected with the Akkadian *tassi*, *tis*, and *tassak*, meaning a warrior or a king, according to Lenormant, and with the Turkic *tös*, "to rule" or "direct." The first part is less evident, perhaps from *zum*, "to destroy," *sumar*, "to throw down," or perhaps from the Turkic *som*, "strong."

(5) *Titar*, probably the Akkadian *ditar*, "judge." In Chinese *ti* means "judge." The name may be read, however, *tisetar*. (See Nos. 1 and 4.)

(6) *Khalep-sar*, "ruler of Aleppo." The word *sar* occurs in Akkadian, and in Turkic languages it is well known as *tsar* for a ruler. This name, therefore, like No. 3, gives a valuable indication of the grammar of the language. If the words were Semitic, we should have *sar kheleb*, and could not possibly have *kheleb sar*.

(7) *Tarkatasas*. The first word is a very widely-spread term for chief, occurring all over Asia Minor and in Etruria in the forms *tarkon* and *tarku*, or *tarkan* and *tarka*. It seems clearly to be the Turkic *tarkhan* or *torgan*, a word for the chief of a tribe, found also in the old Mongol dialect called Buriat as *darga* or *dargo*. *Tasas* appears to be as in No. 4,

but with a final "s," which also occurs in Akkadian and in many other dialects of Western Asia as the end of personal names.

(8) *Lab sunna*. The first word is common in Turkic languages, meaning "good," "brave," "hero," &c. *Sun* may be the Akkadian *sun* for "battle," or perhaps the Medic *sanu*, Turkish *san*—"noble," "powerful," so that the meaning would be "hero of battle," the final *na* being the genitive sign common in all these languages.

(9) *Kamais* suggests the name of Chemosh, which is possibly non-Semitic. Gesenius thought it meant "subduer," which agrees with the Turanian root *kam* or *gam*, "to bend," here found with the personal ending in "s." Possibly, however, the word comes from the Akkadian *Kam* (also a Turkic word) "priest."

(10) *Tarkan nas*. The first part is as in No. 7, a common Turkic word. *Nas* may be compared with the Susian *nazi*, the Akkadian *nazi* or *nis* for "king," which was also used in Hebrew, probably as a loan word.

(11) *Matz rima* or *Mas lima*. This is obscure, though we have *mash*, "soldier," in Akkadian, and *mas* as a form of *bas*, "chief," in Turkic languages. *Lim* in Akkadian is said to mean "front," so that the name may signify a "leader."

(12) *To tar*. The second part, *tar*, we have seen to mean "chief" (No. 1). The first part may be compared with *ta*, "powerful," "high," "great," in some Turanian languages, as, for instance, in Susian, a dialect of Medic, and in Chinese. This is probably the meaning of the name of T'au or T'ai (*Tou* or *Toi*), King of Hamath in David's time, according to the Bible, for which, as a Semitic word, only the meaning "wandering" is obtainable.

(13) *Tsuatsasi* or *Tuatase*. This may mean "strong master," from the Turkic *tot*, *tat*, meaning "strong," and the common Turanian *as*, *asi*, "master," but in Ugric speech we have *susi* for "wolf" (Donner, i. p. 177), and many Altaic tribes claimed descent from wolves. A tribe of Zuzim is mentioned in Assyrian records.

(14) *Khetasar*, "Lord of the Hittites." See what is said of No. 6.

(15) *Maura sar*. See the preceding. Perhaps the first part stands for *murru*, "city."

(16) *Sapa lala*. The word *lala* has already been mentioned as meaning "chief." *Sap* is less evident. It was the name of a Chaldæan deity, and is probably the Philistine *Saph*. There are several roots to which it might be referred.

(17) *Mautenar*.

From this inspection we see that the same key which explains the geographical names also explains the personal names of the Hittites. They appear to be appellations rather than names, just as the Persians or the Chinese took special names when succeeding to the throne. Compare also the title Pharaoh in Egypt.

Four kings of the Hittites are mentioned in cuneiform records. Taking the transliteration given by Schrader, we find them to be—

(18) *Irkhulin* or *Irkhulini*, King of Hamath. This is probably the Turkic *er*, "man," and *khalin*, "strong," "big." It thus answers to the Akkadian *irkalla* or *urugal*, "hero," the Etruscan *erle*, the Greek Herakles, and Latin Hercules, names for which no Aryan etymology is found.

(19) *Sangar*, King of Karchemish. Perhaps from the Turkic *san*, *sang*, "noble," Medic *sanu*, "powerful," an adjective preceding the noun *ar* or *er*, "man"—"the nobleman." The termination of nouns in *r* is common in Akkadian and in Turkic dialects.

(20) *Pisiris*. This appears to come from the Turkic root *pis* or *bis*, whence *bajar* or *bisir*, "a rich man," "the great," or "wealthy."

(21) *Iniel*, probably, is to be compared with the Turkic *yinil*, meaning "victorious."

This sort of investigation may be carried into the languages of all the non-Semitic, non-Aryan tribes defeated by the Assyrians, between Media and Syria, with the same results. Professor Sayce has already pointed out that the nomenclature is of the same character found in Syria, but he has not attempted to compare with living languages.

We, therefore, have, in addition to our previous words, the following Hittite terms:—

<i>Tar</i> , "chief."	<i>Tarka</i> , <i>Tarkan</i> , "chief."
<i>Esebu</i> , "prince."	<i>Pis</i> , "leader."
<i>Kal</i> , "great."	<i>Batus</i> , "chief."
<i>Tas</i> , "leader" (?).	<i>Titar</i> , "judge."
<i>Sar</i> , "lord."	<i>Lab</i> , "bravo."
<i>Nas</i> , "king."	<i>San</i> , "noble."
<i>Pisir</i> , "magnate."	<i>Iniel</i> , "victorious."

This gives us sixty words in all, in addition to grammatical particles,—words, let us remember, of the Canaanite language almost as early as the days of Abraham.

This result fully agrees with the Old Testament account of the sons of Ham. The names Anak, Ephron, Mamre, and



others belonging to Hittite chiefs, Agag among Amalekites, Goliath, Akish, Phicol, and others, among Philistines, do not appear to be Semitic words; but,—which is even more interesting,—there are many words in Hebrew (fifty or sixty, at least) which seem to be borrowed from the old Turanian languages, just as the Assyrian borrows from Akkadian, showing us probably a Turanian element in Palestine as well as in Chaldea. The same is to be noticed in Phœnician, where the names of many of the gods which scholars have been unable to explain are clearly referable to the same Turanian origin.\*

Since then we have clear evidence of a Turanian population in Syria and in Asia Minor, we may apply these languages of the Turkic stock to the interpretation of the ancient hieroglyphic texts in those countries which are neither cuneiform nor Egyptian in character. These hieroglyphics have been found on five stones at Hamath, and at Aleppo, on monuments from various other parts of Asia Minor and Syria, on a bowl from Babylon, and on seals from various places.

Comparative tables from these sources, which I have drawn up, show that this hieroglyphic system consisted of about 120 characters, of which a certain number, about 50 in all, are very common and often repeated, and the rest more rare. It cannot therefore be an alphabet with which we have to deal; it must be a system like other hieroglyphic systems, in which the pictures represent words or syllables.

Now it is generally agreed among those who have studied the subject, that the syllabary of Western Asia, which was deciphered by George Smith, represents the later forms of the hieroglyphics with which we have to deal, and as this syllabary includes 54 sounds, and nearly 60 emblems, we should be able from it to recover sounds for half the emblems of the old, so-called, Hittite hieroglyphics.

It appeared to me, in the first place, necessary to try whether these sounds could be applied to the languages which we have already discussed. Secondly, to analyse carefully the combinations of these sounds; and, thirdly, to compare the forms of the hieroglyphs with those in other systems, such as the oldest Chinese, the oldest cuneiform, and the Egyptian. This has been a work of much labour and of long time, but the result shows that it was worth research. As regards the sounds, taking them from the syllabary, we obtain the common grammatical forms of Turkic languages; *li* for the adjective, *a* for the participle, *ek* for the person, *mek* for

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\* For details see my paper on the pre-Semitic element in Phœnicia, *Archæological Review*, April, 1888.

the verb, *me* for the plural,—as in Akkadian and Medic, *mu*; *na*, *su* for the three pronouns, *ka*, *ta*, *sa*, *na* for the case endings. We find the arrangement of the sentences to be in “packets,” as in agglutinative speech; and the vertical arrangement of the words is exactly the same as in the oldest Akkadian texts.

The comparison with other hieroglyphic systems gives us the probable meaning of many of the emblems, such as the star for deity (as in Egyptian, and Akkadian cuneiform); the foot for come and for the passive voice (as in cuneiform); the legs for “run,” as in Chinese, Egyptian, and cuneiform; the hand grasping for “take,” as in cuneiform, and Egyptian and Chinese; the hand raised for another verb, as in cuneiform; the hand to the mouth for supplication, as in Egyptian. While using these comparisons to assist in understanding the Hittite, I do not mean to say that Hittite is the same as either of the other systems. The differences are very great, and the grammatical signs are quite different, excepting that a series of strokes represents the plural in Egyptian and cuneiform as well as in Hittite. At the same time, I see no impossibility in Chinese, cuneiform, and perhaps Egyptian, having all originated in an old Asiatic picture writing of a very primitive character, to which in some respects (such as the absence of determinatives, of included emblems and of compounds) the Hittite seems probably to approximate nearest.

The translations which (tentative though they are) I have proposed for some of the texts, not only depend on this detailed examination of every emblem, but are also in accordance with the grammatical structure of the ancient Turanian languages. There is, as far as I know, nothing arbitrary in the value which I have assigned to any emblem; in each case the proposal rests on comparative evidence. Out of the 120 emblems, I have, I believe, recovered the sound in 50 cases; and the meaning in about 30 more; while, to the 60 words already mentioned as recovered from the monuments as Hittite words, we may add about 50 more, the sound of which is recovered from the hieroglyphic texts, giving us more than 100 Hittite words in all.

As regards the method of reading, it is exactly the same as in the early Akkadian texts. The syllables of each word stand in a vertical column in the line, or when the word is a long one it may occupy two columns. The only difference is that in Akkadian all the lines read from right to left, but in Hittite, as a rule, as in early Greek texts, the alternate lines read from left to right. I have appended to this paper a list of Hittite emblems in two plates. In the first the sound is,

I believe, recoverable, but in the second plate it is only possible (in thirty cases), to judge the meaning by comparison with the use of similar emblems in other hieroglyphic systems.

As regards the subjects of the various texts, I have only to say that I approached the question with an open mind; and, indeed, much hoped to find them to be historical, yet the probabilities are all the other way. I therefore now believe the texts to be religious and not historical, and this has indeed been already admitted in some cases. Thus the sculptures described by Perrot in Cappadocia clearly represent deities. At Ibreez, on the south side of Asia Minor, a monument with such inscription represents a person adoring a gigantic figure with bull-horned head. The bowl from Babylon, no doubt like many other bowls of later date from the same district, has a charm written upon it, and the reason in other cases for supposing the subjects to be non-historical is the frequent appearance of what have been recognised by Dr. Sayce and by others to be names of deities. In Akkadian we have no early historic texts; those which are known are either invocations of deities, or records of gifts to temples, and we have numerous Akkadian magic texts on cuneiform bricks, but no annals. Historic texts belong to the Semitic period, at least 1000 years later than the period under consideration.

In Egypt, in like manner, the religious literature of the monuments is enormous as compared with the fewer and later historical materials. In Etruria, our information as to the language is derived from tomb texts and from ex votos on little figures like those still hung in Roman Catholic churches. In Greece we have many such dedications, and generally speaking the idea of monumental records of history is not a primitive idea. The earliest effort of savages are directed in great measure to the production of written talismans.

The difficulty of reading the Hittite is greatly decreased by the discovery of the character of the language spoken by the non-Semitic population. As long, however, as we have no bi-linguals, great doubts must exist in the details. Cuneiform is as yet the only character read first without bi-linguals, because in Persian cuneiform the characters are comparatively few, and the treatment of the cypher was thus easier. But no ancient language has been ever understood save by comparison with other languages, and no other method can be anything but arbitrary and unconvincing. In Hittite, as I have shown, we have some 50 out of 120 sounds. We have the position of the emblem to consider,—that is, in other

words, its cypher value,—and we have the comparison of picture value with that of the same emblem in other systems. The texts read in lines alternately from right to left, and left to right, and the words read *vertically* in syllables in the line. These are for the most part accepted facts, and furnish a fair basis for decipherment.

There is in existence a short bi-lingual of six syllables, as pointed out in 1880 by Professor Sayce. It has been called a forgery, but this is a very usual cry when anything hard to decipher is found. Forgers do not invent; they only copy; and when this silver boss with bi-lingual was found the Hittite system was still unknown. The bi-lingual has on it the Assyrian legend, *Tarku timme sar mat Erme*, "Tarkutimme king of the land Erme," according to Mr. Pinches' translation.

The six hieroglyphics may be discussed as follows, according to my decipherment:—

(1) A deer's head. In Akkadian we have *dara* and *darag* for the "deer," Assyrian *turakhu*; but *turakhu* does not seem to be a Semitic word for any species of deer, and is probably (as is so often the case in Assyrian) a loan word from Akkadian, perhaps to be connected with *turgun*, "swift," in Buriat Mongol. It is hardly necessary to remark that this word *Tarku* is that which has already been explained in treating of the names of Tarkatasas and Tarkannas.

(2) The second emblem, somewhat like a conch shell, should have the value *timme* or *dim*. I find that the shape is almost exactly the same as that of the original emblem in Akkadian cuneiform, which has the value *dim*.

(3) A high cone or conical cap, such as is worn by the Cappadocian deities. Professor Sayce sees in this the emblem for "king," and has compared its shape with that of the Cypriote syllable *ko*. *Ko* then should mean king, and so it does in Medic, according to Norris and Lenormant, and in Akkadian, according to Lenormant, Bertin and Pinches. In Turkic speech *ege* means "a lord," and in Manchu Tartar *chu* has the same meaning.\*

(4) A double cone. Professor Sayce saw in this the

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\* In the Akkadian syllabaries the emblem commonly used with the sound *cu* is compared with the Assyrian *bilu*, "a lord," and *rubu*, "a prince" (see Sayce's *Assyrian Grammar*, No. 462). In Akkadian the same emblem has also the sounds, *Khun* (the Turkic *Kan* or *Khan*, "Prince"), and *dur* or *tur* (Turkic *tore*, "chief"). The word *koza* or *kocha* for "lord" or "chief" (Akkadian *kusa*, "chief") used in several Turkic dialects is apparently from the same root.

emblem of country, and this is probable, because it is very like the emblems used for country or mountain in Egyptian in the earliest cuneiform and in Chinese. I also found this emblem to be exactly like the Cypriote syllable *mi* or *me*. Now in Akkadian *ma* means "country," according to Lenormant, Delitzsch, Bertin, and Pinches; and besides this the word *ma*, *me*, or *mu*, means "earth," "land," "home," in several yet living Turanian languages.

(5) Would stand evidently for *er*, but the meaning of the sign is doubtful pictorially.

(6) A series of four strokes. It must have the value *me*, which in Medic, and in Akkadian too, is the plural. Now in Egypt three strokes stand for the plural, and in cuneiform the plural sign seems originally to have been a series of strokes. We thus obtain a very valuable sign to aid us in deciphering other Hittite texts.

The hieroglyphs therefore read :—

(1)	(2)	(3)	(4)	(5)	(6)
Tarku -	dim -	ku -	ma -	Er -	me.
Tarku -	dim	king	land	Er -	me.

Tarkudim is probably a personal name, like the later Tarkondimotos, as Professor Sayce has pointed out.

The fact that the bi-lingual can be read by aid of the Turanian languages is a very strong argument in favour of the correctness of the system, but it is not stronger than that afforded by the recovery of 100 words (as already explained), because no amount of ingenuity could lead to such a result were the language not really that supposed.

We may now turn attention to the seals and cylinders from Asia Minor and elsewhere which belong to the same civilisation. These cylinders are supposed to have been worn as charms, as were also the seal-rings, and they generally present mythological subjects, winged figures, bull-headed genii, hawk-headed, ram-headed, lion-headed gods, and demons represented as mythical monsters. The first thing which is noted in looking at the dozen seals and cylinders recovered as yet in Asia Minor is that in character they are exactly like the Akkadian cylinders brought from Babylonia, and we now see why, since the race and civilisation were the same or very closely similar.

A seal has been published which I also find to throw much light on the Hittite, though it has only three emblems upon it. The first is a star, beneath this a lozenge, and beneath this an eagle. The star is the old cuneiform for "god" (*an*),

the lozenge is the old cuneiform for "sun" (*ut* or *tam*), and we have here the name of a god, which is a dissyllable beginning probably *Tam*. This suggests the name *Tam-zi* or *Tam-ez*, which was the Akkadian form of *Tammuz*, and the eagle should be *zi* or *ez*. In Assyrian mythology we find that *Zi* was the name of a deity who took the form of a bird, and in Turkic speech *is* means to fly or flutter. Here, then, we have the name of *Tammuz* on a seal; but it is yet more interesting to find this same group,—the sign for deity, the sun, and the eagle beneath,—frequent on the Hittite texts; for we thus learn that *Tammuz*, mentioned as a Canaanite idol in the Bible, and well known to be the Phœnician *Adonis*, was worshipped by the Hittites and by the Akkadians as well.

It would take too long to diverge on the subject of these seal cylinders, concerning which I have written a detailed paper.\* On many of them there are emblems,—apparently the names of the deities represented,—which are clearly the same found on the Hittite texts. One of these is the goat's head (*tar* or *tarku*), and another is the bird (*zi*). We know that there was an Asia Minor deity called *Tar* or *Tarku*, and we know of a deity called *Zi*, and here we find them represented on cylinders from Asia Minor, on which also we find gods whose emblems are the ass, the lion, the dove, &c., &c.

There is one other point to be considered. The Egyptians sometimes classed all the inhabitants of Northern Syria as *Kheta* or Hittites. The Assyrians spoke, down to 700 B.C., even of the Philistine city of *Ashdod* as a "city of the Hittites." They must have been a very important tribe, and we should expect the name to have survived late. Now I find that it did so survive to the thirteenth century A.D., and that there are perhaps still a few Hittites living. Not only so, but they are a Mongolian people with a language akin to Mongol and Turkic dialects. The Mongols still apply the name *Khitai* to the Chinese, and it is this which originates the familiar mediæval term *Cathay*. There were *Khitai* living in Northern Mongolia, near Lake *Baikal*, and known to the early Chinese geographers. There were other *Khitai* living in the very centre of *Turkestan*, even as early as the days of the geographer *Ptolemy*. They became a famous people under their early chiefs, and under *Prester John*. They invaded *China*, and brought with them a considerable civilisation, including the arts of drawing and writing. Their power at

\* Quarterly Statement, Palestine Exploration Fund, Oct., 1888.

one time extended over all the regions north of the Oxus, and was only destroyed by Genghiz Khan and the Mongols from further north. In these Khitai I believe we see an eastern division of the same people known to the Egyptians and Assyrians as *Kheta* or *Khatti*, and called *Heth* in the Bible. At the present day a few survivors still remain of the once powerful Khitai both in the region near Lake Baikal, and in Turkestan south of the Chu River. In Asia Minor and Syria the Turkic and Turkoman population, though historically known to have been often recruited from Bactria, still presents to us, as of old, the Turanian population side by side with the Semitic and the Aryan.

I would say a few words (in confirmation of my results) concerning the old languages of Lydia and Caria in Asia Minor. These must, as we have seen, have been akin to the Hittite language (as is indeed very generally allowed), and a few words have been preserved for us by classic writers as follows:—

*Carian Words.*

(1) *Kos*, a sheep. In Turkish *kozi* is a "lamb"; in Buriat Mongol *kozi* is a "ram." In the language of the Kirghiz, *koi* is "sheep," which in Turkish is *koyun*; Hungarian, *kos*, "ram."

(2) *Taba*, a rock. In Ziririanian (a Ugric language) *düb* is a "ridge," and in Turkish languages *tapa*, *tepe*, means a "knoll," or "mound," or "hill."

(3) *Gela*, king. Apparently from the Turkic root *kal*, "to be great" (Akkadian *gal*), whence comes the Tartar *khalga*, a "lord."

(4) *Soua*, a tomb. This has been compared, by Dr. Isaac Taylor, with the Etruscan *su* or *suthi*, which appears to mean a tomb, Etruscan being a language of the same type.

(5) *Glous*, a robber. This seems to be explained by the Mongol (Buriat) root *kulu*, "to steal."

(6) *Ala*, a horse. Compare the Hungarian *lo*, "horse," and Chinese *lu*, "donkey." In Turkic languages (which avoid the *l*) it becomes *at*, "horse," and the Carian is here nearer to the Ugric speech.

(7) *Tumnia*, a rod. Apparently from the common Turanian root *tum*, *tub*, "to strike."

(8) *Kakkabē*, "a horse's head," from *kak*, or *sak*, a word of Finnic speech for "top" or "head" (as in Akkadian *sak*, "head") and *kabe*, apparently the Ugric *hebo*, akin to the Greek word for a horse.

To this list a great many other words might be added, derived, as in the case of the Hittite names given already, from the known personal and geographical names of the region; but it is safer to confine ourselves to words of known meaning. The Carian *Kalabotes* compares with the Hittite *galbatus*, and *Gugos* with the Lydian *Gygēs* and the Biblical *Gog*; while the Carian alphabet contains letters recognised as derived from the old Syrian hieroglyphics.

### *Lydian Words.*

Many words so-called by the classical writers appear to be Aryan, but some which cannot be so explained are clearly of the same stamp with the Carian.

(1) *Lailas*, a tyrant. This has already been found in the Hittite name lists as *lel*, and in Akkadian as *lala*, "ruler." Hunnic *luli*, "chief."

(2) *Targanon*, a branch. This is best explained, perhaps, by the Esthonian *targan*, "to sprout out."

(3) *Sardin*, a year. Compare the Medic *sarak*, "time," and the Turkish *sal* for "year." In Mongolian *sara* means "a month."

(4) *Mōus*, "the earth." Compare the Hungarian *mezo* and Esthonian *meisa*, "earth," "land."

There is a great deal more evidence of the same kind which can be produced showing that the old speech of Asia Minor, like the Etruscan, the Akkadian, and the Medic is to be explained by aid of Tartar and Ugric languages of the present day, but the clear cases here given may perhaps be considered sufficient demonstration. In vain have scholars attempted, by aid of Aryan and Semitic languages, to explain words which are so clearly Turanian.\*

In conclusion, I would say a few words as to the civilisation of the dominant Canaanites of Turanian race, comparing the results obtained from the monuments with the Old Testament. From the monuments we know—

- (1) The Hittites lived in walled towns.
- (2) They had carved representations of the gods.
- (3) They adored Tammuz, and Ashtoreth, and Set.
- (4) They could write on stone and on metal.

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\* Medic has long been known to be nearest to Turkic speech (as Dr. Oppert discovered). Akkadian was thought by Lenormant to be nearer the Finnic, but Dr. Hommel is clearly correct in placing it nearer to Turkic and Mongolian.



- (5) They had chariots and horses.
- (6) They married out of their own tribe.
- (7) They entered into alliance with Egypt.
- (8) They were of Turanian race, and probably, therefore, not circumcised, as that is not a common Turanian custom.
- (9) They had riches of gold, silver, and bronze.

From the Bible, on the other hand, we learn—

- (1) The Canaanites lived in cities “walled up to heaven.”
- (2) They made likenesses of idols, which Israel was to destroy, and no such sculptures have been found between Dan and Beersheba, though they occur in Phœnicia and Northern Syria.
- (3) The Canaanites adored Tammuz and Ashtoreth.
- (4) Letters are mentioned in David’s time, and writing in the time of Moses, but nothing, as far as I know, about Canaanite literature, except that some think Kirjath Sepher means “Book town.”
- (5) The Canaanites had horses, and chariots of iron. Note that the Canaanite chariots are said by Thothmes III. to have been plated with silver, as were Roman chariots.
- (6) Esau married Hittite wives, David and Solomon did the same, so did Rameses II.
- (7) Egypt was the enemy of Israel, and Israel was the enemy of the Canaanites.
- (8) The Canaanites were sons of Ham, and they were uncircumcised.
- (9) Great riches are mentioned as found by the Hebrews when they attacked the Canaanites.

This comparison of the Bible and the monuments is capable of being greatly extended, but the present paper has already extended far enough.
















































































To sum up, we have seen, 1st, that the monumental nomenclature of the Hittite country and of the Hittite chiefs is Tartar; 2nd, that the sounds of the Hittite language on the Syrian monuments are Tartar; 3rd, that the only known bi-lingual gives a Tartar-Ugric language; 4th, that the old languages of Caria and Lydia are Tartar-Ugric; 5th, that the Hittite language and art and hieroglyphic characters compare with the Medic and the Akkadian; 6th, that the subject of most (and I believe of all) the known Hittite texts is religious or magical; 7th, that all these facts agree with the Old Testament accounts of the Canaanites.

I think this subject is not only one of the newest, but one

of the most important archæological subjects that have of late been studied. It opens to us a new chapter in history, not a "forgotten empire," but the diffusion of a race known to all the ancients, and of languages equally familiar, though till lately not recognised because the comparative method had not been sufficiently applied.

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## PLATE 1.

	Hittite.	Cypriote.		Hittite.	Cypriote.		Hittite.	Cypriote.
1		 <i>an</i>	18		 <i>po</i>	35		 <i>ya, a</i>
2		 <i>en</i>	19		 <i>pu</i>	36		 <i>ye</i>
3		 <i>u</i>	20		 <i>le</i>	37		 <i>sa</i>
4		 <i>u</i>	21		 <i>lo, h</i>	38		 <i>se</i>
5		 <i>ka</i>	22		 <i>lu</i>	39		 <i>si</i>
6		 <i>ke</i>	23		 <i>ra</i>	40		 <i>su</i>
7		 <i>ke</i>	24		 <i>re</i>	41		 <i>zo</i>
8		 <i>ka</i>	25		 <i>re</i>	42		 <i>no?</i>
9		 <i>ko</i>	26		 <i>ri</i>	43		 <i>vo</i>
10		 <i>ku</i>	27		 <i>ma</i>	44		 <i>u, o</i>
11		 <i>ta</i>	28		 <i>ma</i>	45		 <i>u?</i>
12		 <i>te</i>	29		 <i>me</i>	46		<i>me</i>
13		 <i>ti</i>	30		 <i>me, mi</i>	47		<i>dim</i>
14		 <i>to</i>	31		 <i>mo</i>	48		<i>dar</i>
15		 <i>pa</i>	32		 <i>ne</i>	49		<i>er</i>
16		 <i>pe</i>	33		 <i>ni</i>	50		<i>zi?</i>
17		 <i>(pi, th</i>	34		 <i>mu, no</i>	51		<i>du?</i>

## NOTES IN EXPLANATION OF THE PLATES.

## PLATE I.

*Hittite Emblems of known Sound.*

No. 1. A star. Cypriote *a*, *an*. Compare cuneiform and Egyptian star, for "deity"; Akkadian and Etruscan *an*, "god"; Turkish *ana*, "saint."

No. 2. A throne. Compare cuneiform throne for *enu*, "lord"; Cypriote *e*, *en*.

No. 3. A fleur-de-lis. Cypriote *u*, appears to be used phonetically.

No. 4. A crook. Cypriote *u*, appears to be phonetic.

No. 5. Cypriote *ka*, used phonetically as a case suffix; Akkadian *ku*, Mongol *aha*, Jacut *gha*, post-position of ablative case.

No. 6. Cypriote *ke*, used phonetically, prefixed and affixed; Akkadian and Turkic *k* for personal affix and prefix.

No. 7. Apparently a key. Cypriote *ke*. Compare the cuneiform emblem *ik*, "to open," used, apparently, as a phonetic equivalent to the last.

No. 8. Apparently a crook. Cypriote *ka*, used as a prefix phonetically. Akkadian *ga*, Jacut *cha*, exclamation.

No. 9. A tiara. Cypriote *ko*; Akkadian *ku*, "prince"; Manchu *chu*, "lord."

No. 10. Another tiara, apparently a variant of No. 9.

No. 11. Hand and stick. Cypriote *ta*, apparently a causative prefix, like the Egyptian determinative; Chinese *ta*, "beat."

No. 12. An herb. Cypriote *te*, Akkadian *ti*, "live"; Turkish *it*, "sprout"; *ot*, "herb"; used, perhaps, as a phonetic.

No. 13. Apparently an arrow. Cypriote *ti*, used phonetically as prefix and suffix. Compare Medic prefix *id*, Akkadian and Etruscan suffix *ta* and *eth*.

No. 14. The hand grasping. Cypriote *to*. Compare the Egyptian cuneiform and Chinese signs for "touch," "take," "have." Akkadian *tu* "have."

No. 15. Apparently a branch. Cypriote *pa*. Compare Akkadian *pa*, "stick" (Lenormant).

No. 16. A vase. Cypriote *pe*, used phonetically. Akkadian *bi*, a cup.

No. 17. A suffix, probably of case. May be the Cypriote *pi*, or Carian *th*. It resembles the Chinese sign for division.

No. 18. A crook (the reversed way to No. 8 in all cases). Cypriote *po*; Tartar *boy*, "bend"; used, apparently, as a phonetic, perhaps for the demonstrative (Turkish *bu*, "this").

No. 19. Apparently a flower. Cypriote *pu*. Compare the Akkadian emblem *pa*, apparently a flower. Akkadian *pu*, "long"; Tartar *boy*, "long," "growth," "grass"; Hungarian *fu*, "herb." Perhaps used as a phonetic.

No. 20. Bull's head. Cypriote *le*, Akkadian *le* or *lu*, "bull."

No. 21. A cross. Cypriote *lo*, Carian *h*.

No. 22. A yoke. Cypriote *lo* and *le*; Akkadian *lu*, "yoke." Used phonetically for the adjective suffix (Turkish *lu* and *li*).

No. 23. A very common luck-mark. Cypriote *ra*. Found in Phœnicia, &c., as well as in Hittite.

No. 24. Probably represents rain. Compare the Egyptian, Akkadian, and Chinese emblems for "rain," "storm," "darkness." Perhaps used phonetically. Cypriote *re*. See Akkadian *ri*, "flow"; Turkic *ir*, *ur*, "flow."

No. 25 seems to represent drops of water equivalent to the last. Only known once. Cypriote *re*.

No. 26. Possibly the "fire-stick." Cypriote *ri*. Occurs as the name of a deity. Akkadian *ri*, "bright," the name of a deity.

No. 27. *Ma* in Cypriote. Perhaps a crown.

No. 28. *Ma* or *gon* in Cypriote. A hand with sceptre.

No. 29. *Me* in Cypriote. A much conventionalised emblem, used phonetically as a verb suffix. Akkadian *me*, "be." Turkish *am*, *em*, "existing."

No. 30. Two mountains. Cypriote *me* or *mi*. The emblem for "country." See what is said in the text of this paper.

No. 31 resembles the cuneiform sign for "female." Used apparently for the first pronoun. Cypriote *mo*. Akkadian *mu*. Common to many Turanian languages for "I," "me," "my."

No. 32. Cypriote *ne*. Used phonetically as prefix and suffix for the third pronoun and genitive, as in many Turkic languages, and in Akkadian, Medic, &c. This is the commonest Hittite sign, and its identification is very important.

No. 33. *Ni* in Cypriote. This is the hieratic form of the emblem usually beginning Hittite texts at Hamath. Medic *na*, "say"; Akkadian *en*, "prayer"; Jacut *un*, "ask."

No. 34. This is the sign of opposition in cuneiform, in Chinese, and in Egyptian. Cypriote *mu* or *no* (*nu*, "not").

No. 35. A pot. Cypriote *a* or *ya*. Compare the Ak-

kadian *a*, "water." It is used in some cases phonetically for the participle, as in Akkadian, &c.

No. 36. A snake. Perhaps the Cypriote *ye*.

No. 37. Apparently a sickle. Cypriote *sa*. Compare the Tartar *sa, se*, "knife." It is used phonetically as a suffix, perhaps the Akkadian *sa*, "with" or "in."

No. 38. The open hand. Cypriote *se*. Akkadian *sa*, "give." Tartar *saa*, "take."

No. 39. Supposed to be the emblem of deity,—a prefix; probably the Cypriote *si*. Perhaps a conventionalised eye (Akkadian *si*, Medic *siya*, "to see"). Compare the common Turanian *es* or *is*, for a deity.

No. 40. Perhaps the Cypriote *su*. Only occurs four times.

No. 41. Resembles the cuneiform and Chinese emblem for "breath," "wind," "spirit." Cypriote *zo* or *ze*. Occurs as the name of a god. Akkadian *zi*, "spirit."

No. 42. A prefix. The Cypriote emblem has the sound *no* or *os*. Probably the second pronoun, as in Akkadian, &c.

No. 43. Used as a verb root. Perhaps the Cypriote *vo*. It seems to mean "word" or "speak." Akkadian *gu* and *mu* (or *vu*).

No. 44. Resembles the Chinese cuneiform and Egyptian emblem for heaven. Akkadian *u*. It may be compared with the Carian letter *u* or *o*.

No. 45. The Lycian *u* resembles this sign, which is apparently phonetic, and perhaps a conjunction (Akkadian *u*, Turkish *u*). In Lycian, such a sign is used also as a stop.

No. 46 has the value *me* on the bi-lingual. See what has been said in the text of this paper. It seems to be the plural, as in other systems.

No. 47. *Dim* on the bi-lingual. Resembles the cuneiform emblem *dim*.

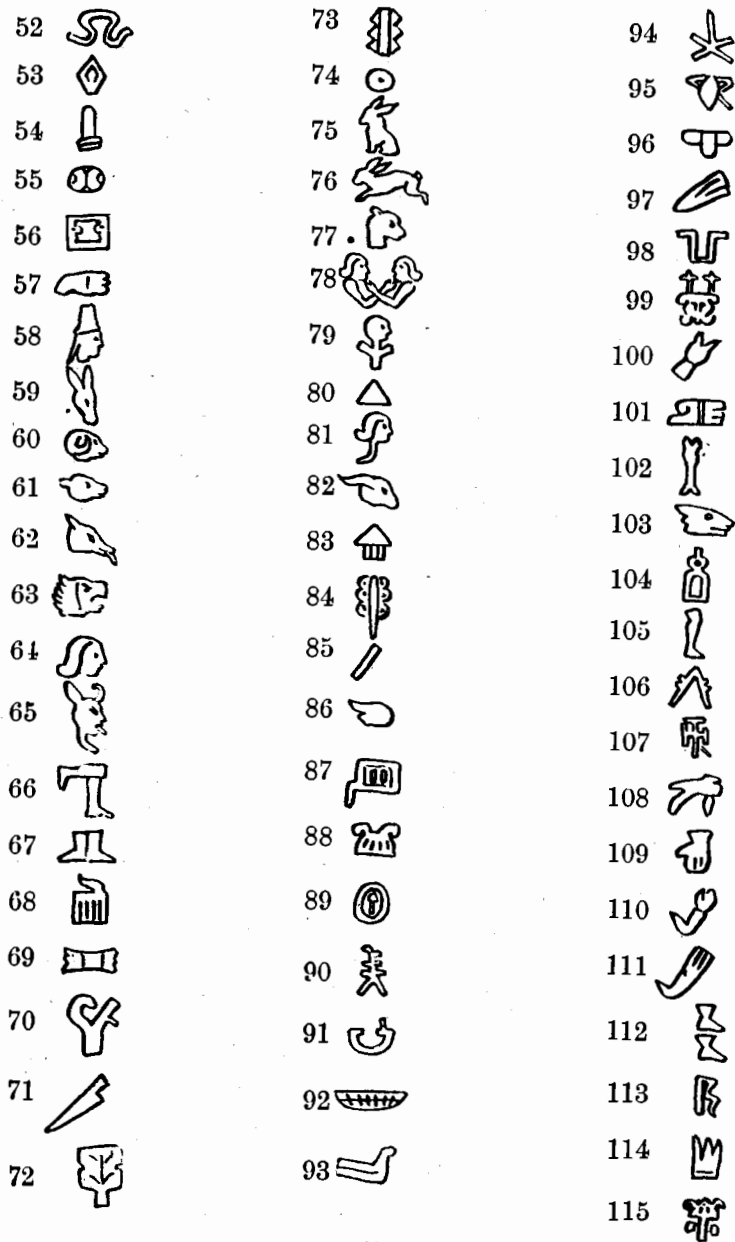
No. 48. The deer's head. *Tar* or *tarku* on the bi-lingual. See what is said in the text.

No. 49. *Er* on the bi-lingual. Apparently a phonetic in other texts with the value *ra*, as in the Akkadian and Medic particle "to."

No. 50. An eagle. Appears to have the sound *zi*, as explained in the text.

No. 51. The foot, used, evidently, as a verb, and resembles the cuneiform *du*. Probably may be sounded as in Akkadian and used for the passive (*du*, "come" or "become").

## PLATE 2.



## PLATE II.

*Hittite Emblems of uncertain Sound.*

- No. 52. A serpent. Occurs in the name of a god.
- No. 53. Perhaps a monument. It recalls the Cypriote *ro*.
- No. 54. Apparently a monument.
- No. 55. Probably the sun (*ud* or *tam*) as explained in the text.
- No. 56. Apparently a house.
- No. 57. Perhaps the sole of the foot.
- No. 58. A king's head with a pig-tail.
- No. 59. A donkey's head. Probably the god Set.
- No. 60. A ram's head. Probably with the sound *gug* or or *guch* and the meaning "fierce" "mighty."
- No. 61. A sheep's head. Probably *lu* or *udu*.
- No. 62. A dog or fox head. Only occurs once.
- No. 63. A lion's head. Only on seals.
- No. 64. The human head. Probably *sak*, and appears to be a phonetic.
- No. 65. A demon's head. Used specially in a text which seems to be a magic charm. (Jerabis, No. 3.)
- No. 66. Two legs. Resembles the cuneiform *dhu*, and means probably "go" or "run."
- No. 67. Two feet. Probably "stand"; or "send," as in Chinese.
- No. 68. Apparently an altar. This is a somewhat common sign, perhaps a phonetic.
- No. 69. Perhaps a bundle or roll.
- No. 70. Perhaps a tree branch or horns; seems to be phonetic. There is a similar Cypriote emblem but of doubtful sound.
- No. 71. Apparently a knife or sword; perhaps *pal*.
- No. 72. Apparently a tree.
- No. 73. Apparently the sacred artificial tree of Asshur.
- No. 74. A circle. Compare the cuneiform *sa*, "middle."
- No. 75. A deity. Only occurs once.
- No. 76. A hare. Only occurs once.
- No. 77. A camel's head. Only occurs once.
- No. 78. Twins. As in Egyptian.
- No. 79. Resembles the Chinese emblem for "small." Occurs once in a sentence, which seems to read "cause to become small."
- No. 80. A pyramid or triangle. Perhaps a phonetic.
- No. 81. A head, perhaps only a variant of No. 43.



- No. 82. Seems to be a wild bull's head.  
 No. 83. Perhaps a variant of No. 80. Only occurs once.  
 No. 84. Apparently a kind of thyrsus. Only found twice.  
 No. 85. A sign dividing clauses and words.  
 No. 86. Perhaps a flame.  
 No. 87. Not frequent: of unknown value.  
 No. 88. Ditto ditto.  
 No. 89. Ditto ditto.  
 No. 90. Ditto ditto.  
 No. 91. Apparently a ship, like the cuneiform *ma*. Appears only on seals.  
 No. 92. Only once found on the Babylonian bowl, and seems to represent the inscribed bowl itself.  
 No. 93. Of unknown value and rare.  
 No. 94. Ditto ditto.  
 No. 95. Ditto ditto.  
 No. 96. Ditto ditto.  
 No. 97. Ditto ditto.  
 No. 98. Ditto ditto.  
 No. 99. Ditto ditto.  
 No. 100. Ditto ditto.  
 No. 101. Ditto ditto.  
 No. 102. Ditto ditto.  
 No. 103. Ditto ditto.  
 No. 104. Only once found, appears to mean "tablet."  
 No. 105. Only once. Value unknown.  
 No. 106. Perhaps a variant of No. 47.  
 No. 107. Only once. Value unknown.  
 No. 108. Occurs on one text (Jerabis, No. 2) may mean "slay," with the sound *be* or *bat*, but may, perhaps, be used phonetically.  
 No. 109. Apparently a hand or glove, pointing downwards. Possibly *tu* or *dun* for "down."  
 No. 110. A commoner emblem. Perhaps for a verb.  
 No. 111. Distinct from the last on the same text. It resembles the cuneiform *da*.  
 No. 112. One of the few reduplications. It occurs also in cuneiform with the sound *du-du*, "cause to go," or "cause to become," "establish."  
 No. 113. May be a variant of No. 25.  
 No. 114. Only once found on a much-worn text (J. iii.).  
 No. 115. Only once found. Compare No. 88.

This list will, I believe, be found to include all the Hittite emblems distinctly decipherable as yet known. The detailed

discussion of the values will be found in the *Palestine Exploration Fund Quarterly Statements* for 1888, and in *Altaic Hieroglyphs*, second edition, where also a full reply is given to such criticisms of detail as have been yet published. The values are often supported by consideration of the words formed by the combinations of these monosyllabic emblems, which may be roughly divided into two classes—1st, the large emblems which are ideograms; 2nd, the smaller attached emblems which appear to be phonetics. A few doubtful and indistinct emblems on the monuments are omitted from the two lists here given.

If this system be the true one it will evidently apply equally well to the longest and shortest texts alike.

At the Karabel Pass there is a figure with an inscription consisting only of seven emblems. This I find reads well. (See Wright's *Empire of the Hittites*, plate xviii.)

*Id-dip-pu-Zi-an i-gu.*

“The monument Zi-an, called” (invokes). Zi-an “the spirit of heaven” is frequently invoked in Akkadian litanies. The figure accompanying the text is that of a bowman with tiara like the figures of male deities discovered at Pterium in Cappadocia.

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LIST OF ONE HUNDRED HITTITE WORDS.

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THE comparison of these words with those of the Akkadian, Medic, Susian, Etruscan, and living Tartar and Ugrian languages has, in many cases, been given in the text. It will be found in detail in a paper read before the British Association (Section H), 1888, which is to be published in the journal of the Anthropological Institute.

<p><i>A</i>, water.  <i>A</i>, participial affix.  <i>Ab</i>, abode.  <i>Ai</i>, mound (?).  <i>Aka</i>, prince.  <i>Aker</i>, field.  <i>Amar</i>, circle (?).  <i>An</i>, god.  <i>Ar</i>, man.  <i>Ari</i>, river.  <i>Arna</i>, ravine.  <i>Ata</i>, chief, father.  <i>Atr</i>, hall.  <i>Aun</i>, city.  <i>Aul</i>, camp.  <i>Ban</i>, shrine (?).  <i>Be</i>? slay.  <i>Bek</i>, fortress.  <i>Bu</i>? pool.  <i>E</i>, house.  <i>Enu</i>, Lord.  <i>En</i>, prayer.  <i>Essebu</i>, prince.  <i>Issi</i>, master.  <i>Ga</i>, oh.  <i>Ga</i>, adjective affix.  <i>Ka</i>, ablative.  <i>Kal</i>, great.  <i>Kan</i>, enclosure.  <i>Kan</i>, this.  <i>Kar</i>, fortress.  <i>Keb</i>, hillock.  <i>Khal</i>, city.  <i>Khat</i>, Hittite.</p>	<p><i>Khi</i>, <i>Hi</i>, good, bless.  <i>Keti</i>, with.  <i>Ku</i>, king.  <i>Kur</i>, mountain.  <i>Lab</i>, brave.  <i>Le</i>, <i>Lu</i>, bull.  <i>Li</i>, <i>Lu</i>, adjective affix.  <i>Lel</i>, chief.  <i>Me</i>, country.  <i>Man</i>, chief.  <i>Mas</i>, soldier (?).  <i>Mc</i>, be.  <i>Meke</i>, verbal affix.  <i>Meti</i>, ditto.  <i>Me</i>, plural.  <i>Mo</i>, I, me, my.  <i>Mur</i>, city.  <i>Nap</i>, sun.  <i>Napiriuri</i>, divine.  <i>Nazi</i>, prince.  <i>Ne</i>, he, of.  <i>Neke</i>, belonging to.  <i>Neli</i>, he of.  <i>No</i>, not.  <i>Pakh</i>, chief (?).  <i>Pap</i>, father, a deity.  <i>Pet</i>, fortress.  <i>Peis</i>, chief.  <i>Pe</i>, vase.  <i>Perg</i>, fortress.  <i>Pil</i>, hill.  <i>Pu</i>, herb.  <i>Ra</i>, power (?).  <i>Re</i>, flow.</p>
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List of Hittite Words (*continued*).

<i>Ri</i> , bright (a deity).	<i>Tarku</i> , chief.
<i>Sa</i> , knife.	<i>Tas</i> , leader ?
<i>Sa</i> , with, in.	<i>Te</i> , <i>Tel</i> , <i>Tene</i> , live, life.
<i>San</i> , noble.	<i>Tep</i> , hill.
<i>Sap</i> , warrior ?	<i>Ti</i> , shoot.
<i>Sar</i> , chief.	<i>Ti</i> , case affix.
<i>Se</i> , give.	<i>Tisa</i> , personal affix.
<i>Si</i> , eye, see.	<i>Teke</i> , only ?
<i>Su</i> , river.	<i>Tur</i> , camp.
<i>Suk</i> , swamp.	<i>U</i> , sky.
<i>Ta</i> , power, beat.	<i>U</i> , and.
<i>Tak</i> , stone.	<i>Vo gu</i> , word, say.
<i>Tam</i> , sun.	<i>Zakar</i> , monument.
<i>Tami</i> , building.	<i>Zi</i> , spirit.
<i>Tan</i> , causative auxiliary.	<i>No</i> , thou (?).
<i>Tar</i> , <i>Tur</i> , chief.	<i>Nonake</i> , thine.

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The AUTHOR.—There are one or two words I would add that have occurred to me since I wrote this paper. It has been devoted to the sons of Ham, with some reference, also, to the small group of Semitic people,—the sons of Shem ; but the Bible speaks of a third race, viz., that of Japheth. Now, I believe, that the 10th chapter of Genesis will be found, both from a geographical and also from an ethnological point of view, to be fully supported by our monumental discoveries. The Semitic races are known to have lived in Palestine and Arabia, and the Hamitic races are known, from the 10th chapter of Genesis, to have lived from an early date in Palestine, and the third race (Japheth) occupied Asia Minor. These people were, apparently, a fair race, for it is known that “Japheth” means *bright, light, or fair*. Now, it is known from the monuments of Lake Van, from the oldest monuments of the 9th century B.C., that there was an early race, probably Aryan (speaking a language of a type entirely different from that of the Semitic languages, or of those that we have been considering to-night), which occupied nearly the whole of Asia Minor and gradually displaced the old population. They spoke an inflectional language, a dialect akin, perhaps, to Armenian. Therefore, in these groups we have, I believe, monumental remains of the three branches of Shem, Ham, and Japheth ; but though these groups of language are so entirely distinct, it is gradually becoming known that they all may prove finally to have a common origin. Within the last two years Dr. Isaac Taylor has discovered the identity of the Aryan and Turanian roots,—the Aryan languages being about 40 and the West Turanian languages 100. Against these there are only eight Semitic languages. Though at the present time no connexion has been traced between the Semitic languages and the other two families, it is undoubted that the Semitic type is an Asiatic type, and I believe in process of time the origin of these three groups of language will be reduced to one common language, and the three very distinct species of race which we call in Biblical terms Shem, Ham, and Japheth, will be reduced to a common ancestor. I believe that to be a pure result of science without any reference to the opinions or beliefs of those who have studied the subject (applause).

The CHAIRMAN (Rev. Preb. Robinson Thornton, D.D., V.P.).—I am sure we must all feel indebted to Major Conder for his very

interesting paper,\* which we shall now have an opportunity of discussing.

REV. G. F. HERRICK, D.D.—May I ask the Author of the paper one question? Can he tell us whether the very remarkable inscription on the native rock in the town of Boghaz Keui, in Asia Minor, has been read, or whether any light has been thrown upon it? It is amongst the Hittite remains, so-called, that have been carefully preserved. In Asia Minor also, there is an inscription in large letters, 10 inches long, on a natural rock, at an angle of about 45 degrees, and extending something like 30 feet. I am not aware that this inscription has ever been read, and am exceedingly anxious to ascertain if any effort has been made, and, if so, with what success. I was told on the spot that a company of Frenchmen had taken impressions of the whole, but the result has never been published, so far as I am aware. I ought to mention, perhaps, that the language I have most used during the last 30 years, has been the Turkish.

THE AUTHOR.—Boghaz Keui is well known as being one of the most important sites in Asia Minor; but I do not think that I know exactly where the second inscription is; probably it might be Lycian or Phrygian. At Boghaz Keui, though the monuments are known to be very important, it is not known, so far as my reading goes, that there are any inscriptions which are legible; and though there are eleven lines of inscription, it is said by Perrot and others who have visited the place that they are hopelessly ruined, and that it is useless to copy them. If other inscriptions could be obtained from this place, they would be very important, because the number of Hittite inscriptions that we possess is very small. I do not know whether Dr. Herrick is referring to a place as far south as Sinjirli?

REV. DR. HERRICK.—Not quite.

THE AUTHOR.—There have been some very important discoveries made there, which, unfortunately, have not come to England. I believe, if Sir Charles Wilson's offer had been accepted, they would have been here, but unfortunately they have gone to Berlin,

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\* Among the many letters received referring to Major Conder's paper, one from Professor A. Hamilton Charteris, of Edinburgh University, may here be quoted. Writing from Wildbad, on May 19, he says:—"I follow Major Conder's work with great interest, and I trust he will be spared to lay all Biblical students under even greater obligations than he has already done."

They are in good hands there, but we cannot at present get any information about them; I believe they are being read by German scholars of the first calibre, and they are said to contain bilinguals in the Hittite language; they are not, however, written in Hittite script, but in cuneiform. If they should prove to be in the Hittite language, we shall have the means of testing the results we have got by the assistance of bilinguals of considerable length, which would be an important gain in the study of the subject, but I much doubt if the Hittites ever used the cuneiform script.

MR. W. ST. C. BOSCAWEN, F.R.Hist.Soc.—I have listened with very great interest to Major Conder's paper. The subject of Hittite civilisation is one that is daily increasing in importance. It has almost, as it were, sprung upon us. A few years ago the few inscriptions we had from Hamath appeared to be connected with hardly anything we knew; but following the discoveries of Prof. Sayce, we now know that these monuments bore a close relation to those of Cyprus and Asia Minor, and that a lost chapter of Oriental history is about to be restored. Major Conder has been able to tell us a great deal on the subject to-night. I have devoted some considerable study to the question, and I have visited one or two of the principal sites where monuments are to be found; but I think, as yet, we are a considerable way from obtaining an accurate key to the inscriptions. Those inscriptions, which have gone to Berlin, I believe, are very important indeed. I saw a few days ago, in a letter, a short account of two of the inscriptions; and, if they are what they appear to be, they exactly agree with what I maintained some few years ago would be the case,—that we should find that the language of these inscriptions was connected with a language which is already partly known to us, which has been read but not deciphered,—I mean the ciphers which appear on the tablets from Cappadocia. I believe Mr. Pinches, who is here this evening, was the first to discover some of those inscriptions, and his discoveries have been supplemented by Mr. Ramsey, who has found other tablets. With regard to comparing the Turanian and Hittite languages, I think we must hesitate before we come to a conclusion, for the case based on the Turanian language is not, to my mind, a strong one. I remember a learned doctor, whose name has been quoted more than once to-night, viz., Dr. Oppert, giving a description of that often-used word "Turanian." He said it was the philologists' "waste-paper basket," and when you had a language with which you

could do nothing you assigned it to the Turanian. You cannot take language as a test of race. Major Conder knows better than I do that in examining these monuments you find clear evidence of more than one race of people. One remarkable point I noticed on examining the monuments of Karchemish, and especially one which I wish could be brought to this country: it is a large slab on which two male figures are represented standing on the back of a couchant lion, and the figures we see there have quite a clear and certainly not a Turanian type of face. They have long beards, their hair is looped up in Assyrian style, or curled, and the type of nose is straight, and not a small snub-nose, nor are the eyes small, as were those of the Turanian people. On the monuments of Boghaz Keui and other towns of Asia Minor you have again this same type of face. There is another record of the Hittites which seems clearly to indicate a mixed character. If they were Turanian, as Major Conder states, it is curious to notice that the *Beni-Heth*, with whom Abraham deals at Hebron, were apparently Semites. They were conversant with the Semitic tongue, and conducted their transactions according to the system of commerce instituted by the Babylonians, which was more Semitic in origin than Akkadian. In the Tel el-Amarna tablets, the general term for the South Palestinian tribes, including the Hittites, is *Khabiri*, "the allies," which would hardly be used were they one homogeneous whole. I think another point to be noticed is that the study of the Hittite monuments, though not followed much as yet, has been, principally from an archaeological point of view, and work in that direction is mainly due to the French authors, MM. Perrot and Guillaume and M. Babelon, who have published works of great interest, and had put forward facts that I put forward in 1880 in the study of the Hittite monuments, dividing them into three periods. The Hittites occupy very much the position of the Phœnicians, though they have not the high commercial instinct of the Phœnician people. They were a people with a certain degree of civilisation, who, coming in contact with nations more civilised than themselves, borrowed and adopted the customs, forms of art, and forms of religion from those with whom they came in contact. Understanding this, if you take the Hittite monuments and inscriptions, you find they can be divided into three periods. First, underlying the whole, is what I may call the native period. Then we have a period represented by later monuments, showing influence of the Assyrian court, and we have in addition to that, monuments which show a clear influence of



contact with Egypt. Now these three periods are almost historical in their character, for, as far as the monuments go, they (both Assyrian and Egyptian) tend to show that the influx of the Hittite people was not from East to West, but from West to East. In the inscriptions of Tiglath-pileser I. you find the Hittites mentioned as coming down from the mountains in the neighbourhood of Marash, and in the inscriptions of Rameses II. we find the Hittites in the regions of the Southern Taurus, and in the district of the borders of the Gulf of Antioch. There is another point I would direct Major Conder's attention to, because I think he would find in it, as I have found, a very valuable means of information, viz., the Vannic inscriptions. If he compares those earlier names on the Vannic inscriptions with those in the Hittite lists they will show some very striking resemblances. These are not merely casual, and I cannot agree with him that there is any trace whatever in the language of the Vannic inscriptions of an Aryan tongue. Wherever the Aryans were at that time, they were certainly not in that country, and even at a later period, if they were in the country, they were certainly not in a position to influence the language of the people in the eighth and ninth century B.C., which we find in the inscriptions of the earlier Vannic kings. These inscriptions have been read with not, perhaps, perfect certainty, by Professor Sayce, but the reading gives a fair sequence of sense, which is more than I can say of other renderings I have yet seen of Vannic inscriptions. We know the period to which these inscriptions belong and the important gap in history which they fill up. Now comes a question with regard to these Vannic people. We know that the Vannic records of that period fill up the period between the fall of the early Assyrian empire (the period of weakness after the time of the early Assyrian empire) until the reigns of Assur-nazir-pal and Shalmanesar III. They belong to the time when Assyria had all her work to do to conquer the tribes that spread in the neighbourhood of Khabour and the banks of the Euphrates. They fought with the Hittites, we know, because the name of the Hittites is found more than once in the inscriptions. They conquered the Hittites, but afterwards entered into a close alliance with them, and if you examine the few remains we have from Van of the rest of the period, there seems to be little doubt that we do find a kindred race in these pre-Aryans to the tribes in the regions of Marash, and the northern regions of the Hittite country. Now, I said just now, that there was more than

one race embodied in the Hittite people. If you look at the monuments you find traces of that, and if you require existing traces of the Hittite people, you need not go to Bactria or the regions of Central Asia. If you travel into the regions of Marash, and between the western mountains of Armenia and the Taurus range, you will find men there working as muleteers, and if you take them and stand them, as I have done, alongside a Hittite sculpture, you will see that they might have stood as models for the Hittite race! With regard to their connexion with Babylonia, I do not see that that can be borne out as yet. There was certainly a Turanian population in Babylonia. Our knowledge of the Akkadian language is gradually increasing, but I notice that out of the list of words which Major Conder has given, there are many which I do not see my way to accept at present; in my own mind, their connexion with Babylonia is not proven. Then there is a point to which I would refer as carrying the subject considerably further,—I mean as connecting them with the alphabet of Asia Minor,—with the Cypriote; and here I would say just as the monuments may be divided into three periods, so the inscriptions may be divided again into two periods and two distinct classes of writings. The author, no doubt, noticed that on comparing the inscriptions from Karchemish, with those of Hamath, that the Hamath inscriptions are much simpler and contain much less of a pictorial character than those of Karchemish. Other inscriptions that have come from Hamath and from Aleppo (which I believe are now utterly destroyed), also belong to the same class, and other inscriptions situated in the region bordering on the Orontes Valley, and on the shores of the Lake of Antioch. Passing round the Lake, or Gulf of Antioch, and following one of the great roads which lead from Phœnicia into Asia Minor, we come to another inscription of Ibreez. This is more pictorial, but not so much as the inscriptions from Marash; and if you wish to compare the so-called Asia Minor alphabet with the Hittite form, you will find that you must do so in the inscriptions of this region, and no doubt it is in this district, in the line of the great commercial road, that the simplification of the characters takes place, and that, therefore, the inscriptions from Hamath, and in that region, are certainly of a later period than those from Karchemish. Now, if we follow this commercial road, and pass from Karchemish through Marash, and so on to the shores of the Ægean, we find a larger and more pictorial form of writing; so it seems to me that Professor Sayce was right when he suggested that

it is in the mountain regions of the Taurus and the Western Armenian Mountains that we are to find the cradle of the Hittite people. There is one other point in respect of which I cannot agree with Major Conder, and that is in comparing the pictorial form of these inscriptions with those in Egyptian, and with those in Assyrian. Wherever you can compare these forms, they are simply the result of the same force which gave rise to writing amongst all nations. Man's desire to record objects and events around him I take to be simply a pictorial or graphic instinct which he so often exercises. We might just as well turn to the Mexican, Central American, and Chinese, and connect them on that ground. One other point before I conclude, and that is as to the great stress,—and far too high stress,—that has been placed on the Elamite civilisation. We all know, at the present time, that Elamite civilisation is comparatively late. There is no record of Elamite inscriptions older than the time of Sargon II., the conqueror of Samaria, and it is difficult to compare their language with such old forms as the inscription. Still, I think, although the paper has not solved the question, it has made very great progress towards doing so. As to the solution of the problem of the common origin of language, I am afraid it will be a long time before we shall ever come to that ground. We know that a few years ago, many German writers, and German writers of considerable note, endeavoured to show that there was a connexion between the Aryan and Semitic languages. Then, again, we have others who, like Professor Isaac Taylor, have attempted to connect the Turanian and Aryan languages, and to find a common parentage for them on the ground of similarity of sound or meaning; but we have to deal with the grammar and the expression of thought of the people, and it will be a very long time yet before we ever reach the solution of that question. We know only one way to reach it, and the result will astonish people, because we shall have to go back into antiquity (we are, year by year, going back further and further), but we shall have to go back into antiquity so far as to make that which we have already attained its mere childhood.

Mr. THEOPHILUS PINCHES (British Museum).—I have, of course, as Mr. Boscawen has done, to express my appreciation of Major Conder's paper. It is a most excellent paper, and I have listened to it with the greatest pleasure. Of course, there are so many questions connected with these ancient people and their language, that it is difficult, sometimes, to come to a conclusion on any specific

point. I have not studied particularly the Hittite side of the question. I have only been interested in Major Conder's researches with regard to the language, in so far as they are connected with the Akkadian, and lately, I must say, that my ideas, such as I have formed, have been rather disturbed by the discovery, of these Tel el-Amarna tablets. As Major Conder remarks, I was of opinion that a language very much like Akkadian, existed in what may be called the country of the Hittites, near Karchemish, at a very early period, and I gave my reasons for it. The principal reason was that among the curious-shaped objects found at Sippara, the interesting ancient Sepharvaim, there is an inscription of a king named, I believe, Ilu-shaba, the son of Tukulti-Mer. Now Ilu-shaba is apparently Semitic;\* and Tukulti-Mer may be regarded as a hybrid, the first element being Semitic (Assyrian or Babylonian), and the second Akkadian, in which language Mer is the equivalent of Rimmon or Hadad. This inscription seemed to indicate that it is very probable that they at least knew Akkadian, though it may not have been their native language. But the tablets from Tel el-Amarna imply that Assyrian was not the native tongue of the place, and that it was a language known not only in Assyria and Babylonia, but also in all the country to the westward, and even in Egypt. Assyrian was, in fact, the language of diplomacy, and the people who used it were obliged to know a certain amount of Akkadian as well. Of course there is a possibility† that the language of the Hittites is allied to the Akkadian, and I do not wish to depreciate the value of any comparisons that have been made. I think they are most valuable. I may state that some time ago, in order to test the trustworthiness of the comparisons made between the Akkadian and Turanian tongues, I thought I would compare Akkadian with something not Turanian. I compared, therefore, certain words with words of similar form in the languages of the Aryan group, and found some very remarkable likenesses, but I do not lay stress on that. I did not publish the results of my studies,—it was simply a test to satisfy myself. Therefore, I am inclined to think, that the Turanian hypothesis cannot be said to be proved. With regard to the question of duality of race in the countries occupied by the

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\* Unless, indeed, we are to read *Dingir garaba* son of *Gishku-Mer*, the probable pronunciation of these names if non-Semitic.

† And even great probability.

Hittites, I regard that as exceedingly probable. It is a remarkable thing, and worthy of some notice, that Semitic populations seem to have been more monotheistic in their ideas than the non-Semitic. In my opinion (and I have a great many arguments in support of this), the Babylonians of the earlier period were, practically, monotheists, plurality of deities during the Akkadian period and later being due to Akkadian influence. Probably, if we could trace this farther westward of Babylonia and Assyria, we might come to some conclusion on the subject.

As to the comparisons which Major Conder has made, I think some of the explanations of the Akkadian words are antiquated. The word for "Hero," for instance, is not *tas*, but *ur\** [p. 43, No. 4]. The word *lala*, in the note at p. 42, I do not recognise P. 45 No. 18, the word *urugal*, "hero," I do not agree with. *Urugal* means *Hades*. It may be owing to a misprint; as there is another word which means something like *hero*, and that is *ushugal*, or *ushumgal*. These are but little discrepancies that I have pointed out, and do not affect the whole question. Major Conder's paper is really an excellent one, and I am very glad to have heard it read. I hope he will continue his studies, and I have no doubt that, if he does so on the same lines, he will arrive at something.

REV. F. A. WALKER, D.D., F.L.S.—I only rise for the purpose of obtaining information on a particular point referred to by Mr. Boscawen. I understood him to say that traces of the ancient Hittites were to be found at Marash and between the mountains of Western Armenia and the Taurus range; and I would ask him if he considers that the Cappadocians are descendants of the Hittites. The Cappadocians are people who, down to the present day, have always preserved their nationality and peculiar dialect; but, I am sorry to add, that they have a very bad reputation for robbery and violence.

MR. BOSCAWEN.—No doubt the old province of Cappadocia extended much nearer to the Euphrates than that we are familiar with in the time of St. Paul; but Major Conder agrees with me, I believe (and he has travelled in that district and about the neighbourhood), that the people there are of a very peculiar, short, powerful type, and very much like the soldiers represented on the Hittite monuments; and I think it stands to reason that those people should retain traces of the old race. All kinds of invasions that have swept across Assyria have come across this region. The old

\* Or, better, *ur-sag*, rendered in Assyrian by *karradu*, warrior, and *idlu*, "hero." Another word of nearly equivalent meaning is *ushumgal* "the great one" (i.e., "the unique," "peerless").

people held out against the Romans and Greeks, and even to this day their successors are mighty troublesome to the Turks, and they have retained the old type: so much have they retained their independence and warlike character, that I dare say some of you remember that in 1879 there was considerable trouble and disturbance raised in Parliament about the massacres that took place in the neighbourhood. They are very good representatives of the Hittite people,—they were just that class of powerful mountain people. A work by M. Perrot has just been published which contains a summary of the question from an archæological point of view, which brings some interesting facts forward with regard to the Cappadocians, and which I think would be worth studying.

REV. F. A. WALKER, D.D.—At Cassaba Dorghuda railway station, 58 miles from Smyrna, along the line to Sardis and Philadelphia, I saw several Cappadocians, with very distinct physiognomy and dress, the characteristics of both of which seem to have been preserved through past centuries.

MR. BOSCAWEN.—I know that those I came in contact with carried arms; but they were not much used. A great deal has been said at different times about the high boot. It is a curved up boot,—simply the boot of a mountaineer, which generally gets a curved toe; but in the sculptures on the rocks and other representations of Hittite soldiers you see these men with high boots, with their legs bandaged round, and carrying a short dirk and girdle, and wearing a cap almost the same as the people in that district now wear.

THE AUTHOR.—I should have been disappointed if, after coming up and offering battle on the subject of the Hittites, I had not met with competent scholars, and this evening I have been more fortunate than I remember ever being before, in having two such authorities to criticise my paper. Mr. Boscawen is very well known as a student of this particular subject, and Mr. Pinches is probably the safest authority we possess in England on the Akkadian language. But it is still more satisfactory to my mind, that Mr. Boscawen should have devoted himself to endeavouring to prove my thesis. In the first place, he tells us that the Cappadocians bear a very strong resemblance to the people represented on the Hittite monuments. I was prepared to hear this, and knew it, to a certain extent, before; but he has not told us to what race these inhabitants of the regions of the Taurus belong. From what we have been told by Sir Charles Wilson, it appears that the basis of that population in Asia Minor is an ancient Turkic population. I have seen

numbers of peasants on the coasts of Asia Minor who were, to all appearance, of the Mongolian type, and the nomenclature of the country to a great extent is pure Turkish. Therefore, while these Cappadocian and Marash people resemble the Hittites, it is evident, as far as I can gather, that if any pure race exists at the present day, they must be a Turkic people. I cannot agree that the Hittites are represented in the Bible as of the Semitic race. But the fact of the matter is, I think, Mr. Boscawen has hardly grasped what has been said by authorities on ethnology with regard to the physical type of the Mongolians. It is true that the extreme Mongolian type, as we have it among the Chinese and some of the northern Mongolians, presents itself to us in snub-noses and Chinese features; but I am assured by ethnologists and anthropologists that this is not the normal Mongolian type, and we have photographic representations of such races with large, and in some cases, aquiline noses, though they are not supposed to be anything but Tartars. With regard to beards, some of these Mongolian people are bearded, and I once thought they could not be Tartars; but I was put right by an authority on Mongolian types, who told me that although their beards grow very late in life, and though at the age of thirty they are a beardless people, still in a later period of life their beards grow to a considerable length, and very thick. There are, also, pictures taken from photographs representing elderly Tartars in the regions of the Oxus, with large beards. As to the Vannic language, the Vannic inscriptions have, to a great extent, been read, though only partly deciphered, by Professor Sayce and by others. The reason is that they are written to a great extent pictorially, and not written in syllables.

Mr. BOSCAWEN.—The verbs are written phonetically.

The AUTHOR.—The verbs are written phonetically. It thus becomes necessary to study these verbs, to get the character of the language and the grammatical structure of the language, and from those together to form an estimate of the language, and Dr. Mordtmann describes it as an Aryan language akin to modern Armenian. This Professor Sayce denied. I have studied the subject, and there are strong reasons for supposing it to be an Aryan inflectional language. If it is an Aryan inflectional language, it is almost impossible to suppose that it could be applied to a hieroglyphic writing, in which the pictorial form is preserved in almost the original shape. Such symbols belong to agglutinative, not to inflectional speech, and to the Hittite language. There are at least forty

known Vannic words which occur also in Aryan languages, especially in Armenian and ancient Persian. Nor is the grammar of the Vannic unlike that of these languages. I have studied the names of Vannic kings mentioned by Mr. Boscawen, but do not find them to resemble the Hittite names; rather do they resemble Persian names, and this people used the Aryan word *baga*, for "God." Mr. Boscawen follows Professor Sayce in suggesting this comparison with Vannic, but after considerable study I have come to a different result. When I used the word "Turanian," I wished to use the word in an historical sense; I am aware it is vaguely used by different people, but it has been used lately in the sense in which it was originally used by philologists. I find there is a prejudice against this word, and I have often used the word "Altaic" as being better than "Turanian." But if "Altaic" is objected to, I would explain that what I mean is a language of the character of Turkish and Mongolian. As regards a higher civilisation being borrowed by the Hittites, I regard that as being, as yet, unproved. There are so few Hittite monuments that it is impossible to divide them into three periods, or any other number. As regards the Vannic kings, they fought with the Hittites, but I am not aware that there are any monuments which state that they entered into an alliance with them, and I stand corrected if such monuments exist. In regard to the Elamite language, inscriptions have been found at Bihistun of a date not later than the sixth century, B.C., but I have already shown in a large number of cases that words in this language can be compared with Akkadian. Now, I know that it is often unsafe to talk about Akkadian, for this reason, that not only do I not know all about it, but I think even Mr. Pinches, great authority as he is, would say that he did not know all that was to be known about Akkadian; the fact being that though he is able to read the inscriptions, he is, in many cases, not sure what the sound of certain words should be. Perhaps he may be right in saying that the Akkadian and Aryan words are sometimes the same, though the grammar is not. But I do not rely on dead languages alone, because that is not safe, as a method, by itself. If I find that a word on the monuments is traceable through a large group of living languages, I feel safer than if I rely on the Akkadian alone. No doubt the word *Lel* for "chief" in Akkadian may be doubtful, but it is a wide-spread Turanian word, even still in use among the non-Aryan people in Northern India, as *lāla*. The word *Tarku* in the Turanian languages, exists down to the present day. It does not exist in the Aryan languages



or the Semitic with which I am acquainted. I also venture to remind Mr. Pinches and Mr. Boscawen that my system of comparison does not depend solely on the comparison of nouns, but on a detailed study of the grammar of the Hittite texts, which is a safer guide than vocabulary alone. As regards the cuneiform letters sent to Egypt, an interpreter was sent with them, which, if they were understood all over Western Asia, perhaps would hardly have been necessary. I have nothing further to add except with regard to the study of ideographs. The study of ideographs, of course, is quite a distinct study from that of sounds or of grammar. If I found that a certain Hittite ideograph only compared with an ideograph in one other system, I should not attach great importance to it; but when I find that one and the same emblem is used in Egyptian, in Cuneiform, and in the oldest Chinese to which we have access, it seems to me a fair presumption that ideographs of similar form may have been used with a similar meaning in Hittite. It may be that they were all independently invented; but it may also be that these resemblances are due to a common origin. Whichever be the true reason, we may, I think, obtain some idea of the value of Hittite emblems, by seeing what their ideographic value is in other systems. There is no doubt, I think, that the Vannic emblems are partly phonetic and partly ideographic, but I have not been able to find that they have anything to do with the civilisation of Western Asia. I thank those who have taken the trouble to come here to give us the benefit of their opinions on the subject, and I think if they themselves were to take the subject up, and take the common emblems which we have in the Hittite, and trace them through all the inscriptions, as I have done, they would probably find they would be able to further the question more than I can claim to have done with my elementary knowledge (applause).

The CHAIRMAN.—I think it is not necessary for me to trouble you with any remarks. Some have occurred to me upon curious specimens of Hittite work, but at this period of the evening I will not trouble you with any of them. I can only convey to the author of the paper the thanks of all present for his very interesting paper, and to those who have joined in the discussion, which has been a satisfactory one, I think, because of the little differences of opinion that have arisen, and which have brought out a vast amount of learning. I hope all our papers will be as successful.

The Meeting was then adjourned.

## REMARKS ON THE FOREGOING PAPER.

CANON ISAAC TAYLOR, LL.D., writes :—

“ Though not convinced by Major Conder’s arguments, which leave room for criticism, the solution of the problem which he has proposed seems to me on *a priori* grounds more probable than any other which has been suggested.”

PROFESSOR G. W. LEITNER, D.C.L., D.O.L., says :—

“ I am not well enough to come to your meeting to-night ; but I hope that it will be as numerous and influentially attended as Major Conder’s paper deserves. I think that his communication is not only highly suggestive, but also most instructive. I have read it with attention, but it obviously requires careful study, and this I am unable to give at present. The connexion between the Hittites and the Khitai seems to be probable. In 1884 a paper by Professor Campbell, on a supposed Hittite inscription found at Attock, was published by me in the English Journal of the Angumani-i-Punjab Society, and my present report on the Hunza language brings to light a number of linguistic and quasi-prehistoric remnants which may throw light on the indigenous Zuechi and the conquering Khitai, and which I will submit to the Institute.”

Mr. G. BERTIN, M.R.A.S., forwards the following, remarking that it “ will be seen that he agrees with Major Conder on the main points of his paper.” He says :—

“ There can be now little doubt of the existence of a non-Semitic population in Syria in early times ; the fact was suspected, but it is only lately that it has been demonstrated, and Major Conder has done much for that. If I do not agree with all the derivations given by the author, I acknowledge that a great many are plausible. The difficulty with the so-called Hittite texts is that we have no bi-lingual inscriptions, for I still doubt the

genuineness of the *boss*, first, because no one ever saw the original ; second, the Assyrian characters cut round it are of various periods, and some altogether incorrect. The middle inscription is, perhaps, genuine, but the Assyrian inscription is the work of a forger ill acquainted with the language and the syllabary of Assyria, and who took the inscription for an Egyptian one, and wrote what he thought would be the name of Tirhaka. The attention I have given to the chronology of Babylonia enables me to state now that the Akkadian or Turanian invasion of Western Asia took place about 7,000 B.C. This population spread all over Babylonia, Syria, and part of Asia Minor, but everywhere they never formed but a minority. This explains how they were so completely absorbed and disappeared. In Babylonia, in 3,800 B.C., the Semites had taken the power ; Akkadian was then but a learned language, and was studied only as Latin is among us. The "Hittite" language and writing may have been preserved among a Semitic population in the same way as Latin was preserved till a few years ago as the official language of Hungary, and was spoken in Parliament. In spite of all that has been said, I still believe that the Shepherd kings were of a Semitic-speaking tribe. For we must not forget that Semitic and Turanian, as well as Aryan, are philological terms, and not ethnological. Populations of two different ethnological groups may speak the same language. It may be also noticed that racial characteristics are the result of many influences, and that new races may be so formed. For instance, the Babylonians, the Assyrians, and the Jews, who are all called Semitic, are ethnologically quite distinct, and the offshoots of different mixtures. The study which Major Conder has taken up has opened up a new field for the historian, and the philologist ; if, however, he has made a few mistakes, or in some cases has been over bold, we must nevertheless applaud his efforts as one of the first in this new path."

## FURTHER REPLY BY THE AUTHOR.

I AVAIL myself of the opportunity to add a few words on the remarks made on my paper by scholars unable to be present when it was read. Before doing so, I would mention that, whilst the discussion has been in the press, one of Mr. Boscawen's hopes has been falsified by further discovery. He compares the Hittite with "a language which is already partly known to us on the tablets of Cappadocia." Unfortunately this language was not known, for as Dr. Sayce has now stated in the *Academy*, it proves to be only an Assyrian dialect,—Semitic,—and thus, as is now generally admitted by all real students of the subject, nowise connected with Hittite. When Mr. Boscawen spoke, he apparently expected the Cappadocian texts to tell a very different story. Dr. Sayce and others now claim to possess cuneiform texts in a "Hittite" dialect; but until they can read these, and show that they are Hittite, the case of the Cappadocian should teach us caution. At the present moment we have not a shred of evidence that cuneiform characters were ever used in Syria, or in Asia Minor proper, or by any but the Assyrians, Babylonians, and races immediately under their influence. The Hittites and the Turanians of Asia Minor had a native script, and as early as the ninth century the Aramaic alphabet was used in Asia Minor, as we know from very recent discovery.

Dr. Taylor's reasons for giving his adhesion are no doubt independent: the fact remains that the conclusions of my paper are accepted by a good Turanian scholar. I owe much to his kindness in aiding my researches in Turanian languages, and I venture to think if he has time to study the details of my work that he will find the development of the grammar and vocabulary more securely based than he perhaps may think without such study.

Mr. G. Bertin is also a valuable ally to whose aid in studying Akkadian I am deeply indebted. He stands second to no scholar in England in special study of that language. I do not share his suspicions as to the genuineness of the bi-lingual boss, nor am I convinced of the very early dates given by some other modern scholars, as well as by himself, for Akkadian civilisation. I do not doubt that if specialists take up the study of Hittite, on the principles which seem now to meet with very general approval, they will far outstrip my first attempts, especially if more Hittite

remains are discovered. Such is the fate all beginners encounter, and one which I announced for my own work when I published "Altaic Hieroglyphs" in 1887; but I also feel assured that when such scholars attempt the detailed examination of the combinations of emblems, which I carried out before forming an opinion as to the language, they will recognise that the work was not done hastily or in an arbitrary manner, but was a natural result of special examination, and that many of my translations will be maintained. As yet, I have met with only fragmentary criticisms of minor details.

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## ORDINARY MEETING.\*

THE REV. F. A. WALKER, D.D., F.L.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and sixty Elections took place (see page 32), after which the following paper was read by the author :—

*INSTINCT AND REASON.* By CUTHBERT COLLINGWOOD, Esq., M.A., B.M. Oxon, M.R.C.P., F.L.S., &c.

*Instinct* signifies those natural powers with which all animals are born, and which are sufficient for the carrying out of the two great bodily functions of nutrition (including self-preservation) and reproduction, which constitute the sum-total of their existence.

*Reason* is the special characteristic of Man, unshared (in its higher regions, at least) by animals,—by the agency of which he is able to accumulate impressions,—in its lower regions, from without, and in its higher regions, from within ; by which impressions the faculties are aroused and developed,—which faculties are, especially in those higher regions, vastly in advance of, and distinct in kind from, any endowments of animals. Moreover, these faculties exist in Man only potentially at birth.

IT is not many years since that the Cartesian theory (so-called) of animal automatism was tentatively offered to the scientific world from a high authority ; a theory which suggested that the lower animals were but machines, impelled to movement and apparent life by a merely unconscious reflex action, alike without feeling or instinct, in any true sense of the term. The theory, it is true, met with no general acceptance, and has since been consigned to the limbo of pseudo-scientific vagaries. Now, on the contrary, instead of being automata, animals are placed virtually upon a level with Man, both as regards their physical organisation

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\* December 2, 1889.

and their mental endowments; only differing in either respect from him in the sense that savage Man differs from his more fortunate civilised brethren.

For current science, not content with the array of facts which suggest that, as to his physical body, Man exhibits so close a relationship with animals as to favour the hypothesis that the evolutionary process has extended to him through them, further endeavours to prove that the mental phenomena of those same animals are of so identical a nature that they cannot be separated by any expressed distinction or conceivable character from those exhibited by intellectual Man himself, any more than they can separate the genus *Homo* by any organic classificatory distinction from the genera of the higher or anthropoid apes.

According to the modern school of Biology, Man differs so little from the higher apes that "there is no just ground for placing him in a distinct order;" and Mr. Huxley, therefore, includes them both under one order, which he terms Primates. Both structure and development prove Man to have a close physical relationship to the animal world; but we are further assured that his moral qualities also have been evolved from certain instincts characteristic of the lower animals, while his intellectual powers are absolutely shared, in a lower degree, by existing animal races. In other words, it is held that Man's moral sense (including his spiritual faculties—if, indeed, he be allowed to possess any) has been developed out of certain social instincts characteristic of animals, including sympathy, which instincts were themselves acquired through the agency of natural selection,

It is admitted, however, by all, that Man possesses a sense of responsibility, which, while it demands a certain course of conduct (which is held to form three-fourths of life), and is claimed by none for the animal world, is yet affirmed to be also developed from some obscure animal instincts—instincts, that is, in beings in which no such sense of responsibility or resultant conduct does, or ever did, or even could conceivably exist. We are not instructed how a strictly positive quality has been developed out of a strictly negative quality—how the distinguishing character of the human mind has been evolved from totally different instincts in the animal, in which its principle is wholly wanting. All this we are to take upon scientific authority, which would have us believe that the simple but uncomprehended instincts of animals, which are palpably corporeal in their

nature, could, by a stretch of imagination, have been so developed as to reach the higher plane of the moral sense and spiritual faculties of Man.

So also, with regard to what is called "animal intelligence," it is claimed for them that "there is no fundamental difference between Man and the higher mammals in their mental faculties," while, however, it has to be admitted that "the difference between the mind of the lowest Man and that of the highest animal is immense." But the doctrine is taught that this immense difference is, after all, "one of degree only, and not of kind." In other words, they are upon the same plane, continuous one with the other; and there is, therefore, a theoretical possibility of the one being converted or developed into the other; and that, in point of fact, it was so converted.

But we believe that arguments can be adduced which tend to disclose a wide chasm between the apparently intelligent actions of animals and the real intellectual operations of Man; and to prove that Man has become the dominant animal—not simply because, through some unknown and entirely speculative influences, he has rapidly evolved a high standard of moral sense and a lofty ideal of intellectual grandeur—but because he is essentially distinct in his non-material nature from what are called, not poetically only, but most truly and correctly also, the lower animals; and also because moral sense and responsibility are his attributes by an absolutely special and peculiar privilege, while his intellectual powers themselves differ *toto cælo* from those of the lower animals, not merely in degree but in very essence and kind. In support of which propositions we offer the following remarks and suggestions.

We are not inclined to dispute the fact that certain animals exhibit mental phenomena which, upon a superficial view, may easily be imagined to be similar to, if not identical in character with, analogous phenomena in Man. But we would, at the outset, draw attention to a certain distinction between the phenomena as exhibited by two widely different classes of animals; viz., first, those exhibited by animals comparatively low in the scale of organisation, but which have, by their singularity and apparent complexity, attracted the interested attention of mankind in all ages—such as, for example, the construction of geometrical cells by the hive bee and symmetrical webs by the spider, or the various complex habits of the families of ants; and second, the half-reasoning (as the poet calls it) efforts of animals of



the highest organisation, such as the elephant, the monkey, or the domesticated dog—undoubtedly the most seemingly intelligent of all the animal races. The first-mentioned class of phenomena is observable in utterly untaught invertebrate, and generally minute, animals, whose sensory ganglia are indeed large in comparison with their total bulk, but yet greatly inferior in anatomic construction, and in differentiation, to the true cerebral lobes of vertebrated animals; in fact, only exhibiting in the highest instances a tendency to the concentration of these ganglia into one or two quasi-cerebral masses.\*

And yet it is the acts of such humble and often tiny members of the invertebrate animal kingdom (Articulata) which most astonish the thoughtful mind, and have furnished the problems alike for the mathematician and the psychologist. And it is, at the same time, such acts which come purely and simply under the term Instinct, acts which, unaided by contact with any other race than their own, and unsuspected of any subjection to human influence or human instruction, are yet performed generation after generation, practically unchanged, and spontaneously by the newest equally as by the oldest of the individuals; whereas the second class of phenomena is exhibited by animals high in the scale of organisation, and in greater degree where human influence, teaching, and example (we might almost say) are brought to bear—as, for instance, among animals subject to domestication.

The great functional principles to which all the phenomena of Instinct may be referred, may be briefly and inclusively classed under the two heads of self-preservation and reproduction. These great functional activities undoubtedly (it is true) constitute an essential and even considerable part of the nature of Man, although we would not be understood to assert that Man possesses them in the same instinctive form as animals undoubtedly do. But the lower nature of Man is more or less swayed by these two natural principles; and the cravings of his sensual part on their behalf place him so far upon common ground with animals. And the more these principles are permitted to act in him, without the restraint of the higher and specially human faculties, the more does he become like the “beasts which perish,” while the more these

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\* Mr. Darwin, with (as it appears to me) a most astounding failure of appreciation of human faculty, says, “the brain of the ant is one of the most marvellous atoms of matter in the world, perhaps more marvellous than the brain of man.”—*Descent of Man*, i, 145.

entirely natural promptings are kept under the dominion of the higher faculties, the more they are subordinated to the intellectual and moral nature, the greater is the distance between Man and the brute. This may appear like stating a truism, but it is necessary; for that very fact exhibits not only the immeasurable gulf between Man and the mere animal, but also the unaccountable circumstance that (if the Darwinian theory be correct) the course of Evolution must have absolutely reversed the original Instinct, and have produced, in fact, in ourselves something which is declared to be "not ourselves!" The brute is totally unable to effect this subordination, for it has no sense of the responsibility which demands such a sacrifice; the Man knows that such a sacrifice is demanded, and the more he strives to effect it, the more he is of a Man, while the more he yields to this lower nature, the more of a brute does he become.

There is thus a certain common ground of Instinct and Intelligence; and all the evil and sin which unhappily so mar and disfigure the true (or higher) nature of Man may be referred to this possession of a common ground with animals, to an inordinate licence arising from a too weak resistance against the cravings of those purely animal propensities which may be classed under the two heads of the instincts of self-preservation (including nutrition) and of reproduction. And these very evils are thus necessities of that community of nature which we share with animals; for, like them, we must provide for the calls of a natural appetite for food and drink, and for self-protection against enemies; and, like them, we are subject to the stings of sensual affections, arising from the œstrus of the sexual or reproductive organs.

But beyond this, what remains of common ground between the instinct of the animal and the Intelligence of a Man, which is thus far merely corporeal, and dependent upon purely terrestrial influences? Both animals and Man are possessed of a natural affection for the offspring (or *στοργή*), while the *ἀντιστοργή* of the animal is provided against in Man by the corrections of the intellectual and moral faculties, in other words by reason and responsibility. But the mere unreasoning natural affection of animals is only a phase of the reproductive instinct; and the courage, devotion, and self-sacrifice of the animal exhibited in the protection of its young are but necessary appendages, as it were, or accessories, in the higher races, of that one great and comprehensive instinct by the instrumentality of which the race is kept

up and perpetuated. It is true that it has a subjective character, but in organised beings possessing an elaborate nervous system such subjective phenomena cannot but be exhibited in correspondence with cerebral development, and in accordance with nervous function; yet only in such proportion as should distinctly adumbrate the full and complete, genuine love of the offspring, which alone is characteristic of the complete human being.

For it is easy to perceive the essential difference between the natural affection existing between animals and their partners and offspring, and the human domestic relations. Among animals such partnerships are, in the majority of cases, merely temporary, and even their parental affection is, as we have seen, soon, in many cases, cast out by stronger instincts. However beautiful and touching the devotion shown by the actual mother to her young, it is not lasting, but is, in fact, frequently succeeded by an equally natural hatred. It is in Man alone that conjugal love is of an enduring nature, and survives the mere attractions of sense, because it is founded upon a distinctly different and essentially higher principle than mere instinctive animal passion; and parental love, in Man, is not the temporary instinctive attachment which it is in animals, but an undying affection, founded in the recesses of an elevated moral nature, and bound to the inmost soul by the ties of conscious duty and responsibility. Love in Man has a different and far higher source, and strengthens with time, surviving and transcending sense, and even Life itself.

In common with animals it is true that we perform certain automatic actions which refer to the spontaneous or habitual exercise of bodily functions, in which we assist Nature, as in deglutition, &c., or, again, certain semi-automatic movements, which take place sometimes with, and sometimes without, our sensible co-operation, such as the application of the hands to the mouth and to various other parts of the body, or the direction of the movements of the feet, as in walking, and the maintenance of the erect posture. Moreover, animals are, like us, subject to impressions of a sensuous nature, and to certain emotions, bearing upon, or related to, and, indeed, inseparable from, the two great categories of instinct above specified. Rising higher in the scale of their endowments, we find them (unconsciously, indeed) associating these impressions, and by the aid of a certain power of memory (of a very external kind) rendering their retrospective impressions subservient to anticipatory

perceptions; and thus exhibiting the semblance of a kind of experience by which they are enabled to profit. This, in fact, constitutes the *rationale* of that plasticity of their mental emotions, which, while it corresponds to the plasticity of their organic forms, is apt to deceive those who imagine that they are endowed with reasoning powers of the same kind as those of Man, because their instinct is thus, within very narrow limits, adaptive, and, therefore, simulates on a small scale the operations of Reason. But all this is in reality merely sensuous in its nature, and has nothing in common with the higher manifestations of memory, experience, and inference, as exhibited by reasoning Man.

In the second category, that of the higher animals, we have also indications of a certain teachableness, within definite limits, in matters, not indeed of morality or responsibility, in any true sense, or even in true intellectual exercise in its most rudimentary form; but in matters relating chiefly to that which is one of the real and sole subjects of instinct, viz., self-preservation (avoidance of danger or of pain) and matters accessory to nutrition and the appetite for food and drink (in the form of rewards for obedience and docility). For it is these impulses which chiefly reconcile such animals to the mechanical performance of tasks which only the superior will of the human teacher can influence them, contrary to their nature, to strive to accomplish.

For, be it observed, Thought does not enter into any of these mental operations of animals. For even in the highest phenomena which spring from this teachableness or docility, there is exhibited nothing more than a certain plasticity of mental endowments which is affected and brought into play by habit and environment, just as their bodies possess such an inherent plasticity which is affected by similar, or, more properly speaking, correlative, influences. And although such phenomena appear to give to the evolution school the countenance which they seek, they are in reality mere accessory manifestations of instinctive powers with a purely corporeal motive, which will be shown, as we proceed, to leave quite untouched the fundamental principles which externally distinguish between animal instinct and human Reason. The plasticity, indeed, even where it exists, is acknowledged by all to have very narrow limits, and, in its highest development, to result in phenomena of so simple and so humble a character, that, if observed in a young child, would scarcely redeem it from the imputation of idiocy.

But in addition to these limited phenomena to which the instinct of the lower animals is confined, Human Intelligence is capable of other, and infinitely more comprehensive, expressions, and of transcendent mental feats which have no analogues, even, in mere instinct. To what animal can we attribute the power of reflecting upon its own being and existence, or of endeavouring to unravel the phenomena of its own consciousness? What animal is capable of conceiving abstract ideas, such as goodness and truth? What animal (out of *Æsop's* fables) can be imagined as exercising private or public judgment, of carrying on an inductive argument, of deducing sound principles from logical premises, or of even remotely comprehending, in the very faintest degree, the simplest or most rudimentary principles of Science or Art, or of experiencing, far less of expressing, any intellectual feeling or emotion? And if we add to all this vast superiority in Man that great prerogative of Reason, articulate speech, truly the difference between the mind of the highest animal and of the lowest Man, in whom all these magnificent capabilities unquestionably exist *in posse*, must be recognised as indeed, in the highest sense of the term, immense—inmeasurable in degree, and also absolutely distinct in kind.

The question has often been discussed, whether either Man or animals are possessed of innate ideas. With regard to Man we shall speak later; but, as far as animals are concerned, it is a question which we shall not find it difficult to answer. For what constitutes an Idea? An idea consists in an impression of something not present, but which the mind is able to present to itself, or to recover by a mental operation or exercise of thought;—as Locke expresses it, “whatever is the object of the understanding when a man thinks.” But what reason have we for supposing that any animal thinks? The most marvellous illustrations of instinct are observed in tiny animals whose nervous masses are necessarily exceedingly minute, and in their structure bear but little comparison with the brain of the really thinking animal, Man, or even with that of the higher Mammalia. And yet the bee, for instance, builds its cell in a geometrical form such as astonishes the mathematician by its accuracy of design and economy of material. But is it supposed by anyone that the bee thinks when it constructs these geometric cells; can it be imagined that the perfection of the cell depends on the bee's thought concerning its work? Does not the bee construct its first cell equally well as its second?

Do not both works result in an equally accurate cell, or is there the faintest difference between its first and last work? How different from a Man's work, who thinks about what he is doing, and whose thought results in improvement—while his first work infallibly betrays his original unskilfulness and inexperience.

And if it cannot be conceded that the bee thinks while constructing its admirably adapted cells, why should it be supposed that the ant thinks when it is engaged in the performance of those extraordinary feats of instinct which are the admiration of all who study its ways, though not perhaps more really noteworthy than the economy of the hive, of which the construction of the comb is a leading feature? If indeed these complicated instincts were carried on under the guidance of thought, bees and ants, with their tiny ganglia, would be even more surprising in their so-called "intellectual" powers than Man, in view of the brief space of the lives (briefer of bees than of ants) into which these mental phenomena are crowded, and the entire impossibility of that experience, which, in really reasoning beings, is an essential both of intellectuality and of progress (see note p. 4). And further, to carry on the argument for the untenability of insect "intelligence," is it supposed that the caterpillar employs a reasoning faculty in the determination of the juncture and method of spinning its cocoon; the moth, upon the nature of the plant upon which it shall deposit its eggs, in order that it may provide a suitable food for its prospective young; or the spider (so nearly allied to insects), upon the position and geometrical arrangement of the threads of its ingenious web?

Again, to take instances from animals higher in the scale. Does the bird (we would ask) think over the weaving of her nest, or the selection of a site for its building? I am aware that it has been claimed by some writers that young birds do not make so perfect a nest as the old ones, but on, I believe, most insufficient data. Leroy and Wilson are quoted, but without references. A writer in *Nature* also asserts that the chaffinch, when taken to New Zealand, varies the character of its nest, and I think, most unnecessarily jumps to the conclusion that the birds so varied, because "they were at a loss for a design, and had no nests to copy"! Surely a difference in environment would be amply sufficient to account for the slight change (see Wallace's *Darwinism*). Does the young duckling, just running from the newly-chipped egg, or from under the wing of its foster-mother,

the hen, think, when it runs, spite of her out-cries, to the water? Surely it is inconceivable that in any of these cases thought enters at all into the matter, or that ideas present themselves to the respective animals' minds in connexion with the operations in question.

Now, all these are typical examples of pure instinct, and among those examples which most strongly call forth our wonder and admiration. Some of them are performed at once, immediately upon birth, and without the possibility of their being learned from maternal or other teaching; and others, although some would have us believe them to be the result of teaching and observation, cannot, after a moment's consideration, be seriously held as such. Thus, no one will surely hold that the cells of the hive are ever defective in form or material to such an extent as to lead to the supposition that some were mere journey-work, while others were those of a master. The first web spun by a spider is not shown to be less perfect than those which follow. Nor is it imaginable that the young bird either observes the character of its own cradle, or takes lessons from its parent in the construction of its nest when its own pairing season arrives. Indeed we know how the maternal instinct, however strong during the helplessness of the brood, is (in most cases at least) succeeded by an *ἀπιστοργή*, which impels the dam to drive away the young, when fledged, to shift for themselves; nevertheless, not only do those same young build their nests to perfection in their turn, but the nests from generation to generation are so closely similar, so characteristic of the respective species in form, material, and situation, that the ornithologist recognises the bird by its nest as infallibly as by its egg. Such statements as those I have already alluded to must be received with the greatest caution—for, in the first place, there is the evidence just referred to against such an idea,—second, it would be strange indeed if after all these years of observation by ornithologists and bird-nesters, such a view could only now be brought forward, tentatively, as it were, by one or two observers, of no greater reputation than thousands of others—and third, the fact remains that there is at least no proof that birds build their nests one whit better than they did a thousand years ago. A standard is acquired upon which it is not pretended that any improvement is made—whereas if any bird thought of what it was doing, it would introduce improvements, however slight, which would be added to by its successors. But naturalists are un-

fortunately by no means always sufficiently careful to exclude spurious fancies, if they support a favoured theory.

If building its nest were not a purely instinctive act, totally unaided by anything partaking of the character of Reason, we must indeed attribute to the race of Birds a very far more equable degree of Intelligence than falls to the lot of human beings. Are there no indolent birds who shirk their work? Are all without exception, equally in earnest, equally clever architects, and equally clever handicraftsmen? They should be (as indeed they are) under the theory of non-intelligence, but not under the opposite theory. For if they used thought in their work—if they learned the art of nest-building from their parents—their nests would infallibly differ more or less from their model, according to the capacity or industry of the individual bird, instead of being, as they are, not indeed identically alike, but all equally perfect, and equally characteristic in workmanship, and material, and situation, within the limits of legitimate and natural variation.

But the instances we have thus selected for illustration are examples of pure instinct; and yet are also instances by no means the least complex of those actions which are well known to be performed by animals for whom there is claimed a certain measure of reason or intellectuality, such as differs from the Reason and Intelligence of Man in degree only. If, however, these typical acts of animals are the products, not of Reason, but of pure instinct, there can be but little question, upon that ground alone, that the acts of animals in the complex, when properly studied, and disengaged from the fallacious arguments which are used for elevating them to the heights of Reason, will be recognised as belonging also to the same category of instinctive actions as those already adduced. Mere instances of apparent Reason, or acts which simulate Reason, might be endlessly multiplied; but when the true principle of Instinct is comprehended, and its essentially lower plane duly perceived, there can be no doubt in any unprejudiced mind that all such cases are merely varieties of manifestation of a wonderful faculty implanted in animals, which is comprehensive and plastic enough to be adequate and sufficient for all their material needs by its perfect adaptation to their sensuous life, and at the same time so complex in its modes of action as to embrace the whole series of those mental phenomena which excite the astonishment of the mental evolutionist, who is



unable to satisfy himself that they have not a cogitative origin of the kind which characterises Man.

In other words, it seems to us thoroughly logical to deduce from them the consideration that, since no sophism can endow the acts quoted above with an origin in thought, reflection, or reasoning, the ground is cut away from those who would urge that certain other actions, apparently, perhaps, a degree more complicated, should be dependent upon or accompanied by such thought, reflection, or reasoning, in or for their performance. If, therefore, the acts described above can be conceivably performed without the aid of reason, properly so-called, in any degree whatever, so also may those of which we are apt to take an anthropomorphic view, and which, perhaps, on that ground, appear to us to be slightly more indicative of intelligence.

But the error lies in carrying the argument the wrong way : in setting out with the hypothesis that Reason, such as that with which Man is endowed, is the mainspring of complicated animal instincts, and thus adapting the active phenomena of the animal kingdom to this view ; instead of viewing these characteristic instincts dispassionately, establishing their nature, and passing from the more simple to others more complicated, such as the so-called political economics of bees and ants, &c. In the first method, the judgment is throughout warped by a prejudice in favour of Intelligence, which entirely prevents an unbiassed examination of the facts.

One would almost imagine that plain common sense would be sufficient to discriminate between the instinct of the lower animals and human Reason. The very fact of the utter impossibility of passing a fixed boundary line in the mental development of animals, either by the most careful and laborious education and training, or by selection from a long line of animals which have had the advantage of contact with Man for indefinite generations, would, one might reasonably suppose, be sufficient to demonstrate that the instinct of animals is a strictly limited endowment, which is not the same in kind as the Reason of Man. In Man may be found every degree of mental endowment, from the merely sensuous and animal perceptions of the microcephalous idiot, with an abortive organ, to the colossal intellect of a Bacon or a Newton, provided with a normal instrument of thought ; but, in animals, their instinctive sensuous perceptions are ever at a standstill. " Thus far, and no farther," is the principle of their minds, Take the

most (apparently) intelligent individual out of the most (apparently) intelligent race of animals, and teach that individual animal with the utmost care, skill, experience, and patience, and what is the result? Nothing can, even under any circumstances, convey to that animal the nature of an abstract idea; nothing can ever give it the power of framing an intellectual conception, or a lofty judgment; nothing can succeed in endowing it with the power of forming a rational inference of the simplest kind. The terms wise, intelligent, intellectual, moral, are clearly misnomers as applied to them. And yet, although all this is indisputable and acknowledged, there is a large school of mental Evolutionists which continues to hold and to teach that the instinct of animals differs from the Reason of Man in degree only and not in kind.

The lowest savage, who lives almost like a beast in his aboriginal condition, on being brought into contact with civilisation, may be taught to use true intellectual processes; may be made to comprehend abstract ideas; may be instructed to appreciate judgment, to reflect on co-existences and sequences; may be led to a sense of responsibility; may, in a word, be proved an intellectual, moral, and religious being. The lowest savage can, indeed, even without teaching or civilising contact, communicate with his fellows, impart ideas, and seek aid and sympathy from his fellow-men by means of articulate speech. But none of these things can any animal do. How say they, then, that instinct and intelligence are alike in kind, and differ only in degree?

So also can the human infant, in the first dawn of its intelligence, comprehend and enter into the ideas of its elders in a continually increasing degree; learn, without difficulty, the use of speech by impartment from its parents or nurse, and rapidly develop its faculties under judicious and suitable instruction; and in all respects proclaim the superior plane upon which its mental constitution is framed, a plane which no imaginable extension of animal instinct in its degree could ever conceivably touch.

But, although we have said that animals possess no innate ideas, for the simple reason that they do not possess ideas at all, inasmuch as they are incapable of thought, we nevertheless wish to be understood as affirming that whatever endowments of a quasi-mental character they do stand possessed of are innate; in other words, that the powers they exhibit of effecting those acts and combinations which come under the general name of Instinct, and which are in all

cases subservient to their habits and modes of life, and beneficial to their possessors, are born with them. For every animal acts according to what we call its nature; and if, in any particular, it aberrates from what is its settled and well-understood order of nature, we recognise in such a "freak of nature"—the exception, which proves the rule of its essential character or nature. Every animal whatsoever is endowed with its own peculiar and specific affection, which is its nature, in obedience or subordination to which it performs every act, and manifests every mental expression. And this nature or affection is always corporeal in its scope and character, and invariably has reference solely to the two great master-functions of nutrition and reproduction. Every animal at its birth is in possession of the entire sum-total of its necessary knowledge and capabilities, and is completely adapted to, and qualified for, the mode of life which is consonant with its nature or quality—with the sole reservation of allowances for growth; some animals being called upon to exercise the functions of their existence at the very outset, and others at a later period of their career. Every animal performs, untaught except by its nature, the specific acts which characterise it, and go to form its life-history, whether that be, as in the case of the sea-anemone, simply to await the stimulus of touch for the seizure of its prey, or whether, in the case of the bee, it is the problem of building perfectly-formed geometrical cells with the smallest expenditure of material.

It is indeed true that certain variations in the degree of mental endowment are observable in different animals of the same species; but these variations are not indicative of any nearer approach in the better-endowed individuals to the lofty and remote degree of human intelligence, but are in no way more remarkable than the bodily variations which exist within the limits of species. Nor, indeed, are they even of so great weight in the argument; for, whereas the Evolutionist shows reason to believe that higher organic forms have been developed from lower in such a manner as to leave no important gap in the animal series, mental endowments have certainly by no means kept pace with organisation. For it is acknowledged by the same school that the difference between the mind of the lowest men and that of the highest animal is immense—in other words, immeasurable—and in such a view we entirely concur.

But it should be the duty of the mental evolutionist to explain, what as a matter of fact they cannot explain, nor

have ever seriously attempted, viz., the remarkable and significant fact, that the gradual and generally continuous development of material organisations has by no means been accompanied by even the shadow of a correspondingly gradual and continuous mental development. Indeed, the complicated instincts of some of the inferior animals (as of certain Articulata) are not paralleled even by the highest Vertebrata. We see such complicated instincts, for example in Bees and Ants, not gradually developed, but suddenly appearing in these animal communities (and then ceasing), which cast in the shade the highest powers claimed for the Dog or the Elephant; instincts which have arisen, as it were, from no traceable source, and which lead nowhere; neither being further developed in the same classes of animals, nor reappearing in other classes, but forming, so to speak *culs-de-sac* of instinct-development, which, on the theory of mental evolution, have no meaning, nor are capable of rational explanation. And, moreover, even the vaunted powers of the very highest animals fall so far short of the intelligence of the lowest men that there is no conceivable explanation, on the theory of mental evolution, of the fact that while, organically (as Huxley affirms), the brain of Man differs far less from the brain of the chimpanzee, than that of the latter (chimp.) does from a pig's brain, nevertheless, psychologically, the difference between the mental endowments of the lowest man and the highest animal are admitted to be immense. Here is a leap, which is contrary to all the boasted laws of continuity. If instinct and Reason are the same in kind, they should be continuous, and there should be no vast or immense difference between the manifestations of the one and the other across the border-line which separates the brute from the Man. Again, Mr. Samuel Laing, in a work just published, *Problems of the Future*, is fain to admit that "the difference is a very fundamental\* one," although with the singular perversity of his class of reasoners, he endeavours to minimise this fundamental or immense difference by referring it to "arrested development," a convenient phrase which explains nothing. But a vast difference, an immense distance, intervenes—a distance really far more vast and immense than is even admitted, an impassable gulf which cuts away the ground of the mental evolutionist, and proves, beyond the shadow of a doubt,

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\* In a former quotation from a writer of the same school the difference was declared to be not a fundamental one.

that the Intelligence of Man is not an extension upon the same plane, or in mere degree, of the instinct of animals, but that a totally new principle is introduced into the human mind which raises it far above and out of the reach of Instinct—a principle which has elevated the human being, if not at once by a bound, yet at least with rapid strides, to an immense height above what had hitherto been the plane of its mere animal analogue, which we call Instinct.

Every animal, we repeat, is possessed at its birth with its own special and peculiar affection, which we call its nature, an affection which is entirely of a corporeal and sensuous character. And inasmuch as this sensuous affection is its very nature, its very self, it governs the animal in all its movements, rules it in all its actions, and is indeed its will, by which it is swayed and led in every particular of its life. In this government and direction of its actions, there is no such thing as thought, but these actions are determined solely by sensuous perceptions through which they are enabled to a certain extent to associate the present with the past; and also by means of such associations to draw simple practical conclusions in the way of experience, which may serve to guide them in the future. These simple conclusions are aided by a low form of imagination and its cognate memory; but all these mental characteristics have reference to sensuous and corporeal states only, as opposed to abstraction and reasoning.

Further, the affection into which every animal is born has constant reference to the two great corporeal functions of nutrition and reproduction. These are their dominant characteristics, and these characteristics express themselves in the various forms and phases of self-preservation and the sexual instinct. To one or other of these may be referred every action and every movement; one or other of these functions lies at the root of every manifestation which illustrates the nature of animals; and these two functions together constitute the affection which is their very life. And even those accessory phenomena which exhibit themselves under certain special conditions, and which appear to be of an exceptional character, may be regarded as resulting from the slightly more than ordinarily complex operations of the same impulses, leading to less easily explicable acts, it is true, which yet, however, cannot be considered as indications of anything approaching to human Reasoning, because Thought is aboriginally wanting in all the animal races.

Animals, however, inasmuch as they are imbued with this affection which constitutes their nature or very life, must be capable of certain cognitions. They must be possessed of what perhaps cannot be strictly called "knowledge," so much as cognitions of certain sensuous perceptions which affect them, either agreeably or disagreeably, and which they recognise as affording sensations either of pleasure or of pain. Such cognitions are essential to that affection or nature into which they are born; for the two are inseparable, and proceed *pari passu*, knowledge of any kind always producing a corresponding affection. And the sounds which animals utter are always characteristic and expressive of these cognitions and associated sensations; and although, as a rule, these sounds are limited to a discordant cry, this cry is capable of considerable modification in accordance with the emotion, which varies as successive cognitions are aroused by sensuous associations or by sensuous memory.

But although the cries of animals may be loosely called a language, it is totally different both in nature and in kind from the intellectual or articulate language used by reasoning beings, and which is as clearly a distinctive mark of intelligence, properly so called, as the cries of animals are of their sensuous perceptions or affections. For Speech presupposes Reason, and becomes more complex and more perfect in its power and in its forms of expression in proportion as the intellectual faculties are cultivated, always following their development with vocabularies framed to suit the growth of intelligence, and to express ideas which have already been conceived within the mind.

Moreover, as we have remarked, there is no neglected savage who cannot be taught to speak intelligibly; nor is there an infant whose powers of reasoning are in a normal condition to whom (by hearing) speech does not come as naturally as the breath he draws. Whereas no animal whatever has the faintest or remotest capability for this crucial endowment; \* any more than it can smile, make fire, or manufacture a tool.

So also are the gestures of animals mere unreasoning reflections of their sensuous states, consisting indeed of unrestrained movements, which, in many respects, interpret

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\* The announcement not long since that a learned man of science was about to teach his dog the art of conversation, and had already commenced his lessons, did not audibly alarm us. We believe the result has not yet been striking. Nor need it scarce be remarked that talking birds are *vox et præterea nihil*.

their inarticulate cries, and are supplementary to them: so that the one may, in most cases, be recognised as uniformly accompanying the other, and both be predicated as coexistent. But there is nothing in these gestures at all comparable with the impartment of ideas by the intelligent signs used by a dumb man, by which signs, indeed, every conception, concrete or abstract, may be conveyed with almost perfect and unerring facility, and entirely without the aid of articulate speech. There is, indeed, as wide a difference between the gestures of an animal and the gesture-language of a dumb man as there is between the bark of a dog and the speech of an orator.\*

The conditions, by a comparison with which we may best estimate the character of animal instinct, are those of somnambulism. The somnambulist performs various actions with the same precision with which he would perform them if awake; moreover, he enacts feats which, in a waking state, he would not attempt; and many marvellous characteristics of this abnormal condition are on record. The somnambulist walks and talks, performs on musical instruments, and carries out plans which have occupied his waking thoughts, and which are thus impressed upon his mind. And yet he has but a very imperfect consciousness of his acts; certain senses are specially acute, while others, and the intellectual faculties in general, are in a state of sleep or abeyance. He acts as in a dream, and for what he does he is not held accountable, inasmuch as his condition is recognised as one in which his ordinary faculties are dormant, and in which he is, therefore, not a responsible being, since he does not possess the guidance of reason and intelligence, or the volition which can only spring therefrom.

So would it appear to be with animals. What is an

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\* It may here be justly remarked that hardly enough stress has been laid upon the influence of form in judging of the actions of certain animals (such as apes) whose organs, from their similarity to homologous organs in Man, give them a power which is wrongly called imitation, and which is liable to be mistaken for an exhibition of intelligence, whereas it is merely a necessary concomitant, and, indeed, consequence, of similarity of structure. The movements of a parrot—its use of a prehensile foot—gives it a “knowing” aspect, too apt to be mistaken for superior wisdom, and the same may be said of certain Rodents; but in a more marked degree with the Simiadae, whose anthropoid forms necessitate certain actions which are thoughtlessly brought under the category of intentional imitation, the fruit of a superior intelligence; whereas the animal possessing legs, arms, and a body so nearly approaching the human can act with them not otherwise than in a manner resembling human movements.

abnormal state of a reasoning Man is the normal condition of unreasoning animals. They perform their actions, their movements, and their gestures according as they are led by their corporeal and sensuous affection; they act as though apparently conscious of and under the influence of surrounding objects and conditions, but the intellectual faculty, the mind, is absent, or as though plunged in a profound sleep. They do not therefore reflect—do not think—and therefore there is no true volition, and they are altogether without responsibility. All the actions of their life fail to come within the grasp of mental consciousness. They are not, it is true, mere automatic machines, but they have each a definite nature or affection implanted in them, against which, like the somnambulist, they cannot possibly act, but which is, in itself, sufficient for their guidance in every event of their lives. To this end their external senses are very acute, and especially those senses which are essential to each particular animal respectively for the perfect working of its special instincts relating to nutrition and reproduction. For since they cannot apply reasoning power either to the cause or direction of their instincts, their capacity of sensation must supply all such deficiencies; and, for this end, it is enlarged to the utmost, in order that the objects immediately presented to those senses may supply a stimulus which shall be in all respects adequate to their needs and requirements.

It is the versatility of instinct, thus produced, which gives rise to actions which so often deceive the observer, from their apparent resemblance to Reason; but it is evident, unless it can be shown that all that we have so far advanced in this paper is unphilosophical, and devoid of foundation in physiological or psychological truth, that while, on the one hand, thought and reason are absent, the stimulus afforded in their place by instinct should be sufficient in its degree, and adequate in its potency, to supply the deficiency—at all events, so far as to enable the animal to perform all those functions which may be summed up as appertaining to the two great generalities of nutrition (including self-preservation) and reproduction.

Moreover, it is a consideration in unison with what we distinctly believe to be the merciful arrangement and disposition of events, that it follows from the above arguments that animals, while not automata, although they undoubtedly suffer pain under the same circumstances which would painfully affect ourselves, nevertheless do not experience painful sensations to the same extent as we do. For they are in-



capable of thought respecting it; they cannot reflect upon it, any more than they can in other circumstances and conditions reflect upon their own consciousness. And thus pain is robbed of at least half its terrors. It is with them but the thing of the moment. It is true their memory may dimly recall such painful experiences, but probably only by the association of impressions, which render them vaguely conscious that the conditions accompanying such pain are exhibiting a tendency to recur.

Let us summarise definitely the points of similarity and dissimilarity which exist between animals and Man, as regards their mental endowments.

Animals agree with Man in the possession of senses which equally enable both to be in strict relation with their terrestrial environment—senses which are far more acute for the most part in animals than in Man, and for obvious reasons.

Animals agree with Man in the possession of propensities. These propensities are also all dependent upon terrestrial relations, and are adaptive to terrestrial environment. They are just those animal feelings which, unchecked in Man, become the sources of immorality; while in animals, which are essentially unmoral, and not immoral, they are necessary for self-preservative (nutritive) or reproductive objects.

Besides these, animals possess, in common with Man, certain feelings or sentiments—mental endowments of a higher class than the propensities—such as are designated self-esteem, love of approbation, cautiousness, imitation, and, highest of all, a kind of conscientiousness and benevolence. These endowments are only found, however, in the higher animals, especially the last two, which are almost, if not quite, peculiar to the highest classes of domesticated animals—animals, that is, which, by some unknown influence, have been deprived of the ferocious nature of their congeners, and have become specially attached to Man as dependents or companions. Some of these endowments, again, are strongly adapted to the two great objects of reproduction—as self-esteem and love of approbation, or self-preservation—as cautiousness; while those still higher endowments which we must allow to a limited class are of an elementary or rudimentary description, and in themselves constitute that very element of tameness, as opposed to ferocity, which specially characterises the higher domesticated animals.

But here the catalogue ends; animals exhibiting these

endowments in a more or less elementary form in proportion to their elevation in the mental scale. But the grand distinction between the animal and the Man lies in the facts that, 1st, these endowments are innate in the animal, but not in Man; 2nd, that in the case of these higher endowments, more or less common to both, there exists a wide, unbridged gap between the mode of their exercise, as exhibited respectively by the animal and by Man; and 3rd, that above these are all the higher and truly intellectual faculties, viz., those of relation and reflection, which characterise Man, but are entirely absent in the animal.

But what, it may be asked, is the explanation of the existence of even these higher endowments of animals? I would reply that the organic relationship in which animals stand to Man and their terrestrial environment equally necessitate the existence of some endowments (other than the propensities) in common with Man, which may subserve to their self-preservation by avoidance of danger, the acquisition of necessary food, and to reproduction for the perpetuation of the species. Such endowments are, we see, common to Man and animals, but are developed in Man by teaching and example, while in animals they are acquired without these aids.

Again, those of the sentiments which we have said to be possessed by animals are only so possessed by animals in a high condition of domestication, a condition which we do not believe to have been induced by any tribe or race of uncivilised or half-civilised Man, since the highest civilisation cannot effect it. No human power can, or has ever availed to, turn the ferocious instincts of the tiger or the wolf into the uniform benevolence and docility which we call the tameness of the cat or the dog.

Further, animals stop as to their endowments at this point, whereas all the higher faculties, moral and intellectual, are peculiar to Man, to say nothing of the highest or spiritual faculties. These are different, not only in degree, from those endowments we have referred to as shared by animals, but they are distinct in kind, and could not possibly have been evolved from lower endowments of a totally different character. Ideality, wit, veneration, such as begets worship, to say nothing of the appreciation of colour and form (art), of number and order (mathematics), of time and tune (music), the general sympathy with, and admiration of, nature, ratiocination, which implies comparison and weighing of causes and their results, introspection, morality, as under-

stood by human beings, the power of choice in the selection of good or evil, spiritual communion with the Creator, and articulate language, all these, and many others are special faculties, distinct in kind from anything possessed by animals, and totally beyond the power of any process of natural selection out of inferior endowments of an altogether different kind, and which no animals ever possessed, even in a rudimentary form.

But not only is it the fact that no animals possess, or ever did possess, any of these faculties, but it is also the fact that all these exist potentially in the human infant of every race, savage or civilised; and their greater or less development depends solely upon the opportunities of instruction which such an infant enjoys, which again are dependent upon the circumstances of its environment.

## *II. Reason.*

In the few remarks which I shall make on this subject I shall advance some further considerations in proof of my position, by pointing out certain characteristics of the human mind which illustrate its absolute and wide separation from those categories of mental phenomena which are exhibited by the lower animals, and to which we apply the term Instinct.

We have already especially dwelt upon the question whether animals possess innate ideas, and have answered it in the negative, upon the plain and simple ground that animals do not possess ideas at all, in the true meaning of the term, either innate or otherwise; because they are not capable of thought, and therefore *a priori* cannot possess, either at birth or at any subsequent period, ideas. Nevertheless we have pointed out that animals are endowed with certain intuitions, which we denominate in the aggregate Instinct, and that these intuitions are innate or connate in all animals. We have shown reason, moreover, to believe that the endowments which animals do possess not only are born with them, but that they are sufficient for all the purposes of their existence; so that all that they do, and all that they know, they do and know without further instruction.

But let us compare with the condition of such young animals that of the human infant. Instead of at once, or as soon as its stage of undevelopment and feebleness is passed through, entering upon its life-duties with a fund of practical knowledge sufficient to carry it through every phase of

common, or even exceptional experience, the infant is long incapable of anything except of drawing nutriment from the maternal bosom. And when the first dawning of intelligence begins to supervene, we find that it appears and gains increment *pari passu* with the degree in which its attention is directed to, or arrested by, the external objects presented to it by its parents or nurse. In other words, the infant is at first a mere corporeal being, with no instinct except that of sucking, and altogether devoid of intelligence; all that conduces to intelligence lying dormant and undeveloped. It is even quite devoid of that affection which we have seen to constitute the nature or the very life of the animal. The infant at first possesses absolutely no knowledge, no cognitions, and is therefore endowed with no affection of any kind; for the affection which constitutes the nature of an animal is based upon cognitions, and cannot exist apart from them. And since no infant possesses such cognitions, it therefore cannot possess intuitions of any kind whatever.

A human infant can only obtain its knowledge by means of external observation, aided by external instruction. It begins to "take notice" at an early period, but this notice or observation would be insufficient to teach it ideas without the intervention of others who already possessed such ideas: and this external intervention or instruction can alone store the dawning mind with facts or experiences, which lead to thoughts and ideas, and which thus gradually establish specific affections. So that, without such external instruction, the infant would and must remain, in its relation to the external world, more ignorant than an animal, since it would not only be void of animal innate cognition, but would have nothing to supply the deficiency, while its internal world would remain as a permanently sealed book, for want of any power of expansion within itself. Such indeed is the condition of the lower savage races, who are born and live without instruction or cultivation from without, and are yet incapable of improving themselves from within. For inasmuch as all are rude and uncultivated alike, none is capable of teaching the rest that of which they are themselves ignorant.

Such uncivilised people would indeed, from observation alone, slowly learn certain rudiments of knowledge, and gain a certain crude experience, which they would apply to the same purposes as those to which the instinct of animals is applied, as to food and shelter and security from danger, for these rudiments could only have reference to the general animal principles of nutrition and self-preservation. But

they could never raise themselves above their savage state, they could never rise to a civilised condition, unless they had assistance from without, any more than the infant could rise above the stage of infantile ignorance unless aided by the example, experience, and instruction of its parent or nurse.

Such indeed has been the positive condition of those rare but interesting cases of human beings who have grown up wild in forests until the age of puberty, and who, when discovered, were in all respects (except in their instincts) like animals, and with no more conception of civilisation or culture than bears and wolves. They had taught themselves nothing, beyond those rudiments which suffice to procure for them food and a rude shelter, they had no idea of articulate speech; and indeed, in the case of Peter the wild boy, never succeeded in learning it, though (as if to prove that that were no adverse argument) in another no less typical and interesting instance, that of Mlle. Leblanc (supposed to have been a year or two younger than Peter, when she was discovered in the forest of Soigny), perseverance in the effort to teach her to speak was at last rewarded with success.\*

We will not here diverge to the further consideration of the corollary which must necessarily be drawn from these facts, viz., that civilisation did not, and never could, begin from within, as self-originated by any race whatever. We are well aware of the views most in vogue among the ethnologists of the day. But it should be evident to any unbiassed and thinking mind that no race of men or semi-men could evolve even the merest rudiments of a complex civilisation from their own unaided potential faculties, since those faculties in all cases remain dormant or undeveloped as long as they are left to themselves, and only evidence their wonderful capabilities when they are drawn out by external influences of a superior nature.†

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\* We are well aware that these remarkable cases are now classed in some quarters under the category of "theroid idiots, which exhibit a striking aptitude for a wild animal life." But it is purely an assumption that they were originally idiots; nor is there any real ground for believing that they voluntarily took to their wild life. A patho-psychical niche is simply created for them, since they do not easily fall in with modern theories.

† No example (says Niebuhr) can be brought forward of an actually savage people having independently become civilised (see *Römische Geschichte*, Pt. I, p. 88). And Mr. Laing, in his latest work, begins by laying down the same axiom, although in several later passages he seems to have forgotten that he had done so, and grievously contradicts himself by his theory of primitive Man having evolved a civilisation for himself.

But if the infant comes into the world entirely devoid of any affection, or even of any kind of knowledge, both of which are possessed by animals to an extent sufficient for their needs from the very beginning, it may be asked, What is the birthright of the human being? What endowment does he possess which shall compensate for the absence of any innate knowledge or ideas? The answer is plainly, Faculties; the power of gaining by experience and teaching the knowledge it does not at first possess; the power of receiving impressions, cognitions, and thence thoughts and ideas; the power of obtaining adequate and suitable furniture for the spacious and prepared chambers of the mind; a power which in its scope is practically unlimited, —not indeed infinite, in the real sense of the expression, but yet unbounded in its progressive capability of development. A Man is born, indeed, devoid of innate ideas, but he possesses in their stead faculties for acquiring ideas to an indefinite extent; and hence his vast superiority over animals, which possess no such faculties or capabilities, but which are restricted from their birth to the sensuous knowledge and perceptions and the corporeal affection or nature into which they are born, and above which they can never by any possibility rise. Instead of differing from animals as regards their mental endowments, in degree only, a Man's intellectual and moral powers are of a radically different kind, discontinuous, and upon a higher plane, capable of indefinite expansion, and of a cumulative progression utterly foreign to the nature of the brute creation.

There exists, then, a most important radical distinction between the instinct of animals and the Intelligence of Man, a distinction which no theory of Evolution can, by any possibility, bridge over, or account for even in the smallest particular. The animal is born in possession of all its mental powers, as it were, ready for use, with everything *in esse*, and with nothing whatever *in posse*. The Man, on the other hand, has no positive endowments at his birth, but he possesses what we term Faculties, capable of being from that time forth indefinitely cultivated. He possesses, that is, nothing whatever *in esse*, but everything *in posse*. The animal knows, at, or in some cases soon after, birth all that he is ever capable of receiving of knowledge, his utmost powers being only of a sensuous kind, into which thought and ideas do not, nor ever can, under any circumstances, enter. The Man is born with nothing but a power of receptivity, a budget of faculties for imbibing knowledge and

reasoning upon it; but he is ready to learn and capable of acquiring everything under favourable conditions. The animal is perfect at birth, with a perfection which is incapable of being expanded beyond the narrow limits of its corporeal senses. The Man is imperfect, but with a power of becoming gradually perfect even in the higher flights of understanding and intelligence. The mind of the animal is like a field already sown with a crop which, although useful in itself, yet totally prevents any other crop from being inseeded therein, a meadow covered with herbage and wild flowers; while the mind of a Man is virgin soil, prepared for the reception of any and every crop, be it tares, which shall run to waste and disorder, or good seed, which shall spring up, and shall yield forty, sixty, or a hundredfold.

This radical psychological distinction between Man and animals is utterly incapable of being explained by any theory of natural selection. It passes it by without contact, and leaves the theory far behind. Any hypothesis of Evolution without superhuman guidance and direction can only act by continuous gradations, acting invariably upon the same plane, and could not by the wildest flight of imagination produce phenomena so utterly discontinuous as the unlimited faculties of Man out of the strictly limited corporeal-sensual instincts of animals. No survival of the fittest, I feel safe in affirming, however long the time granted, could develop something out of nothing, the grand and noble structure of human Reason out of materials so lowly, and so different in quality and essence.

The intellectual and moral faculties of Man are of a nature, character, and power of expansion which Man himself is utterly incapable of duly appraising, or of appreciating with anything approaching to fulness or completeness. In no man, indeed, are all these faculties fully awakened, and in some very much less than in others. They exist, indeed, potentially in all, but in infancy they are all dormant, and are gradually and, one by one, successively unfolded and roused into activity by various external circumstances, and are developed by continual use and practical exercise. A man may possess a faculty of which he little dreams, simply because the occasion for its use has not yet arisen, and it has thus never had an opportunity of being drawn forth and exercised. Thus, one may be endowed with a faculty for numbers, another for mechanics, another for military tactics, which may, by adverse circumstances, be kept quiescent for years, or which may never have an opportunity of being

brought fully into play. One may possess certain faculties to a pronounced and well-marked extent, which in another man may seem to be absent, or at best dwarfed and stunted, and the man in whom they are undeveloped may be incredulous of their existence in another. And a painter or a musician is a phenomenon to a man who has cultivated no faculty for painting or music, but who, under more favourable circumstances, and better developing conditions, would possibly have been at least very much more apt.

And as with the intellectual, so also with the moral faculties, certain of which may be possessed by men who, to others, who have not cultivated them, may appear as simple enthusiasts; but that does not prejudice them as real possessions, prized as such by those who are fully conscious of possessing them. A man with the spiritual faculty opened and developed in him may feel and know that he is in possession of a faculty which is to him a precious reality; while another, who does not possess it, who possesses indeed the capability of its development, but who by persistently denying it incapacitates himself from exercising it, so that, like any other unexercised faculty, it becomes atrophied within him, bestows upon his better gifted neighbour a self-satisfied smile, and points at him as a superstitious weakling. But such a course does not prove anything more than that such gifts are not equally valued by all, although their development demands an exercise of will which can never be set in action if the world into which the faculty leads is, in the outset, denied. It certainly does not in the smallest degree prove away the existence of what the one is conscious of possessing, though the other is incapable of comprehending it.

Those who would limit the faculties of Man to a certain section of them which are correlative with the outer, lower, or mere material world of Nature only, would do well to ponder the grand eulogium of the Poet, who, in language befitting his theme, thus apostrophises that section of the Primates which constitutes the human kind. "What a piece of work is Man! How noble in Reason! how infinite in faculties! in form and moving how express and admirable! in action how like an angel! in apprehension how like a god! The Beauty of the World! the paragon of animals!"\*

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\* It is to be feared, however, that the typical attitude of the mental Evolutionist is to parody this just and magnificent tribute. "What a piece of journey-work is Man!" we might fancy him saying: "How



And where have these faculties their seat and dwelling-place? We reply, in the subtle and inmost recesses of Man's nature, which are quite secure from the scalpel of the anatomist, and from the microscopic investigations of the physiological histologist. Yet must they energise through the instrumentality of the cerebral organisation. Their expression may, therefore, be dulled by a defect or flaw of cerebral structure, which is absolutely imperceptible and inappreciable to the anatomist, it may be by some mere vice of constitution, whether natural or acquired; or they may be altogether veiled and darkened by a more palpable imperfection. Yet the faculties are there, as a man's birthright, only they cannot find vent through the medium of the imperfect organ or instrument; and they must remain numbed and dormant until the unfavourable conditions are changed, and they are set free from their prison-house.

But no man can ever know and realise the extent and scope of his faculties. These which he most calls into exercise will be ever the most apparent and the most active; but he may, and probably does, possess others of which he little dreams, and the conditions for the development of which never arise in his present state. It is probable, indeed, that the highest conceivable subtlety of a merely material brain-organ may be insufficient to energise certain faculties, which therefore can never be capable of manifesting themselves in our present condition, but are reserved for a higher sphere of action. And if this suggestion be reasonable, we may hereafter be endowed with powers whose development will be entirely dependent upon being set free from the grossness of a material organ, however subtle a terrestrial medium, however delicately organised and adjusted.

Phenomenal manifestations of intellectual power are indeed not unusual, and seem to indicate that the special faculty thus exalted may be due to a high degree of development of the special region of the brain which is the seat of the energising power of that special faculty. For doubtless each region of the brain is correlative with certain groups of intellectual manifestations; but we have yet to learn how far localisation and differentiation extend. But while there must be a limit to the possibilities of the manifestation of faculty through a mere material organ, such as the brain,

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ignoble in Reason! how poor and cribbed in faculties! in form and moving how akin to animals! in action how like an ape! in apprehension how like a d-o-g!"

we are not acquainted with that limit; and we may safely judge that such phenomenal manifestations as we distinguish by the name of Genius are rendered possible by some unusually delicate adaptation of a specific region of the brain to the faculty with which it is correlative; a peculiarity, however, utterly beyond the power of the cerebral anatomist to detect. Such manifestations of Genius, which have brightened the history of our race, are due, on this view, to remarkable, and in a sense abnormal, subtlety of brain development, which renders possible a higher exercise of faculties, common indeed to all Mankind, but which in the generality are toned down by the exigencies of our material state and gross organisation. And thus we are led to the same point as before, viz., that when the time arrives that we shall cast off this material husk, there will be nothing to stand in the way of an indefinite expansion of our faculties, a vast exaltation of those with which we are familiar, and perhaps the birth of new ones which could never be adapted to the exigencies of a terrestrial and material life.

Considering the immense importance of the functions of the brain, and the difficulty of satisfactory investigation into the living brain-structure, it would seem that the school of mental evolutionists are somewhat hasty in their estimate of the value of the special characteristics of the human brain. Mr. Romanes, at the outset of his work, feels bound to give prominence to the perplexing character of the relation of Intelligence to the size, mass, and weight of the brain in the animal kingdom as a whole. And indeed it does seem a serious difficulty when we bear in mind the minute size of the brain of animals which exhibit the wonderfully versatile and complex instincts of the ant or the bee. It is true that more bulky animals would seem to demand a brain more proportional to their size and weight; but still the difficulty remains that the ant, with its tiny ganglion, is capable of effecting combinations which would put to shame a mammal with a brain weighing as many pounds as the ant's does grains. It would at all events suggest the belief that we are not fully acquainted with the precise material co-efficient by means of which such operations are effected.

"Now we really know (he adds) so little about the relations of intelligence to neural structure, that I do not think we are justified in forming any very strong conclusion, *a priori*, concerning the relation of intelligence to mere size or mass of brain." And again, "Knowing in a general way that mass plus structure is necessary for intelligence, we do

not know how far the second of these two factors may be increased at the expense of the first" (*Mental Evolution*, p. 46). But does Mr. Romanes mean to infer that the minute mass of the bee's or ant's brain is compensated by structure to a degree sufficient to account for their so-called intelligence? Because, if so, why cannot, in the first place, the superiority of structure be pointed out, or in some manner indicated, by the micro-physiologist?

I have before me Swammerdam's drawing of the dissected brain (or cephalic ganglion) of the bee, which well details the cortical substance communicating on either side (within) with the cord (which itself forms a loop posteriorly, and then gives origin to the first ganglion of the body), while the distal surface of the cortical substance is connected with the cortical fibres of the eyes; which again lie transversely under the membranes which support the pyramidal fibres (of the eye). We do not mean to affirm that Swammerdam gives all that the microscope would now detect; but we may safely surmise that the highest powers of the modern microscope would give no clue to the power which exists in that tiny mass for the carrying out of the wondrously complicated social economy of the hive.

And, in the second place, if superiority of neural structure compensates in these minute-brained animals for mass, what becomes of the doctrine of mental evolution? If the ant or the bee, members of the order Articulata, are so vastly superior in the structure of their brains to animals greatly higher in the scale of organisation, what law of evolution or natural selection can be formulated to account for such an anomaly?

Again, take the brain of any animal in the Mammalian ranks, and compare it with that of Man; can the cerebral physiologist determine wherein lies the vast superiority of the human brain? We are assured that the brain of Man differs less from that of a chimpanzee than the chimpanzee's does from that of a pig. But who does not see that the brain-manifestations of a pig and a chimpanzee are far nearer akin than are those of a chimpanzee and a Man. But if these facts do not justify us in forming strong *a priori* conclusions concerning the relations of intelligence to mere size or mass of brain, yet they do seem to justify us in the conclusion that, while the brain is universally (and no less so by mental evolutionists) regarded as the organ of mind, yet nevertheless, the vast distinctions or gaps in psychical manifestations are not to be accounted for at all on any known physiological

principles dependent upon either mass or structure, whether alone or combined.

But while the physiologist or the anatomist, with all the appliances of the scalpel and the microscope, searches out, we would almost say, all that can be learnt from these potent aids, he yet misses just that all-important element which sets the merely material machinery at work. If, as seems certain, the brain has a proper motion of a pulsating nature (which we should imagine to be highly consistent with natural analogies), it only confirms what we might have imagined *a priori*, viz., that the nerves are tubular vessels for the distribution of a subtle fluid, or perhaps of more than one kind of subtle fluid, utterly undiscoverable by the scalpel; a fluid or fluids adapted for the instantaneous transmission of ganglionic impulses, going from, and returning to, the cerebral cavities, like blood to and from the heart.

We have suggested more than one subtle fluid, for while the blood is usually called the life of the animal, no one supposes that it is in any other sense the life than as the bearer of a prepared pabulum to every part of the organism, both for its building up, and for the supply of waste tissue. The real organic life is not hæmal, but neural; not a gross fluid like the blood, but something which dominates the blood, as it does all the other particulars of the organism—something from which the blood itself derives its living properties. This subtle fluid must penetrate the whole body, through the agency of the nervous fibrillæ, which are its conductors or transmitters.

The material carrier or energiser of organic life must be of a highly subtle character, and the term animal spirit may be applied to it. But no scientific test can be brought to bear directly upon it, though we may hope at some future time for side-lights which may one day demonstrate its existence.

But, besides the animal spirit, or vehicle of organic life, the nervous centres must also be the material organs for the residence and expression of intellect and soul; and for these we can hardly conceive a fluid sufficiently subtle and ethereal. It need scarcely be said that these are suggestions, in which, however, it would be hard to say that there was anything unreasonable. Cerebral physiology, as, perhaps, the very highest walk of biology, is naturally in a very imperfect and undeveloped state, nor do we suppose that the most perfect and accomplished anatomist for a moment imagines that he has exhausted the subject, or even pene-

trated near to its inmost recesses. The probability is that he has not reached their confines.

The object of these remarks and suggestions is to point out the fallacy that mere size and weight of brain alone can be taken as an index of mental power; whereas it is probable that it is the subtle workings of its yet almost unknown fluids or spirits which determine its activities and energies. "Idiocy," it is remarked, "is compatible with large and apparently well-developed brains," but this apparently can only indicate the broad features and characteristics of brain-development, and can take no cognisance of those of which we have been speaking. To be the medium of the intellect (to leave soul out of the question), the brain must be an organ of wondrous delicacy and complexity; and it is conceivable that a very slight, and (by any physiological appliance) utterly inappreciable defect or want of balance would be amply sufficient to interfere with the due exercise of the reasoning functions, and would leave the otherwise rational Man an idiot. And such idiocy would yet be perfectly compatible with the belief that it arises from no absence of faculty, but that, could the defect or flaw in the instrument, or the impediment to the flow of the nervous fluids, be remedied, the faculties would energise; just, in fact, as a small warp or crevice in a flute would put a stop to its capacities for melody, although the same means were used which could otherwise render it musical.

In like manner we may conceive that the slight apparent structural differences between the brain of a Gorilla and that of a Man may be of but little importance, if a higher quality of nervous spirit be admitted as the probable operating cause of the higher manifestations of faculty in Man. Size, and weight, and even microscopic structure are but gross criteria for so excellent an organ as the brain—the sustainer of life, the instrument of thought, the energiser of the intellect, and the bond between the soul and the body.

And lastly, to return to that which led to these remarks, such delicate shades of organisation and such functional activities of the spirituous fluids (influences which very possibly interact) are in all probability the causes of those superior, and, in a sense, abnormal, manifestations of intellectual power in some special direction which we call Genius—manifestations which give us some slight insight into what would be the capabilities of the same faculties were they not hampered by a material organisation, but, instead thereof, lodged in an approximate spiritual organism. Justly guided

and properly directed they would seem to have, not indeed infinite, but certainly indefinite, powers of expansion, of which our highest efforts here serve to afford but a slight glimpse or foretaste. And the manifestations of genius with which we are familiar in exceptionally-gifted human beings, since they thus depend upon organic variation whose ultimate cause is unknown, and, although belonging to the highest regions of organic nature, are nevertheless, like other organic variations, liable to descend by inheritance, and to reappear in the next or even in the alternate generation, so that hereditary genius does not seem to be a phenomenon of greater singularity or import than the heredity of any other organic trait, or of any other of the multitudinous variations which the infinity of nature exhibits.

The possibilities of human nature, and of human faculty, are boundless. But let no man scorn that in another which he does not feel moving in himself; for it may be one day discovered that such shortsighted contempt will bring upon itself its own retributive punishment.

The CHAIRMAN (Rev. F. A. Walker, D.D., F.L.S.) conveyed a vote of thanks to Dr. Collingwood for his able paper, and after a discussion of a general character the meeting was adjourned.

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#### REMARKS ON THE FOREGOING PAPER.

By Professor E. HULL, M.A., LL.D., F.R.S., F.G.S., Director of the Geological Survey of Ireland.—Dr. Collingwood seems to me to have very ably stated the essential distinction between instinct in the lower animals and reason in man. The two master passions in the former—those connected with nutrition and reproduction—are, as he points out, limited to those purposes, and are purely sensuous; in man, they are made subservient to his higher mental and spiritual nature. The emotion or passion arising from the apprehension of impending danger which we call “fear” is equally powerful in man and the brute; though in the former the exercise of the intellectual faculty tends to neutralise its force. The origin of instinct in the lower animals is as great a mystery as the origin of genera and species; and notwithstanding all that has been written on this subject by Darwin, Romanes, and others,

the subject is involved in great obscurity. I doubt if Dr. Collingwood has given sufficient credit to the capacity of the instinctive faculty in the lower animals for expanding, on special occasions, into something very like reason and reflection. Most of us have had opportunities of witnessing examples of this higher exercise of the instinctive faculty—which would have done no discredit to the reasoning faculty in a human being; at least in the case of a boy or girl. But, notwithstanding such exceptional instances, the essentially limited scope of Instinct as compared with Reason appears to show a difference not only in degree but in kind, as the author maintains.

By Professor DUNS, D.D., F.R.S.E., New College, Edinburgh.—I have read Dr. Cuthbert Collingwood's paper with much interest. It is an able statement, review, and criticism of a great subject, which holds at present a prominent place in, so-called, philosophical biology. Is brute instinct generically the same as human reason? Have "the higher organic forms been developed from lower in such a manner as to leave no important gap in the animal series?" The latter question is generally answered first, and, by assumptions for which no reasons are given but subjective ones, the theory of evolution is held to warrant an affirmative answer to both. Oken's *dictum* passes for true science:—"Every organic thing has arisen from primitive slime, which originated in the sea from inorganic matter!" And man is no more than a link in the chain of being. It seems to me that this is begging the whole question, and is not scientific, because science rests on facts. Long ago Sir William Hamilton set this in its true light, so far as man is concerned: "What man holds of matter does not make up his personality. Man is not an organism, he is an intelligence served by organs; they are his—not he." This, moreover, strikes the point at which Scripture and true science bear one testimony as to man's place in Nature. In one aspect of his being man is linked to the lower animals; in another he has mental qualities which make a great gulf between him and the lower animals. When we take into account his rational nature—will, affections, imagination, hopes, capacity of education, self-consciousness, thinking that he thinks—we meet with elements which refuse to fit into any scheme of zoological classification that attempts to deal with man as if his place were not unique in Nature. Dr. Collingwood's able discussions are of much value from this point of view.

By the Rev. W. GUEST, F.G.S.— Dr. Collingwood has laid us under much obligation by his powerful arguments in relation to a current controversy. We may rest confident that the teaching of extreme evolutionists in their contention that the difference is one of degree only between the intellectual perception of man and the lower animals cannot be sustained. They are driven to this assumption; it is the necessity of their position, and will assuredly end in their discomfiture. The reaction is setting in strongly on the part of members of their own school, and Dr. Collingwood has done much to strengthen their protest. Nevertheless, we shall weaken our cause by imitating their positiveness. We lose nothing by acknowledging the mysteries that still shroud the boundaries of Instinct and Reason. Many of our members will hesitate to adopt the language of the author of the paper, and affirm that “Thought is aboriginally wanting in all the animal races;” nor will they be prepared to say that there is not “the remotest capability for the crucial endowment of speech” (pp. 98 and 99); and while firmly holding that the instinct of animals differs from the reason of man in “kind,” they will be unable to withhold from animals an ability of adaptation of actions to the ends sought, which implies more than is found in the unguided steps of the somnambulist (p. 101).



## ORDINARY MEETING.\*

THE PRESIDENT, SIR G. GABRIEL STOKES, BART, M.P., P.R.S.,  
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—Major James Cundy, Surrey ; F. H. M. Corbet, Esq., F.R.A.S., Ceylon.

ASSOCIATES :—E. D. King, Esq., B.A., M.A., Q.C., Canada ; Professor S. R. Leabody, M.A., D.Sc., F.I.C., Ireland ; F. W. Waldron, Esq., A.M., I.C.E. South Africa ; the Library, King William Town, South Africa.

The following works were presented to the Library :—

“Transactions of the Royal Society of Canada.”	<i>From the same.</i>
“                  ”          New Zealand Institute.”	”  ”
“                  ”          Geographical Survey of Canada.”	”  ”
“                  ”          American Geographical Society.”	”  ”
“                  ”          Historical Society of Manitoba.”	”  ”

A paper entitled “Organisation by Creation” was then read, and a discussion ensued, in which Dr. Collingwood, Mr. D. Howard, F.C.S., and the President took part.

The meeting was then adjourned.

\* April 14, 1890.

## ORDINARY MEETING.\*

THE PRESIDENT, SIR G. GABRIEL STOKES, BART., M.P., P.R.S.,  
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following paper was then read by the Author :—

*THE SCIENCE OF RECTITUDE AS DISTINCT  
FROM EXPEDIENCE.* By the Rev. H. J. CLARKE,  
Vicar of Great Barr, Birmingham.†

**H**OWEVER fruitless may be the attempt to imagine a system of Ethics in which it shall be found possible to dispense with the categories severally represented by the terms Right and Wrong, yet, if it can be shown that the question, "What is right?" ultimately resolves itself into "What is expedient?" and that, except as meaning this, it has no meaning at all relatively to fundamental principles, then of course there can be no Science of Rectitude as distinct from expedience. Practically, the supposition I am making is that, so long as we remain on the low level of a vulgar and conventional morality, we are liable to be troubled with reasonings in which we seem to hear a still small voice within, and are conscious of the presence of a monitor who persists in preaching about duty, but that having once succeeded in reaching in our emotions the standpoint of science, we find ourselves free to determine our

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\* April 21, 1890.

† Author of *The Fundamental Science*, etc.

actions by considerations which simply take account of profit and loss. On this supposition, if the discovery that our conscience had mistaken advice administered by ourselves for authoritative commands from the highest source conceivable should give a shock to our minds, and if the effort to substitute for the future in our searchings of heart the hope of pleasure or the fear of pain for the sense of duty should cost us a struggle, we could assign no better reason for our lingering reluctance to endeavour to bring our sentiments into conformity with truth and fact than the strangeness of the repellent doctrine, obviously an indefensible reason for fondly clinging to detected error, and virtually ascribing reality to a species of obligation which has been discovered to have no existence, save in the imagination of the inadequately cultured and informed.

But before we can assure ourselves that we are actually applying the elementary principles of the Science of Expedience to such a concept as *right* or *duty*, and may thereby expect to discover whether it be true that in their presence every such concept undergoes decomposition and disappears, we have to ascertain what that science is. Expedience presupposes an end in view, for the attainment of which means or instruments are used, or methods adopted. Whatsoever conduces (*συμφέρει*) to the desired end is in respect to it expedient, and, simply regarded as having this tendency, may be termed useful or profitable. Illustrations of expedience may thus be found in the contriving of means for the destruction of life and property, as in the application of scientific skill and mechanical ingenuity to the construction of rifled cannon and armour-plated ships, and the invention of explosive compounds, and the improvement of weapons of precision. Those persons who even make it their business to break into houses and safes take care to provide themselves with implements scientifically adapted to effect their purpose, and it would be difficult to imagine what further advance could be made, relatively to this one object, in doing what is expedient. A word then, which, it is plain, has no distinctively ethical significance, is obviously without meaning if employed for the purpose of characterising a system of ethics, thus forbidding us, indeed, to look for any recognition of a fundamental difference between right and wrong, but in all other respects leaving us in the dark as to the fundamental principles of the system. Neither alone, nor in connection with the word Science, does Expedience shed upon them the faintest gleam of light.

If an ethical Science of Expedience is to be constructed, it is obviously necessary that some universal and ultimate object of human action should be found on which the science may be based; for unless the foundation can thus be laid, nothing is more certain than that any attempt to design the superstructure will be a waste of time. Now, of course, no arbitrary assumption could be for a moment admitted: the object must be one that is determined exclusively and unmistakably by the nature of things, and yet we must hold ourselves strictly forbidden to affirm that we are under any moral obligation to aim at it. This is the problem, and utilitarian moralists believe that they have found the solution. They start with the assumption that everyone desires *happiness*. Well, so much may be readily conceded, if by happiness is meant a feeling of complete satisfaction. But satisfaction arises just in so far as desires are fulfilled. In the event of a conflict among them, this feeling will be experienced in the fulfilment of the desire that dominates over the rest, whether an animal appetite or a spiritual aspiration. But in such a case, until those others are either appeased or extinguished, whatever be the degree of happiness enjoyed, it will be qualified by the sense that something is wanting to make it perfect. We are expected then, it appears, to assent to a proposition that may be briefly stated thus: everyone desires that his desires may be fulfilled, namely, his dominant desire, and all others which it suffers him to entertain; or, somewhat to simplify the wording of this incontrovertible axiom, everyone desires those things which he does desire.

Well, seeing that no science can have for its basis a proposition in which nothing is affirmed, the would-be founders of the Science of Expedience must abandon their undertaking, or they must find some object of aspiration which may be fitly substituted for happiness. Will they, then, assert that what everyone desires is his *well-being*? We may presume they will not, if by a man's well-being we are to understand that which it is really good for him to be; for they would be making an assertion at variance with notorious facts. It is true, this is what everyone ought to aim at. But if "ought" be understood to point, not to a duty constituted by human enactment, but to a fundamental obligation, how could they accept the proposition thus amended? This little word, which so naturally suggests itself, and is so difficult to dispense with in the expression of ethical thought, would annihilate the entire system of their utilitarian notions, would pulverise it, so to speak, as effectually and completely as

toughened glass is reduced to powder when disintegrated by the slightest crack. But we have yet to be informed what constitutes man's well-being; and, as must now be apparent, no clue to the meaning of the word is to be found in prevalent desires.

On the supposition, however, that it is allowable to put out of view all volitional aiming at ends, so far as the immediate question is concerned, would it be relevant to observe that the development of every organism in nature strives towards the full expression of some type, or the outcome of a fusion of types, and gives evidence of an innate tendency to make the best of the circumstances by which development is in part conditioned? Undoubtedly, if it may be assumed possible to construct on utilitarian principles a science that shall determine the conditions under which the eventual appearance of the highest attainable type of man, as regards moral sentiments and conduct, may be hoped for. But in the first place, even granting the possibility of such a science, how are its doctrines to be utilised for the purpose of forcing ethical development? How is it to be made apparent that, in respect to sentiments and tastes and manners and customs, the evolutionary acquisition of new characteristics would more than compensate for the surrender of those which inherited disposition, strengthened by habit and prevalent example, struggles hard, even when plied with threats and penalties, to retain? If among any race of men the infirm and helpless are left to perish, or if population is kept within manageable limits by infanticide, the motives to which these practices may be traced are unquestionably utilitarian. Cannibalism may be similarly accounted for, and those who are addicted to it are as far from seeing any reason why it would be better for them to have their appetites and sentiments conformed to the appetites and sentiments of any type of human nature to which it is abhorrent, as an ape is from conceiving the thought that it would be desirable to become a man. How is the advantage of moral evolution to be proved to the satisfaction of those human beings who, however certain it may be that they are in no respect hopelessly deficient in human attributes, yet experience, in the gratification of brutish lusts and savage passions, the highest kind of happiness which their comparatively undeveloped humanity permits them to imagine, and who are devoid of taste for the decencies, the proprieties, the amenities, the salutary restrictions, and the multifarious requirements of civilised life? And from the utilitarian point

of view what reason can be perceived, in the nature of things, why the brutality which, as it would seem, is proper to such creatures at the stage of development where they still linger, should excite in us any other feeling than that with which we contemplate the disgusting habits and the ferocity which characterise gorillas? Further, it must be taken into consideration that the conditions of well-being are not the same for every genus or species in animated nature, but are determined in some measure by the degree which has been reached in the scale of sentient existence. Very narrow limits in respect to both perceptivity and activity are, in such creatures as an oyster or a snail may be taken to typify, consistent with well-being. On the contrary, in mammals of the higher ranks below the human, and not least in those animals whose forms most nearly resemble that of man, well-being presupposes in association with the more advanced morphological development the exercise of superior intelligence duly matched with all needful facility in adapting volitional action to varying conditions. But at the same time characteristics which are repulsive, both to our senses and to our sentiments, are far from being necessarily unfavourable to well-being; indeed, the subjugation of truculent instincts and the supremacy of such propensities as are congenial with our best feelings would prove destructive to many races of undomesticated animals.

Whether on the whole, and in the average of cases, the experiences of an animal in which natural ferocity has been subdued or mitigated by taming, are more pleasurable than those which were incident to its former mode of life, may be a question. No moralist, at any rate, advocates the taming of wild beasts with a view to their well-being. What reason, then, can the utilitarian assign why savages should be, if possible, civilised, except that whatever trouble and expense are thereby incurred by their civilised neighbours will prove ultimately to have been a profitable investment? I am not taking for granted that he accepts the theory of Evolution, although he cannot do so and at the same time deny the pertinency of the illustrations I have just been using; but in either case I fail to perceive that a further and a nobler reason is producible from his necessarily indeterminate conception of a state of existence which is at all times and under all circumstances to be desired for all sorts and conditions of men, that is to say, for every human being in whom it has not yet begun, or, if begun, still falls short of perfection.

Before, however, we can proceed further in testing the assumption that the science in question is possible, if for "Expedience" "Well-being" be virtually substituted in the title, we must be at once distinctly informed whether the latter of these two words is to be understood as pointing to the interest of the individual, or to that of the race, in the event of its being discovered that in some particular or other their respective interests do not coincide. A necessary or invariable coincidence it would be very rash for a utilitarian to take for granted. Throughout organic creation those individuals which contribute most largely to perpetuate a race are, in so far as it undergoes change, obviously such as chiefly determine its characteristics. But the most prolific of sentient creatures are not, as a matter of course, best qualified to derive enjoyment from their surroundings, to search out and explore its sources, to discover the flowers, as it were, which yield it, and to sip the nectar. Moreover, although the races which nature chiefly favours in the process of selection are to be seen in swarming multitudes, the time allotted for enjoyment to each unit in the countless totals which the environment of a fleeting life contains may be but momentary. Indeed, if regard be had to duration of life among the lower animals, there are noteworthy phenomena, not a little suggestive, in which it may be seen that the interest of spreading communities and the interest of the individuals of which they severally consist, considered respectively as such, bear to each other an inverse ratio. Certainly nature is restrained by no sympathetic attention to individual requirements from abridging life within the shortest available periods, if only she can thereby the more effectually multiply and diffuse the race. For the race of mortal men, in all probability, so long as the globe affords room for their multiplication, it must in the long run be most advantageous that every individual should adopt such practices and acquire such habits as are most favourable to longevity; but it by no means follows that the various sacrifices which the larger interest demands will, from the utilitarian point of view, be in every case the surest guarantee of private happiness and personal well-being. Circumstances may easily be conceived under which many persons must perish, unless there be one in whom the wish to save them overcomes the dread of certain death, is strong enough to impel him to make himself, in fact, a vicarious offering. Such circumstances do sometimes occur. Let it be granted, then, that inexorable Fate will accept no lower price for the safety

of the many than the life of some individual whom she has pointed out as the atoning victim ; is it advantageous to him that he should die ? To this question I find as yet no answer in the Science of Expedience.

Nor is it possible even to attempt an answer until it has been settled whether the existence of individual men is to be regarded as limited to that of their mortal bodies, or as prolonged under conditions involving at least the persistence of personal consciousness. Yet, it is quietly taken for granted that we can determine what constitutes man's well-being, while leaving open the question, whether in giving up the ghost he becomes extinct, or does but start upon a new career, and one perhaps which is to have no end. In the name of Science, we may ask, how comes it to have been overlooked that in this assumption scientific caution is conspicuous by its absence, and nothing, in fact, is so glaringly evident and undeniable as a rashness that amounts to audacity ? How could an architect be expected to prepare a plan for a building, if we suppose him to have been left in ignorance whether he were required to design a temporary framework of poles and boards, or a stable and enduring structure ? Is it only considered as a mortal that man may be likened to a building in the erection of which science and skill are available, or, being encompassed with a mortal nature, has he therein but just the scaffolding which is to be utilised in the construction of a permanent edifice ? So long as this question remains unanswered, the would-be builders, the framers of precepts for the formation of character and the regulation of conduct, cannot even make a plausible pretence of knowing what they are about.

A person, let us suppose, who has been upholding what he believes to be the true interests of his fellow men, is at length made aware that, unless he desists, he will suffer death ; and yet he neither accounts the good he might do by showing a martyr's courage and constancy of equal value with his own life, nor looks for any life to come. Will the professors of the Science of Expedience tell us how they would advise him to act, and with what arguments they would support their counsel and their exhortations ? On the supposition that they are at one with him as regards the truth and the importance of the doctrine he has been maintaining, they might of course dilate upon the impetus it is likely to receive from the steadfast courage of prominent advocates, and upon the demoralising effect of a suspicion that the acts and speeches of such men are not the fruit of deep convictions.



But urged from the standpoint of expedience, of what avail would these considerations be? I am putting the case of a man who will ask, not "What is expedient for my neighbour?" but "What is expedient for myself?" If his friends, declining to allow precedence to this question, should insist that it is his duty to consider the benefit he may confer upon society by an act of self-sacrifice, they would be resorting to the application of a species of moral pressure absolutely disallowed by the Science of Expedience, in which, as we are given to understand, the discharge of duties means nothing more than prudential conformity to the laws of the land, good or bad, and to such additional rules as social opinion may have established. Indeed, unless they can deny the legality of the penalty with which he is threatened, they must either disavow their science altogether, or admit that his duty, strictly speaking, coincides with what he conceives to be his interest. If, however, duty is to be kept out of sight, and he is, if possible, to be prevailed upon to become a martyr, it must needs be made apparent to him that he will thereby be a gainer. How is this to be done? Their doctrine is that "the virtue of self-denial is one that receives the commendation of society, and stands high in the morality of reward," that it is nevertheless "a means to an end."\* But on the supposition that he is expected to purchase the commendation of admiring disciples at the cost of ceasing to exist, and that, were he thus to become ever so famous, the revolutions of ages must at length efface from creation all memory of his name and his deed, his friends would have no cause for surprise if they should fail to satisfy him that the end was worth the means. They would find no ground whatever on which their argument could rest in any attempt they might make to convince him that he was mistaken, any serious endeavour to meet his objections with such reasoning as an intelligent and candid utilitarian must allow to be conclusive.

Their reasoning hitherto having thus, as we assume, glanced aside from his self-love, there is just one more arrow left in their quiver, a last inducement with which it is open to them, as utilitarians, to experiment upon him, if they should think it worth their while. They may suggest that he will indemnify himself for the sacrifice of his existence by the previous gratification of certain altruistic sentiments, which, as being of higher dignity than all merely self-regarding

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\* *Mental and Moral Science*, by A. Bain, "Ethics," Part 1, ch. i, § 11.

instincts, seeing that individual happiness largely depends upon social solidarity, have a prior claim to consideration. But let it be granted that, having balanced this gratification against the sacrifice it necessitates, and being of opinion that it has turned the scale, he chooses to throw away the remainder of his life for the sake of the pleasure he hopes to experience during the few days in which he will be awaiting death; on the extravagant supposition that this is the motive which overcomes his reluctance to die, who would respect it? Who would be able to recognise in it a testimony to the truth he had been maintaining? No advocate of the religion of expedience, whose practice consistently illustrates his teaching, can seal his testimony with his blood; by no possibility can the doctrine have a noble army of martyrs; none of its preachers could be enrolled in such a company without betraying their cause and becoming renegades.

We are still, then, waiting to be informed what that science is which resolves moral obligation into expedience, and having assumed this to be the fundamental principle of human action, expects us to ascertain it from the standpoint of Agnosticism relatively to a life to come. A speculation which, as thus appears to be the case, must of necessity be hazy, a theory about something which does not admit of being brought to the focus of a definite and certain meaning, is surely misnamed a Science. If the term is to be fitly applied, we must find for expedience an ultimate and stable foundation, and to this the title must be transferred. The principle we have to look for is seemingly not far to seek, for the human conscience, unless labouring under some radical misconception in persistently assigning to one or the other of the two categories, Right and Wrong, every morally significant action, evidently points it out. What we have now to ascertain is, whether the phenomena in which this kind of discrimination appears, are such as render possible a Science of Rectitude.

Now, seeing that it is in something which had no origin that every originated form of being subsists, it is manifest the latter can nowhere find a standpoint whence, nor ever exercise intelligence wherewith, it could possibly discover in the attributes or operations of the former anything that might be pronounced faulty, anything that might be held to warrant the reflection "this ought not to be." In the judgment of every thoughtful person of sound mind, these attributes and operations are of necessity above criticism; he

classes them as a matter of course among the things which are right.

It will thus appear that any being capable of deviating from rectitude must needs have an originated and therefore dependent existence, yet that its attributes must include a will, that it must be able to make a choice that is real, and not determined absolutely by the exercise of supreme control. If therefore the result of an investigation of that which is necessarily right relatively to such things as may possibly be wrong be the discovery of principles in respect to which it may be affirmed that the will of man is under an obligation to conform to them, the ascertainment of these principles constitutes a Science of Rectitude.

But if power be conceived as being non-volitional, and therefore unintelligent, no obligation to it can be rationally acknowledged. In point of fact, no human imagination ever has invested it with claims upon any creature. A fetish worshipper instinctively associates with the object of his adoration mysterious properties of a volitional kind; otherwise what could he hope to gain by treating it with reverence? No idolatry, however gross, is in this respect absolutely irrational; matter must be somehow spiritualized in imagination before the contemplation of any attributes it may seem to possess can excite the sense of moral obligation; a thorough-going and philosophically consistent materialist is of necessity a utilitarian pure and simple. With him fundamental duty can signify nothing more than what a man is at liberty to conceive, if such be his fancy, that he owes to himself. On the other hand, the notion that the opposition of self-will to the order of the universe is resistance to a rightful claim, and is for that reason reprehensible and merits punishment, postulates a fundamental Will.

How has this notion arisen? We may, I think, freely admit that religious conceptions of the sort which characterises early and immature speculations concerning the government of the universe are polytheistic, and show that the human mind is far from having any innate tendency to an immediate intuition of the necessary existence of a Supreme Ruler. How that light is to be accounted for which has been rolling away the old world darkness, I need not stay to inquire; it may suffice if I call attention to the indisputable historical fact that in the recognition of a unifying principle underlying all phenomena, scientific observation has been anticipated by religious belief. But what we have to ascertain is the nature of the unmistakably reverential sentiment in

which duty, if truly discerned as such, is conscientiously acknowledged, and which constitutes an essential distinction, of profound moral import, between looking upon anything as right, and merely perceiving that it is expedient. The doctrine which substitutes expedience for rectitude assumes the sentiment in question to be nothing but a habit of mind induced by experiences that generate a dread of interminably disastrous consequences in the event of persistent disobedience. Conscientious scrupulousness, it is conceived, may be a somewhat complex feeling; but the reverential regard for what is right which it yields when analysed, turns out to be an acquiescent sense of helplessness in relation to superior might. Each member of a community, learning by experience that the social order in which he finds himself is too strong to be successfully resisted by his individual will, acquires a sober fear of testing its strength by violating any of the rules of conduct to which it has subjected him, and of thus incurring the disapprobation of his fellow men, or, it may be, the entire forfeiture of respectability, and, if he should render himself liable to prosecution as a law breaker, judicially inflicted punishment.

Let it, then, be for a moment assumed that rectitude never receives any other reverential recognition than that which has its root in the fear of such penalties as men have it in their power to inflict. What better outgrowth, we may ask, is to be expected from this kind of fear than the endeavour to avoid such penalties? Its evidently proper fruits are cautious behaviour, diplomatically guarded language, plausible representations, studious care in the outward observance of all conventional proprieties, and, indeed, if it becomes the dominant principle of action, unremitting efforts to obtain by any means the credit of doing the right thing. The most successful students of the wisdom and knowledge which have their beginning in the fear of men must needs be in this species of performance the most accomplished actors, or, to use a very significant word in its strictly accurate sense, the most consummate hypocrites. But does the theory which identifies a conscientious regard for rectitude with the dread of arraignment before one or another of those tribunals at which society passes sentence on delinquents adequately account for all the phenomena of the human conscience? Can we perceive in it the cause of that feeling of compunction with which an honest man is visited, if in any business transaction he finds that he has, through failing to exercise due care and caution, defrauded his neighbour?

The latter, let us suppose, unless informed of his loss, is sure to remain in ignorance of it; and the amount is insignificant. Still, if the other's conscience should forbid him to leave the error unrectified, the scruple by which his action is determined will be perfectly intelligible to upright minds, and not at all abnormal or extraordinary. Perhaps he discovers that he has received from a person of great wealth some payment slightly in excess of the amount he was entitled to. In this case it cannot be pretended that his scruple has sprung from sympathy; the circumstances are such as to preclude all anxiety lest he should be abridging, be it ever so little, the comforts or the pleasures of a fellow-creature; yet so long as he remains conscious of leaving unsatisfied a claim that might justly be made upon him, he is not quite at his ease. Is it conceivable that a feeling of uneasiness which the possession of a secret impenetrably close and secure, so far from stifling, only aggravates, is after all the mere development of a fear generated by coercive measures which society has thought it expedient to adopt with a view to its own preservation? Let the teacher in whose eyes whatever anxiety or terror may be experienced in the recollection of wicked deeds originates in awe inspired by outward and visible authority, and is traceable to this source alone, find, if he can, a name for the motive which now, and then urges an unsuspected criminal to give himself up to justice; and let him explain how it comes to pass that in a variety of cases, in which prudential considerations might seem to counsel the strictest silence, troubled consciences seek relief in confession, and only in this way succeed in ridding themselves of burdens too heavy for them to bear. Human life abounds in concurrent proofs that perturbation, horror, and remorse are liable to arise from the mere consciousness of a deviation from rectitude, and, moreover, that the mental distress thus experienced is by no means proportioned in each case to the dread of incurring such penalties as human tribunals have power to inflict, that timidity as regards these deterrents from crime may coexist with moral insensibility, and on the other hand courage with conscientiousness. Human nature, in so far as earthward tendencies allow its distinctive features to appear, shows itself to have been stamped with no equivocal testimony to the truth that the ultimate ground of all admissible authority is not Might but Right, and that to make this an adversary is to be overthrown and crushed.

Deeds which outrage righteousness and presuppose deep wounds inflicted on the sense of moral fitness are apt to pro-

duce upon the evildoer's imagination such effects as the operation of human laws signally fails to account for. Certain well known characters and scenes which, although in some measure dramatic fictions, are universally allowed to be distinct reflections from a mirror held up to nature, may serve to illustrate this remark. A King of Scotland pays a visit to the castle of an ambitious noble. The host, tempted by the opportunity, and at the same time urged and aided by his still more ambitious wife, treacherously assassinates his confiding guest, and afterwards causes an intimate companion, whose prospects render him formidable, to be put to death. He lives in an age when human life is counted cheap, and when the administration of criminal laws is not such as to infuse into the souls of mighty warriors a spirit of salutary caution; he is now exalted above all earthly tribunals; and he is a man of daring personal courage. But, having done exceptional violence to his moral sense by the perpetration of atrocious deeds, he has become subject to a terrifying impression of guilt, from which he can find no escape, and he quails before a corpse-like spectre which his torturing conscience persists in conjuring up. The partner of his guilt is more resolutely wicked than himself, and her unhallowed aspirations have smothered in her breast whatever affections of a sympathetic nature might otherwise have held her impatience in check, and hindered it from overstepping the bounds within which worldly scheming is ordinarily confined. But she too becomes eventually a terror to herself, and in the breaking down of physical strength under the incessant pressure of a restless spirit she is hypnotised by the all-absorbing impression that the bloody deed has left upon her hand a stain which nothing can ever wash out. She has fearfully lacerated, so to speak, her moral sense, and not knowing where to find or how to apply an effectual remedy, she dies of the wound.

But, as regards the possibility of horror arising from the mere consciousness of having deviated from rectitude, fiction never created or embellished any illustration more instructive or more pertinent than may be found in one of the most memorable of historical facts. It would be difficult to imagine circumstances less favourable to the development of a sense of guilt through awe-inspiring experiences of the majesty of outward and visible authority than those under which Judas Iscariot committed the crime that has rendered his name a by-word. An authority which piety and patriotism alike were accustomed to honour with submissive rever-

ence, and whose powers were formidable, had pronounced the victim of his treachery to be worthy of death. In his former associates he could see nothing which might have made him apprehensive of their vengeance, and in forfeiting their good opinion he had laid under a heavy obligation the magnates of his people, and might now hope for large rewards, if in continuing to place his services at their disposal he were to show intelligent zeal. But no sooner does he become aware that his deed is certain to have a tragical issue and cannot be undone, than he wakes up from pleasing anticipations to the reflection that he has betrayed innocent blood. The possession of the blood-money now fills him with unendurable disquietude. Finding that the persons from whom he received it decline to take it back from his hands, he flings it away. Yet he cannot rest: existence itself has become a burden which he can no longer bear. A desperate effort to get rid of it with suicidal hands is the last recorded testimony he bears to that horror of himself which is the consequence of his abominable deed. By this act of self-murder he makes it evident that what he dreads most is no future penalty, not even punishment in another state of existence; for if he were trembling at the prospect of an account to be rendered in a judgment after death, why should he precipitate the issue of the summons to appear? Are not all the efforts of shrinking fear in such a case determined by the longing for a respite, and is there not ever present the readiness to catch at any seeming warrant for the faintest hope of eventual escape from the impending doom? How, then, is that state of mind to be accounted for which makes the continuance of conscious existence insupportably horrible? Will it suffice to reply, "Any action that is hostile to our interest excites a form of disapprobation, such as belongs to wounded self-interest?" or, "Any action that puts another to pain may so affect our natural sympathy as to be disapproved and resented on that ground?"\* What if a murderer believes that he has sent a Lazarus to Abraham's bosom? Now that the pain he inflicted is at an end, what is there which, from an altruistic point of view, should cause him to feel otherwise than gratified? As to the moral character of the deed, he can have no sufficient reason for feeling uneasy, if we are to accept the doctrine that "a moral act is . . . an act prescribed by the social authority, and rendered obligatory upon every citizen," and

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\* *Mental and Moral Science*, by A. Bain, "Ethics," Part 1, ch. iii, § 11.

that "its morality is constituted by its authoritative prescription, and not by its fulfilling the primary ends of the social institution."\* For surely we are not expected to assume that a person may reasonably account himself wicked who presumes to act or think or feel in any matter or in any respect otherwise than in accordance with laws and rules which owe their authority to civil government or to prevalent custom. If in the court of his conscience he pleads guilty, if he acknowledges that he has acted, not only without due regard to his own interest, but blamably, he recognizes in so doing an essentially deeper obligation than can possibly have for its basis a fluctuating aggregate of more or less conflicting wills. The question at issue leaves it unnecessary to ascertain his religious creed, before we attempt to determine the import of his acknowledgment that he has acted wickedly. He has, it may be, no religious creed at all, but he still proves himself to have deviated from rectitude, and thus bears witness, although unconsciously, to the fact that his will has come into collision with a Will to which are due absolute submission and unlimited reverence. His conscience, in pleading guilty, assuredly recognizes the authority of a Judge whose jurisdiction is the universe, and from whose tribunal there can be no appeal. Of this we suppose him to be unaware: we are not concerned, however, to inquire how he interprets his sense of guilt, but simply to point out that it necessitates a distinction between remorseful acquiescence in the claims of rectitude, and the sort of perturbation which is experienced when recollected acts are discovered, in view of consequences, to have been inexpedient.

Yet, how are the claims of rectitude to be ascertained? For any attempt to expound them systematically, and with the precision which a science presupposes, must of course await the answer to this question. Objectors, as might have been expected, call attention to the undeniable fact that the different nations and races of men have never been of one mind as to what constitutes right and wrong, and that in this matter wide diversities of opinion prevail. We are reminded, among other things, that "polygamy is regarded as right in Turkey, India, and China, and as wrong in England," that "marriages we pronounce incestuous were legitimate in ancient times," that "the views entertained by Plato and Aristotle as to the intercourse of the sexes are now

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\* *Mental and Moral Science*, by A. Bain, "Ethics," Part I, chap. iii, § 10.



looked upon with abhorrence.”\* But what does all this prove? Not that there are no stable principles on which a Science of Rectitude may be established, but that such principles need for their discovery, and with a view to their specific applications, more reliable criteria than are to be found in men's creeds and their notions respecting the ground of social order and social relations—that the science in question, if there be such a science, comprehends more truths than are necessarily perceived in the way of simple intuition, that the acquisition of it presupposes the culture of that faculty of moral discrimination from the exercise of which have sprung the terms *right* and *wrong*, and that it is acquired conformably to the character, and proportionably to the degree, of the culture which the faculty receives.

It is an undeniable fact that some people have a better eye for perspective than others, and some a better ear for music. There is doubtless many a person who, when he looks at a picture in which some of the lines supposed to recede from the spectator in the same direction do not converge towards precisely the same point, fails to detect the error, and to whom, if he were making a drawing of his own, it would never occur even to choose a point of sight and regulate with due regard to its position the course of every line. But who would infer from non-agreement in critical remarks, thus easily accounted for, or from a similarly explicable absence of universally known and accepted rules, that there can be no Science of Perspective? Relatively to diversity in the appreciation of musical sounds, a question of like import may be asked. There are persons whose feelings never vibrate in response to elaborate harmonies. There are ears more easily attracted by a husky pothouse rendering of any of the dullest and heaviest of street airs, and by the feeblest of stridulous instrumental performances, than they would be by the faultless execution of some wonderful masterpiece of a composer of world-wide fame. Indeed, to not a few has been denied the power of so discriminating definite relations in degrees of pitch as to be just capable of distinguishing clearly one tune from another; and to such people music can be little more than a succession of rhythmical variations in certain kinds of sonorous noise. Yet, notwithstanding all the gradations and varieties of shortcoming which may be assumed to exist, if perfect sensibility of ear be taken as the standard, and in spite of the consequent diversities of taste

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\* *Mental and Moral Science*, by A. Bain, “Ethics,” Part 1, ch. iii, § 6.

and opinion, which must needs be innumerable, what person, who could pretend to any knowledge of the subject, would refuse to accord to Harmony the rank of a legitimate science? Its title to this position is of course indisputable; for its laws are no arbitrary aggregate of compromises, no systematised outgrowth from idiosyncrasies in respect to musical taste; they have for their basis complexities of arithmetical ratio between successions, simple and consonant, of sound-producing waves of different lengths, and are therefore grounded upon relations in which the intellect, independently of any aid it may receive from the ear, is able to perceive significance. It is beyond all human power to frame the laws to which musical composition, whether as regards successive or simultaneous sounds, should conform, but the ideally proper function of what is called an ear for music is to be sensitive in exact correspondence with laws which have been determined by the constitution of nature. Germane to this duty is the proper function of the artist's eye; and, in the discharge of both, the acquisition of technical accuracy is facilitated by practice and education. Hence it must be evident that facts of large and profound analogical import warrant the expectation of finding laws into full accord with which it should be our aim to bring the responsive susceptibilities of that innermost sense, that spiritual eye or ear, which indeed cannot act at all without at least discriminating between Right and Wrong, considered respectively as such, yet does not of necessity discriminate correctly, but for the due discharge of its functions needs a healthy development, and therefore the aid of such influences as tend to strengthen the reverential and sympathetic affections, and of such illumination as may ensure a sound judgment, in so far as the co-operation of the intellect is requisite.

Now, in the first place, it will easily be perceived that a certain duty which is commonly held to underlie and determine all other conceivable obligations, virtually receives scientific recognition, on the assumption that Will is an attribute of the First Cause. The original and absolute Will of necessity claims unlimited obedience, and its title is a self-evident fitness, which the human intellect is so constituted as to be able to discern, independently of any impulse it may receive from emotion, and which, therefore, in this respect may be ranked with mathematical axioms. On the same ground, it is of course no less apparent that whatever responsive affection and desire the originated being is

capable of, are due to its Author. Here, then, we have a scientifically sure foundation for the first and great commandment. But for the fulfilment of this, and of the numberless subordinate commandments which it comprehends, a spirit of reverential faith and love is obviously indispensable, and, in proportion as the requisite sentiment is developed and educated, the manifold intimations from which religious duties may be inferred are observed and correctly interpreted.

In the next place, it may be made manifest that we have not far to seek, if we inquire after some fundamental principle of scientific value, available for determining each man's duty towards his neighbour. Whosoever wishes to arrive at it has only to imagine himself in his neighbour's place, and from the standpoint to which he has thus transferred his intellect and sentiments to reflect what sort of treatment he would now deem reasonable and considerate. In doing this he is plainly not adopting an arbitrary method of getting at the truth he is in search of: a self-evident propriety, an unmistakable analogy to conditions of all sorts and kinds under which a naturally expected balance or symmetrical arrangement is brought about declares it at once to be the right method. On the supposition that he puts it in practice, then, to use a Scripture phrase, his way is *equal*. He can claim no praise, as for a work of supererogation; he has done no more than he was bound to do. True, he has rendered himself lovable, yet certainly not by any word, or other token, from which it might be gathered that he expected to be credited with an act of gratuitous favour and laudable generosity, but merely because his sympathies proved equal to the occasion. For, as befits a nature in which heart and intellect are intended to work together, the recognition of the duty was their united act, and accordingly, being emotional, as well as rational, it was effectual.

For the fulfilment of the second commandment, however, no less than of the first, the necessity of moral culture and education is apparent. But by what process of reasoning are the seeming evidences of this necessity, whether as regards the first or the second commandment, held to warrant the conclusion that those evidences are illusory, from which it is commonly inferred that man has been endowed with a *capacity* for moral discrimination? Surely, it would be transparent folly to argue that, because children could not be profitably consulted with a view to the modification of the laws regulating marriage and divorce and the framing

of a new table of degrees of kindred and affinity, and could not be expected to point out under what circumstances one nation may legitimately take up arms against another, and whether or not judicial oaths should be deemed unlawful, they are therefore merely distinguishing the expedient from the inexpedient when they seem to show themselves sensible of an essential difference between right and wrong. What if "the Turkish woman exposing her face is no less conscience-smitten than if she had murdered her child?"\* Such facts as this illustrate the influence which prevalent opinion, especially in the absence of large and liberal culture, commonly exercises in determining the formation of individual minds, and the extent to which the moral sentiment may become distorted in its growth under the unhealthy pressure of a social tyranny. But, if adduced by way of proof that no determinate criteria of right and wrong actions are to be found in the voices of individual consciences, they are beside the purpose; for the Science of Rectitude presupposes that the moral sense is not an origivative, but a receptive faculty, and can attain no healthy and robust development apart from the vigorous exercise of the intellectual powers, and from habits of mind acquired by resolute suppression of sensual and selfish impulses in conformity with the requirements of the highest reason. The education which has for its end and aim the regeneration of the human race, brings more and more distinctly into view the principles and applications of the science which teaches man his Duty; but whatever further development they are destined to receive in ages to come in the operation of reforming laws, customs, sentiments, and modes of thought, and through the revolutions wherein the survivals of all barbarism will at length become wholly extinct, they will still be, as now, the exposition of those Two Commandments on which hang all the Law and the Prophets.

The President (Sir G. GABRIEL STOKES, Bart., P.R.S.).—I will ask you to return your thanks to the author of this paper, who has travelled from a distant part of the country in the present somewhat inclement weather to lay it before us. He has treated his subject very fully and exhaustively, and I may say for myself that I have listened to him with great pleasure, and think that the sentiments he has given utterance to will find wide acceptance.

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\* *Mental and Moral Science*, by A. Bain, "Ethics," Part 1, ch. iii, § 11.

One or two remarks having been made:—

The AUTHOR said:—A few additional words from me seem called for in relation to a science, or what professes to be a science, which it has been proposed to substitute for the utilitarian science of Expedience—I allude to that science which is to be found in Herbert Spencer's *Data of Ethics*. There he virtually insists that there is a science of Rectitude in opposition to that science which the utilitarians have attempted to construct; but that it is not any truly scientific substitute for the utilitarian scheme I think will be apparent to those persons who have followed my remarks, and who have found in my paper a sufficient refutation of the utilitarian doctrine. Mr. Herbert Spencer, starting from the assumption that such actions as are conformable to the nature and requirements of any form of sentient life are necessarily productive of pleasure, and finding that the motives they presuppose are thereby determined, argues that the process of evolution, regarded from a psychic point of view, is the pursuit of pleasure. It is thus that man is progressing towards that ideally perfect state which, as Mr. Herbert Spencer seems to think, he will eventually reach; egoism, it is assumed, being of necessity man's ultimate and fundamental principle of action, but an increasing tendency to subordinate immediate pleasures to those which are more remote, yet comparatively large and diffused, insuring in due measure the culture and the satisfaction of altruistic sentiments, thereby profiting the individual, and at the same time bringing about more and more the better fulfilment of the conditions on which the well-being of the race depends. But what is to be the outcome of human evolution? Is it to be a complete assimilation of all individuals in respect of fortune and personal endowments? Is it to be the entire obliteration of all those differences which may cause preference for one or another? Is it to be the impossibility of anything like invidious distinctions? If so, then perhaps Mr. Herbert Spencer's millennium may be approaching; but if diversities, such as now prevail, are still to exist in some measure, then I shall be glad to be informed by those who hold that doctrine in what way they think that the extinction of envy and jealousy, and of such anti-altruistic sentiments as are thereby engendered, viz.: "hatred, malice, and all uncharitableness," is to be brought about. To me it seems marvellous that anyone who knows what men are, who has any knowledge whatever of human nature, can see in egoistic altruism a fence that

shall keep out of the paradise which Mr. Herbert Spencer's imagination has so glowingly depicted the enemy of all happiness and peace.

The principal weakness of this system is seen in this—that it makes no provision whatever for the suppression of pride and self-will, and all those naturally anti-altruistic sentiments which these are liable to generate. The necessity for self-purification within is altogether ignored. As a matter of course, all religious hopes and fears, as being relatively to this science superfluous, are discarded—they are to be regarded as superstitions, the survival of antiquated cults that had their origin in what is called the "ghost theory," and it is calmly and complacently taken for granted that when men have altogether ceased to look up, in aspiration after holiness, to an invisible searcher of hearts, when God is no longer in any of their thoughts, then there will be a Heaven upon Earth. And, in accordance with this view, no essential distinction is recognised between mere animal characteristics and high moral qualities, or between enfeeblement of animal energy and the sort of injury that is sustained when an unconscientious act is done, or an opportunity of doing good is selfishly neglected. Even a good action, if it should cause pain to the doer, is regarded by Mr. Herbert Spencer as being, not absolutely right, but the least wrong possible under the circumstances. The good effect which is wrought upon character by faith and hope when, engaged in noble undertakings, they persevere through painful and disheartening experiences, is simply overlooked—no notice whatever is taken of the scores which virtue thereby makes; and as regards the life to come, and the voluntary surrender of the present life for righteousness' sake, not a word is said. Such questions as "Whither are we going?" and "What is to become of us?" are altogether ignored; and thus, although in a certain respect the system of Mr. Herbert Spencer is an improvement upon the ethical system of Mr. Bain, although it is certainly a little more scientific, yet it is no true substitute for the science of Rectitude. It professes to be a science of Rectitude; but, after all, it is the science of an indeterminate experience and, therefore, as I maintain, it is no science at all.

The meeting was then adjourned.

## ORDINARY MEETING.\*

H. CADMAN JONES, ESQ., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—B. H. Collins, Esq., Tunbridge Wells ; C. Goodyear, Esq., Manchester.

ASSOCIATE :—Rev. J. C. Hoare, Tunbridge Wells.

The following works were presented to the library :—

“Creation and Physical Structure of the Earth,” by J. Thornhill Harrison, Esq., M.Inst.C.E.

“Development of Osseous Fishes,” by Professor A. Agassiz.

“Egyptology,” by Dr. A. Wiedemann.

“Les Découvertes de Nineve et de Babylone,” par M. le Pasteur J. Walther, V.D.M.

“Physiography,” by Professor E. Hull, F.R.S.

“Science and Geology,” by Rev. W. B. Galloway, M.A.

The publication of the paper read on this occasion is necessarily delayed.

\* May 19, 1890.

## ORDINARY MEETING.\*

THE PRESIDENT, SIR G. GABRIEL STOKES, BART., M.P., P.R.S.,  
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Election was announced :—

ASSOCIATE :—F. C. Huddle, Esq., London.

The following paper was then read.

*GOD IN NATURE: SOME THEISTIC ARGUMENTS  
DRAWN FROM NATURAL PHENOMENA.* By  
Professor EDWARD HULL, LL.D., F.R.S., Director of the  
Geological Survey of Ireland.

IT might seem incredible that, in this nineteenth century when philosophic research has demonstrated that our whole cosmic system consists of phenomena indicating marvellous adaptations and evidences of design, it should be necessary to remind mankind that such evidences exist: and the theist will gladly abandon the attempt to demonstrate that which to him is self-evident whenever the atheist desists from his attempt to prove that there is no God. But until this happy consummation arrives, the theist is bound to endeavour, humbly and reverently, to meet his opponent by arguments, perhaps, often used before, but which are by no means worn out by length of service.

Since the time when the Psalmist pointed to the Heavens as declaring the glory of God and the evidence of His handiwork, astronomy has made many grand discoveries as regards the laws regulating the Universe which were unknown when this inspired poet wrote. St. Paul appealed to

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\* May 5, 1890.



nature as bearing such clear evidence of the power of the Godhead that all mankind were without excuse whoever should ignore that evidence.\* Even the more enlightened philosophers of pre-Christian times recognised the agency of the Creator in nature; though sometimes attributing to His direct action that which can only be properly considered as resulting from the operation of natural laws. This, perhaps, is the special distinction between the views of the ancient and modern theist.

I propose on the present occasion to select out of many examples of creative power two, drawn from the organic part of nature, which have always seemed to me to stand out from amongst those which we regard as ordinary examples; namely, 1. The origin of life on the globe, and 2. The origin of man. Both these problems are of profound interest to ourselves; but I do not regard them as evincing any exceptional or unusual exercise of Divine energy, as all natural phenomena stand on the same level in this respect; for as Pope has well expressed it: "All are but parts of one stupendous whole;" we ourselves and our surroundings all testify to the same Divine power.

1. *The Origin of Life on the Globe.*—It has been admirably argued by Locke that organic vitalised beings cannot have been originated from inorganic inert matter by its own force alone. This result of a process of reasoning finds support amongst many naturalists of eminence at the present day; and all attempts to originate life from lifeless matter, and to prove that life can be so originated, have so far failed.

Whether there be living beings in the other planets of our system, as inferred on astronomical grounds by Sir David Brewster, does not much concern ourselves. What we know about our own world is, that it is inhabited by living, organised beings; and we possess the most incontrovertible evidence that there was a period when such beings did not exist upon its surface. If, as there is every reason to suppose, our world was in a molten condition from heat—living beings could not have commenced to inhabit its surface till this had cooled down to a temperature below that at which albumen coagulates. Hence we have to account for the first appearance of living beings on our globe.

Professor Ernst Haeckel, who ridicules the idea of a miraculous origin for living beings, still makes no attempt to explain their origin from natural causes. I presume that he

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\* Romans i, 19, 20.

well knows that he cannot do so. In his outline of the Darwinian hypothesis he says:—"The theory which, through Darwin, has been placed at the head of all our knowledge of nature is usually called the doctrine of filiation, or the theory of descent. This doctrine affirms that all organisms . . . . are derived from one single, or from a few simple original, forms; and that they have developed themselves from these in the natural course of a gradual change."\* Here "one single, or a few simple original, forms," are postulated; but we are not informed whence they came, or how they are to be accounted for. Unless it is affirmed that purely inorganic matter has had the power in the beginning of organic creation of developing out of itself these "few simple forms," or even one of them (an impossible hypothesis) then certainly we must call in the exercise of a Creative Power outside our world. There appears no escape from this alternative; and once Creative Power has been admitted it is futile to deny its exercise for all future time. It is surprising that Haeckel has not seen that his position is untenable. In adopting Darwin's hypothesis, Haeckel has omitted to adopt his master's declaration that he inferred "from analogy that *probably* all the organic beings which have ever lived on this earth have descended from some one primordial form into which life was first breathed by the Creator."† This one form in a further page is amplified into "a few forms"‡ Whether the Darwinian hypothesis of Natural Selection is sufficient to account for the changes which organic bodies have undergone from the end of the Azoic period down to recent times is a question on which we may differ, and on which I may have something to say presently; but our great English naturalist clearly attributed both the original living forms and their supposed inherent laws of development to the interposition of a Divine Creator; and this being so, it is not necessary (in order to accept the Darwinian hypothesis) that we should banish the Creator from the universe.§

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\* The theory thus stated is not very different from that of Lamarck; and it is scarcely full enough. *Natürliche Schöpfungsgeschichte*, trans. by E. R. Lankester (1876).

† *The Origin of Species*, Edit., 1860, p. 484. ‡ P. 490.

§ Professor Sir W. Thomson in his Presidential Address at the meeting of the British Association at Edinburgh (1871) has hazarded an hypothesis to account for the origin of life on the globe which has few (if any) advocates; and which if proved correct would only move the question a step further back instead of answering it. Believing that there are

2. *The Origin of Man.*—It is worthy of remark that Darwin in his work “On the Origin of Species through Natural Selection,” nowhere goes the length of including man amongst the results of natural laws working in accordance with his hypothesis. He states, indeed, that in the distant future, he sees open fields for far more important researches than he has undertaken; and that light will be thrown on the origin of man and his history.\* This instructive omission arose—not as Professor Haeckel would have us to infer, because Darwin was apprehensive of causing a revulsion of feeling amongst his readers if he suggested a physical connection between man and the brute creation—but, as I presume, because the great naturalist clearly saw how vast is the gulf which separates man from the lower animal creation, and that his hypothesis was insufficient to account for the mental and, perhaps, even physical distinctions.

I am not now entering on the question whether man was originally descended from some quadrumanous animal or not. If he was, it is perfectly certain that the links which connected him with the existing quadrumana are altogether wanting. No one who compares the skull and skeleton of the orang-utan, the gibbon or the gorilla with (for example) that of a native African, can suppose that the one could have been connected with the other, except by a long series of intermediate forms which are not preserved to us. The absence of such intermediate forms (supposing them to have existed) is the more remarkable, because we cannot in this case plead the favourite argument of “the imperfection of the geological record;” unless it be asserted (which it may be) that the human species descended from the *Palæopithecus*, or *Macacus* of the Pliocene period through one line of ancestors whose remains have been lost, while the present monkeys have descended through another. But there is really no evidence for such an hypothesis; its truth can neither be asserted or denied.

In any case man's superiority over the brute creation lies not so much in differences in his form and structure as in his

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other worlds of life besides our own, he thinks it possible that in some collision between this world and a fragment from one of these worlds, the seeds of life may have reached the surface of the globe! He admits that this view “may seem wild and visionary,” but it only shows how hard pressed he must have felt for any explanation from purely natural causes to account for the origin of life, when he had to fall back upon this. See Rep. Brit. Assoc., 1871, pp. 104 and 105.

\* *Loc. cit.*, p. 518.

mental powers. Speech, the expression of the reasoning faculty, is man's grand distinctive attribute; and its origin cannot be explained on any plausible hypothesis except that it is a Divine gift. Lyell admits that the origin of language, with its capacity for grammatical construction and the inflections which denote number, time and quality, is a profound mystery;\* and in the context he enters a well-needed warning to us of confounding the doctrines of "Variation" and "Natural Selection" with Creational laws, in which case we should deify secondary causes or immeasurably exaggerate their influence.

The language of primæval man was doubtless simple and its vocabulary limited, but it differed from the sounds emitted by the animals around him in its capacity for expansion, inflection, and grammatical construction. On the other hand, the roar of the lion, the cry of the hyæna, and the jabberings of the ape are now probably what they were thousands of years ago; they are incapable of being thrown into the forms of grammatical construction, and they are only used as expressions of the animal passions. May we not be permitted to include in the glories of speech the productions of the musical faculty, by which man is capable of expressing the noblest or most pathetic thoughts of his mind; by which he attempts to sing the praises of his Creator, or describe by sound feelings of joy, sorrow, love, or hatred? Sweet as are the notes of the thrush, the black-bird or the nightingale, they are only what they were hundreds or thousands of years ago, and are incapable of development or expansion. It is only the genius of man that can produce the symphonies of a Beethoven, or the anthems of a Handel and a Mendelssohn; and it is only mankind that can appreciate these masterful combinations and variations of sound. Similar conclusions, as Dr. Wallace has shown, may be drawn with regard to the mathematical and artistic faculties which are peculiar to man, and for the existence of which the theory of Natural Selection offers us no satisfactory explanation.† Finally, to man alone has been granted the gift of reason by which he can investigate the laws and conditions of the animate and physical world around him; by which he can compute the distances of the stars, or describe the motions of the planets, and by which he can place on record and transmit to posterity the

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\* *Antiquity of Man*, 4th Edit., p. 518.    † *Darwinism*, p. 461, *et seq.*

thoughts of his heart and the results of his investigations. As Dr. Wallace has shown, the moral and intellectual nature of man cannot be accounted for on the theory of descent; and these and the mathematical, musical and artistic faculties are the peculiar glories of mankind as distinguished from the brute creation.\*

The great structural differences between man and the apes have been fully admitted by all anatomists, and are succinctly enumerated by Wallace, St. George Mivart, and others. These differences are so great that they have to be accounted for, on the Darwinian hypothesis, by throwing the origin of man back into the Pliocene, or, perhaps, the Miocene period. At the same time, the physical resemblances are no less striking and cannot be overlooked in the investigation of the problem of his origin. Dr. Wallace, who claims for man a spirit altogether transcending the instinct of the lower animals, regards the evidence of man's structural resemblance as conclusive of his origin from the *Quadrumana*. If we go with this eminent naturalist so far, and admit a remote but common ancestry for man and the ape, are we the less beholden to recognise the directing agency of the Creator in the evolution of this complex being? In the first place, in all our endeavours to explain the origin of man by any process of natural selection, we are still in the dark why man should have been the ultimate outcome at all! We are in the dark as to the cause why one family of apes in the Miocene or Pliocene period should have started in the career of advance *manwards*, while their brethren were left to remain apes down to the present day. A change in form and structure requires, according to the Darwinian hypothesis, a change in the conditions of environment; but for all ordinary purposes the physical conditions have been persistent through Tertiary times. The hypothesis implies in the words of Dr. Wallace, "that no creature can be improved beyond the necessities for the time being;" and if changes occurred in the physical or animate world around, necessitating an improvement in the structure of the Miocene apes, these ought to have produced modification in the same direction (though not perhaps in the same degree) in all the ape-tribe. One would like to have some light thrown on the process of development from the structure of the four-handed to the two-handed animal, where the hind-hands ultimately were converted into the foot of man, by which he stands and

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\* *Darwinism*, p. 461.

walks erect;—this erect attitude and upward gaze, recognised by the ancient Greeks as the distinguishing mark of man.\* One would like also to have some light thrown on the process by which the brain in man became so enormously enlarged, that the proportions are as 48 or 49 ounces in man to 20 ounces in the gorilla; although the animal remained in a savage state, requiring no greater mental effort than that necessary for the supply of his physical wants and defence against enemies. We might inquire, also, why did the hair fall off his body ere he had commenced to cover himself with clothing in a region which, if Wallace's suggestion regarding the birthplace of man be correct, must have been liable to great alternations of cold and heat?† It is remarkable that the intermediate forms between man and the ape have not been discovered, though much weight need not be attached to this negative evidence. But whether we admit or deny the physical continuity of man and the fossil ape, we are justified in holding that on either hypothesis the outcome cannot be accounted for solely on natural causes. Natural selection there may have been, but supernatural selection there must have been also.

If I were permitted to illustrate my meaning by a case taken from Bible history, I would take that of the call of Abraham out of Ur of the Chaldees. Here God selected, out of the whole human race, one man and his family to found a nation in a new country, through whom all the families of the earth should be blessed, and whose descendants are amongst us at the present day. Some family, or tribe of apes, *may* have thus been specially selected as the progenitors of man, endowed with special powers of development denied to the other primates, and to some extent independent of changes in external conditions. He who considers such an origin for man to be a degradation of the race, let him ask himself whether man does not, by his own act and will, even now degrade himself below the brute creation? The brute in human form who, in the West of Ireland, maims dumb animals in order to injure their owners; or who, in the East of London, mutilates helpless women; or who, in Central Africa, shoots down half a village of unarmed and unsuspecting savages, and carries the remainder into slavery, or con-

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\* *Ἄνθρωπος.*

† Haeckel with more probability places the birthplace in the submerged continent of Lemuria, at the head of the Indian Ocean.

verts them into beasts of burden,\* has morally degraded his being below that of the brute creation around him. History abounds in examples of cruelty and baseness amongst men who, being reasoning beings, have less excuse than the lower animals for acts of ferocity; these being called forth for the supply of their wants or defence against foes. On the other hand, we who believe that man has a spiritual nature capable of immortality, can go a step further and recognise the dignity to which his race has been elevated in the person of the Divine Redeemer—both God and man; who by the union of the two natures has exalted him to a position amongst animated beings of illimitable and unspeakable glory.†

Let the disciples of Lamarck, Darwin, or Wallace, only recognise the agency of a Divine Power, directing the course of this world and of its inhabitants towards a noble and eternal destiny, and they will thus bring natural and spiritual law into harmony with each other; but we refuse to admit that natural law alone (even if such an agency be conceivable) suffices to account for the formation of man and his place in nature.

As a geologist I cannot shut my eyes to the evidence that this world has been throughout past ages in course of preparation for the abode of man and the sphere of his action. Not only are the fruits and seeds of plants of the present day suited for his food, but the animals which came into existence about the same period as himself are remarkably fitted to be both his companions and servants. We recognise in the dog, the horse, the ass, the camel, the elephant, and the ox—animals which, either by their bodily powers, sagacity, or capacity for attaching themselves to man, are almost inseparable from his presence—and essential to his everyday life. It is only in late Tertiary times that these forms were developed. And, as regards the evidence of design, united to the law of “descent with modification,” the horse presents, perhaps, the most remarkable example to which palæontologists can point. Darwin, on witnessing the naked Guachos of South America bestriding the nearly wild horse of the Pampas, has observed how remarkably adapted to each other are the horse and his rider.‡ Yet the ancestry of the horse

\* As described by Professor Drummond in *Tropical Africa*.

† Or, to use the language of very high authority, “so that two whole and perfect natures, that is to say, the Godhead and the Manhood, were joined together in One Person, never to be divided, whereof is one Christ.”  
II. *Article of Religion*.

‡ *Naturalist's Voyage*, p. 143.

can be traced down from the Eocene period;—each successive stage being an advance on the preceding one,\* till the horse, in all his beauty of form, fleetness of foot, and natural docility, becomes an inhabitant of the earth with man as his master.

On the other hand, I cannot but feel strongly that geology presents us with certain phenomena which have not been satisfactorily explained by any hypothesis of evolution yet propounded. Such, for example, is the remarkable persistency of some forms from very early geological periods to the present day, and this during numerous changes and modifications in the environment; while, on the other hand, we have examples (as in the case of the Liassic Ammonites) of repeated modifications of form under apparently similar, or but slightly modified, conditions. The introduction at particular periods of new types of organised forms, such as the vertebrates at the close of the Silurian period, although falling in with the general law of progression, has to be accounted for on the basis of design. Nor is this evidence of design abrogated by the discovery of forms which help to fill up the gaps in the succession of organised forms, such as the birds with teeth, which Professor Marsh regards as connecting the Dinosaurian reptiles with the true birds, and which are found in deposits of the Jurassic period; by such forms the gaps are being narrowed, if not bridged. But, while admitting that if there were no lost pages in the geological record, a complete chain of successive forms might be disclosed, it is no less necessary to recognise the directing agency of "Him in whom we live, move, and have our being; and by whom all things consist."

In attempting to explain the existence of the forms by which our world is peopled, there is reason to fear that the advocates of a purely secondary hypothesis are tempted to recognise analogies which are only imaginary, and to shut their eyes to evidence which appears to militate against their views; and it may be well, in conclusion, to revert to the weighty words of our President in his recent Annual Address, where he says, "It may be, that the impression thus left on the mind, will be that the votaries of science carried away by an excess of zeal in the attempt to discover the causes of natural phenomena, have really, though honestly, over-estimated the

\* This development is most remarkable in the process by which the *Orohippus* of the Eocene is represented by the *Hipparion* of the early Pliocene, with three fully developed toes to each foot, and this by the *Plihippus* of the later Pliocene; and this by the *Equus fossilis*.



evidence. It may be, on the other hand, that the inquirer will perceive the evidence to be weighty and substantial, in which case it behoves him to reconsider the supposition with which he started, that the conclusion was opposed to the teaching of Revelation."\* Lord Bacon has well observed that a little knowledge tends towards scepticism, but a fuller knowledge, disclosing the links by which all natural phenomena are bound together, induces men to recognise the agency of God in Nature; and if men will not recognise this agency thus disclosed, neither will they be persuaded though one rose from the dead to bear testimony to it.†

The PRESIDENT.—I am sure all will heartily accord a vote of thanks to Professor Hull for his very valuable paper, and will only be sorry that a sudden summons to go to Canada, for which he has now sailed, has prevented him carrying out his intention of being present to-night.

[A discussion, which was only of a general character, ensued, after which the meeting was then adjourned.]

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#### REMARKS ON THE FOREGOING PAPER.

The Rev. W. R. BLACKETT, M.A., writes :—Professor Hull seems to dwell more on the negative side of his subject than on the positive. It is well that we should have the weakness of the Darwinian theory once more pointed out to us; but we might have liked to have had the force of the argument from design more fully stated in the two particulars chiefly dwelt upon. The reasoning founded on the fact of the introduction of life upon our globe seems to be not strictly an argument from design: rather it maintains that this introduction can only be accounted for on

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\* Sir G. G. Stokes, Pres. R.S. Journ. of Trans. of Victoria Institute, vol. xxii, p. 17.

† The *Westminster Review* for November contains an Article, by Professor Dewar, illustrating the way in which a man of science can sometimes give the rein to his fancy when dealing with biological problems.

the hypothesis of a creative fiat from a Being Himself living, conscious, powerful, and wise. Then, the adaptation to this life and the ever-advancing complexity of organisation connected with it of a thousand details as to the earth and its corresponding development, furnish a further argument properly from design: This is illustrated by the introduction along with man of so many animals fitted for his use. This argument would bear being more fully and explicitly drawn out.

On the negative side, it is a great advantage for us to have it clearly stated by a *geologist*, first that the development theory does not exclude, nor even render unnecessary, the idea of a Creator; and secondly, that the evidence for the theory is by no means sufficient to establish it. Any one with a common sense power of estimating evidence could see this latter point; but geologists, like other specialists, have been so fond of claiming an exclusive right of judging evidence in their own speciality, that we who *quoad hoc* are laymen, have been almost afraid to state our conviction of the insufficiency of the evidence, lest our doing so should be attributed to theological bigotry. We shall be glad to quote on our side the authority of so eminent a geologist. We owe him special thanks for the suggestion that scientists may possibly overestimate the evidence for a desired conclusion. However, it has always appeared to me to be still more important to realise that there is no theological objection whatever to the theory of evolution, provided it be kept in mind that the theory is quite unable to account for the existence of life in the "one or very few forms" of life, which it postulates. It appears to me to enhance rather than detract from the glory of the Creator to believe that He impressed upon the primary living creature not only the marvellous attribute of life, but the still more amazing faculty of developing into the myriad forms of life that have been and are upon the globe.

With respect to the origin of man, it does not seem to me to be a good answer to the sentimental objection that man is degraded by having assigned to him a *pithecoïd* ape as his ancestor, to point to man's self-degradation below the bestial level. Would it not be better to say that it is as noble to spring from a lower animal as to be formed from the dust of the earth? For in either case, the life and the spirit, which are man's distinction, come from the Creator, and not from the material origin. Is not the develop-

ment of spiritual Christians an instance of true evolution, not by natural selection, but by a Divine addition to previously existing characteristics ?

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#### REPLY BY THE AUTHOR.

I agree with Mr. Blackett, that if we admit the agency of a Creator for the origin of man, it is of little importance as regards his dignity whether he were formed directly "from the dust of the ground," or by evolution from a tertiary ape. And in reference to his remark that I have dwelt rather on the negative side of the subject than the positive, I may reply that the latter (the positive evidence of design) is far too wide a subject to be dealt with, except by reference, in a communication of the present kind ; his note, however, is a valuable supplement to my paper.

Perhaps I may be allowed to take this opportunity of mentioning in connection with what has above been said, that as I regard the Biblical account of Creation as a Divinely inspired word-picture of the origin of the world and its inhabitants, embodying the great laws of creation, the term "dust of the ground" appears to me to mean that the corporeal part of man is essentially that of the material elements of which terrestrial matter consists.

## NOTE.

## ON MAN'S PLACE IN NATURE.

As regards theories on this subject, one, which has been somewhat urged of late, is thus referred to by the President of the Institute, Sir G. Gabriel Stokes, P.R.S., in his paper *On the absence of real opposition between Science and Revelation* (Vol. XVII, p. 195). He says:—

“Some have endeavoured to combine the statements of Scripture with a modified hypothesis of continuous transmutation, by supposing that at a certain epoch in the world's history mental and moral powers were conferred by divine interposition on some animal that had been gradually modified in its bodily structure by natural causes till it took the form of man. As special interposition and special creation are here recognised, I do not see that religion has anything to lose by the adoption of this hypothesis; but neither do I see that science has anything to gain. Once admit special divine interposition, and science has come to the end of her tether. Those who find the idea helpful can adopt it; but for my own part this combination of the natural and the supernatural seems somewhat grotesque,\* and I prefer resting in the statement of a special creation, without prying into its method.”

Sir J. William Dawson, C.M.G., F.R.S., in his new work, *Modern ideas of Evolution*, thus refers to man, anatomically considered:—

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\* Of course it is not to the combination in itself that this is meant to apply, but to the combination in our attempted reasoning; in other words, to the endeavour to infer from merely natural laws what was the condition anterior to the stage at which a supernatural power is supposed to have intervened.

“Anatomically considered, man is an animal of the class *Mammalia*. In that class, notwithstanding the heroic efforts of some modern detractors from his dignity to place him with the monkeys in the order *Primates*, he undoubtedly belongs to a distinct order. I have elsewhere argued that if he were an extinct animal, the study of the bones of his hand or of his head would suffice to convince any competent palæontologist that he represents a distinct order, as far apart from the highest apes as they are from the carnivora. That he belongs to a distinct family no anatomist denies, and the same unanimity of course obtains as to his generic and specific distinctness. On the other hand, no zoological systematist now doubts that all the races of men are specifically identical.

## ORDINARY MEETING.\*

THE RIGHT HONOURABLE LORD HALSBURY, THE  
LORD CHANCELLOR, IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following election was announced:—

LIFE ASSOCIATE:—P. Caudwell, Esq., Guildford.

The following paper was then read by the Author:—

*LAND TENURE IN ANCIENT TIMES, AS PRESERVED BY THE PRESENT VILLAGE-COMMUNITIES IN PALESTINE.* By JAMES NEIL, M.A.

THE greater part of the arable land of Southern Palestine is not, strictly speaking, held as freehold or rented by industrial farmers. The bulk of the soil consists of Crown lands, called in Arabic أرض أميريّة *ard âmiriyyeh*, of which the occupiers have only the *muzara'a*, or right of cultivation, though they possess this right in perpetuity. The *fellahheen*, or, as their name signifies, the “cultivators,” of each district dwell together in unwalled villages and hold all the land that lies around them, varying in quantity from 500 to 6,000 English acres, as *mushaa'*, that is, “in common.” As this custom, like all else connected with that remarkably primitive people, the *fellahheen* of Palestine, is undoubtedly most ancient, has a most important bearing on the present condition of the country, throws a flood of light on the curious nature of land tenure in ancient times, and also illustrates in a very striking and unsuspected way an

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\* Jan. 20, 1890.

obscure Biblical allusion, it will be well to describe its working.

The annual cultivation of arable land begins as soon as the first heavy rain, the Hebrew גשם, *geshem*, Palestine Arabic *wasam*, or "gushing down-pour," has saturated the soil, and has made it possible for the people to plough; for before this the ground becomes baked into a pottery-like hardness during the six consecutive months of rainless, cloudless heat which occur from April to October. These sub-tropical showers usually commence between the middle of November and the latter part of December. Then all the male inhabitants who possess cattle and purpose ploughing meet in a general gathering. There is no such division of permanent classes amongst the people of a Palestine village as we recognise in the terms "farmer" and "labourer." All of them, one as much as another, except such as are slaves, are by birth in a position answering to our "farmer." All of them are born to a right to cultivate a share of the common lands of the village. The only difference amongst them is that some, being wealthier than others, possess more oxen with which to plough, and can therefore cultivate larger tracts of ground.\*

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\* There can be little doubt that cattle, as the means of ploughing the land, were in early times the chief, if not often, the sole, form of wealth. This fact is very strikingly preserved in the etymology of words that stand for property in land and money. Take for instance "fee," with its related terms "feodum," "feud," "fief," and "feudal," which first is the name for an estate in land (anciently the right to the use of a superior's land as a stipend for services to be performed), now seen in such legal expressions as "fee-simple," a "limited fee," or "fee-tail; secondly, is used figuratively for any property or possession, as in Spenser's "laden with rich fee;" and thirdly, signifies "a reward for service," "a charge," or "pay," as a lawyer's or physician's fee, fees of office, marriage fees, &c. There is general agreement that this term "fee" is derived from the Scottish *fe*, *fee*, or *fie*, Old Saxon *fe*, O.H. German *filu*, N.H. German *vieh*, Swedish and Danish *fü*, all which mean "cattle." The words "pecuniary," "impecunious," &c., and "peculium," through the Latin *pecunia*, "money," are equally plainly derived from the Latin *pecus*, "cattle," the first chief form of movable property possessed by mankind in early ages. "Chattels," a legal term which occurs in the expression "goods and chattels," and which stands for every kind of property except the freehold or the things which are parcel of it, a word more extensive in its meaning than "goods" or "effects," comes without doubt from "cattle," which name for domestic animals collectively, more especially those of the bovine genus, through the O. English *catel*, O. French *catel*, *catal*, *cheptel*, Spanish *caudal*, L. Latin, *capitale*, *capitale*, is derived from the Latin *capitalis*, "relating to the head," or "chief," because from the earliest ages, down probably to a much more recent period than many suppose, such beasts constituted the principal

Some, on the contrary, are so poor that they have no cattle, and these, whether relatives or "hired servants," labour as farm hands for those who have. The possessors of beasts which can be employed in tillage, oxen, camels, horses, mules, and asses, such as the Sheikh, or Headman, and the members of his family, do not need to work with their own hands, being able to pay for the labour of others by letting out their cattle on a system of co-operation, as well as by living on the milk and wool of their flocks of sheep and goats.

The assembly of the farmers is held in the house called *Saha*, or *Madafa*, kept, according to the hospitable custom of the East, for the entertainment of strangers, and which serves for all the public meetings of the community. The *Khateeb*, or Mohammedan religious teacher, who is also the scribe, recorder, and accountant of the place, presides at this gathering. He first writes down the names of all who desire to plough, and against each man's name enters the number of ploughs that he intends to work. The farmers now form themselves into several equal groups, generally making up ten ploughs in a group, each of which chooses one of their number to represent them. If there are forty men who desire to farm, making up amongst them sixty ploughs, they will divide themselves into six parties of ten ploughs each represented by six chiefs.\*

The whole of the land is then parcelled out into six equal parts, one for each group of farmers, by the six elected chiefs. The land being in most instances of various qualities, some very good, some much poorer, and some comparatively bad, has to be chosen from different and often distant parts to form each of the six several parcels. Although there are no hedges, ditches, or walls, the tillage is all divided into portions somewhat answering to our fields, marked off from one another by rough natural boundaries, each bearing a name, such as "the field of the partridge," "the field of the mother of mice," &c. It would seem to have been the same in ancient times, for we read of "the fuller's field,"† and "the potter's field,"‡ the latter called afterwards, on account of its purchase with the thirty pieces of silver given to Judas as

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part of the property, or capital, owned by the masses of mankind in every civilised community.

\* By a "plough" must be understood, not the rude implement which goes by that name in Palestine, but the possession of a normal plough-team of two oxen in light lands and of four oxen in heavy lands. The Roman *jugum*, or yoke of two oxen, made a complete plough.

† 2 Kings xviii. 17.

‡ Matthew xxvii. 7, 10.



the price of Messiah's betrayal, by the tragic name of "the bloody field," *Aceldama*.\* As distinguished from its separate parts, which are not apparent to a stranger's eye, the whole arable and pastoral land attached to each village lies around it in one seemingly unbroken stretch, known to the Hebrew Bible as the  $\text{סדה}$ , *sadeh*, "broad acres," or "open-farm-land," the "field" of our Authorised Version, constantly spoken of in the singular, for it has no artificial boundaries like our farm lands, but presents one uninterrupted expanse which can be traversed freely in every direction. Thus we read that Isaac went out "to meditate [or rather, to grieve] in the open-farm-land" (*sadeh*).† *Sadeh* answers sometimes to the Latin *ager*, our "land," as in the expression "the *sadeh* [or land] of the Amalekites."‡ Perhaps that part of England which on many accounts most resembles the general appearance of Palestine arable, is the centre of the chalky downs of Thanet, some two miles inland from Birchington, Westgate, Margate, Broadstairs, and Ramsgate. Here almost all the hedges, fences, walls, and ditches have been removed. The farmsteads with their surrounding grounds and cottages answer to the small, unwalled Palestine villages, and the apparently unbroken stretch of dry, treeless land around them to the Eastern *sadeh*, or "field."

The six representatives, having parcelled out the land, now cast lots for its distribution. Each of them gives some object to the presiding *Khateeb*, such as a stone or a piece of wood, and he puts them into a bag. The *Khateeb* then asks to whom one of the six parcels of ground which he names is to belong, and a little boy, chosen to draw out the objects from the bag, puts in his hand, and the ground in question is adjudged to the party represented by the chief who gave the stone or other object which the child brings out. A very young child is generally chosen for this purpose, in order that there may be no collusion.

When the six divisions are thus allotted, they are again subdivided, in the case of each party, amongst the ten ploughs in a similar way. For this purpose each field of each parcel is divided into ten equal strips, which are now generally, on the mountains, measured out roughly with an

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\* Matthew xxvii. 8; Acts i. 19.

† Genesis xxiv. 63.

‡ Genesis xiv. 7. See also Genesis xxxii. 3; xxxvi. 35; 1 Samuel vi 1, &c.

ox-goad, about eight feet long.\* On the plains, they use for this purpose a rope about twice the length of the ox-goad, made of goat's hair, about half an inch thick, called *hhabaleh*, evidently the Hebrew *hhevel*, "rope," or "measuring line."† Each of these strips is called a *maress*, from the Arabic *meerass*, "inheritance" or "allotted portion." The fields are taken separately, and the ten *mawaress*, or strips, are apportioned amongst the ten ploughs by lot. The owner of two ploughs, for instance, would get one-fifth of each field in his sixth division of the land, and the owner of one plough one-tenth. A man with two weak oxen who can only plough half a day is set down at half a plough, and gets one-twentieth of each field; and another who can only plough for a quarter of a day receives one-fortieth. Each farmer then pays the proportion of the land tax due on the strips of land allotted to him.

A deep furrow divides these strips (*mawaress*), or a stone is placed at each end as a land-mark. It is held to be a heinous

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\* Speaking of the origin in England in Saxon times of *hams* and *hamlets* that is, as the words signify manors, and small or subject manors, Mr. Frederic Seebohm says, "The typical importance in so many ways of the *gyrd*, or *rod*, or *virga* in the origin and growth of the Saxon '*tun*' or '*ham*' is worth at least a moment's notice. The typical site for a new settlement was a clearing in a wood or forest, because of the 'fair rods' which there abound. The clearing was measured out by rods. An allusion to this occurs in Notker's paraphrase of Psa. lxxviii. 55—'He cast out the heathen before them, and divided them an inheritance by line.' The Vulgate, which Notker had before him, was '*Et sorte divisit eis terram in funiculo distributionis*;' and he translated the last clause thus, '*teilta er das lant mit marseile*,' to which he added, '*also man nu tuot mit ruoto*,' as they now do it with rods, i.e., at St. Gall in the tenth or eleventh century. (*Schilter's Thesaur. Antiq. Teut.*, i, p. 158; Ulm 1728). So in England the typical holding in the cleared land of the open fields was called a *yard-land*, or in earlier Saxon a *gyrd landes*, or in Latin a *virgata terra*; *yard*, *gyrd*, and *virga* all meaning *rod*, and all meaning also in a secondary sense a yard measure. The holdings in the open fields were of *yarded* or *rooded* land—land measured out with a rod into acres four rods wide, each *rod* in width being therefore a *rood*, as we have seen." (*The English Village Community*, pp. 171, 172; Longmans, 1883.)

† There is an evident allusion to this division of the separate fields of the *sadeh* into equal parallel strips, measured off by ropes, in Ezekiel's vision of the redistribution of the land of Palestine amongst the twelve tribes. Each of these is said to receive a straight strip of equal size, fifty miles in width, running parallel to the other strips, across the whole breadth of the land from east to west. Of these it is said most elliptically, "Joseph ropes (יָרֵסִים, *hhavaleem*)," that is, "Joseph [shall have two] ropes," or "strip-like portions measured out by ropes" (Ezekiel xlvi. 13), one strip for Manasseh and another for Ephraim side by side (xlvi. 4, 5). The same use of the word in English appears to have survived amongst the South Saxons, and hence the "rapes," that is, "ropes," into which the county of Sussex is divided,

sin amongst this simple agricultural people to remove one of these land-marks after the ground has been sown.\* Doubtless with reference to this particular case the solemn anathema was pronounced on Mount Ebal against a secret fraud, which could be so easily committed, would be so difficult to detect, and would be attended with such serious injury, "cursed be he that removeth his neighbour's land-mark."† It has been hitherto supposed that these words applied to the original boundaries of fields and farms, but such land-marks are for the most part of a permanent and immovable character, while the stones which are yearly brought and placed to distinguish the strip or strips assigned to each individual, can be tampered with far more readily, and in this case not only the land, but also the crop sown and worked by another be thus stolen. Besides, in farming by *maress*, amongst a people wholly given as Israel were to agricultural pursuits, the temptation to such an act of dishonesty would constantly present itself to all, in every part of the country.

An inflexible rule prevails as to the cultivation of the soil thus annually distributed. A man may not sow any crop which he pleases on his strip or strips, but is compelled to grow the same produce as the rest of his fellow-farmers are growing in the field or district where his allotments lie. And there is a good reason for this. When the crop is cut and the ground is bare, the beasts which are at other times kept in the proper pastures of Palestine, wide unfenced desert hills, are brought to these stubble lands, and are fed on the wild growth which then springs up. In agriculture, throughout the East, they never use any manure that requires leading, but the flocks and herds when thus pastured over it serve not only to clear but also to enrich the soil. But this requires that the whole ground in each part of the village lands should lie fallow at the same time, in order that the common rights of pasturage may be enjoyed without doing harm to any adjacent standing crops. Hence the

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\* The *fellahkeen* call the boundary marks they place to distinguish the sown strips (*marwaress*) into which they divide the fields *takhem* (plural *tukhum*), which is evidently the same word as that which occurs in the Talmud for "bound," or "limit," *tehoom*, in the expression, תְּהוֹם הַשַּׁבָּת, *tehoom hashshabath*, "bound of the sabbath," that is, "limit of the sabbath day's journey." M. Clermont-Ganneau discovered this word in the rock-cut inscription twice repeated, תְּהוֹם גֶּזֶר, *tehoom Gezer*, "limit of Gezer," at *Tell el Jezer* (Mr. Bergheim's village, the *Abu Shushkeh* of the maps), now identified with the royal Canaanite city of Gezer, in after times a Levitical city (Joshua xxi. 21).

† Deut. xxvii. 17. See also Deut. xix. 14; Job xxiv. 2.

customary law that harvesting in the lands of a Village-Community must all go on at the same time, and that one man must not begin to reap before his neighbours. Barley or wheat may be sown on different strips in the same field, as the harvest in this case comes about the same time, barley harvest preceding wheat harvest by about a fortnight only. But a man may not sow *simsim*, our sesame, a kind of rape, which, after the olive, is the chief oil-producing plant of Palestine, amongst fields where his neighbours are sowing corn; for the *simsim* would ripen considerably later than the cereals, and this would lead to a breach of the law which requires that the harvesting of the strips in each field must all take place at the same time.

A farmer often finds himself, under this system of allotting the land, with 20 or 30 small strips, all separated from one another, and sometimes miles apart. Yet, notwithstanding its grave inconvenience, the *fellahheen* cling with the utmost tenacity to this ancient usage, and the Turkish Government has vainly endeavoured to induce them to allow the land to be portioned out amongst them individually once for all, in order that each person may be registered as the permanent possessor of a certain portion of the soil. Failing to succeed in this, it has had to content itself with recording the names of all the inhabitants of each village as joint owners of the entire land attached to it.

A part of the land is cultivated each year by the other villagers on behalf of those of their number who, owing to their office, are unable to till the ground for themselves. Such a portion of the soil, cultivated by the community for one of their number, is known as the *Shēkarah*. There is commonly to be seen the *Shēkarat el Khateeb*, or "portion of the religious teacher," and the *Shēkarat en Nejjar*, or "portion of the carpenter," assigned to them each year in return for their respective services.\* Our Saviour, doubtless, like Joseph His reputed father, had His *Shēkarat en Nejjar* cultivated for Him in the arable ground belonging to the Village-Community at Nazareth.†

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\* These are the only two officials so supported, for the carpenter is the only artisan of an ordinary Palestine village, being blacksmith and mason as well, and the *Khateeb* is not only the religious teacher, chairman of meetings, scribe, recorder, and accountant of the place, but also combines with these the offices of medical man and barber.

† For many of the above facts I am indebted to the interesting and accurate observations of Mr. Samuel Bergheim, formerly of Jerusalem, who possessed peculiar advantages for studying the manners and customs

There can be little doubt that this method of allotting the lands each winter, or, at all events, at short and regular intervals, like all the other customs of Palestine, is most ancient, and has probably existed from the very commencement of agriculture. The distribution was probably annual, though it is possible that the re-allotment of land under the Law may have been every seventh year, for the payment of tithes every third year may point to a three years' rotation of crops, twice repeated, followed by a seventh year of fallow.\* We know that the country was first divided amongst the families of Israel by lot. The particular directions given to Moses, after the twelve tribes had been numbered, were: "Unto these the land shall be divided for an inheritance according to the number of names. To many thou shalt give his inheritance much, and to few thou shalt give his inheritance little; to every one shall his inheritance be given according to those that were numbered of him. Notwithstanding the land shall be divided by lot; according to the names of the tribes of their fathers they shall inherit. According to the lot shall the possession thereof be divided between the many and few."† These Divine instructions were carefully carried out by Joshua as soon as he had conquered the country.‡

It has been generally supposed that, in this division amongst the tribes, every man of the 601,730 adult males numbered by Moses was put in absolute possession of his own plot of arable land, which he had no power to alienate. But this absolute ownership of broad acres is nowhere stated or implied, though no doubt it prevailed, as in the instances of Naboth and Jeremiah, as to *house property* in the villages and towns, and in their adjacent gardens (always situated outside), vineyards, olive yards, and fig orchards, &c. The general principle laid down in the above instructions to Moses was, "To many thou shalt give his inheritance much, and to few thou shalt give his inheritance little,"§ and this we are expressly told held good in the case of families as well as of tribes.|| No words could more plainly exclude an

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of the *fellakheen* whilst farming the lands of *Abu-Shusheh* on the Philistine plain.

\* See Deuteronomy xiv. 28; xxvi. 12; and Amos iv. 4. This septennial reallotment has also been inferred from six years being the ordinary term that a Hebrew slave was to serve. Exodus xxi. 2-4; Deuteronomy xv. 12; Jeremiah xxxiv. 14.

† Numbers xxvi. 53-56. See also Numbers xxxiii. 54.

‡ Joshua xiii.-xxi.

§ Numbers xxvi. 54.

|| Numbers xxxiii. 54.

individual holding of land, or point more conclusively to a collective holding, a holding in common by family groups. If each man was to have received his own inalienable possession in a certain tract of ground it would have been said "to every man thou shalt give his own inheritance." Instead of this we have, as it is literally in the Hebrew, "to many thou shalt give his inheritance much, and to few thou shalt give his inheritance little." The "his" here clearly refers to the "family" in Numbers xxxiii. 54, and probably in Numbers xxvi. 54. The full meaning is "to many thou shalt give their family inheritance much, and to few thou shalt give their family inheritance little." This, the only rule laid down for the distribution of the land, overlooks the individual altogether, and has regard to the tribe or clan only, and to its component part the *sept*, or *gens*, the agnatic group of kinsmen made up of various related families under a patriarchal head. Each head of a house doubtless received his own original portion of land, more or less considerable according to the number of his descendants and followers. These, however, were probably very numerous in most cases, and must have become still more so as time went on and the family increased with each new generation. There is every reason to believe, in view of the genius of the East, where the strength of family ties and patriarchal rule forms so strong a bond, that these numerous related groups settled each in their own village, and held a kind of joint possession of all the lands belonging to the family which lay around it, precisely as the villagers of Palestine do now. Indeed, all the allusions in Scripture look this way. The main features of the occupancy of real property amongst Israel are, in all probability, preserved in the present practice of holding in *mushaa'*, or "common," amongst the modern *fellahkeen*. It is extremely interesting, especially at a time when the subject of the tenure of land is so much in the thoughts of men, thus to be able to realise, from the primitive custom existing at the present day, the manner in which Boaz, Jesse, Barzillai, and the other farmers we read of in the Bible, must have held and cultivated the soil in the days of old.

Nor was this joint tenure of land, with its curious accessories, merely a Jewish custom. We have many hints that it prevailed throughout the East long before Israel existed as a separate nation, or came into possession of Palestine. When Abraham sought to purchase the field of Macpelah, he first approached the community, "the sons of Heth," that is, "the people of Heth," who held Hebron and the land round

about it.\* The conveyance he desired appears to have been of land immediately adjacent to a town, and, therefore, as now, in individual holding; but, even in this case, though it was ground in some sense belonging to Ephron, the son of Zohar, yet the patriarch is said to buy it, not alone of this particular Hittite, but of "the sons of Heth."† So again when Jacob bought a parcel of ground where he spread his tent, situated close to a large town, Shechem, it was not from a private owner, but "from the sons of Hamor, the father of Shechem."‡ Moreover, Jacob is said to buy not the *sadeh*, but חֵלְקַת הַשָּׂדֶה, *hhelekath hassadeh*, "the field of the *sadeh*," where his camp had been pitched.§

\* Genesis xxiii. 3, 5.

† Genesis xxiii. 20.

‡ Genesis xxxiii. 19. In the Village-Communities of Palestine, there is a way of excluding strangers from obtaining any foothold on the soil, or any possession of house property, or the holding of fruit trees (such as the olive) apart from the land on which they grow. [This possession, so to speak, of real property in "fruitful trees," is a peculiar feature of the land laws of Palestine and the adjacent countries, alluded to in what would appear to be the conveyancing terms of the first deed on record, that by which Abraham purchased land from Ephron and the sons of Heth, where the description of parcels runs "the *sadeh* of Ephron which was in Macpelah, which was before Mamre, the *sadeh* and the cave that was in it, and every tree which was in the *sadeh* that was in all the borders round about were made sure to Abraham for a possession." Genesis xxiii. 17, 18.] Though, as it is shown in this paper, broad acres were always held, as they still are, in common under the Crown, land and house property in towns and villages, and their adjacent "watered gardens," orange orchards, vineyards, olive yards, or some one or more of their separate trees is *mulk*, or freehold property, in individual holding. Such property may be put up to sale, and bid for by any person or persons from outside, but relatives of the vendor, or, failing relatives, neighbours, or if no relative or neighbour comes forward, any member or members of the Community, have always the right of pre-emption at the price offered by the intending purchaser or purchasers. In this way strangers can be, and generally are, excluded from the Village-Communities. Thus we have an explanation of Abraham's very great and natural anxiety—appearing so strongly, in the original Hebrew, in the broken language and agitation of Genesis xxiii. 13, and in the humble entreaties and attitude of verses 8 and 12—as to whether he would be permitted by the people of Mamre to purchase a freehold in which to bury his wife.

§ The word *hhelekath*, masculine *hhailek*, Arabic *hhakeh*, this last preserving no doubt the Chaldo-Syriac form of the colloquial in our Lord's time, appears to have been the technical term in Hebrew answering to our "field," or small division of open land, as we may gather from the name Ἀκελδαμά (Ἄκϛϛ ϛϛϛϛ), "the field of blood." Many MSS. read Ἀκελδαμαχ, this final χ being no doubt a Greek rendering of the soft aspirate sound formerly attached to ϛ. In the *Shēphailah*, or Philistine plain, almost the precise term *hhelekath* survives to this day in the common expression *hhalkath wateh*, "a field [or portion] of ground."

When Israel were settled in Palestine, it was doubtless partly on account of this joint-tenure of land that under the Law no Hebrew was held to have more than a life interest in broad acres, and neither possessed, nor had power to alienate, any absolute ownership. Provision was made only for the sale and conveyance of his life interest, computed in the Bible at a term of years not exceeding the interval from 20 years, when he came of age, to 70 years, the allotted span of life. All he could alienate in the lands of a village would be the right of *muzara'a*, or "sowing," for a period at most of 50 years, or so much of it as remained unexpired until the next Jubilee, which must often have made the term of years for which this right could be conveyed to another a very limited one.\*

It has been well said, "as Moses recognises a sacred principle in the life and unity of the Israelite nation as a whole, so he likewise consecrated two smaller units, the Tribe and the Household, within the bounds of the holy nation itself. There was, however, an intermediate body between these two latter, mentioned and utilized in the Law,† and assuming great prominence in the Book of Joshua,‡ מִשְׁפָּחָה, *meeshpakhah*, German *geschlecht*, Latin *gens*, which, though like *gens*, it has a wider sense, has a definite and technical sense, 'the Father's House.' Now as this 'Father's House,' or 'Family,' held the important place it obviously did in the social organism, it is natural that it should have its economic function too. In a word we might expect as each tribe had its separate allotted portion, so each family would have a district allotted to itself. This explains Joshua xv, 12, 'according to their families.'§ . . . . In fact we may infer that each 'Father's House,' or 'Family,' or 'Thousand,'|| existing at the time of the conquest, settled in one or more Communes; so that, as the settlement became complete, the Family and the Commune became co-extensive, and it was a chance whether the local or the hereditary name prevailed. Boaz was 'Bethlehem,'¶ in the same sense that Jephtha's father was 'Gilead,\*\* or Pekah's victim 'Argob,'†† in the same sense in which Evan Cameron was Lochiel, and he was

\* Leviticus xxv. 15-17.

† Numbers i, iii, iv., xxvi.

‡ Joshua vii. 17.

§ See also Joshua, xvii. 1-5.

|| That "Father's House" and "Thousand" are identical, see Joshua xxii. 14, 30, and Judges vi. 15, and that "Thousand" and "Family" are identical, see 1 Samuel x. 19, 21.

¶ 1 Chronicles ii. 51 54.

\*\* Judges xi. 1, 2.

†† 2 Kings xv. 25.



son of Salmon in the same sense as the Duke of Argyll is MacCallum More."

This farming in family groups is the key to the communism in land, which, as we have seen, still survives. It had its origin in the idea of possessing things in common which, more or less, characterises all family life. The division made each year afresh of every rod of the soil, for the purposes of cultivation, was amongst persons who were all related by blood, and who lived under a local hereditary chieftain, the father as well as the head of the clan.

Here the reflection forces itself upon us, that the scattering of our modern families in all directions is the measure of the impracticability of our returning now, in these lands of the North-West under our present circumstances, to the holding of broad acres in common. How utterly impossible this would be in connection with a communism of that monstrous modern type, which would hold *all*, even women, in common, and so strike at the very root of family life, which alone gave birth to this primitive tenure, and which alone can maintain its existence and ensure its smooth working!

The cultivation of the soil in Village-Communities consisting almost entirely of blood-relations, drawn and kept closely together by the intermarriage of cousins, which appears to have been universal in early times, just as it is to-day, adds greatly to the weight of the sacrifice made by Abraham, when, in words which the reader will now perceive have a peculiarly pointed and poignant meaning, Jehovah said to His faithful servant, "Get thee out of thy land, and from thy kindred [or birthplace], and from thy Father's House, to the land that I will show thee."\* To leave the *Gens*, or *Sept*, the closely inter-related Village-Community—the dearly loved family group, which held, so to speak, in a ring fence, all one's living kith and kin, at least from an agnatic standpoint, without any break or exception, bound together, not only by natural affection, but also, and even more indissolubly, by an all-prevailing and inexorable custom which forbade them to separate, while it made it very dangerous to do so—must have been indeed a terrible trial!

It is important to observe that the few learned writers who have diligently searched into the nature of land tenure in ancient times have come to the conclusion, that holding in common by related Village-Communities, with a periodical redistribution of the land by lot, prevailed in almost all

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\* Genesis xii. 1.

countries before the feudalisation of Europe, and, in a form necessarily very much modified and blurred, long continued to survive the introduction of manorial rights and individual possession. Sir Henry Sumner Maine's exceedingly interesting and able works afford abundant proof of this position.\* He summarises the researches of G. L. von Maurer, who has written on the law of the Mark, or Township, which is still found in the more backward parts of Germany. The Mark, or Township, was an "organised, self-acting group of Teutonic families, exercising a common proprietorship over a definite tract of land, its Mark, cultivating its domain on a common system, and sustaining itself by the produce. It is described by Tacitus in the *Germany* as the *vicus*; it is well known to have been the proprietary and even the political unit of the earliest English Society; it is allowed to have existed among the Scandinavian races, and it survived to so late a date in the Orkney and Shetland Islands as to have attracted the personal notice of Walter Scott."† Nasse of Bonn says that "the Mark is the origin of manorial rights and customs."

Speaking of the system of these Village-Communities as he saw them in India, Sir Henry Sumner Maine says, "their unexpected and (if I may speak of the impression on myself) their most startling coincidence with the writers who have recently applied themselves to the study of early Teutonic agricultural customs, gives them a wholly new value and importance. It would seem that light is pouring from many quarters at once on some of the darkest passages in the history of law and of society. To those who knew how strong a presumption already existed that individual property came into existence after a slow process of change, by which it disengaged itself from collective holdings by families or larger assemblages, the evidence of a primitive village system in the Teutonic and Scandinavian countries had very great interest; this interest largely increased when England, long supposed to have had since the Norman Conquest an exceptional system of property in land, was shown to exhibit

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\* *Village-Communities in the East and West*. Murray, 1871. His other works which bear on this subject are all of deep interest and value, namely, *Ancient Law*, Murray, 1861; *Lectures on the Early History of Institutions*, Murray, 1875, and *Dissertations on Early Law and Custom*, Murray 1883. The author, Sir Henry Sumner Maine, K.C.S.I., LL.D., F.R.S., was formerly Master of Trinity Hall, Cambridge, Member of the India Council, Reader on Jurisprudence and the Civil Law in the Middle Temple, and Regius Professor of the Civil Law in the University of Cambridge.

† *Village-Communities in the East and West*, p. 10.

almost as many traces of joint-ownership and common cultivation as the countries of the North of the Continent; but our interest culminates, I think, when we find that these primitive European tenures and this primitive European tillage constitute the actual working system of the Indian Village-Communities, and that they determine the whole course of Anglo-Indian administration."\* In another place this learned English jurist tells us, "The most distinguished public servants" of the last century "have left much on record which implies an opinion that no ownership of Indian land was discoverable, except that of the Village-Communities, subject to the dominion of the State."†

We are told of these Communities, as they were found existing in India, that the Headman or council of village elders (this latter always bearing "a name which recalls its ancient constitution of Five persons") who ruled them did not command but merely declared what had always been done, for custom with them was omnipotent and inexorable. Thus any one who had been aggrieved did not appeal to the authorities on the ground of an individual wrong, but of the disturbance of the order of the entire community. Disputes of a civil nature came before the village elders, but criminal law was left to trial and execution by the individuals wronged, who with their own hands avenged manslaughter, murder, and adultery in the case of a wife by the punishment of death. Each farmer had his portion allotted to him by the village, which he cultivated himself with the aid of his sons and slaves; but he could not cultivate as he pleased. He must sow the same crop as the rest of the community. There was a periodical redistribution of the several holdings. The system was that of "shifting severalties," not the separate perpetual holding, much less the absolute power to alienate any part of the soil. "The description," says Sir Henry Sumner Maine, "given by Maurer of the Teutonic Mark of the township as his researches have shown it to him might here again pass for an account, so far as it goes, of an Indian village." To which I may add that both the former Indian village and the Teutonic Mark answer in all this to the present Palestine Village-Community, which is evidently nothing else but the ancient Mark surviving to this hour in a still more ancient and perfect form.

Julius Faucher of Berlin, in his paper on *Systems of Land*

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\* *Village-Communities in the East and West*, pp. 61, 62.

† *Ibid.*, p. 154.

*Tenure in Various Countries*, says that the ancient form of tenure and tillage in Russia "was that of the joint-husbandry of a whole village. The village not the family was the social unit. Supplanting the family for purposes of colonisation, the village, by necessity partook to a certain extent of the character of a family. It stood under patriarchal rule. Movable property alone was individual, immovable, the land at least, was common. With the alien not belonging to the village, not the individual, the village only has to do. The village always had a Mother-village, and the Mother-village again had a Mother-village, and so on. The name of Mother-village in general, or of Mother-village to another village is still attached to many Russian towns and villages."\*

Sir Henry Sumner Maine tells us that "there appears to be no country inhabited by an Aryan race in which traces do not remain of the ancient periodical redistribution."† In England he tells us this prevails more or less in all parts, but more abundantly in some counties than in others. These lands are known by various names. "When the soil is arable, they are most usually called 'common,' 'commonable,' or 'open' fields, or sometimes simply 'intermixed' lands. When the lands are in grass, they are sometimes known as 'lot meadows,' sometimes as 'lammas lands,' though the last expression is occasionally used of arable soil. . . . The several shares in the arable fields, sometimes, but very rarely, shift from one owner to another in each successive year; but this is frequently the rule with the meadows, which, when they are themselves in a state of severalty, are often distributed once a year by casting lots amongst the persons entitled to appropriate and enclose them, or else change from one possessor to another in the order of the names of persons or tenements on a roll. . . . Common fields and common meadows are still plentiful on all sides of us,"‡ though in the last 170 years vast numbers of such commonable fields have been enclosed, especially since the *Common Fields Enclosure Act* passed in 1836.§

\* *Systems of Land Tenure in Many Lands*, pp. 362, 363. Macmillan & Co., 1871. Throughout the Hebrew Scriptures certain dependent villages are called "the daughters of" others, which are spoken of as feminine, and therefore as the "mothers," "mother-cities," or "mother-villages" of these smaller dependent places. Thus we read of "Ekron and her daughters (וּבְתוּרֶיהָ)." (Joshua xv. 45. See also Joshua

xv. 47; xvii. 11; Judges i. 27; xi. 26; &c.)

† *Village-Communities in the East and West*, p. 82.

‡ *Ibid.*, pp. 85, 86, 88.

§ Nearly 4,000 enclosure Acts were passed between 1760 and 1844!

Mr. William Marshall, a voluminous writer on agriculture between 1770 and 1820, who "has left an account of the state of cultivation in almost every English county," speaks very plainly to this effect in a number of his works. As summed up by Nasse of Bonn, his statements declare that in his time, only some eighty years back, "in almost all parts of the country, in the Midland and Eastern Counties particularly, but also in the West—in Wiltshire for example—in the South, as in Surrey, in the North, as in Yorkshire, there are extensive open and common fields. Out of 316 parishes in Northamptonshire, 89 are in this condition; more than a 100 in Oxfordshire; about 50,000 acres in Warwickshire; in Berkshire, half the county; more than half of Wiltshire; in Huntingdonshire, out of a total area of 240,000 acres, 130,000 were commonable meadows, commons, and common fields."\* Some of these common fields were so extensive that the pasturage on the dividing balks of turf, which were not more than 3 yards wide, was estimated in one case at 80 acres. Indeed our words "commonalty" and "commons," as in "House of Commons," and in the expression "Commons of the Realm," and "yeoman" from the German *gemein*, "common," doubtless owe their derivation to a body of peasant proprietors having real property in common, that is, the dwellers in Village-Communities, who formed originally the mass of men in all lands.

Writing four years later in 1875, Sir Henry Sumner Maine alludes to further corroborative evidence of the universal existence in primitive times of related Village-Communities holding the land in common with a periodical redistribution, and that even amongst races other than Aryan. He says, "We at length know something concerning the beginnings of the great institution of Property in Land. The collective ownership of the soil by groups of men either in fact united by blood-relationship, or believing or assuming that they are so united, is now entitled to take rank as an ascertained primitive phenomenon, once universally characterising those communities of mankind between whose civilisation and our own there is any distinct connection or analogy. The evidence has been found on all sides of us, dimly seen and verifiable with difficulty in countries which have undergone the enormous pressure of the Roman Empire, or which have

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\* *Ueber die mittelalterliche Feldgemeinschaft und die Eingehungen des sechszehnten Jahrhunderts in England*, by Professor E. Nasse, Bonn, p. 4.

been strongly affected by its indirect influence, but perfectly plain and unmistakeable in the parts of the world, peopled by the Aryan race, where the Empire has made itself felt very slightly or not at all. As regards the Slavonic Communities. . . . We now know much more clearly than we did before that the soil of the older provinces of the Russian Empire has been, from time immemorial, almost exclusively distributed amongst groups of self-styled kinsmen, collected in cultivating Village-Communities, and self organised and self-governing. . . . The re-examination of the written evidence respecting ancient Teutonic life and custom proceeds without intermission, and incidentally much light has been thrown on the early history of property by the remarkable work of Sohm (*Fränkische Reichs- und Gerichtsverfassung*). The results obtained by the special method of G. L. von Maurer have meantime been verified by comparison with phenomena discovered in the most unexpected quarters. . . . Irish scholars, distinguished by remarkable sobriety of thought . . . had pointed out many things in Irish custom which connected it with the archaic practices known to be still followed or to have been followed by the Germanic races. As early as 1837 Mr. W. F. Skene, in a work of much value called *The Highlanders of Scotland*, had corrected many of the mistakes on the subject of Highland usage into which writers exclusively conversant with feudal rules had been betrayed; and the same eminent antiquarian, in an appendix to his edition of the Scottish chronicle, Fordun, published in 1872, confirms evidence which had reached me in considerable quantities from private sources to the effect that Village-Communities with 'shifting severalties' existed in the Highlands within living memory.\* Quite recently, also, M. Le Play and others have come upon plain traces of such communities in several parts of France. . . . But much the most instructive contribution to our knowledge of the ancient Celtic Societies has been furnished by the Irish Government, in the translations of the Ancient Laws of Ireland, which have been published at its expense. The first volume of these translations was published in 1865; the second in 1869; the third, enriched with some valuable prefaces, has only just appeared [1875].†

\* Mr. W. F. Skene, in a valuable note on *Tribe Communities in Scotland*, appended to the second volume of his edition of Fordun's Chronicle says that "he believes the system of re-division of land to have been once universal, or at least widely extended, amongst the Scottish Celts."

† *Lectures on the Early History of Institutions*, pp. 1, 2, 3, 6, 7, 8.

These Ancient Laws of Ireland, the so-called Brehon Laws, are contained in the two largest of the assemblage of Irish Law-tracts, the *Senchus Mor*, or *Great Book of the Ancient Law*, and *The Book of Aicill*. From these we gather that village groups, or Septs, consisting of related families under a chief, held land in common with a periodical redistribution. In a word the evidence of these Irish law tracts proves "that the elements of what we are accustomed to consider the specially Germanic land-system [the Mark] are present in the territorial arrangements of the Irish tribe." An Irish manuscript, that is believed to date from the year 1100 A.D., the *Lebor na Huidre*, *Book of the Dun Cow*, compiled in the seventh century, declares that "there was not ditch, nor fence, nor stone-wall round land, till came the period of the sons of Aed Slane [A.D. 658-694], but [only] smooth fields. Because of the abundance of the households in their period, therefore it is that they introduced boundaries in Ireland." "Rundale"\* holding still prevails in parts of Ireland, which is a collective enjoyment of land by a group of villagers. "As lately as fifty years since," says Sir Henry Sumner Maine, "cases were frequent in which the arable land was divided into farms which shifted among the tenant families periodically, and sometimes annually. Even when no such division was made, a well-known relic of the Mark-system, as it showed itself in Germany and England, was occasionally found: the arable portion of the estates was composed of three different qualities of soil, and each tenant had a lot or lots in the land of each quality, without reference to position." He adds that it is true that "Irish holdings in 'rundale' are not forms of property, but modes of occupation. There is always some person above who is legally owner of all the land held by the group of families, and who, theoretically, could change the method of holding, although, practically, popular feeling would put the greatest difficulties in his way. We must bear in mind, however, that archaic kinds of tenancy are constantly evidence of ancient forms of proprietorship."† But more than this, he goes on to point out that "the naturally organised, self-existing, Village-Community can no longer be claimed as an institution specially characteristic of the Aryan races. M. de Laveleye, following Dutch authorities, has described these communities as they are found in Java."‡ Rénan sees them amongst Semitic tribes in Africa.

\* Also known in Ireland and Scotland as "runrig," both *rig* and *dole* being names of acre strips (See p. 20). *Dole* (whence "rundale") was a strip of meadow.

† *Lectures on the Early History of Institutions*,

pp. 101, 102.

‡ *Ibid.*, p. 77.

Mr. Frederic Seebohm, in his recent work, *The English Village Community*, a volume of great research and close reasoning, has afforded us abundant materials for a vivid picture of English Village-Communities as they existed during the ages of serfdom, and also for a view, so far as it can now be obtained, of the Welsh, Irish, and Scottish tribal land systems.\* This work is one of much interest and value as an essay in economic history, but it is mainly occupied with examining Village-Communities and the Celtic tribal systems as they appear after the vast pressure of the Roman Empire had modified their once free forms, and, at all events in the case of the former, converted their open fields into the shell of a serfdom, first Roman, then Saxon, and finally Norman. Here Mr. Seebohm has carried his investigations further than those of Sir Henry Sumner Maine, and has shown us exactly the nature of the holding in England of arable land under the open field system of the Roman *villa*, the Saxon *ham*, and the Norman *manor*, all three having much in common with one another, and with the still freer and more primitive tenure of land in pre-Roman times. After the Norman Conquest, the Village-Communities appear to have lost for a time the last vestiges of liberty, the lord of the manor obtaining, for the most part, the absolute ownership of the soil, which in earlier days had been held in common by the people. But even then "the unity of the *villata* [or body of villein tenants] as a self-acting community is illustrated by the fact that in many instances the services of the *villani* [that is, the whole Village-Community in villenage] are *farmed* by them from the monastery [of Boldon] as a *body*, at a single rent for the whole village," as appears from the *Boldon Book*, a survey of the manors belonging to the Bishop of Durham in 1183.

During these feudal times the manor consisted of two parts, the land in demesne and the land in villenage. The land in demesne was that part retained by the lord for his own use, namely, the mansion house and its grounds, the home farm, woods, and other portions of land "irregular in area, let out from it to what are called free tenants (*libere tenentes*), some of them being, nevertheless, villeins holding their portions of the demesne lands in free tenure at certain

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\* *The English Village Community examined in its relation to the Manorial and Tribal Systems and to the Common or Open Field System of Husbandry. An Essay in Economic History.* Longmans, 1883.



rents in addition to their regular holdings." The other part of the soil, the larger part of it, the land in villenage, answering to our modern farms, lay in one open stretch around the village. Part of this in most places would consist of common pasture ground, and, in some at least, of common woods, moors, heaths, and wastes, for we have mention of all these in *Fleta*, an anonymous work which was the *vade mecum* of landlords as early as the time of Edward I. But the principal part was the arable ground.

It was invariably cut up into acre and half-acre strips, always a furlong (furrow-long, *i.e.*, the length of the drive of the plough before it is turned) in length, the acre strip being 40 perches, or rods, in length and 4 in breadth, and the half-acre strip the same length but half the breadth.\* Their Latin name in mediæval terriers and cartularies is generally *selio* (French, *sillon*, "furrow"). These acre and half-acre strips were separated from each other by green balks of unploughed turf. The balks were simply two or three furrows left unploughed, and, when from time to time dug up, unsown, for the term is apparently derived from the Welsh *balc*, "the accidental turning aside of the plough which leaves a sod of grass unturned between the furrows." Sometimes ten of these acre strips running parallel to one another, making a furlong in width, were grouped into a larger division, or field, called a *shot* [probably from the Anglo-Saxon *sceot*, division] or "furlong," and in Latin documents a *quarentena*. The balks which divided the *shots*, or *quarentenæ*, were broader than those between the *seliones*, or acre strips, and were often overgrown with shrubs, doubtless the first origin of our modern hedges. Along the top and the side of the *shot* was a path, or common field way, by which the acre strips could be approached, sometimes within the boundaries of the *shot* and sometimes outside it, called a *headland*, Latin, *forera*, Welsh, *pentir*, Scotch, *head-rig*, and German (from the turning of the plough upon it), *anwende*. Where the *shots* abruptly met others or abutted upon a

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\* In the earliest English law fixing the size of the acre (33 Ed. I) it is declared that "40 perches in length and 4 in breadth make an acre," that is, four roods running side by side parallel to one another, each rood being 40 perches, or rods, long by one rod wide, a strip of 40 square rods. More than 1,000 years ago the shape of the acre in Bavaria was just the same, but the rod in that case was the Greek and Roman rod of 10 feet, instead of the English rod of  $16\frac{1}{2}$  feet, which latter is just about the length of the Palestine *hhabalah*, or measuring-line (Pertz, *Legum*, t. iii, 278. *Lex Baiuvariorum textus legis primus*, 13).

boundary they were called *butts*. A corner of the *shot*, or field, which could not be cut up into an exact acre or half-acre strip was formed sometimes into a strip tapering or pointed at one end, and this was called a *gore*, or "*gored acre*." A few small odds and ends of land remained unused, which from very early times bore the names of "no man's land," or "any one's land," or "Jack's land." On the sides of hills, forming terraces, the strips were called *lynches*, or *linces*, a name properly belonging to the banks, or unploughed, grassy, natural terrace walls that held up and separated the terraces, but which came in time to be given to the terraces themselves. Remains of these are to be seen from the railroad at Luton in Bedfordshire, and between Cambridge and Hitchin, and also on many of the steep sides of the Sussex Downs and the Chiltern Hills.

The three field system of culture was almost universal, that is, the open lands were kept in three divisions, in each of which, as we have seen is the case in Palestine, the same culture was required to be carried on by all at the same time. This rotation of crops was known as 1, Tilt grain, or Winter corn; 2, Etch grain, or Spring, or Lent corn; and 3, Fallow. That is, in each of the three fields wheat or rye was sown one year in autumn, the tilt grain, and the land was then pastured over till the spring of the next year. This second year of etch (*eddish*, *edish*, "stubble") grain, called also *Breach-corn* (from the breach, or breaking of the stubble?), barley, oats, or beans were sown in spring. The third year, fallow, no crop was sown till the autumn.

The land in these open fields in villenage was mainly held by the villein tenants in quantities of acre and half-acre strips known as *hides*, *wistas*, *virgates*, and *bovates*. Normally the *hide*, called also a *carucate* (plough land), and in Sussex "a great *wista*," contained 120 acres;\* the *wista*, or *half-hide*, 60 acres; the *virgate*, or *yard-land*, called in Kent a *yoke* and north of the Tees a *husband-land*, 30 acres; and the *bovate*, called also an *ox-gang* or *half-virgate*, 15 acres. This last land measure, the *bovate*, was so called because it was held to be the amount of land which contributed one ox to the full plough-team of eight oxen needed for a *hide*, or *carucate*, which, consisting of 120 acres, contained just 8 *bovates*. The villein tenants mostly held a *virgate*, or *half-virgate*, and

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\* There was also a *solanda*, or double hide, containing 240 acres, probably the same as the *sullung*, or *solin*, of Kent, signifying "plough-land," from *sull*, "a plough."

answered somewhat to our small farmers, only that they were in abject serfdom, subject to all manner of services, fixed by custom in each manor, fines, penalties, and, above all, compulsory week-work on the lord's demesne sometimes for as much as four days a week. Their normal holding was a *virgate* of 30 acres, or 10 acres in each of the three fields. These villein tenants, or *virgarii*, as they were sometimes called, were in each case hereditary tenants for life, their holdings passing by the lord's re-grant from father to son by the rule of primogeniture, on payment of the customary heriot, or relief. The holding of a *hide* or *carucate*, 120 acres, was ordinarily the mark of a free family. But in the survey of Thorpe, a manor in Essex, we read of a class of *hydari*, who "were probably, as their name implies, groups of *villani*, villein tenants, holding a *hide*," and their services were reckoned in a lump, which they appear to have "clubbed as it were together to perform." (*Domesday of St. Paul*. Camden Society, 1858.)

In most instances in the old rolls we are simply told in the case of each of the villein tenants that A.B., or C.D., is the holder of a *virgate* or a *half-virgate*. A manor is described as consisting of so many *villani* holding so many *virgates* or *half-virgates*, or else we read that the monks of such and such an abbey hold so many *virgates*, or *husband-lands*, in the *villa*, or manor, of a given place. The parcels are not described nor the boundaries mentioned. An exception to this occurs in the Winslow manor rolls in the case of one John Moldeson, whose individual holding of a messuage in the village of Shipton and of 68 half-acre strips of land scattered all over the open fields of the manor of Winslow is given, with the furlong, or *shot*, where each half-acre was situated. Each of these strips is further defined as to its boundaries by being said to be between the land of A.B. and C.D., or the land of A.B. and E.F., &c. But this, be it remembered, is in the middle of the fourteenth century. To put it in Mr. Seebohm's own words, "This villenage of the Winslow tenants was, no doubt, in the fourteenth century mild in its character; the silent working of economic laws was breaking it up; but it was villenage still. It was serfdom, but it was serfdom in the last stage of its relaxation and decay." Exactly so: and there seems every reason to believe that for centuries before this the villein tenants, holding a *virgate* or *half-virgate* in the three open fields, were assigned no individual possession of any particular strips of ground, but had simply the right to till 30 or 15 acres, or thereabouts, as the case might be, in

the whole of the lands in villenage, which were held in common, and were reallocated amongst them as a community in proportion to the number of acre or half-acre strips which each, as belonging either to the class of *virgarii* or *dimidii virgarii*, had an hereditary right to plough. In a word, all that they possessed at first was the ancient right of *muzara'a*, or sowing, in the common lands of the *villata*, or Village-Community now passed into villenage, for which they would have to cast lots each year with the other *virgarii*, or *geburs* as they were commonly called, or possibly with all the *geneats*, or villein tenants in general, including the *cotsetles*, the *bordarii*, or *cottarii*, our cottagers, with small holdings, generally of 5 acres, but varying from 1 to 10 acres, and the simple village officials, who, like those in Palestine to-day, had their land ploughed for them in return for their services, the *faber*, or blacksmith, the carpenter, the *punder*, or keeper of the village pound, the miller, the bailiff, and the *præpositus*, or foreman, this last being the best husbandman temporarily elected by the body of tenants to be responsible for the cultivation of all the arable land. The chief differences between the once free Village-Community and the same Village-Community now in serfdom were that these *virgarii*, or *geburs*, were limited as to the number of acres they were permitted to plough, not as in the former free times, by the number of oxen they might be rich enough to keep, but by the number of acre and half-acre strips to which they were entitled by their feudal holdings, and had to give, amongst other *sordida munera*, or base services, as a rule from one-half to two-thirds of their time to do unpaid compulsory work on the lord's demesne, cultivating their own 15 or 30 acres and those of the village officials when and how they could. And that this really was so Mr. Seebohm not only admits, but in one part of his work attempts to prove. He says. "It will be remembered that there was observed in the Winslow example of a *virgate* a certain regular turn or rotation in the order of the strips in the *virgates*—that John Moldeson's strips almost always came next after the strips of one, and were followed by those of another, particular neighbour. Now this fact strongly suggests that originally the holdings had not always and permanently consisted of the same actual strips, but that once upon a time the strips were perhaps allotted afresh each year in the ploughing according to a certain order of rotation, the turn of the contributor of two oxen coming twice as often as that of the contributor of one ox, and so making the *virgate* contain twice as many strips as

the *bovate*. This, and this alone, would give the requisite elasticity to the system so as to allow, if necessary, of the admission of new comers into the Village-Community, and new *virgates* into the village fields. So long as the limits of the land were not reached a fresh tenant would rob no one by adding his oxen to the village plough-teams, and receiving in regular turn the strips allotted in the ploughing to his oxen. In the working of the system the strips of a new holding would be intermixed with the others by a perfectly natural process. Now that something like this process did actually happen in Saxon times is clear from the way in which the Church was provided for under the Saxon laws.”\*

It is not necessary to go into that part of Mr. Seebohm's work where he labours with much learning and ingenuity to show that G. L. von Maurer is wrong in his theory of the original German *mark* and *free Village-Community*, and that “what looks at first sight so much like a German free Village-Community was a little Roman *vicus*.” Whether Roman or German the *mark* on the Continent, like the *manor* in England, possessed distorted but clearly traceable remains of the Village-Community with its arable land lying in open fields, held and ploughed in common, and constantly re-allotted amongst the native tillers of the soil, all of which are features of that farm life which the changeless East has so minutely preserved, and which, in its exceedingly primitive simplicity, carries us back at one leap two thousand years behind the Roman Empire.

Though as we have seen, in India, these Village-Communities formerly existed everywhere, the unavoidable introduction of our legal ideas of sovereignty, command, duty, right, and sanction, utterly subversive of their system, but inseparable from modern ideas of law and order, have been inevitably modifying and breaking them up. This has occasioned a great part of the difficulty we have met with in ruling that vast Eastern Empire,—for there is no earth-hunger, no attachment to custom, and no antipathy to the interference of strangers in matters social, political, legal, fiscal, and religious greater than that which is to be found in these ancient, highly exclusive, and exceedingly conservative Village-Communities. Powerful oriental monarchs formerly, as they do now—and this must from time to time have been as much the case in the kingdom of Israel as in

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\* *The English Village Community*, pp. 113, 114.

the empires which surrounded it—"swept away the produce of the labour of the Village-Communities and carried off the young men to serve in their wars, but did not otherwise meddle with the cultivating societies. . . . These monarchs with few and doubtful exceptions neither legislated nor centralised. The Village-Communities were left to modify themselves separately in their own way."

If it is asked how, under such a state of society, the numerous oriental court officials and the nobility were maintained, the answer is, plainly, in the same way as they were provided for by the Mohammedan Emperors of Delhi and the Mahratta princes who divided the Mogul Empire, or the still more modern Sikhs, "not by rents, but by assignments of the royal revenue." To acquire the necessary means for this, when their armies were large and their courts magnificent, Eastern monarchs were driven to sweep into their coffers a large and extortionate share of the produce of the soil tilled by their subjects in the Village-Communities, leaving the latter only a bare subsistence. There is every reason to believe that this state of things existed in the days of the kings of Judah and Israel, and it adds a graphic touch to the picture of the greed, insolence, and consequent punishment of the young courtiers and nobles brought up with Solomon's son, whom it will be seen had a direct interest in advising Rehoboam to declare that the fiscal burdens of the people, which had been already unbearably oppressive in the last days of his father's reign, should be increased rather than diminished.\*

It follows, from what has been said, that there was no such thing as rent, in our sense of the term, in former times when the cultivating tribal groups prevailed. Sir H. S. Maine tells us the terrible problem of pauperism "began to press on English statesmen as soon as the old English cultivating groups began distinctly to fall to pieces." In India, he points out, it will be worse, because there is so little mineral fuel for manufactures on a large scale, and "emigration for the most part is regarded as a mortal sin." In fact, so long as the requirements of life were extremely simple, so long as even the poorest people knew their pedigrees and paid homage to a local patriarchal ruler, so long as lands were but sparsely peopled and not as yet completely brought under cultivation, so long as a powerful despotism safeguarded the country from foreign aggression without making

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\* 1 Kings xii. 1—14.

too great demands for men and money, and held back its tax-farmers (*publicani*) from extortion and the soldiers, who accompanied them to convoy the taxes, from violence and robbery, so long life must have gone very happily with the masses under the primitive land system of the Village-Communities—so long, but no longer. It is, therefore, very important to study this system whilst it is still to be seen, for modern civilisation will soon inevitably sweep away its last vestige, and, whilst the present order of society continues, prevent any possibility of its return.

Besides the great historical and legal interest possessed by this subject, it also serves to light up with vivid meaning an obscure allusion to be met with in the Hebrew Scriptures.

David, rejoicing in the favour of God, cries,

“Thou [art] taking hold of my lot,

The measuring-lines (מִקְּלָיִם) are fallen unto me in pleasant [places].”\*

Written as this was amongst a people wholly given to agriculture, it will be seen, in the light of the foregoing facts, to contain a far more graphic and familiar figure than has been hitherto supposed. The word “taking hold of,” תִּקְחֶנּוּ *toameek*, the present participle, *kal* of תִּבְנֶה, *tamak*, translated in our version “maintained,” may possibly be rendered “holding up,” but its first and commonest sense is “taking hold of,” and that would naturally seem to be the meaning here. David is not speaking in these verses of Jehovah’s protecting or maintaining him in the enjoyment of his prosperity, but of his *bestowing* it upon him. This highly figurative passage bears the following interpretation, “Thou art taking hold of, that is, drawing out for me my lot from the bag, and so assigning to me the right of ploughing in the richest parcel of land, and the lines, that is, the strips marked out by the measuring-line, have fallen to me in the fattest fields of this goodly ground.” Under this exceedingly familiar and suggestive figure—for did not all Israel live by

\* Psalm xvi, 5, 6. The word here translated “lot,” גֹּזֶל, *goaral*, appears to be the Arabic *jaral*, “a stone,” or “anything carried about,” the very *goaral*, or “lot,” now in use. It means in the first instance the stone, or other similar object employed in the casting of lots; and in its secondary sense, by metonymy, the parcel of land so assigned. The word “line” here, and in the following passages, is מִקְּלָיִם, *hhevel* (Arabic *hhabaleh*), “measuring-line,” that rope or line by which each field of each parcel of ground was divided into strips, or *maavaress*; and this rope, as we have already seen, by the similar figure of metonymy, gave its name to these *maavaress*, or strips of soil, which it served to measure out.

cultivating the land and witness year by year with absorbing interest its redistribution by "the lot" and "the line?"—David records his own rich and highly prosperous lot in life, and acknowledges it as the assignment of Him Who took him from the lowly calling of a shepherd to make him a king.

The Psalmist has evidently a similar allusion in the verse descriptive of the driving out of the seven Canaanitish nations from Palestine, and its bestowal on the tribes of Israel. It is literally—

"And he drove out nations from before them,

And he caused to fall [for] them (מִלְּפָנָיו) an inheritance by a measuring-line (מִמְדָּתוֹ)."

But this verb נָפַל, "fell," in the *hiphil* structure, is the technical term used for "casting lots," and the Revisers are undoubtedly right in rendering וַיִּפְּלוּם "and allotted them."† It should therefore read—

"And he drove out nations from before them,

And he allotted them an inheritance by a measuring-line."

How pointed and full of meaning the figure now becomes in those words of enticement put by the wise man into the lips of sinners,

"Cast [or thou shalt cast (לְפָנֵינוּ)] thy lot amongst us,"‡

that is, "take part in the joint-husbandry of our village," in other words, "join our community."!

The passage in the Authorised and Revised Versions,

"For the Lord's portion is his people,  
Jacob is the lot of his inheritance,"§

is,

"For Jehovah's field (לְפָנָיו) is his people,

Jacob is the measuring-line (מִמְדָּתוֹ) of his inheritance,"

that is, "His allotted maress, or strip," for here, by metony-

\* Psalm lxxviii. 55.

† נָפַל alone, in the *hiphil* structure, is rendered "divided by lot," "allotted," or "cast lots" in Joshua xiii. 6; xxiii. 4; 1 Samuel xiv. 42; Ezekiel xlv. 1; xlvi. 22; and xlvi. 29, in the Authorised Version, and it is virtually the same in the Revision, though "allotted" is put for "divided by lot."

‡ Proverbs i. 14.

§ Deuteronomy xxxii. 9.



my, the measuring-line stands for that which it measures out. In this bold representation the inhabitants of earth are compared to a *sadeh*, or open stretch of common arable ground, consisting of a number of *hhalakeem*, or "fields" each divided out into *mawareess*, or "strips," of which Israel, His chosen, peculiar, elect nation is the allotted *mareess* "that falls to Jehovah!"

A precisely similar figure is used in describing Israel's assigned portion in the land of Canaan—

"Unto thee will I give the land of Canaan,  
The measuring-line (לְמִדָּה) of your inheritance,"\*

that is,

"Unto thee will I give the land of Canaan,  
The allotted-*mareess* [or strip] of your inheritance."

We may also conclude that in the terrible picture of judgment denounced against Amaziah, the priest of Bethel, on account of his falsely accusing the prophet Amos, the words,

"Thy ground shall be divided by the measuring-line (בְּמִדָּה),"†

are a figurative expression for "others shall farm thy ground," that is, "take thy property from thee."

So too in the "doleful lamentation" in the prophet Micah against the cruel and extortionate oppressors in the land of Israel, we have clearly a similar reference. These, of whom it is said,

"They covet fields and take them by violence,"

are represented as being forced to cry,

"We are utterly spoiled ;

He has changed the field (לְחַיִּל, *hhailek*) of my people :

How he has departed from me !

Surely, turning away, he has divided our *sadehs* (שָׂדֵי, *sadainu*) [to others].

Therefore thou shalt not have one casting a measuring-line (לְמִדָּה) in a lot

In the congregation of Jehovah."‡

That is, "thou shalt have none left to thee alive who have not been carried into captivity or sold into slavery, and thus

\* 1 Chronicles xvi. 18 ; Psalm cv. 11.

† Amos vii. 17.

‡ Micah ii. 4, 5.

removed from their peaceful homesteads in their Village-Communities, from all their kith and kin, and from the cherished, almost sacred right of tilling in *mushaa'* their ancestral lands."

Very grand and terrible is the same allusion as employed by the prophet Isaiah in foretelling the devastation of Idumea, or Edom, which would come in

"The year of great recompense [literally, "recompences"] for the controversy of Zion."

He describes its palaces as ruins overgrown with thorn-bushes, and its fortresses as covered with nettles and thistles and crumbling to dust. Jackals and other beasts of prey are to have it as their place of rest, and to share it with the screech-owl and the vulture. Of these denizens of the desert he cries,

"He has cast a lot for them,  
And his hand has divided [it] to them by a line [יָדָה],"\*

that is to say, the once fertile *sadehs* of Idumea shall have, as it were, for their only landlords and occupiers the wild beasts and birds of the wilderness! All who have traversed this district for many years past have borne witness to the utter desolation so truly drawn in the words of this powerful figure.

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The Right Hon. LORD HALSBURY—the LORD CHANCELLOR—(Vice-President), in the Chair: I suppose there is no one present who would not cordially agree that our best thanks should be accorded to Mr. Neil, who has been so kindly engaged in instructing us upon these somewhat dry subjects, as they would have been in any other hands than his. I imagine if one were at first sight to select a very uninteresting and dry subject (to the popular mind, at all events), it would be that of the tenure of land in our own time—much more in ancient times; but I think the author of this paper has managed to give it an interest which carries us back to a period certainly before history began, and anterior to the time of Abraham, in which he has given us that which I think we can all learn a great deal

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\* Isaiah xxxiv. 13—17.

from, and has informed us of many things, and we have subject for reflection upon many points which, but for his ingenuity, research, and learning, probably we should not have thought worth while to consider. Those chance allusions and expressions, which we pass without any observation at all in matters we have been most of us familiar with from our youth, receive a new light from what he has told us; and I confess, for myself, the explanation has occurred to me, when I have been listening to his learned words, of many subjects which have been, perhaps, a little puzzling to one on reading that Book with which most of us are familiar. He has said so many wise things that I fear being over-fascinated and saying I agree too much in what he has said. As a lawyer, I should pause and consider, and hear somebody on the other side; but, at present, I can only say that I am delighted with what I have heard. It is one of those things for which we are not sufficiently thankful, that men who are accomplished and learned do think it worth their while to go into subjects which are not attractive to the popular mind unless they are rendered so by learning such as we have listened to to-night. I have now only to invite discussion.

MR. W. ST. C. BOSCAWEN: When I read the first six or eight pages of the proof copy of this paper, I thought the author was writing not on Jewish land tenure, but on a very much older system, viz., that of Babylonia; for I find that out of 16 words he quotes, more or less connected with land tenure, there are 14 of those words to be found on the old Babylonian legal tablets. There is hardly a precedent or a custom which he quoted which would not have been in use in Babylonia at the time when Abram left his home. You are probably aware that there are now in the British Museum a series of legal documents, dating from about 2300 years B.C. down to within a century of the Christian Era. There are over 40,000 of those documents, which contain subjects to most people almost as dry as the material they are made of, but still there is no subject, perhaps, more interesting than that of the life of the common people. In studying these inscriptions, you get tired of the long platitudes poured out on the kings, and it is quite a treat to enter into the houses, as it were, and see the common life of the people. What Mr. Neil has said with regard to the light which Arab tenure throws on early Hebrew life, I may carry a little further back perhaps by giving one or two illustrations. He spoke

of land being divided by a sort of council which was held periodically. In Babylonia, when land was leased, it was leased by a court held, not in the guest chamber, for they do not seem to have had one, but in the gate of the city. These elders sat, as in the case of Boaz, and decided the question. Land was leased in this way. The most prominent person was the scribe, who was the same as the *khateeb* here; he wrote down a list of the lands. Then as to village communities, we have a distinct trace of it in Babylonia—certainly at the time of the captivity and even much earlier, in the time of Esar-Haddon and Sennacherib, we find that the wealthy individuals paid their tithe—and even the King—to the Temple; he usually paid it in gold. Only a few days ago, I copied a list in which a number of villages paid their tithe in a body, and were taxed as if they paid individually. Then, again, I noticed a subject of interest with regard to the plough: it comes in with something later in the paper. The two signs used to represent the plough are derived, according to M. Brünnow from a word that means to make a burrow or a scratch with a graving tool. The word *sadeh*, in the Hebrew, has, apparently, a different meaning to the word used in the Hebrew inscriptions. The word for “open country.” is *zuza*, that which is spread out. It has almost exactly the same meaning as the distinction you hear constantly drawn between town and country land; because I find a man saying in a mortgage which we have, on which he borrowed a sum of money, “all that I possess in town and the open country, I give as security.” Then there is another point with regard to the rope or measuring line; the suggestion of the author is ingenious, but I must say that I am not quite convinced by it yet. Certainly, we do know that land was allotted out in Babylonia by the *asslu*, which means a rope or cord; but I do not find much trace of it.

Now, there is another point with regard to two persons having land cultivated for them, namely, the scribe and the carpenter. In Babylonia there was another individual, who was not quite so popular as either of those persons, who had land cultivated for him, and that was the tax collector. He was, moreover, bound to be provided by the village with a donkey on which to go his round to collect the taxes. There are numerous other points to which I might refer—one is blood affinity. I think the author would gain a good deal of information if he were to read Professor

Robertson Smith's last book on the religion of the Semites, in which he deals with what he calls "fundamental principles," first, as to tribes, in relation to the Tribal God, who is usually regarded as the owner of the land, and it was from him that the land was received, and the tribe was thought, or said, to consist of the God and his people, and the God had his share in the village community, who was represented by the tithe as much as any of the population. With regard to the purchase of the cave of Macpelah, it is one of the most remarkable passages in the Old Testament. Indeed, there are two such passages in the early portion of the book of Genesis, which stand out as interesting fragments. One is the purchase of the cave of Macpelah, which reads as if it were taken from Babylonian documents. The whole phraseology of it, even the epithet of "stranger" or *ger*, applied to Abraham, is a word found in Babylonian inscriptions. It means a man who asks to "make a friendship"; the word is equivalent, almost, to the word "client." The other fragment which stands out so clear is that remarkable historical one in the 14th chapter, which is, undoubtedly, a fragment of the olden history of the Hebrew people. May I add a word with regard to that part of the paper referring to village communities. Another trace of these communities in Babylonia is certainly found in the punishment which was inflicted on a man who broke the laws of the family. The law of the family in India implies the recognition of the father as the head, but in Babylonia, amongst the Semites, at any rate, at an early period, the law of maternity was in use, and the mother was represented as the goddess of the house, and an offence against her was punished far more severely than an offence against the father. An offence against the father could be atoned by a money payment, but against the mother it was punished by cutting off of the hair and nails—which you know was a punishment inflicted on captives by the Hebrews—and by banishment from all social rights. These are facts which are gathered from Babylonian inscriptions, and which show that we may carry the system, which Mr. Neil has traced from so early to so late a period, even further back still. There is one more part of the paper to which I will refer before I sit down, and that is the one with regard to the expression "the daughters of the mother cities." The old Babylonian capital, the city of Ekron, was called by the name of "the mother," and this is a phrase frequently repeated in Babylonian inscriptions when

the King besieged the town and captured that city, *alu sa u alani ša bariti šu*, "that city and the cities allied with it," and the cities which clung to it, the word being exactly equivalent, or almost so, to the Levite; the one who clung to the city. The Levite of the Hebrew is represented in Babylonian inscriptions by *sangu*, and was one who was under a bond or vow to the Temple. I hope Mr. Neil may be induced to go on investigating this extremely interesting subject. I might suggest that he would find a great deal of information upon it in a book published by the two Messrs. Revillout on the "Law of Property in Ancient Egypt," and the large Appendix to it on the "Laws of Babylonia." It is a book of very great interest and learning. It was published, unfortunately, somewhat prematurely; before the discovery of a number of documents which have now come to light, but still it is a book of very great interest.

AN ASSOCIATE, in some remarks, denied the prevalence of the village-community system\* in early times, and urged that it did not exist in France.

MR. FREDERIC SEEBOHM.—I should like to say that my study of the subject leads me to suppose that the view taken by the last speaker is not the correct one. I would simply, by way of showing how exceedingly strong the evidence is for the existence in early times of village-communities with the open field system, allude to one point. I think the last speaker mentioned that there was no evidence in the laws of France that France ever had these village-communities, or the land system of which we have heard so much.

AN ASSOCIATE.—The present French Code.

MR. SEEBOHM.—The late extremely interesting and clever writer,

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\* Prescott, who says "the nearest approach to the Peruvian constitution was probably in Judæa," describes it in the second chapter of his work on *The Conquest of Peru*, and remarks that it seemed "suited to a state of society but little advanced." He adds that under it, "the great hardship in the case of the Peruvian was that he could not better his condition . . . nor advance himself a hair's-breadth in the social scale" . . . "the great law of human progress was not for him."—At the third page of the paper reference is made to the expression "a plough of oxen" as signifying two oxen; it may be noted that in some parts of England, Somersetshire, for instance, the expression "a plough of horses" signifies two horses.—ED.

M. Fustel de Coulanges, a great authority on French legal history, did indeed confess to me that he had not been able to discover in early documents of France, which he knew so well, any clear allusion to the open field system. But in a visit last autumn to Brittany, I found the open field system fully in force, and using the same terms as those of the ancient laws of Wales. It exists still to a large extent in the great corn-growing district of France, of which Chartres is the centre. From the tower of the cathedral it may still be seen stretching on the plain as far as the eye can reach, though 100 years have passed since the French Revolution abolished the manorial system under which it was carried on for centuries. In tracing it back, two things have to be considered: first, the holdings composed of strips scattered over the whole area of a township, and secondly, the common right of pasture over the strips when the crop has been gathered. It has been argued that the scattering of the strips is sufficiently explained as the natural way of giving every holder land of all kinds, and so producing fairness and equality. But this does not account for the second point, the common right of pasture over the strips when the crop has been removed. At the present time the holder at Chartres dare not put his own cattle to graze on his own strips till the day comes when the whole area is common to all. This system has been inherited by the village communities from the still older tribal communities. It goes back to the time when cattle and not corn formed the main wealth of the pastoral tribes. These wandering over the country pursued what agriculture they needed by annually withdrawing a portion of their land from the common pasture, to be held in severalty during the crop, and then to fall back under the common pasture when the crop was gathered. This is a mark of the open field system wherever found. We have been told to-night that it exists in Syria. It existed all over Europe, and was not confined even to Aryan ground. It is very widely extended, and seems to me to go back for its origin to the tribal system, which preceded the village communities.

Mr. DAVID HOWARD.—I do not think any one could have known Wilts and Dorset 30 years ago without being aware that village communities existed in England. I have myself seen exactly the same system which Mr. Seebohm describes in operation. It is a survival of an ancient custom even now carried on in some places in England, though utterly unsuited to the present times. When I was a boy there were many examples. The fact of so inconve-

nient a system surviving so long, is proof in itself of antiquity, and I can only say if a shifting severalty has recently sprung up in Palestine, it is much more wonderful than that it should have survived.

Mr. SAMUEL BERGHEIM.—As a native of Palestine and one having had extensive property there, I might mention the fact that village-communities at a short distance off the high roads have different laws from the village-communities close to the high roads. It seems that the different nations who held Palestine at various periods, such as the Greeks, the Saracens, the Crusaders, and the Turks, passed laws which were adopted by the people living in villages near to the high roads, but that these laws were not adopted in the villages at a distance from the high road, say of 5 to 10 miles. In such villages older laws and customs have been kept up; in fact, many of the words used by the inhabitants are different to those used in the ordinary language. Some of their words are not Arabic, but probably a form of Hebrew. For instance, in the expression *hhalkath watta*: if you were to ask an Arab what *hhalkath* meant, he would probably say that there was no such word; but if you were to go to a village such as *Abu Shushah* (the ancient *Gezer*), there they would tell you at once that it meant “a portion of land.” So with the apportioning of land, the land near the towns is not *mushaa'*; each piece of land is freehold. It was made so by a law brought in by the Turks, who have often tried to enforce this law in the whole country, and thus to do away with those rights of cultivation, *mushaa'*, but have failed to do so. When my brother and I bought the lands of a village some years since from its inhabitants, the Turkish authorities recognised us as the *freeholders*, and gave us title deeds, in accordance with a law on freehold passed by the late Sultan about twenty years ago. Not so, however, the inhabitants of the village, for when we came to portion out the land in plots for cultivation, the villagers protested and refused to accept the new arrangement. They would only have the land in *mushaa'*, as explained in the paper just read. These laws, or customs, of cultivating the land still exist, and the people refuse to change them.

Mr. SEEBOHM.—May I add one word which I forgot to say on the alleged absence of documentary evidence for the existence of the open field system in France in ancient times. It seems to me that there is documentary evidence of an indirect but conclusive kind. As in Saxon charters, so in the early charters of France,



properties are granted composed of so many holdings, or the *mansus* of so and so, in a certain place without any description of the holdings by boundaries. Why is this? Simply because both in England and France the land belonging to each holding was scattered in strips about the whole area of the township. This evidence carries back the system in France to the commencement of the sixth century, *i.e.*, as far as the documentary evidence goes.

Mr. BERGHEIM.—I accept what Mr. Boseawen said about the tax collector. The custom is kept up in the village-communities; they are bound to provide him with a donkey.

Mr. BOSCAWEN.—The practice on which that is founded is laid in 1130 B.C., when the right of freedom was granted to places for certain benefits; in future the tax collector was not to go his rounds, and they were not to provide him with a donkey.

Dr. CHAPLIN.—I feel, my Lord, it is great presumption in me to occupy the time of the meeting, as my knowledge of the subject is so inferior to that of many of those gentlemen who have already spoken. As to the argument derived from antiquity, I am unable to add anything. What I do know of the subject, coincides entirely with the points brought forward so ably by Mr. Neil, and I must say that I have derived a great deal of pleasure and instruction from listening to his paper; and may I say that I could not help thinking, as he proceeded, that it would be very interesting to discuss, at least in a brief way and in few words, the influence on the people of this peculiar way of holding land in Palestine. Perhaps it may not be known to some present, that one of the most interesting problems possible is now being worked out in that country, *viz.*, whether this very ancient system of holding lands for agricultural purposes in common, as described to us this evening, is better for the general welfare of the people, than that newer system to which we are accustomed in this country, and which is being introduced into Palestine, where capitalists are purchasing the lands of the villages, and the *fellahkeen* are losing their ancient rights in the land, and, in consequence, the circumstances of the country population are changing. I had hoped that my friend Mr. Bergheim, who knows so much about it, would have told us more than he did. He just lifted one corner of the veil when he said he had inquired into it, but he has not said so much as could be wished. Subjects of great importance and of widespread influence are now being considered in Palestine, which must soon come to the front. I allude more particularly to

those agricultural colonies which are patronised by the leading Jews of this and various other countries of Europe. I suppose that most of those present are aware that there are some ten or twelve Jewish colonies for agriculture in various parts of Palestine, and that very important questions are coming up with reference to the way in which these colonies should be carried on.

Rev. J. G. KITCHEN.—I should like to express the special thanks of all Bible students to Mr. Neil for his paper, for such students know that it is a paper likely to be of great assistance to them. We are already indebted to Mr. Neil for many similar helps, and I do not know anyone, who seems to bring forward such practical ideas which throw light on the Bible, perhaps, since Dr. Thompson, who resided in the East and wrote his well known work thereon. Perhaps no one has had a better opportunity for similar study than Mr. Neil, and of putting it in a popular form. All must feel indebted to him for his researches. (Applause.)

Mr. G. POWELL.—I should like to echo that sentiment.

The AUTHOR.—I heartily thank those present for their kind vote of thanks. Whether my paper is of any value or not, turns really on two questions. First, "Is everything which we find in the East to-day most ancient, or is it not?" That is one of the most important inquiries, and there can be no doubt about the answer. The light coming in from every side—and it is now a brilliant flood of light—throws into boldest relief and gives strongest confirmation to everything that is found alluded to in Scripture. The unchanged manners and customs are in all respects the manners and customs of Bible narratives. Many of the technical terms that are used by the *fellahheen* to-day have no meaning until we take them back to the original Biblical Hebrew, of which they are found to be spoken forms. Every allusion in Scripture, as you go about the country, starts into life. Palestine customs, in their exceedingly primitive features, are evidently of hoary antiquity, as shown by their not only elucidating, but confirming the Bible in every particular. Thus, my Lord, there is a strong *a priori* conclusion that *all* we find now has not been recently introduced, but is most ancient. The second question is, "What is the *nature* of the holding of land alluded to in Scripture?" That they held a certain property in broad acres, as has been pointed out, is clear; the only question is, what was the *nature* of that property. This I have shown was holding in common; but it constituted real property. It had a money value attached to it.

It was a holding that could be conveyed to others, and the lands thus held could apparently be temporarily let to yearly tenants. All those allusions, that appear to us to be to individual holdings in severalty, are really to common rights enjoyed together with fellow commoners—rights of sowing a portion of the open field—not of permanently possessing any part of it. The subject must be so new to many that no wonder doubts arise when it is first put plainly. Give me one single instance of holding broad acres in severalty in all the pages of the Bible! I think the view I take of the ancient character of the tenure of land as now found in Palestine is conclusively confirmed by the remark of Sir Henry Sumner Maine, one of our greatest jurists learned in Indian law, that all “the most distinguished public servants” in India, in the last century held “that no ownership of Indian land was discoverable except that of the village-communities subject to the dominion of the State”—(*Village-Communities in the East and West*, pp. 61, 62.) Oriental monarchs, no matter how powerful, did not interfere with their people’s tenure of land, so long as they paid their taxes and provided men for the army; and the Mohammedans, like the rulers who preceded them, have left the villages to themselves, and thus, thank God, have preserved for us a living commentary on the Book.

The meeting was then adjourned.

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#### REMARKS ON THE FOREGOING PAPER.

A few points strike me in connection with the Rev. J. Neil’s valuable paper on “Ancient Land Tenure, as Preserved by the Villagers (*Fellahheen*) of Palestine.”

I would rather render the term *nusha’a* by *undistributed* than by “common,” though practically “undistributed” land is farmed by the *fellahheen* as “common” land.

It must be remembered that not *all*, but (as Mr. Neil observes) only a large part of arable land is undistributed and allotted annually. In my time, this was chiefly the case on the great corn tracts, *e.g.*, the Sharon and Philistine plains.

If שָׂדֵה, *sādeh*, be derived, as it appears to be, from שָׂדָד, *sadad*, “to break up clods with plough or harrow” (as in Isaiah xxviii, 24; Hosea x, 11), we may well render it as arable grain land, as distinguished from fruit or garden land.

I have elsewhere drawn attention to the fact that agricultural work in Palestine is, as it was in Bible times, divided into three principal kinds, following the main divisions of the soil:—

1st. Corn and grain culture, on arable land, chiefly on the great plains.

2nd. Vine, olive, and fig culture, on the mountains.

3rd. Vegetable culture, in irrigated "*gardens of herbs*," where there is a stream from a fountain head, chiefly in the valleys by the villages, and on a great scale, formerly in the Jordan Valley.

The *sâdeh*, arable land, is, no doubt, now often held in common and allotted annually by the Chiefs of the Village; but we found this allotment greatly influenced by considerations as to mutual protection; the fallowing of the land; and the proper rotation of crops: 1st, wheat, barley; 2nd, pulse and beans; 3rd, summer crops, melons, cucumbers, summer beans, sesame, and millet.

But Israel's fallow was appointed to be in the Sabbatic year, and they were commanded to work the other six.

It must be remembered that for many, many centuries, the population of Palestine has been so sparse that they have had far more land than they needed to use. The *fellaah* population has, moreover, shrunk enormously within the last 40 years. We found that the system of annual conclave and allotment was resorted to on the undistributed land of the Great Sharon Plain by the villages of the overhanging hills (Jezer is situated near this plain) for mutual protection and as a means of ensuring fallow, and also to prevent quarrels over any plot which, being "undistributed" (unappropriated), one might seek to make his own by continuous occupation. That the custom is most ancient is certain, and also that it prevails in many lands, as Mr. Neil has shown. But all arable land is not now "undistributed" in Palestine. Now, as of old, we have arable fields which are private property (Arabic, *mulk*, ملك).

But I think that, according to the Law of Moses, it was intended that every man was to receive an inheritance; and I read Numbers xxvi, as directing allotment—1st, to *Tribes*, and 2nd, to *Families*, משפחות (still called after their fathers, whose names were in the first great muster roll of Moses, and were in use, though they themselves had died in the wilderness); but also, 3rdly, to *Individuals* of full age (20 years, see verses 4 and 51), stated in verse 51 to be 601,730. To them personal and inalienable inheritance was to be granted, as follows, verses 52, 54: "To these shalt thou apportion (divide) the land for inheritance, accord-

ing to the number of the names. To [him who is] many shalt thou increase *his* (not *their*) inheritance; to [him who is] few thou shalt diminish *his* inheritance. To each man shall be given *his* inheritance according to those that were numbered of him."

This surely points to an allotment to each man individually.

The application of Zelophehad's daughters immediately follows and was approved, their claim being allowed. Then follows the Law. In Numbers xxxvi. 8, "Every daughter that possesseth an inheritance in any tribe of the children of Israel shall be wife unto one of the family of the tribe of her father." They and all future heiresses were thus restrained by special enactment from marrying into any other than their own tribe, and thus (singly and personally—not collectively) alienate the inheritance from their father's tribe. Ten portions were allotted to Manasseh (Joshua xvii. 5, 6), because the daughters of Manasseh "had an inheritance among the brethren of their father." So, in Deuteronomy xxi. 17, we read that a first-born son was to inherit a double portion; as Joseph did in Ephraim and Manasseh, when Reuben had forfeited his double portion, 1 Chronicles v, 1.

Again we have, in Joshua xv, from 16 to 19, Caleb giving to his daughter Achsah, a field, שדה, *sadeh*, as personal property. (Note here the use of the phrase, "a blessing," to mean a super-added gift. The natives of Palestine to this day use the phrase in the same sense—"the blessing," *bárakeh*—an additional handfull added to the already full measure; an extra bunch to the full weight of grapes; a small coin, over and above the stipulated pay, all added in token of good will. Thus Achsah received her field, and, besides that, her *bárakeh* of the upper and lower springs).

In 1 Samuel viii. 14, Israel is warned that the future kings may take from them their *fields*, &c., plainly their personal property. Naboth's history, 1 Kings xxi., plainly refers to his vineyard as personal property. The Jubilee laws against alienation of property also refer to personal acts of mortgage or sale. See also the application of those laws to the Prince, in Ezekiel xlvi. 16, 18. Mr. Neil refers to the span of human life given in Psalm xc. 10, but it should be remembered that in this psalm Moses, "the man of God," is not speaking of human life in general, but of the one generation doomed to die in the wilderness within the 40 years. Other Israelites did live to see more than one jubilee period.

In short, I am disposed to regard the *fellahh* custom of working in common, the "undistributed" princely or crown lands (*ardh-*

*miri*), as a survival like many others of aboriginal custom not abolished by Israel, because the Mosaic laws were but imperfectly carried out.

According to Mosaic laws there were no crown lands at all. "The land is Mine," Leviticus xxv. 23. The land marks used by the *fellahheen* for marking their allotments are, as Mr. Neil well observes, but slight piles of stones easily removable. Doubtless similar landmarks were used by the Israelites. But in Deuteronomy xix. 14 reference is made, not to any *recent* landmark but to the ancient boundary גבול, *gavool*, which they "of old time ראשונים have set in thine inheritance." So, Proverbs xxii. 28 and xxiii. 10, "remove not the ancient עולם, *olam*, landmark, which thy fathers have set," "and into the fields, שדה, *sadeh*, of orphans enter thou not" (clearly personal property).

Mr. Neil mentions that a portion is cultivated for the village carpenter and *khateeb*, whose business keeps them from ploughing for themselves. We also found that this portion was called *shkārāh*. Here, as is so often the case, we find a Hebraic term in fellahh dialect. *Shkārāh* means "hire," see Jonah i. 3. *Maress* is derived from *maras*, مرس, "rope," not from ميرات, *meerath*, inheritance. The Hebrew word for rope is חבל, *khavel*, whence our "cable," حبل, Arabic "rope." Then, as now, rope was used for field measurement.

As to the purchase by Abraham, Genesis xxiii., of the field and cave of Macpelah, it is expressly said that these were the personal property of Ephron; but it is clear that Abraham sought to get the children of Heth to waive the right of pre-emption which they had as neighbours, and that he succeeded in so doing, otherwise, any member of their families might afterwards have upset the purchase.

This right of pre-emption, by even a neighbour, is strictly enforced to this day among the *fellahheen*. So also property in fruit trees exists, distinct and separate from that of the soil in which they grow. Abraham had the trees secured to him as well as the field, *sadeh*, and cave.

Connected with this separate property in trees are the curious and interesting laws of tenure by *amār* (cultivation of waste land), into which space and time prevent my entering at present. Nor may I do more than just mention the curious fact that in South Palestine, the peasantry are governed by an unwritten code which they call *Sharyat Ibrahim* = the code of Abraham. This code is

held in the greatest reverence, and is respected even by the Turkish Government officers. It is unwritten, and is administered by the village elders, as distinct from the *Sharyat el Mahhkameh* (Moslem law) and the *Sharyat el Osmanli* (Ottoman Imperial law).

E. A. FINN,

Member of the Royal Asiatic Society.

### REPLY BY THE AUTHOR.

It is a great satisfaction to find that so competent an authority on the manners and customs of modern Palestine as my critic minutely confirms my facts.

I am willing to adopt the derivation of *maress*, from *مرس* *maras* (or rather, for *مرس* is a collective plural, popularly used as a singular in the sense of cable, from *مرسه*, *marasah*), "rope," as preferable to my own from *ميراث*, *meerath* (pronounced by the natives *meerass*), "inheritance;" and this greatly confirms and strengthens the interpretation I have given of all the Scriptural allusions to "the lot" and "the rope."

The reference in Deuteronomy xix. 14, Proverbs xxii. 28, and Proverbs xxiii. 10, to "ancient land marks," may as reasonably be referred to the boundaries of tribal and family inheritances—of which our parish boundaries are probably the modern survival—as to individual holdings in severalty. Clearly no conclusive argument can be established either way on these passages.

The words of Proverbs xxiii. 10, "and into the fields of orphans (*וּבְשָׂדֵי יְתוּמִים*, *oovisdaiy* (plural construct of *sadeh*) *yethoameem*) enter thou not"—by the term *sadeh* my critic admits that the unenclosed arable land is meant—are plainly the figure of synecdoche, either that form of it to which I have alluded on page 4 of my paper, by which *sadeh* stands for land generally, *i.e.*, the part put for the whole, or else that form which consists of the very opposite, the whole put for the part, by which "the *sadehs* of orphans" signifies that portion of the *sadeh* to which they are entitled in the annual allotment. The exceedingly figurative

nature of Bible language, as on its human side that of a purely Eastern book, is even more overlooked than its curious allusions to Eastern manners and customs; for while we have a number of really valuable works on the latter subject, it is deeply to be deplored that we have not even one of a thorough or exhaustive kind in our own, or, I believe, in any other modern tongue, on the former!

This question is not in any way affected by an extraordinary fallow having been appointed for Israel every seventh year, for, whether or no they farmed during the intermediate six years by a rotation of crops, the land would have constantly to lie fallow for short intervals, and would need, as it does now, to be cleaned and manured, year by year, by feeding the cattle over it when in stubble. And, seeing that Israel came up out of Egypt, as they went down into it, a nation of shepherds rather than farmers, the question of pasturage for their vast flocks and herds must have been much more important to them than to the modern *fellahheen* of Palestine, who are farmers rather than shepherds. Equally, too, with the *fellahheen* of to-day, they would be influenced, at their first settlement amid the unexterminated nations of Canaan, and for long years after, by considerations as to mutual protection.

The fact that "all arable land is not now 'undistributed' in Palestine" is explained by Mr. Samuel Bergheim's observations on my paper as to the ceaseless and determined efforts of the Turks, the ruling power, to bring about a holding in severalty, with a view to facilitate the collection of taxes.

But another far more important fact, equally true, that all arable land—even that small portion which in recent times, often by force and fraud, has been wrested from the Village-Communities, and has passed into holding in severalty—is still everywhere open and unenclosed, is the strongest possible argument against this latter mode of tenure being ancient. No remains, nor the faintest traces of remains, are anywhere to be found of walls, ditches, hedges, or fences of any kind separating the *sadehs* of Palestine into fields or farms, which are always to be found where land has been long and legally held in severalty. The utter absence of any such divisions of the *sadehs* witnesses to the common rights of pasture over all the plough land during seasons of fallow, and such common rights of pasture over plough land are only practicable or possible where there are common rights of tillage under the joint husbandry of Village-Communities.

My critic practically grants all that I have mainly endeavoured



to prove, namely, that, however it came about, the ancient tenure of land in Israel, as in all the other nations of that time, was a holding of the *sadeh*, or "broad acres," in common, with a periodical, probably annual, reallotment amongst the commoners, for my critic says, "In short, I am disposed to regard the *fellahh* custom of working in common the 'undistributed' princely or crown lands (*ardh miri*), as a survival like many others of aboriginal custom not abolished by Israel, because the Mosaic Laws were but imperfectly carried out."

The only point, therefore, at issue between us is the construction to be put upon the Law of Moses, as it relates to the tenure of tillage.

This Law was unquestionably given to a people who had never seen or heard of any other tenure of the *sadeh* by the mass of men than that of the holding in common by Village-Communities. My critic appears to admit this. For them, as an Eastern people, custom would have possessed an inexorable power. How, then, on the face of it, is it possible that, if, as my critic maintains, the Law made suddenly for the first time in the experience of mankind so radical a change (and one that has only come about even in later times, and amongst Western nations given to change, very slowly) as that from the holding by tribes and families in common to the holding by individuals in severalty, so little, *so very little*, should be said in that Law on this subject at all, and that little, from a legal stand-point, of the most vague and general character? So sweeping, startling, and tremendous a change would, naturally, call for minute, explicit, and (from the general style of the Mosaic Law) repeated statements. Yet my critic can find *only one* very brief, vague, general provision bearing directly on this subject in the whole Law; as I shall presently show, namely, Numbers xxvi. 52-54, and three allusions to it, Numbers xxxvi. 8; Joshua xv. 16-19; and xvii. 5, 6!

Again, my critic appears to admit—and who can doubt?—the frequent allusion to this custom of periodically assigning each man's portion of land by "the lot" and "the rope," in the language of Hebrew prophets employing illustrations for a Hebrew people. What other conclusion can be drawn from the use of this figure—giving as they always do the most familiar imagery in order to be understood by that primitive, untravelled people, Israel, who were forbidden intercourse with other nations—by David\* and other Psalmists,† by Solomon,‡ by the author of

\* Psalm xvi. 5, 6.

† Psalm lxxviii. 55.

‡ Proverbs i. 14.

Chronicles,\* by Isaiah,† by Amos,‡ by Micah,§ and even by Moses himself,|| than that this periodical redistribution of the lands of each Village-Community was practised by those for whom they wrote, and that it was a lawful and proper practice?

I am willing to rest the whole case on the cogency of these last two considerations.

Of the eight passages which my critic quotes from the Old Testament, Numbers xxvi. 52-54; Numbers xxxvi. 8; Deuteronomy xxi. 17; 1 Chronicles v. 1; Joshua xvii. 5, 6; xv. 16-19; 1 Samuel viii. 14; and 1 Kings xxi., only four have any direct bearing on the question of the nature of the tenure of tillage.

The story in 1 Kings xxi. does not refer to a *sadeh* at all, but to a *vineyard* (בֵּיתֶיךָ), always enclosed by a *jedar*, or unmortared wall of loose rough stones, and, like a garden or a house, as I have shown in my paper, doubtless held formerly, as now, in severalty.

The warning given by the prophet in 1 Samuel viii. 14, as to the king, "And your *sadehs* . . . the best he will take and give to his servants," may as well be applied to the appropriation of lands belonging to a Village-Community as to lands in individual holding, and settles nothing either way. The king's "servants" to whom the lands would be given may equally have been the heads of clans or families who would hold the lands in common.

Deuteronomy xxi. 16, 17, is just as indefinite, for there a man is simply said to "make his sons inherit that which he hath," and commanded to give his first-born, even though by a wife he hates, "a double portion of all that he hath," without specifying whether real or personal property is meant; and, if real property, then, I maintain, the inheritance consisted of his freehold house, garden, vineyard, olive orchard, fig orchard, or trees, standing on the lands of others, and, lastly, his right to plough his share of the annually allotted common *sadeh*.

In 1 Chronicles v. 1, the writer speaks only of tribal inheritance.

My critic says, "according to Mosaic laws, there were no Crown lands at all. 'The land is mine,' Leviticus xxv. 23." But Israel was at first a theocracy. Jehovah was their King. *Agreeing with this, the royal due of Crown land (ard amiriyeh), the tithe, was commanded to be paid to Him.* The words, "the land is mine," together with the claim of the tithe, tell strongly against the absolute holding by individuals in severalty, and as strongly in

\* 1 Chronicles xvi. 18. † Isaiah xxxiv. 17. ‡ Amos vii. 17.  
§ Micah ii. 4, 5. || Deuteronomy xxxii. 9.

favour of the holding in common of Crown lands, Jehovah Himself being the king, and taking the place and privileges of an earthly Eastern sovereign.

And now a word as to the relevant passages. In Numbers xxxvi. 8, we read "Every daughter that possesses an inheritance in any tribe of the children of Israel shall be wife to one of a family of the tribe of her father." This certainly may refer to the possession of an inheritance in a *sadeh*. But what is the *nature* of the inheritance? I hold it to be simply a right to till a shifting annually-allotted portion of the lands of her father's Village-Community, and not a freehold in severalty. There is nothing in the verse my critic quotes to decide either way. But there *is* in the verse immediately preceding, which gives the reason for the enactment, "For every one of the children of Israel shall keep himself to the inheritance *of the tribe of his fathers*." It is more the *tribal* or *family* inheritance than the individual inheritance that is kept before us all through the Old Testament; and the holding in common by the various tribal communities throws a new and vivid light on this peculiar feature of Bible life.

And this disposes of the allusion in Joshua xvii. 5, 6, which, like all the rest of the provisions in this chapter, was distinctly tribal. The chapter begins, "And there was a lot for *the tribe* of Manasseh . . . for Machir, the first-born of Manasseh . . . and he had Gilead and Bashan. . . . There was also [a lot] for the rest of the children of Manasseh *by their families*" (Joshua, xvii. 1, 2).

It also disposes of Joshua xv. 16-19, where Caleb's daughter Achsah, on being given in marriage to his nephew Othniel, first moved her husband to ask her father for a *sadeh*, and afterwards for the upper and lower springs, presumably in its immediate neighbourhood. This occurs in an account of "the lot of *the tribe* of the children of Judah *by their families*" (Joshua xv. 1). Here Caleb, who must have been at that time the venerable head of a large clan of Judah, is said to receive the city of Hebron, apparently with all its dependencies for miles around, for we find him sending out an expedition to conquer Debir (*El Dhoheriyeh*) some twelve miles away. He then gives a *sadeh*—to which, of course, would be attached the possession of the town or village to which it belonged—to his nephew Othniel, also presumably a chieftain, for the Village-Community consisting of his family and followers. The very fact of the gift of the "springs" (גְּלוּלוֹת, *goolloath*; some would render this word "reservoirs," and others "reservoirs fed by

springs") added as a "blessing" (v. 19), points unmistakably to this, for no one knows better than my critic the inestimable value of even a *single* Palestine spring, and how unlikely it is that more springs than one, both on the upper and lower ground, would be given to one man in his separate holding! But nothing is more natural than to suppose that these springs, *four at least*, were sought and given to be enjoyed in common by Othniel and Achsah's Village-Community. This equally explains the gift of Hebron to Caleb in Joshua xiv. 6-15, and of Timnath-Serah to Joshua in Joshua xix. 49, 50.

And now, finally, as to the one and only distinct reference to *sadeh* tenure under the law. This one passage consists of five short verses in all (Numbers xxvi. 53-56), of which we have a brief repetition, still more in favour of the view I take, in Numbers xxxiii. 54. Concerning this passage my critic says first, "I think that, according to the Law of Moses, it was intended that *every man* was to receive an inheritance." But when giving the passage quoted in support of this opinion, my critic immediately limits "every man" to "individuals of full age (20 years, see verses 4 and 51), stated in verse 51 to be 601,730." This excludes all men under 20 years of age. But the number of the men who were to inherit, if the 601,730 were all, is still further limited, as will be seen from verse 2. There it is said, "Take the sum of all the congregation of the children of Israel, from 20 years old and upwards, throughout their father's house, *all that are able to go to war in Israel.*" And, in verse 4, this is said to be done "from 20 years old and upwards; *as the Lord commanded Moses.*" The command here referred to is given in Numbers i. 1: "And Jehovah spake unto Moses . . . Take ye the sum of all the congregation of the children of Israel . . . from 20 years old and upward *all that are able to go forth to war in Israel.*" From this it is clear that only able-bodied warriors over 20 years of age were numbered—the host, or army. In the East men marry early, even from 12 years of age, and the astonishing increase of Israel in Egypt seems absolutely to require this explanation. There must have been, therefore, at their entrance into Canaan a very large number of men with small families between the ages, say, of 16 and 20, and surely, some at least—and those princes and heads of houses—infirm by reason of age, for though, it is true, none, except Joshua and Caleb, were then above 60, many must have been about that age. All these, if my critic's hypothesis is true, received no inheritance at all, and, if we agree with the first

statement, that by the Law of Moses "*every man* was to receive an inheritance," we are shut up to the conclusion that the 601,730, if indeed the country was distributed amongst these only, must have been given the lands of their respective districts, not as their own private *Se, mullk*, or freehold, property, but to be held in common by all their "family," or clan.

My critic reads Numbers xxvi. as directing allotment "1st to Tribes, and 2ndly to Families, *משפחות* . . . but also 3rdly, to Individuals." But where is there a hint as to such a threefold division? The only verses in this chapter that direct allotment at all are as follows: "Unto these the land shall be divided for an inheritance, according to the number of names. To many thou shalt give his inheritance much and to few thou shalt give his inheritance little; to every one shall his inheritance be given according to those that were numbered of him. Only the land shall be divided by lot; according to the names of the tribes of their fathers they shall inherit. According to the lot shall the possession thereof be divided between many and few" (Numbers xxvi. 53-56). And this is the only enactment in the whole Law on the subject, repeated, as I have said, once very briefly in Numbers xxxiii. 54. My critic inserts the words "him who is" twice in verse 54, making it read, by a rendering slightly different from, but in virtual agreement with, mine: "To [him who is] many shall thou increase his inheritance; to [him who is] few thou shalt diminish his inheritance."

I admit that these words may be thus understood by the figure of ellipsis. But if they apply to the allotment to 601,730 individuals, what becomes of the allotment to "Tribes" and "Families," for which there is then no command in this passage or anywhere else? If, on the other hand, "[him who is] many" and "[him who is] few" stand respectively for "the family, or clan, which is many," and "the family, or clan, which is few"—the "him" understood, though not expressed, being a form of metonymy by which the head is put for his house or the chieftain is put for his clan—then all is rendered clear and consistent.

For when we turn to the detailed account of the carrying out of this enactment, given in Joshua xiv-xxi—the *only* account we have of any allotment at all, an allotment, too, which is expressly said to be that which "Jehovah commanded by the hand of Moses" (Joshua xiv. 2, 5)—we find that it is spoken of throughout as an allotment of considerable districts to "Tribes" and "Families" *only*, and not in any sense as an allotment of small freeholds

in severalty to individuals. The account of the allotment in Joshua xv. 1, opens with the words, "And the lot of *the tribe* of the children of Judah by *their families* was to the border of Edom, &c." Then follow the tribal borders, from verses 1-12, and, as soon as these are described, we read, "and this is the border of Judah round about according to *their families*." First Caleb is said to receive the large district of Hebron and its dependent villages, even, as we have seen, to 12 miles away at Debir, an enormous tract of country, which he must have received for his clan and not for himself alone; and in verse 20 the "family" division in general for the tribe of Judah is introduced by the words, "this is the inheritance of *the tribe* of the children of Judah according to *their families*," and a list, not of individual holdings but of cities and villages, follows in verses 21-61. In the next chapter, Joshua xvi., it is the same. Verse 5 commences an account of the tribal boundaries of "the children of Ephraim according to their families," and verse 9 alludes to the separate cities for their families without particularising them. Joshua xvii. speaks in just the same way about the distribution of land to Manasseh. Then, after a short digression, at Joshua xviii. 11, the account of the allotment of the rest of the country amongst the seven remaining tribes is given in like manner, the tribal boundaries first and the cities allotted to families next, but not a hint anywhere of allotment to individuals. The "Tribe" and the "Family" alone come into view, yet this long description of the distribution of the Promised Land closes with the words, "and Jehovah gave unto Israel all the land which he sware to give unto their fathers; and they possessed it and dwelt therein" (Joshua xxi. 43). The discovery of the holding of land in common by Village-Communities, consisting of families or clans, for the first time, throws a flood of light which quite clears up the hitherto apparently defective and inexplicable account of the allotment of the land in the days of Joshua.

## ORDINARY MEETING.

THE PRESIDENT, SIR G. GABRIEL STOKES, BART., M.P., P.R.S.,  
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

**MEMBERS** :—Rev. S. W. Beard, United States ; J. Croston, Esq., F.G.S., Ry. Engineer, Manchester ; J. G. Pochin, Esq., F.R.M.S., F.S.Sc., F.G., President of the Midland Soc. of Nat. Sci. and Lit., Sheffield ; J. W. Teale, Esq., F.G.S., Northallerton ; Severus Watson, Esq., M.A., Ph.D., A.N.S., Curator of Harvard Herbarium, United States.

**LIFE ASSOCIATE** :—Rev. Prof. J. de Witt, D.D., United States.

**ASSOCIATES** :—Rev. J. Barnier, LL.D., Ireland ; Melville M. Bigelow, Ph.D., Jurist, United States ; W. D. Crudass, Esq., Newcastle ; C. H. Hooper, Esq., Stonehouse ; Rev. Professor D. C. Marquis, D.D., United States ; E. Quaile, Esq., Birkenhead ; Rev. J. S. Thompson, West Indies ; Rev. C. D. Williams, M.A., Ch.Ch., Oxon., Middlesex.

At this meeting (6th Jan., 1890) part of the next paper was then read by the Author.

## ORDINARY MEETING.\*

H. CADMAN JONES, ESQ., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

ASSOCIATES :—Major John Bridge, F.R.G.S., F.R.H.S., Isle of Wight ;  
Rev. F. Baylis, M.A., Manchester.

The following paper was then read by the Author :—

*THE BOTANY AND ENTOMOLOGY OF ICELAND.*†

By Rev. F. A. WALKER, D.D., F.L.S., &amp;c.

PART I.—*Botany of Iceland.*

According to information kindly afforded me by Mr. Bennett, the flora of Iceland is a comparatively scanty one for an island somewhat larger than Ireland, and may now be stated at about 428 species. Of these the only true Arctic plants are *Arenaria arctica*, *Epilobium latifolium*, *L.*, *Gentiana detonsa*, *Pleurogyne rotata*, *Salix arctica*, *Platanthera hyperborea*, and perhaps a few others. Two of the above-named Arctic plants, at any rate, namely, *Epilobium latifolium* and *Platanthera hyperborea*, were observed and gathered by me during my short visit. Of the 680 species found in Greenland, Iceland, and the Faroes, Iceland has about 390, the Faroes 310, Scandinavia 570, Nova Zembla 127, Spitzbergen 116, Arctic N. America and Labrador 310. Of the 428 Icelandic species, about 55 are not known to inhabit Great Britain, 165 are not recorded from Greenland. I have been likewise given to understand that a characteristic feature of the Icelandic flora is the large number of doubtfully recorded species (these are not reckoned above), and without actual specimens it is impossible to admit many of them, from their geographical distribution elsewhere being against the likelihood of their occurring. These may be numbered at about

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\* 17th February, 1890.

† This is the first paper upon the Entomology of Iceland which has been written since the advances of science in late years have required a fresh treatment of the subject.—ED.



150 species, that in one or the other of the published works have been recorded as Icelandic from König and Muller in 1770 to the present time. The first record of an Icelandic plant seems to be in 1597 in *Gerarde's Herball*, p. 847, where *Archangelica officinalis* is recorded as from Iceland. This seems to be before any Icelandic record; the earliest of these seems to be in 1676 (*vide* Frideriksson in Copenhagen, Botanical Society's publications) in *Præsterne Jón Dadàson's Laigbsgen*, 1676.

The two most reliable lists of Icelandic plants are Professor Babington's "Revision of the Flora of Iceland" in the journal of the Linnean Society, and Groenlund's "Islands Flora" (1881) Copenhagen.

The latest knowledge of the flora is to be found in the publications of the Copenhagen Botanical Society.

There is no full published list of all the works known to relate to the botany of Iceland; the Icelandic capital, the Advocate's Library at Edinburgh, British Museum, and library of the Museum at Copenhagen, are the richest in books. The island of Jan Mayen to the north of Iceland has only 27 flowering plants known from it.

The coast of Greenland opposite Iceland is very barren, and plant life very scarce; taking the part opposite Iceland, and calling it mid-east Greenland, only 113 flowering plants are recorded (while on the opposite east coast 262 are named), the north part of east Greenland has only 100 plants recorded, while the southern portion has 160. Another list of species from Nova Zembla, Spitzbergen, and the Faroe Isles differs slightly in excess of that recorded above, and is as follows:—

Nova Zembla	has	131	species.
Spitzbergen	"	118	"
The Faroe Isles	"	328	"

How do the statistics of 428 species, being all that are certainly known to occur in Iceland, agree with the number of plants recorded by other travellers? At the end of Baring Gould's book, no fewer than 477 kinds are mentioned, and Sir William Hooker, if I recollect rightly, is the authority for many of the names, while in Paijkull's work are enumerated 413. Personally, I have not sufficient knowledge for determining whether all Baring Gould's and Paijkull's species are ascertained beyond the possibility of doubt or mistake. As the principal object on the part of Staudinger in 1856, as well as of myself last year, was the study of the entomology of

the country, it will readily be understood that his list of the island flora is a comparatively short one, and my own also. His consists of 76 kinds, and mine, on the most moderate computation, of 82. The only facts probably that I have been able to add to the existing knowledge of Icelandic botany are as follows:—

(1.) The discovery of *Daucus carota*, *L.*, small form new to Iceland, and a considerable extension of its northern limit in Europe *just* known from Norway, N. Sweden, Finland, or N. Russia. Judging by the specimen, it is evidently wild (*i.e.*, indigenous), as the plant has not the look or habit of a cultivated species.

(2.) I gathered the second specimen of *Orchis latifolia* found in Iceland, and the first is said to be only doubtfully recorded.

A large proportion of Icelandic plants, and some of them both very common and generally distributed, are either alpine, moor, or marsh species, these being the three prevailing features of the country. For example—

<i>Alpine</i> , as	<i>Moor</i> , as
Erigeron alpinum.	Vaccinium uliginosum.
Saxifraga hypnoides.	Parnassia palustris.
"    stellaris.	Dryas octopetala.
"    aizoides.	Thymus serpyllum.
Gentiana nivalis.	
"    canpestris.	
	Or, <i>Marsh</i> , as
	Pinguicula vulgaris.
	Eriophorus Scheuchzeri.
	"    angustifolium.
	Menyanthes trifoliata.
	Caltha en-palustris.

As instances of plants generally distributed in Iceland may be mentioned—

Armeria maritima.	Silene acaulis.
Dryas octopetala.	Pinguicula vulgaris.
Cerastium alpinum	Thymus serpyllum.

Of plants very plentiful in certain places, as between Thingvellir and the Geysir—

Lychnis alpina.	Platanthera hyperborea.
Geranium sylvestre.	Orchis maculata.

Of plants very plentiful in S.W. of Iceland particularly—

Ranunculus glacialis.	Matricaria inodora.
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Of plants that flourish in closest proximity to the hot springs and steam of the Geysir—

*Thymus serpyllum.*

*Parnassia palustris.*

The flowers seemed to be somewhat later at Thingvellir than Reykjavik, as, for example, *Silene acaulis* was still in full bloom at the former place when almost over at the latter. To an English botanist, the first thing that strikes one is not the number of Arctic species, but the great abundance of plants that are very rare and local in Britain, as *Saxifraga cæspitosa*, *Lychnis alpina*, *Erigeron alpinum*, &c.

Mr. Jön Thoroddsen, resident at Reykjavik, possesses a very fine collection of Icelandic dried plants, and his knowledge of this branch of natural history is only second to, if, indeed, it is not equal to, his acquaintance with the geology of his native land, as acquired by arduous travel and repeated surveys of deserts of lava and of ice.

It is much to be desired that English tourists would gather specimens of plants, especially in out-of-the-way districts; naturally, the Danish travellers do much, but still we ought to keep up the example set by Banks and Solander in 1772, whose plants are now at the British Museum. With respect to the warm springs and vegetation, Thoroddsen records finding *Hydrocotyle vulgaris*, *L.*, in a warm spring at Laugarvatn by Andakilsá, the temperature of which was 48° cent., and *Ophioglossum vulgatum* at Gunnutiver by Reykjanes, among sand at 27° cent. Dr. Lindsay, in 1860, estimated the temperature of some springs at Langanes at 180° Fahr., and in this he found two algæ growing profusely where it must have been at least 130°. This is confirmed by Dr. Hooker in his Himalayan journals, where he records finding flowering plants growing with their roots in water of 100°, and a conferva in springs of 112°, and in others of 169°, near Burdran, Behar, India. While on this subject, I may take the opportunity of mentioning that the flower stems of *Prunella vulgaris* (our common English Self-heal) are remarkable for their size and luxuriance on the brink of the hot springs at Laug, two miles distant from the capital, and where all the laundry work of Reykjavik is performed. The island is without trees of any height, but birch woods, or what are so called (for what is known as the Icelandic forest might more appropriately be denominated birch and willow scrub) occur in some places. Horrebon states that the wood in Frujoskadalsr is 4½ miles long and ½ a mile wide at about the middle of the eighteenth century. Gliemann states that

in 1824 only stumps remained. Sir G. S. Mackenzie passed in 1810 through a wood of birch trees, 6-10 feet high, by the kirk of Bogarfjord. And Henderson, in 1814-15, saw numerous forests of birch by the Lagarfjot. Mr. E. Magnusson informed Professor Babington that the wood at Frujoskadalr has now renewed itself to some extent, and with ordinary care may again become a valuable forest. My own experience is that the birch and willow bushes in the neighbourhood of Thingvellir, and during the first part of the ride to the Geysir, average from 3 to 4 feet in height, and further on, when covering the hill slopes on either side of the Bruará river, attain the larger dimensions of 6 feet. From what I have read in the works of other travellers, I should incline to the belief that the largest woods in the country, in extent as well as in the size of their trees, are situate in the vicinity of the south coast, though I have not visited those spots, not far from where the Markarfjot and other rivers form a regular network of estuaries as they discharge themselves into the Southern Sea.

I am also informed that as yet no great number of observations are recorded on the height attained by Icelandic plants. On the top of Heidarfjall, near 2,480 feet high, 7 species are found. Lieutenant Caroc and Professor Johnstruss find 22 species in the neighbourhood of Asteja, at the height of 4,500 feet. At a height of about 1,660 feet in Dalfjall, 24 species were found, and only 3 of them were other than might be found in Scotland at a similar altitude, as *Draba nivalis*, *Betula alpestris*, and *Salix glauca*.

I here venture to subjoin an ideal sketch of some of the objects of interest to the botanist on his arrival in Iceland. On landing at Reykjavik, he will probably find his attention first directed to the profuse abundance and luxuriant growth of *Ranunculus acris*. The plants of this species (if indeed it is *R. acris* and not *glacialis* to which I refer) here attain a size fully as large as, or larger than it ordinarily reaches in England. And in all likelihood, the yellowed appearance of the hill-sides in the neighbourhood of the capital owing to this cause will have attracted his notice even previous to his leaving the steamer in Reykjavik Bay. Side by side with this *Ranunculus*, on the sloping turf roofs of the dwellings in the outskirts, in the public square containing the statue of Thorwaldsen, in the carefully manured home fields, or "tun" as they are termed, occurs the no less showy species "*Matricaria inodora*" with a flower resembling that of the Ox-eye Daisy, and a leaf like that of the fennel, which the Icelanders

have christened by the poetical appellation of "Baldursbra," or "brow of the god Baldur," after that youthful and beautiful deity of the Scandinavian mythology.

Our traveller will doubtless take an early opportunity of visiting that eminently peaceful scene, the cemetery of Reykjavik, situate above the clear lake, and in the most unbroken stillness, as there is no wheeled vehicle in Iceland; where rests the late Dr. Jon Hjaltalin, that eminent physician of European reputation. When there he will not fail to gather the pretty little *Erigeron alpinum* (alpine flea-bane), not unlike a small Michaelmas daisy, except that its outer petals are somewhat pinker, and growing plentifully on the grassy mounds, although so rare and local a denizen of the Breadalbane hills with ourselves. After inspecting this last resting-place of the departed, and observing the *Angelica Islandica* in the little garden plots on the road thither (differing from our own wild *angelica* in having green instead of white blossoms, but like it, used for confectionary, a native of the Iceland mountains, but only seen by me as indeed by most travellers in a state of cultivation) he may turn his steps to the right, across Vatnsmyri moor, where numerous patches of the white bells of *Silene maritima* shake and quiver on the bare ground of its wind-swept expanse. And on advancing further in the direction of Vesturgata, or West Street, and the sea-shore, he will make his first acquaintance with *Eriophorum Scheuchzeri*, the arctic species of cotton grass that lends a snowy appearance to that boggy portion of the moor over which it abounds. In the open air it is, to all appearance, as snowy-white as any British species, but when gathered and brought home, it will be found to be of a yellower tint, as is perfectly evident to any one who takes the trouble to compare them side by side. On arriving at the beach, he cannot fail to admire the rosy buds and blue flowrets that deck the tendrils of *Mertensia maritima*, as it straggles across the shingle, where also he will find *Cakile maritima*, but more sparingly, as less qualified by nature to stand a cold climate, and at the eastern end of a small lake that stretches parallel with the shore, the upright shoots of *Hippuris vulgaris*. If, on the other hand, he bend his steps to the sloping meadows that skirt the other little lake, or "cjorn," in the rear of the cathedral, he will find several of the maroon-coloured blossoms of *Potentilla comarum*, the species of sedge known as *Carex erytocarpa*, and likewise *Caltha eupalustris*, which last-named plant fringes the watercourses

near their point of confluence with the lake. The hot springs of Laug above mentioned will next claim a visit, and in his progress thither, as well as in the neighbourhood of the observatory, he will note for the first time many of the alpine plants that will shortly greet him along most, if not all of his ride, successively to Thingvellir and the Geysir, such as *Dryas octopetala*, that bears such a close superficial resemblance to our own wood anemone. *Cerastium alpinum*, *Silene acaulis*, *Armeria maritima*, *Pinguicula vulgaris*, and *Viola canina*, this last of unusually large size, but in the midst of all his observations, he will do well to make a cautious as well as wide stride, as he steps from one hillock to another, to avoid the soft and treacherous chalybeate mud, as "experto crede," it is particularly bad walking and tiring work to cover the distance intervening between the springs of Laug and the new road above.

Should the traveller's visit to Thingvellir take place in the middle of July, the first tiny blue stars of *Gentiana nivalis* will welcome him on his walk from the parsonage, in the direction of the historic Lögberg, or "Hill of Laws," all the more grateful because the last part of his 35 miles ride thither from the capital has been over the desolate extent of the weary Mossfell moor, for on that elevated plateau, or "heithi," as commonly termed in Icelandic, there are plenty of bare hillocks of indurated earth for one's pony to stumble over, but flowers are few and far between. This is not, however, the case with every "heithi;" the prevalence or absence of flowers will, of course, largely depend on the amount of elevation and exposure of the particular plateau, the time of year, and the nature of the soil. When I visited the stretch of moor, during the first week of August, above the cliffs of Saudarkrok and those of Akureyri in the north of Iceland, I found it completely covered with the feathery seed-vessels of *Dryas octopetala*, showing what a garden of wild flowers must have decorated that windy region only two or three weeks before. The following is Baring Gould's definition of a 'heithi,' p. 63, of his Iceland:—"High land which can be traversed by horses is called a "heithi." It is either without vegetation, or covered with moss, lichen, *Dryas octopetala*, and *Silene acaulis*."

To resume, *Menyanthes trifoliata* will be hailed as an old English acquaintance covering the pools and boggy ground to the N. of Thingvalla lake, *Eriophorum angustifolium*, with its three or four fluffy tassels will be found also in the direction of the Lögberg, and along with, though much

rarer than its Icelandic congener, *E. Scheuchzeri* above mentioned. There, too, a guide, who was awaiting the arrival of an English gentleman from the north, pointed me out some young plants of the celebrated Iceland moss, and I afterwards found others for myself, but not many, however, and it may have been somewhat early in the season for its full development. As the naturalist descends the deep declivity of the Allmanagga, he will observe another well-known friend, namely, *Geum rivale*, flourishing in its rocky clefts; and as he proceeds along his route to the Geysir he may dismount to gather other lovely flowers, as *Geranium sylvaticum*, and *Orchis maculata*, on the damp banks beneath the birch and willow scrub. He will carefully treasure *Epilobium alsinifolium* and *palustre* as well as *Platanthera hyperborea*, as a souvenir of the islands of moraine encircled by streamlets hard by, where the Skyrlandsá issues from its gloomy gorge. The last-named orchis (*Platanthera*) flourishes likewise in the grassy plain that has to be traversed just before reaching Geysir hill. While making this expedition he must also look out for that largest and loveliest of the willow herbs, *Epilobium montanum*. And as regards the flora of other districts of the island, *Galium boreale* and *sylvestre* will be discovered in the immediate vicinity of Hafnafjord; *Viola tricolor* is to be seen for the first time along the coast road that reaches from Akureyri to Oddeyri, and its shark oil factory. *Saxifraga cæspitosa* flourishes abundantly hard by the ravines of chalybeate soil which form the approach to Krisuvik. The novel appearance of *Poa alpina* *L. f. vivipara*, a truly arctic species of grass, will arrest the attention of the visitor to the banks adjacent to the shore at Reykafjord. And, to conclude, though not to complete, the present list, he will have a pleasurable recollection of Seydisfjord, Eskefjord, &c., on the Eastern coast, owing to the occurrence in these places of *Saxifraga hirculus*, *Oxyria digyna*, *Campanula rotundifolia*, *Gentiana campestris*, as well as its white variety, and many more.

#### LIST OF PLANTS OBTAINED IN ICELAND.

By the Rev. F. A. WALKER, D.D., F.L.S., in the Summer of 1889  
(with their Icelandic names where known).

1. *Thalictrum alpinum*, *L.*, Velindisurt, Krossgras, Júpomem Brjostagras Kverkagras.
2. *Ranunculus acris*, *L.*, Brennissóley.
3. *Arabis petræa*, *L.*, var. *hispida*, *D.C.*
4. *Cardamine pratensis*, *L.*, Engkarse Hlaupbladka Lambaklukka.

5. *Draba incana*, *L.*, Gæsablún.
6. *Cakile maritima*, *L.*, Strandbúi.
7. *Viola canina*, *L.*, Firsfjóra.
8. „ *sylvatica*, *Fr.*
9. „ *tricolor*, *L.*, Premsingargras.
10. *Silene maritima*. With Þúngagras Holurb Hjarlagras.
11. *Lychnis inflata*.
12. „ *alpina*, *L.*, Kveisngras AUGHFRÆ.
13. *Cerastium alpinum*, *L.*, Músareyra; but this is applied to all the genus generally.
14. *Sagina nodosa*, Fenyl.
15. *Spergula arvensis*, *L.*, Skurfa.
16. *Silene acaulis*, *L.*, Lambagras Holtarót.
17. *Montia fontana*, *L.*
18. *Geranium sylvaticum*, *L.*, Stakablágresi Blágresi Litunargras.
19. *Trifolium repens*, *L.*, Smári or Smæra.
20. *Dryas octopetala*, Rjupnalyng. Holtasóley Þétrssóley.
21. *Potentilla comarum*, Lugjarós Myvatág Blodsóley.
22. „ *maculata*, Pirur Gullmura.
23. „ *anserina*, *L.*, Mura Murusóley Murutágar.
24. *Geum rivale*, *L.*, Fjalldeila Solsteim Fjallaþfill.
25. *Alchemilla alpina*, *L.*, Ljónsfotr Ljónskló Kverkagras.
26. „ *fissa*, *Schun.*, v. *faroensis*, Lange
27. *Epilobium montanum*, *L.*, Eyrarós.
28. „ *lactiflorum*, *Hanschh.* ?
29. „ *palustre*, *L.*
30. „ *alsinefolium* vill ?
31. *Hippuris vulgaris*, Hesthali Marhálmr.
32. *Sedum villosum*, *L.*
33. *Saxifraga aizoides*, *L.* }  
 34. „ *hirculus*, *L.* }  
 35. „ *cæspitosa*, *L.* } Steinbijoti applied to all the species.  
 36. „ *hypnoides*, *L.* }  
 37. „ *stellaris*, *L.* }
38. *Parnassia palustris*, *L.*, Hvít Liparnit Myrasóley.
39. *Galium boreale*, *L.* }  
 40. „ *sylvestre* } Suerre Madra applied to all.  
 41. „ *verum*, *L.* } Gullmadra.
42. *Gnaphalium spinum*, *L.*
43. *Campanula rotundifolia*, *L.*, var. *arctica*, Lange Bláklukka to the usual form.
44. *Gentiana nivalis*, *L.*, Digragras.
45. „ *campestris*, Marinvöndr.
46. „ *amarella*, *L.*, applied to the genus.
47. *Nephrodium dilatatum* (prob. fragment of).
48. *Chlora perfoliata*, *L.*
49. *Erythræa centaurium*, *L.* } two plants likely introduced ?
50. *Bartsia alpina*, *L.*, Lokasjódsbródir.
51. *Rhinanthus minor*. *Reich.*, Lokasodr Pennigagras.
52. *Veronica alpina*, *L.*
53. „ *serpyllifolia*, *L.* } Abrnpais to the genus.  
 54. „ *Beccalunga*, *L.* } Vazargi.
55. *Matricaria inodora*, *L.* var. *phæcephala*, *Russ.*, Lugillos, Kamille Baldrsbrá.
56. *Erigeron alpinus*, *L.* Jakobsþfill or Smjörgras.



57. *Thymus serpyllum*, *L.*, var. *prostrata*. Hornem Blódsberg
58. *Prunella vulgaris*, *L.*, *Brúnella*, Blákolla.
59. *Myosotis arvensis*, *Roth.*, Kattaranja to all the genus.
60. *Mertensia maritima*, *Don.* Lungnajud.
61. *Pinguicula vulgaris*, *L.*, Lyfjagras.
62. *Plantago Coronopus*, *L.*
63. " *maritima*, *L.*, Kattartunga.
64. *Atriplex patula*, *L.* form.
65. *Polygonum aviculare*, *L.*, var., *litorale* oddvari or Blódarji to the usual state.
66. *Oxyria digyna*, *Camp.* Olafsúra.
67. *Salix herbacea*, *L.*, Grasvidir, or Kotungslauf.
68. " *glauca*, *L.*, v., *ovalifolia* ?
69. *Platanthera hyperborea*. Lindley, v. *minor* Hornberi, Lange.
70. *Orchis latifolia*, *L.*, f.
71. " *maculata*, *L.*, Brónugr, and five other names.
72. *Luzula campestris*, *D.C.*
73. *Eriophorum Scheuchzeri*, Hippe. } Fifa.
74. " *angustifolium*, *Roth.* }
75. *Carex rigida*, *Good.*
76. " *hyperborea*, *Dreyer.*
77. " *erytocarpa*, *C. A. Meyer.*
78. *Poa alpina*, *L.*, f., *vivipara*.
79. *Cystopteris fragilis*, *L.*
80. *Agrostis alba*, *L.*, Hvingras to all the species.
81. *Empetrum nigrum*, *L.*
82. *Daucus Carota*, *L.*, small form.

I did not come across the common daisy (*Bellis perennis*) in Iceland, as it is very local there, and is only known certainly from two stations in the island, namely, Eyjafjörður and Skagafjörður, although it must occur somewhere near Seydisfjörður, as Mr. Symington, in 1863, had specimens given to him by a native when staying there. The Icelandic names for wild plants are not always to be relied on; in Hjaltalin's "Islenzte grasfræði," 1830, many of the names are manifestly only translations of the Latin names, and Fridrikkson, in an excellent paper in Groenlund's "Islands Flora," (1881), takes him to task on some of his Icelandic names. Fridrikkson is a native Icelander, and his sister, Miss Thora Fridrikkson, has added several localities to the Icelandic Flora.

There are several interesting paragraphs in Baring-Gould's Iceland, relative to the botany of the island, and to which anyone desirous of further information on the subject is accordingly referred. These may be found on pp. 75, 102, 112, 113, 131, 179, 186, 190, 191, 214, 228, 241, 332, 344. Likewise in Paijkull's Iceland, pp. 159, 176. Burton, in his Ultima Thule, has also some interesting remarks about the Iceland moss (*Lichen Islandicus Cetraria Islandica*) as well

as the Archangelica Islandica (Icel. Hvorm), and their growth and uses. Page 176 of his book also contains an interesting record of how Iceland was once wooded, from the sea to the mountains, or inner plateau, in ancient days, and how the forests were destroyed by fire, as well as of the present aspect of its woods, and size attained by the trees. I have ventured to transcribe his list of native simples as not a lengthy one: "The simples collected for use are the Holta-rót (Silene acaulis or moss campion), the Alchemilla or Burnet, a Sanguisorb; the Geldinga-rot (Statice armeria), the speedwell (Veronica officinalis), and various gentians. The "ptarmigan-leaf" or mountain-avens. Dryas octopetala, the Holta-Sóley of older travellers, and the modern Rjupa-lyng) makes a tea good for jaundice; the root also is eaten. The half digested flowers of the blæberry (Vaccinium myrtilus) and the bog whortle (vaccinium uliginosum) are taken from the ptarmigan's crop to make ptisane. The reindeer moss (Cenomyce rangiferina) a small pale-green species with hollow stem, is gathered for sheep feeding. The wild geranium also produces blue tint, of old called Odin's dye.

LIST OF PLANTS noticed in Iceland by Dr. STAUDINGER in 1856 (76 kinds).

Vaccinium uliginosum.	Draba verna.
Silene acaulis.	Juniperus nana.
Caltha palustris.	Epilobium alpinum
Elymus arenarius.	"    origanifolium
Betula humilis.	"    latifolium.
— nana.	Thalictrum alpinum.
Salix arbuscula.	Geranium sylvaticum.
— herbacea.	Sedum acre.
Calluna vulgaris.	Rhodiola rosea.
Arbutus uva-ursi.	Epilobium palustre.
Empetrum nigrum.	Dryas octopetala.
Aralea procumbens.	Rubus saxatilis.
Eriophoron capitatum.	Fragaria vesca.
"    angustifolium.	Armeria maritima.
Comarum palustre.	Thymus serpyllum.
Geum rivale.	Menyanthes trifoliata.
Sanguisorba officinalis.	Cerastium.
Pinguicula communis.	Galium.
Viola canina.	Gentiana.
— palustris.	Parnassia palustris.
Myosotis sylvatica.	Plantago maritima.
Cardamine pratensis.	"    latifolia.
Leontodon Taraxacon.	Potentilla anserina.
Hieracium Schmidtii.	Trifolium repens.

Alchemilla vulgaris.	Andromeda hypnoides.
" alpina.	Kcenigia Islandica.
Angelica Archangelica.	Oxyria digyna.
" silvestris.	Rumex.
Viscaria alpina.	Polygonum viviparum.
Arenaria ciliata.	Anthoxanthum odoratum.
Arabis petræa.	Phleum pratense.
Achillea millefolia.	Poa alpina.
Gnaphalium Norvegicum.	Aira subspirata.
" supinum.	Festuca rubra.
Euphrasia officinalis.	Spiræa ulmaria.
Veronica saxatilis.	Ranunculus.
" officinalis.	Carex.
Pyrola minor.	Luzula.

## LIST OF ICELANDIC PLANTS (BARING-GOULD) (477 kinds).

<i>Dicotyledons.</i>	
<i>Ranunculaceæ.</i>	
Thalictrum alpinum.	Draba muricella.
Ranunculus aquatilis.	" aizoides.
" heterophyllus.	" rupestris.
" hederaceus.	Cakile maritima.
" glacialis.	Subularia aquatica.
" Flammula.	Capsella bursa.
" acris.	Lepidium campestre.
" repens.	
" polyanthemus.	<i>Violaceæ.</i>
" pygmæus.	Viola palustris.
" nivalis.	" canina.
" lapponicus.	" tricolor.
" hyperboreus.	" montana.
Caltha palustris.	
	<i>Droserææ.</i>
<i>Papaveraceæ.</i>	Drosera rotundifolia.
Papaver nudicaule.	" longifolia.
" alpinum.	Parnassia palustris.
	<i>Polygalaceæ.</i>
<i>Cruciferaæ.</i>	Polygala vulgaris.
Arabis alpina.	
" petræa.	<i>Caryophyllaceæ.</i>
" bellidifolia.	Silene acaulis.
" brassicæformis.	" inflata.
Cardamine pratensis.	" maritima.
" hirsuta.	" rupestris.
Nasturtium amphibium.	Lychnis flos-cuculi.
" terrestre.	" viscaria.
Cochlearia officinalis.	" alpina.
" danica.	Sagina procumbens.
" Anglica.	" saxatilis.
Draba verna.	" subulata.
" contorta.	" nodosa.
" confusa.	Spargula arvensis.
" muralis.	Arenaria verna.
	" peploides.
	" ciliata.

Arenaria, serpyllifolia.  
Stellaria media.

” crassifolia.  
” humifusa.

Cerastium vulgatum.

” viscosum.  
” alpinum.  
” latifolium.  
” trigynum.

Alsine biflora.

*Linaceæ.*

Linum catharticum.

*Hypericaceæ.*

Hypericum perforatum.

*Geraniaceæ.*

Geranium sylvaticum.

” pratense.  
” montanum.

*Leguminosæ.*

Anthyllis vulneraria.

Trifolium repens.

” pratense.  
” arvense.

Lotus corniculatus.

Vicia cracca.

Lathyrus pratensis.

” maritima.

*Rosaceæ.*

Spiræa ulmaria.

Geum rivale.

Dryas octopetala.

Rubus saxatilis.

Fragaria vesca.

Comarum palustre.

Potentilla anserina.

” argentea.

” verna.

” aurea.

” tormentilla.

” maculata.

Sibbaldia procumbens.

Alchemilla vulgaris.

” montana.

” alpina.

” arvensis.

Sanguisorba officinalis.

Rosa hibernica.

” camtschatica.

*Porneæ.*

Pyrus domestica.

Pyrus ancuparia.

*Onagraceæ.*

Chamænerium angustifolium.

Epilobium tetragonum.

” palustre.  
” montanum.  
” organifolium.  
” spicatum.  
” alpinum.  
” latifolium.  
” angustissimum.

*Holoragaceæ.*

Myriophyllum verticillatum.

” spicatum.

Hippuris vulgaris.

*Portulacaceæ.*

Montia fontana.

*Crassulaceæ.*

Sedum anglicum.

” album.  
” villosum.  
” annuum.  
” acre.  
” rupestre.  
” rhodiola.

*Saxifragaceæ.*

Saxifraga cotyledon.

” stellaris.  
” nivalis.  
” oppositifolia.  
” hirculus.  
” aizoides.  
” granulata.  
” cernua.  
” rivularis.  
” tridactylites.  
” hypnoides.  
” cœspitosa.  
” petræa.  
” geranoides.  
” bulbifera.  
” tricuspida.  
” autumnalis.  
” groenlandica.  
” cuneifolia.

*Umbelliferae.*

Hydrocotyle vulgaris.

Egopodium podagraria.

Carum carui.

Ligusticum Scoticum.

Angelica Archangelica.  
 „ sylvestris.  
 Imperatoria ostruthium.

*Araliaceæ.*

Hedera helix.

*Cornaceæ.*

Cornus succisa.

*Rubiaceæ.*

Galium verum.  
 „ saxatile.  
 „ pusillum.  
 „ palustre.  
 „ mollugo.  
 „ pumilum.  
 „ pallidum.  
 „ trifidum.  
 „ boreale.  
 „ aparine.

*Valerianaceæ.*

Valeriana officinalis.

*Dipsacaceæ.*

Succisa pratensis.  
 Cephalaria alpina.

*Compositæ.*

Crepis præmorsa.  
 Leontodon taraxacum.  
 „ autumnalis.  
 Hieracium pilosella.  
 „ auricula.  
 „ aurantiacum.  
 „ alpinum.  
 „ murorum.  
 Carduus acanthoides.  
 Crisium lanceolatum.  
 „ heterophyllum  
 „ arvense.  
 Tanacetum vulgare.  
 Gnaphalium sylvaticum.  
 „ uliginosum.  
 „ supinum.  
 „ Norvegicum.  
 „ dioicum.  
 „ carpathicum.  
 Tussilago farfara.  
 Erigeron alpinus.  
 Senecio Jacobæa.  
 „ vulgaris.  
 „ sylvaticus.

Anthemis cotula.  
 Achillea millefolium.

*Campanulaceæ.*

Campanula patula.  
 „ rotundifolia.

*Vacciniaceæ.*

Vaccinium myrtillus.  
 „ uliginosum.  
 „ vitis-idaea.  
 „ oxycoccos.

*Ericaceæ.*

Erica tetralix.  
 Calluna vulgaris.  
 Cassiopea hypurides.  
 Azalea procumbens.  
 Arctostaphylos alpina.  
 Rhododendron Lapponicum  
 Sedum latifolium.

*Pyrolaceæ.*

Pyrola rotundifolia.  
 „ secunda.  
 „ minor.

*Gentianaceæ.*

Gentiana pneumonanthe.  
 „ autumnalis.  
 „ verna.  
 „ quinquefolia.  
 „ ciliata.  
 „ detonsa.  
 „ bavarica.  
 „ involucrata.  
 „ tenella.  
 „ amarella.  
 „ campestris.  
 „ serrata.  
 Swertia rotata.  
 Menyanthes trifoliata.

*Polemoniaceæ.*

Diapensia Lapponica.

*Boraginaceæ.*

Echium vulgare.  
 Mertensia maritima.  
 Myosotis palustris.  
 „ arvensis.  
 „ collina.  
 „ versicolor.

*Scrophulariaceæ.*  
 Veronica spirata.  
 " serpyllifolia.  
 " alpina.  
 " saxatilis.  
 " fruticulosa.  
 " scutellata.  
 " anagallis.  
 " beccabunga.  
 " officinalis.  
 " marylandica.  
 Bartsia alpina.  
 Euphrasia officinalis.  
 Rhinanthus crista-galli.  
 " angustifolius.  
 Pedicularis palustris.  
 " sylvatica.  
 " versicolor.  
 Limosella aquatica.

*Labiatae.*  
 Thymus serpyllum.  
 Galeopsis ladanum.  
 " tetrahit.  
 Lamium album.  
 " purpureum.  
 Stachys sylvatica.  
 Prunella vulgaris.  
 " officinalis.

*Lentilulariaceæ.*  
 Pinguicula vulgaris.  
 " alpina.

*Primulaceæ.*  
 Primula Farinosa.  
 Glaux maritima.  
 Trientalis Europæa.

*Plumbiferæ.*  
 Statice elongata.  
 " maritima.

*Plantaginaceæ.*  
 Plantago major.  
 " media.  
 " lanceolata.  
 " maritima.  
 " alpina.  
 " coronopus.

*Chenopodiaceæ.*  
 Chenopodium album.  
 Atriplex laciniata.  
 " patula.

*Scleranthaceæ.*  
 Scleranthus annuus.  
*Polygonaceæ.*  
 Kcenigia islandica.  
 Polygonum viviparum.  
 " bistorta.  
 " aviculare.  
 " convolvulus.  
 " amphibium.  
 " persicarium.  
 " hydropiper.  
 Rumex aquaticus.  
 " patientia.  
 " acetosa.  
 " acetosella.  
 Oxyria reniformis.

*Callitrichaceæ.*  
 Callitriche verna.  
 " autumnalis.

*Ceratophyllaceæ.*  
 Ceratophyllum demersum.

*Urticæ.*  
 Urtica urens.  
 " dioica.

*Betulaceæ.*  
 Betula alba.  
 " nana.  
 " fruticosa.

*Salicaceæ.*  
 Salix purpurea.  
 " pentandra.  
 " fusca.  
 " ambigua.  
 " reticulata.  
 " myrtilloides.  
 " lapponum.  
 " wulfeniana.  
 " arenaria.  
 " cinerea.  
 " caprea.  
 " arbuscula.  
 " myrsinites.  
 " herbacea.  
 " argentea.  
 " glauca.  
 " arctica.

*Conifereæ.*  
 Juniperus communis.

*Monocotyledons.**Orchidaceæ.*

- Corallorhiza innata.  
 Listera ovata.  
 " nidus-avis.  
 Peristylus viridis.  
 " albida.  
 Orchis morio.  
 " mascula.  
 " latifolia.  
 " maculata.  
 " cruenta.  
 Nigritella angustifolia.  
 Platanthera hyperborea.  
 " Konigi.

*Trilliaceæ.*

- Paris quadrifolia.

*Liliaceæ.*

- Maianthemum bifolium.

*Melanthaceæ.*

- Tofieldia palustris.  
 " calycalata.  
 Anthericum ramosum.

*Juncaceæ.*

- Juncus communis.  
 " arcticus.  
 " lamprocarpus.  
 " bufonius.  
 " squarrosus.  
 " triglumis.  
 " Gerardi.  
 " Jacquinii.  
 Luzula pilosa.  
 " campestris.  
 " spicata.

*Juncaginaceæ.*

- Triglodion palustre.  
 " maritimum.

*Typhaceæ.*

- Sparganium natans.

*Naidaceæ.*

- Potamogeton pectinatus.  
 " crispus.  
 " perfoliatus.  
 " rufescens.  
 " natans.  
 Zostera marina.

*Cyperaceæ.*

- Blysmus compressus.  
 " rufus.  
 Isolepis setacea.  
 Scirpus lacustris.  
 " cæspitosus.  
 " compressus.  
 Heleocharis palustris.  
 " avicularis.  
 Eriophorum Alpinum.  
 " vaginatum.  
 " capitatum.  
 " latifolium.  
 " angustifolium.  
 " Scheuchzeri.

*Elyna spicata.*

- Carex dioica.  
 " palustris.  
 " rupestris.  
 " pauciflora.  
 " incurva.  
 " ovalis.  
 " leporina.  
 " elongata.  
 " vulpina.  
 " muricata.  
 " arenaria.  
 " bahlhi.  
 " cavescens.  
 " capitata.  
 " atrata.  
 " rigida.  
 " acuta.  
 " cæspitosa.  
 " extensa.  
 " flava.  
 " depauperata.  
 " panicea.  
 " pallescens.  
 " capillaris.  
 " limosa.  
 " pseudo-cyprus.  
 " hirta.  
 " ampullacea.  
 " vesicaria.  
 " ornithopoda.  
 " loliacea.  
 " pulla.

*Anthoxanthum odoratum.*

- Nardus stricta.  
 Alopecurus geniculatus.  
 Phleum pratense.  
 " alpinum.  
 " nodosum.

Psamma arenaria.	Triticum repens.
Milium effusum.	"    caninum.
Calamogrostis epigeros.	<i>Acotyledones.</i>
"    arundinacea.	<i>Polypodiaceæ.</i>
Agrostis rubra.	Polypodium vulgare.
"    stolonifera.	"    fontanum.
"    canina.	"    arvonium.
"    vulgaris.	"    phegopteris.
"    pumila.	"    dryopteris.
"    alba.	Woodsia ilvensis.
"    alpina.	Aspidium lonchitis.
"    capillaris.	"    thelypteris.
Aira cæspitosa.	"    filix mas.
"    alpina.	Cystopteris fragilis.
"    flexuosa.	Asplenium septentrionale.
"    subspicata.	"    trichomanes.
"    præcox.	"    filix fœmina.
"    atropurpurea.	<i>Ophioglossaceæ.</i>
Molinia cærulea.	Ophioglossum vulgatum.
Koeleria glauca.	Botrychium lunaria.
Sesleria cærulea.	<i>Lycopodiaceæ</i>
Hierochloe borealis.	Lycopodium clavatum.
Poa aquatica.	"    annotinum.
"    fluitans.	"    selaginoides.
"    maritima.	"    alpinum.
"    distans.	"    selago.
"    compressa.	"    dubium.
"    pratensis.	"    complanatum.
"    trivialis.	Iscetes lacustris.
"    alpina.	<i>Equisetaceæ.</i>
"    laxa.	Equisetum arvense.
"    nemoralis.	"    sylvaticum.
"    annua.	"    limosum.
"    cæsia.	"    palustre.
Briza media.	"    hyemale.
Festuca ovina.	"    pratense.
"    heterophylla.	
"    elatior.	
Bromus hordaceus.	
Phragmites communis.	
Elymus arenarius.	
Triticum cristatum.	

## LIST OF ICELANDIC PLANTS (PAIJKULL) (413 kinds).

<i>Ranunculaceæ.</i>	Ranunculus hyperboreus.
Thalictrum alpinum.	"    reptans.
Ranunculus aquatilis.	Caltha palustris.
"    glacialis.	<i>Crucifereæ.</i>
"    acris.	Cardamine bellidifolia.
"    repens.	"    pratensis.
"    polyanthemis.	"    hirsuta.
"    nivalis.	"    intermedia.
"    lapponicus.	



- Draba alpina.*  
 „ *muricella.*  
 „ *hirta.*  
 „ *hirta, β oblongata.*  
 „ *muralis.*  
*Erophila vulgaris.*  
*Cochlearia officinalis.*  
 „ *danica.*  
 „ *anglica.*  
*Thlaspi campestre.*  
*Cruciferum maritimum.*  
*Capsella bursa pastoris.*  
*Subularia aquatica.*  
*Sinapis pratensis.*
- Violaceæ.*
- Viola palustris.*  
 „ *canina.*  
 „ *tricolor.*  
*Drosera rotundifolia.*  
 „ *longifolia.*  
*Parnassia palustris.*
- Caryophyllaceæ.*
- Silene inflata β marit.*  
 „ *rupestris.*  
 „ *acaulis.*  
*Lychnis flos cuculi.*  
 „ *alpina.*  
*Sagina procumbens.*  
*Spergula arvensis.*  
 „ *nodosa.*  
 „ *sagin.*  
 „ *subulata.*  
 „ *Edwardsii.*  
 „ *humifusa.*  
 „ *crassiflora β sub alp.*  
 „ *biflora.*  
 „ *cerastoides.*  
*Arenaria rubella.*  
 „ „ *b. hirta.*  
 „ *ciliata β.*  
 „ *serpyllifolia.*  
 „ *peploides.*  
*Cerastium vulgatum.*  
 „ *holosteoides.*  
 „ *alpinum.*  
*Linum catharticum.*  
*Geranium sylvaticum.*  
 „ *pratense.*
- Leguminosæ.*
- Lotus corniculatus.*  
*Anthyllis vulneraria.*  
*Trifolium repens.*  
 „ *pratense.*
- Trifolium arvense.*  
 „ *frugiferum.*  
*Pisum maritimum.*  
*Lathyrus pratensis.*  
*Vicia cracca.*
- Rosaceæ.*
- Spiræa ulmaria.*  
*Potentilla anserina.*  
 „ *maculata.*  
*Tormentilla erecta.*  
*Comarum palustre.*  
*Fragraria collina.*  
*Geum rivale.*  
*Dryas octopetala.*  
*Alchemilla vulgaris.*  
 „ *β montana.*  
 „ *alp.*  
*Sibbaldia procum.*  
*Sanguisorba offic.*  
*Rubus saxat.*  
*Rosa pimpinella, fol., v. islandica*  
*Sorbus aucuparia.*
- Cenograrieæ.*
- Epilobium angustifol.*  
 „ *latifol.*  
 „ *montan.*  
 „ *tetragonum.*  
 „ *palus.*  
 „ *organifol.*  
 „ *nutans.*  
 „ *alpin.*
- Haloragaceæ.*
- Myriophyllum spicat.*  
 „ *verticillat.*  
*Hippuris vulgaris.*  
*Callitriche verna.*  
 „ *autumn.*
- Portulacaceæ.*
- Montia fontana.*
- Crassulaceæ.*
- Tillæa aquat.*  
*Sedum acre.*  
 „ *ann.*  
 „ *anglic.*  
 „ *villos.*  
 „ *rhodiola.*
- Ceratophyllaceæ.*
- Ceratophyllum demersum.*
- Paronychieæ.*
- Scleranthus annuus.*

*Saxifrageæ.*

- Saxifraga cotyledon.  
 " stellaris.  
 " nivalis.  
 " oppositifolia.  
 " hirculus.  
 " aizoides.  
 " granulata.  
 " cernua.  
 " rivularis.  
 " tridactylites.  
 " hypnoides.  
 " cæspitosa.  
 " petræa.  
 " tricuspidata.

*Umbelliferae.*

- Hydrocotyle vulgaris.  
 (Egopodium) podagraria.  
 Carum carui.  
 Ligusticum Scoticum.  
 Angelica Archangelica.  
 " sylvestris.  
 Imperatoria ostruthium.

*Aralliaceæ.*

- Hedera helix.

*Corneæ.*

- Cornus succisa.

*Galium.*

- Galium trifidum.  
 " sylvestre.  
 " saxatile.  
 " palustre.  
 " uliginosum.  
 " verum.  
 " mollugo.  
 " boreale.

*Valerianææ.*

- Valeriana officinalis.

*Dipsacææ.*

- Scabiosa succisa.

*Composite.*

- Leontodon taraxacum.  
 "  $\beta$  tenue.  
 Apargia taraxaci.  
 " autumnalis.  
 "  $\beta$  asperior.  
 Hieracium alpinum.  
 " pillosella.

- Hieracium auricula.  
 " præmorsum.  
 " aurantiacum.  
 " murosom.  
 " prænanthoides.  
 Gnaphalium alpinum.  
 " rupium.  
 "  $\beta$  filiforme.  
 " uliginosum.  
 " fuscatum.

- Tussilago farfara.  
 Erigeron alpinum.  
 " alpin  $\beta$  uniflor.  
 Senecio vulgaris.  
 Pyrethrum inodorum.  
 "  $\beta$  marit.  
 Achillea millefolium.  
 Carduus arvensis.  
 " heterophyllus.  
 " acanthoides.

*Campanulacææ.*

- Campanula rotundifolia.

*Vaccinææ.*

- Vaccinium myrtillus.  
 " uliginosum.  
 " vitis-idaea.

*Ericinææ.*

- Erica vulgaris.  
 " tetralix.  
 Andromeda hypnoides.  
 Arbutus alpin.  
 " uva ursi.  
 Rhododendron lappon.  
 Sedum latifol.  
 Azalea procum.  
 Pyrola rotundifol.  
 " minor.  
 " secum.  
 " unifol.

*Empetrææ.*

- Empetrum nigrum.

*Gentianææ.*

- Gentiana aurea.  
 " nivalis.  
 " amarella.  
 " campes.  
 " tenella.  
 " serrata  $\beta$  detonsa.  
 " serrata J. acuta.

Swertia sulcata.  
Menyanthes trifoliata

*Convolvulaceæ*

Trientalis Europ.  
Glaux maritima,

*Diapensiæ.*

Diapensia lapponica.

*Boraginæ,*

Myosotis arvensis,  
Pulmonaria maritima,  
Echium vulgare.

*Rhinantaceæ,*

Rhinanthus cris. galli.  
Euphrasia offic.  
Pedicularis palus.  
" sylv.  
" flamin,

Bartsia alp.  
Limosella aquat,  
Veronica saxat,

" alp.  
" serpyll.  
" beccabung.  
" anagallis.  
" offic.

*Labiatæ.*

Lamium purpureum.  
" amplexicaule,  
Galeopsis tetrahit,  
" ladanum,  
Stachys sylv.  
Thymus serpyll.  
Prunella vulg.

*Lentibulaceæ.*

Pinguicula vulg.  
" alp.

*Primulaceæ,*

Primula elatior.  
" farinosa.  
" striata.

*Plumbaginieæ.*

Armeria marit.  
Plantago maj.  
" lanceol.  
" marit.  
" coronopus

*Chenopodiaceæ.*

Chenopodium alb.  
Atriplex patula.  
" laciniata.

*Poligoneæ.*

Kœnigia island.  
Polygonus vivip.  
" amphibium.  
" hydropiper.  
" persicaria.  
" aviculare.  
" convolv.  
Rheum digynum.  
Rumex domest.  
" acetosa.  
" acetosella.

*Urticeæ.*

Urtica urens.  
" dioica.

*Amentaceæ.*

Betula nana,  
" alba,  
" fruticosa.  
Salix pentard,  
" purp.  
" myrsinitis.  
" myrtilloides,  
" arbuscula,  
" arct.  
" herbac.  
" retic.  
" lanata,  
" glauca.  
" lapponum,  
" repens.  
" fusca.  
" versifol.  
" caprea.

*Conifereæ.*

Juniperus nana.

*Monocotyledons,*

*Orchideæ,*

Orchis mas,  
" morio.  
" latifol,  
" mac.  
" hyperb.  
" cruenta.  
Satyrium viride.

- Satyrium albid.  
     "    nig.  
 Ophrys nidus avis.  
     "    ovata.  
 Corallorrhiza innata.  
     *Smilacææ.*  
 Paris quadr.  
     *Colchicacææ.*  
 Tofieldia bov.  
     *Juncææ.*  
 Juncus arct.  
     "    squarrosus.  
     "    lamprocarp.  
     "    trifid.  
     "    buffon.  
     "    biglum.  
     "    triglum.  
     "    bulbos.  
 Luzula campes.  
     "    spicata.  
     "    pilata.  
     *Typhacææ.*  
 Sparganium natans.  
 Zostera marina.  
     *Cyperacææ.*  
 Carex dioica.  
     "    capitata.  
     "    pulicaris.  
     "    microgloch.  
     "    rupes.  
     "    incurva.  
     "    vulp.  
     "    norveg.  
     "    oval.  
     "    arenar.  
     "    muricata.  
     "    carta.  
     "    loliacea.  
     "    lagopina.  
     "    elong.  
     "    saxat.  
     "    cæspit.  
     "    acuta.  
     "    pulla.  
     "    vahlii.  
     "    atro-fusca.  
     "    fulig.  
     "    pillulifera.  
     "    flava.  
     "    palescens.  
     "    pedata.  
     "    ornithopoda.  
 Carex panicea.  
     "    capill.  
     "    limosa  $\beta$  rariflora.  
     "    pseudo-cyperus.  
     "    vesicaria.  
     "    ampullacea.  
 Kobresia scrip.  
 Schoenus rufus.  
 Scirpus palus.  
     "    cæspit.  
     "    setac.  
     "    lacus.  
 Eriophorum capitat.  
     "    angustifol.  
     "    latifol.  
     *Gramineææ.*  
 Nardus stricta.  
 Phleum pratense.  
     "     $\beta$  nodosa.  
     "    alpina.  
 Alopecurus genicul.  
 Milium effus.  
 Arundo epigeios.  
     "    varia.  
     "    arenaria.  
     "    phragmites.  
 Agrostis canina.  
     "    alp.  
     "    vulg.  
     "    stolonif.  
 Aira aquat.  
     "    subspic.  
     "    cæspit.  
     "    flexuo.  
     "    flexuo.  $\beta$ .  
     "    atropus.  
     "    alp.  
     "    præcox.  
 Melica cærul.  
 Holcus odorat.  
 Sesleria cærul.  
 Poa flex.  
     "    marit.  
     "    distaus.  
     "    laxa.  
     "    alp.  
     "    alp.  $\beta$  vivip.  
     "    pratens.  
     "    trivial.  
     "    nem.  
     "    nem. j. firmula.  
     "    d — cæsia.  
     "    annua.  
     "    compressa.

Festuca rub.	Botrych. lun.
"    rub. $\beta$ arenar.	Ophioglossum vulg.
"    ovina.	Asplen. trich.
"    ovina $\beta$ vivip.	"    septent.
"    duriusc.	
"    elatior.	<i>Marsilleaceæ.</i>
"    fluit.	Isoetes lacustris.
Elymus arenar.	
Triticum rep.	<i>Lycopodiaceæ.</i>
"    can.	Lycopodium clavat.
Anthoxanthum ardor.	"    selago.
<i>Filices</i>	"    complan.
Polypodium vulg.	"    alp.
"    Phegop	<i>Equisetaceæ.</i>
"    ilven.	Equisetum arv.
"    dryop.	" $\beta$ alp.
Aspidium lonchitis.	"    sylv.
"    filis mas,	"    palus.
"    filis fœm,	"    fluviat.
"    frag.	"    limos.
"    thelyp,	"    hyemale.
Pteris crispa.	

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## PART II.—*Entomology of Iceland.*

The earliest information that we possess, in all probability, concerning the entomology of Iceland is to be found in a work of the date of 1772, comprising two quarto volumes, and bearing the title of *Eggert Olassens og Braine Povelens Reise igiennen Island*. It is a very scarce book, and was, I believe, published in Copenhagen. I am also given to understand that it has been much referred to and drawn on by more modern writers on Iceland. There is a copy of it in the Royal Library at Copenhagen, and the naval authorities are obliged by law to have a copy on board on the periodical voyages of the steamers to Iceland. Through the kindness in this respect, as in other instances, of Commander Hovgaard (who is a man of some mark, having been Norden-skjold's lieutenant on board the "Vega," at the exploration of the N.E. passage), I was enabled to refer to this work in the cabin of the Danish steamship "Thyra," as we coasted round the island. For the benefit of such as have not seen it, I may be allowed to state that in addition to the history and antiquities, &c., of the country, it apparently deals with all orders of natural history, and has been intended to do for

Iceland, of course in the most pioneer and rudimentary fashion, what the voyage of the "Challenger" has in our day achieved for the shores of the lands adjoining the South Seas. Only a very small portion of one of the two quarto volumes is devoted to the consideration of entomology, and Hovgaard and I at first turned over the book in vain without being able to discover that there was any mention of insects therein at all. Fortunately for me, the descriptions of such species as were recorded were in Latin, and moreover perspicuous and helpful for determining the particular kind intended, and the information afforded was, to the best of my judgment, correct, although the number of species given is very scanty, to wit, only 6 Coleoptera, whereas 19 are enumerated in the Appendix to Paijkull's book (which dates from 1824, and was compiled by another author, and in existence long before Paijkull's book itself), 81 set down by Staudinger in 1857, and 16 kinds, possibly, captured by me during July and August of the present year. For the sake of clearness, I have subjoined at the end of this record Staudinger's, Paijkull's, as well as my own list of Coleoptera, and that of the old Danish book in full, and have marked certain species in the four above-named lists with 2 or 3 or 4 respectively ascending, as they occurred in 2 or 3 or all of the catalogues. It has not been an easy task, as personally I am not well up in the Coleoptera, and there has been subdivision of genera in the thirty-two years that have elapsed since Staudinger's visit. My own Coleoptera are as yet indicated by the genus only, and not in each instance by the particular species; but, wherever I possess the same genus as one indicated by Staudinger, I have taken for granted that it is one of his species, and not a new one previously unnoticed, simply owing to the fact that in my own experience it is common and widely distributed. The only merit that my short list of Coleoptera of the district is entitled to is in consequence of the locality in each case being given, and the whole tendency of careful statistics of date, place, latitude, and longitude, having been drawn up, has been to show the extensive prevalence and wide geographical distribution of some kinds met with alike on the W. N. and E. coasts of a country larger than Ireland, with a coast line deeply indented by far-reaching and very numerous fjords, and along shores many hundred miles in extent. In no case, has observation, necessarily limited and brief, but at the same time very careful, established the fact that each, or indeed that any district had its own peculiar Fauna. That

there is a fortnightly difference of species according to the season of the year is, on the other hand, very evident, but the experience of Mr. Steincke as a resident (living during the summer at Akureyri, and in the winter at Copenhagen) would not appear to exceed my own as regards the number of Coleoptera, when he informed me that there were a great number of beetles to be found in the N. of Iceland in May, but only ten species. My friend Dr. Mason's experience is also confirmatory of this statement, as he remarked on the immense number of individuals in proportion to the paucity of species. Staudinger narrates that most of the species of Coleoptera he found under stones, in turf, all the Staphylinidæ in dung, or under dead birds. I captured nearly all my Coleoptera under stones, generally on the ground, occasionally, as at Flatey Island, under stones on the top of a low wall surrounding the homestead—the only beetles that I took on the wing being *Creophilus maxillosus* in a lane bordered by stone walls in the outskirts of Reykjavik, and a specimen of *Byrrhus* on the slopes above Eskefjord—of which genus Staudinger mentions two species, *Byrrhus pilula* and *fasciatus*. To consider 2 or 3 of Olassen's and Povelsen's 6 species of Coleoptera in detail: their Latin descriptions commence with Coleoptera, and are continued successively by 1 species of Hemiptera, 4 of Lepidoptera Heterocera, counting a *Phrygania* as one of the moths in question, 3 Hymenoptera, and about 11, as far as I can make out, of Diptera. It is highly interesting to find a weevil recorded in 1772 as "*Curculio abdomine ovato, niger coleoptris striato-granulatis*," because this is probably the commonest beetle in all Iceland, and I collected specimens of it accordingly from Reykjavik in the S.W., Stykkisholm, Flatey Island, Arnafjord, Onundafjord, Isatjord on the W. coast, and Reykafjord and Saudarkrok on the N. It is interesting to be able to adduce an instance of the continuity, if I may so phrase it, of the entomology of the country since 1772, because in other respects the island has undergone great changes since that period. For example, these same authors, Olassen and Povelsen, on their journey through Iceland, mention wheat growing in the southern districts, and Captain Burton records in connection with this fact that the cause of the change, sometimes attributed to oscillations of temperature, is simply disforestation, which has promoted the growth of bog and heath now covering half the island, which allows storm winds to sweep unopposed over the surface, and which, since the Saga times, has necessarily rendered the cold less

endurable to cereals. A number of local names, beginning with Reynir the sorb apple (*Sorbus edulis*), proves that groves of the wild fruit tree, whose pomaceous berries, rich in malic acid, were munched by the outlaw, once flourished where there is now not a trace of them. Yet again, volcanic agencies in Iceland have undergone great alteration during the lapse of a century. Two instances of this fact may suffice: (1) Hveravellir, spoken of by Olassen and Povelsen as the most wondrous sight in Iceland, with its roaring mountain of steam, is now reduced to a dozen caldrons of boiling water. (2) The geysir which Henderson saw in the crater of Krafla plays no longer, and its place is occupied by a still, green pool of cold water.

To revert to the Coleoptera, the old Danish book also speaks of "*Carabus (vulgaris) niger, capite et elytris nigris thorace rubro*" (Linnæi *Carabus melanocephalus*). I take this to be the same as my own "*Calathus melanocephalus*," recorded from such widely distant localities as Reykjavik, Flatey Island, Patreksfjord, and Saudarkrok. I note that Staudinger mentions a *Calathus nubigena*, and in Paijkull's Appendix, too, *Carabus melanocephalus* occurs. Also in the Danish book, *Staphylinus pubescens major*, Linnæi *maxillosus*, is known in Staudinger's list as *Staphylinus maxillosus*, and in that of Paijkull as well, in my own as *Creophilus maxillosus*, which I took at Akureyri as well as at Reykjavik. As no localities are given by the compiler of Paijkull's list, I cannot tell how far Gliemann had travelled, or in what particular districts he captured insects, but am inclined to think that he did not, any more than Staudinger, survey the coast line as I have done. To explain the apparent contradiction that may suggest itself to some of the readers of the Entomologist, where a fjord on the N. coast is spoken of as being lower in point of latitude than one on the western shore, I may state that some on the N. coast and Akureyri (Ofjord in Danish) in particular, are far distant from the open sea, Akureyri being 30 miles away. To such an extent do these fjords penetrate the land, and this distance of 30 miles in the case of Akureyri is in its turn succeeded by 30 miles more of valley, so that a branch of the sea may have run up far further at a remote period. The short space of time allowed at each fjord, and in many places the steepness, not to say perpendicularity, of the cliffs necessitated my collecting at only a few hundred yards' distance from the shore. Only at Akureyri and Saudarkrok did I ascend a watercourse to the moor above. At Eskefjord, I possibly



attained an equal elevation, but by a more gradual rise. But my impression is that the vicinity of the shore, as more sheltered, is the most favourable spot, the moors are so wind-swept, that nothing, as a rule, is to be gained by climbing the hills in pursuit of insects. Apropos of Pajkull's list, it is avowedly taken from Gaimard, a Frenchman, but its origin, according to Professor Newton, is to be found in Gliemann's *Geograph Beschreibung in Island Altona*, 1824, and contains less than 100 species, even though including arachnida, lice, mites, &c., &c.

## STAUDINGER.

1. *Nebria gyllenhali*.
2. *Notiophilus semipunctatus*.
3. *Patrobis hyperboreus*.
4. *Calathus nubigena*.
5. *Platysma borealis*.
6. *Argutor strenuus*.
7. *Amara Quenselii* (2).
8. *Bradycellus coquatus* (2).
9. *Trechus paludosus*.
10. *Bembidium bipunctatum*.
11. " *nigricorne*.
12. *Colymbetes dolabratus* (2).
13. *Agabus Solieri*.
14. *Hydroporus nigrita*.
15. *Cercyon melanocephalum*.
16. " *litorale*.
17. " *anale*.
18. *Catops nigricans*.
19. *Homalota circellaris*.
20. " *atramentaria*.
21. " *vestita*.
22. " *binotata*.
23. " *excellens*.
24. " *nigra*.
25. " *gregaria*.
26. " *fungi*.
27. " *elongatula*.
28. " *graminicola*.
29. " *islandica*.
30. *Oxypoda islandica*.
31. " *hæmorrhœa*.
32. *Tachinus collaris*.
33. *Quedius fulgidus*.
34. " " *sp. ?*
35. " *attenuatus*.
36. " *boops*.
37. *Philonthus ceneus* (2).
38. " *xantholoma*.
39. " *cephalotes*.
40. " *sordidus*.
41. " *trossulus*.

## PAJKULL.

1. *Scarabæus fimetarius* (2).  
(Dunhill beetle.)
2. *Dermestes lardarius* (2).  
(Leather eater.)
3. *Silpha tabulosa*.  
(Carrion beetle.)
4. *Silpha pedicularis*.
5. *Cerambyx testaceus*.
6. " *for*.
7. *Dytiscus marginalis*.
8. " *striatus*.
9. " *semi-striatus*.
10. " *latissimus*.
11. *Carabus vulgaris*. (Bull head.)
12. " *ferrugineus*.
13. " *velox*.
14. " *melanocephalus* (4).
15. " *piceus*.
16. *Staphylinus maxillosus*. (Rove beetle.)
17. " *fucipes*.
18. " *rufipes*.
19. " *politus*.

## WALKER.

1. *Otiorhynchus monticola* (3).  
Stykkisholmur.  
Flatey Island.  
Arnafjord.  
Onundafjord.  
Isafjord.  
Reykjafjord.  
Sandarkrok.  
Reykjavik.
2. *Otiorhynchus inaurus*.  
Reykjavik.  
Thingvellir.
3. *Calathus melanocephalus* (4).  
Flatey Island.  
Patreksfjord.

## STAUDINGER.

42. *Staphylinus maxillosus* (4).
43. *Luthrobium fulvipenne*.
44. *Micralymna brevipenne*.
45. *Lestena bicolor*.
46. *Omalium fucicola*.
47. " *rivulare*.
48. " *fossulatum*.
49. " *concinnum*.
50. *Stenus opacus*.
51. " *canaliculatus*.
52. *Cryptophagus pilosus*.
53. " *distinguendus*.
54. " *scanicus*.
55. *Atomaria analis*.
56. " *apicalis*.
57. " *fuscipes*.
58. *Mycetæa hirta*.
59. *Typhcea fuscata*.
60. *Byrrhus pilula* (2).
61. " *fasciatus*.
62. *Cytilus varius*.
63. *Aphodius alpinus* (2).
64. *Cryptohypnus riparius* (2).
65. *Malthinus hericollis*.
66. " *mysticus*.
67. *Ptinus crenatus*.
68. *Barynotus Schonherri*.
69. *Tropiphorus mercurialis*.
70. *Otiorhynchus maurus*.
71. " *rugifrons*.
72. " *monticola*.
73. *Erirehinus acridulus*.
74. " *costirostris*.
75. *Rhizoneus castor*.
76. *Pissodes pini*.
77. *Chrysomela staphylæa*.
78. *Phratora vulgatissima*.
79. *Lathridius porcatus*.
80. " *elongatus*.

## OLASSEN OG POVELSEN.

1. *Dermestes tomentosus ovatus aurato-nebulosus*. (Linnæi *Dermestes pilula*).
2. *Curculio abdomine ovato* (3) *niger coleoptris striato-granulatis*.
3. *Staphylinus pubescens major* (4). (Linnæi *maxillosus*).
4. *Dytiscus e nigro-bruneus* (extremo abdominis albido).
5. *Carabus (vulgaris) niger capite*(5) *et elytris nigris thorace rubro*.

## WALKER.

- Saudarkrok.  
Reykjavik.  
Thingvellir.  
Onundafjord ?
4. *Nebria gyllenhali*.  
Reykjavik.  
Stykkisholmur.  
Akureyri.  
Seydisfjord.
  5. *Pterostichus*.  
*Platysna vitreum* (Dejean) ; or  
" *boreale* (Staudinger).  
Reykjavik.  
Stykkisholmur.  
Patreksfjord.  
Isafjord.  
Reykafjord.  
Akureyri.
  6. *Oreophilus maxillosus (alias staphylinus)*.  
Reykjavik.  
Akureyri.  
(From this last locality with the pubescence rubbed off.)
  7. *Colymbetes* (2), or  
*Cymotopterus dolabratus*.  
(Water beetle.)  
Reykjavik.
  8. *Byrrhus* (2).  
Reykafjord.  
Eskefjord.
  9. *Philonthus* (2) or *Quedius*.  
Reykafjord.
  10. *Amara* (2).  
Reykjavik.  
Saudarkrok.
  11. *Aphodius alpinus*.  
Reykjavik.
  12. *Lina* (2) or *Chrysomela Staphy leon* (Staud.).  
Akureyri.
  13. *Bradycellus*.  
Saudarkrok.
  14. *Cryptohypnus riparius* (2).  
Isafjord.
  15. *Otiorhynchus* ?  
Reykjavik.
  16. *Notiophilus*.  
(Locality uncertain).
  17. *Patrobus septentrionis*.  
(*Hyperboreus Dej.*)  
Reykafjord.  
(Also from fjords (unfortunately mixed).

## OLASSEN OG POVELSEN.

- (Linnæi carabus melanocephalus.)  
 6. *Scarabæus thorace inermi nigro*  
 (2), *elytris rubris et Linnæi*,  
*Scarabæus fimetarius*.

## WALKER.

- Otiorhynchus monticola*.  
*Nebria gyllenhali*.  
*Calathus melanocephalus*.  
*Pterostichus*.  
*Amara*.  
*Cryptohypnus riparius*.  
*Cryptohypnus riparius*, Fab.,  
 usually more bronze with first  
 joint of antennæ reddish and  
 femora red.

## NOTES ON THE COLEOPTERA.

N.B.—*Nebria brevicollis* (fr. Thorshavn in the Faroe Isles), is a larger insect than *N. Gyllenhali*, the species found in Iceland, although closely allied to it.

I found *Calathus melanocephalus* at Reykjavik to consist mostly of Staudinger's var. *nubigena* with the black or blackish thorax, very few of the typical form with the red thorax. The Flatey I. one, black. The specimen from Patreksfjord, intermediate. The Saudarkrok do., red typical. The Thingvellir do., black. The Onundarfjord do., black.

I found the *Colymbetes* above-mentioned in the mud below stones on the brink of a small lake about a mile W. of Reykjavik, and at its eastern end, on the afternoon of July 20th. *Hippuris vulgaris* grows plentifully in the immediate vicinity. Waters of lake had recently receded, owing to the fine hot weather of July compared with the unfavourable days of the latter part of June.

Some of the specimens of *Pterostichus* (*Platysna*, in other words) are brownish, the others jet black, but the difference in colouring does not constitute them two species. Of my two specimens of *Byrrhus*, the one taken at Reykafjord, N. coast, lat. 65° 58', is darker than the one at Eskefjord, E. coast, at. 65° 5', the latter, when examined under the glass, being seen to have several light hairs, but the English specimens found here in the spring are very variable in this respect.

*Neuroptera.*

Of the *Neuroptera*, there is but little to be said. They consist solely of the *Phryganidæ*. Olassen and Povelsen only mention one species, which they include among the *Lepidoptera* "*Neuropteris Linnæi Phryganea bicaudata*." *Phryganea bicaudata* occurs again in Paikull's list in conjunction with two other species, *P. rhombica* and *P. flava*.

Staudinger speaks of 9 Neuroptera, all Phryganidæ in other words, but does not enumerate them specifically, as far as I know. The three species of Phryganidæ that I succeeded in capturing were, I believe, *Grammotaulius atomaria*, *L. griseus*, and *L. picturatus*. Of these, *Limnephilus griseus* would seem to be the most widely distributed along the coast, and at Reykjavik proved by far the most abundant species. It is a very variable kind both in size and markings. At Thingvellir, on the other hand, *Limnephilus picturatus* was the commonest species. Several of the specimens of *Limnephilus griseus* possess a special interest for me, as I caught them as late as 11.30 p.m. beneath an indescribably gorgeous sunset, by pushing the marsh mari-golds that fringe the watercourses which run into the lake at the rear of the cathedral at Reykjavik. The occurrence of *Limnephilus* at Siglaffjord is all the more interesting, as the most northerly locality which I visited, too northerly perhaps for the moths, at any rate, I saw none there.

#### PHRYGANIDÆ.

Reykjavik, 25 specimens.	Akureyri, 2 specimens.
Engy I, 5 specimens.	Seydisfjord, 3 specimens.
Isafjord, 4 specimens.	Eskefjord, 1 specimen.
Seydisfjord, 1 specimen.	Thingvellir, 42 specimens.

*Hemiptera*.—The hemiptera likewise may be briefly summed up. Olassen and Povelsen treat of Hemiptera next to Coleoptera, but they only mention one species, namely, *Cimex grylloides* Linnæi. On referring to Paijkull's appendix, I found the following two kinds:—

<i>Cimex grylloides</i> , Bug.
„ <i>littoralis</i> .

I regret that I myself observed no Hemiptera, and can, therefore, add nothing to this subject. Staudinger, as I have already stated in my article in the Entomologist of June last, considers that the total sum of the insects found in Iceland is about 312 kinds, and one fifth of these (61) consists of Hymenoptera, and one tenth of the following orders, to wit:—

From 26 to 29 kinds {	9 Neuroptera.
	8 Hemiptera.
	6 Parasites.
	3—6 Poduridæ.

but does not specify the particular species of Hemiptera.

*Hymenoptera*.—In reference to Hymenoptera, this constitutes the fourth group in Olassen's and Povelsen's arrangement, but they only mention three species, and I have only observed four, and five are all that are stated in Paijkull's appendix.

Olassen's and Povelsen's three species are as follows:—

1. *Tenthredo aculeo crasso*.
2. *Ichneumon errator* Linnæi.
3. *Apis hirsuta nigra thoracis cingulo flavo et ano albo*.  
(*Apis terrestris* Linnæi.)

These three species, the Sawfly, the Ichneumon, and the Humble bee, are all recorded in Paijkull's appendix, namely:—

1. *Tenthredo pratensis*, Sawfly.
2. *Ichneumon ovulorum errator*, and
3. *Apis terrestris*, Humble bee.

and two other species of Ichneumon as well.

4. *Ichneumon sarcitorius*.
5. „ „ *manifestator*.

Two species are thus added to the list in the course of 52 years, from 1772—1824. And I can do no more than confirm the record of the above-named kinds, as I only obtained three specimens of Ichneumonidæ at Engey, Hafnafjord, and Thingvellir, consisting of *Ichneumon albicinctus*, ♀ and ♂, and *Pimpla sodalis*, and *Bombus hortorum*, the only species of bee that I found in Iceland, and that is not particularly plentiful. I took it at Reykjavik, and managed to secure eleven specimens at Thingvellir, and subsequently two more at Eskefjord, the only place on the E. coast where I observed it, and situate in nearly the same latitude as Reykjavik; Eskefjord being 65·5 N. lat. and 14·1 W. long.; Reykjavik being 64·8 N. lat. and 22·55 W. long. North of these two places on the E. and W. coast, respectively, I have not seen the insect.

To revert to Staudinger, he has set down specifically no fewer than 52 kinds of the 61 Hymenoptera, which he mentions as constituting one-fifth of the insects found in the island.

#### STAUDINGER'S LIST OF HYMENOPTERA.

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 1. <i>Ichneumon albicinctus</i> . | 6. <i>Phygadenon cylindraceus</i> . |
| 2. „ „ <i>latrator</i> .          | 7. <i>Aptesis microptera</i> .      |
| 3. „ „ <i>thulensis</i> .         | 8. „ „ ? <i>concolor</i> .          |
| 4. <i>Cryptus picticornis</i> .   | 9. <i>Pezomachus instabilis</i> .   |
| 5. <i>Phygadenon infernalis</i> . | 10. <i>Pimpla coxator</i> .         |

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| 11. <i>Pimpla sodalis</i> .          | 34. <i>Prosacantha punctulator</i> .  |
| 12. <i>Bassus festivus</i> .         | 35. <i>Platygaster splendidulus</i> . |
| 13. " <i>carinulatus</i> .           | 36. " <i>opacus</i> .                 |
| 14. <i>Tryphon æmulus</i> .          | 37. <i>Diapria aptera</i> .           |
| 15. " <i>hæmatopus</i> .             | 38. <i>Ephedrus parceicornis</i> .    |
| 16. " <i>instabilis</i> .            | 39. <i>Trioxys compressicornis</i> .  |
| 17. <i>Atractodes bicolor</i> .      | 40. <i>Monoctonus caricis</i> .       |
| 18. " <i>tenebricosus</i> .          | 41. <i>Praon volucris</i> .           |
| 19. " <i>ambiguus</i> .              | 42. " <i>peregrinus</i> .             |
| 20—24. 5 unnamed species of          | 43. <i>Aphidius cingulatus</i> .      |
| <i>Chalcididæ</i> .                  | 44. " <i>restrictus</i> .             |
| 25. <i>Emphytus grossulariæ</i> .    | 45. <i>Microctonus intricatus</i> .   |
| 26. <i>Nematus conductus</i> .       | 46. <i>Periclitus islandicus</i> .    |
| 27. " <i>Staudingeri</i> .           | 47. <i>Alysia conspurcator</i> .      |
| 28. " <i>coactulus</i> , n. sp., 28. | 48. <i>Orthostigma pumilum</i> .      |
| 29. " <i>suavis</i> .                | 49. " <i>exile</i> .                  |
| 30. " <i>variator</i> .              | 50. " <i>distracta</i> .              |
| 31. <i>Encelia simulatrix</i> .      | 51. <i>Dacnusa pubescens</i> .        |
| 32. <i>Xystus obscuratus</i> .       | 52. " <i>confinis</i> .               |
| 33. <i>Lagnodes rufescens</i> .      |                                       |

*Diptera*.—To proceed to the *Diptera*. Staudinger regards them as constituting over one-third (110) of the total number of species, 11 are described by Olassen and Povelsen, and 22 enumerated in Pajkull's appendix. Some of the kinds that I captured are, as a matter of course, the same as those indicated in the two last-named lists. *Syrphidæ* appeared to be most varied in kind, and most abundant at Thingvellir, and doubtless the abundance of flowers there had something to do with their putting in so plentiful an appearance. I am under the impression that when all this group is correctly worked out and named, I shall be able to contribute a few additional species to former lists, including a black var. of *Scæva pyrastris*, that I found in the interior of Akureyri Church, in which edifice were also some hundreds of *Calliphora greenlandica*, the greater part dead and strewing the window sills and floor, but many still buzzing about the panes. This species is comparatively rare with us, and on further examination of about a couple of hundred specimens that I brought away, I found them to include a few of *Musca azurea*, and *Sarcophaga mortuorum*, as well. *Helophilus pendulus*, that fly so prettily marked, like all others of its tribe, occurs at Reykjavik, Engey, Thingvellir, and Eskefjord too, but its geographical range, like that of *Bombus hortorum*, would appear to be limited to the south, and to be confined to the same localities as that insect. It is to be met with on boggy soil in the vicinity of a well, in the middle of Vatnsmyri moor, Reykjavik, more abundantly than elsewhere. *Tipulidæ*, so far as my observa-

tion went, were decidedly scarce, being confined to three or four specimens, taken at Thingvellir. The green-flowering *Angelica Islandica*, cultivated for culinary purposes in rows along the garden borders in and around Reykjavik serves as a great attraction to various flies, as *Calliphora erythrocephala*, *Musca domestica*, and several more, and its flowers are quite blackened by the number of its visitors on a hot day. Possibly the reason why Diptera are to be found in a higher latitude than moths extend to is that they are hardier, and can better shelter themselves from inclement weather, under stones, as I observed their taking refuge in this way on the hill slopes at Saudarkrok, and also that the absence of flowers does not affect them similarly, as they settle with equal readiness and thrive on the heads or refuse of fish that strew the shores everywhere. The inhabitants of Reykjarjord attributed the absence of moths to the day not being a sunny one, and stated that there had been several moths. There was no evidence whatever to show that the moths they referred to were not Tortrices and Crambidæ which are to be found, as at Isaffjord, at a point where the range of geometridæ would seem almost to cease. The showiest fly in Iceland, but not over easy to catch, is *Sarcophaga mortuorum* with pear-shaped body of as brilliant blue or green, as *Musca cæsar*, and fully as large as *Calliphora erythrocephala*. Though widely distributed, it is not particularly plentiful, flies with a loud buzz and considerable vehemence, so that many specimens taken are found to have their wings battered. I noted at once that it differed from any fly I had seen on the wing before. The orange pubescence of *Scatophaga stercoraria* is frequently very brilliant, but this is probably, however, mere local variation.

#### OLASSEN OG POVELSEN.

1. *Tipula maxima* alis hyalinis, dilute fusca, maculis alarum nigris, pedibus longissimis (*Tipula hortorum* Linnæi).
2. *Tipula lutea* alis albis in sedendo erectis.
3. *Tipula culiciformis plumosa* Linnæi. *Tipula nigra* subvirescens alis hyalinis non-punctatis.
4. *Tipula nigra subhirta* alis hyalinis, pedibus ferrugineis.
5. *Tipula nigra glabra* alis nigricantibus. *Tipula* Marci.
6. *Tipula* alis glaucis, puncto marginali corporeque atro, pedibus rufis.

It will be observed from the foregoing list that two, if not more, distinct tribes of Diptera are included under the one generic name of *Tipula*. What are now termed *Culex pipiens* and *Bibio Marci* reckoned along with *Tipula hortorum*, in other words.

## MUSCÆ.

- Musca (variegata) thorace nigro, nitente, abdomine virescente, lineis tribus transversis albis (Linnæi Musca pyrastræ).*  
 2. *Musca hirsuta lutea, puncto alarum fusco, Musca stercoraria.*  
 3. *Musca gibba, capite albo luteo, et viridi variegato corpore aureo. Musca domestica auctorum.*  
 4. *Musca (aurata) thorace nigro abdomine cæruleo-viridi Linnæi muscis auratis.*  
*Hippobosca (ovina) alis nullis.*

## PAIJKULL.

- |                                     |                              |
|-------------------------------------|------------------------------|
| 1. <i>Tipula rivosa, Crane fly.</i> | 11. <i>Musca domestica.</i>  |
| 2. " <i>regelationis.</i>           | 12. " <i>fenestralis.</i>    |
| 3. " <i>pennicornis.</i>            | 13. " <i>petionella.</i>     |
| 4. " <i>monoptera.</i>              | 14. " <i>ribesii.</i>        |
| 5. " <i>plumosa.</i>                | 15. " <i>larvarum.</i>       |
| 6. <i>Musca pyrostris, Fly.</i>     | 16. " <i>cremiterorinum.</i> |
| 7. " <i>stercoraria.</i>            | 17. " <i>gibba.</i>          |
| 8. " <i>fimataria.</i>              | 18. <i>Culex pipiens.</i>    |
| 9. " <i>scyboldaria pendula.</i>    | 19. " <i>reptans.</i>        |
| 10. " <i>Cæsar.</i>                 | 20. <i>Hippobosca ovina.</i> |

It will be noted once more in connection both with Olassen's and Povelsen's list, and that of Paijkull, that the genera of *Scæva*, *Musca*, *Calliphora*, *Scatophaga*, &c., are all included under the one comprehensive title of *Musca*.

## WALKER.

- |   |   |
|---|---|
| 1. <i>Helophilus pendulus.</i><br>Reykjavik.<br>Engøy.<br>Thingvellir.<br>Eskefjord.  | 6. <i>Calliphora greenlandica.</i><br>Reykjavik.<br>Hafnafjord.<br>Krisuvik.<br>Akureyri.<br>Vopnafjord.  |
| 2. <i>Scatophaga stercoraria.</i><br>Reykjavik.<br>Thingvellir.<br>et passim.   | 7. <i>Sarcophaga mortuorum.</i><br>Reykjavik.<br>Hafnafjord.<br>Krisuvik.<br>Saudarkrok.<br>Siglufjord.<br>Akureyri.<br>Vopnafjord.<br>Seydisfjord.<br>Eskefjord. |
| 3. <i>Calliphora erythrocephala.</i><br>Reykjavik.<br>Engøy.<br>Thingvellir.<br>Hafnafjord.<br>Krisuvik.<br>Reykafjord.<br>Akureyri.<br>Vopnafjord.<br>et passim. | 8. <i>Scæva Pyrastræ (black var. Akureyri).</i>   |
| 4. <i>Culex pipiens.</i><br>Reykjavik Hotel, Reykjavik,<br>Thingvellir.   | <i>Tipulidæ.</i>  |
| 5. <i>Homalomyia canicularis.</i><br>Akureyri.  | 9. <i>Limnephila arctica.</i><br>var. <i>fuscipennis.</i><br>near Thingvellir.  |



## WALKER.

- |   |                                   |
|---|-----------------------------------|
| 11. <i>Simulia reptans</i> , n. Geysir. | 16. <i>Sphærophoria scripta</i> . |
| 12. <i>Syrphus ribesii</i> .            | Thingvellir.                      |
| 13. " <i>arcuatus</i> .                 | 17. <i>Dryomeia hamata</i> .      |
| 14. " <i>nitidulus</i> .                | Thingvellir.                      |
| 15. <i>Platychirus albimanus</i> .      |                                   |
| Thingvellir.                            |                                   |

*Moths (Lepidoptera Heterocera).*

The accompanying table will serve to show the proportion of moths that I took at the various localities visited.

Patreksfjord, 3 moths.	
Arnafjord, 63 moths.	Reykjavik—
Dyrafjord, 117 moths.	Moor below observatory .... 50
Onundafjord, 32 moths.	Vatnsmyri moor .... 9
Isafjord, 5 moths.	Meadow by ejorn or lake.... 51
Saudarkrok, 4 moths.	
Akureyri, 6 moths.	Total .... 110
Seydisfjord, 1 moth.	
Eskefjord, 2 moths.	Thingvellir (upwards of 300).

Krisuvik, 1 (taken by Dr. Knaggs).

Engey, 7.

Hekla, 4 (taken by Dr. Knaggs).

These statistics seem, on the whole, to prove decisively that the west coast furnishes a better collecting ground than is the case with the north and east. One reason for my success at Dyrafjord, on the west coast, was that I landed there in the evening, when multitudinous geometridæ were on the wing at the approach of dusk. The most abundant tribe in Iceland, and consequently, the large proportion of moths above indicated consists of geometridæ, and next to these the noctuæ.

## STAUDINGER.

1. *Episema graminis*.
2. *Agrotis Islandica*.
3. " *Rava*.
4. *Noctua confua*.
5. *Triphæna pronuba*.
6. *Hadena* (?) *exulis*.
7. " *sommeri*.
8. *Mamestra Pisi*.
9. *Plusia interrogationis*.
10. *Cidaria truncata*.
11. " *munitata*.
12. " *propugnata*.
13. " *cæsiata*.
14. " *Thulearia*.

## PAIKULL.

1. *Phalæna graminis*.
2. " *betularia*.
3. " *oleracea*.
4. " *lucernea*.
5. " *vaccinii*.
6. " *prunata*.
7. " *undulata*.
8. " *fluctuata*.
9. " *pratella*.
10. " *topezella*.
11. " *pellionella*.
12. " *surcitella*.

## STAUDINGER.

15. *Cidaria alchemillata*.
16. " *elutata*.
17. *Enpithecia scoriata*.
18. " *satyrata*.
19. " *Valerianata*.
20. *Teras Maccana*.
21. *Tortrix Pratana*.
22. *Penthina Betuletana*.
23. *Crambus Pascuellus*.
24. " *extinctellus*.
25. *Pempelia Carbonariella*.
26. *Tinea rusticella*.
27. *Plutella cruciferarum*.
28. " *Dalella (Rhigognostis)*.
29. " *septentrionum (Rhigognostis)*.
30. *Gelechia Thuleella*.
31. *Endrosis Lacteella*.
32. *Coleophora Algidella*.
33. *Pterophorus Islandicus*.

## OLASSEN OG POVELSEN.

1. *Phalæna maxima* colore obscure sericeo pallescente, toto corpore plumosa, ore spirilingui.
2. *Phalæna fluctuata* Linnæi.
3. *Phalæna tota aurea punctulis nigris conspersa*.

It will be noticed that all the moths specified by Pajjkull, and the three species recorded by Olassen and Povelsen, likewise are comprehended under the one genus *Phalæna*, and there is also some awkwardness in comparing Staudinger's list with one's own, as—

<i>Cidaria munitata</i> of Staudinger	is now	<i>Coremia munitata</i> .
" <i>propugnata</i>	" "	" <i>propugnata</i> .
" <i>caesiata</i>	" "	<i>Larentia caesiata</i> .
" <i>alchemillata</i>	" "	<i>Emmelesia alchemillata</i> .
" <i>elutata</i>	" "	<i>Ypsipetes elutata</i> .
<i>Episema graminis</i>	" "	<i>Charœas graminis</i> .
<i>Hadena exulis</i>	" "	<i>Crimodes exulis</i> .

## WALKER.

- |  |   |
|--|---|
| <p style="text-align: center;"><i>Noctue.</i></p> <ol style="list-style-type: none"> <li>1. <i>Crimodes exulis</i>.<br/>Reykjavik.<br/>Thingvellir.<br/>Also seen at Geysir.</li> <li>2. <i>Agrotis cursoria</i> (4 specimens).<br/>Akureyri.</li> <li>3. <i>Agrotis</i> ? Possibly new.<br/>Akureyri.<br/>Dyrafjord.</li> <li>4. <i>Plusia gamma</i>.<br/>Reykjavik.</li> </ol> | <ol style="list-style-type: none"> <li>6. <i>Noctua confusa</i> (abundant).<br/>Reykjavik.<br/>Thingvellir.<br/>Geysir.<br/>(Markings of forewings very variable.)</li> <li>7. <i>Charœas graminis</i>.<br/>Reykjavik.<br/>Hafnafjord.<br/>Patrekafjord.</li> <li>5. <i>Plusia interrogationis</i> (two specimens).<br/>Thingvellir.</li> </ol> |
|--|---|
- One dark var. from Krisuvik common.

## WALKER.

- |   |   |
|---|---|
| <p>8. <i>Hadena akureyriensis</i>, suggestive of <i>pisii</i>.<br/>Akureyri.<br/><i>Geometridæ</i>.</p> <p>9. <i>Larentia cæsiata</i> (very abundant).<br/>Thingvellir.</p> <p>10. <i>Cidaria immanata</i>, and var. <i>marmorata</i>, &amp;c.<br/>Reykjavik.<br/>Arnafjord.<br/>Dyrafjord.<br/>Onundafjord.<br/>Isafjord.<br/>Akureyri.<br/>Saudarkrok.</p> <p>11. <i>Coremia munitata</i>.<br/>Reykjavik.<br/>Thingvellir.<br/>(Very abundant. Markings of fore-wings very variable).</p> | <p>12. <i>Coremia propinquata</i> var. <i>vatusmyriensis</i>? Vatnsmyri moor.<br/>Reykjavik.</p> <p>13. <i>Melanippe biriviata</i>, moss below Observatory, Reykjavik.</p> <p>14. <i>Pempelia fusca</i>.<br/>(Common Thingvellir.</p> <p>15. <i>Aphelia pratana</i> (abundant).<br/>Reykjavik.<br/>Akureyri.<br/>Thingvellir.<br/>Engøy.</p> <p>16. <i>Cecophora pseudo-spretella</i>.<br/>Engøy.</p> <p>17. <i>Crambus pascuellus</i>, var. <i>extinctellus</i>?<br/>Engøy.</p> <p>18. <i>Crambus culmellus</i>?<br/>Isafjord.</p> |
|---|---|

*Previous Entomological Exploration.*

According to Staudinger, Finsterwalden landed at Siglufjord after a voyage of thirty days, on May 2nd, 1856, and collected off the poorest neighbourhood, but very diligently.

Dr. Krueper, after a voyage of 27 days, landed on May 20th, visited Hofsos, on the Skagafjord, Fridriksgáfa, on Eyjafjordur and Reykjalit, on the border of Lake Myvatn. The remaining two of the company of four German naturalists, Kalisch and Dr. Staudinger, landed at Reykjavik, and visited Thingvellir, Geysir, and Grafungér. Krueper found *Hadena Sommeri*, at Hofsó's, N. Iceland, but Finsterwalden did not succeed in meeting with it at Siglufjord. Krueper found *Plusia interrogationus* at Myvatn, and Finsterwalden took one specimen of this species (which I captured at Thingvellir) at Siglufjord. I am glad that my experience of the absence of moths at so northerly a locality as Siglufjord is borne out by their scarcity there, at all events, as recorded by former travellers. Kalisch found *Hemerobius nervosus* (Neuropt) at the end of May. Hofsos, it may be noted, is in the middle of the east shore of Skagafjord, and Fridriksgáfa, (also above-mentioned), alias Motruvellir, is about four-fifths down the whole distance of Eyjafjordur from the sea, and near the western shore of that spacious

inlet from which it is distant only two or three miles up the river Hórga.

*Some of the leading characteristics of the Entomology of Iceland.*

Total absence of butterflies.

” ” of orthoptera.

Neuroptera only represented by Phryganidæ.

Beyond all doubt the two most abundant tribes of insects in Iceland are moths and Diptera.

Moths and Diptera appear to take the place on the flowers there that butterflies and Hymenoptera do here.

The Fauna of one locality exhibits no diversity from that of another in respect of the particular species occurring there, so far as I can ascertain, by coasting round the W., N., and E. coasts, and landing at 14 of the 16 different fjords at which the steamer stopped. But there would seem to be decidedly fewer species on the N. and E. coasts than are met with on the West. Isafjord is the most northerly fjord visited on the W. coast and the line of demarcation where species decrease in number may probably be fixed between that place and Onundafjord, or about 50 miles S. of the arctic circle. At Onundafjord, Dyrafjord, and Arnafjord on the contrary, geometridæ are very abundant. There would appear to be a regular succession of geometridæ in point of time, and the average duration of any one species, or at all events its duration in abundance and in good condition, is about a fortnight.

The insect fauna and likewise the flora of Iceland have remarkable affinity to those of Scotland. The var. tending to melanism of *Larentia cæsiata* is found in Iceland, just as it is in Scotland, but the Iceland var. is not more melanic than the Scotch. *Coremia munitata*, which has a patch of dull brick-red on its forewings in Scotland, has said patch of a dusky slate colour in Iceland. If a reddish one is found there, it is quite the exception. This moth is said to abound in the Orkneys; it would be interesting to know its prevailing tint there. Some moths, notably such geometridæ as *Coremia munitata*, *Larentia cæsiata*, and *Cidaria immanata* abound on the butter-cups in the hay-meadows, and rise up in a perfect cloud from the dwarf birch and willow scrub, when the bushes are lashed by the rider's whip. The wild thyme (*thymus serpyllum*) is the flower *par excellence* favoured by the noctuæ, owing to its fragrance, and both it and the

noctuæ seem to luxuriate in the hot air in the neighbourhood of the geysirs. *Noctua confusa* is the commonest species of thick-bodied moth, and its forewings are very variable in tint, reddish, brown, or greyish; the reddish type being the most abundant. Three-fourths of the noctuæ that I saw at the geysir belonged to this one kind.

*Crimodes exulis*, common in Iceland, is rare in Scotland, or else replaced there by a closely allied species, *Hadena assimilis*, "the northern arches." Between the commoner British species and *C. exulis* there would appear to exist, however, some confusion. However, there are different types of *Crimodes exulis* as occurring in Iceland also, the ordinary type having been taken by me at Reykjavik, and a particularly melanic form having been brought me by a friend from Krisuvik.

The total absence of large, or showy-coloured species is another noticeable fact. Most of the moths are dusky or marbled so as to be undistinguishable from the lichen on the boulder, or from the lava rock when settled, and so escaping detection.

#### POINTS OF SIMILARITY AND DIVERSITY BETWEEN ICELAND AND THE FAROES.

##### *Similarity.*

Absence of trees.  
Houses built of wood.  
Same common genera of Coleoptera, *Nebria Calathus*, &c.  
*Helophilus pendulus* among Diptera, common to both.

##### *Diversity.*

Oats and barley in Faroes. No cereal in Iceland.  
*Tipula oleracea* in Faroes. Not in Iceland.  
Mountain ash, small oaks, willows, sycamores, in gardens in Faroes.  
Only mountain ash in gardens in Iceland.  
Greater warmth of climate in Faroes and productiveness accordingly.  
Potato crops, currant bushes, &c., larger, more abundant and flourishing in Faroes than in Iceland.  
*Caltha eu palustris*, larger and more plentiful in Faroes than in Iceland.  
Larger size of blossoms of *Euphrasia officinalis* in Faroes than in Iceland.  
*Forficula auricularia* in Faroes, not in Iceland.  
Neater paths through fields, stiles, &c.; signs of greater nearness to civilization in Faroes than in Iceland.  
*Narthecium ossifragum*, *Polygala*, *Scabiosa*, in Faroes, not occurring in Iceland so far as my observation goes.

## PART III.

## REMARKS IN REFERENCE TO THE GEYSIRS AND THE FISHERIES OF ICELAND.

*The Geysir.*

On the 11th of July, at 10.30 a.m., the Reverend F. W. Henstock and I started for the Geysir with two guides and eight ponies. Our route, for a considerable time after leaving Thingvellir, lay through an extensive forest of birch and willow. After gaining the summit of a steep rise we halted for luncheon, and at 12.55 started again. At 2.30, after the descent of a long and steep slope, we rested for a short time in the midst of a grassy plain. The mountains immediately surrounding this plain resemble gigantic cinder heaps, diversified by grey lichen in many places of the upper portion of their surface. Geometridæ proved abundant, especially on the first portion of our journey. The weather was cloudy, much cooler and more adapted for travelling than it had been. Up a valley stretching to the left of our line of route we observed a large hole half-way up the side of the mountain, but I had no means of obtaining accurate information how far this cave extended within the hill. We then passed two lakes at some little distance on our right;—during the last part of this day's journey there was a drizzling mist on the mountains. Myrdal farm, the half-way house to the Geysir, is close to a newly-built church of wood, a clean building, where we obtained a comfortable bed, eider-down quilts being brought from the farm for our benefit. The rivulet at Myrdal, as it issues from a dark and gloomy gorge close by, is divided into various sections, encircling extensive beds of moraine, and is known by the name of the Skylandsa. A small green-flowering orchis, *Platanthera hyperborea*, is to be found in tolerable abundance here, as also, subsequently, on the approach to the Geysir, and a small flowering *Epilobium* (*Epilobium palustre*), whose natural habitat is this loose shingle. The only centipede (*Lithobius forficatus*) that I have seen in Iceland was discovered by me this evening, under a stone on the wall of the Myrdal homestead.

After a pouring rain, which continued all night and also

into the morning, only ceasing for brief intervals, we started at 10.20 on the 12th July, for a day's journey, which led us through another Icelandic forest of dwarf birch and willow, consisting of trees rather taller than those passed yesterday. We crossed the Bruara river, with its rapids foaming down one chasm above and another below the wooden bridge over which we passed. At 2.10 we took a little refreshment at a farm hard by another church, and left about 3.10, arriving at Muli, a farm 4 miles from the Geysir, at 4.15, and then, after unpacking our provisions and obtaining a good meal, we started for the Geysir and Strokkur, although drenching showers continued at intervals. One of the smaller basins (the little Geysir, I believe) erupted a fountain of boiling water, ranging from 2 to 10 or 12 feet for several minutes continuously. Other natural cavities held water bubbling, surging, and moaning, as though in constant struggle to escape. A strong sulphureous smell pervaded the vicinity, and there were red pits and steep banks of thoroughly baked soil. Around the edge of the basin of the great Geysir was a deposit of sinter which, as continually receiving accessions at each overflow, is ever augmenting the heap. The flowers that I noticed as flourishing in closest proximity to the boiling springs are *Parnassia palustris*, *Armenia maritima*, and especially *Thymus serpyllum*. *Geometridæ* and *Crambidæ* were very abundant again this evening, but damaged in the catching; the vegetation was in such a soaking condition. The farmer to whom the ground surrounding the Geysirs belongs told us that the great Geysir would probably go off in the night; but we discredited his statement, considering it only a device to get us to lodge at his farm, and so we returned to Muli.

Two very widely distributed, and, I may add, representative flowers of Iceland, buttercups and the blossoms of *Matricaria inodora*, which closely resemble an oxeye daisy, were sewed up in the mouth of the trout we had for breakfast. Next morning we started a second time for Geysir, and heard from a farmer, whom we met riding along the valley that skirts the base of the Geysir and Strokkur hill, that Geysir had gone off at 5 A.M. to the height of 200 feet. Whether he or anyone else was there at the time to see it go off, and could positively testify that it reached that height, is another matter, but that it had gone off recently I feel convinced, as, on arrival, I noticed the slope still streaming with fluid, containing thick deposit, as though sundry milk pails had been overturned. The inky-black and deep cobalt-

blue of the water below the surface of the pools of Blesi, as well as their white calcareous rocks far below their subaqueous depths, present marvellous beauty of colouring. Some distance beneath may be descried a natural arch of stone, that at first sight appears to be a dividing wall, and may possibly have been formed by successive deposits of incrustation; but on looking carefully the waters will be seen to be united below as well as above. There is also a small channel in the surface of the rock that extends from the tops of the pools of Blesi in the direction of the great Geysir. The water of Blesi and that of the great Geysir are too hot to bear one's hand in more than momentarily, but that of the latter is not at all amiss to taste, having only a slight burnt taste, when it has cooled a little. A small overflow of the great Geysir did take place after our arrival, the fountain, accompanied by clouds of steam, rising probably to the height of 10 feet. Warned by the rumbling of the ground, like pistol shots, beneath where I was standing, I was the first to call the attention of Mr. Henstock and the guides to the fact, and we thought it was about to erupt a second time, but it only proved to be the usual after-flow previous to its finally subsiding into its basin. Another small spouting of the little Geysir also ensued, similar to the one it displayed last night. Strokkr consists of a circular well-like rocky opening, level with the surface of the very gradual slope, inferior in elevation to the basin of the great Geysir, but above the little Geysir, and its bubbling water is several feet below the opening, except during the few minutes of eruption, whenever it occurs, and which we strove in vain to bring about by the usual method of having a quantity of turf brought up on pony back from the valley beneath, and cast in; but in spite of all our efforts, it remained quiescent, and is commonly reported to have been choked by an overdose of stones and earth last year, administered, according to some, by some Americans; though the farmer, on whose property it stands, charges a well-known guide, who, however, I have heard strenuously deny it, with having done it. The well of Geysir is situated in the very middle of its steaming basin, which is upwards of 40 feet across, while the well itself may possibly be 6 feet in diameter; the ground, of course, gradually shelving down from the circumference towards it. When photographed, together with its basin, I took my stand firmly on the very edge, only about 3 inches from the hot water. There were any number of *Noctuæ* flitting about, and also frequently settled on the



wild thyme, which is the flower that these insects most affect, by reason of its delicious fragrance. They consist, however, probably of only about half-a-dozen species. I secured a large number, but only having a killing bottle with me, as I did not reckon to find much at the Geysir, unfortunately all my specimens got violently shaken, and so hopelessly spoiled during the return ride. The weather turned out much better and more enjoyable to-day, as there were only small occasional showers in the evening, and no rain at all after 1 P.M. The sun shone brightly, and the day proved a very hot one. In the evening we started on our return journey, leaving Muli at 6.45, and reaching Myrdal at 10.5, where beds were again made up for us in the church.

The 14th July was another bright morning. We reached Thingvellir once more, shortly after noon, while the Icelandic service was in progress at the church.

The 15th July was a bright fine day, and we caught *Larentia cæsiata*, which species has recently appeared in full force, and some *Noctuæ*, in the direction of the Lögberg, where an English-speaking guide, who was waiting at Thingvellir for an English gentleman from the north, pointed out to me some embryo shoots of Iceland moss. At 6.40 we started on our return to Reykjavik.

### *The Fisheries of Iceland.*

Any account of the principal industry of the country on which the whole of the population depends for its subsistence is manifestly intimately connected with the characteristic features of Iceland. Not only may many boats be seen out at sea engaged in the capture of fish, as well as returning to shore laden with the produce of the deep, but the beach itself is dotted at almost every landing-place with fish, in all directions, spread out on the shingle to dry. During the brief summer season, when alone may be obtained the abundant harvest of the finned and scaly creatures, nearly every available hand is employed in the requisite work, little mites of children wading into the water, and clambering into the approaching boats, and thence emerging with the fish (rock-cod, as a rule) piled on their heads. Then the women proceed with the work of cleaning, spreading out, flattening with heavy blows of a wooden mallet, temporarily piling up in a small stack by the side of the road, or on the moor, packing in a warehouse, between layers of salt, all the

produce that their fathers, husbands, and brothers have just obtained. A large proportion of the fish thus taken is subsequently exported on board the passing steamers to Scotland, England, Denmark, France, and last, not least, Spain. The Spaniards are especially reputed to be great consumers of fish from Iceland, and the markets of Western Europe are thence supplied to a greater extent than from any other place. All the captures of course are not conveyed on board the periodical steamers; there are English, American, Danish, Norwegian, Faroese, French sailing vessels in and around the different fjords, that remain there for a month or two at a time, July and August, for example, while the fishing lasts, and then stand off home again with their cargo. The fishing banks round the coast of Iceland are far too lucrative to be altogether in the hands of the natives, and men like Geir Zoega, the head of the well-known family of Zoega at Reykjavik, that has furnished so many guides to the passing visitor, and is of Italian extraction, find it profitable to buy fish from the boatmen there, or from the farmers up country, warehouse them in a large shed erected for the purpose at the end of Vesturgata, or West Street, close to the landing-stage at Reykjavik, with each layer duly salted, and thence send it abroad. Mr. Paterson, the genial and pleasant Scotch Consul, residing at Hafnafjord, also engages in the same trade, and constructs his own packing cases in the wooden building wherein he stores his fish, and the member for the Westmann Islands has also, I believe, gained money by the same profitable business in his insular home; but Zoega does the largest trade in this way. A large number of fish, moreover, is stored up by the natives for their own winter consumption; their ponies, as well as themselves, are fed to a great extent on the cod heads, which are, as a rule, not eaten by ourselves, but all the same are reputed to contain a great deal of nutriment, and it is a very ordinary sight to behold an up-country farmer jogging along on his shaggy pony with a string of cod heads round the animal's neck.

The first glimpse that I had of the staple industry of Iceland was off Kaupstad, the largest of the Westmann Islands, towards the evening of July 3rd, when four cod were hauled on board from an Iceland fishing boat for our consumption, for the sum of 60 ore = 8*d.*, about one-third of the price they would fetch off Southport Pier. And the same sight greeted me, only on a far larger scale, as I landed at Reykjavik harbour, on the morning of the following day. As the invariable rule in Iceland is to strew the beach with

the heads and refuse of the numberless fish that are taken, which are successively turned over by the advancing or receding tide, and anon sweltering in the sun, and spotted with blue-bottles, it may be imagined that the odour of fish, fish, multitudinous fish everywhere, as well as its sight, is far from pleasant. In the outskirts of Reykjavik, on the beach, over most of the walls, on the boulders of the moor, are any number of cod spread out to dry, and in piles under boards covered with big stones at the top.

On the eider duck island of Engey, in Reykjavik Bay, a precisely similar sight may be witnessed, as a fish curing factory has been erected there, a very short distance above high water mark, and cod are everywhere on the rocks and walls drying. Fishing is occasionally engaged in in the winter at Reykjavik, and even beneath a blinding snowstorm, by those who act as guides in the summer, as though the eastern fjords are then impenetrably locked by ice, and the northern ones also, the weather, as subject to the influence of the Gulf stream, is milder off the W. and S.W. coast. But the real harvest, as I previously stated, is during the short-lived summer.

Although the vast majority of captures consist of rock cod, many haddock are also taken, and these may readily be distinguished from the former fish by a dark dorsal line, one on each side of the vertebræ. I have elsewhere stated that what are known as the Places under the Jokull, in other words, the west coast on the north side of Snaefell, used to be the best fishing ground in the west of Iceland, but that the cod have now left that place. Without doubt, moreover, the introduction of steamers has given an impetus to the export trade. The member for the Westmann Islands, a cheery, typical Icelander, in the course of conversation with me, bore witness to the wholesale destruction of salmon, haddocks, &c., by the gulls, and wished that thousands of the latter could be destroyed. The mention of salmon leads me briefly to advert to the fresh-water fish of Iceland. An Icelandic fishing club has been formed, and some of its members who have visited Iceland for two or three seasons past were fellow passengers with ourselves on board the "Magnetic." Two brothers (one of them a clergyman) of the name of Darley, and who had rented these salmon streams communicating with the Borga fjordr, a Mr. and Mrs. Armitage from Manchester, and a Mr. Austice. All the above belonged to the said fishing club, and all, with the exception of Mr. Austice, had previously visited Iceland. The fortune attendant on

the fishermen who rent these salmon streams is, of course, variable in different seasons, and in different rivers. This year the greatest success was obtained by Mr. Murphy, who rented the so-called Thomson's river, from the fact of its belonging to a thriving merchant in Reykjavik. About sixty salmon and salmon trout were captured by his rod in this river, which is on the road to Thingvellir, and about four miles distant from the capital, and he kept our dinner table at Hotel Reykjavik well supplied by this means.

Fish abound likewise in some of the lakes, and in the rivers, more especially near their point of contact with the lakes, and trout and char therefore are frequently obtainable at Thingvellir parsonage, and at the farm houses between that place and the Geysir. I was anxious to fulfil my promise to Dr. Gunther, of the British Museum, to bring him back, if possible, an Icelandic char in spirits, as believed to be a different variety from that of other countries of Europe, but failed to do so, although I communicated with the minister at Thingvellir on the subject; I believe he would have done all in his power to help me, but the fish in question were more abundant a few weeks later in the season, in August instead of the middle of July, and likewise more plentiful at the southern end of the lake and its adjacent stream ten miles away from its northern boundary, close to which we were lodged for two or three days. I saw, however, some large ones rise towards evening, probably at the Phryganidæ, one species of which, *Limnephilus picturatus*, is very abundant near the confluence of the river with the lake. In the neighbourhood of Stykisholm on July 28th, and in that of Patreksfjord on the following day, dolphins were seen to leap repeatedly out of the water, projecting themselves several feet into the air, with their silvery underside uppermost.

If I recollect rightly, it was at Arnarfjordur that I first experienced the very disagreeable scent of train oil and shark oil, which is stored up in barrels on the beach and along the landing places of so many northern Icelandic fjords. On some occasions the stench seems to permeate one's cabin, and almost to be tasted at meal time, and I narrowly escaped being thoroughly upset in consequence. Stacked up in one place at the said Arnarfjordur, as well as lying about on either side of its factory of Biloudalr, might be seen the huge and massive bones of a whale, somewhat odoriferous, it must be owned. Further along the coast I hear we shall come across two whaling companies, by whom

the bones are turned to good account, being ground down to serve for the same purpose as guano. The whale above mentioned may have been hemmed in by the ice, and so got aground, or, being a *Balæna* (rorqual, in other words, and so without teeth), may have been pursued to land by what is known as the whale of prey, with teeth, namely, the Cachalot, Greenland, or sperm whale.

Dyrafjordr was the next place I visited, and there are many large bones of whales at this place also. One of the two Norwegian whaling companies is established here, and makes a great deal of money by shooting whales, which are rapidly diminishing in number accordingly. On the last expedition they obtained thirty or forty.

At Dyrafjordr also may be seen from time to time vessels of all nations engaged in the cod fishery. English and American vessels are anchored in its harbour at the present time, and have been there most of the summer, and will return home about the middle of August. From one of our own fishermen I learned that they had taken about 30,000 or 40,000 cod this season, and from the conversation of one of the American fishermen with the Danish steward of the "Thyra," that the Americans put down their halibut in salt, and that immediately on their arrival in New York they were dispatched to Chicago and the far west, where there was a great demand for them. Sometimes the prices were low, and on other occasions they fetched a great deal of money. He also stated that halibut sold for 5 or 6 cents a pound, that the very large and fat ones were not so good as those of more moderate size, and that the fins were particularly good eating, and that the English vessel was provided with tanks of water to bring the halibut home alive.

Onunadafjord possesses four smacks engaged in the shark fishery, and a great many barrels of shark oil were brought off to the steamer in a small boat from a merchant's factory this morning, and transferred to the hold. This place is also an emporium for whale oil, but the whaling company, I understand, send it away direct in their own boats, as many as 900 barrels having been sent at one time. The shark oil establishment is situate close to the shore, beneath the hills, not like the rest of the village, on a low projecting point. And we landed here from the steamer this morning in a boat redolent of train oil. The best fishing ground at this present day in the west of Iceland is off a little village known as Bolungarvik.

Hnifsdalr, another fishing hamlet of great repute, is next

passed on the right, and yet another one, Arnardalur, on our left, as we approach Isafjord, where we have to make the greater part of the circuit of the finest harbour in Iceland in order to enter the dock, which is formed by a natural reef. This harbour is surrounded on every side like a deep-set basin, where the sea is almost always calm, by lofty hills. There were a large number of barrels or, more strictly speaking, wooden vats of large dimensions, in close proximity to the beach here, varying of course in size, but several of them large enough for ten, twelve, or twenty persons to stand in comfortably. These are all used for shark oil, and its odour, as the vats in question are exposed to the rays of the noonday sun, is not agreeable.

[The President, Sir G. Gabriel Stokes, Bart., here left the Chair, having to go to Cambridge to fulfil his University duties.]

The CHAIRMAN (Mr. H. Cadman Jones).—It is my pleasant duty to propose that the thanks of the meeting be accorded to Dr. Walker for his interesting paper, and to invite discussion thereon.

Dr. J. RÆ, F.R.S.—As it is so long since I visited Iceland, I came here to listen only, and have been much interested in Dr. Walker's account of that island. I have never been along its coast, but went right across the island, when on the telegraph survey. Like Dr. Walker, I never saw any butterflies, and I suppose the question of their non-existence in Iceland may now be considered settled. The inland transport is really very curious, and the way of getting over the rivers in a box, like a tea-box hung on to ropes, in which you pull yourself over, is not comfortable; the little ponies swim over, and are excellent travellers in every way. We found the people extremely hospitable to travellers. It is not generally known that a great many Icelanders are settling in Manitoba, where they make admirable colonists. They work very hard, and generally place themselves near lakes, where they can combine fishing and farming. They are thriving amazingly well, and are freed from the exceedingly hard life which they would have to pass in Iceland, and their good qualities show to great advantage.

Dr. J. S. PHÉNÉ.—In travelling some 500 miles through Iceland on ponies, my guide managed that we should arrive at a clergyman's house each night. In consequence of my travelling by a new route, I came upon unknown monuments, including the great ship mound, which is in the form of an inverted ship. Tumuli were, I

believe, not thought to exist in Iceland, but I excavated several in the presence of the clergymen, and generally found layers of bones of the ox and sheep—the ox and the sheep bones together in a layer—then an interval, as though perhaps 50 or 60 years had elapsed; and then another layer of ox and sheep bones. These had evidently been sacrificial mounds: they were at right angles with the corners of the old temples, and were evidences of the old Icelandic worship, prior to the introduction of Christianity. Amongst other things, I found upon the ground—not elevated—an ancient gigantic cross, made of seven blocks of lava.

Mr. JAMES LOGAN LOBLEY, F.G.S.—The chief geological teaching of Iceland, beyond the volcanic phenomena it presents, is the wonderful evidences it gives of past glacial action. The cutting of the deep fjords that penetrate the island, on the northern and western sides especially, has been effected by this action. This shows—although it has been said that glaciers are now advancing again on the cultivated lands—that in pre-historic times the whole island was covered by an ice cap such as covers Greenland in the present day, and that this ice cap has gradually made its way to the sea coast, and has broken up into different glaciers, which have cut back the land and penetrated into the sea, and so these great fjords have been formed.

Dr. G. HARLEY, F.R.S.—Although I have not visited the Icelandic geysirs, I have visited those of Montana and Wyoming, in North America, where they are very numerous. I saw no less than twenty play there in one day. The geysirs there are enormously large in comparison with those in Iceland. Some are said to throw up a column of water 350 feet high, and of a diameter of 15 feet. This I cannot vouch for, as I did not measure them; but I measured the outlet of one after it had subsided, and it was no less than  $6\frac{1}{2}$  feet. We were told that one went up 300 feet; but, even if we allow for exaggeration, surely a column of water 6 feet in diameter, going straight up into the sky even 150 feet, is a marvel. Now the interesting point about these geysirs is their periodicity—they are almost life-like things. Everything they do is periodic, although not always regular. One of them, called "Faithful," plays regularly every 50 or 60 minutes, and it has played at that rate for the last seven years without a single exception. Others

again play only once a day, some of them play every three or four days, others every week, others every month. Then as to the temperature of the water; Dr. Walker has told us that he could put his hand into it in Iceland; but, in the Yellowstone Park, no human being could do so, for there it is at the boiling point. The very ground about the geysirs was so hot in some places that we felt it through the thick soles of our boots. Now what I am coming to is this: it is said that the geyisir in Iceland has stopped because it has been blocked up; I think this is incorrect, I believe it has died. In the Yellowstone Park, a district of 60 square miles, we saw some gradually coming into existence, growing up, as it were, into manhood; in manhood's prime, some gradually getting old and effete, and dying. Some were dead, and others not only dead but, if I may use the word, eviscerated. One of them had been dead for years, and my son and his uncle went down into it, and walked about in a large space beneath the surface of the earth, and they might have penetrated into chamber after chamber but that the carbonic acid gas was too strong to permit it. Now, I fear that Strokkur has just worked itself out. It may come to life again. But I think it is unlikely, because, as far as we could see, those that had completely died never seemed to resume operations, but others took their places at a little distance from them—sometimes half a mile or more, sometimes only a short distance; and so, though I fear we shall see no more of Strokkur, I hope some other will come in its stead.

Rev. J. W. BRAMLEY MOORE, M.A.—From what I saw of the Strokkur I am not prepared to say that it has died out. (The AUTHOR.—I am inclined to agree with you.)

The AUTHOR.—I have to thank you for the kind reception accorded to my paper, which I have tried to make as complete as possible, because no entomological work on Iceland has been published for the past 33 years; about 1856 one was published in Germany, and since then the genera have been so subdivided as to require a new treatment of the subject. With respect to the remarks made on my paper:—As to the geyisir playing, the Icelanders say it is sure to after heavy rains. Then as to the remark by one speaker in regard to the height of the trees, the tallest willows and birch I saw were not over 6 feet high. Then as to the exodus of Icelanders, about 200 Icelanders go out to Lake Winnipeg



every year, where they find plenty of their own countrymen comfortably settled. The population of Iceland, which had increased gradually up to 76,000, does not now number more than 72,000. Another speaker alluded to the fact of Iceland presenting remnants of what Greenland is at the present time. Well, the fact is that early in the fourteenth century there was a period of storms everywhere; Greenland was rendered more arctic, even than formerly, by the violent snow storms, and the west coast of Iceland—the nearest part of that island to Greenland—received a shock of a wonderful character from which it has never thoroughly recovered; because, prior to that date, in feudal times, we know wild apples were found in Iceland. The name Reyda, which signifies the wild crab,\* sufficiently indicates this; it is retained in several places. As to Strokkur, in the summer of 1888 it was in full activity. I do not know whether it has been generally observed to be the fact, but I noticed the very deep pools at Thingvellir are surrounded, as I took it, by cliffs of prehistoric lava; at least, the tradition is that the lava at Thingvellir and Reykjavik is prehistoric. But these pools at Thingvellir, though the colours far within are just the same as at Blesi, have icy-cold waters—icy-cold where once there was a great volcanic outburst and eruption, as is the characteristic of all those springs that once were in a proportional state of boiling heat when forces, now long extinct, were in full play. About the deep fjords on the north and west sides, that is so. Breidifjörður, on the west, and Hunafjord, on the north, come so near to each other that they nearly cut off the north-west peninsula and make it an island. But the southern part of the island, where some of the glaciers are said to be even now approaching the sea, is much less indented than the north and west, and to some extent even than the east.

The meeting was then adjourned.

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\* Captain Burton's work on *Ultima Thule* is my authority for the etymology of Reyda. I have, however, met with those who assign another meaning to the word.—I have since revisited Iceland (June 7 to July 18, 1890), and been twice round the island in the steamer "Laura," and made fresh collections of its flora and insect fauna, and acquired a good deal of miscellaneous information, and was present at the celebration of the one thousandth anniversary of the colonisation of the Eyjafjörður by Helg Magri (Helgi the Lean or Meagre), from Norway, in A.D. 890.—F. A. W.

## THE ORIGIN OF MAN.

REMARKS THEREON

BY

PROFESSOR RUDOLPH VIRCHOW.

As President of a gathering of the German and Vienna Anthropological Societies, recently held in Vienna, Professor Virchow made the following remarks upon *the Anthropology of the last twenty years*; and, considering the many theories in regard to the origin of man that have been put forward, and the far-reaching and somewhat startling arguments that have been founded thereon, even during the past few years, an English translation\* of the calm utterances of so impartial and careful an investigator will not be deemed out of place in this journal.

After alluding to the recent labours of Anthropologists in Germany and Austria, Professor Virchow referred to the importance attached by them to the question of nationality, and said:—

“ You all know that from the Anthropological point of view the question of nationality stands in the foreground: we must always start from existing data; for us things do not float in the air, as with the zoölogists who are concerned only with habitat, which has a second place with us; we Anthropologists begin with nationality; until we know a person's descent, from whom he is derived, and what is his origin, he is not a legitimate subject for investigation. The same is true in examining every human skull.

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\* From the *Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie*.—ED.

For the instant, indeed, even an unknown skull may be an interesting object of enquiry, but from the point of view of scientific research it first receives importance when inserted in a local frame *τίς, πόθεν εἰς ἀνδρῶν*. This is the natural question not only with the ordinary man but also with the Anthropologist. If, for example, we start with craniology, it is exceedingly difficult to make discoverers understand, that what we lack is not skulls, but skulls of definite persons, and definite races. Only with the knowledge of the tribe or the person begins the Anthropological interest. A skull as such, is for us often tedious, even odious, and we either cannot use it at all or only very little. It begins in a manner to exist for us when it confesses its nationality, this is indubitable. But we must not forget that our ideas of nationality are attached primarily to existing relations. This loses its worth the further we go back, till gradually we reach those times, in which nationalities capable of proof are not known at all. Indeed, if we ascend to the prehistoric domain in the stricter sense, every idea of nationality ceases, the thing begins to be abstract. We must first construct a nationality; and finally names are sought for, which, however, are only designations for a certain period, in themselves without worth, and of which a later age will know nothing. When we hear of a race of Cannstatt or of a race of Cro-Magnon, it has the appearance of a profound wisdom; nevertheless, I hope that a time will come when men will no longer speak after this fashion. Even in the present it is often very hard to determine the nationality. To be sure we may succeed pretty well when we visit an island in the Pacific: there nationality is in full bloom, there the people are palpable, there every one knows that he is a national being, with whom one can reckon, and go to work, and it fares with us as with zoölogists, who, from a single animal skull, or at most from a few, can reconstruct an entire genus, at any rate even from a single skull demonstrate the craniology of an entire species. Yes, if we could every time in a single human skull read the history of the whole tribe, that would be agreeable and convenient; but unhappily we only too often fall into the region of variations, and these variations are not seldom so considerable that we lose all basis for the construction of nationalities. Then we turn for recreation to some place in the Pacific which is of more scientific than political interest; there we do indeed find the

*analoga* of the 'good' races of animals, namely, races grown up on a small scale, presenting definite peculiarities, in whom one can see at once what special characteristics they have. They really do possess a definite type of their own.

"Unhappily we can seldom do as much with continental tribes, least of all with those great aggregates, which we choose to call nations in a political sense. It would be the business of days to discuss the question of European nationalities.

"Here I would only observe how little we Anthropologists are entitled to place the point of view of narrow nationality in the foreground of our investigations. We know that every nationality that concerns us—among them the German as well as the Slavonic—is of a composite nature and that no one at present can say from what original tribe they have been developed." (After reviewing archæological progress in Austria and Germany, he continued):—

"I will not say that the present endeavour to fix the origin of the Aryan race in Germany or Belgium, as has been suggested, should be helped by assuming that the race of Cannstatt or of Neanderthal (a long-headed population) represents the central stock. At present we know nothing certain about that. I may perhaps remind you that lately the prehistoric character of that much discussed skull of Cannstatt has been made very doubtful, and that it certainly does not fit into the hoar antiquity to which our French neighbours assign it. This connection must be given up. The difference of view, to which I would call special attention, lies in this, that *archæologically we must ascribe greater importance to international intercommunication in ancient times than has hitherto been done.* In proportion as this conviction gains ground, a higher worth will be assigned to all links in the chain of evidence which shews that civilization has been transmitted in definite directions.

"I personally have greeted nothing with greater joy than the discovery of those great fields of graves, which have been opened under the direction of several inquirers, especially Messrs. De Marchesetti and Szombathy, in the most southern part of the Austrian Alps, on the coast and in Istria. Thereby a significant chain of new links has been inserted into the old system of transmissions. We shall soon have the gratification

of hearing original lectures on this subject. In this place, therefore, I would specially indicate the point—that these discoveries appear most valuable in one respect, that they represent international prehistoric intercourse (not migrations, that we cannot know), and show the ways which civilisation once followed. I believe they will also tend to awaken somewhat greater modesty and amiability in international intercourse, than is sometimes found where the feeling of nationality is over-excited. If the different tribes would learn more to recognise one another as independent fellow-workers at the great tasks of humanity, if all had the modesty to acknowledge the merits of neighbouring tribes also, much of the contention that moves the world would disappear.

“The revolution which has taken place in the department of Anthropological investigation is far greater than that in the department of Archæology.

“When we met in Innsbruck twenty years ago, just at the time when Darwinism had made its first victorious march through the world, my friend, Karl Vogt, who, with his usual vivacity, had thrown himself into the ranks of the combatants, had, by coming forward in person, secured a decided advantage for Darwin's views. It was then hoped that the idea of descent in its extreme form would be victorious, sharply defined and developed, not by Darwin, but by his followers. For it was not with Darwin, but the Darwinists, we had to do. There was general expectation that man's descent from the ape or from some other animal would be demonstrated. This was the claim set up, and posted in the van. Every one knew of it, was interested in it, spoke for or against it; it was held to be the greatest problem of Anthropology that waited solution. Here may I remind you that Natural Science, so far as it is Natural Science, can be concerned only with actual objects. A hypothesis may be discussed, but it only attains importance when actual proofs are brought forward in its favour, either through experiment or direct observation. This, at least in Anthropology, Darwinism has not, up to the present time, succeeded in doing. In vain have the links which should bind man with the ape been sought; not a single one is to be recorded. The so-called *Fore-Man*, the *Pro-anthropos*, which should represent this link, has never yet been found. No man of real learning professes that he has seen

him. For the Anthropologist, therefore, the Pro-anthropos is not an object of discussion founded on fact. Perhaps someone may have seen him in a dream, but when awake he will never be able to say that he has come across him. Even the *hope* of his future discovery has fallen far into the background, he is now scarcely spoken of, for we live not in a world of imagination or dreams, but in an actual world, and this has shown itself extremely unyielding. At the time that we were together in Innsbruck, it seemed as if in the storm it might be possible to prove the course of descent from the ape or some other animal to man. At present, to our pain be it said, *it is not even possible for us to show the descent of single races from each other.*

“It was not then known that it is no easy matter to prove that man is the brother of all other men, and yet men made efforts to teach how all the various races are connected together. Men were inclined, from among the human remains in ancient caves, such as the caves of the valley of the Maas, to select certain skulls and skeletons as normal types, and from these to reconstruct the primeval race. One party said:—‘this race was Mongoloid,’ indeed there were many who asserted this; others declared that primitive men were Australoid; and just as they happened to hold Mongolians or Australians to be the lowest in the scale of races, so, they held, must the first Europeans have appeared. We have not, however, yet found the original European; possibly, he may yet be found. At present we only know that among archaic men none have been found that stood nearer the ape than men of to-day. The ancients were thoroughly well-formed men; they bore no characteristic marks which we do not meet with in the present day among living peoples. There is not a single one of them of ever so degraded a constitution that we could say, *e.g.*, that he shows the lowest form of skull. Twenty years ago little was known of the forms of skulls of the lowest uncivilized tribes.\* That was one reason why men judged somewhat over-hastily. On the other hand there were the boldest ideas of what the physical constitution of low races was. Men had no clear idea of the constitution of the Patagonians, Esquimaux, etc. At present there is hardly one entirely unknown race upon the earth.

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\* *Naturvölker.* Dr. Leitner remarks:—“Literally ‘Nature’s races,’ as distinguished from peoples living in a state of civilization.”—ED.

There is still one single place in the world where there is a slight possibility of new discoveries—that is, in the Peninsula of Malacca. We have an energetic agent at work there. From certain statements, it seems that the natives there may, in some measure, correspond to the demands made for the lowest race. Elsewhere we know them all. Patagonians, Esquimaux, Bushmen, Veddass, Laplanders, Australian, Polynesian and Melanesian islanders, have gradually become known, and of many among them we really know more than of European peoples. If, for example, you compare some of these islanders with the Albanians, I may say that there has been far more investigation into the physical constitution of the Polynesian natives than into that of the several Albanian tribes. So then, all these uncivilized tribes, who stand so low in their intellectual development, have been gradually discovered to us. Of most of them we have seen good typical examples, even in Europe, of whose entire organism the most exact observations have been taken: not a few have died in Europe, and thus have been made the subjects of exact investigation. For instance, we possess more exact investigations of the brain of the Patagonian than of the brain of civilised Asiatic peoples. From all these investigations it is clear that among all uncivilised tribes there is not a single one that would stand so near, or at all nearer, to the ape than to us. But the following is the usual calculation by which the systematic naturalist describes the limit between species and genera. When he finds that the sum of the characteristics of the one equals the sum of that of the other, he draws a line by which both are separated from neighbouring species or genera. But if the sum of the characteristics are unequal, he separates them by a line, making them distinct species or genera. Such a line we always make in favour of the individuality of man. Each living race of men is still purely human; none has yet been found that can be affirmed as ape-like or half-ape-like. This is the great difference of our present experience.

“I will, however, remark, that among men also there is a set of phenomena which has been designated as ‘apish’ (*pithecoïd*). I myself have never been blind to the existence of certain formations, which could not be simply made intelligible as mere disturbances or obstructions in development. For example, to take a special case, the higher apes often display a peculiar

development of the skull, and that in the region of the temples. There, as in man, under the surface among the muscles different bones meet. From below, the great wing of the sphenoid bone with its upper edge is attached to the parietal bone (*os parietale*); the squamosal part of the temporal bone, on which the ear is seated, borders on this part posteriorly, and anteriorly the frontal bone. All four bones converge here in such a way, that the *os parietale* and the wing of the sphenoid bone, lying upon one another hold apart the temporal and frontal bones; they thrust themselves between, so that the latter cannot meet. But in the higher apes the temporal bone often throws out a long process forwards as far as the frontal bone, and thus separates the *os parietale* from the wing of the sphenoid bone. This is a characteristic and extremely striking distinction, which is of great importance, because, as a rule, nothing of the kind occurs in man. There are, however, individual men in whom this phenomenon, usual in the higher apes, is also found. If now we examine in large collections of skulls, and draw up statistics, the result is, that certain races shew this phenomenon oftener than others. So far as our knowledge extends, we are acquainted with three races in whom this occurs not very seldom. In the first place the Australian and the African, *i.e.*, black races; and then the yellow race in the Malay archipelago, especially dispersed over that chain of islands which connects New Guinea with Timor, and to which join on the Moluccas in the North, Australia in the South. I have lately discussed\* a set of Alfuren† skulls from Tenimber, among which this peculiarity appeared in several instances. At the same time another peculiarity was found, which I will briefly mention: it is the enormous formation of the jaw, most prominent in the strongly projecting edges of the arch of the jaw and in the teeth. With this projection (*prognathy*) is generally connected a great curving of the nose inward, not seldom with a very extreme flattening, as though some one had sat upon it; the bones of the nose in some cases had

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\* *Verhandlungen der Berliner anthropologischen Gesellschaft*, 1889, p. 177.

† *Alfuren*, or *Haraforen*, a name given by the Dutch to the wild natives of the interior of Celebes and other islands.



grown together into a single bone, which elsewhere is scarcely found in man. These are forms peculiar to apes, especially to catarrhine apes. The catarrhine nose therefore is a kind of pithecoïd element (*Theromorphy*). This is found more frequently no doubt in certain places, and one might conceive that there perhaps there may have been nearer relations to the apes. Nor is it without importance, that of anthropoid apes, the gorilla and chimpanzee, have their home in Africa, the orang and the gibbon in the Indian archipelago.

“But if you ask further: may not the Australians and African negroes, may not the Malays and Alfuren, be themselves the missing links, which lead to the bridge between man and ape, no one can answer with an absolute No. Why should it not be possible? But from possibility to reality there is a very long step; even all else that constitutes an ape. For it is not merely the process of the temporal bone, the catarrhine nose and the prognathic jaw, that make an ape, but many other characters are necessary to constitute him. *First of all, we can demonstrate an ape from every strip of hide.* No anatomist, I suppose, has ever doubted the fact. Indeed, the distinctions between man and ape reach so far, that almost every fragment suffices for a diagnosis. Here much is wanting to the proof of descent. Hence if I keep in view the problems of the future, I would insist on the necessity, precisely within the regions above indicated, of far more searching investigations in respect to earlier development. As the first and most important requisite I would lay down investigations on a larger scale into *the prehistoric man of Australia.* In Indonesia especially many researches still need to be made. If *anthropologically trained physicians* reside there permanently and carry on investigations, there may perhaps be forthcoming essential and important evidence. But up to the present such evidence is wanting; if we would study the history of man, our evidence is limited to what is offered by the ancient graves, a couple of caverns, the lake dwellings and the present time.

“I must not, however, conceal from you that the investigations of all known burial-places and lake dwellings and caves have always revealed to us men of whom we need not be ashamed. We can recognize them as full brothers. Through the kindness and help of Swiss colleagues, it was possible for me to make a com-

parative investigation of almost all extant skulls from the Swiss lake dwellings; with the result that at the time of the lake dwellings we meet with distinctions between various tribes which probably followed one another on the scene. But among these tribes not a single one is found that would be outside the lines of the physical form of peoples of to-day.

“ At present we cannot say whether all races come from a single human pair or from many. That is not a subject of knowledge in the domain of Natural Science. We must, therefore, leave it to each one to decide that for himself. We make no objections to one who, on religious grounds, decides for a single human pair. We must acknowledge the possibility that all races and tribes, by change, may have come from one human pair; but it has not yet been demonstrated that negroes came from white ancestors, or that a white posterity came from negroid ancestors. That has never been seen. No object of actual observation shows such a change. Where a black race is found, there the naturalist assumes black ancestors; and where a white tribe appears, the natural presumption is that it always was white. Yet that is a presumption that cannot be directly proved. The proof is wanting that a people or a tribe can be so changed in its physical constitution.

“ We see this in Egypt. I thought that I could obtain some evidences of the change of the Egyptians in historic time by comparative investigation of the living with the remains and likenesses of the dead. I returned with the conviction that, so far as historical and prehistoric evidences reach, so far as man has been discovered, ancient Egypt and its neighbouring lands have not essentially changed their populations. If Menes really existed, he certainly saw negroes; for very ancient wall-pictures portray the negro and his unmistakable physical individuality. The real Egyptian people offer few *data*. The Egyptian of to-day possesses just the form of the ancient Egyptian. Unfortunately, Egyptian skulls and skeletons do not carry us back as far as desirable. As yet, no prehistoric skull has been found in Egypt. As yet, no one has ever seen a skull contemporaneous with the first three dynasties. Hence, there is no possibility of direct verification. Still, the verification with positive certainty does go quite far back, beyond 3,000 B.C.; that is, 5,000 years from the present. During this long time the only difference that has appeared is

that between the brachycephalic man of the old empire and the dolichocephalic and mesocephalic man of the new empire. At all events, the definite proof is given, that, from the beginning of the new empire (1,700 B.C.), no change of type worth mentioning has taken place. Thus the permanence of types is assured for at least 35 centuries.

“There is nothing improbable in assuming a certain influence of climate and occupation. *In this there is no difference between the severest orthodox and Darwinists of purest water.* Their thesis is the same. The one goes back to the first man, the others go beyond the first man to the nearest pair of beasts. That is the only difference. Both assume the transformation of the original man into various races. But the one cannot scientifically prove its thesis for man, nor can the others prove their thesis for the ape. If you ask me, Were the first men white or black? I must say, I do not know. We have no proof for such a decision: there is no place in the world where this has been made clear. That, for instance, in France in the time of the Troglodytes, pure negroes with curly hair existed, and that from these came white, straight-haired men, is not provable. Besides, I cannot discover how and where that could have taken place. The most ancient objects display great diversity. It sounds very plausible to say that the North makes men blond. But in America, where similar relations obtain, it has not made men blond. Not only the old Germans, but also the Finns, of Mongolian origin are fair; how they have become blond while the other Mongols remain black or very dark, is a question we cannot answer. It should not be forgotten that the linguistic elements stand in no correlation with the external physical appearances. On the contrary, they are to each other like the frontal process,\* which may come out strongly as the only characteristic, without its following that all other characteristics correspond to this peculiar one. So one cannot say that behind a clear skin the same arrangement of the internal organs is always found. There may be great differences.

“On this point I have, from the first appearance of Darwinism, endeavoured to modify the teaching of heredity. I recognize

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\* *Stirnfortsatz.* Frontal prominence.

heredity, but I have always insisted and do now insist that, *with man, all heredity is partial. A general heredity in the zoological sense, where all characteristics are preserved from generation to generation, is not to be found among men.* If botanists have begun on the basis of local variations to make subordinate divisions, to fix individual sub-species within the same species, variations with inherited characteristics, nothing is easier than out of these sub-species to make new species. But this circumstance, that within the same species many individual variations occur, and that within the same species some peculiarities are transmitted as inherited, only proves that *the same individual may inherit various heredities.* Thus it is known that one may inherit peculiarities from father and from mother, and so unite in himself a *double heredity*; he may show peculiarities that correspond to the characteristics of his grandfather or grandmother, whilst he shows other characteristics that belonged to his parents. *In the same individual there is united a sum of partial inheritances, which are limited to smaller or greater parts.* There may be many such portions, but that all portions agree cannot be proved. Only with twins does it sometimes occur that, except by the most careful observation, they cannot be distinguished. When they are distinguished, it must be by special marks." (After referring to one or two examples of heredity, Professor Virchow continued):—

"We do not know certainly how far the sphere of heredity reaches. By reason of this uncertainty the matter of human relations is very largely complicated. That, for instance, human development may be influenced by climate and other circumstances of life, is probable, although at present no cogent reasons prove that existing men were able to change themselves wholly. We know of no fact that proves with certainty that the local climate could change any men to that form of man native there.

"Thus far have we retreated in our knowledge. You will say, That is strange! in the last twenty years you have gone back, you know less than the people of twenty years ago! I agree that, in fact, we know less, but it is our pride that we have so far clarified our knowledge that we know what we really know. Twenty years ago men did not know so much; they only 'believed they knew.' We have now made this pretended knowledge the subject of scientific test. Natural Science has taken possession of its domain,

and we can now say—Much that was formerly set forth is no more allowable; it has continued in faith, but to Science it does not belong.”

\*\*\* To the Reverend Professor J. E. B. Mayor, M.A., of Cambridge, special thanks are due for his generous and valuable aid in regard to the foregoing translation.—THE EDITOR.

## ORDINARY MEETING.\*

THE PRESIDENT, SIR G. GABRIEL STOKES, BART., M.P., P.R.S.,  
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced by General G. S. Hallows, *Acting Honorary Secretary*:—

MEMBERS:—The Ven. Archdeacon Gibson, M.A., South Africa; Rev. W. T. McCormick, M.A., F.R.G.S., Brighton; Rev. J. Oxley Oxland, South Africa.

ASSOCIATE:—Rev. W. L. Paige Cox, M.A., Birkenhead.

The following Paper was then read by the Author:—

*THE DISPERSAL OF PLANTS AS ILLUSTRATED  
BY THE FLORA OF THE KEELING OR  
COCOS ISLANDS.* By H. B. GUPPY, M.B.

THROUGH funds placed at my disposal by Mr. John Murray, I was enabled last year to take advantage of the invitation of Mr. G. C. Ross to make a short stay in the Keeling or Cocos-Keeling Islands. As it happened, however, I remained there nearly ten weeks, and amongst other things devoted my attention to the subject of this paper. It will be seen that I obtained much valuable information from the proprietor of these islands, that I owe much to the courteous assistance of Dr. Treub, the Director of the Botanical Gardens at Buitenzorg, and that I am especially indebted to Mr. Thiselton Dyer, Professor Oliver, and Mr. Botting Hemsley with respect to the examination of my collections at Kew. Mr. Hemsley examined my specimens in the light of his extensive experience in this department of Botanical science; and it will be at once perceived by those interested in this paper that my part has been that of a collector and an observer. Having, however, previously paid some attention to this subject in the Solomon Islands, I was to some

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\* February 3rd.

extent on familiar ground, and many of the littoral plants of Keeling Atoll were in truth old acquaintances of mine.

My remarks will refer almost entirely to the original plants of these islands, and I shall endeavour to describe the early condition of the flora before the final occupation of the group by man between 60 and 70 years ago. At present the original plants are being rapidly exterminated by the cultivation of the cocoa-nut, so that in a few years' time it would be a very difficult matter to collect the materials for a paper of this kind. According to Mr. Keating (*Holman's Travels*, vol. iv), who left the atoll in November, 1829, after a residence of 12 months, these islands were first occupied by Captain Le Cour, of the brig "Mauritius," in 1825. When Captain Ross, the grandfather of the present proprietor, established his family there a year or two afterwards, he found, according to Mr. Keating, some characters, apparently Arabic, cut on the trees. Not improbably these characters marked the visit of some adventurous Bugis traders, whose prau had been blown there from the coasts of the Indian Archipelago. In fact, Mr. Ross informs me that one of these crafts, with a starving crew on board, had been picked up about 200 miles east of the Keeling Islands. The circumstance that the early settlers in the first quarter of this century found the islands of Keeling Atoll frequented by myriads of sea-birds that have been banished altogether since the final occupation by the Ross family, goes to show that there had been no previous permanent residents on the islands for a considerable period. In truth, after examining the earliest accounts and maps of these islands, I find nothing to show that man has ever inhabited them before the present century. There have been numerous visits, and several ships have probably been lost there; but Mr. Ross assured me, on several occasions, that there never had been discovered any trustworthy evidence of an earlier permanent occupation of the islands; and it cannot be doubted that the original inhabitants would have left some such evidence behind them. I therefore take the standpoint that the Keeling Islands have never been permanently occupied by man before the present century.

This being so, it is remarkable that when these isolated oceanic islands were first settled on, they possessed numbers of cocoa-nut palms. Van der Jagt\* and Keating testify to the great prevalence of these palms in 1829, and Darwin, in

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\* *Verhandl. Batav. Genootschap der K.*, Deel xiii; Batavia, 1832.

1836, remarked that the cocoa-nut tree seemed at the first glance to compose the whole wood. In truth, however, we learn from the early edition of Horsburgh's *India Directory*, which was published in 1809, some 15 or 16 years before the occupation of these islands, that they were "covered with trees, principally the cocoa-tree," and that the navigators who had previously landed here had found "no article of utility except cocoa-nuts." Long before this date, in 1749, when Captain Ekeberg visited North Keeling Island, he described "the whole strand" as "full of cocoa-nut trees," whilst the northern shore of the adjacent islands of Keeling Atoll he referred to in his journal as "overgrown with cocoa-nut trees."\* Hence it is that in the French atlases of last century, and in the early Dutch maps, these islands are nearly always named the Cocos Islands; and this is the name that they bear in a general map of the Eastern Archipelago and adjoining seas which was published at Amsterdam in 1659 (British Museum Press Mark KAR). I have been unable to find any allusion to these islands by their supposed discoverer, Captain William Keeling (1607-1610), in the accounts of this voyage given by Purchas, Prévost, and others. However, the evidence I have above given is sufficient to establish the fact that the cocoa-nut palm had established itself on this isolated group long before its occupation by man. Of this there is further proof.

In a plan of these islands, attributed to Jan de Marre, the Dutch navigator, in 1729, which is contained in the 6th volume of Van Keulen's Atlas, published at Amsterdam in 1753, the principal islands are represented as covered with these palms, and the following quaint remark, extracted from page 19 of this volume, will serve to introduce the second point that I desire to prove. After referring to the circumstance that these islands are low and wooded, possessing *no inhabitants*, but having plenty of cocoa-nut palms, the writer observes that "it would seem that nature herself has produced these trees." This is an exceedingly interesting point, and I cannot rival the simple language of the Dutch author in thus stating it. Before inquiring, however, into the capabilities of the stranded cocoa-nut for establishing itself on a coral island, it will be necessary to remark that the other vegetation of these islands which has been described or referred to by Van der Jagt, Keating, and Darwin, must have mostly occupied the interiors of the larger islands before the

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\* Dalrymple's *Plans and Charts*, No. 475.



occupation. North Keeling Island, where the original vegetation has been less interfered with by the cultivation of the cocoa-nut palm, affords proof of this; and I have further corroborative testimony in the recollections of Mr. Ross, who was also familiar with the accounts given by his father and grandfather of the condition of the vegetation before the islands were occupied. In those early days the thick belt of cocoa-nut palms that covered the strand concealed or disguised, to great extent, the character of the interior vegetation of the larger islands, and thus the early navigators, who sailed by these islands and but rarely landed on them, formed a somewhat exaggerated estimate of the prevalence of the cocoa-nut palm.

There are various opinions as to whether the cocoa-nut is able to establish itself on a coral island. Professor Dana doubts it, and he says: "There is no known evidence that any island never inhabited has been found supplied with cocoa-nut trees" (*Corals and Coral Islands*, 1872, p. 281). This is too sweeping a statement; but all the evidence goes to show that the chances against a drifted cocoa-nut finding a home on a coral island are very numerous. Foreign cocoa-nuts are frequently drifted to the Keeling Islands, where they sometimes germinate; but, as Mr. Ross informs me, the sprouting nut is always destroyed by the crabs. It would, however, be unreasonable to suppose that fortune does not sometimes assist this ocean waif. Supposing, even, that only 50 foreign cocoa-nuts are stranded on the Keeling Islands in the course of a year, and that but one of these is able to develop into a tree in the course of a century, the student of nature would not regard 5000 to 1 as unacceptable odds when the field is unlimited, and the time of the competition practically unrestricted. Of course it must first be proved that cocoa-nuts can germinate sometimes after long immersion in salt-water. After considering the evidence in his work on the botany of the "Challenger" Expedition, Mr. Hemsley considers it "doubtful whether oceanic currents have played an active part in their diffusion;" yet he thinks their "present wide area is partly due to this agency," and he cites the instance of cocoa-nut palms having been found on the Keeling Islands when they were first settled on in the early part of this century. He also quotes Jouan, who holds that too much importance has been attached to the influence of oceanic currents in the dispersion of the cocoa-nut, which requires to be first buried up, or else attached to the soil before it can expect to survive. I shall show in a later part

of this paper that in the Keeling Islands many drift seeds and seed-vessels cannot be protected from the crabs, unless first covered over with sand by the waves in heavy gales; and amongst them we may include the cocoa-nut.

Regarding the cocoa-nut palms as having been originally for the most part confined to the strand of these islands, I come to the consideration of the other vegetation. Through the cultivation of the cocoa-nut the original flora of the islands of Keeling Atoll is now but scantily represented; but I very much doubt whether any of the trees or shrubs have in this manner become actually extinct. Their scanty occurrence, however, is sufficient to explain the fact that I have been able to add several new names to the list of littoral plants collected by Darwin in 1836 (*Ann. Nat. Hist.*, i, p. 337, 1838) and by Forbes in 1878 (*Eastern Archipelago*, p. 42), plants, the absence of which had been previously a cause of surprise to me. Notwithstanding, I should have had considerable difficulty in restoring the original flora of the islands of Keeling Atoll if I had had to depend only on the fragments that yet remain. Fortunately, however, I was able to visit North Keeling Island, lying 14 or 15 miles to the northward. This small island, which was visited by neither Darwin nor Forbes, presents the flora of these islands in some parts of its area much as it was before the Ross family were established in this group. From its examination, assisted by facts supplied to me by the residents, I have been able in some measure to give a general idea of the vegetation of these islands before they were finally occupied by man; but it should be remarked that most of the additions to the flora would have been made if I had never visited North Keeling Island, the visit to that island having been mainly productive in enabling me to form a correct idea of the relative proportion and arrangement of the original vegetation.

Neither Van der Jagt\* nor Keating,† who described the condition of these islands in 1829, allude to the smaller vegetation, and they refer to the prevalence of the cocoa-nut palm in such a sweeping manner that, to avoid forming an exaggerated idea of the matter, we have to recall the remark of Darwin seven years later, that the cocoa-nut *seemed at the*

\* *Verhandl. Batav. Genootschap der K.*, Deel xiii; Batavia, 1832.

† *Holman's Travels*, vol. iv.

*first glance* to compose the whole wood. The Dutch officer, however, was engaged in making a commercial rather than a scientific report to the Netherland Indian Government,\* whilst Mr. Keating was content with giving a general description to Mr. Holman, the blind traveller. However, there can be no doubt that in their time, and in that of Darwin, the cocoa-nut palms formed the conspicuous vegetation. Van der Jagt, however, gives the native Malay names and the uses of a few trees on the islands, names and uses which they still retain, and from his report as well as from the description of Keating, and from a paper on these islands, apparently by Mr. J. C. Ross (*Gleanings in Science*, Calcutta, 1830), I gather that the first residents found several other trees on the atoll besides the cocoa-nut palm.

The plants collected by Darwin in 1836, and enumerated by Henslow in the *Annals of Natural History* (vol. i, p. 337, 1838), are given by Forbes in his *Eastern Archipelago*, where they are supplemented by his own additions in 1878, which included, however, numerous plants that had been introduced in the interval. Darwin, in 1836, observed five or six trees besides the cocoa-nut palms; the two, which he said he did not obtain specimens from, were probably *Pisonia (inermis?)*, as pointed out by Forbes, and *Hernandia peltata*. Amongst my collections in 1888 the following, as identified at Kew, have not hitherto been recorded from these islands:—

*Calophyllum inophyllum*, Linn. Keeling Atoll.

*Thespesia populnea*, Corr. Keeling Atoll.

*Triumfetta subpalmata*, Solander. Keeling Atoll.

*Suriana maritima*, Linn. Keeling Atoll.

*Erythrina indica*, Lamk. Keeling Atoll (perhaps introduced).

*Canavalia obtusifolia*, D.C. North Keeling Island.

*Canavalia*, sp.

*Terminalia Catappa*, Linn. Keeling Atoll and North Keeling Island.

*Barringtonia speciosa*, Forst. Keeling Atoll.

*Sesuvium Portulacastrum*, Linn. North Keeling Island.

*Ipomœa grandiflora*, Lamk. Keeling Atoll.

*Ipomœa biloba*, Forsk (*pes capræ*, Roth). Keeling Atoll.

*Premna obtusifolia*, R.Br. North Keeling Island.

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\* The annual yield of cocoa-nuts for all the islands of Keeling Atoll was estimated by Van der Jagt in 1829 at 431,000.

*Hernandia peltata*, Meissn. Keeling Atoll and North Keeling Island.

*Euphorbia*, sp. aff. *E. thymifolia*. North Keeling Island.

*Casuarina equisetifolia*, Forst. Keeling Atoll (introduced).

Almost all the above are common littoral plants, and *all but three in every probability formed part of the original flora of the island.* The evidence for this statement will be found in a note at the end of this paper.\*

After I have endeavoured to give a general idea of the other vegetation of the islands of Keeling Atoll before man's occupation, I will refer to the plants of North Keeling Island, and then I will proceed to harmonise the facts with my observations on the dispersal of plants.

On the weather or seaward sides of the islands of Keeling Atoll, *Tournefortia argentea* and *Scævola Kœnigii* lined the beach, just as they do at the present time. It is worthy of note that these plants, in places where they are exposed to the full force of the South-East Trade and of the frequent hurricanes and gales, have a very stunted growth. In sheltered situations, as on the lee or west side of the atoll and in a few places bordering the lagoon, they grow to a much greater height, and possess more abundant foliage, and more numerous flowers. These facts go to show that these two plants do not necessarily prefer exposed situations on the weather coasts of islands. They are most frequent there because the waves first stranded their seeds on the weather-coasts; but if their seeds became a favourite food with crabs and birds, they would soon be distributed all over the interior of the islands. As it is, however, crabs and birds do not assist the spread of these plants in any marked degree, and they are in consequence restricted for the most part to the coasts where first they obtained their footing, whence their seeds are drifted by the waves to the coasts of the other islands, or they may be transported, as I shall subsequently show, in the crevices of logs and floating pumice.

A species of *Pandanus* was also frequent on the southern and eastern coasts; but in clearing the ground for cocoa-nut palms, the pandanus trees have been almost entirely removed, and only survive in any number at the South-East Cape, where exposure to the strong Trade and to hurricanes has given them a stunted growth. Bushes of *Pemphis acidula* grew

\* It is of importance that this note should be referred to, because the apparent absence of certain common littoral plants from the flora of this atoll has been a subject of surprise.

on the weather shores, but more often lined the margin of the lagoon, and are still frequent in these situations. Just within the line of these bushes on the shores of the lagoon, but sometimes immediately bordering the water, occurred forests of the Keeling Ironwood (*Cordia subcordata*). At present this tree is only scantily represented, the forests having been destroyed through the agencies of fire and of the axe. Another plant, *Cesalpinia Bonducella*, that grew near the beach, is now rarely to be found. This is evidently the *Guilandina Bonduc* of the lists of Darwin and Forbes.

In the interiors of the islands, and occasionally on their weather and lagoon shores, grew numbers of trees that have had to make way for the cultivation of the cocoa-nut palm, such as *Pisonia (inermis?)*, *Barringtonia speciosa*, *Ochrosia parviflora*, *Calophyllum inophyllum*, *Terminalia Catappa*, *Hernandia peltata*, and *Guettarda speciosa*. Two other trees preferred the shores of the lagoon, namely, *Hibiscus tiliaceus* and *Thespesia populnea*; the first may still be often there observed, but *Thespesia populnea* has been almost exterminated, except in Horsburgh Island, where a few trees still occur. *Barringtonia speciosa* is at present only represented by a single tree in the interior of South Island, and by a few trees in the island immediately north of it. Similarly, *Calophyllum inophyllum*\* is only saved from extinction by the survival of a few trees in South Island. *Terminalia Catappa* is also rare, and like *Hernandia peltata*, *Pisonia (inermis?)*, and *Ochrosia parviflora*, is only represented in a few localities. *Guettarda speciosa* still flourishes in some of the smaller islands, as in Pulu Kumbang. However, generally speaking, the extermination of the trees has been nearly effectual, and it is only here and there that a few survivors occur. Half a century ago the interiors of South and West Islands were largely occupied by tall forests of *Hernandia peltata* and *Pisonia (inermis?)*. These rapid growing trees have hitherto managed to resist total extermination; but the forests are gone and only individual trees remain. This is to be regretted, since the preservation in one island at least of the original flora would have added greatly to the attractiveness of these islands. Even if only the forests of *Terminalia Catappa*, *Pisonia (inermis?)*, *Ochrosia parviflora*, and *Cordia subcordata*, had been preserved in the Settlement

\* The proprietors of the islands have in past years planted in their garden *Calophyllum inophyllum*, *Barringtonia speciosa*, and some others nearly extinct in the state of nature.

and Direction Islands, where they once thrived, the lover of nature might have found some consolation for the destruction of the rest.

Now and then, however, the old order of things asserts itself, as when newly formed tracts of sand, which have been added to these islands, receive their first vegetation. A coarse grass, assisted by such creeping plants as *Ipomœa pes capræ*, *Triumfetta procumbens*, and *Triumfetta subpalmata*, first clothes the surface, which is soon after occupied by bushes and young trees of *Tournefortia argentea*, *Scaevola kœnigii*, and *Morinda citrifolia*, over the foliage of which *Ipomœa grandiflora* frequently spreads. When these islands were first occupied, *Morinda citrifolia* was scantily represented; but having been re-introduced for commercial purposes, which have been long since abandoned, it now threatens to over-run every island.\* . . . . A tendency to return to the original condition of things is again to be seen in the localities where the observant eyes of the proprietor or of those under him have not been cast for some time. For the crabs, who ably assist Mr. Ross in keeping all vegetable intruders out of the islands, as I shall subsequently show, sometimes turn against him in the war of extermination, and do their best whilst storing the fruits of *Hernandia peltata* and other trees in their holes in the ground, to scatter the seeds far and near over the surface of the island. Hence the recrudescence of the *Hernandia* in islands not visited for some time, and the subsequent wrath of the proprietor. . . . . Before proceeding to refer to North Keeling Island, mention should be made of *Casuarina equisetifolia*, introduced into the Settlement Island more than half a century ago by the grandfather of the present proprietor, and now spreading by natural means. Reference should also be made to another tree, *Suriana maritima*, which within the last 20 years has established itself through natural agencies on the weather margin of Gooseberry Island.

North Keeling Island, the vegetation of which I will now briefly describe, as I have before observed, has never been visited by a naturalist. It is a small atoll rather over a mile in length, and has an opening on its eastern side leading into a shallow lagoon. Its soil is richly impregnated with guano, and great numbers of frigate-birds, boobies, gannets, and other sea-birds, still occupy parts of the island. The effect

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\* It was thus overlooked by Darwin in 1836, but recorded in 1878 by Forbes.

of this is seen in the unusually luxuriant growth of the vegetation that clothes its surface.

Covering the flats on the shores of the lagoon, where they are overflowed at high tide, we find *Sesuvium Portulacastrum*. Immediately bordering these flats are the bushes or low trees of *Pemphis acidula*; and directly behind them rise the arched trunks of the Keeling Ironwood (*Cordia subcordata*), which sometimes also borders the water and extends as well into the interior, where most of the larger trees have been burnt or cut down. Within the island, in the localities where the original vegetation has been best preserved, as in the northern part, grow the tall cabbage-tree (*Pisonia (inermis?)*), *Ochrosia parviflora*, *Hernandia peltata*, *Terminalia Catappa*, *Premna obtusifolia*, and *Guettarda speciosa*. In other parts of the island, however, the trees are often barely in sufficient numbers to attest their presence. Formerly, they alone occupied the interior, where the cocoa-nut plantations now thrive. Amongst the trees originally found in the island, as I have previously remarked, was *Morinda citrifolia*. Of late years it has been spread so rapidly by fowls as to become a nuisance. The Papaw tree, introduced by the proprietor many years since, is now being distributed all over the interior by the same agency . . . . In the last place I should refer to the vegetation of the weather coasts where *Tournefortia argentea* and *Scaevola Koenigii* line the beach. Spreading over the foliage of the trees near the sea we observe the climbing leguminous plant *Canavalia obtusifolia*.

I come now to refer to the fact that several familiar littoral trees have not succeeded in establishing themselves in the Cocos or Keeling Islands. We notice their drifted seeds germinating on the beaches, but we do not find their names amongst the flora. It is a remarkable circumstance that, although the low, muddy, lagoon-shores of all these islands are very well suited for the mangrove, the nipa, and *Lumnitzera coccinea*, the place of these widely spread trees is here taken by rows of bushes of *Pemphis acidula* and by the over-arching trunks of *Cordia subcordata*. The fruits of the nipa, the germinated seeds of the mangrove, and the seeds of *Lumnitzera coccinea*, are thrown in numbers on the beaches, where some sprout and begin to take root; but they have never yet obtained a footing by natural means, and never would except through man's intervention. Of the host of other fruits and seeds that are brought by the waves and currents to these islands, many make similar ineffectual efforts to establish themselves. Amongst the stranded fruits that have failed in their attempts;

one recognises some belonging to trees such as *Heritiera littoralis*, *Cerbera Odollam*, and *Cycas circinalis*, which, as we well know, prefer the sandy soil of a coral island. How comes it then, that these trees have not found a home on these islands, though their seeds and seed-vessels drift ashore? In replying to this question, I shall have to draw attention to the necessity, whilst studying the causes of the dispersal of plants, of inquiring into the agencies that destroy the stranded seeds and seed-vessels, and prevent their obtaining a footing. The drifting seed, in fact, is comparatively safe on the open sea, but when it gets stranded on the beaches of the Cocos Islands and begins to germinate, it is at once destroyed by the crabs. Of the 50 or 60 different kinds of fruits and seeds found commonly amongst the vegetable drift on the beaches of these islands, not more than a dozen have succeeded in establishing themselves. The long immersion in salt-water may have injuriously affected some, but the majority are destroyed by the crabs.

I have been informed by the proprietor, that sometimes when a large amount of vegetable drift has been stranded on the beaches, a line of sprouting plants may be shortly observed just above the usual high-tide mark. The tender shoots are soon eaten by the crabs, and in a little time every plant is gone. Many of the seeds that germinate on the beach are beans. In fact, beans, varying in size from those of *Entada scandens* downward, form about one-third of the vegetable drift; but the crabs effectually prevent them from getting a footing. I have come upon stranded seeds and fruits that have been thus attacked and partly eaten.

Many attempts have been made by Mr. Ross to establish the stranded seeds on the islands, but the crabs have nearly always succeeded in defeating his efforts. It was only after many unsuccessful trials that he was able to grow one of the large beans of *Entada scandens* in his garden, where it is now flourishing. A few years since, he made a similar experiment with the seeds of *Calophyllum inophyllum* that had been cast up on the weather beaches. Several hundreds were planted, and many germinated and sprouted; but the crabs destroyed every shoot except one, which survived in a sickly condition.

The square fruits of *Barringtonia speciosa*, which often arrive at these islands in a fresh state, not uncommonly germinate; but only in very rare instances do they escape the crabs. Although this tree has established itself on the islands of Keeling Atoll, it has not yet obtained a hold in North



Keeling Island. However, in August, 1888, I observed two young trees,  $1\frac{1}{2}$  feet high, growing on the shores of the North Keeling lagoon. They evidently owed their preservation, as Mr. Ross pointed out to me, to the circumstance of the fruits having been concealed when germinating by the bed of fine drift pumice that had been deposited on the shores of the lagoon after the Krakatoa eruption. It is probably owing to this, or to some similar accident, such as the heaping up of sand over vegetable drift after a gale, that stranded fruits and seeds, when they begin to sprout, are ever able to escape the notice of the crabs in these islands. Although the fruits of both *Barringtonia speciosa* and *Calophyllum inophyllum* are often washed up on the shores of North Keeling Island, neither tree has succeeded in permanently establishing itself. On the islands of Keeling Atoll, where these two trees have nearly been exterminated to make way for the cocoa-nut plantations, and where the few survivors only exist on sufferance, neither has been able to regain its footing, although unfailing supplies of their drifted seeds and fruits are washed up on the beaches.

In truth, vegetable waifs in these islands meet with a fate as ruthless as that which used to await shipwrecked mariners on the shores of the Pacific Islands. In this work of extermination the proprietor ably assists the crabs. Thus, to take the case of the triangular seeds of *Carapa moluccensis*, which are amongst the commonest fruits of the vegetable drift. Although during their lengthy passage to these islands these fruits are often attacked by the *Teredo* and other boring molluscs, a goodly proportion arrive in an entire condition and often sprout on the beach. Such germinating fruits are not only killed off by the crabs, but also by the proprietor of the islands himself, to whom the tree is not of any value. However, as above remarked, Mr. Ross has sometimes endeavoured to give the ocean waifs a chance. His father tried to introduce the mangrove into Horsburgh Island, the germinated seeds of which often occur amongst the vegetable drift. But the crabs frustrated his efforts in all parts of the island except around the shores of the enclosed lagoonlet where the mangrove survived and is still thriving. Reference has been made to the circumstance that the sprouting fruits of the nipa are always destroyed by the crabs. In consequence, although the fruits drift here in considerable numbers, they have never obtained a hold. I have said so much about the exclusive dealings of the crabs, that it is only fair to them to add, as also pointed out by Mr. Forbes, that they are important

though ignorant agents in distributing over the islands the seeds and fruits of trees already established there, such as those of *Cordia subcordata*, *Hernandia peltata*, and *Morinda citrifolia*. When these seeds germinate amongst the vegetation in the interior of the islands, they often escape the attention of the crabs: whereas, when they attempt to sprout in full exposure on the beach, they can rarely evade their notice, unless they are concealed by sand or pumice.

Since the occupation of these islands about 62 years ago, the frigate-birds, gannets, boobies, and other sea-birds, that once nested here in myriads, have been driven away; and in consequence one of the important agencies of seed distribution no longer exists. So many disturbing elements, in fact, have been created in these islands, during their occupation by man, that even if the group was deserted for ages, the ancient condition of things could never be restored. By accident or design, a great number of strange plants have been brought here through human agency. A brief comparison of the lists of the flora made by Mr. Darwin in 1836 and by Mr. Forbes in 1878 will at once convince those interested in this subject that such is the case. But more important still, many mammals, birds, and new insects have been introduced accidentally or intentionally during the last half century, which have exercised a very noticeable disturbing influence in the plant-life of these islands. Sheep, deer, cats, rabbits, pigs, rats, fowls, &c., now play, or have recently played, an important part in the floral economy of this group by distributing some plants and exterminating others. For instance, as already observed, the fruits of *Morinda citrifolia* are eaten by sheep, deer, fowls, &c., and the seeds pass unharmed through their digestive canals and are voided in a fit state for germination. Hence, the tree is spreading with great rapidity all over the islands, and is a cause of much trouble to the proprietor. In North Keeling Island the Papaw tree rapidly increases in numbers through the agency of fowls in a similar fashion. In a like manner fowls have been the means of spreading another introduced plant, *Canna indica*. Some years ago, a cassowary that was kept on the Settlement Island, was a very efficient distributor of seeds. The fruits of *Ochrosia parviflora* were his especial favourites; and, as a consequence, the undigested seeds were scattered everywhere, and the young trees became so numerous that they had to be destroyed. As an example of the manner in which the struggle for life amongst the animals may affect the survival of plants, I may refer to the circumstance that

for many years rabbits found a home in Horsburgh Island and in North Keeling Island, and played their part in the distribution of seeds. They have now been exterminated in the latter island by the Cocoa-nut Crab; and in Horsburgh Island the crabs have nearly succeeded in destroying them all.

I now come to consider the means by which this group of the Cocos or Keeling Islands received its original flora. My observations in this locality, as well as my previous experiments in the Solomon Islands, throw much light on this subject. First, with regard to the common littoral trees, *Scaevola Kœnigii* and *Tournefortia argentea*, which, as in the Pacific Islands, line the beaches on the weather coasts. It is often difficult to ascertain whether the seeds of these trees have been brought from distant regions by the currents or whether they have been derived from the trees already growing on the coasts of these islands. However, there is no doubt that the fruits of *Scaevola Kœnigii* will float in sea-water during a considerable period. Some ripe fruits, that I picked off a tree, continued to float buoyantly after they had been kept for 50 days in sea-water, losing during the early days of their immersion their white fleshy covering. Notwithstanding this long immersion, nearly all the seeds readily germinated after having been sown out by Dr. Treub at Buitenzorg. (The series of experiments commenced by me in the Keeling Islands and completed by Dr. Treub at Buitenzorg are given further on in this paper.) Although doubtless usually transported directly by the currents, the seeds of *Scaevola Kœnigii* are probably at times carried about in the crevices of floating pumice and logs.

By a similar experiment I found that the freshly-picked fruits of *Tournefortia argentea* remained floating after 40 days in salt-water. During the first fortnight these small round hard seed-vessels split into halves and lost their outer dark skin, this being the condition in which they are found in the vegetable drift. Seven of these hemispherical seeds were subsequently sown out at Buitenzorg, and all readily germinated. But there is another means of transport for the seeds of this wide-spread tree. They occur in considerable numbers on the sand in the vicinity of the trees, and in this way often get into the crevices of stranded logs and pumice. I found an old log beached just above the usual high-tide level on the weather coast of one of the eastern islands. It was thoroughly honeycombed by the Teredo, long since dead, the empty cavities being largely filled with sand, fine

pumice, pebbles, a little mould, and a very considerable number of the seeds of *Tournefortia argentea*, with a few other small seeds. There were no trees in the vicinity that could have supplied the *Tournefortia* seeds, and it was evident that this log had been washed away from some other part of the coast where it had been lying for a long time near a *Tournefortia* tree. During unusually high tides and gales; sand, seeds, and pumice had been washed into the empty burrows of the *Teredo*; and after a time the log was swept away and stranded in its present position. I examined some other honeycombed logs, just beached, in which the *Teredo* was still fresh, though dead. No sand, pumice, or seeds occurred in their cavities.

Mr. Ross informed me that not infrequently, later on in the year than the time of my visit, he has observed the seeds of *Pemphis acidula*, *Scaevola Kœnigii*, and *Triumfetta procumbens*, sprouting from pumice on the beach. The pumice is generally old pumice drift which has been washed up during gales under the littoral trees, where it becomes partially covered with sandy soil and leaves, and seeds often drop into the crevices. When such old pumice is carried off by an unusually heavy sea and stranded on another part of the coast, the seeds often germinate, but the crabs soon bite off the shoots. I have never found seeds in recently-arrived pumice, though I have observed grass growing in the cells of pumice that has lain a long time on the ground. It is, however, easy to perceive from the foregoing remarks how logs and pumice that have been lying for some time on the shores of an island under the shadow of littoral trees, may often be swept away into the open sea and carry seeds in their crevices over a wide extent of ocean.

The numerous *Pandanus* seeds that occur in the vegetable drift on these coasts in certain times of the year, at once explain how this tree originally reached these islands. The origin of some of the littoral trees does not admit of so easy an explanation. Take, for instance, *Suriana maritima*, which, in spite of the circumstance that it is found on nearly all tropical shores, both insular and continental, has only *established itself* here within the last 20 years. It is not included in the lists of Darwin and Forbes, and the Cocos Islanders take such an interest in the plants of their atoll that there is no reason to doubt the recent appearance of the shrub on the weather side of Gooseberry Island. Its seeds are small, rather soft, and are ill suited for drifting on the sea, since they sink after floating between two and six days.

Probably enough they were brought here in the crevices of a drifting log. Why is it, however, that these insignificant seeds have not germinated here successfully before?

Many of the trees that originally took a prominent place in the flora of these islands have been long known to be distributed by the ocean currents. Thus, the drifting fruits of *Barringtonia speciosa*, *Calophyllum inophyllum*, and *Terminalia catappa* are very commonly stranded on these islands, and I have already referred to the fact that those of the two first-named trees have been found germinating on the beaches. The Ironwood tree (*Cordia subcordata*), which is widely dispersed in the Indian and Pacific Oceans, is evidently distributed by ocean currents. Its fruits, which are frequently transported by the sea to these islands, float for long periods on its surface, their corky or suberous outer covering eminently adapting them to withstand immersion.\* It is necessary, however, before they are fitted for flotation, that they should first lie on the ground for some time, in order that they may become dry and lose their thin green skin. Such fruits I have found to float buoyantly after remaining 40 days in sea-water; and after the experiment 7 fruits were sown out at Buitenzorg; 10 out of a total of 28 seeds germinating. If, however, the experiment is made with ripe fruits, freshly picked from the tree and still bearing their outer skin, most of them will become rotten and sink in from two to four weeks, and only a small proportion will survive. *Pemphis acidula* is often associated with *Cordia subcordata* at the borders of the lagoon. Its small seed-vessels sink when freshly picked, but after a fortnight's drying they will float between two and five days, a period, however, quite insufficient to explain the wide distribution of this small tree or bush over the coral islands of the Pacific and Indian Oceans. Its seeds, also, are very small and ill suited for drifting on the sea, although they float, whilst the seed-vessel, when freshly picked, sinks. Probably, sea birds are the agents mainly engaged in its distribution. It is on the bushes of *Pemphis acidula*, bordering the lagoon of North Keeling Island, that the frigate-birds and boobies nest in thousands, and it is of the small sticks and twigs of this bush

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\* A corky covering is commonly found to invest fruits and seeds that occur in numbers in vegetable drift, as in the case of those of *Terminalia catappa*, *Scaevola Koenigii*, *Guettarda speciosa*, *Cerbera odollam*, *Ochrosia parviflora*, and other trees. It is this covering that adapts the seeds of the Teak tree for transportal by the ocean currents.

that they construct their nests. In that island these birds have often been observed to be greatly incommoded by the number of the seed-vessels that have been entangled by the broken stalks in their plumage; and I have been informed by the residents that sometimes the bird has been killed by this cause. Although in the main distributed by sea birds, the seed-vessels of *Pemphis acidula* are also probably transported in the crevices of floating pumice and drift-wood. As already remarked, the young plant has been seen growing out of a piece of pumice stranded near one of the trees.

Other well-known littoral trees in these islands, trees that are also to be found, like nearly all the larger plants, on the coral islands of the Pacific, have, without doubt, reached this isolated group through the agency of ocean currents. Such are *Ochrosia parviflora* and *Guettarda speciosa*, the fruits of which are often to be observed amongst the vegetable drift stranded on the beaches. The fruits of *Guettarda speciosa* float when newly picked. After they have lost their outer green covering they float more buoyantly. Those that I experimented on in this condition continued to float after remaining 50 days in sea-water. Two fruits were subsequently sown out by Dr. Treub, and one seed germinated.

The wide-ranged *Hibiscus tiliaceus* and *Thespesia populnea*, that originally spread their branches over the sheltered waters of the lagoon of Keeling Atoll, where they may be still observed, have evidently reached these islands through the same agency of the ocean currents. After the capsules of *Thespesia populnea* had been about a week in sea-water, they began to get rotten and to break up, so that the seeds escaped and floated buoyantly. It happened in one instance, however, that the fruit sank before the seeds were liberated. Out of several seeds that I placed in sea-water, a few sank in about a month, but the majority floated during 40 days without any apparent injury, and would have doubtless floated for a still longer period. After the experiment, seven or eight of the seeds were sown out at Buitenzorg, and of these only one germinated, a proportion, however, of from 12 to 14 per cent., which is quite sufficient to establish the fact that the seeds of this tree can germinate after a transportal over a wide tract of ocean. Unlike those of *Thespesia populnea*, the capsules of *Hibiscus tiliaceus* dehisce on the tree, when the seeds drop, sooner or later, to the ground. Its small, hard, reniform seeds are more likely to escape notice than the much larger seeds of *Thespesia populnea*; but they will float on salt water for a long time. Those that I experi-

mented upon continued to float after remaining during 40 days in the water. Six of these seeds were sown out on November 11th, but up to February 20th none had germinated. It is probable, however, that these small and hardy seeds may often drop into the crevices of stranded logs and punice, and be distributed in the manner before described. Birds may also aid in their dispersal. There can be no doubt that the seeds of a tree so useful and ornamental as *Hibiscus tiliaceus* have often been carried from place to place by man; but we learn from Van der Jagt that in 1829, two or three years after its occupation, Keeling Atoll already possessed the Waro tree, which is still the name of *Hibiscus tiliaceus* in these islands, as well as throughout a large part of the Indian Archipelago.

We have already seen that *Morinda citrifolia* is being rapidly spread over these islands through the agency of fowls, sheep, &c. In all likelihood sea-birds or migrant land-birds may sometimes similarly carry these seeds in their stomachs and intestines over a considerable expanse of ocean to some distant island. Yet these seeds might with equal, if not with greater, probability have been transported to this group by the ocean-currents. The ripe fruit floats in sea-water; but in a few days it begins to rot, and the seeds, of which it contains a great number, drop out and float buoyantly. Ten of the seeds were placed in sea-water, and after 53 days they still floated. They were all afterwards sown out at Buitenzorg, and five germinated. Probably when Hemsley finds an explanation of the wide dispersal of this plant in its varied economic uses, and when Jouan prefers to call in the aid of ocean currents (*Botany of the Challenger*), they are both in a measure right, though to the agencies of man and of the waves, we should add that of birds and other animals.

Conspicuous amongst the larger trees that originally occupied the interiors of these islands, where they are yet scantily represented, were *Hernandia peltata* and *Pisonia (inermis?)*. It seems strange that the former tree should have escaped the notice of previous observers. It grows very rapidly, and a fine specimen is now to be seen over the grave of a British commodore buried 50 or 60 years ago in South Island. The marble-like seeds of the *Hernandia* continued to float after remaining 42 days in sea-water: of those experimented on, five or six were sown out and one germinated. The spiny and glutinous seeds of the *Pisonia*, according to Forbes, often prove fatal to the herons and boobies

that nest in the branches. Hence, as he observes, "it is easy to perceive how widely this tree might be disseminated by the birds that roost on it." (*The Eastern Archipelago*, p. 30.)

There are yet a few Cocos plants that need especial reference. Unfortunately I had no opportunity of experimenting on the seeds of *Ipomæa pes capræ*; they occur, however, commonly amongst the seeds stranded on these islands. The seed-vessels and seeds of *Ipomæa grandiflora* float both in the green and dry condition; the capsules, however, soon open in the water, when the seeds escape, but sink usually in six or seven days, only a few seeds surviving that period. I was surprised, however, to find two seeds out of nine still floating at the end of six weeks. One of these two seeds was sown out by Dr. Treub, but it did not germinate. . . . Further observations are needed with reference to the dispersal of these two widely spread species of *Ipomæa*, especially of *I. pes capræ*, which is one of the first plants to establish itself on a coral island.

Amongst the precursors of the vegetation on such an island is *Triumfetta procumbens*. The fruits float both in the green and dry condition; but as they sink in from three to seven days, they evidently require some intermediary agent or vehicle to enable them to traverse the wide expanses of sea in the Indian and Pacific Oceans that they have crossed in past ages. We have not long, however, to look for a means of transport, since one of the seeds has been observed growing in the crevice of a piece of stranded pumice at the Cocos Islands. Probably also sea-birds aid in the distribution of this plant, for I learn from Mr. Ross that he has sometimes found the seed-vessels attached to the feathers of boobies, the soft investing spines with recurved points well adapting them to this end. There is another species of *Triumfetta* (*T. subpalmata*) not very common in the Cocos Islands, which is also one of the pioneers of the vegetation. Its seed-vessels float; but I did not carry the experiment further: the spines investing it are not recurved.

There is another littoral shrub, *Cæsalpinia Bonducella*, that grows near the beach on the weather coasts of these islands, the young plants of which may be sometimes seen growing amongst the vegetable drift just above the ordinary high-tide level. Its hard grey marble-sized seeds are often brought there by the ocean-currents; but, as I am informed by the residents, they are sometimes found in the stomachs of frigate-birds and boobies, so that here we have another means of transportal for this plant, though probably a less



certain one. The pods of another leguminous plant, *Canavalia obtusifolia*, that climbs over the foliage of trees in North Keeling Island, also float on sea-water; but I do not know how long the beans will stand immersion, though judging from the wide dispersal of this plant, they probably will withstand it for a long period without injury.

The small cones of *Casuarina equisetifolia*, a tree that has been introduced intentionally into these islands, require a considerable amount of drying and exposure to the sun before the seeds will germinate. Mr. Ross has found it necessary to bury them for some time, and then to expose them to the sun and rain before he could succeed in raising trees. This explains why none of the fallen and apparently well-dried cones that strew the ground under the trees ever germinate in that situation. Such cones will only float for one or two days in sea-water, a circumstance which shows that my experiment on the cones of *Casuarina equisetifolia* in the Solomon Islands (see *Botany of the Challenger*) was not carried far enough. Hence it is probable that they can only be transported by a drifting log or some similar agency. It is noteworthy, however, that although this tree is now spreading itself by natural means from island to island, it was not included, as far as we know, in the original flora of the group.

Here end my observations on the flotation and mode of dispersal of the plants of this atoll. There are, however, some of the trees with the mode of dispersal of which I am not acquainted, as, for instance, *Premna obtusifolia*, found both on North Keeling Island and on the south coast of Java. Then again, how did the tiny seeds of *Portulaca oleracea* succeed in reaching this atoll?

EXPERIMENTS ON THE FLOTATION AND SUBSEQUENT GERMINATION OF SOME OF THE COMMON FRUITS AND SEEDS OF THE PLANTS OF THE KEELING ISLANDS.

Name.	Floated in* sea water.	Sown out at Buitenzorg on Nov. 11th, 1888.	Germinated up to Feb. 20th, 1889.
<i>Cordia subcordata</i> ..	40 days ..	7 fruits .. .. .	10 seeds.
<i>Hernandia peltata</i> ..	42 " ..	5 or 6 seeds .. ..	1 "
<i>Guettarda speciosa</i> ..	50 " ..	2 fruits .. .. .	1 "
<i>Thespesia populnea</i> ..	40 " ..	7 or 8 seeds .. ..	1 "
<i>Scævola Koenigii</i> ..	50 " ..	3 fruits .. .. .	5 "
<i>Morinda citrifolia</i> ..	53 " ..	10 seeds .. .. .	5 "
<i>Tournefortia argentea</i>	40 " ..	7 " .. .. .	7 "
<i>Hibiscus tiliaceus</i> ..	40 " ..	6 " .. .. .	0 "
<i>Ipomœa grandiflora</i> ..	42 " ..	1 " .. .. .	0 "

It is a noteworthy circumstance, not brought out in the above table of results, that the seeds most ready to germinate during the first month in the ground were those of *Scævola Koenigii*, *Tournefortia argentea*, and *Cordia subcordata*, of which the two first are the commonest trees and shrubs on the weather coasts bordering the beaches, whilst the last was a few years ago one of the most frequent trees bordering the lagoon. The seeds of *Morinda citrifolia* mostly germinated during the second month in the ground. Those of *Thespesia populnea* and *Hernandia peltata* are slow to germinate, whilst none of the seeds of *Hibiscus tiliaceus* had germinated up to February 20th.

It will have been noticed that I was indebted to Dr. Treub, the Director of the famous Botanic Gardens of Buitenzorg, for the important completion of my experiments on the flotation of the Keeling seeds and fruits. It will, however, have been observed that the seeds and seed-vessels of several well-known littoral trees of coral islands are not represented in the list. The fact is, that believing that those of *Barringtonia speciosa*, *Calophyllum inophyllum*, &c., had often demonstrated their powers to cross an ocean and still germinate, I preferred to select some of those seeds and seed-vessels concerning which our evidence had been, if not less certain, at least not so familiarly demonstrated. The results, to use the words of Dr. Treub, have been very satisfactory.

\* The numbers of days here given refer to the length of the experiment, and not to the time during which these seeds can float in sea-water, which is probably in nearly all the cases considerably longer than the duration of the experiment.

It might have been thought that I had proved that Keeling Atoll has been mainly stocked with plants by the waves, assisted by birds. It is, however, quite open to some to suggest that the arguments can only be clinched by taking an instance of an island that is absolutely bare of vegetation, and then following the process. This has been accomplished by Dr. Treub\* in the case of the volcanic island of Krakatoa, which, as he conclusively proves, was entirely deprived of vegetation by the thick covering of fiery ashes and pumice that invested its slopes, from the sea margin to the summit, at the time of its great eruption in 1883, forming a soil proved by chemical analysis to be completely sterile. When he visited the island nearly three years after the eruption, he found stranded on its shores seven seeds and fruits, all of which are very familiar amongst the seeds and fruits stranded on the Keeling Islands: they were those of *Heritiera littoralis*, *Terminalia Catappa*, *Cocos nucifera*, *Pandanus* (two species), *Barringtonia speciosa*, and *Calophyllum inophyllum*. Excluding the first-named, and remembering that the species of *Pandanus* were not identified, it may be said that nearly all these trees have established themselves on Keeling Atoll. What, however, is more important, is the fact that on the shore Dr. Treub observed growing nine young plants, of which at least four, *Calophyllum inophyllum*, *Hernandia peltata* (syn. *sonora*), *Ipomœa pes capræ*, and *Scaevola Kœnigii*, belong to species well known in the flora of Keeling Atoll. Seven species of flowering plants had already begun to ascend the slopes of the volcano, two of them being *Tournefortia argentea* and *Scaevola Kœnigii*, so characteristic of the weather shores of the Keeling Islands. I cannot doubt but that the waves were mainly instrumental in presenting the island of Krakatoa with these familiar coral island plants, which were evidently derived from the shores of the Sunda Strait, and from the coasts in its vicinity. Dr. Treub, however, ascertained that ferns formed the prevailing vegetation (eleven species having been collected), and that a thin coating of algæ, which covered the pumice and ashes on the slopes, prepared the soil for the growth of the fern-spores, the ferns in their turn performing the same service for the flowering-plants. It is evidently to the agency of the winds that we must attribute the presence of the ferns

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\* *Annales du Jardin Botanique de Buitenzorg*, vol. vii, p. 213. See also *Nature*, August 9th, 1888.

and algæ on Krakatoa; and this brings me to refer to the remarkable absence of ferns in the Keeling Islands, or rather to the fact that they have never been recorded from there. Its cryptogams were represented at the time of Darwin's visit by a moss and a fungus; but no species of fern is shown in his list. This is a singular circumstance when we remember what a conspicuous part ferns take in such isolated islands as Juan Fernandez, Tristan d'Acunha, the Kermadecs, &c. Even the remote coral-group of the Paumotus in the central Pacific contained *Asplenium nidus* and a *Polypodium*. (Gray's *Botany of the Paumotus*.)

In the next place I will refer to the drift fruits and seeds that are continually being stranded on the weather or southern and eastern beaches of the Keeling Islands, and which the navigator can observe for himself on the ocean's surface during the voyage to and from this atoll. In August and September, 1888, I collected between 50 and 60 different kinds, of which, as previously observed, one-third were beans, including those of the large seeds of *Entada scandens*, which are cast up in numbers. Probably later in the year, as I was informed by the residents, I would have made a yet larger collection. Many of these drift fruits and seeds are incrustated with serpulæ, polyzoa, and cirripedes. Amongst the most numerous are those of *Barringtonia speciosa*, *Terminalia Catappa*, *Ochrosia parviflora*, *Cerbera odollam*, *Nipa fruticans*, and the large triangular seeds of *Carapa moluccensis*, which last are often occupied by the *Teredo* and other boring molluscs, though a goodly proportion are not thus attacked. Amongst other seeds and fruits also commonly found are those of a species of *Pandanus*, and the germinated seed of the mangrove,\* with those of *Calophyllum inophyllum*, *Hernandia peltata*, *Guettarda speciosa*, *Cordia subcordata*, *Heritiera littoralis*, *Aleurites moluccana*, *Cycas circinalis*, *Ipomœa pes capræ*, and *I. grandiflora*; and amongst the leguminous plants, those of *Cœsalpinhia Bonducella*, *Mucuna macrocarpa*, *Erythrina indica*, and more than one species of *Entada*. Of these stranded seeds and seed vessels, not more than a dozen or thirteen have ever succeeded in finding a home on this group of islands. I now append the list of stranded seeds and fruits, as determined at Kew:—

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\* The seeds of the *Pandanus* and Mangrove were not included in my collections. They are thrown up in numbers later in the year.

## DRIFT SEEDS AND FRUITS FROM THE KEELING ISLANDS.

(The asterisk indicates those plants that have established themselves on the island).

- Anonaceæ*,  
*Pangium edule*, Reinw.  
 \**Calophyllum inophyllum*, Linn.  
*Guttifera*?  
*Heritiera littoralis*, Dryander,  
 \**Triumfetta procumbens*, Forst.  
*Carapa moluccensis*, Lam.  
*Vitis* sp.?  
*Erythrinae spinæ*?  
*Erythrina indica*, Lam.  
*Mucuna macrocarpa*, Wall.  
 " *gigantea*, D.C.  
 " spp.? (3 or 4).  
*Dioclea reflexa*, Hook, f.  
*Phaseolus*?  
*Cynometra cauliflora*, Linn.  
 \**Cesalpinia Bonducella*, Fleming.  
*Entada scandens*, Bth.  
*Leguminosæ*? huge cotyledons.  
*Rhizophora*, sp.  
 \**Terminalia Catappa*, Linn.  
*Lumnitzera coccinea*, Wight et Arn.  
 Various drift seeds not identified.
- \**Barringtonia speciosa*, Forst.  
 " sp.  
 \**Guettarda speciosa*, Linn.  
 \**Scævola Koenigii*, Vahl.  
*Cerbera Odollam*, Gærtm.  
 \**Ochrosia parviflora*, Hensl.  
*Lactaria salubris*, Rumph.  
 \**Tournefortia argentea*, Linn.  
 \**Ipomœa grandiflora*, Lam.  
 \**Ipomœa pes capræ*, Roth (*biloba*, Forst).  
 " spp.  
 \**Hernandia peltata*, Meissn.  
*Aleurites moluccana*, Willd.  
*Excoecaria indica*, Muell. Arg.  
*Quercus* spp.  
*Casuarina equisetifolia*, Forst.  
*Gnetum* sp.  
*Cycas circinalis*, Linn.  
*Nipa fruticans*, Wurmbr.  
 \**Pandanus* sp.  
*Caryota*?

It is not a difficult matter to ascertain the direction from which this vegetable drift comes. Almost all of it is thrown up on the southern and eastern coasts, and it is evident that they have been brought by the equatorial or westerly current from the adjacent islands of the Indian Archipelago, and from the north-west coasts of Australia. It has been surmised by Mr. Keating that these fruits and seeds in order to reach this group from the Indian Archipelago have first been drifted down to Western Australia, whence they have been transported by the equatorial current to the Cocos or Keeling Islands. I do not believe that the vegetable drift from the archipelago follows such a circuitous course of over 2,000 miles. This would imply a sea-passage of several months, seeing that the first half of the distance depending on the uncertain force of the north-westerly winds during the monsoon season would necessarily be very protracted. Rather I would hold that the equatorial current or westerly drift brings the fruits and seeds in a fairly direct course from their original source, whether it be from the Indian Archipelago or the north-west coast of Australia.

What are the facts that support such an opinion? In the first place the westerly drift has not a constant direction

from the south-east, although this is the prevailing direction of the trade-wind and therefore of the surface current. For days together, the winds during the height of the trade season at the Cocos Islands may blow freshly from east-north-east to east, and in this manner by the deflection of the prevailing surface current coming from the south-east many seeds and fruits are stranded on the Cocos Islands, which otherwise would have drifted to the northward of the group. This circumstance explains how it is that vegetable drift together with floating pumice usually reaches these islands in large quantities at a time, and not as a regular and continuous supply. Again, the residents tell me that the vegetable drift arrives in greatest abundance in the months of December and January, when the trade-wind is less steady and is interrupted by the variable westerly, northerly, and north-easterly winds. It is just at this time that drifting fruits and seeds from the Indian Archipelago would be deflected towards the Cocos Islands. Thus it will be seen that our acquaintance with the winds and currents of this part of the Indian Ocean does not render it necessary to suppose that the vegetable drift from the islands of the Indian Archipelago has first to be transported to the vicinity of Western Australia before it can arrive at the Cocos or Keeling Islands.

There are, in fact, many proofs that the passage is accomplished direct from the Indian Archipelago. Many of the fruits and seeds cast up on the Cocos Islands are in a very fresh condition, and show no signs of having been more than a few weeks in the water. Others, again, however, have an ancient sodden appearance, and may have been floating for a much longer period. Yet it is a most improbable circumstance that three or four living snakes which during the last few years have been drifted on bamboos and logs to the eastward coasts of these islands, could have performed the passage thither from the Indian Archipelago by the circuitous route of Western Australia, a circumstance which would imply a sea-voyage of some 2,000 miles in length and of several months' duration. Undoubtedly they came either direct from the nearest coasts of the Indian Archipelago, 700 miles away, as is most likely in the majority of cases, or direct from Western Australia, 1,200 miles distant, or from the islands intervening between these two localities. Again, it is highly improbable that a crocodile, that arrived at these islands on a large log a quarter of a century ago, could have performed a sea-passage of 2,000 miles. No doubt, it

originally came direct from the Indian Archipelago: for in such cases it is necessary that we should assume that the nearest land is the starting-point. Again, the Krakatoa pumice arrived at the Cocos Islands in great quantity a few weeks after the eruption in the Sunda Straits, a circumstance showing that it must have pursued a course fairly direct from its source.

Hence we must conclude that most of the vegetable drift takes a course fairly direct to the Cocos Islands, whether from the Indian Archipelago or from the western shores of Australia. My experiments and those of Dr. Treub make it quite clear that several of the seeds of the trees already established on these islands can germinate after floating 6 or 7 weeks in sea-water. During this period they might have been transported by a surface-current running only one knot an hour a distance of from 1,000 to 1,200 miles, which is all that we require to establish the possibility of their germinating after a passage from the islands of the Indian Archipelago or from the nearest coasts of Australia.

Java and Sumatra, with the islands adjacent to them, probably supply a large proportion of the fruits and seeds stranded on the eastern shores of this small group. According to Mr. Keating, as quoted by Mr. Darwin, many of the familiar woods, seeds, and fruits of the region of the Indian Archipelago arrive at the Cocos Islands. A canoe has been thence drifted, and I may add that Java water-bottles, made of bamboo, and the large bamboo fishing-stakes employed in that part of the archipelago, are now frequently beached on the Cocos Islands. However, I must leave to those who determine my collections the task of ascertaining more definite facts concerning the source of the vegetable drift. I may, however, add that, as shown in the note appended to this paper nearly all the Cocos Island plants are to be found on the adjacent south coast of Java.

The part taken by sea-fowl and migratory birds in stocking these islands with plants has yet to be investigated. It is obvious, however, that birds are less certain agents in the process. The frigate-bird, for instance, when it takes its flight over the inland regions of Java and returns to Christmas Island and to North Keeling Island, where it nests in great numbers, must sometimes aid in the distribution of plants in the manner I have already instanced in the case of *Casalpinia Bonducella*. The species of *Pisonia* distributed in the Cocos Islands is evidently distributed in the fashion before remarked. I have also pointed out that the seeds of *Pemphis acidula* and

*Triumfetta procumbens* are also dispersed by sea-birds. Notwithstanding these facts, it is evident to my mind that in comparison with the agency of the westerly drift, birds have played a secondary part in stocking these islands with plants. The absence of the fruit-pigeon has deprived the flora of the Cocos-Keeling Islands of many of the conspicuous features of the vegetation of a coral atoll in the Western Pacific or of the numerous coral islands of the adjacent waters of the Indian Archipelago. The littoral trees so familiar to me on the beaches of the Solomon Islands, 4,000 miles to the eastward, and occurring with equal frequency in the yet more distant islands of the Central Pacific, are in truth nearly all represented in the Cocos-Keeling Islands, owing their extended distribution from ocean to ocean mainly to the common agency of the currents. But here in these remote coral islands in the Indian Ocean, I missed the huge banyans and other ficoid trees, the tall Kanary, and the yellow-flowered *Eugenia*, that give height and character to the interiors of the numberless coral islets of the Western Pacific. Fruit-pigeons have not found a home here. Hence the westerly drift has held the sway, and these islands have become stocked with a monotonous and sombre flora. Rather, I should write in the past tense, since a few years hence but little of the original vegetation will remain, and some brief record, such as these lines record, will be all that is left to remind the visitor of the condition in which man first found these islands.

#### NOTE ON THE LITTORAL PLANTS OF THE SOUTH COAST OF WEST JAVA.

Since there can be no doubt that the Cocos-Keeling Islands have largely derived their flora from the neighbouring coasts of the Indian Archipelago, it will be of interest to learn what are the common littoral plants on the coast most adjacent to them, namely the south coast of West Java. Having been engaged for nearly six weeks in examining the geological structure of the southern sea-border of West Java, between Java Head and Cape Mandaran, promontories about 200 miles apart, I am also able with some degree of confidence to describe the general character of the littoral vegetation of this coast.

The greater portion of this extent of coast is low and sandy, and for the most part destitute of coral reefs. Here the sea-border is formed by a low, sandy belt, usually 200 to



500 yards wide, backed inside by low hills and inland cliffs, and terminating at the beach in a mound or dune of sand raised from 5 to 10 feet above it. Here and there a headland descends to the sea, and in places the coast terminates in cliffs, usually of moderate height, and formed of foraminiferous tuffs and clays, limestones, and volcanic rocks. Where coral reefs occur, they are usually scanty and broken, and belong to the fringing class. It is only along shores fringed by reefs that the sea-border may be swampy. Numerous rivers, mostly shallow, and widening out at their mouths into large lagoons, descend to the south coast.

The sand mound that borders the beach, forming, as I have just described, the raised border of the low sandy belt which is the prevailing feature of the south coast of West Java, is covered for the most part with *Crinum asiaticum*, *Calotropis gigantea*, *Scævola Koenigii*, *Pandanus* sp., *Ipomœa pes capræ*, *Triumphetta subpalmata*, and last, but by no means least frequent, *Spinifex squarrosus*. In many localities, in fact, *Spinifex squarrosus*, *Crinum asiaticum*, and *Calotropis gigantea* together occupy the entire surface of the mound, or it may be covered only with *Pandanus*. Just inside the mound littoral trees occur, *Cycas circinalis* and *Hibiscus tiliaceus* being often noticeable; but the greater portion of the sandy belt inside is covered with short grass and spurges, being only dotted here and there with occasional pandans and some of the commonest littoral plants, such as *Crinum asiaticum* and *Calotropis gigantea*.

Such are some of the more conspicuous characters of the prevailing littoral vegetation on the south coast of West Java, that is to say, wherever the sea-border is low and sandy. Where the coast is cliff-bound, pandans are very frequent. It is, however, along those shores that are to a greater or less degree fringed by coral reefs that we usually find the most varied littoral flora. On the coasts between Capes Mandaran and Genteng, where the sea-border is for the most part low and sandy and nearly destitute of coral reefs, we find in consequence the more varied flora only at rare intervals. For instance—to take the only locality with which I am personally acquainted—along the reef-girt shores a few miles east of Ranzaherrang occur the familiar and widely spread littoral trees, *Scævola Koenigii*, *Tournefortia argentea*, *Calophyllum inophyllum*, *Terminalia Catappa*, *Guettarda speciosa*, and others; whilst *Crinum asiaticum* also may be sparingly represented. It is, however, on the coast west of Wynkoops Bay, especially on the Bantam coast in the vicinity of Tjiara,

where it is irregularly fringed by coral reefs, that we find most extensively represented these and other common littoral trees. A little within the belt of pandan trees and of *Crinum asiaticum* that immediately lines the beach, the coast-road for several miles traverses a forest of fine old trees of *Hernandia peltata*, with which is associated also in considerable numbers *Cerbera odollam* and *Premna obtusifolia*, together with *Terminalia Catappa*, *Guettarda speciosa*, and an occasional *Calophyllum inophyllum*. It is scarcely necessary to refer here to the ubiquitous *Ipomœa pes capræ*, which commonly clothes the ground near the beach in this locality as well as along the whole south coast of West Java. . . . It may perhaps be of interest to those who have not the time or the inclination to visit the remote south coast of Bantam, to learn that along the west shore of Wynkoops Bay between Palabuan and Tjisolok the littoral trees are well represented. Bordering the beach there we find pandan trees, *Crinum asiaticum*, *Scaevola Kœnigii*, *Cerbera odollam*, &c., whilst immediately within, the coast-road traverses a belt of handsome old trees of *Calophyllum inophyllum* and *Terminalia Catappa*, with which are also associated banyans and the familiar *Hibiscus tiliaceus*. . . . I should, in the last place refer to a species of *Tacca* (*T. pinnatifida*), of which one observes, but only at rare intervals, a few solitary individuals growing a little within the vegetation lining the beach.

The mode of dispersal of the majority of the plants above mentioned has been already referred to in my remarks on the Cocos-Keeling Islands; and it will be at once perceived that these islands might have largely been stocked with their flora from the south coast of West Java. There are, however, some of their trees that did not come under my observation on this coast, as, for instance, *Barringtonia speciosa* and *Cordia subcordata*. Doubtless, however, they do occur, though not in many localities; yet it should be remarked that I very rarely came upon the fruits of the first-named tree among the vegetable drift on the beaches, whilst those of *Cordia subcordata* did not come under my notice at all. Then, again, I may be permitted to record the rarity, if not the absence, of *Pemphis acidula* on this part of the Java coast. Probably the sea-birds, to which as before shown this tree evidently in the main owes its dispersal, do not nest in any numbers on this coast.

It is remarkable that two of the commonest littoral plants of this part of the coast of Java, namely, *Crinum asiaticum* and *Calotropis gigantea*, do not occur in the Cocos-Keeling

Islands. The fruits of both float in salt-water,\* but I do not know for how long; they, however, do not occur in the drift fruits of these islands. Then, again, *Cycas circinalis*, common enough in some parts of this coast a little way in from the beach, is also unrepresented in the Cocos-Keeling Islands, though its fruits deprived of their fleshy covering occur there amongst the vegetable drift. I should here observe that these fruits are better fitted to be transported across wide tracks of ocean than a single experiment a few years ago in the Solomon Islands led me to believe. Then I found that out of ten green fruits picked off the same tree only one floated in salt-water. When, however, I repeated the experiment on the south coast of Java, I found that out of three green fruits all floated in sea-water, though heavily. After stripping the fleshy outer covering off one of these fruits I noticed that it floated more buoyantly; but by allowing it afterwards to dry for some time, I ascertained that its buoyancy was still greater, this being the condition in which these fruits are stranded on the beaches of the Cocos-Keeling Islands, where the crabs often break them open to get at the pulpy seed inside . . . . . There is another plant represented (though sparingly) on the south coast of Java, which does not occur in these islands, viz., *Tacca pinnatifida*. I ascertained that the freshly picked fruits float heavily in sea-water, whilst the seeds sink.

In the following list I have enumerated the plants that came casually under my notice on the south coast of West Java. The asterisks denote those that are found in the Keeling Islands; and a single glance will be sufficient to convince one that the Keeling Islands have largely derived their plants from the adjacent coasts of the Indian Archipelago, of which the south coast of West Java may be taken as fairly typical as regards its littoral vegetation.

#### LITTORAL PLANTS ON SOUTH COAST OF WEST JAVA.

(As observed casually by the Author.)

- |   |  |
|---|--|
| * <i>Calophyllum inophyllum</i> , Linn.   | <i>Cerbera odollam</i> , Gærtn.                              |
| * <i>Hibiscus tilaceus</i> , Linn.        | <i>Calotropis gigantea</i> , R.Br.                           |
| * <i>Triumphetta subpalmata</i> , Soland. | * <i>Tournefortia argentea</i> , Linn.                       |
| * <i>Terminalia Catappa</i> , Linn.       | * <i>Ipomæa pes capræ</i> , Roth ( <i>biloba</i> ,<br>Fork). |
| * <i>Guetiârda speciosa</i> , Linn.       |  |
| * <i>Scaevola Kœnigii</i> , Vahl.         | * <i>Premna obtusifolia</i> , R.Br.                          |

\* The fleshy seed of *Crinum asiaticum* has not the appearance of a seed that would float more than a week in salt-water.

\**Hernandia peltata*, Meissn.

*Cycas circinalis*, Linn.

\**Pandanus*, sp.

*Crinum asiaticum*.

*Tacca pinnatifida*, Linn.

*Spinifex squarrosus*, Linn.

*Note*.—Most of the plants in the above list I was already familiar with. I am, however, indebted to Dr. Treub and to the officials at Kew for the identification of the specimens belonging to those of which I was uncertain, namely, *Triumfetta subpalmata*, *Cerbera odollam*, *Calotropis gigantea*, *Premna obtusifolia*, *Hernandia peltata*, *Cycas circinalis*, *Crinum asiaticum*, *Tacca pinnatifida*, and *Spinifex squarrosus*.

#### NOTE ON THE VEGETABLE DRIFT OF THE SOUTH COAST OF WEST JAVA.

The drift fruits and seeds that came most frequently under my notice on this coast were those of *Terminalia katappa*, *Cerbera odollam*, *Pandanus* sp., *Calophyllum inophyllum*, *Heritiera littoralis*, with numerous beans, most of them familiar to me amongst the drift on the beaches of the Cocos-Keeling Islands, especially *Mucuna macrocarpa*. The fruits of *Barringtonia speciosa* rarely came under my observation. There were also several other fruits and seeds; and amongst them I picked up on the beach a seed of *Crinum asiaticum* in a germinating condition. Amongst those of less frequent occurrence were the triangular seeds of *Carapa moluccensis*, and the hard black seeds of *Aleurites moluccana*. On the south coast of Bantam in the vicinity of Malingping I found on the beaches numbers of acorns of a species of *Quercus* which occur also amongst the drift of the Cocos-Keeling Islands; the tree is found in the interior of Java, amongst other localities, in the elevated region of the Genteng Promontory.

In all probability the great majority of these drift fruits and seeds were derived from trees on the same coast; some, however, were brought down by the rivers from the interior of Java, there being usually an accumulation of the seeds and fruits of non-littoral plants on the beaches at the mouths of the rivers. The importance of the agency of rivers in bringing down to the sea the fruits and seed-vessels of inland plants is, I think, rather apt to be overlooked. Such an agency readily explains the occurrence of the fruits or seeds of inland as well as cultivated plants, as the *Quercus*, sp. (above mentioned), *Pangium edule*, &c., amongst the drift of the Cocos-Keeling Islands.

Although, as above stated, the great majority of the fruits and seeds of the vegetable drift are evidently derived from the trees on the same coast, since they may be

observed in all conditions, from the green state to the dry, yet this does not affect the importance of their occurrence, seeing that it is of interest to ascertain not only what seeds and fruits have come from distant regions to any particular island, but also the manner in which such seeds and fruits start upon their ocean journeys, and the locality from which they may have been transported. It is probable enough that many of the familiar seeds and seed-vessels of the vegetable drift of tropical seas lie for some time on the beaches, in the vicinity of which the parent trees are growing, before unusually high tides, or the seas of a heavy gale, sweep them off into the ocean. This preliminary stage of preparation, though not always necessary, gives the fruit or seed a better chance of being drifted across a wide expanse of sea. It is in this manner that the fruits of *Terminalia Catappa*, *Ochrosia parviflora*, *Cerbera odollam*, *Guettarda speciosa*, and many others lose their outer fleshy covering before they commence their ocean voyage. In fact in some cases, as in the instance of *Cordia subcordata*, it is, as I have before shown, almost essential that the seed should first lose its outer skin; otherwise it rots in the salt-water.

There are, however, some of the seeds and fruits occurring amongst the vegetable drift on the beaches of the south coast of West Java, that almost certainly have been derived from more distant islands. Take, for instance, the triangular seeds of *Carapa moluccensis*, which I have found on these beaches with their interiors hollowed out and occupied by the empty tubes of the *Teredo*: it is in this condition that these seeds usually occur amongst the drift of the Cocos-Keeling Islands.

The following is the list of drift seeds and fruits picked up by me on the south coast of West Java, as determined at Kew:—*Calophyllum inophyllum*, Linn; *Heritiera littoralis*, Dryander; *Carapa moluccensis*, Lam.; *Pometia eximia*, Hook, f.; *Mucuna macrocarpa*, Wall.; *Mucuna gigantea*, D.C.; *Mucuna*, sp.; *Pongamia glabra*, Vent.; *Entada scandens*, Benth.; *Terminalia catappa*, L.; *Cerbera odollam*, Gærtn; *Ipomœa biloba*, Forsk ?; *Quercus*, spp.; *Aleurites moluccana*, Willd; *Excœcaria indica*, Muell-Arg.; *Pandanus*, sp; *Crinum (asiaticum?)* . . . It is to be noticed that of the 17 drift seeds and fruits here named, 14 occur in my list of the seeds and fruits stranded on the Keeling Islands, the exceptions being those of *Pometia eximia*, *Pongamia glabra*, and *Crinum (asiaticum?)*.

My paper is now brought to a close. In it I have omitted

little that does not push my argument home concerning the stocking of this coral atoll with its plants. I have described its original vegetation, before man's disturbing influence began; I have demonstrated by observation and experiment the facilities for dispersal possessed by the plants, and have pointed out the reason of the absence of certain familiar species; I have dwelt in detail on the seeds and fruits brought by the currents to these islands, and have ascertained the direction in which they drifted; I have followed these ocean waifs to their principal home on the coasts of the Indian Archipelago, and have observed the parent plants growing on those shores; lastly, I have referred to an instance of an island in these seas, absolutely bare of vegetation, where the process of plant-stocking has been carefully observed, and where amongst the first of the flowering plants to grow from the seeds and seed-vessels stranded on its shores were those of familiar Keeling Island species. This method of itself would be conclusive, as long as the facts are trustworthy, and for this I can safely vouch.

#### CONCLUSIONS.

The principal points of this paper may thus be summed up:—

(1.) The evidence goes to show that the cocoa-nut palms established themselves on these islands before their occupation by man.

(2.) Several coral island plants, not recorded by Darwin in 1836, but which there are good reasons for believing originally existed in these islands, occur in my collections (see page 272).

(3.) Crabs, by eating the seeds stranded on the beaches, are important agents in preventing certain common littoral plants from establishing themselves on these islands (page 276). Thus it has happened that not more than one-fourth of the numerous seeds and seed-vessels brought by the currents have found a home on this atoll.

(4.) It is well known that the familiar fruits of *Barringtonia speciosa*, *Calophyllum inophyllum*, *Terminalia Catappa*, &c., will float for a long time in sea-water unharmed; and the experiments recorded on page 287 show that several other coral island plants will germinate after floating from six to seven weeks in sea-water.

(5.) The flora has been mostly derived through the agency of the currents from the adjacent coasts of the Indian Archi-

pelago, though it is probable that sea-birds have assisted in the process.

(6.) Since this paper was written, Mr. Hemsley has removed my difficulties concerning the transportal by currents of such small seeds as those of *Portulaca oleracea* and *Suriana maritima*, which seem ill fitted for this end. They may be carried in the seed-vessels attached to the floating plant or branch.

Mr. Hemsley has very kindly read the proof of this paper, and has made some suggestions and corrections; but I am entirely responsible for the opinions and conclusions it contains, and of course I cannot expect assent on all points. He has ascertained for me that the stranded seed of a species of *Crinum (asiaticum?)*, which I picked up in a germinating condition on the coast of Java in January, 1889, has developed into a healthy plant a foot high at Kew (January, 1890).

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NOTE ON THE PLANTS REFERRED TO IN THE EARLY  
ACCOUNTS OF THE KEELING ISLANDS.

From the accounts of these islands given by Van der Jagt,\* Keating,† and Ross,‡ all of which were written in either 1829 or 1830, only two or three years after the establishment of the settlement, and some six or seven years before the visit of Mr. Darwin, it is evident that amongst the vegetation found by the first settlers on these islands there were several littoral trees, some of which were observed by Mr. Darwin, whilst others, owing to the shortness of his visit and on account of their probable paucity, were not recorded. I have marked with an asterisk those which are not to be found in Mr. Darwin's list: they are characteristic coral island plants, and they are still, though scantily, represented.

\**Barringtonia speciosa*. "A large tree with a square nut of about 6 inches in diameter and rusky on the outside" (Ross).

†*Hibiscus tiliaceus*. "The Waroe or Warroo" (Ross and Jagt). This is a common Malay name for this tree in the Indian Archipelago, and the Keeling Islanders still only know it by this name. Its ornamental and useful purposes are noted, such as supplying fibres for fishing lines and nets, &c.

\**Thespesia populnea*. "A tree like the Waro, growing near the shore" (Ross).

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\* See footnote on the second page of this paper.

† Holman's *Travels*.

‡ *Gleanings in Science*: Calcutta, 1830. Also *Journ. Roy. Geogr. Soc.*, vol. i, 1831. Mr. Ross carefully distinguishes the indigenous from the introduced plants.

\**Hernandia peltata*. "A tree with a fruit like that of the Jack-in-the-box of the West Indies" (Ross).

\**Morinda citrifolia*. "A tree with a fruit like plum-cake, and with a root that has a scarlet dye" (Ross).

*Cordia subcordata*. The Keeling Islanders now call it "Grongang," and in 1829 it was known as the "Borongang" (Jagt), which is simply the name with the Malay prefix of "bua," a fruit. All the earlier accounts refer to the arching mode of growth of this tree, to its durable wood, and to its suitability for ship and boat building.

*Scævola koenigii*. The "Bessie" of Jagt and the Gagabæssan of some parts of the Indian Archipelago. The Keeling Islanders now call it "Kankong-cumbang-sabla," i.e., the half-flowered plant, referring to the gaping corolla.

*Pemphis acidula*. Its present name of "Burung" or "Bœrceng" is the same as "Hœrceng," with the prefix of "bua," the name in the early days (Jagt). The tree was described then as with foliage like that of the box-tree, and with reddish or yellowish wood, employed for houses.

\**Pisonia (inermis?)*. The "Ampol" of 1829 (Jagt), and of the present day.

\**Pandanus*, sp. (Jagt and Keating).

"Chinkauen" or "Dadap," a soft-wooded, green, and thorny-barked tree (Ross).

"A tree resembling the *Protea* species, with a very soft wood and a silver leaf" (Keating).

"A tree somewhat similar to the Norway pine, growing about 30 feet high, and with a heart-shaped leaf" (Keating).

Three of the trees marked with an asterisk as not appearing in Mr. Darwin's list were included in Mr. Forbes' list of 1878, namely, *Morinda citrifolia*, *Pisonia (inermis)*, and *Pandanus*, sp.

On referring to the list of *previously unrecorded* plants given on p. 272, it will be noticed that two trees there named, namely, *Calophyllum inophyllum* and *Terminalia catappa*, are apparently not mentioned by the early settlers. In this paper, however, I have shown the probability of their having been then on these islands. The currents bring their fruits in numbers to this atoll. *Suriana maritima* is referred to on pp. 275-281. *Erythrina indica* and *Casuarina equisetifolia* have been probably introduced by man. All the other unrecorded plants, perhaps excepting the *Euphorbia*, are common coral island plants.

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The PRESIDENT (Sir G. GABRIEL STOKES, Bart., M.P., P.R.S.)—  
I will ask you to return your thanks to Dr. Guppy for his very interesting paper.\* I am sure all will be sorry to hear that the

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\* Letters were received from some unable to be present at the Meeting, including one from Mr. W. H. Hudleston, F.R.S., lamenting the prospective disappearance of the original flora of the Keeling Islands, and one from the (now late) Sir Warrington W. Smyth, F.R.S., regretting that ill health prevented his presence at the Meeting. Sir Warrington has since passed away, and the scientific world has lost one of its most esteemed and valued members.—ED.



cause of the absence of our Honorary Secretary, Captain Petrie, is that he is very dangerously ill.

Dr. CUTHBERT COLLINGWOOD referred to a visit he had made to the uninhabited Pratas Coral Atoll where he had observed two influences at work, the destructive influence of the crabs and the carrying agency of the birds. When on a small island off the coast of Borneo, he had observed the hermit crab to live almost entirely on the tender parts of the Mango, and in the Keeling Islands, where they abounded, he could well understand their not permitting any tender shoot, of the cocoa-nut tree, for instance, to survive. As regards the producing force he was surprised to find sea birds considered to be carrying agents for seeds, as they usually fed on fish; on the islands he had alluded to as having visited, the birds were numerous and very tame, although they would not permit one to approach them, always vomiting their food (apparently fish), and flying away when anyone did. On shooting frigate birds he had always found fish in their stomach. He did not mean to contravert the statements of the author and could only suppose that in the absence of fish the birds might sometimes feed on seeds.

Rev. F. A. WALKER, D.D., F.L.S., remarked that in one part of the paper the author said "New insects have been introduced accidentally or intentionally during the last half century," and asked what insects had been found and what was the fauna known to exist in the Keeling Islands, 50 years ago, and whether the fact of new insects having been introduced pointed to efforts at acclimatisation by any of the present residents in the Keeling Atoll. As the Solomon Islands had been mentioned in the paper he might add that it was worth while to notice that it was curious to find there not only a new species of bird wing (ornithoptera) but also the species known as the swallow-tail. Nearly every island of the Malay archipelago had a species of bird-wing butterfly peculiar to itself, and the Malay group of islands was the only one in the world containing many large and handsome species of butterflies that had not been found on the adjacent continent also.

The AUTHOR.—My other duties have prevented my paying much attention to insects, but Mr. Forbes was on the islands in 1878, and made a collection, which, however, he unfortunately lost in Java, through the upsetting of a boat, but he has published his

observations in an account of his travels in the Indian archipelago. As regards frigate birds not bearing seeds, of course, I only hold that they do so very rarely, perhaps one in a thousand, but several people showed me the seeds, *Cœsalpinia Bonducella*, and I think that there is no doubt about the mode of their conveyance. When I was cruising in H.M.S. "Lark" in the South Atlantic we caught a Cape pigeon and found a small seed inside it. We were 700 miles from the nearest land and these birds followed us across the Indian ocean, in fact, they go round the globe. Of course the subject of the dispersal of plants is one which we are only beginning to know something about, and therefore there must be a good deal of guess work in respect to it, and the only way is to investigate by experiment whenever we can. Most of the specimens I have here are very common in the Coral Islands. One is *Barringtonia speciosa*, another is *Pangium edule*, which is eaten in Java, and it is often carried to the Keeling Islands, but never germinates, for the crabs eat the kernel.

The Meeting was then adjourned.

#### REMARKS ON THE FOREGOING PAPER.

Professor T. RUPERT JONES, F.R.S., &c., writes:—"I was unable to attend the meeting and hear Dr. Guppy's paper, but I have read it with much pleasure and advantage.

"It is full of fact and good inferences relative to the struggle for existence among plants and animals, and will be a rich source for philosophical scientists to gather notions from in the future. The scientific care and precision of the observations, experiments, descriptions and conclusions are very noteworthy, and make the paper highly worthy of any Society that takes up the subject."

Mr. JOHN MURRAY, of the "Challenger" expedition, writes:—"I have read, with very great pleasure, Dr. Guppy's paper, and I do not think I can speak too highly of it as a solid contribution to the history of a coral island. His explorations and observations are well known; his experiments and the way he has worked up his collections will, I am sure, be fully appreciated by all naturalists who take an interest in the distribution of organisms over the face of the earth, and in a very special manner by all who are interested in oceanic islands."

NOTE.—A most interesting example of the way in which vegetation spreads has been furnished by Krakatoa, which after the great catastrophe of 1883, was left absolutely bare of life; the heat was intense, for the whole island was covered with a layer of cinders three feet thick. And yet already, after the short space of six years, the island, on being examined by an enthusiastic botanist, has been found to have a number of ferns flourishing on its unpromising soil. He writes:—"these would not have obtained a footing had not some of the lower forms of microscopic plants first established themselves, and rendered the soil a little gelatinous and moist for the fern roots. The ferns in their turn are preparing a surface soil on which stray seeds of the higher plants will be able to germinate. This illustration of the process by which a heap of cinders is converted into a palmy South Sea Island is the most striking on record. The fern spores must have been borne on the winds."—ED.

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#### AUTHOR'S FURTHER REPLY.

Dr. H. DE VARIGNY, in the *Revue Scientifique* for March 28, 1891, gives a lengthy review of my paper. He has there not only given the artist's touch to my bare narrative of facts and experiments, but has given point and clearness to many of my imperfectly expressed conclusions, and for method and arrangement his review is certainly superior to my original paper. "L'étude de M. Guppy," thus he concludes the notice, "méritait mieux qu'une simple mention: c'est une œuvre faite avec beaucoup de soin, répondant aux exigences de la critique expérimentale, et qui certainement fera beaucoup pour établir sur une base solide l'hypothèse d'après laquelle les courants océaniques jouent un rôle important dans la dispersion des êtres. Ce n'est même pas aller trop loin de dire que M. Guppy a fait de l'hypothèse une réalité, de la théorie un fait acquis."

The following additional experiments on the flotation of the seeds and seed-vessels of coral island and tropical plants have been recently made by me (the author).

On June 8th, 1890, I put in sea-water a single bean of *Entada scandens*, a bean of another species of *Entada*, a seed of *Cæsalpinia Bonducella*, and a seed of *Aleurites moluccana*, all of which were

collected in the autumn of 1888 amongst the drift thrown up on the Keeling beaches. They were all still floating in the first week of June, 1891, and were seemingly as buoyant as ever. Five seeds of *Morinda citrifolia*, a seed of *Thespesia populnea*, two fruits of *Scævola Koenigii*, a fruit of *Cordia subcordata*, and a seed of *Ipomœa grandiflora*, all obtained in the fresh condition in September, 1888, from their respective plants in the Keeling Islands, were placed in sea-water on June 8th, 1890, and were still afloat just twelve months afterwards, in June, 1891, apparently unharmed. Four fruits of *Tournefortia argentea* (from Keeling plants) that I picked up from the ground in September, 1888, remained afloat in sea-water in June, 1891, after being just twelve months in the water. Five seeds of *Tacca pinnatifida* from a fruit that I picked off a plant on the coast of Java in November, 1888, were placed in sea-water on June 8th, 1890, and are still afloat after an interval of twelve months. When I obtained the fresh fruits I noted that they floated heavily in sea-water, while their seeds sank. Two pods of *Pongamia glabra*, found washed up on the Java coast in December, 1888, were placed in sea-water on June 8th, 1890; one sank after 125 days, and the second floated 202 days before sinking. Three seeds of *Hibiscus tiliaceus*, obtained from a tree on the Keeling Islands in September, 1888, were placed in sea-water on July 20th, 1890; the first sank on September 18th, 1890, the second early in February, 1891, and the third in the second week of March, 1891. A single Teak fruit (*Tectona grandis*) from Java has now been floating just twelve months, having been kept dry previously for nearly two years. The beans of three or four species of *Mucuna*, collected by me in the vegetable drift of the beaches of the Keeling Islands and of the Java coast during the latter part of 1888, were placed in sea-water in June, 1890; but their powers of flotation varied greatly, three beans of one species sinking in from three to eight days, two beans of another species sinking in from 60 to 100 days, whilst two beans belonging to other species are still floating buoyantly after twelve months in the water. I have remarked in my paper that the seeds of *Suriana maritima* sink in a few days, but I should have said "fresh" seeds. Six seeds that I had by me for over two years, seeds obtained from the identical tree to which the fresh ones belonged, were placed in sea-water on March 9th, 1891, and four of them were still afloat about four months afterwards. Three seeds of *Coix lachryma*, obtained in the Solomon Islands in 1884, floated only from two to six days in sea-water in 1891. (The sea-water in

all these experiments was shaken about every few days, and the position of the floating seeds and fruits frequently changed.)

I am now completing the experiment. Most of the seeds will take a long time to germinate, but those of *Thespesia populnea* and *Ipomœa grandiflora*, have already germinated after floating a year in sea-water. An interesting point in connection with this experiment is that it has been carried out in London, and all the seeds and seed-vessels that have been afloat twelve months, were exposed to a degree of cold in the winter, that kept fresh-water frozen for three weeks on the same table. I am bold enough to think that a Coral Island seed might be carried, in summer, across the North Pole, and yet germinate, that is, if there is a current to carry it.

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### ORDINARY MEETING.\*

H. CADMAN JONES, ESQ., M.A., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :

LIFE MEMBER:—The Ven. Archdeacon J. Ingham Brooke, M.A., Halifax.

MEMBERS:—The Rt. Hon. Lord Brassey, Sussex; the Rt. Hon. Lord Teynham, Kent; the Rt. Rev. the Bishop of Columbia, Victoria; Sir Sydney Webb, K.C.M.G., D.L., J.P., Twickenham; A. Boutwood, Esq., Southgate; S. Causton, Esq., Kent; Rev. C. Pickering Clarke, M.A., Surrey; Rev. A. Fairbanks, M.A., London; Rev. W. D. Fanshawe, M.A., London; Rev. H. Griffin Hellier, London; Isaac Hoyle, Esq., M.P., Prestwich; J. F. Hewett, Esq., Surrey; Rev. E. A. Knox, M.A., Leicester; J. Monro, Esq., C.B., London; J. M. Peebles, Esq., M.D., United States; Rev. Reuen Thomas, Ph.D., D.D., United States; T. Ward, Esq., J.P., F.G.S., Northwich.

LIFE ASSOCIATE:—Anson Phelps Stokes, Esq., United States.

ASSOCIATES:—Rt. Rev. G. R. Eden, Bishop of Dover; Rev. W. J. Adams, M.A., D.C.L., Dorchester; S. A. Bradshaw, Esq., Middlesex; Captain J. G. Bourke, War Department, United States; Rev. Howard A. Crosbie, M.A., Cambridge; Col. W. Carey, C.B., R.A., Southampton; Rev. W. H. Duke, M.A., Kent; Rev. G. G. Findlay, B.A., Leeds; Rev. G. H. Fowler, M.A., Leeds; Major R. D. Gibney, Devonshire; C. H. Goodman, Esq., Surrey; Rev. S. W. Heald, United States; Lt.-Gen. G. C. Hankin, C.B., Guildford; Alpheus Hyatt, Esq., United States; Rev. G. W. King, United States; Hon. and Rev. A. V. Lyttelton, M.A., South Africa; E. Liddon, Esq., M.D., Taunton; Rev. J. Malet Lambert, M.A., LL.D., Hull; Rev. H. E. Maddock, M.A., F.G.S., Hull; Surgeon Washington Matthews, War Department, United States; Rev. W. H. H. Marsh, A.M., United States; Rev. R. C. Oulton, A.M., T.C.D., Belfast; Rev. J. R. Porte, A.M., T.C.D., Surrey; Rev. R. C. W. Raban, Weston-super-Mare; Rev. F. H. Woods, B.D., Bucks.

HON. CORRESPONDING MEMBERS:—Rt. Rev. C. Hamilton, Bishop of Niagara; Prof. J. Geikie, D.C.L., LL.D., F.R.S., F.R.S.E., F.G.S., &c., Edinburgh; Rev. G. U. Pope, D.D., Oxford; Rev. A. Robertson, Venice; A. Finn, Esq., H.B.M. Consul, Malaga.

The following Paper was then read by the Author:—

*SKETCH OF THE GEOLOGICAL HISTORY OF EGYPT AND THE NILE VALLEY.* By Professor EDWARD HULL, LL.D., F.R.S., F.G.S.

#### PART I.—INTRODUCTORY.

YOUR respected Hon. Secretary has suggested to me that a sketch of the Geological or Physical History of Egypt might be acceptable to the members of the Institution, and I have great pleasure in complying with his suggestion. The paper may be considered as supplementary to those I have already contributed on Sinai and Palestine, giving the results of the expedition sent out in 1883 by the Committee of the Palestine Exploration Fund.\*

Within recent years, much has been done towards the elucidation of the physical history of this remarkable country. It is scarcely necessary that I should even refer to what was done before geology became a branch of exact science; but, amongst recent researches, special mention should be made of those of the late Mr. Leonard Horner,† of Sir J.

\* *Journal Victoria Institute*, vol. xxi, p. 11.

† *Phil. Trans. R.S.* (1885), vol. 145, p. 105, and more fully elaborated in his work *Modern Science in Bible Lands* (1888).

W. Dawson,\* Oscar Fraas, in his work entitled *Aus dem Orient*, of Carl A. Zittel,† whose elaborate work is the most important essay on the subject which has hitherto appeared; and numerous reports by Dr. Schweinfurth, who has for a series of years been carrying on geological investigations in Egypt and adjoining countries under the auspices of the Berlin Geological Society. In connection with the geological structure of Sinai and Palestine, that of Egypt necessarily calls for some observations, as the physical history of all the region bordering the Levant is very much the same. Geologically speaking, those countries extending from Asia Minor and the Lebanon through Palestine and into Egypt are all of very recent age, and came into existence as land areas, reclaimed from the ocean in Middle Tertiary times.

But before entering on such details, a rapid survey of the physical features of Egypt and bordering countries may be considered desirable.

## PART II.—GENERAL STRUCTURE OF UPPER AND LOWER EGYPT.

The physical divisions of Egypt are somewhat different from those of Ptolemy, wherein we have Lower, Middle, and Upper Egypt in succession from north to south, or from the Mediterranean coast to, and beyond, the First Cataract. Physically and geologically, the most convenient plan of territorial arrangement is to assume a ternary division in a somewhat different direction, as follows:—

1st, The Delta (or Lower Egypt) and Nile Valley; 2nd, the Libyan Desert, lying to the west of the Nile Valley above Cairo; and 3rd, the region between the Nile Valley and the Red Sea and Gulf of Suez, called in some of our maps by the rather misleading name of the "Arabian Desert," a name more properly applicable to the region east of the Red Sea and the Gulf.

A very brief description of these three regions is all that is here necessary.

1. The Delta,‡ is the smallest, but, economically, the most important, of the three divisions, extending from the open-

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\* "Notes on the Geology of the Nile Valley and of Egypt," *Geol. Mag.*, Nos. 241, 242, 243, 244; and *Egypt and Syria* (1883).

† *Ueber den Geol. Bau der Libyschen Wüste* (München, 1880).

‡ See Plate, also Dr. Porter's description of this region, *Journal*, vol. *ix*, p. 15.

ing of the Nile Valley at Cairo to the shores of the Mediterranean, and from the plateau of the Libyan Desert on the West to the Isthmus of Suez on the East. This western margin of the Delta is formed of horizontal beds of Nummulite limestone, which break off in an escarpment, rising from 200 to 250 feet, above the surface of the Delta, and thus producing a commanding site for the Pyramids, the Sphinx, and other structures of ancient Egyptian art.

The range of hills forming the margin of the Badiet et Tih, or Desert of the Wanderings, east of the Isthmus of Suez, is formed of similar limestone strata, and these are again met with along the range of hills, extending from Jebel Mokattam, near Cairo, to Jebel Attaka, which rises above the Gulf of Suez in a terraced escarpment of limestone rock, strikingly imposing when viewed from the waters of the gulf.

The general structure, therefore, of the tracts bordering the Delta to the south, east, and west leads us to infer that the region of Lower Egypt has been formed by the denudation or erosion of the limestone strata, which once extended over its whole surface, almost horizontally (Fig. 3). The eroded portion has been subsequently to some extent filled in by sediment brought down by the Nile, and annually distributed during flood-time over its surface, so that it consists of a vast plain of alluvial land with scarcely any natural elevations except the sandhills near the coast. These sandhills rest upon a reef which forms a powerful dam against the encroachments of the Mediterranean, and which Russegger describes as being in a constant state of formation and waste. It consists of a calcareous stone of a dull grey colour, composed of sand mixed with worn fragments of marine shells, sometimes minute or microscopic. A few of these are of land or fresh-water origin, brought down by the Nile and thrown up by the sea and mingled with marine shells.\*

2. *The Libyan Desert.*—This second natural division consists of a vast slightly elevated plain composed of limestone, which breaks off in an escarpment ranging along the western margin of the Nile Valley and the plain of Lower Egypt, to the shore of the Mediterranean near Alexandria.

The average level of this plateau may be taken at 1,000 feet; but towards the south, in the latitude of Siut, the limestone plateau gradually rises to levels of about 1,500 feet, and below the First Cataract breaks off in lofty rocky escarp-

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\* *Reisin in Europa, Asien und Africa*, Stuttgart, 1843.



ments, along the Nile Valley and the northern boundaries of the Oases of Chargeh and Dachel.

From the Oasis of Siuah, in lat. 29° 10' N., a well-pronounced escarpment trends in a N.N.W. direction for a distance of 200 miles, as far as Moghara, then bends sharply round to the north-west, and stretches away towards the coast of the Mediterranean, where it terminates in Ras el Kanais. The elevated table-land thus enclosed is represented by Zittel as formed of marine strata, consisting of limestones, marls, and shales of Miocene age.\* To the south of the Oasis of Siuah at the "Echo-Thal," lacustrine beds set in, overlying those of marine age, and apparently extending under the vast tract of sand dunes which continues southwards for several hundred miles. Zittel arranges the Libyan Desert under three forms: (1) The plateau desert tracts, formed of hard stony ground, destitute of vegetation, and covered by blocks and fragments of limestone, due to the decomposition of the rock; the process of decomposition being accelerated by the changes in temperature from day to night, which cause the stone to crack and disintegrate in all directions. (2) The hollows (Daga) in the horizontal beds of limestone, containing small lakes or salt marshes, and bounded by mural terraces and escarpments. Of these, the most remarkable is the Birket-el-Querûn (or Lake of the Horn), lying in the depression of the Fajûm (Fayûm) at a distance of about 20 miles to the west of the Nile above Cairo.† It is about 30 miles in length from west to east, bounded on the north by a terraced escarpment of limestone cliffs, and its surface, according to Mr. Cope Whitehouse, about 150 below the level of the Mediterranean.‡ Inside this basin are recent terraces composed of estuarine materials. The lake is fed by the Bahr Jussuf (or Joseph's Canal), which takes its supply from the Ibrahmîc Canal, fed by the Nile not far from Assiut, and serves to both irrigate and

\* First described by Ehrenberg in 1820, see further on, p. 13.

† Schweinfurth, "Karte des Depressionsgebietes in Umkreise des Fajûm," *Zeitschrift d. Gesells. f. Erdkunde*, Berlin, 1882. See also Cope Whitehouse, *The Bahr Jusuf*, London, 1886.

‡ Schweinfurth makes the surface 40·071 mètres; Mr. Cope Whitehouse makes it 150 feet below the level of the sea, and the Rayân depression still deeper, viz., 200 feet below. At the meeting of the British Association at Leeds a paper was read by Mr. C. Whitehouse on the great works of irrigation and water supply being carried out by utilising this great natural depression as a reservoir for the Nile waters when in flood.

drain the western side of the Nile Valley for a distance of 150 miles, as well as to irrigate the Rayân and Fajûm basins. Other hollows and oases are those of the Sittrah Sea, Uttiah, Aradj, and Siuah, some parts of which are lower than the Mediterranean. The origin of these remarkable depressions is somewhat difficult to explain. They are, it must be recollected, hollowed out of limestone strata, in which water acts as a solvent when containing carbonic acid gas. But their original formation doubtless dates back to the Pluvial period, to which we shall presently recur, when water action was vastly more effective over these regions than at the present day.

3. The sandy desert, the most frightful of all desert surfaces, is covered by mounds, sometimes 100 mètres high, of pure quartz sand. The source of this sand, which often covers limestone strata on the borders of the Sahara, was, according to Zittel, probably the "Nubian sandstone formation," which underlies the limestone, and which has been drifted from its outcrop by the winds northwards from the Oasis of Chargeh, and westwards along the parallel of lat. 25°. Doubtless, also, some of this sand may have constituted the sandy bed of the sea, when the whole region of northern Africa was gradually rising from beneath the waters, in later Tertiary times, and extensive denudation of the strata was in progress.\*

*Forest of Silicified Wood.*—Lying in a direction due west of Cairo, lat. 30, and in a region but little explored, are to be found great numbers of silicified stems of trees, apparently belonging to a sandstone deposit, and extending over a tract 1,600 square miles. This forest is formed of the stems of trees of the genus *Nicholia*, &c., and has its counterpart in a similar forest on the plateau of Jebel Ahmar, near Cairo, where the trees have been embedded in reddish loam and variegated sandstone or conglomerate. This deposit is generally regarded as of Miocene age.†

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\* Professor Judd states that the sands of the alluvial deposits of Lower Egypt give evidence of having been derived originally from granitoid rocks, as the grains contain fluid-cavities and crystals of rutile seen under the microscope. A similar observation has been made by Dr. J. S. Hyland as regards the grains of quartz in the sands at Korti, which contain gas- and fluid-cavities as well as hair-like needles, presumably of rutile. *Scient. Proc. Roy. Dublin Soc.*, Feb. 10, 1890.

† For fuller accounts of this deposit, see Dawson, *Modern Science in Bible Lands*, p. 543. Zittel, *Libyschen Wüste*, p. 132. Carruthers *Geol. Mag.*, 1870.

The great tracts of desert above described lying to the north of lat.  $25^{\circ}$  terminate along the south in the escarpment of Jebel Djefata, which reaches a height of 1,550 feet above the sea level. To the south of this escarpment the beds of the Cretaceous formation set in, with a slight northerly dip, to be succeeded still further south by those of the Nubian sandstone, which first makes its appearance in the Nile Valley at Esbeh, near Edfu, and which in turn reposes on the crystalline rocks of the First Cataract at Assouan, the ancient Syene.

3. *The Region of the Arabian Mountains.*—This region, lying between the Nile Valley and the Red Sea, presents a striking contrast to that we have just described lying to the west of the river. Its western portion consists of the same strata as those which form the Libyan Desert, but it is generally more diversified by high plateaux bounded by terraced escarpments and deep valleys, and is also intersected by a range of mountains formed of crystalline rocks of vast geological antiquity, which gives a special character to this region, and which may be designated "the Archæan protaxis." In a word, while the region west of the Nile is an elevated tableland, that we are now considering is, properly speaking, a mountainous tract. (See Fig. 1, p. 14.)

At Cairo, the lofty terraced banks which form the eastern margin of the Nile Valley abruptly change their direction and bend round to the east at Jebel Mokattam and thence extend in a broken escarpment to Jebel Attaka, already referred to as overlooking the Gulf of Suez. These escarpments form the northern margin of the Arabian Mountains, which stretch southwards, till they ultimately merge into the vast Nubian plateau.

The protaxis, or culminating ridge, of this tract is formed by the line of crystalline rocks which ranges from the Wady el Arabah in a southerly direction, and therefore parallel to the shore of the Gulf of Suez, by Jebel Ghareb (Mt. Agrib), by Doukhan (Mons Porphyrites) to Fateereh, and Zobara, containing quarries of green breccia marble, quarried by the ancient Egyptians. The higher elevations of this range attain a height of 6,000 to 7,000 feet above the sea. The ridge presents its steepest flank to the eastward, and sends off numerous valleys on either side; those running to the east opening out on the sea coast, those in an opposite direction opening into the Nile Valley, between lofty terraces of limestone. The most remarkable of these valleys are the Wady Qeneh, which runs along the western base of the ridge for a

distance of 100 miles, and opens out on the Nile at the village of the same name. The Wady el Arabah, which opens on the Gulf of Suez, is remarkable for its width and the loftiness of the cliffs by which it is bounded, and has been graphically described by Schweinfurth, who has discovered Palæozoic strata therein.\*

These valleys are now waterless, but from their ramifying form, and the physical features of the sides, indicating extensive erosion of the strata, together with the alluvial gravel of their floors, they enable us to infer, without any hesitation, that they were originally formed by water-action, and that they were once the channels of no inconsiderable streams and rivers. They have their counterparts in Arabia Petræa and Southern Palestine, and other districts of the African Continent.

### PART III.—THE NILE.

The region thus described is traversed from south to north by the one river of Egypt, the Nile, which, rising in the great central lake, embosomed amidst lofty mountains, the Victoria Nyanza, at a level of 3,740 feet, flows for a distance of 2,000 miles, till it enters the Mediterranean by its two great branches, those of Rosetta and Damietta; the only representatives of seven original outlets known to ancient geographers.

In its upper reaches, south of lat. 10° N., the Nile receives many tributaries, but north of this, there are but two, the Bahr el Azraq (or the Blue River) and the Atbara or Bahr el Aswad (or the Black River), which descend from the highlands of Abyssinia. It is now known, from the account of Sir Samuel Baker and others, that the periodic inundations of the Nile in Egypt are due to the thunderstorms which burst upon the Abyssinian mountains about the summer solstice, and which, pouring down in torrents by its great rivers, chiefly the Atbara, carry along the muddy sediment derived from the breaking down of their banks. At the island of Philæ, about five miles south of Assouan, the Nile may be considered to make its entrance into Egypt. At Assouan, the level of the river is, according to the barometric measurements of Russegger about 300 feet above Cairo, and 365 feet

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\* *Bull. Institut Egyptien*, No. 6 (1885). There is another and greater valley of the same name in Arabia Petræa, extending northward from the Gulf of Akabah.

above the Mediterranean; and, the distance between Assouan and Cairo by the river being 556 miles, the average fall is little more than half a foot in a mile. Between Philæ and below Assouan the river passes through a labyrinth of granitic and crystalline rocks, causing a series of rapids, known as the First Cataract. The Arabian hills, forming the right bank of the river, break off in a line of cliffs throughout nearly their whole length. In the neighbourhood of Assouan, they rise little more than 200 feet above the river, but they go on increasing in height to the vicinity of Thebes, where they attain an elevation of 1,065 feet above the Nile; and from this northwards, they have a gradual fall, but rise again on approaching the apex of the Delta to about 900 feet. Above Cairo, the cliffs of Eocene limestone are worn into terraces and caverns, indicating former depressions of the whole land surface beneath the sea, and ancient sea margins to which I will have occasion to refer again. Below Assouan, the granitic rocks are covered by the Nubian sandstone, which extends along both sides of the river as far as Esneh, about 85 miles below Assouan, where it in turn passes below white limestone strata, referable to the period of the Cretaceous Limestone or Chalk of England.\*

#### PART IV.—GEOLOGICAL FORMATIONS.

Such being the general form and features of the region now under description, it remains to give very briefly some account of the geological formations of which it is built up; and, as this subject has already been so fully dealt with by geologists of eminence, only a slight sketch will be necessary here before we come to discuss the physical changes which the region has undergone from the time when the land first emerged from below the ocean until it assumed its present form and condition.

(1.) *Fundamental Crystalline Rocks.*—The rocks which constitute the foundation of all others in this part of the world are probably of the age known as “Archæan” or “Laurentian.” They form the ridge which crosses the Nile at the First Cataract† and extend into the protaxial range of

\* An excellent account of the physical phenomena connected with the Nile and its channel is given by Mr. Horner in his paper on Lower Egypt, *Philosophical Transactions*, 1855; also in Réclu's *Nouvelle Géographie*, vol. x. Space does not permit of any fuller description here.

† These rocks have been described by Lieut. Newbold, F.R.S., *Quart. Jour. Geol. Soc.*, vol. iv, p. 324; J. C. Hawkshaw, *ibid.*, vol. xxiii, p. 115

Mt. Agrib, in the Arabian Mountains. They also constitute the mountain masses of the Sinaitic Peninsula, and the flanks of the Edomite range on the borders of the table-land of the Arabian Desert.\* They consist of micaceous, hornblendic, and chloritic schists, clay-slate, and quartzite, with numerous granitic veins, below which are beds of gneiss and schist with dykes of granite and diorite, which have been used in Egyptian works of art. According to Dawson, this older series, which may be referred to the Archæan age, is overlain unconformably by a second series seen at the Island of Biggeh, above the First Cataract, and near to Philæ; which series consists of porphyry, gneiss, and porphyritic granite, all probably of Plutonic origin, and possibly referable to the Huronian Series of North America. Newbold has described granitic and schistose rocks as ranging from near the shore of the Red Sea at Kosseir inland, in a band about 30 miles in breadth, forming a part of the great central axis of Mt. Agrib. The fundamental part of this range appears to be granite (or gneiss), supporting various schists, and penetrated by dykes of basalt, greenstone, porphyry, and serpentine. In Gebel Zubara are found emeralds, avanturine, and specular iron ore; and from the potstone, nephrite, and "green felspar" of Mount Baran have been sculptured cooking vessels, images, and scarabæi.

In the same region is also found the celebrated Breccia di verde, resting on the slate in unconformable thick-bedded strata, containing angular fragments and rounded pebbles of greenstone, gneiss, slate, serpentine, and marble cemented by a slightly calcareous paste. This breccia has been largely used for ornamental work, in Egypt, Italy, and Constantinople.† These old crystalline rocks form the core of the Abyssinian Highlands, and range into the region of the Central African Lakes by Mounts Kenia and Kilimanjaro.

(2.) *The Nubian Sandstone.*—This formation is found resting on the Archæan crystalline rocks north of Assouan on both banks of the Nile, and on the flanks of the great central axis of crystalline rocks in the Arabian mountains. Having been extensively used by the ancient Egyptians in their works of monumental art, amongst which may be

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(with map); J. Russeger, "Reisen in Europa, &c.," *Journ. Leonhard und Bronn*; Sir J. W. Dawson, *Modern Science in Bible Lands*, p. 556, &c.

\* "Phys. Geol. Arabia Petræa and Palestine," *Mem. Palest. Explor. Society*, 1886.

† Newbold, *supra cit.*, p. 329.

specially mentioned the colossal statues of the Memnium at Thebes, it was called by De Rozière the "Monumental Sandstone."\*

This rock consists of red and variegated sandstone several hundred feet in thickness, and is destitute of fossils, except plants. Where it rests upon the old crystalline rocks it becomes a breccia, or conglomerate; in fact it constitutes a beach or shore bed, made up of pebbles derived from the original floor and bordering uplands of crystalline rocks. Red sandstone occupies large areas in Nubia, and Middle and Southern Sahara.† It is also found in Arabia Petræa, and along the eastern slopes of the Arabah Valley and shores of the Dead Sea. Its geological age has been long a subject of discussion amongst observers and travellers in the East, and it has been referred successively to the Cretaceous, Triassic, Permian, and Devonian ages. It is now known that it belongs in part to two geological periods widely separated, viz.: the Lower Cretaceous and the Lower Carboniferous. The discovery of limestone strata with Carboniferous marine fossils, within the mass of the red sandstone in the Wady Arabah, near the western shore of the Red Sea, by Schweinfurth;‡ in the Wady Nasb, in the Sinaitic Peninsula, by Bauerman;§ and to the east of the Dead Sea by the author, shows that the lower portion at least is in some places Carboniferous, or older; while the upper strata, passing as they do into the Lower Cretaceous series and conformably stratified therewith, indicates that these beds are of Cretaceous age. It is probable that the Carboniferous sandstones are only local; and that more generally the greater mass, including that in the Nile Valley, is of Cretaceous age. To the lower (or Carboniferous) division I have given the name of "The Desert Sandstone," to distinguish it from the upper or Cretaceous division, to which the name "Nubian Sandstone" properly belongs.|| It is not improbable that the Adigrat sandstone formation of

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\* "Grès Monumental," which happily avoided any theory regarding its geological age. De Rozière, "Description de l'Égypte," *Hist. Nat.*, 11.

† Zittel, *loc. cit.*, p. 41. The red sandstone of the Ahaggai Mountains is considered by Zittel to be Palæozoic.

‡ "Sur une récente Exploration géologique de l'Ouadi Arabah," *Bull. del'Institut Egyptien*, 1887.

§ *Quart. Journ. Geol. Soc.*, vol. xxv., p. 27; also "Geol. Arabia Petræa and Palestine," *Mem. Pales. Exploration Fund.*, p. 44.

|| *Ibid.*, p. 45.

Abyssinia, described by Dr. Blanford as underlying Jurassic limestone, belongs to this lower or Palæozoic division.\*

The only fossils in the Nubian sandstone proper are stems of plants; and it is probable that this great formation was deposited within the waters of a vast inland lake, occupying the greater portion of Northern Africa. The sediment of which it was formed was derived from the disintegration of the granites, crystalline schists, and quartzites of the Archæan rocks, forming the continental land by which it was enclosed. Gradually this region subsided and was invaded by the waters of the Cretaceous ocean.

(3.) *Cretaceous and Eocene Limestones*.—The calcareous strata which overspread the Libyan Desert and the greater part of the Arabian Mountains belong to two formations: the Cretaceous and Eocene. The former is represented by the Chalk formation of England, France, and Belgium, and consists of soft white limestone and calcareous marls with characteristic fossils such as: *Exogyra Overwegi*, *Inoceramus Crispi*, *Hippurites*, *Nautilus desertorum*, *N. Danicus*, &c.

The Eocene limestone, generally known as the Nummulite limestone, from the occurrence of species of *Nummulites*, often in great numbers, is chiefly formed of solid beds of limestone with bands of chert. The fossils, which are numerous, are specifically different from those of the Cretaceous beds, though the strata are similar in character and origin, and are approximately conformable to each other. How are we to account for this remarkable change in the fauna of the two similar formations? Probably somewhat in this way: The Cretaceous limestones and marls were formed over the bed of the great ocean which spread its waters over all this region, from the Red Sea to the Atlantic, except where the mountainous tracts of ancient Palæozoic or Archæan rocks rose above its surface. In the waters of this ocean the characteristic Cretaceous forms lived abundantly; but, towards the close of the period, the bed of the ocean was slowly and generally elevated till it became either dry land, or very shallow. During this process of upheaval and desiccation the animals which had lived in the waters were necessarily destroyed; and when the region again partially subsided and became oceanic, new forms of living beings migrating from other oceanic areas, took possession of the waters, amongst which Foraminifera of the genus *Nummulites* were the most

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\* W. T. Blanford, *Geol. and Zool. of Abyssinia*, p. 170.



abundant. Thus we can understand how that, with but little discordance of stratification, the specific forms became changed.

The Nummulite limestone is fairly laid open to view in the quarries of Gebel Mokattam, near Cairo, and amongst other forms may be seen well preserved specimens of crabs, with their limbs attached to the crustaceous body; also large Nautili, and Echini of the genera *Echinolampas* and *Spatangus*. The ancient quarries on the right bank of the Nile above Cairo are those which yielded the stone of which the two great Pyramids have been constructed.\*

The combined thickness of the two limestone formations, the Cretaceous and Eocene, in the Egyptian territory may, according to Zittel, be estimated at nearly 4,000 feet; and as these strata were formed mainly from the remains of marine animal forms such as Foraminifera, Crinoids, Crustaceans, and Molluscs, the length of time included in this period of accumulation of material is necessarily very vast indeed.

(4.) *Miocene Strata*.—It is probable that at the close of the Eocene stage, the bed of the ocean was again subjected to elevatory movement, some portions became dry land, others were converted into inland lakes or estuaries. In these latter, clays and sandstones were deposited, and the plants peculiar to Africa grew round their margins, or partially were aquatic. The stems of these trees have in several places become silicified, and afford at the present day the remarkable spectacle of the silicified forests of Jebel Ahmar, near Cairo, and of the Libyan Desert, in lat. 30° N. and long. 29° 30' E., called by Zittel "the Nicolien Wald," from the prevalence of the trees called *Nicolia Ægyptiaca* and *N. Oweni*, to which may be added several other forms, including a conifer and a palm. The presence of those trees in a region now arid and treeless shows that the climate of this region has undergone a great change in Post-tertiary times: to this subject I shall again refer.†

The Miocene period in Egypt, as in Europe and the British Isles, was one remarkable for terrestrial movement

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\* It is lamentable to reflect that the Mahomedan Caliphs in their zeal for the religion they had adopted showed little respect for the memory of the ancient Lords of Egypt, and did not scruple to strip the polished and sculptured casing of marble from off the pyramids in order to obtain material for building their mosques, and the walls of the city.

† Zittel, *loc. cit.*, p. cxxxiii. The leaf of an oak, *Quercus ilex*, was found by this author in the Oasis of Chargeh.

and disturbance, and for faulting and flexuring of strata. Large areas of what had been for ages the bed of the ocean were converted into dry land, and along with this elevation of the strata extensive denudation was carried on by wave and river action. We may go so far as to say that to the Miocene period is to be referred the development of the leading physical features of the region here treated of, together with both Syria and Palestine. Owing to this cause, Miocene strata are of rare occurrence, as the period was one of denudation rather than of deposition of strata.

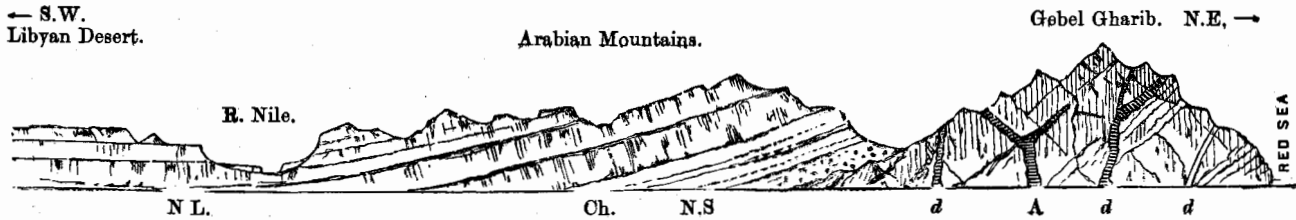
Nevertheless, strata both of marine and lacustrine origin, referable to this period according to Zittel, are to be found in isolated positions not much elevated above the sea level, as for example in the Oasis of Siuah, or Ammon, and adjoining plateau of Barco, at Jebel Geneffe north of Suez, and a few places bordering the Gulf of Suez, to the south of that place. The strata, consisting of limestone, marls, and sand in these localities, are generally of marine origin, as indicated by the fossils, which include *Pecten*, *Spondylus*, *Ostrea* of several species, *Placuna*, and Sea-urchins, such as *Echinolampas*, *Scutella*, *Clypeaster*.\* They appear to be conformably superimposed on the Upper Eocene beds at Siuah; but in the case of the beds near Suez, they occupy positions in reference to the Nummulite limestone, which show that that formation had been upheaved and largely denuded previous to the deposition of the Miocene strata. They may therefore be regarded as representatives of the period locally deposited where the sea-water prevailed in the vicinity of the emergent lands.

5. *Pliocene or Pleistocene Strata*.—The representatives of this period consist of raised beaches and shore beds with sea shells and corals found at intervals on both sides of the plain of Lower Egypt, and at an elevation of 200 to 220 feet above the present sea level (Fig. 2). In the oases of the Fayûm and Rayân basins, by beds of sand, loam, and marl, with sea shells such as *Turritella transitoria*, Mayer, *T. turris*, Bast, *T. carinifera*, *Corbula pyxidicula*, *Tellina pellucida*, Desh.,† &c., and in the Nile Valley by terraces of gravel, sand, and loam, rising for 100 to 130 feet above the highest inundations of the river in the neighbourhood of Assouan. When these beaches and terraces were in course of formation, the gulf of Lower

\* The Pliocene beds of Siuah were first noticed by Ehrenberg in 1820, those of Suez by O. Fraas, Fuchs and Schweinfurth. Plates of fossils are given in Zittel's work, Plates I, II, III, and IV, &c.

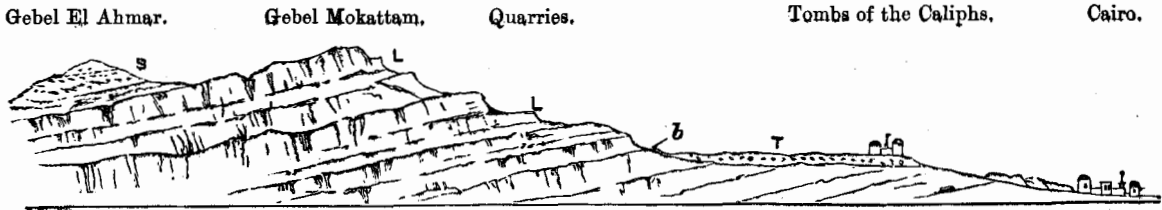
† Figured in Plate XXIII of Zittel's *Libyschen Wüste*.

FIG. 1.—SECTION ACROSS THE "ARABIAN MOUNTAINS," TO SHOW SUCCESSION OF STRATA.



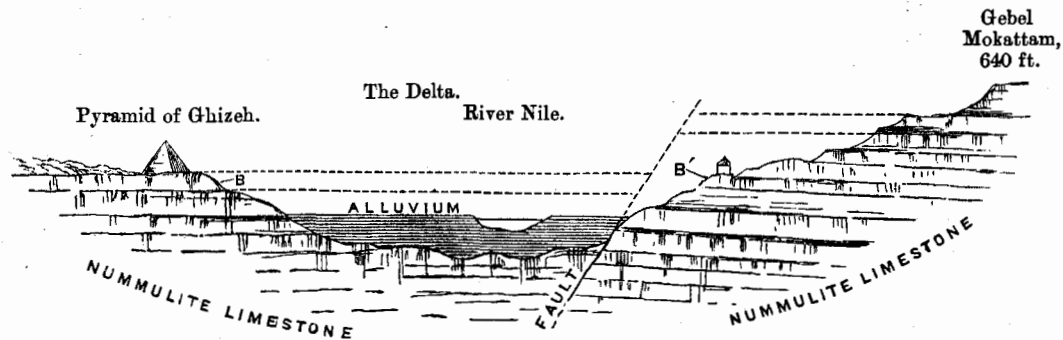
N.L. Nummulite Limestone (Eocene).  
 Ch. Chalk (Upper Cretaceous).  
 N.S. Nubian Sandstone (Cenomanian or Neocomian) with conglomerate or brecciated base.  
 A. Archæan Rocks, Granite, Gneiss, Schists, &c., with dykes of trap (dd).

FIG. 2.—SECTION THROUGH GEBEL MOKATTAM, NEAR CAIRO, TO SHOW THE RELATIONS OF THE STRATA AND RAISED SEA-BED.



S. Sandstone of Gebel El Ahmar with silicified trees.  
 L.L. Eocene Limestone. Upper beds brown with *Nummulites planulatus*.  
 Lower, white with *Nummulites Ghizehensis*, &c.  
 T. Terrace of sand and gravel, with recent shells; b, position of Pholas borings at 220 feet above Red Sea.

FIG. 3.—GEOLOGICAL SECTION ACROSS THE NILE VALLEY ABOVE CAIRO, SHOWING THE RELATIVE POSITION OF THE STRATA ON EITHER SIDE, AND THE CHANNEL WITH ALLUVIAL SILT.



The dotted lines show the position of the limestone strata before they were denuded, as displaced by the fault. B shows the position of the Old Pleistocene sea-beach near the Pyramid of Ghizeh, and B' its position as shown by Pholas borings in the cliff on which stands the Mosque of Mehemet Ali, on the East of the Nile Valley.

Egypt had already been hollowed out of the Eocene limestone strata, and the whole region was re-submerged to a depth of over 200 or 250 feet below its present level, relatively to the surface of the Mediterranean and Red Seas. It is since that period of submergence that the alluvial deposits of the Delta have been accumulated.

#### PART V.—PHYSICAL HISTORY OF EGYPT AND THE NILE VALLEY.

(1.) During the Cretaceous and Eocene periods, the whole region embraced by Egypt and the Libyan Desert was submerged beneath the waters of the sea, which extended southwards from the Mediterranean area, probably as far as lat. 12° in the meridian of the Nile Valley (see map). The limits of the Eocene sea were probably defined by the Sinaitic and Arabian mountain chain extending southwards into the Abyssinian Highlands. The southern limits are at present uncertain. Without doubt the unsubmerged land of the period included the high region surrounding the great Central African lakes, and extending in a north-westerly direction into the Air and Tibesti district, constituting the Asgar (or Ahaggar) Mountains; composed, according to Zittel, of Palæozoic (Devonian?) sandstone, slate, gneiss, and granite with volcanic rocks, forming the southern border of the desert. Towards the north the borders of this Tertiary sea were formed by the Morocco Atlas and Algerian Highlands, amongst which various Palæozoic rocks appear, sometimes penetrated by granite and porphyry. Such were in brief the general limits of the Tertiary inland sea, and into its waters some of the existing affluents of the Nile, from the great equatorial lakes in the south, and the Abyssinian Highlands in the east, emptied themselves.

With the succeeding Miocene epoch, the quiescent condition of the earth's crust over this region came to a close. A general elevation of the sea-bed into land surfaces took place over Northern Africa and the adjoining tracts of Sinai and Palestine. Faulting and flexuring of the strata also supervened. It was during this period that the great Jordan-Arabah fault, which has been traced from the Lebanon to the Gulf of Akabah, was produced;\* as also, in the Egyptian area, the fault running parallel with the

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\* "Geol. Arabia Petræa and Palestine," *Mem. P. E. F.*, p. 103.

Nile Valley, by which the strata of Nummulite limestone have been let down about 250 feet on the west side of the valley, as shown by Schweinfurth and Dawson, as compared with their position in Mokattam Hill, on the east bank\* (Fig. 3). This line of fault, trending in a N.—S. direction along the base of the eastern cliff, corresponds with the line of the valley for a distance of nearly 100 miles, and doubtless caused the river to select its course in this particular district. With the rising of the sea-bed into land it became necessary for the various affluents of the Upper Nile to select a channel seawards, and it is easy to show that no other course than that actually selected was possible. It has been suggested more than once that the Nile at one time flowed through some abandoned channel into the Red Sea; but no such channel exists or was possible. The long range of the Abyssinian and Arabian Highlands, formed of ancient rocks, effectually barred any outlet in an easterly direction. And for a similar reason a westerly course, which would have brought the river into contact with the Tibesti and Ahaggai Highlands, was impossible. A river in seeking an outlet towards the sea necessarily flows along the lowest accessible ground, and such a tract appears to have existed generally along the present Nile Valley, formed of Cretaceous and Tertiary limestone strata, which was probably slightly depressed as compared with the bordering tracts. The fault in the valley of Lower Egypt above described, which was an effectual guide to its course there, probably gave place further south to a slight depression or channel in the old sea-bed, and along this the river seems to have had a line of flow of least general resistance to its course towards the outer sea.

We may therefore suppose that, as the sea-bed over the Egyptian and Libyan areas gradually rose, and became land, the river waters followed the line of retreat of the sea waters northwards, the several streams converging into one central channel; and when the whole tract had been reclaimed from the sea, this channel would become deeper by reason of the increased eroding action of the waters, tending to deepen the channel back from the outlet.†

\* *Proc. German Geol. Survey*, 1883, quoted by Dawson, *loc. cit.*, p. 538. The disturbances and dislocations in the rocks near the Second Cataract, described by Leith Adams, are probably referable to the same period, *Quart. Jour. Geol. Soc.*, vol. xx, p. 11.

† These streams are well shown in Ramsay's *Orographical Map of Africa*, published by E. Stanford, and in the "Carte du bassin du Nil" in Reclus' *Nouv. Geog.*, vol. x.

One or two barrier ridges had, however, to be crossed in the case of the Nile, as in that of most rivers of any importance. The explanation of this singular physical fact is now fully understood. For a while these barriers, formed by the limestone escarpment where it crosses the valley north of the First Cataract, and by the sandstone and granite near Ipsambol below the Second Cataract, would prove formidable, and the waters probably accumulated behind them, till they rose above the lowest lip, and then poured down, continually deepening their channel as time went on. Once the channel was formed, it so remained,\* and it must not be forgotten that the strata being somewhat elevated in a southerly direction during the period of movement, was itself undergoing denudation, or lateral erosion; and the rainfall being doubtless abundant (as testified by the forests now silicified), the rocks were worn down by rain and river action, along the lines of outcrop of the strata.

This deepening process, by water erosion, must have gone on *pari passu* with the uprising of the land. It is also necessary to suppose that the uprising continued until the land formed of Eocene limestone was elevated much higher relatively to to surface of the then ocean than is at present the case; because, the erosion of the limestone beds in the valley of the river, and the Delta, must have gone on till the present floor of the Delta was reached, but which is now filled with sediment up to (or above) the level of the Mediterranean. The maximum depth of the floor is not yet ascertained, notwithstanding the boring experiments carried out by the Royal Society, 1854, under Mr. Horner, and more recently in 1886. If we assume the greatest depth to be 200 feet below the present surface of the alluvial plain, then this will give us approximately the amount of the additional rise of the land, relatively to the surface of the then outer sea.†

The greater relative elevation of the land during the Miocene period would result in giving the river a greater fall, and increasing the eroding power. Very little sediment would under these conditions be deposited; and thus, at the close of the Miocene epoch, we may contemplate the Nile as rushing along its rocky bed towards the outer sea, its banks

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\* It will be understood I do not refer to the changes of position of the Nile within the limits of its alluvial plain.

† This will be evident when it is recollected that erosion could only go on above the sea level; for, under the opposite conditions of the land deposition of sediment, and not erosion, would be in progress.

of limestone rock towering some 200 feet more than at present where it leaves its narrow channel at the apex of the Delta,\* and numerous streams wearing back the limestone cliffs till they had assumed somewhat of the form and position they now occupy all round the plain of Lower Egypt.

(2.) *Pliocene Epoch*.—Geological history, especially during the later periods, presents us with frequent examples of depression of land succeeding elevation, and this is still going on over the surface of our globe. We are therefore not to be surprised when in working out the physical history of Egypt we find evidences of such oscillations of land and sea. The Miocene period was evidently one of elevation and erosion, as we have just seen; but it seems to have given place to one of depression of the land to an extent not indeed sufficient to cover the Libyan and Arabian tracts with sea-water, but to an extent of about 220 to 250 feet, if we take the present sea level as a datum. This inference is arrived at by the discovery of raised beaches, and terraces with sea-shells at levels such as are above stated at various points along the flanks of the hills bounding the Delta on both sides,† as well as in other parts of the region bordering the Levant. The positions of these terraces and beaches are indicated in Figs. 2 and 3.

Before, however, entering upon the discussion of this last submersion, it may be well to refer to a remarkable episode in the zoological history of this part of the world, for the elucidation of which we are much indebted to Dr. Wallace. I refer to the great migration of Pachyderms, Carnivores, and other Mammalia from the Europasian continent into Africa, which took place about the time that we have now reached in the physical history of Egypt.

*Zoological Episode*.—Towards the close of the Pliocene period the animals which ranged over the Europasian tract of continental land were largely representative of those of the

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\* At what particular stage of the Miocene period the marine strata referable to this stage at Siuah (Ammon) and Geneffe were deposited it is difficult to say. Those of the former appear to have been formed within an arm of the sea stretching inland from the Gulf of Sidra. There are very few shells common to both deposits.

† Of course the existence of the shore beds here referred to might be accounted for by supposing the level of the outer sea (now the Mediterranean) to have risen 250 feet higher than at present; but this is not a probable supposition, as it would involve the idea of a general rise of the whole outer ocean. As Lyell and others have shown, it is the land which rises and falls, while the ocean surface maintains nearly always its geodetic level.



present day. A few forms, such as the *Machairodus* and *Mastodon* have become extinct; others have been somewhat modified, but the general change is not very great. During this epoch there is reason to believe that the continent of Africa was the abode of a very different and less varied fauna, which is now represented by that of the Island of Madagascar and the Seychelles at the present day. How then are we to account for the presence in Africa of the numerous forms of *Pachyderms*, *Felides*, *Antelopes*, and *Ruminants* which people this great continent? The explanation which Wallace offers is clear and satisfactory. At the close of the *Pliocene*, or commencement of the *Pleistocene*, period a great migration of the *Europasian* animals took place into Africa, by which the aboriginal forms were exterminated or driven out, and replaced by the invading host of fiercer and more powerful animals.\* But in order to render such an invasion possible, one or more highways had to be constructed across the barrier of waters, caused by the *Mediterranean*, the *Gulf of Suez*, and the *Red Sea*. Under existing conditions, it is clear, such a migration would be impossible except by one narrow passage, the *Isthmus of Suez*, which would have been quite insufficient for such an invasion as is now contemplated. It would appear, however, that the very same cause which forced on the southward migration gave rise to the formation of, at least, two causeways from Europe to Africa across the *Mediterranean* as it now exists. This was the increasing cold of the on-coming *Glacial* period, which made itself felt towards the close of that of the *Pliocene*. The gradual lowering of the temperature, owing to which the animals were driven southwards, caused the streams which feed the *Mediterranean* from the northward to become frozen, and ultimately to be converted into ice. As the snows accumulated on the *Pyrenees*, the *Alps*, the *Carpathians*, and the vast plains of *Russia*, the sources of the rivers feeding the *Mediterranean* from the north would be dried up, or become much reduced, and as a consequence its surface would be lowered. Mr. Wallace considers that there were three causeways thus produced by which the animals passed over into Africa; one, the *Straits of Gibraltar*; another, between *Italy*, *Sicily*, the *Maltese Islands*, and *Tunis*; and a third, the *Isthmus of Suez*, which still remains. There may also have been a general elevation of the *Mediterranean* region, by which the connec-

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\* Wallace, *Island Life* (1880), and *Geographical Distribution of Animals* (1876).

tion with the Atlantic Ocean was cut off.\* The large number of remains of Elephants, Hippopotami, and other forms in the caves of Sicily and Malta, as shown by the late Drs. Falconer and Leith Adams, bear testimony to the extent of the land connection here indicated; and it is known that there is a large extent of very shallow water in this part of the sea, separating deep gulfs on either hand.

Bearing on the subject of the formation of the channel of the Nile and the denudation of the plain of Lower Egypt, it may be observed that the lowering of the Mediterranean waters would cause increased velocity in the flow of those of the Nile, and consequently deeper and more rapid scouring out of the original channel. As already stated, the depth of the original floor of the basin of Lower Egypt is probably not less in some places than 200 feet from the present surface; the Rosetta boring described by Colonel Maitland, R.E., having gone down 153 feet without reaching the solid rock, and leaving off in coarse sand and pebbles.

Other excavations and borings made by the aid of funds granted by the Royal Society, reported upon by Horner and Judd, do not attain greater depths than about 75 feet, and are in alternating strata of desert sand and Nile mud.†

#### PART IV.—THE AGE OF MAN.

The period at which we have arrived, representing the "First Continental Period" of Lyell, continued on from the Pliocene into the Post-Pliocene or Glacial. It was one of general elevation of land, of shallowing of seas, of increasing cold and prevalence of glacial conditions over Northern and Central Europe and Asia. It was also the age of the Mammoth, of the woolly Rhinoceros, and, most important of all, of Palæocosmic Man.‡ Perhaps man followed in the steps of

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\* The subject has been ably discussed by Mr. T. F. Jamieson, *Geologica Magazine*, May 1885, p. 199, and is treated in my *Sketch of Geologica History* (1887), p. 129 *et seq.* The Mediterranean may have been considerably different in form at this epoch from what it is at present.

† Horner, *Phil. Trans.*, 1855; Judd, *Proc. Roy. Soc.*, vol. xxxix, Nov. 1885. Analyses of these deposits are given by both these authors, and by Dr. J. S. Hyland of those at Korti, in the Nile Valley, *Scien. Proc. Roy. Dublin Soc.*, Feb. 1890.

‡ I have taken this term from Dawson in preference to Palæolithic, which is more generally in use. The reader will do well to consult Sir J. W. Dawson's excellent work, *Modern Science in Bible Lands*, for a fuller account of this part of my subject than I can give here.

the great Pachyderms and Felines into Africa, where they became objects of the chase. Certain it is, that rude stone weapons, works of human art, occur in the ancient terraces on the banks of the Nile at Wady Halfa, and perhaps elsewhere, and which are of an age long anterior to the most ancient works of Egyptian art which adorn the banks of the river.

(4.) *Pluvial Period* ("Champlain Period" of America). *Depression of Land and Raised Beaches.*—I have already referred to the raised sea-beaches of Lower Egypt, at intervals along the margin of the table-lands by which the alluvial plain of the Nile is bounded. They have been recognised on the slopes of Gebel Mokattam, behind Cairo, at an elevation of about 220 feet above the present sea level; at G. Attaka, and Moses' Wells, near the coast of the Gulf of Suez,\* and at a spot about 2 miles south of the Pyramid of Ghizeh, on the margin of the platform of Nummulitic limestone on which the Pyramids have been erected. These old sea-margins were first recognised by Dr. Oscar Fraas,† and have since been described by Schweinfurth,‡ Dawson,§ and the Author.¶ At Gebel Mokattam, the Eocene limestone cliff has been perforated by *Pholades* (*Ph. rugosa*, Broc.), and in the gravel beds lying up against the rock, and sloping away towards the south, shells such as *Ostrea undata*, *Terebratella forscata*, *Pecten Dunkeri*, and *Balanus*, now inhabiting the Red Sea, are also found. The beds of gravel and marl, near the Pyramid platform, contain similar shells and numerous large *Clypeasters* (*C. Egyptiacus?*), which have long been known to the Arabs, but only recently to the scientific public. The terrace of the one side of the valley is undoubtedly representative of that on the other; and, together with others at various parts of the coast of Palestine and Syria, prove a general depression of the land

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\* These terraces are very well marked between Moses' Wells and the escarpment of the limestone, at the base of which are terraces of sand full of oysters, *Trochus*, *Conus* and other shells at successive levels.

† Fraas, *Aus dem Orient*, p. 161.

‡ Schweinfurth. "Ueber de Geolog. Schichten d Mokattam," *Zeitsch. d. Deuts. Geol. Gesellschaft* (1883).

§ Dawson, *Geol. Mag.*, No. 241; also *Modern Science in Bible Lands*, p. 537.

¶ *Phys. Geol. Arabia Petraea*, p. 70. These beds were considered as Miocene by Fraas, but Schweinfurth and Dawson both consider them more recent, probably "Pleistocene," in which view I concur.

to a depth of over 200 feet, at a very recent period\* (see Figs. 2 and 3).

Thus after the general elevatory movement of the Miocene and early Pliocene periods above described, a movement of depression in later Pliocene times set in, and the ocean waters gradually spread over the deeply eroded plain at the Nile mouth. As the land continued to sink, the sea would continue to wear down the cliffs and carry away exposed rock masses, and thus ultimately Lower Egypt became a wide gulf, into which the Nile Valley opened out northwards, until the waters reached the level indicated by the shell beds of Mokattam and Ghizeh.

The submergence of Lower Egypt and the Mediterranean coasts could not but make itself felt far up the Nile Valley. The sea must have sent an arm into the channel, while the waters of the river still higher would be pent up and rise to higher levels.

The effect of this inundation may be clearly recognised in the terraces which occur on both banks of the river from below the First, to above the Second, Cataract, and in the caves marking higher levels of the river margin. These occur both in the limestone and Nubian sandstone, and are from 60 to 70 feet above the highest Nile. The terraces, consisting of gravel and alluvial matter, with fluviatile shells, have been described by the late Dr. Leith Adams.† These old terraces with fresh-water shells were observed at levels of 110 to 130 feet above the highest inundations of the present river; as, for example, at Derr, the capital of Nubia, and at Abusir, Gharbea, north of Koroske, &c. The shells in these terraces belong to fresh-water species, such as *Cyrena fluminalis*, *Unio pictorum*, *Paludina bulimoides*, and *Bulimus pulus*. The tooth of a Hippotamus considered by Dr. Falconer to be that of *H. amphibius*, the existing species of the country, was dug out of one of these terraces by Dr. Adams.

\* These raised beaches were recognised by the author at Akabah, Wady esh Sheriah, near Gaza, at El Mejdal and Esdud, in Palestine, &c. Dr. J. Walther describes two coral reefs of modern date on the shores of the Red Sea near Tor at levels of 230 feet and about half this height above the surface, *Die Korallenriffe d. Sinai halbinsel*, ch. vi.

† *Quart. Journ. Geol. Soc.*, vol. xx, p. 6. These terraces are also described by Sir J. W. Dawson. It may be presumed that the numerous hammerstones and worked flakes found by Surgeon-Major S. Archer at Wady Halfa during the recent Soudan Campaign, and described by Dr. J. S. Hyland, come from these terraces, but this is not very clear from the description itself. See *Scientific Proceedings Royal Dublin Society*, Feb., 1890.

There can be little doubt that these old river terraces are the fluvial representatives of the ancient sea-beaches of Lower Egypt, formed during the latest submersion of the region bordering the Levant. The First Cataract is at a level of about 100 mètres above the present sea, which is a little higher than the level of the old sea-beach at Mokattam and Ghizeh; so that when the waters rose to this level, they extended nearly to the First Cataract, above which the Nile waters, thus dammed back, and probably very much more abundant than at the present day, spread over large tracts of alluvial land, clearly described by Dr. Leith Adams as stretching for miles away beyond the present river margin. During the same period, with the submersion of the present plain of Lower Egypt, the Mediterranean and the Red Sea were united, and strips of varying width along the coasts of these two seas were overspread by the waters, including a large part of Philistia, the vale of Achre, and the coasts of Asia Minor and Cyprus. As I have endeavoured to show elsewhere, the waters of the Jordan rose so high as to fill the whole valley to a level of about 1,400 feet above the present surface of the Dead Sea, forming a lake of about 120 miles from north to south, that is, about 100 feet above the present surface of the Mediterranean.\*

It now remains to consider what may be the precise period in the physical history of Egypt to which the submergence above described is to be referred. First, it is clear from the species of shells, both marine and fluvial, that it is very recent. Nearly all the forms are those still surviving in the Red Sea, notwithstanding the great change this sea has undergone since it was cut off from the Mediterranean on the emergence of the land. Again, there is every reason for supposing that it was a period of excessive rainfall over the now arid regions south of the Mediterranean. In looking at the map, or examining the country itself, we are struck by the large and deep valleys which must have been once the channels of rivers, but are now permanently dry. The valleys entering the Nile from both sides show great deposits of ancient river gravel and sand, sometimes cut down into by

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\* According to the measurements of the officers of the Ordnance Survey, the surface of the Dead Sea is 1,292 feet below that of the Mediterranean. The old terraces of the Jordan Valley have been described by Canon Tristram in his *Land of Israel*, 2nd Edit: by Dr. Lartet in his *Voyage d'Exploration de la Mer Morte*, and the Author, *Geol. Arabia Petraea and Palestine*.

more recent channels due to occasional storms. The wide and ramifying valleys, such as the Wadies Queneh, Tarfeh, and Sonoor, by which the Arabian Mountains east of the Nile are traversed; those of the Sinaitic peninsula,\* and of the Arabah, the deep-cut channels of the Edomite, Moabite, and Palestine table-lands, all testify to the existence of rivers in former times which have either altogether disappeared, or are represented only by occasional and evanescent floods. The same observation applies to very large regions of Central Africa.† Hence, we are obliged to have recourse to cosmical, and not merely to local, agencies for an explanation of this remarkable diminution of rainfall, and consequent drying up of the springs and rivers.

In casting about for such agencies, we are brought face to face with the fact that, about the period at which we have now arrived in the history of Egypt, physical conditions very different from those of the present prevailed over the Northern Hemisphere. I refer to the conditions of climate during the Glacial period already referred to. These are now so generally recognised that it is unnecessary to insist upon them, so that I need only observe that during their prevalence a climate resembling that of the Arctic Regions prevailed over the northern and central portions of Europe and Asia: the higher mountainous regions besides much of the plains and valleys were filled with perennial snow and ice, where these are only to be found now during winter. The Lebanon was the seat of glaciers; and where these now exist, as in the Alps, Pyrenees, and Caucasus, they descended at the time referred to far below their present limits. Under such conditions of Northern and Central Europe, it is evident that the regions lying immediately to the south of the snowy tract must have experienced a climate very different from that of the present day. Their climate would necessarily be of a humid and temperate character, with abundant rainfall and vegetation. Large streams would flow down the valleys of Egypt, Libya, Sinai, and Southern Palestine, where now there are none; it is thus that the erosion of these great valleys may be accounted for. To the same period may in all probability be referred the erosion of those remarkable

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\* Maps of the Ordnance Survey of Sinai, under Col. Sir Charles Wilson, R.E.

† As noticed by Livingstone in his *Last Journals*, vol. ii, p. 217. Prof Henry Drummond states that Lake Nyassa is slowly drying up, *Tropical Africa*, p. 196.

basin-like depressions already referred to in the Libyan Desert, of which the Fayûm and Rayân are the most important examples.

We have already seen the effect which this refrigeration of the climate at the commencement of the Glacial period had upon the animals of the Europasian continent in driving them southwards into Africa; this was at a time of land-elevation, and of lowering of the Mediterranean waters. The period of submersion, now being discussed, succeeded to this, and may have to some extent continued while the climate was undergoing amelioration after the epoch of intense cold. With the melting of the snows and the accompanying copious rainfall, the river valleys would become channels of large streams. Hence, this may well be designated the "Pluvial period," coextensive with the later glacial stages of the European area, and gradually passing into that of recent times, and the dawn of ancient Egyptian civilisation.\*

(5.) *Silting up of the Nile Valley and Plain of the Delta.*—During the Pluvial period the waters of the Nile, independent of the periodic floods of Abyssinia, probably carried down larger quantities of sediment than at the present day, and partially filled up the great gulf formed during the period of elevation. This precipitation of sediment, no doubt, continued during the rising of the sea-bed, and after Lower Egypt had been converted into a fluviatile plain with its seven rivers.† Within historic times, there is every reason to believe the waters of the Red Sea extended far north of their present limits at Suez, as places far north of that town

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\* A sketch map of this region during the Pluvial period will be found in the *Phys. Geol. and Geog. of Arabia Petræa, &c.*, p. 72. The Pluvial period of the Eastern Hemisphere is representative, at least in part, of the Champlain period of American geologists; on which subject see paper by Prof. J. D. Dana, *Amer. Journ. Sci.*, vol. xxiii (1882).

† The following is an account of the strata passed through at the deep boring made at Rosetta, communicated to the Royal Society by Col. Maitland, R.E. :—

1. Alluvial mud and clay	....	....	33 feet.
2. Sands and clays	....	....	61 "
3. Hard clay in lumps	....	....	29 "
4. Sand and clay alternating...	....	....	20 "
5. Coarse sand with pebbles....	....	....	10 "
Total	....	....	153 "

The pebbles above stated may possibly be concretions.

were on the coast in historic times; and on a former occasion I have shown how this fact solves a difficulty regarding the passage of the Red Sea by the Israelites under Moses, which must occur to every Biblical student who regards the present limits of sea and land as conterminous with those in existence at this eventful epoch. The Isthmus of Suez, as far as the great Bitter Lakes, is an old sea-bed, and was no doubt under water at the time of the Exodus.\*

Attempts have been made to estimate the length of time required for the deposition of the alluvial deposits of the Nile Delta from data observed regarding the rate of deposition within historic times. Such estimates can never be more than very loose approximations, because the present rate of deposition may be very different from that of previous years. In the earlier years of the recent period, deposition, as well as erosion, were in all probability more rapid than subsequently. Sir J. W. Dawson, on an assumption of one-fifteenth of an inch per annum, arrives at the conclusion that the length of time required would be about 5000 years, and that from the period to be allowed for the colonisation of Egypt since the Palæocosmic age is about B.C. 3000 years.† The computations of authorities on the periods of Egyptian dynasties are at present hopelessly at variance. Fortunately for us, they are outside the scope of this paper.‡

The CHAIRMAN (H. CADMAN JONES, Esq., M.A.).—I am sure all will accord their best thanks to Professor HULL for this paper, which opens our 1891 Session.

Captain F. PETRIE, F.G.S. (Honorary Secretary).—The following communications have been received.

The first is from Professor T. RUPERT JONES, F.R.S., who, in making some suggestive remarks, says: "I should like to state what I think of the paper; it is a careful and satisfactory account of the physical structure and physical history of Egypt, and certainly it is a good example of the necessity of a knowledge of geology in depicting geographical features. I do not know that any remarks are needed on the clear and useful description of the strata and their relative position, and their effect on the constitution of land surface."

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\* *Mount Seir, Sinai, and Western Palestine* (1884).

† Dawson, *Modern Science in Bible Lands*, p. 330

‡ Thus M. Mariette places the First Dynasty at a period B.C. 5004, while Professor Lepsius places it at B.C. 3892, a difference of 1112 years!



The second is from the Rev. A. IRVING, B.A., D. Sc., F.G.S., Senior Science Master at Wellington College, who writes:—

I regret very much that my professional duties prevent me from being present at the reading of the important paper by my friend, Professor HULL, on Monday evening. One can only wish that more were done by competent experts, whose minds are free from all hostility to Revelation, to make us better furnished with exact knowledge of the countries which form the background of Sacred history. In these days of criticism, some friendly, some hostile, this becomes every year a matter of increasing importance, as tending to add often concurrent and incidental testimony to the substantial truth of the historical books of the Bible.

I may perhaps be allowed to add an extract from a letter which I received last week from an old pupil, Lieutenant H. G. LYONS, who is stationed now at Cairo, and has already done such good work at home as to give promise of becoming, with the facilities which his position as an officer in the Royal Engineers afford, a very competent geologist. He has lately been up the Nile with Colonel Ross, of the Irrigation Department. He writes:—

“The geology of the Nile Valley would be extremely interesting to any one who had a year or two to study it carefully and quietly. There is plenty to be done. I must say I learned much in my ten days’ trip as to river-silting, &c., as I went up at high Nile and got a number of specimens of last year’s Nile mud. Another thing I have learnt from riding in the desert is the enormous amount of sub-aërial erosion at work by heat and cold, and by the heavy few hours’ rain which falls in the winter; great gorges, with cliffs 300 to 500 feet high, and deeply undercut by water at their bases. There is a deposit here of a dense quartzite-like sandstone (Gebel Ahmar) which Dawson puts down to geyser action. This Zittel rejects, and certainly I can see no support for it. It looks to me much more like the Sarsen-stone case again, and I am going to prepare some sections for the microscope. Then these fossil-trees, the silicification of which no one has hitherto explained: I think they are possibly due to the same cause, for in all cases the decay seems to have commenced externally at the time of the replacement of their tissues by silica.”

The discussion which followed, was of a general character; many expressed warm appreciation of the value of Professor HULL’s paper, and it was felt that it was so full of close research and so carefully arranged, that no room was afforded for criticism. Professor HULL having thanked those present for the kind way in which they had received the paper, the meeting was then adjourned.

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