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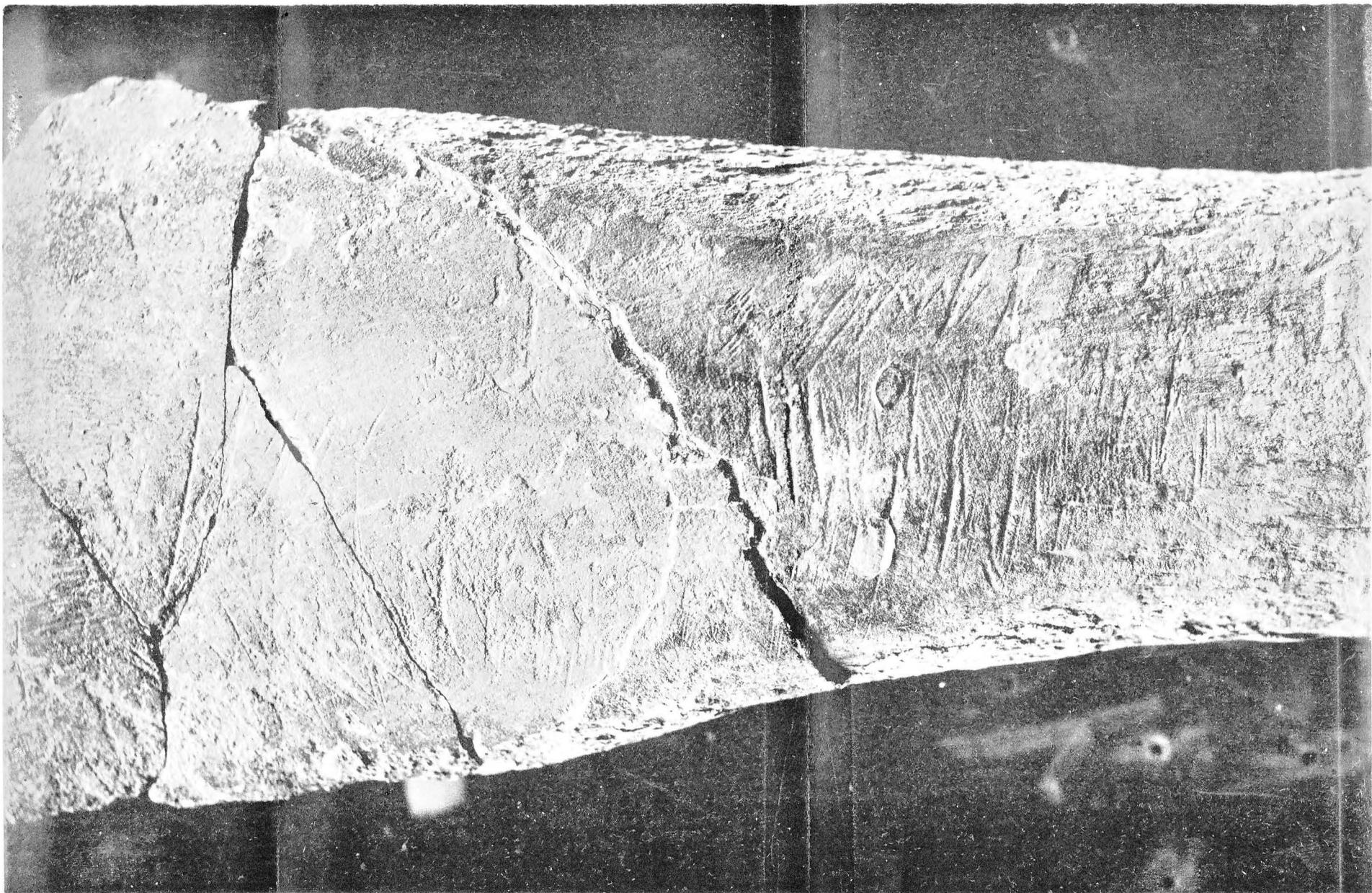
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PHOTOGRAPHED FROM A CUT BONE FROM THE KIMMERIDGE CLAY- FULL SIZE.

To illustrate a paper read before the Victoria Institute by Prof. T. M^CK. HUGHES, F.R.S.

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

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

VOL. XXIII.



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ERRATA.

- Page 199, line 7 from end, *for* Cyrus *read* Sirius.
 ,, 246, line 13 from end, *read* elements.
 ,, 284, line 6 from end, *for* Mr. *read* Professor.
 ,, 291, line 3, *read* Mr. A. W. Franks, C.B.
 ,, 296, line 7 from end, *for* specialised *read* specialised.

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

P R E F A C E .

THE Twenty-Third Volume of the *Journal of the Transactions* of the VICTORIA INSTITUTE is now issued. It contains papers by the following authors:—The Rev. C. G. ASHWIN, M.A., on “Modern Science and Natural Religion.” The Rev. H. J. CLARKE, on “The Logos of Philosophy.” Surgeon-General C. A. GORDON, M.D., C.B., some “Notes on the Ethnology and Ancient Chronology of China,” to which the Rev. JAMES LEGGE, Professor of Chinese at Oxford University, and DR. S. BEAL, Professor of Chinese at University College, have added valuable remarks. Dr. H. B. GUPPY, on “Coral Islands and Savage Myths,” to the discussion on which Professor JAMES GEIKIE, F.R.S.; Mr. W. H. HUDLESTON, F.R.S.; Mr. JOHN MURRAY (of the Challenger Expedition); Captain W. J. L. WHARTON, R.N., F.R.S., the Hydrographer to the Admiralty; and others, have contributed. To this paper the Institute has been permitted to append Dr. GUPPY’s “Preliminary Note” on the “Keeling Atoll,” giving the results of the further investigations carried on during the expedition from which he has just returned. Dr. GUPPY’s investigations, in which he has had the advantage of more perfect instruments than were used in Darwin’s explorations, have suggested a reconsideration of some of that great naturalist’s views on the questions involved. Mr. T. Mc’KENNY HUGHES, F.R.S., Woodwardian Professor of Geology at Cambridge University, in a paper “On Cuts on Bone as Evidence of Man’s Existence in Remote Ages,” well shows the great need for caution when attributing marks found

on bone, &c., to primitive man ; his paper is illustrated by a carefully executed colotype of the photograph of a bone which was found by Professor Hughes in such a position as to render it impossible that the remarkably artificial looking marks upon it could be attributable to human agency : The discussion on this paper was taken part in by Professor T. RUPERT JONES, F.R.S. ; Mr. A. SMITH WOODWARD, F.G.S. ; Mr. PARK HARRISON ; the Rev. J. M. MELLO, M.A., F.G.S. ; and others. Mr. W. F. KIRBY, F.E.S., of the Zoological Department of the British Museum, gives a paper "On the Butterflies and Moths of Africa," showing that the strictly Northern Fauna of Europe hardly touch Africa at all. Dr. G. W. LEITNER, a paper "On the Sciences of Language and of Ethnography, with general reference to the Customs of the People of Hunza." The Rev. J. MAGENS MELLO, M.A., F.G.S., a paper "On the Dawn of Metallurgy," to the discussion on which Mr. J. ALLEN BROWN, F.G.S., and others, have contributed. Sir M. MONIER-WILLIAMS, K.C.I.E., an Address "On Mystical Buddhism in connexion with the Yoga Philosophy of the Hindus," to which is added the remarks of the BISHOP OF DUNEDIN ; Sir H. BARKLY, K.C.B., G.C.M.G., F.R.S., ; Sir J. RISDON BENNETT, F.R.S. ; Mr. H. W. BRISTOW, F.R.S. ; and others. This Address is followed by one by the same author "On a few of the Contrasts between the Essential Doctrines of Buddhism and of Christianity." Mr. JOSEPH JOHN MURPHY contributes a paper "On the Factors of Evolution in Language," to which PROFESSOR MAX MÜLLER has added some remarks. That distinguished Egyptologist Monsieur E. NAVILLE gives an account of "The Historical Results of the Excavations at Bubastis," &c., the discovery of which was due to M. Naville's implicit reliance on the guidance of the Bible record. The Rev. F. A. WALKER, D.D., F.L.S., a paper "On Colours in Nature."

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

The advance of the Institute both in the importance of its work and in the strength of its numbers continues.

In conclusion, it is gratifying to be able to record that the Porte, after an interval of nine years, has at last granted the *Firmans* necessary to enable Eastern Exploration to be resumed.

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, 4TH JUNE, 1888.

The President, Sir GEORGE GABRIEL STOKES, BART., M.P., D.C.L., P.R.S.

IN THE CHAIR.

CAPTAIN FRANCIS PETRIE, Hon. Sec., read the following Report :—

Progress of the Institute.

1. IN presenting the TWENTY-SECOND ANNUAL REPORT, the Council is glad to be able to state that the progress of the Institute continues, and that increasing interest in its objects is evinced both at home and abroad. During the past year Her Majesty has very graciously accepted an Address from the Institute,* accompanied by its latest volumes.

2. The steady support of the Institute's Members continues, and has been of the utmost value in giving solidity to the Institute, in strengthening its working, and in causing many who might otherwise not have joined or aided in its work, to do so. Attention is called to this, as the future of the Institute so much depends upon the use made of present opportunities.

* See Preface, Volume XXI.

3. An increasing number of home and foreign Members and friends have contributed to enhance the value of the Institute's Philosophical and Scientific Investigations, and to make the Institute fill the position that its aims demand.

4. The system under which papers are read, and the discussions and comments thereon published, now enables Members in the most distant parts of the world to contribute papers, and to take part in the discussions.

5. It is satisfactory to note the continued prosperity of "The American Institute of Christian Philosophy," an independent society, founded on the lines of the Victoria Institute, whose statement of objects has been wholly adopted by it.

6. The Council desires to call attention to the importance of the increase of the Institute's Library of Reference, which has been got together by the help of many Members and Associates. A complete collection of the standard works of the day bearing upon the many subjects that come within the scope of the Institute would be of the greatest advantage, as such works are constantly inquired for both by town and country Members.

7. The following is a list of the new Council:—

President.—Sir George Gabriel Stokes, Bart., President of the Royal Society.

Vice-Presidents.

Sir H. Barkly, G.C.M.G., K.C.B., F.R.S.
 Sir J. Risdon Bennett, M.D., F.R.S.
 Sir Joseph Fayrer, K.C.S.I., F.R.S.
 W. Forsyth, Esq., Q.C., LL.D.
 Philip Henry Gosse, Esq., F.R.S.
 Alexander McArthur, Esq., M.P.
 Rev. Robinson Thornton, D.D.

Hon. Secs.—Wm. Nowell West, Esq. **Hon. Sec.**—Capt. F. W. H. Petrie, F.G.S., &c.

Hon. Subscribers.—G. Crawford Harrison, Esq.; J. Allen, Esq.

Council.

Robert Baxter, Esq.* (*Trustee*).
 Right Hon. Sir Robert N. Fowler, Bart.*
 (*Trustee*).
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 The Bishop of Wakefield.*
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 Surg.-Gen. Gordon, C.B., M.D.
 R. H. Gunning, Esq., M.D., F.R.S.E.
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 Rev. J. J. Lias, M.A.
 General G. S. Hallowes, Cor. Sec.
 Rev. A. I. McCaul, M.A.
 Staff Com. E. W. Creak, F.R.S.
 Rev. F. A. Walker, D.D., F.L.S.

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

Professor J. Avery, of Bowdoin College, U.S.A., *A.*; H. Edward A. Allen, Esq., *A.*; Rev. H. Carrow, M.A., *A.*; D. C. Fox, Esq., *M.*; T. Goringe, Esq., *M.*; J. Walter Lea, Esq., *M.* (one who took a part at the foundation of the Institute); H. W. Lucas, Esq. (a Foundation Associate); Sir W. McArthur, K.C.M.G., *M.* (who was associated with the Institute from its foundation); The Rev. W. Niven, B.D. (who was also a Foundation Member); The Right Rev. Bishop V. W. Ryan, D.D., *A.*; C. Rolleston, Esq., C.M.G. (late President Royal Society of N.S.W.), *A.*; His Grace C. C. J. Manners, Duke of Rutland (a Foundation Member); J. Shields, Esq. (a Foundation Member); Rev. Urban Smith, M.A., *A.*; Huddleston Stokes, Esq., *A.*; Rev. Preb. C. A. Swainson, D.D., *A.*; H. A. Trulock-Hankin, Esq., *M.*; The Ven. Archdeacon F. Watkins, B.D., *A.*

* * * *M.* Member; *A.* Associate.

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

	Life		Annual	
	Members.	Associates.	Members.	Associates.
Numbers on 4th July, 1887 ...	52	37	312	691
Deduct Deaths			8	11
„ Retirements, &c.			6	7
			— 14	— 18
			298	673
Joined to May 31st, 1888	4	3	34	76
	56	40	332	749
	96		1081	
Total.....	1077			

Hon. Correspondents number 107. Total..... 1284*

Finance.

10. The Treasurer's Balance Sheet for the year ending December 31, 1887, audited by two specially-qualified Members not on the Council, shows a balance creditor of £1. 8s. 6d. The amount invested in New Three per Cent. Annuities is £1,365. 18s. 9d.

The Council desires to urge the great advantage it would be if Members would 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 add to its success. Forms for the payment of the Subscriptions through a banker are used by a large number, and may always be had.

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

11. The arrears of subscription are as follow :—

	1882.	1883.	1884.	1885.	1886.	1887.
Members ...	3	5	5	2	3	10
Associates...	8	1	6	30	21	20
	—	—	—	—	—	—
	11	6	11	32	24	30

12. Meetings.

- MONDAY, DECEMBER 5, 1887.—“Evolution and Revelation.” By the Rev. H. J. CLARKE. Additions by Sir J. W. DAWSON, K.C.M.G., F.R.S., and others.
- MONDAY, JANUARY 2, 1888.—“On the theory of Natural Selection and the Theory of Design.” By Professor DUNS, D.D., F.R.S.E. Remarks, &c., by LORD GRIMTHORPE, and others.
- MONDAY, JANUARY 16.—“The Aborigines of Australia, their Ethnic Position and Relations.” By J. FRASER, LL.D., F.R.S. (N. S. Wales).
- MONDAY, FEBRUARY 6.—Lecture on “Genesis i. and its Critics.” By Dr. WARRING.
- MONDAY, FEBRUARY 20.—Lecture on some New Chaldean and Assyrian Discoveries. By W. ST. C. BOSCAWEN, F.R.Hist.Soc.
- MONDAY, MARCH 5.—“Oriental Entomology.” By Rev. F. A. WALKER, D.D., F.L.S.
On Dr. EARL FLINT's discoveries, “Ancient Human Footprints in Nicaragua,” and Dr. BRINTON's remarks explanatory of the same. (With photograph.)
- MONDAY, MARCH 19.—“On the Results of many Years' Survey among the Coral Formations in the Pacific.” By Dr. H. B. GUPPY, R.N. With remarks by the Hydrographer to the Admiralty Captain WHEARTON, R.N., F.R.S., Professor J. GEIKIE, LL.D. F.R.S., Mr. JOHN MURRAY (“Challenger” Expedition), Mr. W. H. HUDLESTON, F.R.S., F.C.S.
- MONDAY, APRIL 9.—“Lecture on the Wave of Translation described by Mr. J. SCOTT RUSSELL, F.R.S., and its Effects as noticed in both Hemispheres.” By Admiral SELWYN, R.N. With remarks by Admiral SCOTT, and others.
- MONDAY, APRIL 16.—“A Physical Theory of Moral Freedom,” being a refutation of the Theory of Automatism. By Mr. J. J. MURPHY, M.A. Remarks by Sir JOSEPH FAYRER, K.C.S.I., F.R.S., and Others.
- MONDAY, MAY 7.—“On the Names of the Lists of Thothmes III. which may be assigned to Judea.” With Map. By M. MASPERO. Translated by the Rev. H. G. TOMKINS. With communications from Sir CHARLES WILSON, K.C.B., F.R.S., Professor SAYCE, M. LE PAGE RENOUF, Major C. R. CONDER, and Others.*

* Canon Liddon has called attention to the great value of M. Maspero's paper, saying, “while the invasion of Palestine by Thothmes III. does not traverse (it really supports) the Bible history, his list of his conquests affords various indirect confirmations of the truth of the Bible narrative. And, moreover, it is an important feature of the great fabric of Ancient Egyptian history, to which we may look with increasing confidence for the means of showing how mistaken are those theories which, *for purely or mainly subjective reasons*, would place the date of the earliest books of Holy Scripture so late as to be entirely inconsistent with belief in their general trustworthiness, to say nothing of higher claims.”

MONDAY, JUNE 4.—Annual Address. “Mystical Buddhism in connexion with the Yoga system of Philosophy.” By Sir MONIER MONIER-WILLIAMS, Professor of Sanskrit at Oxford University. The President in the chair. Speeches by the Bishop of Dunedin, Sir H. Barkly, K.C.B., F.R.S., Sir J. Risdon Bennett, F.R.S., Professor H. W. Bristow, F.R.S. (Senior Director, Geological Survey of Great Britain), &c.

[*Annual Meeting held at the House of the Society of Arts.*]

MONDAY, JUNE 18.—“On the Botany of Syria.” By Professor G. E. Post, M.A., M.D., an important paper, containing the results of several years’ careful exploration,—prepared by special request.

The Meetings during the Sessions have been well attended.

The Journal.

13. The Twenty-first Volume of the *Journal of Transactions* has been issued. It contains many papers and communications from those whose names and the value of whose scientific researches are a sure guarantee for the “full and impartial” character of their investigations (Object 1), and for the manner in which they have “considered the mutual bearing of the various scientific conclusions arrived at in the several distinct branches into which science is now divided, in order to get rid of contradictions and conflicting hypotheses, and thus promote the real advancement of true science” (Object 3). Such work, if carried on, must tend to the advantage of science, and to a right interpretation of the book of nature, and we may well believe that when the truth in regard to that book is fully understood, it will not be found to clash with that other book—the book of Revelation.*

14. *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. 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 had 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 had 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,

* One University has begun to use the papers in the *Journal* as class-books.

in their respective 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.*

The increasing correspondence that reaches the Council from every part of the world urges the necessity for making the Institute more widely known.

15. *The Special Fund.*

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 summaries of the Institute's more important transactions.
- IV. To organise the publication of the People's Edition at home and abroad.

The *proved* importance of each one of these objects is such as to make this fund merit wide support.

The twelve papers in the People's Edition are now on sale throughout the United States, Australia, New Zealand, in the South African Colonies, and Canada. As regards India, increased support to the Special Fund is necessary to make efficient action possible.

Conclusion.

16. Finally, the Institute has done good service in many ways, more especially in elucidating the truth on several philosophical and scientific questions, upon which there was room for doubt and an urgent need for investigation.

* Letters from Members and non-Members in all parts of the world urge the great value of the Papers and Discussions in the Society's Journal, on account of their careful and impartial character ; and also by reason of their taking up those questions of Philosophy and Science said to militate against the truth of Revelation (notably by its enemies).

The steady progress of the Institute in every way, and the increasing number of those in the highest walks of Science who are taking part in its work—the greater such support the greater will be the value of the work done—and the ever-increasing esteem in which its Transactions are held, afford much cause for thankfulness, and give rise to an earnest hope that it may ever accomplish its work *Ad Majorem Dei Gloriam*.

G. G. STOKES,
President.

SPECIAL FUND IN 1887.

	£.	s.	d.
G. Harries, Esq.	20	0	0
F. Bisset Hawkins, Esq., F.R.S.	5	0	0
J. W. Lea, Esq., F.G.S.	5	0	0
Rev. C. J. Garrard, M.A.	3	3	0
E. Bailey, Esq.	2	2	0
Dr. Jardine	1	1	0
Miss G. Harrison	0	10	0
Rev. E. P. Thwing, D.D.	0	10	0
Mrs. J. Wainwright	0	10	0
Mrs. Christian	0	4	3
	<hr/>		
	£38	0	3

The following Balance-Sheet was then read :—

The Honorary Secretary (Captain FRANCIS PETRIE, F.G.S.) first read the letters of regret from those unable to be present, adding that Sir Richard Owen, of whom all Englishmen were so justly proud, had sent a special letter of regret. Having referred to the presence that evening of one of the Council,—Dr. R. H. Gunning,—who had done so much for the advancement of science by his munificent donation of £16,000 last autumn to various British scientific institutions,* he concluded by pointing out the leading features of the Report which was in the hands of all present; alluding,—first, to the increasing number of distinguished men joining the Institute, and remarking that in no one year since its foundation had so many new members joined; secondly, to the growing importance of its transactions; thirdly, to the need of a larger special fund, so that the library books of reference and other matters might not be neglected; and finally, pointing out the important uses made of the Institute by its members, as detailed in the fourteenth section of the Report.

Sir J. RISDON BENNETT, F.R.S.—I have to ask this meeting to accept the following resolution:—“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 past year.” I regret very much that this duty has not fallen to some one more competent to speak upon the subject than I can pretend to be, owing to my want of close acquaintance with the working of the Institute. I am, however, happy to be able to say that the question of the utility of the Institute is no longer before us; for it is, I think, admitted by all who have had any knowledge of its operations, that it has all along been so conducted as to have been productive of a vast deal of good, while it is well calculated to effect a still larger amount

* Dr. Gunning's Victoria Jubilee gifts included,—£105 triennially to the Royal Society of Edinburgh, to be named the “Victoria Jubilee Prize” for the Advancement of Science; £40 yearly to the Society of Antiquaries of Scotland; £200 yearly to Edinburgh University for eleven post gradation prizes; £100 triennially to the Royal College of Physicians of Edinburgh as a prize for the greatest benefit done to practical medicine; £120 triennially to the Royal College of Surgeons, as a prize to be open to all Fellows and Licentiates, for the greatest benefit done to practical surgery; £40 annually to the Edinburgh Association for the University Education of Women for a bursary; also £100 to the Ben Nevis Observatory; and many other gifts. Dr. Gunning, F.R.S.E., is a dignitary of the Brazilian Empire, where he has just given a large sum for the advancement of somewhat similar objects.

of useful work. We have only to look at the volume just issued by the Society to perceive how very varied have been the subjects, and how specially competent have been the men, who have initiated and sustained the discussions. The great value of the Victoria Institute is, that it brings forward special subjects of a scientific character through the medium of those who have devoted their attention to the particular line of research connected with those matters, while on the evenings upon which the discussions are taken, those who are interested in the questions dealt with, and capable of criticising or confirming the views of the authors of the papers, are enabled to enter into a full and efficient examination of the points at issue. I believe there are comparatively few persons in this room who are competent to criticise all the papers contained in the remarkable volume just issued by the Institute. No single individual is capable of entering into the details of these varied branches of science, and I think I may say we are all aware that in those particular departments of science which we do cultivate, we are obliged to admit that we are still in a state of progress, and are not in a position to speak dogmatically, except with regard to a very small part of the branch to which our lives may be devoted. All our knowledge is progressive, year by year we are making further and further advances, and it would be folly to say that in any single department of science we have so settled and determined our facts and inferences that it is impossible to alter their position. All scientific men will admit this. No doubt we have certain principles as to which we may say that every advance in science has only tended to confirm them; but we know that many of the objections that have been raised against Divine Revelation are based on so-called facts connected with science that have as yet received very imperfect confirmation. I will not occupy your time by dilating on the general operations of this Institute, especially as we shall have before us to-night a paper on a subject that will interest a large portion of this audience, and in regard to which comparatively few of us know what we should like to know. The subject is, however, one so frequently referred to, that it is of extreme importance we should have the advantage of its elucidation by one so thoroughly competent as the author of the paper. I will, therefore, simply confine myself to moving the resolution I have read.

Mr. H. W. BRISTOW, F.R.S. (Senior Director of the Geological Survey of Great Britain).—In seconding the resolution just sub-

mitted to the meeting, I may say that I am sure all present have heard with great pleasure the Report read by the Honorary Secretary. The Institute is now established on a firm, sure, and solid foundation, the number of our members has been largely increased, and the papers read before the Institute continue to retain all their former value and importance. I was very glad to see in the last volume issued by the Institute that among the papers which have been contributed were two,—one by my old and valued colleague, Professor Hull, and the other by Professor Hughes, of Cambridge,—both of them men well capable, from long experience, of discussing the subjects on which they have written. I hope we shall see many more such papers from them, and I trust that the circulation of the volumes of our Proceedings will be still more augmented, not only through this country, but also in our Colonies, and elsewhere, wherever the English language is spoken. I also hope we may continue to hear of large increases, both in the number of our members and in the contributions necessary for the support of this Society. It is a gratifying circumstance that so far our course has been one of hopefulness, and our progress one of successful achievement. I think we may regard the future with a confident trust in the continued success of the efforts of the Institute, and that we may look forward to the time when our former efforts may be largely increased under the auspices of our President, whose calm and dispassionate judgment and extended survey over the vast world of science and philosophy, aided and supported as he is by a large and influential Council, whose names and abilities are recognised, and who are assisted by the constant efforts of a zealous and indefatigable Honorary Secretary, must result in continued advantage to this important and useful Society.

The motion was then put and carried unanimously.

Mr. D. HOWARD, F.C.S.—On behalf of the Council I have to thank you for the vote which has just been passed. I can assure you that to all the members of the Council the work in which we engage is one in which we are at all times very deeply interested, and is a matter of most anxious thought. If we have succeeded in any appreciable measure, we are thereby most amply repaid. To take part in the great work which is set before us is, in itself, no slight privilege. I will not take up the time of the meeting by going over ground upon which we are all agreed in regard to the great importance of this Institute; but I would ask you one and all to be upon your guard, and to induce others to be upon their

guard, against what appears to me to be the greatest danger we have to encounter—namely, ignorance of ignorance. There are so many of those among us who can speak with authority on subjects on which they are entirely in accord with us, and yet who do not seem to realise the need for it; they are sure in their own minds of the self-evident fact that truth cannot contradict itself; but, at the same time, they are ignorant of the ignorance of others. In the clearness of their own judgment they little know how utterly unable is the ignorance of which I speak to follow out the conclusions arrived at by the leaders of science, or to understand the real bearings of that science; and the result is that they do not take their proper part in guarding the truth against abuses—in guarding the progress of science against an utter misunderstanding of what has really been arrived at. Therefore I ask you, who take an interest in science, to help us in this matter, so that we may guard against the abuse of Ignorance, and the unintentional evil caused by the misuse of the progress of science. True it is that the truth will take care of itself; what we should aim at is to see that we all do our part in fighting on the right side.

Sir M. MONIER-WILLIAMS then delivered the "Annual Address."

*MYSTICAL BUDDHISM IN CONNEXION WITH THE
YOGA PHILOSOPHY OF THE HINDUS.* By SIR
MONIER MONIER-WILLIAMS, K.C.I.E., D.C.L., LL.D.,
Ph.D., Boden Professor of Sanskrit in the University of
Oxford.*

THE first idea implied by Buddhism is intellectual enlightenment. But Buddhism has its own theory of enlightenment—its own idea of true knowledge, which it calls Bodhi, not Veda. By true knowledge it means knowledge acquired by man through his own intellectual faculties and through his own inner consciousness, instincts, and intuitions, unaided by any external or supernatural revelation of any kind.

But it is important to observe that Buddhism, in the carrying out of its own theory of entire self-dependence in the search after truth, was compelled to be somewhat inconsistent with itself. It enjoined self-conquest, self-restraint, self-concentration and separation from the world for the attainment of perfect knowledge and for the accomplishment of its own *summum bonum*—the bliss of Nirvāna—the bliss of deliver-

* In this paper some of the diacritical marks, required for the accurate representation of Oriental words in the Roman character, have been omitted.

ance from the fires of passion and the flames of concupiscence. Yet it encouraged association and combination for mutual help. It established a universal brotherhood of celibate monks, open to persons of all castes and ranks, to rich and poor, learned and unlearned alike—a community of men which might, in theory, be co-extensive with the whole world—all bound together by the common aim of self-conquest, all animated by the wish to aid each other in the battle with carnal desires, all penetrated by a desire to follow the example of the Buddha, and be guided by the doctrine or law which he promulgated.

Cœnobitic monasticism, in fact, became an essential part of true Buddhism and a necessary instrument for its propagation.

In all this the Buddha showed himself to be eminently practical in his methods and profoundly wise in his generation. Evidently, too, he was wise in abstaining at first from all mystical teaching. Originally Buddhism set its face against all solitary asceticism and secret efforts to attain sublime heights of knowledge. It had no occult, no esoteric system of doctrine which it withheld from ordinary men.

Nor did true Buddhism at first concern itself with any form of philosophical or metaphysical teaching, which it did not consider helpful for the attainment of the only kind of true knowledge worth striving for—the knowledge of the origin of suffering and its remedy—the knowledge that suffering and pain arise from indulging lusts, and that life is inseparable from suffering, and is an evil to be got rid of by suppressing self and extinguishing desires.

In the *Mahā-parinibbāna-sutta* (Rhys Davids, 11-32) is recorded one of the Buddha's remarks shortly before his decease.

“What, O Ananda, does the Order desire of me? I have taught the law (*desito dhammo*) without making any distinction between esoteric and exoteric doctrine (*anantaram abahiram karitvā*). In the matter of the law, the Tathāgata (*i.e.*, the Buddha) has never had the closed fist of a teacher (*ācariya-mutthi*)—that is, of a teacher who withholds some doctrines and communicates others.”

Nevertheless, admitting, as we must, that early Buddhism had no mysteries reserved for a privileged circle, we must not shut our eyes to the fact that the great importance attached to abstract meditation in the Buddhist system could not fail in the end to encourage the growth of mystical ideas.

Furthermore, it is undeniable that such ideas were, in some countries, carried to the most extravagant extremes. Efforts to induce a trance-like or hypnotic condition, by abstracting the thoughts from all bodily influences, by recitation of mys-

tical sentences and by superstitious devices for the acquisition of supernatural faculties, were placed above good works and all the duties of the moral code.

We might point, too, to the strange doctrine which arose in Nepal and Tibet—the doctrine of the Dhyāni-Buddhas (or Buddhas of Meditation)—certain abstract essences existing in the formless worlds of thought, who were held to be ethereal and eternal representatives of the transitory earthly Buddhas.

Our present concern, however, is rather with the growth and development of mystical Buddhism in India itself, through its connexion with the system called Yoga and Yogācāra.

The close relationship of Buddhism to that system is well known. The various practices included under the name Yoga did not owe their origin to Buddhism. They were prevalent in India before Gautama Buddha's time; and one of the most generally accepted facts in his biography is that, after abandoning his home and worldly associations, he resorted to certain Brāhman ascetics who were practising Yoga.

What then was the object which these ascetics had in view?

The word Yoga literally means "union" (as derived from the Sanskrit root "yuj," to join), and the proper aim of every man who practised Yoga was the mystic union (or rather re-union) of his own spirit with the one eternal Soul or Spirit of the Universe, and the acquisition of divine knowledge through that union.

It may be taken for granted that this was the Buddha's first aim when he addressed himself to Yoga in the fifth century B.C., and even to this hour, earnest men in India resort to this system with the same object.

In the *Indian Magazine* for July, 1887 (as well as in my *Brāhmanism and Hindūism**) is a short biography of a quite recent religious reformer named Svāmī Dayānanda Sarasvatī, whose acquaintance I made at Bombay in 1876 and 1877, and who only died in 1883. The story of his life reads almost like a repetition of the life of Buddha, though his teaching aimed at restoring the supposed monotheistic doctrine of the Veda.

It is recorded that his father, desiring to initiate him into the mysteries of Saivism, took him to a shrine dedicated to the god Siva; but the sight of some mice stealing the consecrated offerings and of some rats playing on the heads of the idol led him to disbelieve in Siva-worship as a means of union with the Supreme Being. Longing, however, for such union

* Published by John Murray, Albemarle Street (see p. 529).

and for emancipation from the burden of repeated births, he resolved to renounce marriage and abandon the world. Accordingly, at the age of twenty-two, he clandestinely quitted his home, the darkness of evening covering his flight. Taking a secret path, he travelled thirty miles during the night. Next day he was pursued by his father, who tried to force him to return, but in vain. After travelling farther and farther from his native province, he took a vow to devote himself to the investigation of truth. Then he wandered for many years all over India, trying to gain knowledge from sages and philosophers, but without any satisfactory result, till finally he settled at Ahmedabad. There, having mastered the higher Yoga system, he became the leader of a new sect called the Ārya-Samāj.

And here we may observe that the expression "higher Yoga" implies that another form of that system was introduced. In point of fact, the Yoga system grew, and became twofold—that is, it came in the end to have two objects.

The earlier was the higher Yoga. It aimed only at union with the Spirit of the Universe. The more developed system aimed at something more. It sought to acquire miraculous powers by bringing the body under control of the will, and by completely abstracting the soul from body and mind, and isolating it in its own essence. This condition is called Kaivalya.

In the fifth century B.C., when Gautama Buddha began his career, the later and lower form of Yoga seems to have been little known. Practically, in those days earnest and devout men craved only for union with the Supreme Being, and absorption into his essence. Many methods of effecting such union and absorption were contrived. And these may be classed under two chief heads—bodily mortification (tapas) and abstract meditation (dhyāna).

By either one of these two chief means, the devotee was supposed to be able to get rid of all bodily fetters—to be able to bring his bodily organs into such subjection to the spiritual that he became unconscious of possessing any body at all. It was in this way that his spirit became fit for blending with the Supreme Spirit.

We learn from the *Lalita-vistara* that various forms of bodily torture, self-maceration, and austerity were common in Gautama's time.

Some devotees, we read, seated themselves in one spot and kept perpetual silence, with their legs bent under them. Some ate only once a day or once on alternate days, or at intervals of four, six, or fourteen days. Some slept in wet clothes or on ashes, gravel, stones, boards, thorny grass, or spikes, or

with the face downwards. Some went naked, making no distinction between fit or unfit places. Some smeared themselves with ashes, cinders, dust, or clay. Some inhaled smoke and fire. Some gazed at the sun, or sat surrounded by five fires, or rested on one foot, or kept one arm perpetually uplifted, or moved about on their knees instead of on their feet, or baked themselves on hot stones, or entered water, or suspended themselves in the air.

Then, again, a method of fasting called very painful (*aticricchra*), described by Manu (xi. 213), was often practised. It consisted in eating only a single mouthful every day for nine days and then abstaining from all food for the three following days.

Another method, called the lunar fast (vi. 20, xi. 216), consisted in beginning with fifteen mouthfuls at full moon, and reducing the quantity by one mouthful till new moon, and then increasing it again in the same way till full moon.

Passages without number might be quoted from ancient literature to prove that similar practices were resorted to throughout India with the object of bringing the body into subjection to the spirit. And these practices have continued up to the present day.

A Muhammadan traveller, whose narrative is quoted by Mr. Mill (*British India*, i. 355) once saw a man standing motionless with his face towards the sun.

The same traveller, having occasion to revisit the same spot sixteen years afterwards, found the very same man in the very same attitude. He had gazed on the sun's disk till all sense of external vision was extinguished.

A Yoghi was seen not very long ago (Mill's *India*, i. 353) seated between four fires on a quadrangular stage. He stood on one leg gazing at the sun, while these fires were lighted at the four corners. Then placing himself upright on his head, with his feet elevated in the air, he remained for three hours in that position. He then seated himself cross-legged, and continued bearing the raging heat of the sun above his head and the fires which surrounded him till the end of the day, occasionally adding combustibles with his own hands to increase the flames.

I, myself, in the course of my travels, encountered Yogis who had kept their arms uplifted for years, or had wandered about from one place of pilgrimage to another under a perpetual vow of silence, or had no place to lie upon but a bed of spikes.

As to fasting, the idea that attenuation of the body by abstinence from food, facilitates union of the human soul with

the divine, or at any rate promotes a keener insight into spiritual things, is doubtless as common in Europe as in Asia; but the most austere observer of Lent in European countries would be hopelessly outdone by devotees whose extraordinary powers of abstinence may be witnessed in every part of India.

If we now turn to the second great method of attaining mystic union with the Divine Essence, namely, by profound abstract thought, we may observe that it, too, was everywhere prevalent in Buddha's time.

Indeed, one of the names given by Indian philosophers to the One Universal Spirit is Cit, "Thought." By that name of course, is meant pure abstract thought, or the faculty of thought separated from every concrete object. Hence, in its highest state the eternal infinite Spirit, by its very nature, thinks of nothing. It is the simple thought faculty, wholly unconnected with any object, about which it thinks. In point of fact, the moment it begins to exercise this faculty, it necessarily abandons for a time its condition of absolute oneness, abstraction and isolation, to associate itself with something inferior, which is not itself.

It follows, therefore, that intense concentration of the mind on the One Universal Spirit amounts to fixing the thought on a mere abstract Essence, which reciprocates no thought in return, and is not conscious of being thought about by its worshipper.

In harmony with this theory, we find that the definition of Yoga, in the second aphorism of the Yoga-sūtra, is, "the suppression (nirodha) of the functions or modifications (vritti) of the thinking principle (citta)." So that, in reality, the union of the human mind with the infinite Principle of thought amounts to such complete mental absorption, that thought itself becomes lost in pure thought.

In the *Sakuntalā* (vii. 175) there is a description of an ascetic engaged in this form of Yoga, whose condition of fixed meditation and immovable impassiveness had lasted so long that ants had thrown up a mound as high as his waist, and birds had built their nests in the long clotted tresses of his tangled hair.

Not very dissimilar phenomena may be witnessed even in the present day. I, myself, not many years ago, saw at Allahabad a devotee who had maintained a sitting, contemplative posture with his feet folded under his body, in one place near the fort for twenty years.

During the Mutiny cannon thundered over his head, and bullets hissed all around him, but nothing apparently disturbed his attitude of profound meditation.

It is clear, then, from all we have stated, that, supposing Gautama to have made up his mind to renounce the world and devote himself to a religious life, his adoption of a course of Yoga was a most ordinary proceeding.

In the first instance, as we have seen, he tested the value of painful self-mortification by a long sexennial fast. Then, after discovering the uselessness of mere bodily austerities, he took food naturally, and adopting the second method, applied himself to profound abstract meditation.

A large number of the images of Buddha represent him sitting on a raised seat, with his legs folded under his body, and his eyes half-closed, in this condition of abstraction (*samādhi*)—sometimes called *Yoga-nidrā*; that is, a trance-like state, compared to profound sleep, or a kind of hypnotism.

According to the account given in the *Mahā-vagga* (i. 1), he seated himself in this way under four trees in succession, remaining absorbed in thought for seven days and nights under each tree, till he was, so to speak, re-born as Buddha "the Enlightened." Till then he had no right to that title.

And those four successive seats probably symbolised the four recognised stages of meditation* (*dhyāna*) rising one above another, till thought itself was converted into non-thought.

We know, too, that the Buddha went through still higher progressive stages of meditation at the moment of his death or final decease (*Pari-nirvāna*), thus described in the *Mahā-parinibbāna sutta* (vi. 11):

"Then the Venerable One entered into the first stage of meditation (*pathamajjhānam*); and rising out of the first stage, he passed into the second; and rising out of the second, he passed into the third; and rising out of the third, he passed into the fourth; and rising out of the fourth stage, he attained the conception of the infinity of space (*ākāsānañcāyatanam*); and rising out of the conception of the infinity of space, he attained the conception of the infinity of intelligence (or second *Arūpa-brahma-loka*). And rising out of the idea of the infinity of intelligence, he attained the conception of absolute nonentity (*ākīñcaññāyatanam*); and rising out of the idea of nonentity, he entered the region where there is neither consciousness nor unconsciousness; and rising out of that region, he entered the state in which all sensation and all perception of ideas had wholly ceased."

This strange passage shows that even four progressive

* I give this as a theory of my own. M. Senart considers that the sun's progress is symbolised. I am no believer in the sun theory as applicable to this point.

stages of abstraction did not satisfy the requirements of later Buddhism in regard to the intense sublimation of the thinking faculty needed for the complete effacement of all sense of individuality. Higher and higher altitudes had to be reached, insomuch that the fourth stage of abstract meditation is sometimes divided and sub-divided into what are called eight vimokhas and eight samāpattis—all of them forms and stages of ecstatic meditation.*

A general name, however, for all the higher trance-like states is *Samādhi*, and by the practice of *Samādhi* the six transcendent faculties (*Abhiññā*) might ultimately be obtained, viz., the inner ear, or power of hearing words and sounds however distant (clair-audience, as it might be called), the inner eye or power of seeing all that happens in every part of the world (clair-voyance), knowledge of the thoughts of others, recollection of former existences, the knowledge of the mode of destroying the corrupting influences of passion, and, finally, the supernatural powers called *Iddhi*, to be subsequently explained.

But to return to the Buddha's first course of meditation at the time when he first attained Buddhahood. This happened during one particular night, which was followed by the birthday of Buddhism.

And what was the first grand outcome of that first profound mental abstraction? One legend relates that in the first watch of the night all his previous existences flashed across his mind; in the second he understood all present states of being; in the third he traced out the chain of causes and effects, and at the dawn of day he knew all things.

According to another legend, there was an actual outburst of the divine light before hidden within him.

We read in the *Lalita-vistara* (chap. i.) that at the supreme moment of his intellectual illumination brilliant flames of light issued from the crown of his head, through the interstices of his cropped hair. These rays are sometimes represented in his images, emerging from his skull in a form resembling the five fingers of an extended hand.

Mark, however, that it is never stated that Gautama ever attained to the highest result of the true Yoga of Indian philosophy—union with the Supreme Spirit. On the contrary, his self-enlightenment led to entire disbelief in the separate existence of any eternal, infinite Spirit at all—any Spirit, in fact, with which a spirit existing in his own body could blend, or into which it could be absorbed.

* These are described in Childers's *Pāli Dictionary*, s.v.

If the Buddha was not a materialist, in the sense of believing in the eternal existence of material atoms, neither could he in any sense be called a "spiritualist," or "spiritist."

With him Creation did not proceed from an Omnipotent Spirit evolving phenomena out of itself by the exercise of almighty will, nor from an eternal self-existing, self-evolving germ of any kind. As to the existence of any spiritual substance in the Universe which was not matter and was imperceptible by the senses, it could not be proved.

Nor did he believe in the eternal existence of an invisible, intangible, human self or Ego, commonly called Soul, as distinct from a material body. In this he differed widely from the Yoga. The only eternity of early Buddhism was in an eternity of "becoming," not of "being,"—an eternity of universes, all succeeding each other, and all lapsing into nothingness.

In short, the Buddha's enlightenment consisted, first, in the discovery of the origin and remedy of suffering, and, next, in the knowledge of the existence of an eternal Force—a force generated by what in Sanskrit is called *Karman*, "Act." Who, or what, started the first act the Buddha never pretended to be able to explain. He confessed himself in regard to this point a downright Agnostic.

All he affirmed was that every man was created by the force of his own acts in former bodies, combined with a force generated by intense attachment to existence (*upādāna*). The Buddha himself was so created, and had been created and re-created through countless bodily forms; but he had no spirit or soul existing separately between the intervals of each creation. By his protracted meditation he attained to no higher knowledge than this, and although he himself rose to loftier heights of knowledge than any other man of his day, he never aspired to other than the extraordinary faculties which were within the reach of any human being capable of rising to the same sublime abstraction of mind.

He was even careful to lay down a precept that the acquisition of transcendent human faculties was restricted to the perfected saints called *Arhats*; and so important did he consider it to guard such faculties from being claimed by mere impostors, that one of the four prohibitions communicated to all monks on first admission to his monastic Order was that they were not to pretend to such powers.

Nor is there any proof that even *Arhats* in Gautama's time were allowed to claim the power of working physical miracles.

By degrees, no doubt, powers of this kind were ascribed to them as well as to the Buddha. Even in the *Vinaya*, one of

the oldest portions of the *Tripitaka*, we find it stated that Gautama Buddha gained adherents by performing three thousand five hundred supernatural wonders (in Pāli *pātihāriya*). These were thought to be evidences of his mission as a great teacher and saviour of mankind; but the part of the narrative recording these, although very ancient, is probably a legendary addition of later date. It is interesting, however, to trace in other portions of the first literature, the development of the doctrine that Buddhahood meant first transcendent knowledge, and then supernatural faculties, and finally miraculous powers.

In the *Akkanheyya Sutta* (said to be written in the fourth century B.C.) occurs this remarkable passage, translated by Professor Rhys Davids (p. 214):—

“If a Monk should desire through the destruction of the corrupting influences (*āsavas*), by himself, and even in this very world, to know and realise and attain to Arhatship, to emancipation of heart, and emancipation of mind, let him devote himself to that quietude of heart which springs from within, let him not drive back the ecstasy of contemplation, let him look through things, let him be much alone.

“If a Monk should desire to hear with clear and heavenly ear, surpassing that of men, sounds both human and celestial, whether far or near; if he should desire to comprehend by his own heart the hearts of other beings and of other men; if he should desire to call to mind his various temporary states in the past, such as one, two, three, four, five, ten, twenty, a hundred, a thousand, a hundred thousand births, or his births in many an age and æon of destruction and renovation, let him devote himself to that quietude which springs from within.”

Then, in the *Mahā-parinibbāna-sutta* (i. 33) occurs the following:—

“At that time the Blessed One—as instantaneously as a strong man would stretch forth his arm, or draw it back again when he had stretched it forth—vanished from this side of the river, and stood on the further bank with the company of the brethren.”

And, again, the following:—

“I call to mind, Ānanda, how when I used to enter into an assembly of many hundred nobles, before I had seated myself there, or talked to them, or started a conversation with them, I used to become in colour like unto their colour, and in voice like unto their voice. Then, with religious discourse, I used to instruct, incite, and quicken them, and fill them with gladness. But they knew me not when I spoke, and would

say, 'Who may this be who thus speaks? a man or a god?' Then, having instructed, incited, quickened and gladdened them with religious discourse, I would vanish away. But they knew me not even when I vanished away; and would say, 'Who may this be who has thus vanished away? a man, or a god?'" (*Mahā-parinibbāna-sutta*, iii. 22.)

Such passages in the early literature afford an interesting exemplification of the growth of supernatural and mystical ideas, and account for the ultimate association of the Northern Buddhistic system, with Saivism, demonology, magic, and various spiritual phenomena connected with what has been called "Esoteric Buddhism."

These ideas, however, originated in India, and we may now proceed to trace their development in the later *Yoga* or "aphorisms of the Yoga philosophy," composed by Patanjali, to which I have already referred.

In that work eight requisites of Yoga are enumerated (ii. 29); namely, 1, abstaining from five evil acts (*yama*); 2, performing five positive duties (*niyama*); 3, settling the limbs in certain postures (*āsana*); 4, regulating and suppressing the breath (*prānāyāma*); 5, withdrawing the senses from their objects (*pratyāhāra*); 6, fixing the thinking faculty (*dhāraṇā*); 7, internal self-contemplation (*dhyāna*); 8, trance-like self-concentration (*samādhi*).

These eight are indispensable requisites for the gaining of Patanjali's *summum bonum*—the complete abstraction or isolation (*kaivalya*) of the soul in its own essence and for the acquirement of supernatural faculties.

Taking now these eight requisites of Yoga in order, we may observe, with regard to the first, that the five evil acts to be avoided correspond to the five commandments in Buddhism, viz., "kill not," "steal not," "commit no impurity," "lie not." The fifth alone, "abstain from all worldly enjoyments," is different, the Buddhist fifth prohibition being "drink no strong drink."

With regard to the second requisite, the five positive duties are—self-purification, both external and internal (both called *saucha*); the practice of contentment (*santosha*); bodily mortification (*tapas*); muttering of prayers, or repetition of mystical syllables (*svādhyāya*, or *japa*), and contemplation of the Supreme Being.

The various processes of bodily mortification and austerities have been already described.

As to the muttering of prayers, the repetition of mystic syllables such as Om (a symbol for the Triad of Gods), or of any favourite deity's name, is held among Hindūs to be

highly efficacious.* In a similar manner among Northern Buddhists the six-syllabled sentence: "Om mani padme hūm"—"Reverence to the jewel in the lotus. Amen"—is used as a charm against the sixfold course of transmigration. The Jewel may mean Avalokitesvara, the patron saint of Tibet, fabled to have sprung from a lotus, or it may contain a *double-entendre*—an occult allusion to the Sāṅkhya Puruṣa and Prakṛiti, or to the Linga and Yoni of Śaivism, as symbolising the generative force of Nature. No other prayer-formula in the world is repeated so often.

Other mystical syllables (such as sam, yam, ram, lam) are supposed to contain some occult virtue.

The third requisite—posture—would appear to us a somewhat trivial aid to the union of the human spirit with the divine; but with Hindūs it is an important auxiliary, fraught with great benefit to the Yogī.

The alleged reason is that certain sitting postures (āsana) and cramping of the lower limbs are peculiarly efficacious in producing bodily quietude and preventing restlessness. Some of the postures have curious names, for example:—Padmāsana, "the lotus posture"; vīrāsana, "the heroic posture"; śinhāsana, "the lion posture"; kūrmasāna, "the tortoise posture"; kukkūtāsana, "the cock posture"; dhanur-āsana, "bow posture"; mayūrāsana, "peacock posture." In the first the right foot is placed on the left thigh, and the left on the right thigh.

In short, the idea is that compression of the lower limbs, in such a way as to prevent the possibility of the slightest movement, is most important as a preparation for complete abstraction of soul.

Then, as another aid, particular twistings (called mudrā) of the upper limbs—of the arms, hands, and fingers—are enjoined.

In Europe violent movements of the limbs are practised by devotees with the view of uniting the human spirit with the Divine. Those who have seen the whirling and "howling" dervishes of Cairo can testify to this. The fainting fits which result from their violent exertions, inspirations, expirations, and utterances of the name of God are believed to be ecstatic states in which such union is effected.

The fourth requisite—regulation and suppression of the breath—is perhaps the one of all the eight which it is most difficult for Europeans to understand or appreciate; yet with Hindūs it is all-important (being called Hatha-vidyā). Nor are the ideas connected with it wholly unknown in Europe.

* See my *Brāhmanism and Hindūism* (John Murray), p. 105.

According to Swedenborg,* thought commences and corresponds with respiration :—

“When a man thinks quickly his breath vibrates with rapid alternations; when the tempest of anger shakes his mind his breath is tumultuous; when his soul is deep and tranquil, so is his respiration.” And he adds: “It is strange that this correspondence between the states of the brain or mind and the lungs has not been admitted in science.”

The Hindū belief certainly is that deep inspirations of breath assist in concentrating and abstracting the thoughts and preventing external impressions. But, more than this, five sorts of air are supposed to permeate the human body and play an important part in its vitality. The *Hatha-dīpikā* says: “As long as the air remains in the body, so long life remains. Death is the exit of the breath. Hence the air should be retained in the body.”

In regulating the breath, the air must first be drawn up through one nostril (the other being closed with the finger), retained in the lungs, and then expelled through the other nostril. This exercise must be practised alternately with the right and left nostril. Next, the breath must be drawn forcibly up through both nostrils, and the air imprisoned for as long a time as possible in the lungs. Thence it must be forced by an effort of will towards the internal organs of the body, or made to mount to the centre of the brain.

The Hindūs, however, do not identify the breath with the soul. They believe that a crevice or suture called the *Brahma-randhram* at the top of the skull serves as an outlet for the escape of the soul at death. A Hindū Yogī's skull is sometimes split at death by striking it with a sacred shell. The idea is to facilitate the exit of the soul. It is said that in Tibet the hair is torn out of the top of the head, with the same object.

In the case of a wicked man the soul is supposed to escape through one of the lower openings of the body.

The imprisonment of the breath in the body by taking in more air than is necessary for respiration, is the most important of the breath exercises. It is said that Hindū ascetics, by constant practice, are able by this means to sustain life under water, or to be buried alive for long periods of time. Such feats of endurance would be wholly impracticable in the case of Europeans. It seems, however, open to question, whether or not it may not be possible for human beings of particular constitutions to practise a kind of

* Quoted in Colonel Olcott's *Yoga Philosophy*, p. 282.

hibernation like that of animals, by some method of suspending temporarily the organic functions. A certain Colonel Townsend is said to have succeeded in doing so.

A well-known instance of suspended animation occurred in the Punjāb in 1837. A certain Yogī was there, by his own request, buried alive in a vault for forty days in the presence of Runjit Singh and Sir Claude Wade; his eyes, ears, and every orifice of his body having been first stopped with plugs of wax. Dr. McGregor, the then residency surgeon, also watched the case. Every precaution was taken to prevent deception. English officials saw the man buried, as well as exhumed, and a perpetual guard over the vault was kept night and day by order of Runjit Singh himself. At the end of forty days the disinterment took place. The body was dried up like a stick, and the tongue, which had been turned back into the throat, had become like a piece of horn. Those who exhumed him followed his previously-given directions for the restoration of animation, and the Yogī told them he had only been conscious of a kind of ecstatic bliss in the society of other Yogīs and saints, and was quite ready to be buried over again.

What amount of fraud, if any, there may be in these feats it is impossible to say. The phenomena may possibly be accounted for by the fact that Indian Yogis have studied the habits of hibernating animals for ages.

I may add that it is commonly believed throughout India that a man whose body is sublimated by intense abstract meditation never dies, in the sense of undergoing corruption and dissolution. When his supposed death occurs he is held to be in a state of trance, which may last for centuries, and his body is, therefore, not burnt, but buried—generally in a sitting posture—and his tomb is called a samādh.

With regard to the fifth requisite—the act of withdrawing the senses from their object, as, for example, the eye from visible forms—this is well compared to the act of a tortoise withdrawing its limbs under its shell.

The sixth requisite—fixing the principle of thought—comprises the act of directing the thinking faculty (*citta*) towards various parts of the body, for example, towards the heart, or towards the crown of the head, or concentrating the will-force on the region between the two eyebrows, or even fixing the eyes intently on the tip of the nose. (Compare *Bhagavad-gītā*, vi. 13.)

The seventh and eighth requisites—viz., internal self-contemplation and intense self-concentration—are held (when conjoined with the sixth) to be most important as leading to

the acquisition of certain supernatural powers, of which the following are most commonly enumerated :—(1) *Animan*, “the faculty of reducing the body to the size of an atom”; (2) *Mahiman*, or *Gariman*, “increasing the size or weight at will”; (3) *Laghiman*, “making the body light at will”; (4) *Prāpti*, “reaching or touching any object or spot, however apparently distant”; (5) *Prākāmya*, “unlimited exercise of will”; (6) *Isitva*, “gaining absolute power over one’s self and others”; (7) *Vasitā*, “bringing the elements into subjection”; (8) *Kāmāvasāyitā*, “the power of suppressing all desires.”

A *Yogī* who has acquired these powers can rise aloft to the skies, fly through space, pierce the mysteries of planets and stars, cause storms and earthquakes, understand the language of animals, ascertain what occurs in any part of the world, or of the universe, recollect the events of his own previous lives, prolong his present life, see into the past and future, discern the thoughts of others, assume any form he likes, disappear, reappear, and even enter into another man’s body and make it his own.

Such were some of the extravagant ideas which grew with the growth of the *Yoga* system, and all these exist in the later developments of Buddhism. The Buddha himself is fabled by his followers to have ascended to the *Trayas-trinsa* heaven of *Indra*, walked on water, stepped from one mountain to another, and left impressions of his feet on the solid rock; although in the well-known *Dhamma-pada* it is twice declared (254, 255), “There is no path through the air.”

Of course it was only natural that, with the development of Buddhism and its association with *Saivism*, the Buddha himself should have become a centre for the growth and accumulation of supernatural and mystical ideas. It is in this way that the later doctrine makes every Buddha have a threefold existence or possess three bodies, much in the same way as in *Hindūism* three bodies are assigned to every being.

The first of the Buddha’s bodies is the *Dharma-kāya* “body of the Law,” supposed to be a kind of ethereal essence of a highly sublimated nature and co-extensive with space. This essence was believed to be eternal, and after the Buddha’s death, was represented by the Law or Doctrine (*Dharma*) he taught. Its *Brāhmanical* analogue is probably *Brahman*, “the Universal Spirit,” which, when associated with *Illusion* (or the *Kāraṇa-sarīra*), may assume a highly ethereal subtle body, called *Linga-sarīra*.

The second body is the *Sambhoga-kāya*, “body of conscious bliss,” which is of a less ethereal and more material nature than the last. Its *Brāhmanical* analogue appears to be

the intermediate celestial body belonging to departed spirits, called Bhoga-deha, which is of an ethereal character, though it is composed of sufficiently gross (sthūla) material particles to be capable of experiencing happiness in heaven.

The third body is the *Nirmāna-kāya*, "body of visible shapes and transformations," that is to say, those visible concrete material forms in which every Buddha who exists as an invisible and eternal essence, is manifested on the earth or elsewhere for the propagation of the true doctrine. The Brāhmanical analogue of this third body appears to be the earthly gross body, called *Sthūla-sarīra*.

There is a well-known legend which relates how the great Brāhman sage Sankarācārya entranced his gross body, and then, having forced out his soul along with his subtle body, entered the dead body of a recently deceased king, which he occupied for several weeks.

In connexion with these mystical ideas, I may here allude to the belief that certain modern Eastern sages, skilled in occult science, have the power of throwing their gross bodies into a state of mesmeric trance, and then by a determined effort of will projecting or forcing out the ethereal body through the pores of the skin, and making this phantasmal form visible in distant places.*

We learn from Mr. Sinnett that a community of Buddhist "Brothers" called Mahātmas, are now living in secluded spots in the deserts of Tibet, who have emancipated their interior selves from physical bondage by meditation, and are believed to possess "astral" or ethereal bodies (distinct from their gross bodies), with which they are able to rise in the air, or move through space, by the mere exercise of will.

I am not aware whether the Psychological Research Society has extended its researches to the deserts of Tibet, where these phenomena are said to take place.

In curious agreement with these notions, are the beliefs of various uncivilised races. Dr. Tylor, in his *Primitive Culture* (i. 440), relates how the North American Indians and others believe that their souls quit their bodies during sleep, and go about hunting, dancing, visiting, etc.

Old legends relate how Simon Magus made statues walk; how he flew in the air; changed his shape; assumed two faces; made the vessels in a house seem to move of themselves (Yule's *Marco Polo*, i. 306). Friar Ricold relates that "a man from India was said to fly. The truth was that he

* Colonel Olcott and Mr. Sinnett mention this faculty as characteristic of Asiatic occultism.

did walk close to the surface of the ground without touching it" (Yule's *Marco Polo*, i. 307).

As to the phenomena of modern spiritualism, these are declared by Mr. Sinnett to be quite distinct from those of Asiatic occultism. He maintains that modern spiritualism requires the intervention of "mediums," who neither control nor understand the manifestations of which they are the passive instruments; whereas the phenomena of occultism are the "achievements of a conscious living operator," produced by a simple effort of his own will. The important point, he adds, "which occultism brings out is, that the soul of man, while something enormously subtler and more ethereal and more lasting than the body, is itself a material body. . . . The ether that transmits light is held to be material by any one who holds it to exist at all; but there is a gulf of difference between it and the thinnest of the gases." In another place he advances an opinion that the spirit is distinct from the soul. It is the soul of the soul.

And again: "The body is the prison of the soul for ordinary mortals. We can see merely what comes before its windows; we can take cognisance only of what is brought within its bars. But the adept has found the key of his prison, and can emerge from it at pleasure. It is no longer a prison for him—merely a dwelling. In other words, the adept can project his soul out of his body to any place he pleases with the rapidity of thought."*

It is worth noting that many believers in Asiatic occultism hold that a hitherto unsuspected force exists in nature called Odic force (is this to be connected with Psychic force?), and that it is by this that the levitation of entranced persons is effected. Some are said to have the power of lightening their bodies by swallowing large draughts of air. The President of the Theosophical Society, Colonel Olcott, alleges that he himself, in common with many other observers, has seen a person raised in the air by a mere effort of will.

Surely these phenomena may be mere feats of conjuring. In the *Asiatic Monthly Journal* for March, 1829, an account is given of a Brâhman who poised himself *apparently* in the air, about four feet from the ground, for forty minutes, in the presence of the Governor of Madras. Another juggler sat on three sticks put together to form a tripod. These were removed, one by one, and the man remained sitting in the

* *The Occult World*, by A. P. Sinnett, Vice-President of the Theosophical Society, pp. 12, 15, 20.

air. On the other hand, it is contended, that "since we have attained, in the last half-century, the theory of evolution, the antiquity of man, the far greater antiquity of the world itself, the correlation of physical forces, the conservation of energy, spectrum analysis, photography, the locomotive engine, electric telegraph, spectroscope, electric light, and the telephone, who shall dare to fix a limit to the capacity of man?"* Few will be disposed to deny altogether the truth of such a contention, however much they may dissent from Colonel Olcott's theosophical and neo-Buddhist views.

There may be, of course, latent faculties in humanity which are at present quite unsuspected, and yet are capable of development in the future.

I may also refer to the statement of Sir James Paget, in his recent address on "Scientific Study," that many things now held to be inconceivable and past man's imagination are profoundly and assuredly true, and that it will be in the power of Science to prove them to be so.†

Clearly mystical Buddhism is far too big a subject to be compressed within the limits of a single paper.

I will merely, in conclusion, express my doubts whether Asiatic occultism, as connected with the Yoga philosophy, and as believed in by Colonel Olcott, Mr. Sinnett, and many others, will ever bear the searching light of European scientific investigation.

Nevertheless, it seems to me to be a subject which ought not to be brushed aside by our scientists as unworthy of consideration. It furnishes, in my opinion, a highly interesting topic of inquiry, especially in its bearing on the so-called "Spiritualism," "neo-Buddhism," and "Theosophy" of the present day. The practices connected with mesmerism, animal magnetism, clairvoyance, thought-reading, &c., have their counterparts in the Yoga system prevalent in India more than 2,000 years ago. "The thing that hath been, it is that which shall be; and that which is done is that which shall be done: and there is no new thing under the sun."

* Colonel Olcott's *Lectures on Theosophy and Archaic Religions*, p. 109.

† Report in the *Times* newspaper.

The BISHOP OF DUNEDIN.—I believe I owe it to the absence of a more important individual than myself that I have been asked to propose the resolution I now have the honour to submit,—namely, “That our best thanks be presented to Sir Monier Monier-Williams for the Annual Address now delivered, and to those who have read papers during the session.” It is one of the many pleasures and gratifications afforded to a Colonial bishop in the very occasional visits he makes to the home country to find himself once more plunged, as I do to-night, into the very centre of the world’s emotions and currents of thought—indeed, one may say, into what is almost the focus of the thought of the whole world. I have been astonished to find, during my short residence in England since I returned from New Zealand, how prominent a place the old religions of human origin, and those systems of philosophy which we have been accustomed to regard as not very materially affecting us, have of late taken in the minds of men. I find that on every side these things are the subjects of thought and comment. I was myself invited by some friends in another part of London to address a meeting this evening on the subject of Mahommedanism, so that, while in one place there is a discussion on that subject, in another a meeting is being held on the system of Buddha. The reason why so much interest is now taken in these matters, as compared with what was the case in former times, appears to be that there is an idea abroad that these ancient religions and systems of philosophy conflict with, if they do not overturn, the claims of Christianity. I think it is this idea that has brought these subjects to so great a prominence at the present day. I propose, in the short space of time permitted to me in moving this resolution, to address myself to one or two points which seem to me to be of some importance to bear in mind, as marking out, in a clear and definite manner, the lines of distinction between Christianity and these ancient religions. One hears on every side that Christianity is on its trial; as if there ever had been a time since the commencement of the Christian faith when it was not upon its trial. I think that perhaps the true meaning of such an expression is, that there is a new phase of trial to which Christianity is now being subjected. There was a time which, doubtless, most of us remember when, in our younger days, people were content to accept Christianity largely because they knew nothing of any other system which they could put into comparison with it. Such knowledge has, however, now been forced upon them, not only by the spirit of inquiry of the present day, but,

perhaps, even more largely by the necessities of a certain class of literary men, who have to produce articles of an interesting and novel kind for their several publications from month to month, and who, therefore, ransack all sorts of subjects and bring them to the front, so that people are obliged to know something, though probably too little, of these things; the little they are made to know being somewhat startling to them, particularly if the matter relate to religion, while they do not learn enough to enable them to compare what is put before them with that which they were aware of long ago. It seems to me that this, to some extent, accounts for the condition, almost of alarm, which appears to prevail in some quarters, from the facts I have mentioned; and, on the other hand, for the premature pæans of triumph which elsewhere resound in regard to these matters. If we knew a little more about such things, we should probably not witness this alarm, nor perceive these premature notes of triumph. Therefore, we are greatly indebted to those who present such subjects as that of this evening's Address in all their details, so that we may come to see how vastly different are the systems they relate to from the Christianity in which we have rejoiced so long. It is said by those who would present these matters to us as conflicting with Christianity, that there are points of resemblance between Buddhism and the Christian faith which they would have us believe are a proof that Christianity owes its origin to these more ancient philosophies. I do not intend to detain you to-night, after what we have heard,—indeed, it would be presumptuous in me to do so; but I may say, in passing, that the amount of mystery connected with the Yoga philosophy is one reason why it becomes so attractive, while, at the same time, the general ignorance which prevails in regard to these things renders it possible for any writer to indulge in such random expressions, and to enter into as many almost wild speculations with regard to them as he may deem fit, because he knows he is perfectly safe in presuming on the ignorance of those for whom he writes. I would here say a word or two on the relationship, or rather on the contrast, between Buddhism and Christianity. We are told there is a connexion between the Yoga philosophy and Buddhism, and that one has been largely adopted by the other. I think we may say it has been proved by those who have examined the subject that such resemblance as may exist between Buddhism and Christianity has been the resemblance which has grown up in the later rather than in the earlier ages of

Buddhism,—that is to say, if we examine Buddhism before Christianity, we do not find those resemblances which are pointed out, and perhaps purposely exaggerated, to support the idea that all religions are of human origin. We have heard about the ascension of Buddha, and that is compared with the Ascension of Christ. We are also told of the footmarks on the mountain, and so on ; but it has been shown that these resemblances had their origin 400 or 500 years after the existence of Christianity. Therefore, it is possible that something has taken place in the history of Buddhism which resembles what in natural history is termed mimetic analogy. We know that there are particular insects which owe their safety from their natural enemies to the fact that they closely resemble another species possessed of an armature or means of self-defence,—it may be some essential oil, the smell of which is not liked, and which prevents the insect being seized as prey,—the insect which has a resemblance to it thereby escaping capture. It may be that the Buddhists of later times, having found a living, vital force in Christianity, have endeavoured to give life to their system of philosophy by copying a virtue, not innate in their own doctrine, but which is possessed by Christianity. This is in favour of Christianity, for the better does not imitate the worse. If you will allow me to make some comparison between the nature of Christianity and that of Buddhism, I would say that Christianity is essentially and professedly an intervention on the part of the Divine Being for the good of His creatures ; while Buddhism is an effort on the part of man himself to work out a deliverance from experienced evils. There is no sort of connexion between the two things, and the case is not altered because we find that in the pursuit of this object the professors of Buddhism have attained what are undoubtedly some noble conceptions, have worked on principles which may to some extent call forth our admiration, have made careful observation of the character of the human mind and of nature generally, and have carried out their observations with intense thought and care. The essential difference between the two systems is not thereby affected. The position of the Buddhist is, after all, not greatly dissimilar from that condition which we find prevailed in ancient times, and which finds its illustration in the efforts of the Babel builders to reach heaven by the construction of a material fabric. In one case you have a number of men seeking to reach celestial spheres through physical instrumentality, while in the other you have the idea that man can by mental and moral process

sublimate himself, and obtain by his own efforts contact with God. If we examine still more closely the apparent resemblances between the two systems we find them to be only in appearance, not in fact. It is pointed out that both alike prescribe self-abnegation, and that therefore the morality of Christianity is not original. But there is a whole realm of difference between *self-mortification* and *self-denial*. One is reducible to innate selfishness and pride, the other to God-like and God-given desire to promote the good of others. The one is the moral of Buddhism, the other of Christianity, and the qualities are neither the same in themselves nor in their motive. There is, therefore, this essential difference between Buddhism and Christianity,—the one is distinctly human, and, at its best, can only be described as an exalted system of philosophy, while the other is Divine, and is nothing less than the impartation of the nature of God Himself to mankind. I have great pleasure in moving the resolution.

Mr. W. S. SETON-KARR (late Foreign Secretary to the Government of India, and Vice-Chancellor of the Calcutta University).—I feel that my only excuse for rising to second this motion lies in my old friendship with Sir Monier Monier-Williams, from whom you have had so interesting an Address. I shall not attempt to follow the Bishop of Dunedin in his admirable remarks as to the points of contact and of dissimilarity between Buddhism and Christianity, beyond saying that, having had some practical experience of Hindooism, Mahomedanism, and Buddhism, I am convinced that, whatever morality or civilisation may be found among the exponents of those systems, whenever Christianity is confronted with them it is perfectly able to hold its own. Nor will I follow Sir M. Monier-Williams into his extremely interesting and instructive Address on the connexion between the Yoga philosophy of the Hindus and the system of mystical Buddhism. But I may say something with regard to what he has stated about the juggler who was apparently suspended in the air without any visible support. I say that I could hardly believe my eyes when I saw this very feat performed at Jessore. How it was done I, of course, do not pretend to say; but I saw what Sir Monier Monier-Williams has described. I do not ask any one here present to believe it, because, although I saw it, I hardly believe it myself. With regard to the paper generally, I can only add that, in order to be able to deliver such an address to such an assembly as this, it must be necessary that the writer should not only have been a deep and careful student of Oriental literature, but

that he should also have visited India, so as to become acquainted with what Pundits have said and done, and with what the Oriental system of religion is in practice.

The motion was unanimously agreed to.

Sir MONIER MONIER-WILLIAMS, K.C.I.E.—I will first thank you, on behalf of those who have read papers during this session, for your kind vote. As regards myself, I will only say that I am much obliged to my friend, Mr. Seton-Karr, for what he has just said, and also to all who are here for the very kind way in which they have received me, and the attention with which they have listened to what I have had to say upon this subject. My best thanks are due to all.

Sir H. BARKLY, K.C.B., G.C.M.G., F.R.S.—It affords me the greatest pleasure to move, "That the thanks of the meeting be presented to the President." All who are acquainted with the multitudinous engagements that have to be fulfilled by Professor Stokes* will feel deeply grateful to him for the interest he has taken in the work devolving upon him as President of this Institute during the last two years, and more especially for the able and profound Address which he delivered to us at the last annual meeting,—an Address which, apart from its great interest, coming from one in his distinguished position as a scientific man holding the office of President of the Royal Society of Great Britain, cannot fail to have had the greatest influence in conducing to the successful progress of the Institute referred to in the report to-night. It seems to me that it would be impossible to appreciate too highly the independence of spirit and the moral courage that have been displayed by Professor Stokes in placing himself, in these days of aggressive agnosticism, at the head of an institute whose avowed object it is to investigate those questions of philosophy and science which bear upon the great truths revealed to us in the Holy Scriptures. I say "aggressive agnosticism," because, as we all know, there is a great deal of aggression in the agnosticism of the present day. The agnosticism springing from honest doubt and genuine difficulty in reconciling the natural phenomena with Divine Revelation we are all bound to speak of with the utmost respect and the deepest sympathy; but we know, on the other hand, that there are a great many agnostics who not only profess not to know, but who really do not wish to know, anything about the Christian religion. Still, we must rejoice that there are men of eminence in the scientific world

* Now Sir G. G. Stokes, Bart.

who are equally desirous with many of these agnostic gentlemen that the truth, the whole truth, and nothing but the truth, should be taught in matters of philosophy, science, and history, and who choose to come boldly forward and associate themselves with an institute like this, which is striving, and has been striving zealously for the last twenty years, to promote the full and free discussion of these subjects in their religious aspect. I will not detain the meeting longer by dilating on the claims of Professor Stokes to our gratitude, but will at once ask you to join me in according a hearty vote of thanks to him for his great kindness in fulfilling the duties of President of this Society.

The Rev. ROBINSON THORNTON, D.D., V.P.—At the end of a long meeting like this, when the audience may be supposed to have been reduced to the condition of *pratyahāra*, a virtuous state, which consists in the withdrawal of the senses from all external objects, I will not attempt to detain you at any length in seconding this resolution; for I may say that the condition I have mentioned is one I have observed to be produced by long after-dinner speeches, by lengthy addresses towards the close of a meeting, and also by a certain class of sermons. I shall therefore not trespass on your time very long, and, in what I have to say, will merely endeavour to answer a question put by Sir M. Monier-Williams in his paper. Towards the end he asks whether the Psychical Research Society have extended their researches into the phenomena said to be displayed by the community termed Mahātmas. As a member of that Society, I may say that we made inquiries as to whether there were any Mahātmas at all, and the replies we obtained were such that we are extremely doubtful about their existence. But, even if they do exist, I do not think it would be any use to send out a commission of inquiry, inasmuch as no one, we are told, can see a Mahātma unless he is a Mahātma, or next door to one, himself. I have now only to second the vote of thanks which Sir Henry Barkly has proposed to our President, assuring him of the pleasure we all experienced in electing him to the office he holds, and of the satisfaction we feel in his presence here this evening.

The resolution having been unanimously accorded,

The PRESIDENT said:—I have to return you my thanks for the kind way in which you have received this motion. I feel that I have been very backward in what I have been able to do for the Society; but, as you are aware, I have a great many irons in the fire, and, that being the case, I am unable to give that minute

attention to the affairs of the Institute of which it is really deserving. This, however, I will say, that my best wishes are with you; and with regard to one remark which fell from Sir Henry Barkly, I would observe that, having a large acquaintance with scientific men, I know what numbers of them there are who are not agnostics at all, but the reverse.

The Members, Associates, and their friends then adjourned to the Museum, where refreshments were served.

ON A FEW OF THE CHIEF CONTRASTS BETWEEN THE
ESSENTIAL DOCTRINES OF BUDDHISM AND OF
CHRISTIANITY, BY SIR M. MONIER-WILLIAMS, K.C.I.E.

“It is one of the strange phenomena of the present day, that even educated persons are apt to fall into raptures over the doctrines of Buddhism, attracted by the bright gems which its admirers cull out of its moral code, and display ostentatiously, while keeping out of sight all the dark spots of that code, all its triviality and all those precepts which no Christian could soil his lips by uttering. It has even been asserted that much of the teaching in the Sermon on the Mount is based on previously current moral precepts, which Buddhism was the first to introduce to the world, 500 years before Christ. But this is not all. The admirers of Buddhism maintain that the Buddha was not a mere teacher of morality, but of many other great truths. He has been justly called, say they, ‘the Light of Asia,’ though they condescendingly admit that Christianity, as a later development, is more adapted to become the religion of the world.

NOTE.—Those who have observed the progress of modern thought in regard to Neo-Buddhism will appreciate the insertion of the above remarks as a sequel to the Address: they were delivered at a public Conference this year, and have been revised for the Institute by the author. Another distinguished Member of the Institute writes:—“It has always seemed to me that the important point to keep in view as to Neo-Buddhism is that the sentiment in Arnold’s *Light of Asia* is utterly false; that the conceptions there are borrowed from Christianity; that Buddhism has not merely failed in practice, but is essentially the bare hollow emptiness that Sir M. Monier-Williams describes, and offers nothing but metaphysics and superstition; that, in fact, as to the first Schopenhauer is a better leader for those who wish Nihilism, and that the whole of Esoteric Buddhism is a fraud.”—Ed

“Let us, then, inquire for a moment what claim Gautama Buddha has to this title, ‘the Light of Asia.’

“Now, in the first place, those who give him this name forget that his doctrines only spread over Eastern Asia, and that Mohammed has as much right as Buddha to be called ‘the Light of Asia.’ But was the Buddha, in any true sense, a Light to any part of the world? It is certainly true that the main idea implied by Buddhism is intellectual enlightenment. Buddhism, before all things, means enlightenment of mind, resulting from intense self-concentration, from intense abstract meditation, combined with the exercise of a man’s own reasoning faculties and intuitions. It was only after such a course of meditation that the so-called Light of Knowledge burst upon the man Gautama. It was only then that he became Buddha, the Enlightened One. We read in the *Lalita Vistara* that, at the supreme moment of this enlightenment, actual flames of light issued from the crown of the Buddha’s head. Of what nature, then, was this so-called Light of Knowledge that radiated from the Buddha? Was it the knowledge of his own deep depravity of heart, or of the origin of sin? No; the Buddha’s light was in this respect profound darkness. He confessed himself a downright Agnostic. The origin of the first evil act was to him an inexplicable mystery. Was it, then, a knowledge of the goodness, justice, and holiness of an Omnipotent Creator? Was it a knowledge of the Fatherhood of God? No; the Buddha’s light was in these respects also absolute darkness. Here, too, he acknowledged himself a thorough Agnostic. He knew nothing of the existence of any Supreme Being—of any Being higher than himself. What, then, was the light that broke upon the Buddha? What was this enlightenment which has been so much written about and extolled? All that he claimed to have discovered was the Origin of suffering and the remedy of suffering. All the light of knowledge to which he attained came to this: that suffering arises from indulging desires; that suffering is inseparable from life; that all life is suffering; and that suffering is to be got rid of by the suppression of desires, and by the extinction of personal existence. You see here the first great contrast. When the Buddha said to his converts, ‘Come, follow me,’ he bade them expect to get rid of suffering; he told them to stamp out suffering by stamping out desires. When the Christ said to His disciples, ‘Come, follow me,’ He bade them expect suffering; He told them to glory in their sufferings, to rejoice in their sufferings, nay, to

expect the perfection of their characters through suffering. It is certainly noteworthy that both Christianity and Buddhism agree in asserting that all creation travaileth in pain, in bodily suffering, in tribulation. But mark the vast, the vital distinction in the teaching of each. The one taught men to aim at the glorification of the suffering body, the other at its utter annihilation. What says our Bible? We Christians, it says, are members of Christ's Body, of His flesh and of His Bones, of that Divine Body, which was a suffering body, a cross-bearing body, and is now a glorified body, an ever-living, life-giving body. A Buddhist, on the other hand, repudiates, as a simple impossibility, all idea of being a member of the Buddha's body. How could a Buddhist be a member of a body which was burnt, which was dissolved, which became extinct at the moment when the Buddha's whole personality became extinguished also? But, say the admirers of Buddhism, at least you will admit that the Buddha told men to get rid of sin, and to aim at sanctity of life? Nothing of the kind. The Buddha had no idea of sin, as an offence against God, no idea of true holiness. What he said was, Get rid of the demerit of evil actions and accumulate merit by good actions. This storing up of merit—like capital at a bank—is one of those inveterate propensities of human nature from which Christianity alone has delivered men.

Only the other day I met an intelligent Sikh from the Punjab, and asked him about his religion. He replied, 'I believe in One God, and I repeat my prayers, called Jap-jee, every morning and evening. These prayers occupy six pages of print, but I can get through them in little more than ten minutes.' He seemed to pride himself on this rapid recitation as a work of increased merit. I said, 'What else does your religion require of you?' He replied, 'I have made one pilgrimage to a sacred well near Amritsar; eighty-five steps lead down to it. I descended and bathed in the sacred pool. Then I ascended one step and repeated my Jap-jee in about ten minutes. Then I descended again to the pool and bathed again, and ascended to the second step and repeated my prayers a second time. Then I descended a third time, and ascended to the third step, and repeated my Jap-jee a third time; and so on for the whole eighty-five steps. It took me exactly fourteen hours, from 5 p.m. one evening to 7 a.m. next morning.' I asked, 'What good did you expect to get by going through this task?' He replied, 'I hope I have laid up a great store of merit, which will last me for a long time.' This, let me

tell you, is a genuine Hindu idea. It is of the very essence of Brahmanism and Hinduism. It is equally a Mohammedan idea. It is even more a Buddhist idea. Buddhism recognises the terrible consequences of evil actions, but provides no remedy except the accumulation of merit by good actions as a counterpoise. The Buddha never claimed to be a deliverer from sin. He never pretended to set any one free from the bondage of sinful acts and sinful habits. He never professed to provide any remedy for the leprosy of sin, any medicine for a dying sinner. On the contrary, by his doctrine of Karma he bound a man hand and foot to the consequences of his own acts with chains of adamant. He said, in effect, to every one of his disciples, 'You are in slavery to a tyrant of your own setting up; your own deeds, words, and thoughts in the present and former states of being are your own avengers through a countless series of existences. If you have been a murderer, a thief, a liar, impure, a drunkard, you must pay the penalty in your next birth; either in one of the hells, or as an unclean animal, or as an evil spirit, or as a demon. You cannot escape, and I am powerless to set you free.' 'Not in the heavens' (says the Dhamma-pada), 'not in the midst of the sea, not if thou hidest thyself in the clefts of the mountains, wilt thou find a place where thou canst escape the force of thine own evil actions.' Contrast the first sermon of Christ, 'The Spirit of the Lord is upon me, because He hath sent me to proclaim liberty to the captives, and the opening of the prison to them that are bound.' Yes, in Christ alone there is deliverance from the bondage of former transgressions, from the prison-house of former sins; a total cancelling of the past, a complete blotting out of the handwriting, that is against us; the opening of a clear course for every man to start afresh; the free gift of pardon and of life to every criminal, to every sinner—even the most heinous.

But here, again, I seem to hear some admirers of Buddhism say:—'We admit the force of these contrasts, but surely you will allow that in the law of Buddha we find precepts which tell us not to love the world, not to love money, not to show enmity towards our enemies, not to do unrighteous acts, not to commit impurities, to overcome evil by good, and to do to others as we would be done by?' Yes, I admit all this; nay, I admit even more. I allow that some Buddhist precepts go beyond corresponding Christian injunctions; for the laws of Buddha prohibit all killing, even of animals for food. They demand total abstinence from stimulating drinks, disallowing even moderation in their use. They bid all

who aim at the highest perfection abandon the world, and lead a life of celibacy and monkhood. In fine, they enjoin total abstinence, because they dare not trust human beings to be temperate. How, indeed, could they trust them, when they promise no help, no Divine grace, no restraining power? The glory of Christianity is, that having freely given that power to man, it trusts him to make use of the gift. It seems to speak to him thus: 'Thy Creator has endowed thee with freedom of choice, and therefore respects thy liberty of action. He imposes on thee no rule of total abstinence in regard to natural desires; He simply bids thee keep them within bounds, so that thy self-control and thy moderation may be known unto all men. He places thee in the world amid trials and temptations, and says to thee, 'My grace is sufficient for thee, and by its aid thou mayest overcome them all.'

And, believe me, the great contrast between the moral precepts of Buddhism and Christianity is not so much in the letter of the precepts as in the motive power brought to bear in their application. Buddhism says: Be righteous by yourselves, and through yourselves, and for the final getting rid of all suffering, of all individuality, of all life in yourselves. Christianity says: Be righteous through a power implanted in you from above; through the power of a life-giving principle, freely given to you, and always abiding in you.' The Buddha said, to his followers:—'Take nothing from me, trust to no one but yourselves.' Christ said, and says to us still:—'Take all from Me; take this free gift; put on this spotless robe; eat this bread of life; drink this living water.' He who receives a priceless gift is not likely to insult the Giver of it. He who accepts a snow-white robe is not likely willingly to soil it by impure acts. He who tastes life-giving bread is not likely to relish husks. He who draws deep draughts at a living well is not likely to prefer the polluted water of a stagnant pool. If any one, therefore, insists on placing the Buddhist and Christian moral codes on the same level, let him ask himself one plain question: Who would be the more likely to lead a godly, righteous, and sober life—a life of moderation and temperance—a life of holiness and happiness; the man who has learnt his morality from the extinct Buddha, or the man who draws his morality and his holiness from the living, the eternal, the life-giving Christ?

Still, I seem to hear some one say, 'We grant all this, we admit the truth of what you have stated; nevertheless, for all that, you must allow that Buddhism conferred a great benefit on India by

setting free its teeming population, before entangled in the meshes of ceremonial observances and Brahmanical priestcraft.' Yes, I admit this ; nay, I admit even more than this. I admit that Buddhism conferred many other benefits on the millions inhabiting the most populous part of Asia. It promoted progress up to a certain point ; it preached purity in thought, word, and deed (though only for the accumulation of merit) ; it proclaimed the brotherhood of humanity ; it avowed sympathy with social liberty and freedom ; it gave back much independence to women ; it inculcated universal benevolence, extending even to animals ; and, from its declaration that a man's future depended on his present acts and conditions, it did good service for a time in preventing stagnation, promoting activity, and elevating the character of humanity.

But if, after making all these concessions, I am told that, on my own showing, Buddhism was a kind of introduction to Christianity, or that Christianity is a kind of development of Buddhism, I must ask you to bear with me a little longer while I point out certain other contrasts, which ought to make it clear to every reasonable man how vast, how profound, how impassable is the gulf separating the true religion from a mere system of morality, founded on a form of pessimistic philosophy. And, first of all, let us note that Christ was God-sent, whereas Buddha was self-sent. Christ was with His Father from everlasting, and was in the fulness of time sent by Him into the world to be born of a pure virgin, in the likeness and fashion of men. Buddha, on the contrary, by a force derived from his own acts, passed through innumerable bodies of gods, demi-gods, demons, men, and animals, until he reached one out of numerous supposed heavens, and thence by his own will descended upon earth, to enter the side of his mother, in the form of a white elephant. Then Christ came down from heaven to be born on earth in a poor and humble station, to be reared in a cottage, to be trained to toilsome labour as a working man. Buddha came down to be born on earth in a rich and princely family ; to be brought up amid luxurious surroundings, and finally to go forth as a mendicant, begging his own food and doing nothing for his own support. Then, again, Christ as He grew up, showed no signs of earthly majesty in His external form, whereas the Buddha is described as marked with certain mystic symbols of universal monarchy on his feet and on his hands, and taller and more stately in frame and figure than ordinary human beings. Then, when each entered on his ministry as a teacher, Christ was despised and

rejected by kings and princes, and followed by poor and ignorant fishermen, by common people, publicans, and sinners ; Buddha was honoured by kings and princes, and followed by rich men and learned disciples. Then Christ had all the treasures of knowledge hidden in Himself, and made known to His disciples that He was Himself the Way and the Truth, Himself their Wisdom, Righteousness, Sanctification, and Redemption ; Buddha declared that all enlightenment and wisdom were to be attained by his disciples, not through him, but through themselves and their own intuitions, and that, too, only after long and painful discipline in countless successive bodily existences. Then, when we come to compare the death of each, the contrast reaches its climax, for Christ was put to death violently by wicked men and died in agony an atoning death, suffering for the sins of the world at the age of thirty-three, leaving behind in Jerusalem about one hundred and twenty disciples after a short ministry of three years ; whereas Buddha died peacefully among his friends, suffering from an attack of indigestion at the age of eighty, leaving behind many thousands of disciples after forty-five years of teaching and preaching. And what happened after the death of each ? Christ the Holy One saw no corruption, but rose again in His present glorified body, and is alive for evermore. Nay, has life in Himself ever-flowing in life-giving streams towards His people. The Buddha is dead and gone for ever ; his body, according to the testimony of his own disciples, was burnt, more than 400 years before the Advent of Christ, and its ashes distributed everywhere as relics. Even according to the Buddha's own declaration he now lives only in the doctrine which he left behind him for the guidance of his followers. And here again in regard to the doctrine left behind by each, a vast distinction is to be noted. For the doctrine delivered by Christ to His disciples is to spread by degrees everywhere until it prevails eternally. Whereas the doctrine left by Buddha, though it advanced rapidly by leaps and bounds, is, according to his own admission, to fade away by degrees, till at the end of 5,000 years it has disappeared altogether from the earth, and another Buddha must descend to restore it.

Then that other Buddha must be followed by countless succeeding Buddhas in succeeding ages, whereas there is only one Christ, who can have no successor, for He is still alive and for ever present with His people. 'Lo, I am with you alway, even unto the end of the world.' Then observe that, although the Buddha's doctrine was ultimately written down by his disciples in certain collections

of books, in the same manner as the doctrine of Christ, yet that a gulf of difference,—a fundamental difference of character,—separates the Sacred Books of each, the Bible of the Christian and the Bible of the Buddhist. The Christian's Bible claims to be a supernatural Revelation, yet it attaches no mystical talismanic virtue to the mere sound of its words. On the other hand the characteristic of the Buddhist Bible is that it utterly repudiates all claim to be a supernatural revelation; yet the very sound of its words is believed to possess a meritorious efficacy, capable of elevating any one who hears it to heavenly abodes in future existences. In illustration I may advert to a legend current in Ceylon, that once on a time 500 bats lived in a cave where two monks daily recited the Buddha's law (the recitation being called 'Bana'). These bats gained such merit by simply hearing the sound of the words that when they died they were all re-born as men and ultimately as gods.

But, again. I am sure to hear the admirers of Buddhism say,—Is it not the case that the doctrine of Buddha, like the doctrine of Christ, has self-sacrifice as its key-note? Well, be it so. I admit that the Buddha taught a kind of self-sacrifice. I admit that it is recorded of the Buddha himself that on one occasion he plucked out his own eyes, and that on another he cut off his own head, and that on a third he cut his own body to pieces, to redeem a dove from a hawk. But note the vast distinction between the self-sacrifice taught by the two systems. Christianity demands the suppression of selfishness. Buddhism demands the suppression of self, with the one object of extinguishing all consciousness of self. In the one the true self is elevated and intensified. In the other the true self is annihilated by the practice of a false form of non-selfishness, which has for its final object the annihilation of the Ego, the utter extinction of the illusion of *personal* individuality.

Then note other contrasts. According to the Christian Bible, regulate and sanctify the heart's desires and affections. According to the Buddhist, suppress and utterly destroy them if you wish for true sanctification. Christianity teaches that, in the highest form of life, *love* is intensified. Buddhism teaches that, in the highest state of existence, all love is extinguished. According to Christianity, go and earn your own bread, support yourself and your family. Marriage, it says, is honourable and undefiled, and married life is a field on which holiness may grow and be developed. Nay, more. Christ Himself honoured a wedding with his presence,

and took up little children in His arms and blessed them. Buddhism, on the other hand, says, Avoid married life ; shun it as if it were a burning pit of live coals ; or, having entered on it, abandon wife, children, and home, and go about as celibate monks, engaging in nothing but in meditation and recitation of the Buddha's Law,—that is, if you aim at the highest degree of sanctification. And then comes the important contrast, that no Christian trusts to his own works as the sole meritorious cause of salvation, but is taught to say, I have no merit of my own, and when I have done all I am an unprofitable servant. Whereas Buddhism, on the contrary, teaches that every man must trust to his own merits only. Fitly do the rags worn by its monks symbolise the miserable patchwork of its own self-righteousness. Not that Christianity ignores the necessity for good works ; on the contrary, no other system insists on a lofty morality so strongly, but only as a thank-offering—only as the outcome and evidence of faith,—never as the meritorious instrument of salvation.

Lastly, I must advert again to the most important and essential of all the distinctions which separate Christianity from Buddhism. Christianity regards personal life as the most precious, the most sacred of all possessions, and God himself as the highest example of intense personality, the great 'I am that I am,' and teaches us that we are to thirst for a continuance of personal life as a gift for Him ; nay, more, that we are to thirst for the living God Himself and for conformity to His likeness ; while Buddhism sets forth as the highest of all aims the utter extinction of personal identity—the utter annihilation of the Ego—of all existence in any form whatever, and proclaims, as the only true creed, the ultimate resolution of everything into nothing, of every entity into pure non-entity. What shall I do to inherit eternal life ? says the Christian. What shall I do to inherit eternal extinction of life ? says the Buddhist. It seems a mere absurdity to have to ask, in concluding this address, Whom shall we choose as our guide, our hope, our salvation—'the Light of Asia,' or 'the Light of the world' ? the Buddha, or the Christ ? It seems mere mockery to put this final question to rational and thoughtful men in the nineteenth century :—Which book shall we clasp to our hearts in the hour of death—the book that tells us of the extinct man Buddha, or the Bible that reveals to us the living Christ, the Redeemer of the World ?

ORDINARY MEETING,*

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

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

MEMBERS.—The Right Hon. Lord Penzance, P.C., Godalming ; T. Cogswell, Esq., Kent ; Rev. L. W. Hayhurst, A.B., M.A., United States ; A. Norman Tate, Esq., F.I.C., F.C.S., Liverpool.

ASSOCIATES.—Faris Nimr, Esq., Cairo ; H. C. Nisbet, Esq., London ; Rev. J. C. Walker, Esq., Wymondham ; Rev. W. Andrews, M.A., Camb., Japan ; Rev. C. S. Green, Buxton ; Rev. R. R. Kane, LL.D., &c., Belfast ; Madame Z. A. Ragozin, United States.

The following paper, illustrated by diagrams, was then read by the author :—

CORAL ISLANDS AND SAVAGE MYTHS.

By H. B. GUPPY, M.B.

PART I.

I AM not aware whether much stress has ever been laid on the important bearing which the traditions of some of the Pacific Islands possess in connexion with the first emergence of coral islands above the waves. Since this subject is of interest in relation to the origin of coral reefs, I will commence my paper by gathering together a few of these legends.

The Rev. Wyatt Gill in his *Myths and Songs from the South Pacific* (pp. 72-74), refers to the legendary origin of the atolls of Manahiki (Humphrey I.) and Rakaanga (Reirson I.), two coral islands lying to the northward of the Society Group. . . . A Rarotongan fisherman, having brought news back to his island of a vast block of stone which he had discovered at the bottom of the ocean, at a great distance from his home, the three brothers Mani sailed away to the northward for a distance of between 600 and 700 miles in search of the

* March 19, 1888.

sunken island. After finding "the great block of coral" at the bottom of the sea, they commenced to fish over it. Maui, the younger, ultimately hooked the sunken block, and up came the entire island of Manahiki. But his "mighty straining" broke the canoe and precipitated them all into the sea. His two brothers were drowned; but Maui, the younger, preserved his safety by resting one of his feet on the solid coral of the ascending island. "At length Manahiki rose high and dry above the breakers, drawn up from the ocean depths by the exertions of the now solitary Maui." On the return of the Rarotongan fisherman to his old fishing-ground, he contested the possession of the island with Maui, who, during the fight, cleft the original island into two parts by a violent stamp with his foot on the earth. Of the two parts, one retains the ancient name of Manahiki, the other is called Rakaanga; but these "twin coral islands" are now separated by a wide open channel of twenty-five miles. The legend ends with the ascent of Maui into the heavens; whilst the fisherman established himself on Manahiki, and introduced the first cocoa-nut palm by planting a cocoa-nut he had picked up on the sea. Maui, as we learn from Mr. Gill, was one of the ancient heroes of the Hervey Group. The production of these two coral atolls was his "last and greatest achievement."

An Aitutakian myth, referring to the emergence from the sea, and to the first peopling of the island of Aitutaki, one of the Hervey Group, is also given in this work (pp. 139-141).

. . . Two brothers, "who had long lived in utter darkness in the shades," made canoes, and started away in search of "the land of light." After three abortive expeditions they reached their destination, and, approaching a partially submerged island, they were unable to land on account of the heavy surf and the absence of any dry land. However, they contended with the ocean, and "the shallow waters vanished, leaving the island elevated far above the surrounding ocean." Here they took up their abode, and named the island Aitutaki, which means "God-led." . . . This island, as we know it at the present day, is 360 feet high; but from this elevation probably 100 feet should be subtracted to allow for the height of the trees. It is said to be of coral formation, and to be surrounded by a barrier reef.

In Mariner's *Tonga* we have a similar account of the origin of the Tonga Islands, which were drawn up by the fishing-hook of the god, Tangaloa (chap. ix.). These islands are formed by elevated atolls and barrier-reefs rising up to some 200 or 300 feet.

Dr. George Turner, in his *Samoa, a Hundred Years Ago*,

and *Long Before* (p. 304), gives a tradition relating to the origin of Savage Island, an upraised atoll, about 100 feet high, which lies some 200 miles east of the Tonga Group. The present inhabitants trace their descent from two men, named Huanaki and Fao, who swam from Tonga. They found the island just above the surface, and washed by the ocean. They got up on it, stamped with the foot, up it rose, the waters ran off, and the dry land appeared. They stamped again, and up sprang the grass, trees, and other vegetation. Then they caused a man and a woman to grow from the *ti* plant, and from these sprang the present inhabitants.

An interesting Mangaian tradition, related by the Rev. Wyatt Gill, in his *Life in the Southern Isles* (p. 80), refers to the early condition of Mangaia, after its emergence above the waves. This island, one of the Hervey Group, is an upraised atoll rising to a height of about 300 feet. According to the native tradition, "the surface of Mangaia originally was everywhere a gentle slope to the sea, without a single depression or valley." Through the subsequent rivalry of the gods of the Wind, the Rain, and the Ocean, who endeavoured to overwhelm the island and its inhabitants in their strife, the present agreeable diversity of hill and vale was eventually produced.

It is very remarkable that all these legends relate to living and upraised atolls (Aitutaki, as I hold, probably belonging to the latter class). This circumstance seemingly points to the comparatively modern age of these coral islands; and it is to be noticed that all the stages in the formation of an upraised atoll island are here illustrated. First, we have the totally submerged or shoal-like condition, represented in the instance of Manahiki, which was brought up by Maui's fish-hook to the surface of the ocean. Then we have the living atoll as represented in the early condition of Savage Island and Aitutaki, the stage at which the native legends begin. Afterwards we have these two islands upraised by god-like heroes to their present elevation above the sea. Then follows the carving out by the denuding agencies of the smooth slopes of the uplifted atoll, in the manner described in the Mangaian tradition. Lastly, there spring up "the grass, trees, and other vegetation." From these old traditions we may at least learn that the Pacific Islanders regarded the origin of these living and upraised atolls as due to a movement of upheaval. The submerged coral shoal was raised to the surface, and formed the living atolls of Manahiki and Rakaanga. The living atoll was further upheaved and formed the upraised islands now known as Mangaia, Aitutaki, and Savage Island.

The recent peopling of these islands, as their traditions imply, is a noteworthy circumstance. Mr. Gill holds the view that not only the Hervey Group, which includes Aitutaki and Mangaia, but also that all the eastern Pacific islands have been peopled in comparatively recent times. "The colonisation of the Hervey Group," as he writes, "may not date back beyond five or six centuries."* The legends, therefore, relating to the origin of Mangaia and Aitutaki, and also of Manahiki and Rakaanga, discovered as coral shoals by the Rarotongan fisherman, would belong to a still more modern period; and the origin of these living and upraised coral islands would, according to this view, be of a very recent date. This is a conclusion, however, which we cannot accept. The evidence which we possess goes to show that certain coral atolls of the present day have remained very much in their present condition for three centuries and more, in fact as far as reliable records take us back. Though accepting the traditions of the natives of the Hervey Group, in so far as they throw light on the mode of origin of the living and upraised atolls, I cannot, on account of the evidence that follows, assign such a modern date for the origin of these islands as Mr. Gill's view of the recent peopling of the Hervey Group would seem to suggest.

Both Mr. Darwin and Professor Dana give evidence of the extremely slow rate of growth of coral reefs; but the former distrusts his evidence and advances facts apparently supporting the opposite conclusion, facts, however, which as he himself allows, afford only direct proof of the increase of the islets on the reef and not of the reef itself. I, however, agree with him that the stationary condition of a submerged coral reef or of a single large mass of coral may afford no proof whatever of the slow rate of coral growth. The fact of the coral knolls in the lagoon of Diego Garcia having remained at the same depth below the surface for a period of eighty years, and the stationary level of the Dolphin Shoal off Tahiti during a lapse of sixty-seven years,† may be otherwise explained when we know more of the causes that limit the upward growth of reef corals. Professor Dana, however, writing many years after and with more recent and more exact data at his disposal, arrived at the conclusion that a reef increases its extent with extreme slowness. But information is greatly needed in these matters; and we are scarcely in a position to form a true idea of the rate of growth of coral reefs.

Of the outward growth of coral atolls, we have abundant proof

* *Journ. Anthropol. Inst.*, vol. iii. p. 334.

† Darwin's *Coral Reefs* (1842), pp. 69, 72.

in the concentric ridges of shells and broken corals, which, in the instances of Christmas Island and of the neighbouring guano islands, mark the successive strips of land gained from the sea. The fact that the shells lying on the bare surface of Christmas Island have not decayed is urged by Mr. Darwin as affording evidence of an increase of the reef in a period not very remote. This is true enough ; but, in connexion with this fact, we should remember that marine shells and corals, though much weathered and decayed, are still to be found among the trees in the interior of certain upraised coral islands in the Solomon Group, which were visited and described by the Spanish discoverers in 1567.

We possess no reliable evidence to show that a coral atoll is rapidly formed. On the other hand, we know that atolls have remained in their existing condition for centuries. The present Wake's Island, when it was first discovered to the north of the Marshall Islands by the Spaniards in 1567, had much the appearance that it presented to Commodore Wilkes in 1840. It was described by the Spanish narrator as a low uninhabited islet enclosing the sea, and possessing a sandy surface with some patches of bushes. Commodore Wilkes describes it as an uninhabited atoll, probably at times washed over by the sea, and bearing shrubs but no trees. Again, if we compare the Musquillo Islands of the Marshall Group, as described by their Spanish discoverers in 1567, with the same islands as described by Captain Bond in 1792, we shall observe that the condition of this large double atoll did not materially change in the interval. This atoll was apparently as thickly populated in 1567 as it is at the present day. If, again, as seems very probable, the inhabited Isle of Jesus, discovered by the Spaniards in the same year, should prove to be one of the northern atolls of the Ellice Group, then we have another example of an atoll, which, as pointed out by Mr. Woodford, has been occupied by natives of very similar habits for over 300 years. Sikyana Atoll, again, as we learn from Quiros, was inhabited in 1606 by natives possessing the characters of the present occupants.

The foregoing remarks are for the most part taken from my general work on the Solomon Islands, to which reference for further details should be made. They are sufficient, I think, to show that there are atolls which have been in the same habitable state for more than three centuries, and atolls which during the same period have remained in a barren, uninhabitable condition. The living atoll of the Pacific I am inclined to regard as possessing great antiquity. Those which, like Mangaia, Tongatabu and Savage Island, have been upheaved between 60 and 300 feet above the sea, are probably of greater age.

PART II.

THE ORIGIN OF CORAL REEFS.

THE problem of the formation of coral reefs has, perhaps, attracted more general attention than it originally merited from the fact of its having excited the interest and employed the genius of Mr. Darwin. The difficulties, however, that attend their examination have until within the last seventy years prevented any serious attempts to investigate their structure; yet it is very remarkable that the explanation of atolls proposed by Chamisso, the naturalist who accompanied Kotzebue, the Russian navigator, in his voyage to the South Sea in the years 1815-1818,* is the very one towards which all recent observations are tending. The larger and more massive species of corals, as this naturalist states, prefer the surf at the outer edge of the reef; whilst the corals in the interior are hindered in their growth by the accumulation of shell and coral débris. In this manner the outer edge of a submerged reef first approaches the surface, and a ring of land enclosing a lake is subsequently formed from the materials piled up by the waves. Thus the atoll was produced, in the opinion of Chamisso, by the *natural growth of corals and by the action of the waves*. Mr. Darwin himself supported this view of Chamisso, when he remarked that a reef growing on a detached bank would tend to assume an atoll structure. Some atolls in the West Indies had been probably formed, as he says, in this manner; but it was mainly the difficulty of assuming that there could be so many submerged coral banks in the Indian and Pacific Oceans that led him to reject the explanation of Chamisso as generally applicable to oceanic atolls. Mr. Darwin's lack of evidence led him to his theory of subsidence. The researches, however, of more recent years are leading us back to the original explanation of Chamisso, which Mr. Darwin, with our evidence before him, would have in the main accepted.

I will pass over the theory of subsidence, supported though it was by Dana, Couthouy, and Beete Jukes, because the more recent facts concerning the ocean depths and the regions of living and upraised reefs compel us to regard it as no longer necessary, and I will pass to the consideration of the views advanced since the year 1850. In 1851 Professor Louis Agassiz, in his Report to the Superintendent of the

* *Kotzebue's Voyage, 1815-18, vol. iii. p. 331. London, 1821.*

American Coast Survey, re-echoed the opinion of Chamisso in the instance of the reefs of Florida. All the modifications which these reefs presented were in his estimation "the natural consequence of the growth of reef-building corals."* In the year 1856, Professor Joseph Le Conte, after an examination some years before of the same reef-region of Florida, advanced a view, in a paper read before the American Association, which was simply Chamisso's explanation of atolls applied to barrier-reefs. Since corals, as he stated, will not grow on muddy shores or in water upon the bottom of which sediment is collected, the favourable conditions can only be found at some distance from the shore, where, "limited on one side by the muddiness and on the other by the depth of the water," a barrier-reef would ultimately be formed.†

After a long investigation of the reefs of the Pelew Islands, Professor Karl Semper published in 1863 the results of his researches.‡ Additional notes were appended to his original paper from time to time, by which his observations were brought into accordance with the results of the deep-sea explorations of the *Challenger* expedition, and with the facts brought to light by Agassiz, Pourtales, and others, in the Florida seas; and in 1881 the whole of his views on coral reefs were included in his interesting work entitled *The Natural Conditions of Existence as they affect Animal Life* (vol. xxxi. *Internat. Scient. Ser.*). This naturalist attributed the formation of the different classes of reefs to the following causes:—the strength and direction of the constant currents, the repressive influence of sand and sediment in the interior, the tidal scour, and the boring action of plants and animals. He showed that, wherever strong currents impinging on a reef run parallel with the coast, the corals grow perpendicularly, and the reef has an abrupt and perpendicular fall along the line of the current, but that, in eddies and places where the current is weak, the corals grow irregularly in all directions. The growth of an atoll, as he pointed out, is well illustrated in the growth of a large mass of porites, which while below the surface possesses a rounded summit, but when exposed at low tide becomes arrested in its upward growth and obtains a flat top. Whilst growing at its margin, where it is exposed to the tidal currents, its centre dies from the accumulation of sand; and in course of time the action of boring-molluscs, echinoderms and sponges, and the scour of

* *Bull. Mus. Compar. Zool.*, vol. i. p. 363.

† *Amer. Journ. of Science*, 2nd series, vol. xxiii. p. 46.

‡ *Zeitschr. Wissen. Zool.*, vol. xiii. p. 563.

the waves, hollow out a basin surrounded by a margin of living coral. In this manner a miniature atoll is produced.

In 1870 Dr. Rein appeared in the field as a supporter of the view that the forms of reefs are due to the natural growth of corals. The Bermudas he regarded merely as portions of a large atoll crowning a submarine bank.*

In 1880 Mr. John Murray published his theory of the origin of coral reefs.† Though placed in direct antagonism to the accepted theory of subsidence, it was in no way a change of front, if we view it in the light of the researches made within the previous thirty years. The new view, in supplying a foundation for atolls without the aid of a sinking movement, filled up the great gap in the original explanation of Chamisso, a point of weakness, which, it will be remembered, led Mr. Darwin to his theory of subsidence. It had been previously shown by Agassiz and Pourtales, in 1871, that on the surface of the Pourtales Plateau in the Florida Seas, at a depth of from 100 to 250 fathoms, there was a great abundance of deep-sea corals and other organisms by which a modern coral limestone was being formed.‡ Mr. Murray, with all the facts of the explorations of the *Challenger* at his disposal, showed that in tropical seas submerged banks and plateaux are continually in process of formation, by the rapid accumulation of the shells, skeletons, and other hard parts of the organisms that flourish in great numbers and variety on their summits. Submarine volcanic peaks could in this manner be levelled up to the zone in which the ordinary reef-corals thrive, and ultimately the coral atoll would appear at the surface. This I hold to be the important feature of Mr. Murray's theory, and for these two reasons. It filled up the great gap in that explanation of the origin of coral reefs, which ascribed their forms to their mode of growth. It has been remarkably confirmed by more recent researches and discoveries in the Florida Seas and in the Western Pacific. The forms of reefs Mr. Murray ascribed to well-known physical causes, concerning which later observers only differ as to the importance they would attach to each particular agency. Atolls, he says, owe their form to the more abundant supply of food to the outer margins and to the removal of dead coral rock from the interior portions by currents and by the dissolving action of the carbonic acid of the sea-water. Barrier-reefs have built out from the shore on a foundation of volcanic débris, or on a talus of coral

* *Bericht Senckenberg, Naturforsch. Gesellsch.*, 1869-70, p. 157.

† *Proc. Roy. Soc. Edin.*, 1879-80.

‡ *Illustr. Catal. Mus. Compar. Zool.*, 1871.

blocks and reef débris, and the lagoon channel is formed in the same way as the lagoon of an atoll. This is but a more precise and more scientific statement of the natural growth of reefs. Whilst Professor Semper relies more on the agencies of impinging currents, tidal scour, deposition of sediment, and the degradation of reefs by the numberless organisms that infest each block of coral, Mr. Murray depends more on the agency of solution, and on the distribution of the food-supply. Those accustomed to balance evidence will be inclined to consider that the more probable explanation of the forms of reefs will be found in the association of the several agencies included in the explanations of these two naturalists.

In November, 1882, Professor Alexander Agassiz published an important memoir on the Tortugas and the Florida reefs.* According to the American investigator, the atolls and barrier-reefs of the Florida Seas owe their form to the action of the breakers and currents, to the repressive influence of sediment, and to the habits of the corals. This opinion was the independent result of a line of investigation very similar to that which led Mr. Murray to his particular views. After alluding to the circumstance that the elder Agassiz had made no attempt to explain the substructure upon which the Florida reefs were based, this eminent naturalist proceeds to point out how the bottom is prepared and gradually raised to the levels in which reef-corals flourish by the accumulation of the stolid parts of the numberless organisms that have lived and died upon it. On account of the increased supply of food brought by the Atlantic Equatorial current and by the Gulf Stream to the animals living on the sea-bottom in the Gulf of Mexico and in the Caribbean Sea, the deposits arising from the accumulations of the remains of molluscs, echinoderms, alcyonarians, deep-sea corals, crustacea, &c., have been mainly heaped up in the track of these great oceanic currents. There they have built up the great submarine plateaux, known as the Florida, Yucatan, and San Pedro Banks, on the surface of which the abundance of animal life is stated to be beyond our conception. A modern limestone, of which large portions were brought up in the dredge, is thus rapidly forming on these banks, which are in this manner being gradually raised to the level at which reef-corals flourish. In Yucatan, caverns penetrate this modern limestone, underlying the coral reefs to a depth of over 400 feet.

* *Mem. Amer. Acad. Arts and Sciences.*

By this line of investigation, Professor Agassiz arrived at the conclusion that the coral reefs of these seas owe their form to agencies acting at and near the surface. The baneful action of sediment seemed to be amongst the more powerful of these agencies in determining the forms of reefs. The barrier-reefs are explained much in the way that Le Conte previously explained them. The corals, unable to live in the muddy waters and on the muddy surface of the Florida Bank, flourish in the clearer water of the steeper slopes beyond. Atolls owe their form to the action of the breakers and the currents, which, by driving the silt to leeward, cause the repression of the growth of coral except at the margins of the reef.

We are now in a position to regard in one comprehensive view the explanations of Semper, Murray, and Agassiz concerning the forms of reefs. Though prominence is given by each of these three naturalists to particular agencies,—Semper dwelling on the currents and the tidal scour; Murray, on solution and the distribution of the food supply; Agassiz, on the repressive influence of the sediment and the action of the breakers,—these differences arise from the circumstance of the problem being viewed and attacked from different stand-points. We cannot doubt that we have in the views of these three observers an enumeration of the principal agencies that determine the forms of coral reefs. On the outer edge of the reef we have the directing influence of currents, the increased food-supply, and the action of the breakers. In the interior of the reef there are the repressive influence of sediment, the degradation of the dead coral by numerous boring organisms, the solution of the dead coral by the carbonic acid in the seawater, and, lastly, the tidal scour. Few of those who have been engaged for any time in the examination of coral reefs can have any doubt as to the reality of these several agencies; the only difference of opinion will be as to the relative importance they ascribe to each. These are the lines along which future observers will direct their researches. They are those, in fact, which have been followed in the more recent observations published since 1882.

In a paper on the Recent Calcareous Formations of the Solomon Islands, which was published in the transactions of the Edinburgh Royal Society for 1885, I described my discoveries amongst the upraised coral reefs of this region. Here I found, as terrestrial formations, underlying the ancient reefs, the volcanic muds, the coral muds, the pteropod and globigerina oozes, and the deep-sea clays of the *Challenger* Expedition, deposits that were originally formed in depths

varying from 100 to 2,000 fathoms. In more than one upraised atoll, denudation had also exposed to view the original volcanic peak, thus corroborating in a remarkable manner the theory of Mr. Murray, that submerged volcanic peaks are levelled up to the zone of reef-corals by the accumulation upon them of organic deposits, and that these deposits are finally crowned by the atoll.

In another paper on the living Coral Reefs of this region, which was published in the Proceedings of the same society for 1886, I removed the chief objection against Mr. Murray's views, one which gave powerful support to Mr. Darwin's theory, namely, the awkward fact, as it was then believed to be, that lagoons and lagoon-channels are sometimes deeper than the zone in which reef-corals thrive. This belief was shown to be founded on a misconception of the conditions that limit the downward extension of this zone. Observers in different regions have variously estimated its depth between five and thirty and even forty fathoms. This great variation is due to differences in the local conditions, not only in different localities, but, as I found in the Solomon Islands, in the same locality. The main determining condition of the depths of reef-corals in all regions is to be found (as Professor A. Agassiz has also shown) in the injurious effect of sand and sediment rather than in the general influence of depth, the distribution of these materials being dependent on such local conditions as the angle of the submarine slope, the presence and situation of submarine declivities, the amount of sediment held in suspension, the force of the breakers, and other influences. Local conditions will usually restrict the reef-coral zone to depths less than twenty fathoms; but where there are a moderate submarine slope, clear water, and breakers of no great size, reef-corals may be found flourishing in depths of fifty and even sixty fathoms.

In the same paper I also referred to the conditions described by me as the determining causes of a barrier-reef. Where there is a rapid submarine slope,—for instance, more than 10 degrees,—the sand and gravel produced by the action of the breakers on the outer edge of the shore-reef will extend to depths far beyond those in which reef-corals thrive; but let the slope be small, say 1 or 2 degrees, the lower margin of the belt of sand and débris will then lie within the zone of reef-building corals, and in consequence a line of barrier-reef will ultimately be formed with a deep channel inside. This explanation I afterwards found to be precisely the same as that advanced by Professor Le Conte thirty years before in the instance of the Florida reefs, a view which I have pre-

viously shown to be but an adaptation of Chamisso's explanation of the growth of an atoll to the origin of barrier-reefs. A very gradual submarine slope and the presence of sediment in suspension in the shore waters are the determining causes of the lagoon-channel; the agencies of solution, diminished food-supply, organic degradation, and tidal scour, being, as I think, auxiliary causes which come into play after the reef has begun to grow at that distance from the shore where the suitable conditions for reef-growth exist.

A circumstance, hitherto not satisfactorily explained, is to be found in the usual apparent position of a barrier-reef at the margin of a submarine plateau, beyond which the slopes descend rapidly to great depths. I have employed the epithet "apparent" because I do not desire to commence my line of argument by assuming the point at issue. Let us examine for a moment the submarine profile of coasts bounded by barrier-reefs. I will first take the east end of the large island of Bougainville, in the Solomon Group, a locality with which I am personally acquainted. Its submarine profile is that of a submarine ledge, 15 miles in width, and possessing a scarcely recognisable slope represented by a total drop of about 300 feet, or at the rate of 20 feet per mile: at its edge lies a barrier-reef; and beyond, the slope descends very rapidly to the 100-fathom line at angles varying between 15 and 25 degrees. Take the barrier-reef of Tahiti, distant about a mile from the shore and with a depth of on the average 20 fathoms inside it, which gives the ledge, at the margin of which the reef lies, a gentle slope of somewhat over a degree. Beyond the reef, the submarine slope for the first 250 yards descends at an angle of 15 or 16 degrees to depths of from 30 to 40 fathoms; during the next 100 yards the slope is very steep, and sometimes exceeds 45 degrees; between 350 and 500 yards from the reef, the slope has an angle of about 30 degrees. Beyond this distance the angle of slope decreases, until at about a mile from the reef the angle is 6 degrees and the depth 590 fathoms. Such are the results of the soundings made by Mr. Murray and Lieutenant Swire off the Tahiti barrier-reef. I come now to the line of barrier-reef lying at a distance of between 20 and 30 miles off the north-west coast of Viti Levu, Fiji. The broad ledge, at the border of which the reef lies, has an average drop only of from 10 to 15 feet in the mile; it is, therefore, for all practical purposes, a level surface. Outside the reef, however, judging from the soundings hitherto made in this locality, the submarine slope descends to depths of between 300 and 400 fathoms at an angle of about 25 degrees, and the average

angle from the 100-fathom line to a sounding of 1,200 fathoms is about 15 degrees.

I have taken the foregoing examples because they illustrate the various kinds of barrier-reefs surrounding large islands. The instances of New Caledonia and of Florida might have been similarly cited. I have, however, gone far enough to show that barrier-reefs have, as a general rule, the appearance of being situated at the edge of a submarine ledge or plateau. There are two different explanations of this apparent position of barrier-reefs that readily present themselves to the mind.

The first is that of subsidence, which Mr. Darwin offers in his theory, the shore-reef by such a movement becoming a barrier-reef separated by a deep channel from the coast. In the instances before cited of the great Fiji barrier-reef and of the reef of Bougainville Island in the Solomon Group, this explanation, however, is at once negatived, because these localities are situated in regions of upheaval, where coral reefs and their foundations have been lifted in recent times to heights of several hundred feet above the sea.

The second explanation is that advanced by Mr. Murray in his new theory. By him this plateau-like appearance is attributed to the seaward growth of a barrier-reef on its own talus, whilst the lagoon-channel is being formed by the decay and solution of the coral. Though well convinced of the fact of the seaward growth of reefs, and of the important influence of solution, I scarcely consider the outward growth to be sufficiently rapid, or the effect of solution to be sufficiently great, to explain the situations of such distant barrier-reefs as those fronting the east coast of Australia and the north side of Viti Levu in Fiji. Both Darwin and Murray would associate the formation of the so-called submarine ledge, from the margin of which a barrier-reef appears to rise, with the history of the reef. The question now arises whether the position of a barrier-reef at the edge of a submarine plateau is apparent or real; or, in other words, whether there was a submarine ledge before the coral reefs began their growth.

To this question I expected no answer; but, after examining the submarine profile of the east border of Australia, from Cape York to Cape Howe, I obtained a very unexpected reply. There at once opened up before my imagination a new road towards the solution of this problem; and I think when I have pointed out this new method of investigation, which consists in comparing the profile of a coast outside the region of coral reefs with that of the continuation of the same coast

where it is fronted by barrier-reefs, it will be seen that my hopes will not altogether be disappointed.

Let us consider the characters of the submarine profile of the east border of Australia from Cape Howe to Torres Straits. The northern half of this coast, from the vicinity of Sandy Cape northward to Torres Straits, lies within the region of coral reefs, limited here roughly by the tropical circle, and is fronted by the great Australian barrier-reef. The southern half, between Sandy Cape and Cape Howe, lies outside the coral-reef region and is bare of reefs; but there exists a characteristic submarine ledge stretching southward all along the coast from Sandy Cape. This ledge is well defined by the 100-fathom line; its width usually varies between 18 and 25 miles, but it attains double this breadth as we approach Sandy Cape. Its slope, represented usually by a fall of from 20 to 30 feet in a mile, has an angle of only a small fraction of a degree. Beyond this ledge, judging from the soundings off Wide Bay, Low Bluff, and Cape Byron, the average angle of descent to depths between 2,000 and 2,500 fathoms varies between 7 degrees and 14 degrees. Here, then, we have an undoubted submarine ledge on that portion of the Australian coast which lies outside the region of coral reefs, or, in other words, outside the tropical circle, the limit in this locality of the growth of reef-corals.

Let us now examine the submarine profile of the region fronted by barrier-reefs which extends from near Sandy Cape to Cape York. The presumption is, unless by some singular coincidence the submarine ledge terminates where the barrier-reef begins, that this ledge or plateau originally extended along the remainder of the east border of Australia northward to Torres Straits. We should naturally expect, therefore, that there would be a great difference in contour between the northern part of the ledge, which has been incrustated for unknown ages with the growing mass of the great barrier-reef, and the southern part of the ledge, which, being outside the area in which reef-corals live, is destitute of reefs; and such we find to be the case. From Sandy Cape northward to Flinders Passage, a distance of about 500 miles, the 100-fathom line extends to distances varying between 60 and 120 miles from the coast; but we have to proceed between 30 and 40 miles beyond, and to a depth of about 250 fathoms, before we can define the submarine plateau of this part of the Australian coast. The contour presents a great contrast to that of the submarine ledge south of Sandy Cape, which has a breadth of from 18 to 25 miles, and is sharply limited by the 100-fathom line. North of Flinders Passage the 100-

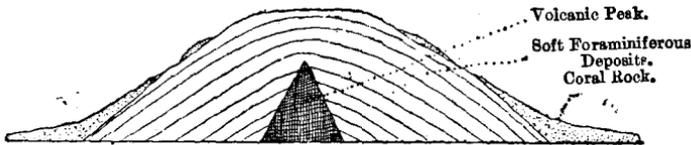
fathom line lies usually between 25 and 30 miles off the coast; and beyond this, there seems to be a gradual descent to deeper water, but the plateau is not sharply defined, and the submarine contour is very different from that of the ledge, bare of reefs, south of Sandy Cape.

To what conclusion do these facts tend? If we believe that the sharply-defined submarine ledge, characterising the southern half of the east coast of Australia, also exists in the northern half, but covered and concealed by the Great Barrier-reef, then the differences between the submarine profiles of the part north and the part south of Sandy Cape are mainly to be attributed to the existence of the Great Barrier-reef. Unless we can explain the reason why this ledge should end where the barrier-reef begins, the presumption arises that this submarine ledge, destitute of coral reefs for a distance of some 900 miles between Sandy Cape and Cape Howe, is extended along the remainder of the now coral-girt Australian coast. Here, then, we seem to be within a measurable distance of ascertaining the thickness and bulk of the Great Australian Barrier-reef. We assume the existence of an underlying ledge or plateau. We now require the nautical surveyor to supply us with a few lines of close soundings to the deep water in order to enable us to determine the angle of the submarine slope. After these data have been obtained, it will be possible to model the outline of the coast before the existence of the barrier-reef. I should here remark that the manner in which the Great Australian Barrier-reef has altered the submarine profile of the coast is well shown in Mr. Murray's coloured chart of the depths of the ocean, which accompanies his paper in the *Scottish Geographical Magazine* for last January.

I have now gone far enough to establish the probability, judging from the instance of the Australian Barrier-reef, that reefs of this class are in reality, and not in appearance, situated on the border of a submarine plateau or ledge. Such a position, according to the explanation of barrier-reefs, first advanced by Le Conte, and supported by myself, presents the most favourable conditions for reef-growth, the corals being limited on the outside by the depth, and on the inside by the sediment in the water. The influences of food-supply and currents act subsequently as auxiliary causes.

What, then, is the explanation of the submarine ledge? The supposition that it is a continuation of the land slope is at once negatived by the fact that the slope of the land in the reef-encircled islands of the Pacific is usually 6 degrees or 7 degrees, sometimes only 3 degrees or 4 degrees, but often

as much as 10 degrees or 12 degrees, whilst the submarine ledge, when stripped of reefs and defined by the 100-fathom line, would possess a scarcely recognisable inclination, represented by a fraction of a degree. It will be found, however, when we examine the contour of such an island as Vanikoro, that the distance of the barrier-reef from the coast may vary according to the slope of the land. Thus, on the west side of this island, the average angle of the land slope is 6 degrees, and the distance of the barrier-reef about $2\frac{1}{2}$ miles. On the north side the inclination of the land is between 11 degrees and 12 degrees, and the barrier-reef is rather over a mile distant. This is just what we should expect. The more gradual the land-slope, the broader will be the submarine ledge, cut out in the course of ages by the action of the sea, and the more distant will be the barrier-reef that has grown up along its margin. This I believe to be the true explanation of the position of barrier-reefs. A submarine ledge is in the first place necessary; and, since the sediment and mud in the shallower waters on the ledge repress the growth of corals, reefs will naturally spring up towards the margin of the ledge, where the water is clearer and where the depth is within that of the reef-coral zone.



IDEAL SECTION OF AN ISLAND IN THE SOLOMON GROUP.

These ledges are sometimes of great antiquity. From the surface of the plateau inside the barrier-reef of Bougainville Island there rise up extinct volcanic cones, forming separate islands, a few hundred feet in height. Here lies also the large island of Fauro, composed of old volcanic formations. We notice the same in the instance of the great plateau inside the barrier-reef on the north side of the Fiji Group. A line of volcanic islands, varying between 700 and 1,800 feet in height, rises from the interior waters of the plateau.

It should be remarked, in conclusion, that this explanation of the situation of barrier-reefs at the margins of submarine ledges is by no means a novel one. It was suggested in 1831, by Messrs. Tyerman and Bennett, in the case of the reefs of the Society Islands.*

* *Voyage and Travels*, vol. i. p. 215.

The PRESIDENT, Sir GEORGE GABRIEL STOKES, Bart., D.C.L., P.R.S., in the chair:—I am sure all will agree in according a vote of thanks to Dr. Guppy for his paper (applause). I will now ask those present who have made the subject their study to give the meeting the advantage of their views.

Captain W. J. L. WHARTON, R.N., F.R.S., Hydrographer to the Admiralty.—It has afforded me great pleasure to hear Dr. Guppy's most excellent paper. In it he has given us a very good abstract of the condition of affairs as regards our knowledge of coral reefs and their growth. It is rather presumptuous in me to offer an opinion, because I do not pretend to a mastery of the different branches of scientific knowledge which are requisite adequately to deal with the question of coral growth, but I have taken great interest in it, and have seen a great deal of coral reef in my time, and have formed my own ideas as to their formation. Speaking generally, I agree with Dr. Guppy, although on one point towards the end of his paper—to which I shall refer presently—I do not quite concur with him. In the early part of his paper he mentions the question of the growth of coral. A fact has recently come to my knowledge,—at least I believe it to be a fact,—and that is that at the Keeling islands, which Mr. Darwin examined, a part of the rim of the reef, which was submerged at the time the survey was made, is now above water. The depth of water over it in 1831 was eighteen feet. I have this information from a gentleman who knows the island, and who has lived there all his life,—Mr. Ross. I have written out to him to ask his opinion as to what has been the cause of this,—whether it is a growth of the coral reef itself or an upheaval; and, until we get that definite information, perhaps my observations may seem rather premature, because we cannot deduce much from what we are not quite sure of. Dr. Guppy mentioned the antiquity of coral reefs. There is one experience of my own which impressed me more than anything else with the great antiquity, not only of these reefs, but of the world in general, and that was an examination of the island of Aldabra, in the Indian Ocean. This is an upraised atoll about twenty feet high, which, from the steepness of the submarine slope outside, could never have been much larger, though it has been worn away on the outside by the action of the sea for some 150 or 200 yards, and is being slowly but surely disintegrated on the inside by the action of the mangroves which grow in the lagoon. In this small island there still exist gigantic tortoises of a species very distinct from those in other islands of the Indian Ocean. To form

this distinct species must have required thousands of years, and this is a strong proof of the antiquity of coral reefs, and of the amount of time needed to wear away coral rock. On the question of barrier-reefs, especially the barrier-reef of Australia which Dr. Guppy has mentioned, I must demur to his supposition that that ledge will necessarily extend the whole length of the Australian coast. I think it would be much more extraordinary if, for a distance of over 2,000 miles, there was the same width of ledge the whole way, than that at a certain point the ledge should widen out. As Dr. Guppy truly remarks, different effects might be produced by breaker action and also by the slope of the land on which the breakers impinge, and where you get either a varying nature of the rock or a varying nature of the sea. Down on the southern part of the coast, the sea is very much heavier,—there is there a tremendous sea; but on the other part of the coast you only get the trade wind, which blows parallel to the coast, so that one can, to a certain extent, imagine that the bank here on the southern portion of this part of coast should be wider; the ledge on the north would be narrower in consequence of the comparative smoothness of the sea, unless the rock on the coast is softer. I did not quite follow the author's argument of the growth of coral reefs in reference to his theory that the reef started on the edge and did not grow out from the land. I do not see that that would make the ledge wider above than it is farther down. There is another point; but the author is, probably, not in a position to be aware of it, because soundings have only recently been taken. He mentions that soundings are wanted. They were obtained only a few months ago, and have not been published yet, though I have had access to them. We got soundings out from the coast, showing that the slope is very gradual, and that the reef is not actually at the edge, but begins where the depth becomes about thirty fathoms. It approaches the land very closely to the north, and the reef is one narrow line, comparatively close to the shore, and the ledge is about the same width as it is down at the south of Australia.

Mr. JOHN MURRAY (of the *Challenger* Expedition).—I have listened with pleasure to this excellent paper, which suggests many questions, and, while with some of Dr. Guppy's contentions I agree, there are others with which I disagree to some extent. Perhaps one gets the best conception of what one has written when one hears it discussed by other people. The author has pointed out to-night, what he thinks a most important point, a matter which,

for my part, I never thought important at all, that is, with regard to the formation of submerged reefs up to the level of the sea. That has been so amply proved that it does not appear to me to be important. It has always appeared to me that there are two fundamental things in the growth of coral reefs which must take precedence of all others, first that corals grow most abundantly and luxuriously wherever they get most food. I think that might almost apply to the human populations as well as to coral formations. Wherever there is abundance of food and other favourable conditions, coral reefs will most be found. Then, again, whenever life loses its hold of the coral structure which has been built up by the coral animals, whenever death ensues, inorganic changes commence their operations. It matters not whether this is assisted by creatures that bore into the solid structure, or whether it is due to the inorganic action of the sea. I think that by these general principles you can generally explain almost all the appearances that coral reefs present. However, there are a great many varieties and a great many differences due to locality. Temperature and the kind of food are two of the most important. For instance, you never find coral reefs except in those places where you have pure ocean currents. They are either found in mid-ocean, or off those continents or islands where the pure water is driven in upon the shores. The reason, of course, is the abundant supply of food that comes from the open ocean, driven by the trade winds. As to the question of barrier-reefs, when I read my original paper on that subject, it never occurred to me to guard what I said with respect to shallow and deep water. Whether it is that I had been accustomed to talk of deep water, I do not know; but I always considered that anything under 100 fathoms was shallow water. My view is that banks are formed at the lower limit of breaker action, but that the depth varies very greatly. Take, for instance, our own coast. Off the north end of the Butt of Lewis, where you have the whole extent of the Atlantic Ocean sweeping against the north of the Butt, you find that the sea is in motion down to 150 fathoms. The great waves that come across the Atlantic wash upon the shore, and you have moving sand and mud; but, if you go to the north-east, where there is less extent of ocean and less depth, there the depth at which sediment commences to form gets less and less. I think the author is quite right about the large extension of the bank out towards New Caledonia. For instance, we know, as I have pointed out in a recent paper, that we have a very large area

of land between the coast line and 100 fathoms, very much greater than between that depth and 500 fathoms. That, in part, may be due to wave action, and in part due to the bank being sunk down, as in the case of Newfoundland. These shores may have been extended by breaker action. There are so many subjects raised, that, had I the time, I could say a great deal more.

Mr. W. H. HUDLESTON, F.R.S. &c.—Those who have spoken are very well acquainted with corals, and have been in those mighty oceans where corals grow. I am unable to speak with a similar advantage; but, at the same time, I think there are many points in Dr. Guppy's paper, which we have heard to-night, and also in his book, which I have read with very great interest, which have an important bearing on geological questions. So far as I can see, one of the great objections to the Darwinian or subsidence theory, is the very great thickness of coral which was supposed to be now forming in the Pacific and Indian Oceans. I believe that something like 2,000 feet of massive coral-rock is supposed to be the thickness in some places. In the old geological formations there is nothing of that kind to be seen. We know nothing of great thicknesses of that sort, and, according to geological calculation, the coral masses which are upon the Solomon Islands, and perhaps on others similarly situated, instead of being solid accretions of coral-rock, 1,000 or 2,000 feet in thickness, as has been hitherto supposed, are simply a veneer or facing of coral, perhaps 200 feet thick, upon the upraised oceanic muds and volcanic materials which really constitute the bulk of such islands. That seems to be very much more in accordance with what took place in former days in the various formations of the earth's crust. I am afraid that in some cases geologists have exhibited a certain amount of unwillingness in accepting these corrections. It may be that Darwin, Dana, and other high authorities have not accepted the views now propounded, and indeed they are not bound to yield to every change of theory; but so far as I can see—and I have thought so for a long time—Mr. Murray's views, subject to modification, are gaining ground slowly but surely, and those views, adopted as they have been by many practical men of great experience, and ably illustrated as they have been by Mr. Guppy in his writings, and in what he has said this evening, demand attention in the most conservative centres of scientific thought.

Captain FRANCIS PETRIE, F.G.S. (Hon. Secretary).—Some MS. communications have been received in regard to this paper.

The first is from Professor JAMES GEIKIE, F.R.S., of Edinburgh University, who writes:—

“Dear Sir,

“I regret my inability to attend the meeting of the Institute on Monday. I have read Dr. Guppy’s paper with the greatest interest, and am of opinion that he has made out a very strong case, indeed against the theory of coral island formation advanced by Darwin. When Mr. Murray published his antagonistic views in 1880, I felt that the whole question of the origin of reefs was opened up again, and that one could no longer accept Mr. Darwin’s theory without some considerable modifications. I consider that Dr. Guppy’s researches have removed many of the difficulties in the way of accepting the views advocated by Murray, Agassiz, and others; and that the famous Darwinian theory of coral reefs can no longer be said to hold the field. But, although the theory so ably supported and illustrated by Dr. Guppy seems most likely ere long to be generally accepted, it does not, I think, forbid the probability that some coral reefs may have originated in the manner suggested by Darwin.”

The second is from Mr. ROBERT IRVINE, who writes:—

“I am sorry I cannot attend the Victoria Institute meeting, and that the time at my disposal is too limited to prepare any comments upon the paper, other than that I think it places the facts in connection with this interesting subject in a very clear light; and the deductions the author draws seem to me reasonable as accounting for the interesting calcareous formations known as coral reefs. I presume you have seen my letter in *Nature*, of March 15th, on this subject.”

The third is from Mr. S. R. PATTISON, F.G.S., who writes:—

“Had the late Mr. Darwin possessed the advantage of considering the discoveries made, and the careful collation of facts observed by Dr. Guppy, and of perusing the able digest of previous publications on the subject which he has now put forward, I feel convinced that the great naturalist would have accepted the explanation of the phenomena now formulated, and would have given up his ingenious theory of gradual elevations and subsidences of the sea bottom. Observation has now shown, that there is simply no occasion for Mr. Darwin’s or any other theory in the case. The facts should, coupled with our knowledge of the power of sea-water to

dissolve carbonate of lime, explain themselves. We can see *vera causa* of the phenomena, and it would be unphilosophical to search further. This, however, does not relate to the elevatory movement from beneath, which has, in so many instances, raised the coral banks into islands, and even into cliffs and hills. This movement is not connected with the peculiar forms of atolls and reefs. I presume that the celebrated hypothesis of Mr. Darwin, first given to the world in 1837, and often repeated since, must be considered to be abandoned."

Permit me, in conclusion, to refer to a paper "On the Tidal Currents of the Ocean," read by Mr. J. Y. Buchanan, M.A., F.R.S.E., before the Royal Society last month, in which I find some concluding remarks, which have a certain bearing upon the subject before us this evening. He says:—

"These currents, in sweeping clean the rocky eminences at the bottom of the ocean, prepare a lodging place for deep-sea corals, and bring food to them when settled, thus enabling them to build up their pillar-like banks, a very fine example of which was discovered and surveyed by the *Dacia* on the 12th October, 1883. It lies in lat. $34^{\circ} 57' N.$, long. $13^{\circ} 57' W.$, and the shoalest sounding was 435 fathoms. The surface of the bank was locally very rough, and sloped gradually to the edge in about 550 fathoms, when it terminated in an actual precipice, dropping to 835 fathoms in one place. The coral on this bank was living and growing in the greatest luxuriance, and many specimens which were brought up showed that the living corals were growing on a mass of dead ones. There can, therefore, be little doubt that in this case we have a submarine bank which is in vigorous growth towards the surface, and which has been in existence long enough to have risen through a height of about 300 fathoms, or 1,800 feet. I have little doubt that, in a large number of the coral islands of the Pacific, the intermediate platform between the tropical reef-building coral and the volcanic peak, plateau, and ridge, which most probably form the foundation, is formed by these deep-sea corals, largely assisted by annelids, especially serpulæ, which secrete calcareous tubes. The tidal currents assist their growth both by bringing the animals nourishment, and by removing light débris which might choke them."

Dr. GUPPY, in reply, said:—To begin at the end, that is, in reference to the remarks of Mr. Buchanan, I would say that he, to some extent, removes one of the objections against Mr. Murray's views, and that is, that it was difficult to imagine that so many volcanic peaks could be raised up to the surface of the sea or near the surface to form the foundation for the coral. Of course, in the neighbourhood of big groups of islands like the Solomon Islands, you have an immense amount of débris washed down from the reef,

and that sediment is carried for 20 or 30 or 100 miles and would tend to form the reef. In the atolls in the middle of the ocean, and not in the vicinity of large groups of volcanic islands, at a distance of 500 or 1,000 miles, it is difficult to imagine how the sediment would be sufficiently raised to build these volcanic peaks up to the surface. Being some distance away from the large islands there is no débris brought down to cover the peak. In that way Mr. Buchanan's idea is that in the open sea the place of this sediment would be taken by the deep-sea corals. With regard to Captain Wharton's remarks, I must allow his correction as regards the width not being greater at the northern portion of the east coast than a little lower down, but it seems strange that this should increase and widen where the barrier-reef begins. Then, as regards the cause of the ledge widening out, this is produced by the barrier-reef gradually going on. According to Mr. Murray's idea, the reef would form on the edge of the ledge and would advance on the edge of the ledge seawards, so that the excess of this ledge over the lower part would represent the outer growth of the reef. I wanted to make a remark about the manner in which Mr. Darwin formed his original view of coral reefs. It was simply, no doubt, because he had at his disposal no evidence,—in fact, there is not a single possible explanation of the origin of coral reefs that is not in his book. His views on the subject are all objected to because he had not the evidence necessary to support them. The starting-point of Mr. Murray's view, the covering of these volcanic peaks and the lifting up of sediment, was simply objected to because there was then no evidence in regard to it. With reference to what Mr. Hudleston has said about the thickness of coral reefs, that I looked upon as the principal point of the discovery in the Solomon Islands. According to Mr. Darwin's theory, if this coral rock were formed by the sinking of the sea bottom, you would have a tremendous thickness in a certain time, 2,000 or 3,000 feet; but, if they were not caused by this sinking, but were caused by the other theory, you would only have a thickness of coral reef of not more than 200 feet, so that it is quite incompatible with any movement of the sinking of the sea bottom.

The meeting was then adjourned.

REMARKS ON THE FOREGOING PAPER.

By Mr. G. C. BOURNE, M.A., F.L.S.

Dr. Guppy may fairly claim to be one of the greatest authorities on the subject of coral reefs, and I am somewhat shy of venturing to criticise his paper.

His account of Pacific myths as bearing on the origin of atolls is most interesting, but personally I am not inclined to attach much value to them as giving evidence of the upheaval of these islands. The Malays of N. Celebes, for instance, have wonderful legends relating to the formation of nearly every hill and island in or adjoining to their country, and very few of them can give any insight into the formation of those hills and islands. It must not be forgotten that an island would appear to a party of savages in a sense to rise out of the waters as they approached it, and each newly-discovered island would thus be readily described as rising out of the sea; the legendary stories would subsequently group themselves round the names of the first colonisers of the newly-discovered island.

I agree cordially with Dr. Guppy in thinking that the vast majority of atolls and barrier-reefs have remained in their present condition for upwards of three centuries. As to the extremely slow rate of coral growth, the evidence, which I have carefully considered, is very conflicting. All that can be certainly said is, that some species of coral grow far more rapidly than others, and that identical species vary very much in their rate of growth according as the conditions to which they are exposed are favourable or the reverse. Dr. Guppy, apparently quoting Mr. Darwin, says that the coral knolls of Digo Garcia have remained stationary for upwards of eighty years. This is hardly the case. I have most carefully compared the chart made by H.M.S. *Rambler* in 1885 with that made by Captain Moresby in 1837, and find that the knolls marked in the two charts rarely correspond with one another. Where they do correspond they are sometimes marked with a less depth in the later survey, sometimes with a greater. Some allowance must be made for errors of observation, but the chart of the *Rambler* shows conclusively that the reef westward of middle islet at the entrance of the lagoon has increased very largely since the original survey in 1837, as also has the reef and the number of coral patches eastern-

most of the three channels leading into the lagoon. Speaking generally, the knolls, reefs, and banks within or at the mouths of the lagoon of Digo Garcia appear to have shallowed rather than to have remained stationary, but there are not a few exceptions to this statement. With much that Dr. Guppy says in the latter half of his interesting paper, I agree very heartily. In particular I am pleased to see that he admits the co-operation of several agencies, viz., currents, food supply, tidal scour, solution, and the action of breakers as necessary for the formation of an atoll or barrier-reef. It is my conviction that a true solution of the problem is only to be found when all these agencies are taken into account. Dr. Guppy's own observations are so good, and his reasoning is so convincing upon this subject, that I must refrain from criticising what I may call the individual part of his paper.

His explanation of the great barrier-reef of Australia is admirable, and there can be no doubt that fresh investigations made on other reefs will yield valuable results, which I hope will confirm his views, and enable us to formulate a general law for this class of structures.

By the Rev. WILLIAM WYATT GILL.

Dr. Guppy, in his interesting paper on "Coral Islands and Savage Myths," quotes a statement made by me several years ago before the Anthropological Society, that "the colonisation of the Hervey Group may not date back beyond five or six centuries," adding, "that the origin of these living and upraised coral islands would, according to this view, be of a very recent date. This is a conclusion, however, which we cannot accept," &c.

I still adhere to my opinion as to the modern colonisation of the Hervey Group. The grounds upon which I base this opinion may be found, not in the legend of Mani, &c., &c., given in my "Myths and Songs," but the long series of historical stories, commemorative songs, and genealogical tables given in my "Historical Sketches of Savage Life,"* published by the New Zealand Government in 1878. No critic of that volume (and there have been many in the southern hemisphere), has attempted to set aside my conclusion.

The question as to "the origin of these living and upraised coral islands" is not to be settled by traditions however interesting, but by the science of geology. I believe them to be several thousands

* W. B. Whittingham & Co., 91, Gracechurch Street, E.C.

of years old. As to the growth of coral, we need a wider basis and a longer period of observation, ere a final solution of our perplexities can be obtained. I have noted in the Pacific that the nearer we get to the equator the more numerous and extensive do these atolls become. The warmer the ocean the more active the coral zoophyte. In Torres Straits, and elsewhere, I have been astonished at the rapid growth of coral. Dr. Guppy's theory, as to the formation of the Australian barrier-reef and other reefs, appears to me to be entirely sound.

I may be permitted to add, that I have read Dr. Guppy's work on the Solomon Islands with the greatest pleasure and profit.

"PRELIMINARY NOTE" ON THE KEELING ATOLL.

By H. B. GUPPY.

After Mr. Guppy had read the foregoing paper before the Institute he left England to explore the Keeling Atoll, known also as the Cocos Islands, and through the courtesy of Messrs. Macmillan, the proprietors of *Nature*, the Institute is enabled to insert his "preliminary note" to Mr. John Murray, thereon:—

During my sojourn of nearly ten weeks in these islands, I was able to make a fairly complete examination of them. Here I can only refer to some of the new features of this atoll which my investigations have disclosed, and must leave the details to be subsequently worked into a general description of the islands. Regarding myself as very fortunate in being able to examine the only atoll visited by Mr. Darwin,—the atoll, in fact, which gave rise to the theory of subsidence,—I at once set about making observations, without reference to any particular view of the origin of coral reefs. I examined all the islands and islets, more than twenty in number, making a separate description of each, and reaped the benefit of the fact that this atoll had been occupied for more than half a century by residents interested in their surroundings. The result has been to convince me that several important characters of these islands escaped the attention of Mr. Darwin, partly owing to his limited stay, partly also due to his necessarily defective information of the past changes in the atoll. The features, in fact, that escaped his notice, throw considerable light on the mode of origin of these lagoon islands, and give no support to the theory of subsidence.

In the first place, I have ascertained that Keeling Atoll consists essentially of a ring of horse-shoe or crescentic islands, inclosing a lagoon, and presenting their convexities seaward. The crescentic form is possessed in varying degrees by different islands; some of the smaller ones are perfect horse-shoe atollons, and inclose a shallow lagoonlet; others, again, exhibit only a semi-crescentic form; whilst the larger islands have been produced by the union of several islands of this shape. The whole land surface, however, is subject to continual change. The extremities of islands are often being gradually swept away or extended. Some islands are breached during heavy gales, others are joined, so that by the repetition of these changes

the island, in the course of time, loses its original form. Hence it is that, although the crescent is the primitive shape of each island, this structure is partly disguised in the case of some of the larger islands by the union of several of smaller size. The Admiralty chart gives but an imperfect idea of the true shape of the islands; but, notwithstanding, its inspection will prove very instructive.

In truth, Keeling Atoll exhibits, in an incomplete manner, the features of the large compound atoll of the Maldivé Group. If it was considerably larger and possessed a less protected lagoon, so that open-sea conditions prevailed in its interior, it would have all the features of a compound Maldivé atoll; that is, an atoll consisting of a circle of small atolls or atollons. In its original condition, however, it was an atoll consisting of a circle of crescentic islands. Such it is essentially now, but extensive changes have often partly disguised this feature.

Before proceeding to explain the origin of the incompleated compound atoll of the Keeling Islands, it will be necessary to dwell on the exaggerated prevailing notion of an atoll. This kind of coral reef is usually described as a circular reef inclosing a deep basin or lagoon; but this description only applies to very small atolls less than a mile across. By drawing a section on a true scale of an atoll of average size, like Keeling Atoll, it will at once become apparent that such a description gives a very misleading idea of the real nature of this class of reef. A section of Keeling Atoll, drawn from the 1,000-fathom line on a true scale of an inch to the mile, and intended to illustrate a breadth of six miles, and a depth in the lagoon of 9 or 10 fathoms, would represent to the naked eye a flat-topped mountain, the depth of the so-called basin on the summit being merely represented by a slight central depression of about $1/100$ of an inch. If the lagoon possessed a depth of 30 fathoms, the inclosed basin so-called would only be indicated in this section by a central depression of about $3/100$ of an inch. So trifling a proportion does the depth of an atoll of ordinary size bear to the breadth, that such a reef can only be accurately described as possessing a broad level surface, with very slightly raised margin. A correct model of Keeling Atoll would at once convey a just idea of the true relative dimensions of a reef of this class. The lagoon would be there only represented by a film of water occupying a slight hollow in the level mountain-top. By thus grasping these facts, we at once perceive that by reason of our failing to view an atoll in relation to its surroundings, and

through our misconceptions of its dimensions, we have been led to introduce a great cause to explain a very small effect. The slightly raised margins can be easily explained by causes dwelt upon by Murray, Agassiz, and others. No movement of the earth's crust is necessary for this purpose. The mode of growth of corals, the action of the waves, and the influence of the currents, afford agencies quite sufficient to produce the slightly raised margins of an atoll.

The development of the islands of an atoll into horse-shoe or crescentic islands, as in the instance of Keeling Atoll, or into perfect small atolls or atollons, as in the Maldive Group, is a subsequent process to be shortly explained. These small atolls and horse-shoe islands only assume their characteristic forms *after the island has been thrown up by the waves*. Such was the conclusion I arrived at concerning small atolls and crescent-shaped coral islands in the Solomon Islands (*Proc. Roy. Soc., Edinburgh, 1885-86, p. 900*); and, as just stated, I have formed the same opinion concerning the islands of Keeling Atoll. There is, in the first place, the island from which "lateral extensions grow out on either side so as to ultimately form a horse-shoe reef," which itself under favourable conditions may develop into a small atoll. In the Solomon Islands I imperfectly grasped the method by which these changes in form are effected. In Keeling Atoll I saw the process in operation, and I arrived at the conclusion that whenever a coral island stems a constant surface-current, the sand produced by the breakers on the outer edge of the reef will mostly be deposited by the current on each side of the island in the form of two literal banks or extensions, giving the island ultimately a horse-shoe form, with the convexity presented against the current. The process may be aptly compared to the formation of a V-shaped ridge of sand when a stake or some other obstacle is placed in a river bed. The stake represents the original small island thrown up by the waves. The V-shaped ridge of sand represents the arms of the horse-shoe island which are subsequently formed. The back-wash or eddy may in the river-bed join the arms of the V-shaped ridge of sand. In a similar manner a horse-shoe island may have a bank thrown up across the mouth, and thus a small atoll is formed. Such is the process, imperfectly disclosed to me in the Solomon Islands, that I found illustrated in all its stages in Keeling Atoll. In the Keeling Islands, however, it was necessary to satisfy myself of the reality of the agencies chiefly concerned in this process. For instance, I had to ascertain how and to what

extent the surface-currents acted, and to discover the source of the sand. It was also necessary to observe what changes in the form and extent of the islands had occurred in the experience of the residents during the half-century of their occupation.

The westerly equatorial drift or south-east trade current, striking the south-east angle of the atoll, there divides and sweeps around the coasts, the two branches meeting and forming an eddy off the north-west island, a spot where drift timbers are often detained and stranded after having been swept around half the circumference of the atoll. Advantage of this current is taken by the proprietor of the islands, who directs his men to mark any logs of valuable timber thrown up on the weather or south-east coast, and then to launch them again outside the breakers. In this way huge logs are transported by the current to any particular island. If left alone, the logs, whether drifted around the north or south side of the atoll, arrive finally in the eddy off the north-west angle. This current finds its way into the lagoon through the several passages between the islands, its rate there varying usually from half a knot to two knots in the hour. Only rarely is there any check to the inflow of water through the passages, as, for instance, during north-west gales.

The current in these passages carries daily a large amount of sand into the lagoon. I discovered this accidentally whilst using the tow-net for catching the pelagic animals brought in by the current. The source of this sand is the weather edge of the reef on the outer side of the islands, where the breakers are unceasingly at work in keeping up the supply. After several measurements under varying conditions of current, tide, and depth, I estimated that during every day of ordinary weather at least 10 tons of sand are carried through the passages into the lagoon. During gales and cyclones this amount is greatly increased; and probably the estimate for an ordinary year would not be less than 5,000 tons. The bulk of this sand is deposited by the current near the inner mouths of the passages and on the margins of the lagoon, where it goes to extend the islands in the form of banks stretching into the lagoon. In this manner an island obtains a horse-shoe shape, just as the V-shaped ridge is formed by placing a stake in a river-bed. The first stage is represented by an island with two sand-banks extending into the lagoon, one from each extremity. The second stage is that in which the island has attained a semi-crescentic shape by the encroachment of its vegetation on the newly-formed banks. In the course of time, when the vegetation of the island has en-

tirely occupied the banks, the third stage, that of the horse-shoe island, is reached. In some instances, there is yet a further stage, when, during a long continuance of westerly winds, another bank is thrown up across the mouth of the horse-shoe, and a small atoll with a shallow lagoonlet is produced. Thus the currents are the principal agencies in forming the horse-shoe islands of Keeling Atoll. In large atolls, where more open-sea conditions prevail in the lagoon, and especially where, as in the Maldives, there are two opposite sets of winds and surface-currents, each prevailing in its own half of the year, we should expect to find the horse-shoe island replaced by an atollon. Keeling Atoll, however, lies for eleven months out of the twelve within the region of the constant trade-wind and westerly drift current, so that the situation is only one favouring the formation of horse-shoe islands facing to the southward and eastward. The protected character of the lagoon, also, is not a condition that would assist the growth of a circular island or atollon.

Another important feature in this atoll is to be found in the existence outside the seaweed edge of the present reef of a series of submerged lines of growing corals separated from each other by sandy intervals. Unfortunately, I was not able to examine these to the extent I desired, since it can only be satisfactorily done later in the year, when the sea is sufficiently smooth to allow boats to approach the breaker edge of the reef. This feature, however, is familiar to the residents, who have supplied me with information on the subject. It would seem that all around the circumference of this atoll there is a space outside the present edge of the reef varying from 200 to 500 or 600 yards in width, where ships have anchored, and where boats in the calm season go with fishing parties. Here the submarine slope slopes gradually down to 20 or 30 fathoms; but beyond this the descent is precipitous. It is on this gradual slope that the lines of growing coral occur, separated by sandy intervals from each other. There may be two or three of these lines, the innermost covered by 4 or 5 fathoms, and the outer by from 20 to 30 fathoms.

We are thus able to perceive that the outward extension of the reef is effected, not so much by the seaward growth of the present edge of the reef, as by the formation outside it of a line of growing corals, which, when it reaches the surface reclaims, so to speak, the space inside it, which is soon filled up with sand and reef *débris*. The evidence, in fact, goes to show that a reef grows seaward rather

by jumps than by a gradual outward growth. This inference is of considerable importance, since it connects all classes of reefs together in the matter of their seaward growth, the degree of inclination of the submarine slope being the chief determining factor.

Following Le Comte, I have previously shown (*Proc. Roy. Soc., Edin.*, 1885-86, p. 884) that where there is a very gradual submarine slope the deposition of sand and the presence of much sediment in the water will prevent the growth of corals in the shallow water outside the seaward edge of the reef, and that in consequence a line of living corals will spring up in the clearer and deeper waters a considerable distance beyond. The appearance of this line of coral at the surface will result in the production of a barrier-reef with a lagoon-channel inside. In a similar manner the submerged line of growing corals immediately outside the weather-edge of the reef of Keeling Atoll would form a barrier-reef, if it was removed some miles from the shore instead of being only about 100 yards distant. As it is now situated, it lies too close to the edge of the present reef to prevent the obliteration of the channel inside it after it has reached the surface. Its lagoon-channel would be very quickly filled with sand and reef-*débris*, and as a result we should merely have a permanent addition to the present reef-flat, which, when the process was complete, would be 100 yards wider. The process is the same as in the case of a barrier-reef, the difference in the result being due to the submerged line of corals being too close to the edge of the reef for the preservation of the interior channel; and this circumstance is due to the fact of the submarine slope being greater than in the case of a coast fronted by a barrier-reef. These remarks are merely intended to be suggestive. They may, perhaps, direct the attention of other observers to the examination of the outer slopes of atolls and to their mode of seaward growth. This can only be done during unusually calm weather.

I have discovered many other new features of minor interest in connexion with Keeling Atoll, to which I will refer in my full description of these islands. The island of North Keeling, lying fifteen miles to the north, is a small atoll connected with Keeling Atoll by a bank. I hope to describe it at some future time.

In conclusion, I may state that most of my observations in these islands were directed towards estimating the age of Keeling Atoll. These data have yet to be worked up, and I am fairly confident of getting a satisfactory estimate. The lagoon is rapidly filling up

with sand and coral, but it is almost impossible to state in precise terms the changes since the visit of the *Beagle*, as the survey then made was little more than a sketch. The present Admiralty chart is of but little service in inquiring into past changes, for in it the original survey of the *Beagle* in 1836 has received several later additions, and there is nothing to distinguish the one from the other. For the purpose of navigation, and for the advantage of science, a complete examination of these islands should be made. The best season for surveying is during the calm weather of the months of January and February, when boats can venture close to the edge of the reef, and a satisfactory examination of the outer shores, as well as the interior of the atoll, can then be made. In collecting information from the residents, it will be necessary to remember that no records are kept in the islands; and in studying past changes the observer will have to receive what may at first sight appear to be very interesting facts with scientific caution. Some corroboration of such facts should always be looked for.

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 :—

MEMBER:—Rev. A. Momerie, M.A., D.Sc., Professor of Logic and Metaphysics, King's College, London.

ASSOCIATES:—Rev. C. G. Ashwin, M.A., Bristol; E. Clapton, Esq., M.D., F.R.C.P., F.C.S., Kent; Rev. R. B. Fairbairn, D.D., LL.D., United States; M. A. B. Gilmour, Esq., Edinburgh; Missouri Young Men's Christian Association; Rev. Chancellor W. W. Totheroh, D.D., Ingham University, United States; T. Williams, Esq., B.A., Chester; Rev. W. R. Wright, United States.

A Lecture on some of the principal Races mentioned in the Bible, with Illustrations from the Babylonian, Assyrian, and Egyptian Monuments was then delivered by the Rev. H. G. Tomkins, and illustrated by photographs shown by lime light.

A Report of the Rev. H. G. Tomkins' lecture, with its Illustrations, is now being prepared for the Journal.

* December 3, 1888.

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 :—Rev. D. Stewart Dodge, M.A., United States.

MEMBERS :—Sir J. Coode, K.C.M.G., C.E., London ; The Very Rev. G. A. Chadwick, Dean of Armagh, Armagh ; A. Briggs, Esq., J.P., Yorkshire ; Major Alten W. Beamish, R.E., Middlesex ; Rev. Thomas Good, B.D., Ireland ; Rev. James McCormick, M.A., T.C.D., Ireland ; Christopher W. Smith, Esq., Norfolk ; James H. Tritton, Esq., F.S.S., London.

ASSOCIATES :—The Right Rev. the Lord Bishop of Antigua ; Judge M. Arnold, B.L., United States ; Rev. Prof. G. B. Albrook, A.M., Ph.D., United States ; J. E. Bedford, Esq., Leeds ; Rev. M. P. Bell, United States ; A. Bird, Esq., London ; Rev. W. M. Beauchamp, S.T.D., United States ; Brander Library (Rev. D. Shearer, Ph.D.), Scotland ; Rev. J. C. Clyde, A.B., A.M., D.D., United States ; T. H. Devonshire, Esq., London ; W. Gribble, Esq., London ; Rev. J. G. Hoare, M.A., Canterbury ; Rev. E. P. Herbert, C.M.S., India ; Rev. A. Henderson, Crieff ; B. St. J. B. Joule, Esq., J.P., Rothesay ; Rev. Canon J. Le Mesurier, M.A., R.D., Isle of Wight ; W. J. Parker, Esq., M.D., United States ; Mrs. Pringle, of Torwoodlee, Scotland ; Rev. S. G. Potter, D.D., Southsea ; Rev. J. G. F. Raupert, Essex ; Rev. J. T. Smith, D.D., LL.D., United States ; Rev. W. T. Sattianadhan, B.D., India ; Prof. G. H. Schodde, Ph.D., United States ; C. H. Tompkins, Esq., United States ; Rev. E. G. Wheeler, United States ; Silvanus Wilkins, Esq., London ; Rev. J. Urquhart, Weston-super-Mare.

NOMINEE ASSOCIATE :—The Chinta Deprettah Christian Association, India.

Also the presentation to the Library of the Proceedings of the following Societies :—

Proceedings of the	Royal Society.
”	Royal Asiatic Society (Bombay Branch).
”	Royal Colonial Institute.
”	Royal Dublin Society.
”	Royal Geographical Society.
”	Royal Institution.
”	Royal Irish Academy.
”	Royal Society of Canada.
”	Royal United Service Institution.
”	Geological Society.
”	American Geographical Society.
”	” Geological Society.
”	” Philosophical Society.
”	Canadian Institute.
”	New Zealand Institute.
”	Smithsonian Institute (Washington).
”	Society of Arts.
”	Sydney Museum.
”	Society of Biblical Archæology.
”	The various United States Government Surveys
	And others.

The following Paper was then read by the Author :—

COLOURS IN NATURE. By the Rev. F. A. WALKER,
D.D., F.L.S.

“Scarlet and blue and purple and fine linen.”

SUCH was the combination of colours ordained of God by Moses for the service of the Tabernacle at the commencement of the Jewish national history. And there have not been wanting those who, in allegorising the whole of the prescribed ritual, have professed to regard the above productions of art as symbolising the four elements in the world of Nature,—to wit, scarlet, fire; blue, water; purple, as I suppose, air, from the tint of the mountains and clouds when viewed through the medium of distance; and fine linen, earth, from flax, of which it is composed, being a product of earth. I am not prepared to endorse this interpretation as the real one, although I do not go so far as to assert that no symbolism is intended, and with regard to scarlet, at any rate, the deep dye and glaring character of sin may be hereby portrayed, as is more particularly exemplified by scarlet being one of the offerings required for the cleansing of the leper; and

having regard to such a passage of Holy Writ as Isaiah i. 18 : "Though your sins be as scarlet, they shall be as white as snow; though they be red like crimson, they shall be as wool." But the special reason why I have mentioned the colours enjoined for the service of the Tabernacle is, that scarlet, blue, and purple are here spoken of in combination, and scarlet, blue, and purple are three of the colours in Nature to which I wish to draw your attention, more particularly in the case of purple, as there is without doubt great variety and discrepancy in the particular colour intended by the word purple, as employed in different writers, ages, and countries. The ordinary modern acceptation of the word purple without doubt signifies such a tint as belongs to the *Viola odorata* and the purple crocus, to the purple, moreover, of a leaden-coloured cloud when lighted up by sun-light; and this statement derives additional corroboration from the fact that a large South American butterfly, *Caligo Inachis*, is also termed Uranus, or Heaven, from its purple wings with yellow band, being supposed to resemble the purple and gold of sunset. As an entirely different colour is intended, and described in the lines,—

"The roseate hues of early dawn,
The brightness of the day,
The crimson of the sunset sky,
How fast they fade away."

So, too, the purple mountain of Killarney, exhibiting a similar appearance in the intensity of its tint to the beautiful title of Athens in classic times as the "city of the violet crown," *ἰοστέφανοι Ἀθήναι*, from its environment by such purple hills as Pentelicus, Hymettus, &c., as I have seen and can personally testify.

Of quite another hue was the Tyrian purple of the ancients, that became a synonym for royal attire. For example, the purple that is mentioned, together with fine linen, in St. Luke's Gospel. We may feel assured of this from the original word in the Greek being *πορφύρεος*, also employed to designate the dark, dull red stone known, when Anglicised, as porphyry. Similarly, "born in the purple" became a proverbial expression for offspring born to reigning monarchs. A Byzantine prince was termed Porphyrogenitus, when born in an apartment with royal hangings of red, which was assigned for births in the imperial family, and the porphyry, or red, in which ancient missals, splendidly illuminated and richly decorated with gold or silver, were bound, was said to be of the

colour of dark bull's blood, so the better to show up the brightness of the metal. It is likewise noteworthy, with regard to the robe in which the soldiers attired our Lord before His crucifixion, St. Mark and St. John describe it as "purple," St. Matthew as "scarlet," and St. Luke speaks of it as "gorgeous." If purple and scarlet could be used by two different writers in reference to the same dress, it is clear that the purple of the ancients must have been decidedly of the colour that we should now term red. And it is highly probable that the robe in which our Lord was clad in mockery of His title as King of the Jews was a "paludamentum," or old military cloak, of the Roman soldiers, possibly scarlet, like our regimentals.

There can be no question but that the Greek *πορφύρεος* (from which both the Latin *purpureus* and our "purple" are derived) conveyed in its first notion, when used in the Homeric poems, the signification of dark without any particular reference to colour. Thus, in *Iliad* I. 482, *πορφύρεον κύμα* is "a dark wave"; *Iliad* XVI. 391, *πορφύρεον ἄλς* is the dark sea; *Iliad* XVII. 551, *πορφυρέη νεφέλη* is a dark cloud. Then it came to be used more definitely of colour, as *πορφύρεον ἄμμα*, crimson blood; *πορφύρεος θάνατος*, bloody death, death in battle. It is also used in other passages of garments and cloths coloured by the dye of the murex, like *φοινικίεις* in this respect, just as the Latin *Tyrius* is likewise an equivalent for *purpureus*, for the Phœnicians or Tyrians are reported to have been the first to discover and use this colour. With regard to the meaning of *purpureus* in the Latin poets, when denoting a particular colour, it signifies rosy, red, or reddish, as used of the rose in *Hor.*, *Od.* III. 15, 15, "*purpureus flos rosæ*"; of the dawn, "*Aurora*," in *Ov.*, *Met.*, 3, 184; of blushes, "*rubor oris*," *Ov.*, *Trist.* 4, 3, 70; of poppies, "*papavera*," *Prop.* I. 20, 38.

And likewise bright, brilliant, apart from any special tint, as of "*lumen juventæ*," the light of youth; of "*orbes*," equivalent to "*oculi*," the eyes, *Val. Fl.* 3, 178; of "*colores*," colours, *Hor.*, *Od.* IV. 1, 10. Occasionally, but more rarely when used of the wave, it means dark,—"*purpureus fluctus*" thus corresponds to the Homeric *πορφύρεον κύμα*. We are probably all of us familiar with the anecdote of the blind person who, when asked what he supposed the colour of scarlet to resemble, replied that he imagined it was like the sound of a trumpet,—no bad illustration, when we reflect that of all hues it is the most glaring and dazzling. And some of us may have read long ago the old-fashioned fairy-tale of *Miranda*, who, expressing herself tired of the perpetual verdure, had her imprudent wish suddenly

realised by all the foliage being turned to the brightest red, resulting in dazzled and aching eyes, and convincing her that no tint in Nature was so productive as the green of springtide of softness and repose, and so unattended by inconvenience. It may be remarked, *en passant*, concerning scarlet, that very few of our English wild flowers are of this colour,—the field poppy and the pimpernel, for example; but the field poppy is the only one of sufficient size and occurring in sufficient quantity to create a noticeable feature in the landscape, wherever it fills the cornfields. A much larger proportion are pink or crimson, as the foxglove, the lychnis, the bloody crane's-bill, the willow herb, the herb Robert, the lythrum, common mallow, ragged robin, clover, &c. It is very possible that the ferruginous character of the soil in places may contribute to the abundant number or to the intensity in hue of several crimson flowering plants. And similarly different chemical agencies are rendered subservient to the production every season of variations in colour in cultivated kinds. It may be observed with regard to butterflies, as a parallel to what has been above stated, that very few species indeed are entirely scarlet or red,—*Harma sangaris* of West Africa, and *Appias nero* of East Indies, furnishing two notable exceptions; but in almost every other instance the red does not constitute the only, or even the ground colour, but occurs in spots or patches.

Among birds also, and to take the parrot tribe as a serviceable example, there are more green than red kinds, though in the case of butterflies and moths there are few species entirely green like the African *Charaxes eupale* among butterflies and the "Emeralds" among British moths. And in British plants *Helleborus viridis*, or green hellebore, is one of the very few conspicuous kinds that have an apple-green flower similar in tint to an ordinary leaf. To blue, on the contrary, has been assigned a far larger place among the works of creation.

"Blue rolls the waters, blue the sky
Shines like an ocean hung on high."

Blue is the colour of Virgil's thundercloud:—

"Olli cœruleus supra caput astitit imber,
Noctem hiememque ferens."

The heavens declare the glory of God, and when we assert of any object of Nature that it is sky-blue, we are purposely ascribing to it the most lovely tint of all imaginable hues. When, in Exodus xxiv., Moses and Aaron, Nadab and Abihu,

and seventy of the elders of Israel alone out of all the congregation, saw the God of Israel, the sacred narrative proceeds to state that in that vision of the Creator of all things, the colour of blue was specially conspicuous, as, so to speak, the footstool of the God of glory. "There was under his feet, as it were, the paved work of a sapphire stone, and, as it were, the body of the heaven in its clearness." We are all of us familiar with the expression "true blue" in ordinary parlance, but the very triteness of its usage may of itself be an indication that there is a deep and solemn reality underlying this idea. Is there not a tacit, though, it may be, almost unconscious, acknowledgment of the eternal verities hereby implied, that blue are the distant hills—blue by reason of their distance, which, above all objects of the visible creation, seem, by their towering summits heavenwards, by their lonely heights and unbroken solitude, apart from the life and ways of men, to speak of Him who is the unchanging Truth, and by their massiveness and enduring character to be girded about with power; and are they not in Holy Writ the favoured scenes of special manifestations of the Deity, and of communion between Himself and His creatures?

Blue is the "great and wide sea also," unchanging in outward appearance through the lapse of ages, and showing no traces of alteration as the earth does in process of time, owing to eruption, earthquake, landslip; or other geological change.

"Time writes no wrinkle on thine azure brow,
Such as Creation's dawn beheld, thou rollest now."

Again, certain seas (those around the Channel Isles and also the Mediterranean) are of a particularly bright blue. If we now revert to the living products of the Divine hand, we shall find abundant evidence in flowers and butterflies of blue preponderating over some, and holding its own with all colours, and especially in the case of the butterflies. Of our own English wild flowers may be quoted as examples the various kinds of violet, the scabious, pinguicula, ajuga, self-heal, gentian, harebell, and other species of campanula, *Vicia cracca*, ground ivy, speedwell, forget-me-nots, blue pimpernel, sea aster, *Scilla verna*, *Scilla nutans*; corn blue-bottle, &c.

Again,—what more lovely sight than that of a wood in early springtime, when, through the carpet of last autumn's leaves sodden, trodden down, and decaying amid the miry clay, myriads of blue spires of our wood hyacinth, the *Scilla nutans*, are struggling upwards? Do they not seem to speak to us of dull earth transmuted into a higher nature, ever as

in their direction they point heavenwards, and in their colour reflect the sky's own tint, teaching what we might be, a little bit of heaven's blue in the midst of senseless clods, and springing out of the prevailing decay?

In reviewing the butterflies, the Morphidæ of South America pre-eminently suggest themselves to all our minds. *Morpho*, a Greek word denoting form or beauty, was a Spartan title for Venus, and certainly the tribe of insects thus named, large in size, conspicuous in beauty, and numerous in the number of its species, fully deserves the appellation it has received. The title Morphidæ is regarded as including the whole tribe comprehending some fine genera, as Pavonia, Caligo, &c., that are not in many instances of a brilliant blue, but dusky. The word *Morpho* is reserved for such as are of a uniform azure or pearly tint, and nothing can exceed the beauty of many of those denizens of the Western tropics. Blue, unlike red, in many of these species, constitutes the ground and only colour. In the case of other kinds broad blue bands intersect a black or dark brown surface. Morphidæ are decidedly the largest in size of all the tribes of butterflies known in the Western hemisphere, several of the species equalling in stretch of wing any that occur in the Eastern also. The range of most of the kinds is confined to South America, but few extend as far north as, and a few more are peculiar to, Central America and Mexico. The beauty of many of the kinds, and the minute differences, variations, and gradations of tint are indescribable, and can only be realised by close inspection, some recalling moonlight in water, others an opal-like radiance or mother-of-pearl suffused with mauve, or a blue unsurpassed in lustre by any created object, unless it be the breast of another inhabitant of the same region, I mean a tropical humming-bird.

Several species of our own, and the Continental, African, and East Indian Lycænidæ, small and insignificant in appearance as they are in comparison with the *Morpho*, are, nevertheless, wholly blue, some brighter, some duller, some dark, some purplish, and others again silvery. It may be remarked that a yellow flower, when dried, preserves its colour much better than a blue one. Take the *Centaurea cyanus* (corn blue-bottle) as an instance. For the first five or six days it will appear to keep almost its original tint, and then suddenly it will turn completely white. Among butterflies the contrary holds good. Place a blue *Morpho*, and a yellow or orange *Callidryas* in a glazed case in a shop-window, and the blue will retain its hue for a long period after the other insect has

become faded and bleached. To a certain extent the colouring of butterflies, as well as their size, shape, and markings, indicates the particular tribe to which they belong,—*e.g.*, the blue of many of the *Morphidæ*, the yellow of the *Ornithoptera*, the bright and various tints of the *Catagrammas* are peculiar to themselves, and have no parallel among other genera of butterflies. On the other hand, there is such a similarity between some species of *Papilio* and those of *Euploea*, between one particular *Diadema* and a species of *Danais*, between the genus *Euryphene* and that of *Romalæosoma*, as a whole, that the distinctions must be sought for in the nervation of the wings, or in some other structural divergence, and not in the respective outward colouring merely.

The survey of an Oriental crowd gathered together on some public occasion, as the setting forth or return of a procession, when all the spectators attired in flowing robes have donned their best dresses to view the sight, will inevitably lead to the conclusion that blue is the Eastern's favourite colour, and worn far more extensively than orange, black, or white. The blue in question is obtained by steeping the garments in vats of indigo dye, such as may be seen at the doors of the clay-built huts of *Keneh*, Upper Egypt, and the garments so stained are then suspended on cords across the narrow street to dry. Now, there must be some prompting of a picturesque effect that has led the Oriental to the adoption of this colour,—possibly the contrast between it and the green palm-trees and yellow sand that form his every-day surroundings in so many places,—as his preference for it is manifestly not confined to articles of dress, but window-shutters, door-posts, palisades, &c., are similarly painted, and thus afford additional evidence of his taste in this particular.

With regard to the question how far the colour of insects is caused or modified by outward circumstances, I have had to apply for information to those who have made these and such-like matters their special study, and am credibly informed that the larvæ of certain species can be modified by varying surroundings, and the pupæ also, but independently; in other words, I conclude that we are to understand that both caterpillars and chrysalids can have their colours altered or modified by external causes, but that the chrysalids do not derive their altered tint from the caterpillar stage, but undergo a separate modification in their turn; also in no case does the effect go on into the next stage, or make any difference to the imago (as far as work has gone at present). Only in one case does larval dimorphism (green and brown)

affect a later stage, and that only the pupal, and in this case, as far as my informant can see, the larval colours cannot be produced artificially.

There is no evidence for colours being due to the presence of chemicals, although, no doubt, advantage is taken of their presence to produce certain colours; but in the vast majority of cases the colours are due to arrangements of molecules, &c., and *not* to peculiar or uncommon elements. None of these have been shown to exist in insects.

It is not believed that the fact of the insect beholding the surroundings could ever account for resemblances, but that it is a case of survival of the better-adapted variations. In certain cases colour is modified by beholding surroundings, although, in the case of larvæ, it is more probably by *feeling* the colours through the skin, and not through the eyes. But in these cases we have no *explanation* of the *origin* of colour, for it is more than doubtful whether the result can be inherited.

In the case of the changing colour of the chamæleon, trout, &c., it is obvious that the *results* cannot be transmitted, only the *power* of changing, and it is believed that it is also the same with the results arrived at in insects.

The blue sky and sea cannot account for blue in animals, for the two colours depend upon such different chemical substances, and often different optical principles. Nor is there any evidence for any colour tending to produce a similar colour in other bodies.

Those who desire more detailed information on this topic, and kindred subjects, are referred to Mr. Edward Poulton's papers in the *Proceedings of the Royal Society for 1885 and 1886* on the special colour-relation between *Smerinthus ocellatus* and its food-plants, the outcome of laborious investigation, accompanied by varied experiments, modifications of colour produced and noted by feeding larvæ on leaves of different trees, and also on leaves of different sizes and shapes, as well as different kinds; also the contrivance of fastening leaves together, so that some larvæ should only see the upper surface, others only the under, and as the upper surface differs in tint from the under, a varied result is expected and, in many cases, obtained. The experiment has also been varied by feeding some larvæ which had been given a different tint artificially by removing the "bloom" from the under surface, and, to test whether the ocelli formed the impressionable part of the larvæ by investigating the effect upon colour of covering those organs with some innocuous opaque pigment.

The effects of certain food plants, about which the evidence was conflicting, were also further investigated, the periods inquired into during which the larvæ are most susceptible to the influence of the food plant, and the instances carefully watched for of individual variation among the larvæ from the same batch of eggs, and fed upon the same food. The influence of the food plant, so far as observation has been made, is not uniform, and must act during a large proportion of the whole family life to produce an effect. It is probable that effects accumulate during successive generations. The effects are partially due to pigment which is proper to the larva, and which has no immediate relation to the food plant. The changes produced in derived pigments are more complicated, and due to the predominance of one or another of vegetable colouring matters in the tissues and blood. The food in the digestive tract is a probable first cause of larval colour, and the dark dorsal line of the larva a very early marking. Where the large-leaved varieties of the willow have been used as the food plant, the tendency in the larva has usually been towards a whitish hue, and where the long but narrow and small-leaved ditto, towards yellow. Towards yellow again when the dark green upper side of *Salix viminalis* has served as food, and, on the other hand, the tendency always towards white, when the feeding has taken place on the under-sides of the same leaves, the said under-sides being, of course, hoary, as in the case of the poplar, upon which tree as well as upon many varieties of willow, and upon the apple, and cultivated and wild crab, experiments have been made. Another kind of willow, *Salix triandra*, with whitish bloom, is evidently in the direction of yellow, but ditto without the white bloom, more strongly than the last in the direction of yellow. This, of course, would indicate that the presence of white bloom on the leaf counteracts so far as it produces any effect, although it cannot counteract altogether and effectually, yellow in the larva. The parent larvæ experimented on of *Smerinthus ocellatus* were extreme white varieties, and belonged to a group which evidently inherited a very strong tendency in this direction, as was shown by the comparatively slight effect that followed the use of foods which most powerfully tend to produce white varieties. It is noteworthy to observe that the leaves of the crab produced most extreme white in the bred larva, as also in the case of the parents previously experimented on, but that *Salix rubra* and *Babylonica* produced much less effect than in the case of the parents. And Mr. Poulton's argument, drawn

out *in extenso* from these data, would, I suppose, be somewhat as follows:—The parents in each case are of the extreme white variety. One set of these, and likewise the larvæ that are their offspring in the following season, were fed on crab leaves, tending to produce and to perpetuate white, while the other set, and likewise their larvæ, in succession were fed on small-leaved varieties of the willow, that similarly tend towards yellow (small-leaved varieties having this tendency, and *Salix Babylonica*, the Eastern weeping willow, being the smallest leaved of them all). So that when a second generation of larvæ was fed on yellow producing food, the effect in the direction of white was much less manifest, although the same yellow producing food had no result whatever in the case of their progenitors, selected, as has been already noticed, from the extreme white variety. It is a highly interesting matter of observation, as it seems to me, how far, how long, and in how many individuals of a batch of caterpillars, the selected and inherited white will prevail, when the food plant, season after season, is of a yellow tendency, or, to speak more correctly, the plant with which the larval sensory surface is brought into contact, as there is considerable evidence for believing that the influence of food upon larval colour does not consist in the eating, not in the comparatively simple phytophagous influence, but through the nervous system regulating the amounts and kinds of the vegetable pigments made use of, and that of the larval pigment deposited. I am of course open to correction, if I have unintentionally misrepresented the bearing of Mr. Poulton's arguments in any particular while under the necessity of compressing the record of his experiments into small compass, and of only very partially and incompletely referring to the sundry and laborious investigations that one so talented and possessed of such power of research has conducted on behalf of science.

Such work as he has so laudably commenced ought to be conducted by many individuals at the same time in reference to a great many species of insects, with a no less great variety of food plants, and through every succeeding season, for the compass of a whole lifetime, the consequent breeding and rearing, experimenting and observing and registering should be conducted,—and notably in the tropics, as much as if not more than at home,—if anything like an adequate generalisation, only attainable, as it seems to me, by the comparison of a multitude of instances, and through long process of time is to be arrived at; for after all there are

pretty certain to be several exceptions to the rule as regards cause and effect in colour, partly, it may be, arising from incompleteness of knowledge and imperfection of experiment as yet, while only on the threshold and borderland of an almost untrodden field, and same reasons, moreover, when no results are attainable from a brood of caterpillars suddenly dying out by reason of an epidemic or otherwise.

Again, with regard to colour in animals generally,—not insects only, but all living creatures viewed as one great whole,—certain great truths are sufficiently manifest. First, the relation between colouring and light is very evident in beings which inhabit the earth and air, and in some instances, but by no means in all, and not in the same way or to the same extent in those of the water also. Many statements have been given in support of this, several of which I unhesitatingly admit, while others I accept subject to certain qualifications and reserve. It has been asserted with regard to the denizens of earth and air, that those are the most brilliant which are exposed to the sun; those of the tropics are brighter than in the regions around the North Pole, and the diurnal species than the nocturnal. But it should be borne in mind, that to institute a comparison between the tropics and the neighbourhood of the North Pole in reference to any order in Nature, is to pre-suppose two extreme cases, and the fact is ignored, that though the tropics possess a far greater number of rich and radiant-coloured birds and insects than any other part of the globe, they contain at the same time many more dull-coloured ones as well,—butterflies, at all events. And while dwelling on the subject of diurnal Lepidoptera, with which tribe I am most familiar, I may take the opportunity of mentioning that our seven British species of genus *Vanessa* equal in beauty any other kinds of the same family from warmer climates. Again, it has been stated, and stated truly, that birds which fly, as it were, bathed in light, do not offer the strong contrast of tone between the upper and lower side; in other words, that the breast resembles the head, or back, or wings, one or other if not all of these in colouring, I suppose. But the writer of the article that appeared several years ago in *Chambers's Journal*, and from which I am now quoting, adds, "And the wings of many butterflies are as beautifully feathered below as above." As beautifully feathered,—yes; but very differently coloured, and very differently marked. I have in my mind's eye at this moment three different species of the South American genus *Catagramma*, that may serve as one example out of many that I

could produce. The upper surface of each of these three butterflies, consisting of bluish green metallic bands upon a very dark, if not black ground, is so similar that they look almost like one species. The under surface in every instance presents a marked contrast to the upper as well as to the under side of the two others, being primrose in one species, pale brown in another, and stone colour, almost white, in a third. I will go further, and myself allege that the wings of some butterflies are not only as beautifully feathered, but more beautifully below than above, as I could prove from my own collection. But this does not do away with the equally true fact that all the numerous bright blue morphos which have been previously referred to in the course of this paper, have, without exception, their sides of a sober brown, and I think it cannot be disputed that the under surface of no English butterfly is equal to the upper in beauty, and also that the upper surface of the majority of the species from all over the globe surpass the under in gayness and lustre of colour. Beetles, wasps, and flies are likewise stated to have the metallic colouring of blue and green, and to possess rings equally dark all round the body. Precisely, because beetles, wasps, and flies, like birds in this respect, have the whole of their bodies equally exposed to the rays of the sun, so that if the sun's brightness produces any effect and any intensifying of colour in them at all, it must do so on every part of them alike. But the colouring of the bodies of by far the greater proportion of butterflies and moths is not worth mentioning. It is with their wings that we are concerned, and what I would assert is that the upper surface of a butterfly's wings must naturally and perforce be far more exposed to the bright sunlight than the under, for if it flaps its wings in rapid flight, even then the upper surface receives more of the sunlight, and if, on the contrary, it floats along with its wings spread out horizontally like a fan, then a portion of the upper surface is all that the sun shines on; the lower is turned towards the earth. View the same creature when it has settled. Its under surface rests against the flower, or if the wings should be closely pressed together and erect it will frequently be noticed that the weather is cloudy, or that it is the hour of declining day, and that in any case the butterfly is asleep.

Again, "one star differeth from another star in glory," and the beauty of the scarlet-and-black patches of the upper side of *Catagramma cynosura* is very diverse from that of the orange-and-blue markings of the under in that South

American butterfly. Both are lovely, and should be displayed equally in cabinet specimens, but that of the scarlet-and-black, which necessarily receives more of the sunlight, is the more gorgeous. Some butterflies have dull upper and under surfaces equally, others are beautiful on either side; some, dull on the upper, present a strikingly handsome contrast on the lower, while the greater number are far more beautiful above than below. But in those instances where each side is beautiful the colours and markings of the two sides respectively, be it noticed once more, are very different. Hence arises the question, Is the sunlight so important, after all, if the under surface that does not enjoy so much radiance is, although so different from the upper, and perchance not so gorgeous, still so beautiful? But the answer is obvious. Sunlight is not, for the most part, necessary to the production, but it is to the maintenance of colour in all organic beings, although I could exhibit instances from my own collection of the differences in colour both of the wings and body in a certain dragon-fly (*Calepteryx ludovisiana*), as caught after it had newly emerged, from other specimens that had been exposed for some days to the light and heat of the sun. Intestinal worms and larvæ found in the ground or in wood are all colourless, as also are certain little beetles in the depths of the crevasses of snowy mountains, or the eyeless reptiles and fishes inhabiting the waters of subterranean caves, in the same way that sea-kale, rhubarb, &c., are effectually blanched when growing amid darkness under an inverted pot. A gorgeous butterfly is never, it is true, brighter in tint than in the hour when it emerges from the chrysalis. It does not become brighter by disporting itself day after day in the noontide beam (for its colours are altogether differently constituted from those of the dragon-fly); but what the sun's rays do for it is this: Its first act on reaching the perfect state is to flutter towards the light, and to place itself in a position whence it can gradually unfurl, expand, and hang its wings downwards, until those wings, by reason of the warmth, gain nerve, and are no longer limp, but fully capable of an extended flight. Bright sunshine is requisite for the appearance as well as the abundance, no less of dragon-flies than of butterflies, if not even more so; and it is worth notice to observe what a difference a bright hot day makes in the rapidity and wildness of flight of a certain butterfly,—our only British swallowtail, *P. Machaon*, in the Cambridgeshire fens. It is also remarkable how, if but a transient cloud pass over the sun, the insects,

even if there be no rain, will all in a moment disappear, and where they betake themselves is equally past finding out. One's own shadow projected across a flower or leaf on which an insect is settled, without the slightest noise, will cause it rapidly to take wing, so dependent is it for its brief hour of enjoyment on the sun's brightness. Although, as I just now said, it becomes no brighter for many days of sunlight, it does become considerably faded in some instances between the beginning and end of the season. Observe a specimen of a painted lady, butterfly that has successfully hybernated, and reappeared in the ensuing spring, and look at the difference that those humble bees ordinarily known as red tails (*Bombus lapidarius*, for example) show between spring and autumn and the period when they are found on the early blossoms of the dead nettle and the time when they haunt the flowers of the late lingering thistles,—in the former instance bright orange, and in the latter a dull rust colour. Again, birds, fishes, and insects have been correctly said to alone possess the metallic colour; while plants and zoophytes are without reflecting shades, and the mollusca to take a middle path with their hue of mother-of-pearl. But in any inquiry,—so far as inquiry can be made,—into the causes to which animal colouring is due, we must be careful to distinguish between three sorts of colour, which I will venture to term for convenience' sake uniform, metallic, and iridescent, and then to convey my meaning with regard to these three appellations.

Uniform, such as all butterflies possess, and which is evident to the most superficial observer, and seen even under a dull light, as for example the yellow of the sulphur, the crimson and blue of the peacock, the scarlet, black, and white of the red admiral.

Metallic, peculiar to certain tribes of birds and butterflies like humming-birds and morphos. In the case of *Morpho cypris*, for example, it is a shifting tint, for as that resplendent insect is viewed flat in a drawer, now one side appears bright blue, and now again the other, while the left or right wing alternately seems dark. The drawer requires to be held up and turned to and fro under a full, strong light, for the beauties of insects of this description to be thoroughly realised. It is noteworthy to observe with regard to another species of this group, *Morpho sulkovskii*, and its metallic tint, that it has the same markings in consequence, though not the same tint on both upper and under surface, owing to its wings being very transparent, presumably from the coating of scales being very thin, and that the pencilled markings on

the comparatively dull surface of the under side reflect a bright mauve on the mother-of-pearl expanse of the upper. None of this tribe can be effectively represented by a coloured illustration, inasmuch as the opaline tints of some cannot be depicted at all, while the brilliant blue of others is only represented by a dull indigo hue, and can be seen flashing like a speculum or mirror for an immense distance as the insect wings its rapid flight in its own land through the tropical sunlight. With regard to the humming-bird, when the beautiful feathers on its breast are examined under the microscope, it has been said that it is astonishing to see none of the shades the mystery of which one could penetrate. They are simply made of a dark-brown opaque substance, not unlike those of the black duck. There is, however, a remarkable arrangement,—the back of the feathers, instead of being a fringed stem, offers a series of small squares of horny substance placed point to point. These plates, of infinitesimal size, are extremely thin, brown, and, to all appearance, exactly alike, whatever may be the reflection they give. They have been described as so many little mirrors, but that comparison is not correct, for then they would only give back light without colouring it. Neither do they act by decomposing the rays which pass through them, for then they would not lose their iris tints under the microscope. It is to metals alone that the metallic plumage of the humming-bird can be compared; the effects of the plates in a feather are like tempered steel or crystallised bismuth. Certain specimens emit colours very variable under different angles, the same scarlet feathers seeming, when turned to ninety degrees, a beautiful emerald green. The same process which nature has followed in the humming-bird is also found in the wing of the butterfly. It is covered with microscopic scales, which play the part of the feathers, arranged like the tiles of a house, and taking the most elegant forms. They also lose their colour under magnifying power, and the quality of reflection shows that the phenomena are the same as in feathers. There is, however, a difference in the extent of the chromatic scale. Whilst the humming-bird partakes in its colours of the whole of the spectrum, from the violet to the red, passing through green, those of the butterfly prefer the more refrangible ones from green to violet, passing through blue.

As regards iridescent hues, a brief statement will suffice. On the upper surface of the wings of certain Swiss species of the genus *Erebia*, that are of a dark reddish brown, as a rule, I have noticed the play of a greenish and also a purplish tint

when the specimens have been in fresh and good condition; but my belief is that this appearance is very transient, and does not long survive their capture and transference to cabinet drawers. I do not pretend to say what occasions the combination of green and purple, but it is possibly worth while to notice that short iridescent hairs of somewhat the same tints clothe the back of the doris or sea-mouse as it appears cast up upon the beach, and this consideration leads us to the question of colour in another order of organic beings—namely, fishes. In these the action of light is apparent. The part of the body turned towards the light is always paler than that which is undermost. Fishes which live on the side, as the sole and turbot, have the left side, which answers to the back, of a dark tint, whilst the other side is white. Nevertheless, it would appear that the fishes of the richest shade, in distinction to the beings inhabiting the earth and the air, exist where the light is more tempered, and that some kinds found both on the shores as well as in depths requiring the drag-net, are of a bright red purple in the latter regions, and of an insignificant yellow-brown in the former. Other bright objects of the deep, such as certain species of sea anemone, and the like, only occur at a considerable depth below the surface water, so that they cannot be observed at all in their natural habitat, except in some sea caves which the tide fills to a considerable height, only receding from the entrance sufficiently to allow of ingress two or three times a year, whereby I obtained a sight of these numerous and marvellous creatures studding the rocky walls. I shall take occasion to advert to these marine caverns again, so before quitting this part of the subject would merely remark that those who bring up gold fish know well that to have them finely coloured they must place them in a shaded vase where aquatic plants hide them from the extreme solar heat, and that under a hot July sun they lose their beauty. Similarly on a summer's day common carp and roach, &c., will betake themselves to the shelter of the expanded leaves of the water-lilies in our ponds. A great deal of what has been above stated tends to show that it is vain to say that an animal is beautiful in shape or in colouring, in order to please the human eye; and Wallace testifies to the same truth in the second volume of his *Malay Archipelago*, wherein on obtaining a specimen of the king bird of paradise, he states:—

“I knew how few Europeans had ever beheld the perfect little organism I now gazed upon, and how very imperfectly it was still known in Europe.

“The remote island, in which I found myself situated, in an almost unvisited sea; the wild, luxuriant tropical forest, which stretched far away on every side; the rude, uncultured savages who gathered round me,—all had their influence in determining the emotions with which I gazed upon this ‘thing of beauty.’”

“I thought of the long ages of the past during which the successive generations of this little creature had run their course, year by year being born, and living and dying amid these gloomy woods, with no intelligent eye to gaze upon their loveliness; to all appearance such a wanton waste of beauty. Such ideas excite a feeling of melancholy. This consideration must surely tell us that all living things were *not* made for man. Many of them have no relation to him. The cycle of their existence has gone on independently of his, and is disturbed or broken by every advance in man’s intellectual development.” And more to the same purport.

One object for which the birds of paradise are endowed with beauty of plumage,—beauty, be it remarked, entirely confined to the cock birds,—is, without doubt, the delight of the hens, when their mates, in the case of the great birds of paradise, for example, shake out their saffron feathers like a fountain.

To quote from Wallace again on this subject:—

“The birds had now commenced what the people here call their ‘sácaleli,’ or dancing parties, in certain trees in the forest, which are not fruit-trees, as I at first imagined, but which have an immense head of spreading branches and large but scattered leaves, giving a clear space for the birds to play and exhibit their plumes. On one of these trees a dozen or twenty full-plumaged male birds assemble together, raise up their wings, stretch out their necks, and elevate their exquisite plumes, keeping them in a continual vibration. Between whiles they fly across from branch to branch in great excitement, so that the whole tree is filled with waving plumes in every variety of attitude and motion.”

I find it difficult to reconcile the different experiences of Wallace and Kingsley on the subject of colour in the flora of the tropics as affecting the general scenery. It is true that Kingsley visited the West Indies and Wallace the Malay Archipelago, but the latter was also familiar with the New World, having previously visited the Amazon, or some of the tributary branches of that mighty river.

The discrepancy had best be given in their own words. Wallace says:—

“Persons who have formed the usual ideas of the vegetation

of the tropics, who picture to themselves the abundance and brilliancy of the flowers and the magnificent appearance of hundreds of forest trees covered with masses of coloured blossoms, will be surprised to hear that though vegetation in Aru is highly luxuriant and varied, and would afford abundance of fine and curious plants to adorn our hot-houses, yet bright and showy flowers are, as a general rule, altogether absent, or so very scarce as to produce no effect whatever on the general scenery.

“It is true that Aru seemed to me exceptionally poor in flowers, but this is only an exaggeration of a general tropical feature, for my whole experience in the equatorial regions of the West and the East has convinced me that in the most luxuriant parts of the tropics flowers are less abundant, on the average less showy, and are far less effective in adding colour to the landscape than in temperate climates. I have never seen in the tropics such brilliant masses of colour as even England can show in her furze-clad commons, her heathery mountain sides, her glades of wild hyacinths, her fields of poppies, her meadows of buttercups and orchises,—carpets of yellow, purple, azure blue, and fiery crimson, which the tropics can rarely exhibit. We have smaller masses of colour in our hawthorn and crab-trees, our holly and mountain ash, our broom, foxgloves, primroses, and purple vetches, which clothe with gay colours the whole length and breadth of our land.

“It is very easy to see what has led to this erroneous view of the nature of tropical vegetation. In our hot-houses, and at our flower shows, we gather together the finest flowering plants from the most distant regions of the earth, and exhibit them in a proximity to each other which never occurs in nature. A hundred distinct plants, all with bright, or strange, or gorgeous flowers, make a wonderful show when brought together; but perhaps no two of these plants could be seen together in a state of nature, each inhabiting a distant region or a different station. Again, all moderately warm extra-European countries are mixed up with the tropics in general estimation, and a vague idea is formed that whatever is pre-eminently beautiful *must* come from the hottest parts of the earth. But the fact is quite the contrary. Rhododendrons and azaleas are plants of temperate regions, the grandest lilies are from temperate Japan, and a large proportion of our most showy flowering plants are natives of the Himalayas, of the Cape, of the United States, of Chili, or of China and Japan, all temperate regions,” &c.

Now Mr. Kingsley's contrary view, as told in his *Christmas in the West Indies*. His whole description of the unspeakable marvels of a tropical forest extends over many pages, but I will select a few passages descriptive of flowering shrubs :—

“Beyond it [namely, a coco-palm], again, blaze great orange and yellow flowers, with long stamens, and pistils curving upwards out of them. They belong to a twining, scrambling bush, with finely-pinnated mimosa leaves. That is the ‘flower fence,’ so often heard of in past years, and round it hurries to and fro a great orange butterfly, larger seemingly than any English kind. Next to it is a row of hibiscus shrubs with broad crimson flowers. Over the low roof rises a tall tree, which looks like a walnut, but is not one; it is the *poui* of the Indians, and will be covered slowly with brilliant saffron flowers.”

And again: “And yet, where the fire passed six months ago, all is now a fresh, impenetrable undergrowth of green creepers, covering the land, climbing up and shrouding the charred stumps. Young palms, like Prince of Wales's feathers, breaking up, six or eight feet high, among a wilderness of sensitive plants, scarlet-flowered dwarf Balisiers, climbing fern, convolvuluses of every hue, and an endless variety of outlandish leaves, over which flutter troops of butterflies.”

Again: “Oh that we could show you the view in front. The lawn, with its flowering shrubs, tiny specimens of which we admire in hot-houses at home; the grass as green (for it is now the end of the rainy season) as that of England in May, winding away into the cool shade of strange evergreens; the yellow cocoa-nut palms on the nearest spur of hill throwing back the tender blue of the higher mountains; the large central group of trees,—Saman, Sandbox, and Fig,—with the bright ostrich plumes of a climbing palm towering through the mimosa-like foliage of the Saman and *Erythrinas* (*Bois immortelles*, as they call them here), their all but leafless boughs now blazing against the blue sky with vermilion flowers, trees of red coral, sixty feet in height.”

Again: “One tall coolie ship at anchor seen above green cane fields and coolie gardens, gay with yellow Croton, and purple *Dracæna*, and crimson *Poinsettia*, and the grand leaves of the grandest of all plants,—the Banana,—food of Paradise.”

And yet once more: “Under the perpetual shade of the evergreens haunt *Heliconias* and other delicate butterflies

who seem to dread the glare outside, and flutter gently from leaf to leaf, their colouring,—which is usually black, with markings of orange, crimson, or blue,—coming into strongest contrast with the uniform green of leaf and grass.” And so forth.

In the second paper on Oriental Entomology that I had the honour of reading before a meeting of this Society, mention was made of the similarity of insects to vegetation constituting a protective resemblance in the case of butterflies, as also the means whereby other orders of insects were enabled to seize their prey unawares. To give an illustration of my meaning which I did not, I think, touch upon:—A spider coiled up at the bottom of a flower will precisely counterfeit the green axil of the flower-bud. And so, too, with animals. The stripes of the tiger are often deceptive, like the tint of the bamboos and canes wherein he makes his lair; the hue of the lion's hide resembles the sand of the desert on which he stalks. The ptarmigan in winter and the Arctic hare at the same season are white as the surrounding snows, the better to elude their natural enemies, while the Polar bear depends upon that self-same hue the more easily to surprise the unwary seal; and the ermine and Arctic fox are likewise clad in white fur at that time of year, the more readily to seize their prey. It has also been observed that hares, rabbits, stags, and goats possess the most favourable shade for concealing them in the depths of the forest or in the fields. And that when the most suitable colour for the riflemen at the first enrolment of the volunteer corps was discussed, it was supposed to be green, but, contrary to expectation, that which escaped the eyes of the enemy was the fawn colour of the doe, when soldiers dressed in different shades were placed in woods and plains to try which offered the best concealment. The birds which prey upon the smaller tribes, and carnivorous fishes like the shark, are clothed in dead colours, so as to be the least seen by their victims; and it was for no unmeaning fancy that the negroes of the Soudan were depicted in the paintings of the old Egyptian tombs clad in the yellow skins of the leopard or the panther. Nor can I wonder that the *Kallima*, or Indian leaf butterfly, manages so successfully, after it has settled, to elude the birds, when I myself once made with outstretched hand for an autumnal leaf standing upright on end in the mud of a Cambridgeshire lane,—as it exactly presented a superficial resemblance to the lemon colour and dull violet patches of the under side of the wings of a South American butterfly (genus *Callidryas*).

The causes of animal colouring are very various. Some living creatures have it in themselves, owing to molecular arrangements, the particular tint varying, one may conceive, according to the position, quantity, and closeness of the molecules, but the brightest colours are not, as a rule, bound up with the tissues; sometimes they arise from a phenomenon like that by which the soap bubble shows its prismatic hues. Then there is the special matter called pigment united with the organic substance, as, for example, the brilliant paint carmine is the pigment of the cochineal insect, and the red colour of blood which may be collected in crystals is separate from the other particles to which it is united.

A great deal has been already stated relative to the colour of butterflies in this paper, but I have hitherto omitted to notice that a numerous genus of South American butterflies (*Ithomia*) have their wings entirely free from colouring matter and any scales whatever, and as transparent as those of flies; another tribe (*Hetera*) has also the whole of the wings transparent, with the exception of a rose-coloured spot close to the base of the lower wing, so that the insect has been aptly described by Mr. Bates to resemble a wandering rose petal in its flight as the transparent part is unnoticed while it is on the wing. Others again as the *Acræidæ* of Africa and Madagascar have the coloured scales over the whole of the surface, with the exception of the tips of the upper wings; and as I have dwelt on those butterflies which possessed an under side as beautiful as, but completely different from, the upper, I may now mention that some species of the South American genus *Lycoreæ*, for example, have on their under side a similarity to the upper surface, but at the same time a very faint reproduction of its orange, yellow, and tawny tints and markings, possibly because the under surface possesses a more sparse and scanty arrangement of molecules, or because the thinness of the wings produces a reflection of the vivid hues and markings that grace the other side.

To resume, not only do butterflies, when rudely and hastily caught, leave powder on the hands of their captor; but birds like the white cockatoo leave white powder on the hands, and an African traveller was astonished on a rainy day at seeing his hands reddened by the damp plumage of the bird that he had killed. When the particles are scattered they scarcely influence the tint, but when close together the effect is very conspicuous, as, for instance, the abundance of brown pigment that may be seen to underlie the skin of a negro after it has been raised by a burn, gives rise to his sable colour. Colour

likewise results not from a flat surface, but from the different depths of layers in the flesh. The varying rose and lily tints proceed from the more or less free circulation of the blood; the bluish tint well known to painters, proceeds from the vesicles when seen under the skin, and similarly blue veins present a false appearance, because the blood is red; it is the skin that thus dyes what lies beneath it; and blue eyes owe their shade to the brown pigment that lines the other side of the iris. Fishes, on the other hand, owe their lustre,—causing the contents of the fishing-net to resemble an immense opal,—not to the scales but to thin layers below the scales and under the skin and round the blood-vessels, that look like so many threads of silver running through the flesh. Of these plates or layers, with the addition of glass and glue, false pearls are manufactured. The exceptional brightness of colouring displayed by male animals during the spring season, and at nesting time, far exceeding their hue at any other period of the year, is well known; to quote a few examples out of many, that of the yellow-hammer among birds, of the common newt among reptiles, and of the stickleback among fishes.

Whiteness, be it remarked, is never a sign of strength, even if the said whiteness results from constitutional variety, as much as from age or illness. Hoar hairs sometimes result from sudden fright, or dangerous fever, or long continuance of severe headaches, as well as from advanced years; but from whatever cause, it is always a sign of decrepitude. And there are albino varieties of the cat, the rat, the guinea-pig, the mouse, the crow, &c., as well as of human beings; but this peculiarity is almost invariably accompanied with some constitutional defect, that of red eyes in nearly if not quite all the creatures above mentioned. White cats, moreover, are said to be always deaf.

And human albinos, such as I saw, too, very many years ago in the streets of London, are reported to lack vigour of intellect, and certainly presented a pitiable appearance with their red, raw, and inflamed eyes, seemingly unable to bear the daylight. Similarly, the white varieties of the common orchis, and hyacinth, &c., are never of such vigorous growth, or so free for blossoming, as the ordinary types, while they certainly are far rarer. Age replaces the colouring matter in the hair (when it turns white) with small air-bubbles, and so, too, the brilliant white of feathers is due to the air which fills them; and the plumage of domestic poultry often turns whiter at each successive moult, just as much as the hair of human beings or the coats of horses at the approach of age. It would be

interesting if it could be conclusively shown that the frequently different colours of the beard and whiskers to that of the hair could be traced in any degree to the fact that the former are exposed to the full light when the latter is for the most part covered by the hat; for if my observation is correct, the hair may be dark, and the beard of a lighter tint; or again the hair may be light and sandy, and the beard of a more reddish tint, or the hair and beard may be alike dark, or the hair and beard alike light, and alike red; but what one does not, at any rate, commonly see is the beard darker than the hair, or the hair redder than the beard; so that the fiery tint may, to some extent, be caused by the unimpeded action of the sun, which likewise develops red patches of pigment, whatever the chemical nature of that pigment be, in the complexion. One must not, at the same time, forget that a good deal of the perception of colour is purely relative to the individual, and may present a very different appearance to a different order of created beings, as man has no inherent dislike to bright red or scarlet, such as the bull and turkey-cock invariably exhibit, and the glass-stained bright yellow to our eyes would appear, from Sir John Lubbock's experiments, to be correspondingly dark to the vision of the ants, which immediately began removing their eggs to a spot beneath the said glass. And the first instinct of these creatures, when their nest is disturbed, is to seize and carry off their young to some dark and inner part of the nest as yet untouched, and to preclude them from curious observation, so that if the same tint affects the optic uerves of human beings and of ants in so contrary a manner, either the ants or we, or both, must be colour blind. Animals indeed are far more powerfully affected by colour, or more strictly speaking, by the want of colour than by the time of day, just as I have noticed domestic fowls go to roost at four or five in the afternoon on the approach of the dusk of a winter's evening, and similarly to seek their perches while the earth, in full daylight, was temporarily darkened by an eclipse. If the power of the eyes of several flies be as that of a magnifying lens consisting of many facets, why may not also subtle gradations of colour, such as the human eye could never distinguish, be thoroughly perceived by these lower creatures, just as there is reason for supposing that their sense of hearing and that of smell are far keener than those possessed by man? I should be glad, in conclusion, to mention a few instances of colours in nature that I have witnessed, and which may not, perhaps, have come under the

observation of all present. One is that of phosphorescent animals, that of the luminous centipede, for example, of our gardens and lawns, whose light is of a pale yellow, not green like that emitted by the glowworm. Another instance that may be quoted is that of the phosphorescent sparkles of the Mediterranean resembling the light of the moon, caused by the numerous mollusca of the family of salpidæ and termed by the French "*une mer de lait*." Another lovely spectacle was the appearance of a perfect flotilla of Medusæ-like fairy umbrellas about two feet beneath our boat towards the close of day on Loch Sweyn in the western Highlands, and these also are to some extent phosphorescent. Again, as distance causes the mountains to appear blue, so depth and profundity would seem to have the effect of making living objects far beneath the waves look blue likewise, as the sardines, silvery when brought to the surface, resemble flashes of blue light when seen deep down in the clear depths in the Bay of Naples from the rocks near Sorrento. The grotto Azurra at Capri still remains one of the few spots unvisited by me in that region; but I have seen similar effects of light and shade in several sea caves beneath the cliffs of Sorrento, where rocky walls above the water and boulders far beneath the tide alike show themselves of a chastened and beautiful blue. The Gonliot caves again in the island of Sark are places that for reasons previously recorded in this paper very few have visited. How shall I attempt to describe the sides of the largest cavern where the tide rises to a height of forty-one feet, completely covered with a large species of barnacle, red and green sea anemones such as are ordinarily known as strawberries, bright orange sponges, &c.; or those of another cave completely covered in parts with clusters of the tubularia, expanding their delicate arms and feathery mouths; on others with bright yellow and orange actinias of large size and in great numbers, true flowers of the deep, resembling in their shape large alamanda blossoms, some expanded, others closed. Here and there the sea slug crawling, from which the dye is obtained; brought home and placed in a basin of water it died in the night staining the water with a deep crimson. It is one of the very few places and it was one of the very few times in the year where submarine treasures and richness of colouring are revealed to the eye.

I am also in a position to state my own experience of the real tints of that much misrepresented reptile the chamæleon, having captured and received specimens of this creature at Beyrout, on the Jordan, and in Nubia. It possesses, pro-

perly speaking, only two colours, bright apple green with some yellow spots on the side of the body, and a dusky olive tint approaching to black; the former when enjoying open air and sunlight, and the latter when shut up in a box or when poked and teased, on which occasion it puffs out its cheeks and hisses by way of manifesting its displeasure. The effect of feeding the *Lacerta viridis* (Jersey green lizard), also of a bright green when in a state of nature, entirely with milk,—which is not its natural food,—renders its skin likewise very dull in captivity.

How shall I tell of the *Leucojum roseum*, the tiny snow-drop of Corsica, with flower no larger and stalk no longer than that of a violet, with just such a suspicion of pink as may be beheld within the lip of a delicate shell, which I gathered on a November's morning on the short turf above the sea beach at Ajaccio, and which, I have since been told, is to be gathered nowhere else; or how describe flowers beautiful in themselves, rendered more lovely still in consequence of their local surroundings, as the furze thickets of Guernsey, aptly termed "The Field of the Cloth of Gold," that cover the cliffs above and present a lively contrast to the bright blue waters of Moulin Houet Bay; or the sulphur anemone and blue gentian surrounded by perpetual snow as they flourish on the borders of a little blue tarn just beneath the summit of the Great St. Bernard; or the snowy tressed acacia in the suburbs of Constantinople, or those of Smyrna, prettier even than its wont when viewed against the medium of a deep-blue eastern sky or the masses of mauve blossom of the *Paulownia imperialis*,—each flower as large as that of a foxglove, and forming part of a spike and growing on a tree of the dimensions of an English horse-chestnut,—which crown the steep slopes that skirt the Bosphorus; or that gem of beauty, a crimson primula, flowering on the very verge of the Mer de Glace.

Where shall I behold

"Heaven's deathless blue and Earth's eternal green,"

as where the snow-streaked summits of the mighty range of the Lebanon, standing out against the western sky, have their bases carpeted with miles upon miles of young and verdant wheat, waving in the springtide hour, and alternating, like some textile fabric, with the deep red soil?

How can I adequately picture the inimitable blue and green of the ice as seen twenty and thirty feet within the narrow depths of an Alpine crevasse, and all the bluer and all the

greener because of the dazzling fields of snow that shroud the glacier's surface? Or how describe the glaciers themselves, with their billows seemingly all on a sudden congealed, some more snowy than others because more free from the grimy moraine that is rolled down and ground at the same time by their ceaseless action, but all picturesque? How can I do justice to the reddened mountain peaks of Switzerland, reddened in two ways—by the rose of the Alps that clothes their steep sides, and, secondly, as often as those heights of snow blush with a brilliant rose colour beneath the glory of the springing or that of the declining day.

We are familiar with the lines,—

“Where Afric's sunny fountains
Roll down their golden sands.”

And if the term “golden” be understood as applying to the colour only, and not to the metalliferous deposit of those sands, no more suitable appellation could be derived, for nowhere have I ever seen softer, purer, and more golden sands than those forming the drifts which skirt the Libyan banks of the Nile, while partially covering its temples and its tombs. Last, but not least, in point of rarity, I have once in my life seen red snow as it is called, but really consisting of the particles of a very elementary species of lichen, the *Protococcus nivalis*, which grows in high latitudes on the surface of the snowfells, while ascending the great St. Bernard. I may add, in conclusion, that in the compilation of this paper,—which contains too varied facts and results to be the outcome of one person's experience alone, in addition to the record of unscientific travel and observation,—I have been largely indebted to an article in *Chambers's Journal*, Wallace's *Malay Archipelago*, Kingsley's *Christmas in the West Indies*, as well as to Mr. Poulton's scientific papers in the *Proceedings of the Royal Society*.

The CHAIRMAN (H. Cadman Jones, Esq.).—I am sure all present will join in according a vote of thanks to Dr. Walker for his paper. I will now ask the Honorary Secretary to read the communications received in regard thereto.

Captain FRANCIS PETRIE, F.G.S.—The first communication is from Mr. H. E. Cox, F.E.S., who writes :—

“In reading Dr. Walker’s interesting paper on ‘Colours in Nature,’ one cannot but be struck by his reference to the prevalence of blue. I think this can scarcely be considered to extend further than the sky and the sea. The indigo blue, which, no doubt, is the favourite colour in the East, not only in Egypt, but still more in China and Japan, is favoured, I imagine, not so much from the ‘prompting of a picturesque effect,’ as from the facility with which indigo dye can be obtained in those regions compared with the dyes for orange or black.

“In insects I do not think that blue can be called a prevalent colour; certainly among the coleoptera it is not so.

“I can scarcely agree with Dr. Walker in supposing that the usually brighter upper side of the wings of butterflies is due to more exposure to sunlight. I think that I have seen the “white admiral” butterfly sitting on a bush, alternately raising and lowering its wings, and showing a dull black and white upper side and a bright red and white under side. The fritillaries, again, are much brighter on the under side (adorned, as many of them are, with silvery spots), than anything the upper side can show.

“Concerning the iridescence and variable colouring exhibited by some insects, I would observe that, so far as my experience goes, the variable colouring in beetles appears to be confined to red and green. Of this there is a notable example in a *Carabus* found in Spain, the elytra of which appear, when viewed from one direction, to be of an intense coppery red, and, when seen from another point, they become a vivid emerald green. In some of the *cetonidæ* there is a peculiarly bright polished appearance, giving the insect an aspect of having been covered with liquid.”

Mr. F. P. PASCOE, F.L.S., writes:—

“I have read Dr. Walker’s interesting paper, and I can only suggest that the alleged fondness of insects for blue flowers might have been mentioned, as well as Sir J. Lubbock’s experiments with regard to colours in relation to ants. I can confirm Wallace’s account of the absence, or rather the scarcity of flowers in the forests of the Amazon and other tropical parts of South America. Kingsley is also right. In the West Indies, especially in the smaller islands, cultivation has displaced much of the arboreal vegetation, but I doubt if in any of them anything like the Brazilian forests ever existed. Darwin was ‘most affected by the emotions of the

sublime' in those forests (*Life*, iii., p. 55). Dr. Walker's account of the two colours of the chameleon agrees with what I have seen of them in Asia Minor and in Algeria."

The Rev. THEODORE WOOD, F.E.S., writes:—

"Page 86, near end.—The blue of the *Morpho* is due to iridescence; hence, probably, the stability of the colour when exposed to sunlight.

"None of our British moths are blue, and very few of them have any trace of blue about them. I do not know enough of exotic species to state whether this rule holds good among them also; but it is certainly a striking fact as regards those of our own country. Possibly blue is a colour depending more upon sunlight for its development than other hues; red, yellow, and green are all common enough among moths, although the last of these fades so rapidly that it is often only visible in recently-emerged specimens.

"Page 87, near end.—Larvæ of *Arctia caja* fed from birth upon black currant are said to produce very dark *imagines*. Specimens of *Vanessa urticae* and *Polychloros*, reared under blue or yellow glass, are also said to be pale and faded in appearance. In these cases the alteration in hue in the imago would be due to influences affecting the earlier stages only; but the second, of course, cannot occur in nature."

A discussion, of a conversational character, then ensued on various minor points in the paper, in which Major T. A. Freeman, M.A., Oxon., the Revs. Dr. Irving, F.G.S., and Dr. F. A. Walker, F.L.S., and others took part.

The meeting was then adjourned.

ORDINARY MEETING.*

D. HOWARD, ESQ., F.C.S., &c., IN THE CHAIR.

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

LIFE ASSOCIATE :—The Venerable Archdeacon G. Smith Winter, Canada.

ASSOCIATES :—J. Allan Osman, Esq., D.S., United States ; Major Papillon, R.A., Reading.

The following is a report of an extempore address then delivered :—

ON "*THE SCIENCES OF LANGUAGE AND OF ETHNOGRAPHY,*" WITH GENERAL REFERENCE TO THE LANGUAGE AND CUSTOMS OF THE PEOPLE OF HUNZA. By DR. LEITNER, PH.D., LL.D., D.O.L., etc.

THE time has long ago passed when grammar and its rules could be treated in the way to which we were accustomed when at school. Vitality has now to be breathed into the dry bones of conjugations and declensions, and no language can be taught, even for mere practical purposes, without connecting custom and history with so-called "rules." The influences of climate and of religion have to be considered, as also the character of the people, if we wish to obtain a real hold on the language we study. Do we desire to make language a specialty, the preparation of acquiring early in life two dissimilar languages, one analytic and the other synthetic, is absolutely necessary, because if that is not done we shall always be hampered by the difficulty of dissociating the substance from the word which designates it. The human mind is extremely limited, and amongst the limits imposed upon it are those of, in early life, connecting an idea, fact, or process, with certain words ; and unless two languages, at least, are learnt, and those two are as dissimilar as possible, one is always,

* January 21, 1889.

more or less, the slave of routine in the perception and in the application of new facts and of new ideas, and in the adaptation of any matter of either theoretical or practical importance. It is a great advantage, for linguistic purposes, which are far more practically important than may be generally believed, that the study of the classical languages still holds the foremost place in this country; because, however necessary scientific "observation" may be, it cannot take the place of a cultured imagination. The stimulus of illustration and comparison, which, in the historical sense of the terms, is an absolutely necessary primary condition to mental advance, is derived from classical and literary pursuits. The study of two very similar languages, however, is not the same discipline to a beginner in linguistics, *e.g.*, to learn French and Italian is not of the same value as French and German, for the more dissimilar the languages the better.

Again, if you desire to elicit a language of which you know nothing, from a savage who cannot explain it and who does not understand your language, there are certain processes with which some linguists, no doubt, are familiar, and others commend themselves in practical experience; for instance, in pointing to an object which you wish to have, say, a fruit which you want to eat, you may not only obtain the name for it, but the gesture to obtain it, if you are surrounded by several savages whose language you do not know, may also induce one of the men to order another to get it for you,—I suppose on the principle that it is easy for one to command and for others to obey; but, be that as it may, this course, to the attentive observer, first obtains the name for the required thing and next elicits the imperative; you hear something with a kind of inflection which, once heard, cannot be mistaken for anything else than the imperative. Further, the *reply* to the imperative would either elicit "yes," or "no," or the indicative present. This process of inquiry does not apply to all languages, but it applies to a great many; and the attitude which you have to assume towards every language that you know nothing about, in the midst of strangers who speak it, is that, of course, of an entirely sympathetic student. You have, indeed, to apply to language the dictum which Buddhist Lamas apply to religion—never to think, much less to say, that your own religion (in this case your own language) is the best, *i.e.*, the form of expression in which you are in the habit of conveying your thoughts, is one so perfectly conventional, though rational in your case, that the greatest freedom from prejudice is as essential a consideration as the wish to acquire the language

of others. In other words, in addition to the mere elementary acquisition of knowledge, you have to cultivate a sympathetic attitude; and here, again, is one of the proofs of a truth which my experience has taught me, that, however great knowledge may be, sympathy is greater, for sympathy enables us to fit the key which is given by knowledge. Gestures also elicit a response in dealing, for instance, with numerals, where we are facilitated by the fingers of the hand. Of course, one is occasionally stopped by a savage who cannot go, or is supposed not to be able to go, beyond two, or beyond five.

I take it that in the majority of cases of that kind, a good deal of our misconception with regard to the difficulty of the inquiry lies in ourselves—that ideas of multitude connected with the peculiar customs of the race that have yet to be ascertained, are at the bottom of the inability of that race to follow our numeration. For instance, we go up to ten, and in order to elicit a name for eleven, we say “one, ten”; if the man laughs, change the order, and say “ten, one”; the chances are that the savage will instinctively rejoin “ten *and* one,” and we then get the conjunction. Putting the fingers of both hands together may mean “multitude,” “alliance,” or “enmity,” according as the customs of the race are interpreted by that gesture.

I am reminded of this particular instance in my experience, because I referred to it in a discussion on an admirable paper on the Kafirs of the Hindukush by the eminent Dr. Bellew, who, I hoped, would have been present this evening. If you do not take custom along with a “rule,” and do not try to explain the so-called rule by either historical events or some custom of the race, you make language a matter entirely of memory, and as memory is one of the faculties that suffers most from advancing age, or from modes of living and various other circumstances, the moment that memory is impaired your linguistic knowledge must suffer,—you, therefore, should make language a matter of judgment and of associations. If you do not do that, however great your linguistic knowledge or scholarship, you must eventually fail in doing justice to the subject or to those with whom you are dealing.

The same principle applies as much to a highly civilised language like Arabic, one of the most important languages in the way of expressing the multifarious processes of human thought and action, as to the remnant of the pre-historic Hunza language with which I am going to deal to-night, and which throws unexpected light on the science of language.

Let us first take Arabic and the misconceptions of

it by Arabic scholars. In 1859 I pointed out before the College of Preceptors, how it was necessary not only to discriminate between the Chapters in the Koran delivered at Mecca, and those given at Medina, but also to arrange the verses out of various Chapters in their real sequence. I believe we are now advancing towards a better understanding of this most remarkable book. But we still find in its translation such passages, for instance, as, "when in war women are captured, *take* those that are not married." The meaning is nothing so arbitrary. The expression for "take" that we have there is *ankohu*—marry, *i.e.*, take in marriage or *nikáh*, as no alliance can be formed with even a willing captive taken in war, except through the process of *nikáh*, which is the religious marriage contract. Again we have the passage, "Kill the infidels wherever you find them." There again is shown the want of sympathetic knowledge which is distinct from the knowledge of our translators who render "qátilu" with "kill" when it merely means "fight" and refers to an impending engagement with enemies who were then attacking Muhammad's camp. Apart from accuracy of translation, a sympathetic attitude is also of practical importance, *e.g.*, had we gone into Oriental questions with more sympathy and, in consequence, more real knowledge, many of our frontier wars would have been avoided, and there is not the least doubt that in dealing with Oriental humanity, whether we had taken a firm or a conciliatory course, we should have been upon a track more likely to lead to success than by taking action based on insufficient knowledge or on preconceptions. For instance, in this morning's *Times* there was a telegram from Suakim about the Mahdi, to the effect that El Senousi was opposing him successfully. I do not know who El Senousi is, but very many years ago I pointed out the great importance of the Senousi sect in Africa, and, unless the deceased founder of that name has now arisen, whether it is a man of that name or the now well-known sect that is mentioned, one cannot say from the telegram. The sender of the message states that as sure as the El Senousi rises to importance there will be a danger to Egypt and to Islam. But I am not sure that the writer accurately knows what Islam is; though there can be no doubt that the rise of fanatical sects, like the Senousi, which is largely due to the feeling of resistance created by the encroachments of so-called European civilisation, is opposed to orthodox Muhammedanism. Be that as it may, I also turned to-day to "the further correspondence on the affairs of Egypt" which a friend gave me, and really I now know rather

less about Egypt than I did before. For instance, I find (and I am specially referring to the blue-book in my hand) that letters of the greatest importance from the Mahdi are treated in the following flippant manner: "This is nothing more or less than an unauthenticated copy of a letter sent by the deceased Mahdi to General Gordon!" Is this not enough to deserve attentive inquiry? General Gordon would, probably, not have agreed with the writer of this contemptuous remark, which is doubly out of place when we are also told that the Mahdi was sending Gordon certain verses and passages from the Koran, illustrative of his position, which are eliminated by the translator as unnecessary, of no importance, and of very little interest! Now, considering that this gentleman knows Arabic, I think I am right when I add that with a little more sympathy he would have known more, and had he known more he would have quoted those passages, for it is most necessary for us to know on what precise authority of the Koran or of tradition this so-called Mahdi bases his claim, and knowledge of this kind would give us the opportunity of dealing with the matter. Again, on the question of Her Majesty's title of "Kaisar-i-Hind," which, after great difficulty, I succeeded in carrying into general adoption in India, the previous translators of "Empress" had suggested some title which would either have been unintelligible or which would have given Her Majesty a disrespectful appellation, whilst none would have created that awe and respect which, I suppose, the translation of the Imperial title was intended to inspire. Even the subsequent official adopter of this title, Sir W. Muir, advocated it on grounds which would have rendered it inapplicable to India. With the National Anthem, similarly, we had a translation by a Persian into Hindustani which was supported by a number of Oriental scholars in this country, who either did not study it or who dealt with the matter entirely from a theoretical point of view, and what was the result? The result was—that for "God save the Queen" a passage was put which was either blasphemous, or which, in popular Muhammedan acceptance, might mean "God grant that Her Majesty may again marry!" whereas one of the glories of Her Majesty among her Hindu subjects is that she is a true "Satti" or Suttee, viz.: a righteous widow, who ever honours the memory of her terrestrial and spiritual husband—neither of these views being intended by the translator, nor by that very large and responsible body of men who supported him, and that still larger and emphatically loyal body that intended to give the translation of the National Anthem as a gift to India at a cost of several

thousand pounds, when for a hundred rupees a dozen accurate and respectful versions were elicited by me in India itself.

I, therefore, submit that in speaking of the sciences of language and ethnography, we have, or ought to have, passed, long ago, the standpoint of treating them separately; they must be treated together, and, as I said at the beginning, taking *e.g.* Arabic, with its thirty-six broken plurals (quite enough to break anybody's memory), you will never be able to learn it unless you thoroughly realise the life of the Arab, as he gets out of his tent in the morning, milches his female camel, &c., and unless you follow him through his daily ride or occupations. Then you will understand how it is, especially if you have travelled in Arabia, that camels that appear at a distance on the horizon affect the eye differently from camels when they come near, and are seen as they follow one another in a row, and those again different from the camels as they gather round the tent or encampment; and therefore it is that in the different perceptions to the eye, under the influence of natural phenomena, these multifarious plurals are of the greatest importance in examining the customs of the people. Then will the discovery of the right plural be a matter of enjoyment, leading one on to another discovery, and to work all the better; whereas, with the grammatical routine that we still pursue, I wonder, when we reach to middle or old age, after following the literary profession, that we are not more dull or confused than we are at present. When one abstract idea follows the other, as in our phraseology, it is not like one scene following another in a new country which is full of stimulus, but the course we adopt of abstract generalisations, without analysing them and bringing them back to their concrete constituents, is almost a process of stultification.

Coming now to one of the most primitive, and certainly one of the remnants of a pre-historic language, that of Hunza, which I had the opportunity of examining twenty-three years ago, while Gilgit was in a state of warfare, and where I had to learn the language, so to speak, with a pencil in one hand and a weapon in the other, and surrounded by people who were waiting for an opportunity to kill me, I found that on reverting to it three years ago the language had already undergone a process of assimilation to the surrounding dialects, owing to the advance of so-called civilisation, which in that case, and which in the case of most of these tribes, means the introduction of drunkenness and disease, in this instance, of cholera, for we know what has been the condition of those countries which lie in

the triangle between Cashmere, Kabul, and Badakhshan, and to which I first gave the name of Dardistan in 1866.

Now, what does this language show us? There the ordinary methods proved entirely at fault. If one pointed to an object, quite apart from the ordinary difficulties of misapprehension, the man appealed to, for instance, might say "your finger," if a finger were the thing of which he thought you wanted the name. If not satisfied with the name given in response, and you turned to somebody else, another name was obtained; and if you turned to a third person, you got a third name.

What was the reason for these differences? It was this, that the language had not emerged from the state in which it is impossible to have such a word as "head," as distinguished from "my head," or "thy head," or "his head"; for instance, *ak* is "my name," and *ik* is "his name." Take away the pronominal sign, and you are left with *k*, which means nothing. *Aus* is "my wife," and *gus* "thy wife." The *s* alone has no meaning, and, in some cases, it seemed impossible to arrive at putting anything down correctly; but so it is in the initial stage of a language; in the Hunza language under discussion, that stage is important to us as members of the Aryan group, as the dissociation of the pronoun, verb, adverb and conjunction from the act or substance only occurs when the language emerges beyond the stage, when the groping, as it were, of the human child between the *meum* and *tuum*, the first and second persons, approaches the clear perception of the outer world, the "*suum*," the third person. Now, during the twenty years referred to "his" (house), "his" (name), and "his" (head) are beginning to take the place of "house," "name," "head," generally, in not quite a decided manner, but still they are taking their place. When I subsequently talked to the Hunzas, and tried to find a reason for that "idiom," if one may use the term, it seemed very clear and convincing when they said, "How is it possible for 'a wife' to exist unless she is somebody's wife?" "You cannot say, for instance, if you dissociate the one from the other, 'her wife,' or 'his husband.' 'Head,' by itself, does not exist; it must be somebody's head." When, again, you dissociate the sound which stands for the action or substance from the pronoun, you come, in a certain group of words, to another range of thought connected with the primary family relation, and showing the existence of that particularly ancient form of endogamy, in which all the elder females are the mothers and all the elder men are the fathers of the tribe. For instance, take a word like "mother," "m"

would mean the female principle, "o" would be the self, and the *ther* would mean "the tribe"; in other words, "mother" would mean: "the female that bore me and that belongs to my tribe." Now, fanciful as this may appear to us, it is the simple fact as regards the Hunza language, which, when put to the test of analysis, will throw an incredible light on the history of Aryan words. For instance, taking Sanskrit as a typical language, you will, I believe, find how the early relations grew, and you will get beyond the root into the parts of which the root is made up; each of which has a meaning, not in one or two instances, but in most. I am not going to read you this volume which I am preparing for the Indian Government, and which is only the first part of the analysis with regard to this language, and only a very small portion indeed of the material that I collected in 1866, 1872, and 1884 regarding that important part of the world, Dardistan, which is now being drawn within the range of practical Indian politics—a region situated between the Hindukush and Kaghan (lat. 37° N. and long. 73° E. to lat. 35° N. and long. 74°30' E.), and comprising monarchies and republics, including a small republic of eleven houses—a region which contains the solution of numerous linguistic and ethnographical problems, the cradle of the Aryan race, inhabited by the most varied tribes, from which region I brought the first Hunza and the first Káfir that ever visited England, and of which region one of its bigger Chiefs, owing to my sympathy with the people, invested me with a kind of titular governorship. In that comparatively small area the questions that are to be solved are great, and it is even now in some parts, perhaps, as hazardous a journey as, say, through the dark continent. Whether you get to the ancient Robber's Seat of Hunza, where the right of plundering is hereditary, or into the recesses of Kafiristan or the fastnesses of Pakhtu settlers; whether you proceed to the republics of Darel, Tangír or Chilás, or proceed to the community, where women are sometimes at the head of affairs, and which is neither worse nor better than others, an amount of information, especially ethnographic, is within one's reach, which makes Dardistan a region that would reward a number of explorers. I may say, in my own instance, if my life is spared for ten years longer, all I could do would be to bring out the mere material in my possession in a rough form, leaving the theories thereon to be elaborated by others. My difficulties were great, but my reward has been in a mass of material, for the elaboration of which International, Oriental, and other Congresses and learned societies have petitioned Government since 1866. My official duties

have hitherto prevented my addressing myself to the congenial task of elaborating the material in conjunction with others. In 1886 I was, however, put for a few months on special duty in connexion with the Hunza language, at the very time that Colonel Lockhart was traversing a portion of Dardistan. But I think you will be more interested if, beyond personal observations, I tell you something about that little country of Hunza itself, which in many respects differs from those surrounding it, not only in regard to its peculiar language, which I have mentioned, but in other respects also. Unfortunately, it is also unlike the surrounding districts in being characterised by customs, the absence of some of which would be desirable. The Hunzas are nominal Muhammedans, and they used their mosques for drinking and dancing assemblies. Women were as free as air. There was little restriction in the relation of the sexes, and the management of the State, in theory, is attributed to fairies. No war is undertaken unless the fairy (whom, by the way, one is not allowed to see), gives the command by beating the sacred drum. The witches, who get into an ecstatic state, are the journalists, historians, and prophetesses of the tribe. They tell you what goes on in the surrounding valleys. They represent, as it were, the local *Times*; they tell you the past glories, such as they are, of raids and murders by their tribe; and when the *Tham* or ruler, who is supposed to be heaven-born (there being some mystery about the origin of his dynasty), does wrong, the only one who will dare to tell him the truth is the Dayal, or the witch who prophesies the future, and takes the opportunity of telling the Rajah that, unless he behaves in a manner worthy of his origin, he will come to grief! This is not a common form of popular representation to be met with, say, in India. Grimm's fairy-tales sometimes seem to be translated into practice in Hunza-land, which offers material for discussion alike to those who search for the Huns and to those who search for the very different Honas.

Then with regard to religion, as I said before, though nominally Muhammedan, they are really deniers of all the important precepts of true Muhammedanism, which is opposed to drunkenness, introduces a real brotherhood, and enjoins great cleanliness as absolutely necessary before the spiritual purification by prayer can take place. The people are mostly Muláís, but inferior in piety (?) to those of Zébak, Shignán, Wakhan, and other places. Now, what is that sect? It is represented by His Highness Prince Aga Khan, of Bombay, a person who is not half aware of his importance in those regions, where, till very recently, men

were murdered as soon as looked at. One who acknowledges him, or has brought some of the water with which he has washed his feet, would always be able to pass through those regions perfectly unharmed ! I found my disguise as a Bokhara Mullah in 1866 to be quite useless, as a protection, at Gilgit, whence men were kidnapped to be exchanged for a good hunting dog, but in Hunza they used to fill prisoners with gunpowder, and blow them up for general amusement. His Highness, who is much given to horse-racing, confines his spiritual administration to the collection of taxes throughout Central Asia from his followers or believers, and the believers themselves represent what is still left of the doctrine of the Sheik-ul-Jabl or the Ancient of the Mountain, the head of the so-called Assassins, a connexion of the Mahdi, if he be the Mahdi, or the supposed Mahdi, in the Soudan. I consider he is not the Mahdi as foretold in Muhammedan tradition ; but, be that as it may, the 7th Imám of the Shíahs has given rise to the sects both of the Druses in the Lebanon and to the Hunzas on the Pamir. They are the existing Ismailians, who, centuries ago, under the influence of *Hashish*, the Indian hemp, committed crimes throughout Christendom and were the terror of Knight-Templar, as "Hashishín," corrupted into "Assassins."

Now I have been fortunate enough, owing to my friendship with the head of their tribe, to obtain some portions of the *Kelám-i-pír* volume, which takes the place, really, of the *Korán*, and of which I have got a portion here. I thought it might not be unworthy of your society to bring this to your knowledge, as a very interesting remnant which throws, *inter alia*, considerable light, not only on their doctrine, but also on the Crusades. By a similar favour, I have had the opportunity of hearing the *Mitháq*, or covenant of the Druses, and that covenant of the Druses is a kind of prayer they offer up to God, not only in connexion with the Old Man of the Mountain, the head of the Assassins who began about 1022, but also with those mysterious rites which also take place in what I may call the fairy-land of Hunza. I do not know whether you are already wearied, but, if not, I might, perhaps, read you out some portions. First, with regard to the covenants, or one of them, which the "U'quelá" or the "initiated" or "wise," as distinguished from the "Juhelá" or "ignorant" "laity," among the Druses, offer up every night.

This Druse covenant makes the mad Fatimite ruler of Egypt, Hakim, the "Lord of the Universe." As I said before, the present "Lord of the Universe" for the Hunzas is the lineal descendant of the 7th Imám, a resident of Bombay, one to whom the *Muláís* make pilgrimages, instead of going to

Mecca or to Kerbelá. You may imagine that, even as regards the Druses, there must be something higher than *their* "Lord of the Universe"; but, such as he is, it is with him that this covenant is made. Reverting to his living colleague, the Indian "Lord," it may be stated that there are men scattered throughout India of whose influence we have only the faintest conception. I pointed out in 1866 that if any one wanted to follow successfully my footsteps in Dardistan he would have to get recommendations from His Highness Aga Khan of Bombay, and I am glad to say that Col. Lockhart has taken advantage of that recommendation. The Druse "Lord of the Universe" is regarded as one with whom nothing can be compared. The Druses are to render him the most implicit obedience, and to carry out his behests at the loss of everything, good name, wealth, and life, with the view of obtaining the favour of one who may be taken to be God; but the sentence is so constructed as to make him, if not God, only second to God; in other words, only just a discrimination between God as the distant ruler of the Universe and, perhaps, some lineal descendant of Hakim, or rather, Hakim himself as an ever-living being, as the ruler of *this* world. This and some other prayers, with some songs, one amongst which breathes the greatest hatred to Muhammedanism, and speaks of the destruction of Mecca as something to look forward to, seem to be deserving of study. There are also references in them to rites connected with Abraham. A full translation of these documents, compared with invocations in portions of the Koran, would, indeed, reward the attention of the student.

I will now again revert from the Druses of the Lebanon to the Muláís in the Himalayas. I obtained the poem in my hand from the head of that sect, and the wording is so that it denies whilst affirming the immortality and transmigration of souls. It says, "It is no use telling the ignorant multitude what your faith is." "Tell them," continues the poem in effect, "if they want to know, in an answer of wisdom to a question of folly: 'if your life has been bad you will descend into the stone, the vegetable, or the animal; if your life has been good you will return as a better man. The chain of life is undivided. The animal that is sacrificed proceeds to a higher life.' You cannot discriminate and yet deny individual life, and apportion that air, stone, or plant to the animal and to man, but you ought to be punished for saying this to others!" And on this principle at any rate the Druses also act or acted, that that is no crime which is not found out; and a good many people, I am sorry to say, elsewhere think

much the same; whereas in Hunza they have gone beyond that stage, and care extremely little about their crimes being found out. The Mitháq and other religious utterances of the Druses and the Kelám-i-Pír of the Hunzas, if published together, with certain new information which we have regarding the Crusade of Richard Cœur-de-Lion, would, I think, were time given and the matter elaborated, indeed deserve the attention of the readers of your "Transactions." It also seems strange that where such customs exist there should be a prize for virtue, but there is one in Hunza for wives who have remained faithful to their husbands, something like the French prize for *rosières*.

(Formerly Suttee was practised, but Suttee had rather the meaning of Sáthi or companion, as both husband and wife went to the funeral pyre.) Prizes are similarly given to wives who have not quarrelled for, say, a certain number of years with their husbands. The most curious custom which seems to permeate these countries is to foster relationship in nursing where a nurse and all her relations come not only within the prohibited degrees, which is against the spirit of Muhammedanism, but also create the only real bond of true attachment that I have seen in Dardistan, where other relatives seemed always engaged in murdering one another.

Nearly all the chiefs in Dardistan give their children to persons of low degree to nurse, and these and the children of the nurse become attached to them throughout life, and are their only friends. But this foster-relationship is also taken in order to get rid of the consequences, say, of crime; for instance, in the case of adultery, or supposed adultery, the suspected person who declares that he enters into the relationship of son to the woman with whom he is suspected, after a certain penalty, is really accepted in that position, and the trust is in no case betrayed. It is the only kind of forgiveness which is given in Dardistan generally to that sort of transgression; but further than that, drinking milk with some one, or appointing some one as foster-father, which is done by crossing two vases of milk, creates the same relationship, except amongst the noble caste of Shins, who were expelled by the Brahmins from India or Kashmír, and who hold the cow in abhorrence as one of their religious dogmas, whereas in other ways they are really Brahmins, among whom we find Hindooism peeping out through the thin crust of Muhammedanism.

Finally, there are differences amongst Muhammedans as great as there are between a good Christian who tries to follow the Sermon on the Mount, and a merely

nominal Christian. Science and religion, according to a Muhammedan saying, are twins, and if I understand the object of this Society, it is in order to make this twinship (if I may be allowed to use the expression) more real than your labours have been initiated, and that, under Providence, they have been carried to the successful results that have followed them both here and abroad.

The CHAIRMAN (David Howard, Esq., F.C.S.).—Dr. Leitner has given us a most interesting discourse, interesting not only in what he has placed before us, but also in his suggestions of what we should like to hear. I believe the principle that he has laid down of the importance of not merely studying a language, but of studying it in connexion with the modes of thought, habits, and life, and so forth, of the people, is of primary importance. You find people trying to understand Eastern literature in the light of Western thought, and importing generic terms and tenses into a language which has no tenses at all, and so on. I believe the principle of Dr. Leitner's subject is of vital importance, and the glimpses he has given us of strange people and languages throw an interesting light on a mysterious problem, upon which I trust we shall hear a good deal more, from the learned author, than we have yet heard. Dr. Leitner is obliged to hurry away, and I am sure, on your behalf, I may convey to him your hearty thanks for having come here at no little inconvenience to himself to give us this most interesting address.

The meeting was then adjourned.

REMARKS.

Dr. CHAPLIN writes as follows: "Dr. Leitner's remarks upon what he called 'sympathy' in investigating the speech of a little-known people seemed to me just and valuable. Doubtless, a consideration of the physical conditions, history, and habits of thought of a people is most important to the understanding and explaining idioms and forms of speech. When a Spanish Jewess, for instance, in reply to a polite inquiry after her well-being, says 'sus enemigos,'—'your enemies,' her meaning is not clear until we remember that she is accustomed to think and speak in an Oriental way, and unconsciously

to use Bible phraseology. In her mind to say 'sus enemigos' is a courteous way of intimating that she is suffering trouble; 'May your enemies be as I am'! (cf. 2 Samuel xviii. 32). When we are told (Genesis xxix. 1) that 'Jacob lifted up his feet and came into the land,' &c., we are to understand that he *hastened* on his way. The phrase is still in use, and indicates the raising of the feet in running or rapid walking, instead of the slouching gait common to people who wear unwieldy shoes or sandals when they are going leisurely. It is an every-day custom in Palestine for the country people to take off their shoes and carry them in their hands or their girdle in order that they may more readily 'lift up their feet' when in a hurry."

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 :—The Rev. Canon W. Barker, M.A., London ; Professor G. W. Curtis, M.D., Vice-Chancellor of the University of the State of New York, United States ; C. A. Vince, Esq., M.A., Fellow C.C. Cambridge, Head Master of Mill Hill School ; Rev. Joseph Wood, M.A., Principal of Wesley College, Nottingham.

HON. CORRESPONDENTS :—Professor H. W. Parker, Professor of Natural History, Iowa College, United States ; Principal W. N. Willis, B.A., St. John's Coll., Camb. ; Ascham School, Eastbourne.

The following Paper was read by the Author :—

MODERN SCIENCE AND NATURAL RELIGION. By
the Rev. C. GODFREY ASHWIN, M.A.

THERE is always a tendency to over-estimate the personal and the present ; and it would be presumptuous to anticipate the verdict of succeeding generations on the nineteenth century, in which our lot is cast. But there is a general consensus of opinion amongst its contemporaries that it constitutes one of the critical periods of human history, leading up to some great climax, if not to the greatest, in the world's history. And the question occurs, To what do all the mighty changes by which it is characterised tend?—to a happier state of things, or to something like moral and political chaos ? These changes manifest themselves in three marked lines :—

Political changes,—changes in which the constitution of civilised lands, brought about by home reforms, are greater even than the national changes which have been brought about by war.

Religious changes,—Christian activity greater than in any previous period since the Apostolic days, so that the nineteenth century is emphatically the missionary century of the world ; but, accompanying this activity, a more wide-spread and open scepticism than in any previous time.

Scientific changes,—a truly marvellous advance in the knowledge of nature and some of the laws by which she is

governed, and an application of her treasury to the enrichment of human life, with comforts, luxuries, and information of which poets may have dreamed, but our predecessors formed no conception.

And many nervous minds are trembling lest the discoveries of modern science, or rather the more accurate observations of modern scientists, should overturn the conclusions our forefathers had arrived at from their more limited observations of the physical universe. This is the subject of the present paper. How far do the demonstrations of science justify scepticism? Are the conclusions of modern scientists in the direction of Agnosticism or Theism? Do they modify the deductions of what we understand as Natural Theology? *Natural Theology*,—for Revealed Religion occupies an altogether different platform, and as far as our present subject is concerned, we have nothing to do with the Bible.

But Natural Theology is a very wide subject, and embraces two distinct lines of thought,—physical and metaphysical,—the latter of these will be considered of primary importance by those who think that “the proper study of mankind is man,” and the natural yearnings of the spirit of man for a knowledge of the Father of spirits can best be sought in the history and constitution of the human mind; the former by those who think a knowledge of the mysteries of the physical world is best calculated to reveal The Secret that underlies all things. To the first class the anatomy, physiology, and pathology of man’s mental and moral nature must appear the most promising and hopeful field of investigation; and John Stuart Mill and Herbert Spencer, and writers of that kind, will be regarded as the great authorities from whom they may hope to derive the light they seek. Respecting this branch of the subject, notwithstanding the common protestation against anything like anthropomorphic views of the Creator, supposing the universe to be a creation, it seems impossible for the human mind to form any conception of the Divine Being that is not anthropomorphic. For it is impossible for beings possessing any consciousness of intelligence, will, purpose, and power, to conceive the universe to have been formed, organised, and governed by a Being who does not possess, in an unlimited degree, those attributes which distinguish, though in a limited degree, man from all other beings with which he is acquainted. That is, he cannot but endow the God of his imagination with anthropomorphic qualities. Mr. Frederic Harrison, the Positivist leader, says:—“I say, in a word, unless religion is to be anthropomorphic there can be no working religion at all!”

Still, although the mental and spiritual nature of man cannot be altogether passed by by the scientific man in any conclusions he may draw from his studies of nature,—for mental and spiritual facts are as positive existences as the sun and the earth,—far more attention is paid to physical science, and far greater progress has been made in its study than in that connected with the inner man, and it is to the modern reading of what is called “the book of nature,” and its bearing on the older deductions from it, the attention of the reader is more especially directed. The book of nature is one whose leaves have been well thumbed by many careful readers,—read and re-read and differently interpreted by successive generations of students, and by the same student in different stages of his education; and we must bear in mind that this book is to a considerable extent written in a foreign language, the niceties and peculiarities of which are still only partially understood by its ablest scholars. So much so, indeed, that it is like a picture, the most perfect, the most sublime, the most expressive that can be conceived, but still a picture, which each observer reads through the idiosyncrasies of his own mind; and as even articulate words, in our own language, convey different shades of meaning to different minds, we must be prepared, to some extent, for different interpretations of recognised facts of science.

But while prepared to accept fully and most gladly any clearly-proved facts, no matter what may be involved in the recognition,—more than this, while willing to give all due consideration to any probable theory which cannot as yet be regarded as proved,—we must carefully distinguish between facts and theories, and remember that the history of scientific progress is the history of a long list of erroneous, imperfect, and discarded theories, each preparing the way for less erroneous interpretations. None recognise this more clearly than the great apostles of modern science; for instance, the late Mr. Darwin said, in his *Descent of Man*, p. 385: “Many of the views which have been advanced are highly speculative, and some, no doubt, will prove erroneous. False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as every one takes a salutary pleasure in proving their falseness; and when this is done, one path of error is closed, and the road to truth is often at the same time opened.” Professor Huxley is, if possible, even more definite. He says: “Our way of looking at nature and speaking about her varies from year to year, but a fact once seen, a relation of cause to effect once demonstratively apprehended, are possessions which

neither change nor pass away, but, on the contrary, form fixed centres about which other truths aggregate by a natural affinity."*

Every one must admit the truth of this conclusion as regards *facts*, and no one could give a more earnest warning respecting the theories, that vary from year to year, than he has done in these words: "The army of liberal thought is at present in very loose order, and many a spirited free-thinker makes use of his freedom mainly to vent nonsense." †

This must be borne in mind in considering both the accepted facts of science and some of the more prominent and plausible speculations. The following are generally admitted as facts:—

1. The immense duration of the earth's history.
2. The gradual formation of the earth's crust by processes still in operation.
3. The homogeneous character of the materials of which sun, moon, and planets, including our own earth, are composed.
4. The uniformity and inviolability of the laws of nature.
5. The vast duration of human life on earth.
6. The indestructibility of matter.

It is true that some would relegate the last two of these from the category of proved facts to that of prominent and plausible speculation. For, the evidence of the extreme antiquity of man does not appear conclusive to all. And the theory that matter may be merely a form of vortical motion of a pure fluid which fills the universe is supposed by some to modify former conclusions as to the indestructibility of matter. ‡

Amongst the plausible speculations not yet accepted as facts are,—

(a.) The evolution of higher from lower forms of organic life, including the animal and man.

* *Lay Sermons*, p. 124.

† *Ib.*, p. 69.

‡ Supposing the Kinetic theory of the structure of matter be proved, and a very superficial knowledge of the theory is deeply interesting and highly suggestive, how far does it affect the question of the destructibility or indestructibility of matter? Professor Tait says: "If we adopt Sir William Thomson's notion of a perfect fluid filling infinite space, all vortex rings, and therefore, according to Sir W. Thomson, all atoms of matter, must necessarily be endless; that is, must have their ends finally united together. Secondly, Helmholtz shows that such a ring is indivisible; in that sense 'a vortex ring' is literally an atom. Therefore, if any portions of the perfect fluid have vortex motion communicated to them, they will remain for ever

(b.) That all life is developed from some common protoplasm.

(c.) That all the phenomena of life are the necessary consequences of certain complicated combinations of the particles of matter.

Now, if the six propositions assumed to be facts and the only accepted facts of science upon which the highest authorities on the subject are agreed be accepted, what do they absolutely involve?

First. A beginning so distant as to be practically, to our finite minds, an illimitable past.

Secondly. A common origin of the whole universe,—at any rate, of all parts of it which are open to human observation.

Thirdly. A ceaseless progress from a lower to a higher stage of existence, brought about by the operation of perfect and, therefore, unchangeable instrumentalities.

Fourthly. Uniformity of the operations of these instrumentalities.

Fifthly. Uniformity of design pervading the whole, and most clearly manifested in the vegetable and animal kingdom.

These conclusions from what are generally accepted by scientific men as facts, are not affected by those speculations which, in some form or other, are widely accepted as to the evolution of all life from some common protoplasm; the necessary connexion of vitality with a certain combination of molecular particles; for, if ultimately proved to be true, they would only deepen the conviction of an eternity past,—a common something or nothing, out of which all things have been produced,—a constant, ever-active, ever-efficient force or power, which has brought into their present condition the world we inhabit, the unmeasured numbers and variety of living creatures which crowd it, and, chiefest of all, the wonderful powers of thought and delicacy of feeling and vitality of memory which distinguish Man as the highest, noblest organisation of which science has any knowledge. It is manifest these conclusions in no way justify Scepticism,—for Scepticism concerns itself with the question of Revelation from

stamped with that vortex motion; they cannot part with it, it will remain with them as a characteristic for ever, or at least until the creative act which produced it shall take it away again." But "if this property of rotation should be the basis of all that to our senses appeals as matter," and must go on for ever,—unless checked by a similar act of force which first set it in motion,—then it would but return to the condition of the supposed perfect fluid, of which it is alone composed, to a condition of imperceptible materiality, which, by again receiving vortical motion, would again become perceptible matter.

a recognised Creator,—but do they naturally lead on to Agnosticism or to Deism? It seems to the writer that though many of the prophets of science call themselves Agnostics, their deductions from nature are distinctly Theistic! They have removed many erroneous interpretations of physical facts,—they have brought many fresh truths before the mind, but the more clearly they have laid open the vastness and complexity of nature,—the more conclusively they have demonstrated the almost incredible activity of molecular motion,—the more distinctly they have established the inseparable connexion which unites every particle of our solar system,—the more clearly, *also, they have proved* the all-embracing order, *law, purpose*, by which they are associated, through which they have been brought into their present condition, from “a beginning, infinitely remote,” by which they are still acting, governed, and directed.

Let them speak for themselves. First, they recognise “a beginning.” Professor Huxley says: “Astronomy, which leads us to contemplate phenomena the very nature of which demonstrates that they must have had a beginning and that they must have an end, but the very nature of which also proves that the beginning was, to our conception of time, infinitely remote, and that end as immeasurably distant.”*

Then they emphatically exclude the possibility of “chance” having brought about the phenomena they have investigated: declaring that a “purpose” was being worked out, by means “adapted” to accomplish it, through the instrumentality of “law” and “order,” directed by a “force” which “necessitated” the accomplishment of the purpose.

For Professor Tyndall says: “Within the long range of physical inquiry,” and that extends from “the outer rim of speculative science,—for beyond the nebulae scientific thought has never ventured hitherto,”—“within the long range of physical inquiry they have never discovered the insertion of caprice, throughout this range physical and intellectual continuity have run side by side.” “No matter how subtle a natural phenomenon may be, whether we observe it in the region of sense or follow it into that of imagination, it is, in the long run, reducible to mechanical law.” He illustrates this, as regards the mineral kingdom, by the Pyramids. “The blocks in this case were moved and posited by a power external to themselves, and the final form of the Pyramid expressed the thought of the human builder.” “In the same way salt crystals,” therefore all crystals, “are built up, those molecular

* *Lay Sermons*, p. 17.

blocks of salt are self-positing, being fixed in their places by the forces with which they act upon each other." But the gifted scientist goes on to apply this manifestation of "mechanical law," this outcome of this force, to vegetable and animal life, to the arrangement of "self-posed" molecules in a grain of corn and in every portion of the animal frame, so that "an intellect, the same in kind as our own,—if only sufficiently expanded,—would be able to follow the whole process from beginning to end," and "with the necessary data, the chick might be deduced as rigorously and as logically from the egg as the existence of Neptune from the disturbances of Uranus." Moreover, he goes on to say there is a necessity underlying the molecular action, "as the motion of the hands of a watch follow of necessity from the inner mechanism of the watch when acted upon by the force invested in the spring, the phenomena of nature have their inner mechanism, and their store of force to set that mechanism going."

Professor Huxley is equally definite in his testimony. He says, speaking of the development of the lobster from "a semi-fluid mass of yolk not so big as a pin's head, contained in a transparent membrane, and exhibiting not the least trace of any one of those organs, whose multiplicity and complexity in the adult are so surprising," appeals to this development as a proof of unity of plan, and says: "Thus the study of development proves that the doctrine of unity of plan is not merely a fancy, that it is not merely one way of looking at the matter, but that it is the expression of deep-seated natural facts."

Again, he says: "Suppose we had known nothing of the lobster but as an inert mass, an organic crystal,—if I may use the phrase,—and that we could suddenly see it exerting all these powers, what wonderful new ideas and new questions would arise in our minds! The great new question would be, How does all this take place? The chief new idea would be the idea of *adaptation to purpose*,—the notion that the constituents of animal bodies are not mere unconnected parts, but organs working together to an end"; but he goes even further than this. He says: "All who are competent to express an opinion on the subject are at present agreed that the manifold varieties of animal and vegetable life have not either come into existence by chance, nor result from capricious exertions of creative power, but that they have taken place in a definite order, the statement of which order is what men of science term a natural law," and while their deductions are so distinct from what they accept as facts, they are confident that these conclusions will not be modified,

supposing the present favourite theories should ultimately be received as facts.

Darwin, in speaking of his conclusions respecting the descent of man,* says: "I am aware that the conclusions arrived at in this work will be denounced by some as highly irreligious; but he who thus denounces them is bound to show why it is more irreligious to explain the origin of man, as a distinct species, by descent from some lower form, through the laws of variation and natural selection, than to explain the birth of the individual through the laws of ordinary reproduction. The birth of the species and of the individual are equally parts of that grand sequence of events which our *minds refuse to accept as the result of blind chance.*" Dr. Asa Gray says: † "There is no tendency in the doctrine of variation and natural selection to weaken the foundations of natural theology, for, consistently with the derivative hypothesis of species, we may hold any of the popular views respecting the manner in which the changes of the natural world are brought about." And Tyndall, in the magnificent scientific prose poem which constituted his address on "the scientific use of the imagination," before the British Association at Liverpool, in 1870, in considering the question whether the commencement of life was a new creation, after the earth had been brought into a state for its reception, or whether it was an evolution from previously existing matter, says: "We long to know something of our origin. If the evolution hypothesis be correct, even *this unsatisfied yearning* must have come to us across the ages which separate the unconscious primeval mist from the consciousness of to-day. . . . Fear not the evolution hypothesis. Steady yourselves in its presence upon that faith in the ultimate triumph of truth which was expressed by old Gamaliel, when he said, 'If it be of God ye cannot overthrow it.' Under the fierce light of scientific inquiry this hypothesis is sure to be dissipated if it possess not a core of truth. Trust me, its existence in the mind is quite compatible with the simultaneous existence of all those virtues to which the term Christian has been applied. It does not solve, it does not profess to solve, the ultimate mystery of the universe. It leaves, in fact, that mystery untouched."

True, they are careful to express their Agnosticism of the origin of the source of the "force which set the mechanism of nature" going. Thus, speaking for all scientists, Tyndall

* *Descent of Man*, vol. ii. p. 395.

† Lyell's *Antiquity of Man*, 4th edition, p. 551.

says: "If you ask him whence is this matter of which we have been discussing, who or what divides it into molecules, who or what impressed upon them the necessity of running into organic forms?" he has no answer to give. Science is mute in reply to such questions. But, if the materialist is confounded, and science rendered dumb, who else is prepared with a solution? To whom is the arm of the Lord revealed? Let us lower our heads, and acknowledge ignorance, priest and philosopher, one and all.

But they recognise a something—or some One—beyond and above the physical universe, which fills their hearts and minds with "awe" and calls forth "worship."

Thus, Tyndall says: "When the stroke of action has ceased and the pause of reflection has set in, the scientific investigator finds himself overshadowed with the same awe which filled the mind of Immanuel Kant, when he said: 'Two things fill me with awe, the starry heavens and the sense of moral responsibility in man,' and 'breaking contact with the hampering details of earth, it associates him with a power which gives fulness and tone to his existence, but which he can neither analyse nor comprehend.'" And Huxley speaks of the "necessity of cherishing the noblest and most human of man's emotions,—Religion,—by worship, for the most part, of the silent sort at the altar of the Unknown and the Unknowable." It is clear that Natural Theology has nothing to fear from the facts of physical science. But one of its greatest masters, Professor Huxley, recognises "that as the different flowers of monœcious plants must be brought together to render the tree fruitful, so it is with physical and metaphysical studies. I may be taking too much a naturalist's view of the case, but I must confess that this is exactly my notion of what is to be done with metaphysics and physics. Their differences are complementary, not antagonistic, and thought will never be completely fruitful until the one unites with the other."* Let us unite the testimony of the metaphysician to that already given by the physicists. Herbert Spencer says:—"Those who think that science is dissipating religious beliefs and sentiments seem unaware that whatever of mystery is taken from the old interpretation is added to the new. Or rather, we may say, that transference from one to the other is accompanied by increase, since for an explanation which has a seeming feasibility, science substitutes an explanation which, carrying

* *Lay Sermons*, p. 371.

us back only a certain distance, then leaves us in the presence of the avowedly inexplicable."* And he concludes the article with these words:—"But amid the mysteries which become the more mysterious the more they are thought about, there will remain the one absolute certainty that he is ever in the presence of an Infinite and Eternal Energy." From this "Infinite and Eternal Energy"—he is careful to use capital letters,—he declares "all things proceed." †

To this "Infinite and Eternal Energy" he only hesitates to apply the word Person, because "though the attributes of personality, as we know it, cannot be conceived by us as attributes of the Unknown Cause of things, yet duty requires us neither to affirm nor deny personality; but the choice is not between personality and something lower than personality, but between personality and something higher, and the ultimate power is no more representable in terms of human consciousness than human consciousness is representable in terms of plant functions."

Again, he says: "I held at the outset, and continue to hold, that the Inscrutable Existence, which science in the last resort is compelled to recognise as unreached by its deepest analysis of matter, motion, thought, and feeling, stands towards our general conception of things in substantially the same relation as does the Creative Power asserted by Theology."

Uniting these "different flowers of monocœious plants," physical and metaphysical, what fruits of thought spring from their union? In the mineral world atoms are piled together indicating plan and design as distinctly as the final form of the pyramid expressed the *thought* of the human builder, by some hidden "force"! Could that have been effected without intelligence and foreknowledge? In the vegetable and animal kingdom, in the molecules of a corn grain, and the development of a chick from an egg, the processes are so regular, so orderly, so necessarily tending to the purpose proposed, that "an intellect, the same in kind as our own, if sufficiently expanded, would be able to follow the whole process from beginning to end." Could that process have taken place without its having been designed by an Intellect possessing the requisite expansion, accomplishing its object by the necessary power?

And men of the highest intellectual power and culture

* *Nineteenth Century*, Jan. 1884, p. 10.

† *Ib.*, p. 12.

recognise a power *outside nature* which fills them with *awe*, which necessitates *worship*. Is it possible for such minds to "worship a mere" non-intelligent power? and can *such a power* "give fulness and tone" to the existence of such men?

Moreover, the only reason that "personality" is not attributed to this "power" is, that His attributes transcend those which our limited experience and consciousness associate with personality! An all-embracing Intellect is recognised, an all-efficient Power is admitted. Practically, personality is acknowledged "in the Unknown All-Being."

The conclusion is, then, that these writers are not what ordinary men would call Agnostics, but distinctly and positively Theists.

And modern scientists are in harmony with the students of natural religion in bygone times, and tell us that the inarticulate utterances of all physical things, animate and inanimate, call upon man to worship the Unseen Creator and Governor of the world, whom Christians and Jews alike recognise as the One and Only Living God.

The CHAIRMAN (H. Cadman Jones, Esq.).—I am sure we are greatly obliged for Mr. Ashwin's interesting paper.

In reply to an inquiry from one of the audience as to in what sense he used the expression "natural religion," the author said:—The expression "natural religion," generally used by such writers as Paley and Butler, is universally understood as representing the highest idea the cultured mind of man can form, apart from the testimony of Revelation. The conclusion of man's reason, reasoning from his knowledge of the universe, that that universe must have had a Creator. I have written this paper because I know, from past experience, that there is an enormous sceptical wave passing through the minds of men, especially young thinking men, the working men in our great manufactories, the working men in our great engineering works, and the thoughtful men amongst the educated clerks and men of business in our large towns; and I regret to say that, to a great extent, I am convinced that that scepticism has been produced by the unjustifiable dogmatism of many teachers of religion. I was anxious to bring forward the testimony of the great scientists I have quoted, to the effect that they all recognise a something which is beyond the compass of their minds, underlying that which is subject to their mental capacities; there is a distinct testimony on their part that they

recognise what they will not call a Creator, but what corresponds with that idea, and I believe that one way in which we may hope to save some of the younger men of the present day from plunging into scepticism is by bringing before them the testimony of such men as these, that they do in reality recognise what we understand as God. The human mind apart from Revelation cannot rise further than that.* My paper does not touch Revealed Religion, therefore I have not referred to the Bible in my argument, and I think I have shown that these men do recognise that there is a God. Finally, let us bring calm, quiet, thoughtful, reverent minds to the study of God's Word, and remember that there must be the same gradual correction of preconceived misapprehensions respecting that Word as has taken place in the gradual removal of erroneous views respecting the explanation of the natural laws now at work in the universe. Growth in the knowledge of God's Revealed Word must, I think, be *pari passu* with growth in the knowledge and interpretation of the works of nature.

The meeting was then adjourned.

* Natural Religion, which has had many and long ages to develop its fruits, has failed to meet the exigency of man's spiritual condition. The state of man everywhere, without a Divine Revelation, is sufficient proof of this.—Ed.

NOTE.

BY THE EDITOR.

THE statement has often been made by the opponents of the Christian Religion,—that the progress of Science has given a death-blow to all belief in the truth of the Bible, and that men of Science no longer regard that book or the religious belief it inculcates. So false a statement might not be worthy of notice, but that it is repeated, in publications and on the platform, in almost every land, and it has been credited, not only by individuals in all classes,—especially the working classes,—but even by some charged with the regulation of education both at home and in our colonies: yet it is noteworthy that we find Professor Huxley, when lecturing at Liverpool on education (Feb. 16, 1883), mentioning the Bible as the first of the books which, in his opinion, our youth should study,—“I have said it before, and I repeat it here: If a man cannot get literary culture of the highest kind out of his Bible . . . he cannot get it out of anything.” Again, he wrote, in the *Contemporary Review*, Dec., 1870, “I must confess I have been no less seriously perplexed to know by what practical measures the religious feeling, which is the essential basis of conduct, was to be kept up, in the present utterly chaotic state of opinion on these matters, without the use of the Bible.” Again, Professor Tyndall, at Manchester, stated, “I have, not sometimes, but often, in the spring-time . . . observed the general joy of opening life in nature; and I have asked myself the question, Can it be that there is no being in nature that knows more about these things than I do? Do I, in my ignorance, represent the highest knowledge of these things existing in the universe? Ladies and gentlemen, the man that puts that question fairly to himself, if he be not a shallow man, if he be a man capable of being penetrated by profound thought, will never answer the question by professing that creed of atheism which has been so lightly attributed to me.” Again, Dr. Darwin, in his *Origin of Species*, sixth edition, page 146, says, “Have we any right to assume that the *Creator* works by intellectual powers like those of man?” Also, Sir Charles Lyell, in *Principles of Geology*, tenth edition, page 613, says, “In whatever directions we (geologists) pursue our researches, whether in time or space, we discover everywhere the clear proofs of a *Creative Intelligence* and of its foresight, wisdom, and power.” Pasteur, Sir R. I. Murchison, and many other leading men of science, have written to the same effect, but the authors here quoted are those whose works are most used (often unfairly enough) by the opponents of Religion. Again, Professor Max Müller, speaking of language, says it may be a product of man’s nature, or of human art; but, he adds, “If it be the gift of God, it is God’s

greatest gift ; for through it God spake to man, and man speaks to God in worship, prayer, and meditation." Finally, as regards agnosticism, the opinion in regard to it, as expressed by Carlyle, and quoted in his *Life* by Froude, vol. ii., p. 216, may conclude these remarks : "The agnostic doctrines are to appearance like the finest flour, from which you might expect the most excellent bread ; but, when you came to feed on it you found it was powdered glass, and that you had been eating the deadliest poison." *See also* vol. xvii.

INTERMEDIATE MEETING.*

THE PRESIDENT, Sir GEORGE G. 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 :—W. H. Williams, Esq., D.L., J.P., London ; Rev. Alban H. Wright, B.A., Barbados ; Rev. Principal M. B. G. Eddy, Mass. Metaph. Coll., Boston, United States.

LIFE ASSOCIATES :—Right Rev. E. G. Weed, D.D., Bishop of Florida, United States ; Eber Caudwell, Esq., M.R.C.S., L.R.C.P., London.

ASSOCIATES :—W. Batchelor, Esq., London ; Rev. J. Brittain, Harrogate ; Rev. R. K. Collisson, London ; Rev. J. E. Dwinell, A.M., D.D., U.S.A. ; Rev. J. Ellis, A.C.S., India ; J. R. Van Millingen, Esq., Stamboul ; Rev. Principal G. Washburn, D.D., Robert College, Constantinople ; Mrs. J. D. Vollar, Ceylon.

HON. COR. MEMBER :—Rev. A. Shipton, A.M., Taunton.

A Paper "on Geological Science in accordance with the Christian Faith," by C. S. Wilkinson, Esq., F.G.S., President of the Royal Society of New South Wales, was then read as a Lecture in the Author's unavoidable absence in New South Wales. A discussion ensued, in which many took part.

The Meeting was then adjourned.

* February 18, 1889.

ORDINARY MEETING,*

HELD AT THE HOUSE OF THE SOCIETY OF ARTS.

THE PRESIDENT, SIR GEORGE G. 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:—

VICE-PATRON:—His Imperial Majesty the Emperor of Brazil.

[His Majesty sent a message, of which Dr. R. H. Gunning, F.R.S.E., was the bearer, expressing his wish to be admitted a Member.]

MEMBERS:—His Excellency Count Bernstorff, Berlin; S. Joshua Cooper, Esq., Yorks.; Rev. R. M. Ferguson, M.A., Cheltenham; Rev. A. A. E. Taylor, D.D., LL.D., United States.

ASSOCIATES:—W. J. Gunning, Esq., United States; Revs. J. Dark, E. Hargrave, and F. C. Williams, New South Wales; Rev. E. H. Smart, B.A., Oxon, Northallerton.

The following Paper was then read by the Author:—

*THE HISTORICAL RESULTS OF THE EXCAVATIONS
AT BUBASTIS.* By EDOUARD NAVILLE.

THE King of Babylon had led into captivity part of the population of the kingdom of Judah; the inhabitants of Jerusalem had turned a deaf ear to the warnings of the prophet Ezekiel, and the threatened judgment had fallen on them. Standing near the river Chebar, in a strange land, the prophet turns for a while from his unfortunate countrymen, and, looking towards the neighbouring nations, predicts that some day the storm will burst upon them. The curse of Egypt is one of the most striking and the most terrible. Thus saith the Lord God: "I will also destroy the idols, and I will cause the images to cease from Noph; and there shall be no more a prince out of the land of Egypt; and I will put a fear in the land of Egypt. And I will make Pathros desolate, and will set a fire in Zoan, and will execute judgments in No. And I will pour my fury upon Sin, the stronghold of Egypt; and I will set a fire in Egypt; Sin shall be in great anguish, and No shall be broken up: and Noph shall have adversaries in the day-time. The young men of Aven and of Pi-beseth shall fall by the sword: and these cities shall go into captivity" (Ezek. xxx. 13-18).

It is interesting to notice the cities which are mentioned by

the prophet. They are clearly the most important, and those which were best known to his countrymen. I shall not insist here on several of these names, which differ according to the translations, but I should like to direct your attention to this sentence: "The young men of Aven and Pi-beseth shall fall by the sword." Aven (Heliopolis) is well known; but what is Pi-beseth (Bubastis)? It is one of the localities which are most frequented by travellers, or at least near which hundreds and thousands constantly pass. Whoever goes from Cairo to Suez is obliged to stop at Zagazig, a junction of several lines. Before reaching the station and after leaving it, the railway skirts large mounds covered with ruins of brick walls, which mark the site of Bubastis. The mounds, even now, cover a considerable surface, though they are much reduced from what they were. Of the 4,000 acres which they occupied at the beginning of this century, the greater part has been levelled, and is now cultivated; there are now only 800 acres left, and they are diminishing every day.

Several Egyptologists have visited the place. The opinion generally prevailing being that the temple had entirely disappeared, leaving no other traces than a few blocks scattered here and there in a great depression, which was the site of the building. Mariette had attempted excavations, which had proved fruitless; and one might reasonably think that the temple of Bubastis, which, according to the description of Herodotus must have been of considerable size, had suffered the same misfortune as many others; that it had been quarried out entirely, and the stones all carried away for building or for agricultural purposes. I shall not recall here the reasons which induced me to settle at Bubastis with Mr. Griffith in the spring of 1887, and to begin excavations. Our first attempts soon showed that the temple had not disappeared; on the contrary, the earth concealed heaps of granite blocks and gigantic columns, which reminded one of what is seen in the ruins of Sān. Our task, therefore, was to lay bare all this field of ruins, the extent of which we could judge to be considerable, and we applied ourselves to this work during the winters of 1888 and 1889. Not only did we remove all the earth which covered the stones, but in order to be quite certain that nothing was left hidden we pulled down the heaps of stones which had been piled up by the fall of the walls of the two first halls. We rolled and turned every block, and this long and costly, but sometimes most exciting, proceeding has given us inscriptions and monuments of the greatest value.

Standing at the entrance on the eastern side, one overlooks

now a field of ruins, which is still most impressive, although not so much so as last year, since a great many interesting monuments have been carried away. A space of the length of 600 feet is covered with enormous granite blocks, capitals of columns, fragments of Hathor heads and broken statues of colossal size. The general form of the temple is still discernible. It consisted of four halls, the dates of which differ. The first, from the east, which is perhaps the most ancient, had at the entrance two enormous columns with palm capitals; outside the door were the two great Hyksos statues, one of which is now in the British Museum. Beyond was a second hall, also very old. After the time of Osorkon II. it was called the "festive hall," in memory of a great religious ceremony which took place in the twenty-second year of his reign. Further west still was the most luxurious part of the temple: a hall supported by columns with lotus or palm-leaf capitals, and by pillars ending in a beautifully-sculptured Hathor head, the best specimen of which is now in the Boston Museum. The termination of the temple was a room of a very extensive area, probably the largest of the four; it was never finished, and at the end was the shrine of the goddess Bast, an exquisite piece of sculpture, fragments of which are to be seen in the British Museum.

Except Tanis, a city which in many respects has a great resemblance to Bubastis, there is no city in the Delta which has yielded so many monuments, of such very different epochs, varying from the Fourth dynasty to the Ptolemies. I must say I do not believe one could easily find excavations more interesting, and at times more exciting, than these. A circumstance which added to the surprises and to the unforeseen, is, that there is no temple which has gone through such frequent and complete transformations, and where the usurpation is so easily discernible and has been practised on such a large scale. You have heard of the mania of Rameses II. for writing his name everywhere, no matter who was the author of the monument on which he desired to record his memory. The occasions in which the name of Rameses II. is met with in the temple of Bubastis are nearly innumerable. I have examined with the greatest care the colossal architraves on which his name is written in hieroglyphics more than two feet high, and I have not found one of them which was not a usurpation; everywhere an old inscription had been erased; what Rameses II. really added to the temple is probably not considerable, though at first sight one would think that hardly anything had existed before his reign.

One of the results of the excavations is to show that

Bubastis was already a large city at a very remote date, and that it went through the vicissitudes which have marked the history of Egypt. It must rank between Tanis in the north, and Heliopolis further south; and in the narratives of the events which took place in Lower Egypt, we must take account of the presence of a great city at the entrance of the valley called the Wadi Tumulât, the high-road from Egypt to Syria.

Let us go back to the dawn of the history of Egypt. Manetho says, that under the first king of the Second dynasty, a chasm opened itself near Bubastis, in which a great many people lost their lives. We do not go quite so far back in our discoveries, but the Old Empire has left important traces in the two first halls. Before having moved one single block, we could see on the top of the ruins of the entrance hall a stone where was sculptured a false door, such as is constantly met with in the tombs of the Old Empire, namely, two door-posts, between which is a large roll generally bearing the name of the deceased. How that kind of ornament occurs in a building without funerary character, I cannot explain; however, it is to be traced to the Old Empire, but I could not make out which king had it made, for his cartouches have been so carefully erased, that there remain only the top of the oval and a disk. The subsequent researches in that part of the building have not been fruitless; we have unearthed the standard of Cheops, and the standard and name of Chefren, the constructors of the two great pyramids, who have both written their name in the temple of Bubastis in large and beautiful hieroglyphs; the great antiquity of the temple is thus well established. In the second hall we found, in 1887, the cartouche of a king of the Sixth dynasty, Pepi, and not only his name, but his titles which he engraved on what must have been the entrance of a room. At the beginning of this century, Burton had discovered the name of Pepi further north, at Tanis; a doubt had been expressed whether it was the king himself who had extended his constructions so far north, or whether perhaps in later years a stone bearing his name had been brought to Tanis with building material, by Rameses II. or some other king; but now the doubt is no longer possible. It is not in Tanis only, but also in Bubastis, that stones bearing the name of Pepi are found, and here there are several, fitting together, and the remains of a construction may be traced; besides, Pepi is in company with two other kings, a great deal more ancient. Thus the foundation of Bubastis carries us back to the beginning of the historical times of Egypt, and is contemporary with the pyramids, its oldest monuments.

It is to be noticed that the three early kings whose names we met with were conquerors, or, at least, warriors, who fought against the inhabitants of Sinai. What may have been the motive of these struggles? Perhaps the possession of mines of copper, which have been worked from a high antiquity in the peninsula, or perhaps also the quarries; for it is an interesting question, and one which has not yet been solved in a satisfactory way, where the stones came from with which some of the Egyptian monuments are made, especially black granite. It has always been admitted that it came from the quarries of Upper Egypt, situated in the Arabian desert, at a place now called Hamamât, between the present cities of Keneh and Kosseir. This explanation, which holds good in the case of kings who had the command over the whole land of Egypt, is not to be accepted for kings like the Hyksos, who ruled only over Lower Egypt, and were at war with the native princes of Thebes. Where was the stone quarried for the great statue which is now in the British Museum? The solution of this question is rendered more interesting by the fact that in the last discoveries of very early Chaldæan monuments, at a place called Telloh, in Lower Babylonia, it has been noticed that for several of them the stone is the same as that used for some Egyptian statues. The eminent Assyriologist, Dr. Oppert, maintains that this material was found in the country, called in the cuneiform inscriptions *Maggan*, namely, the Sinaitic peninsula and the part of Egypt near the Red Sea, while other Assyrian scholars think that it came from the coast of the Persian Gulf. The question is an open one, to be settled only by geologists, who will allow me to direct their attention to the search for the quarries of the Sinaitic peninsula.

Two of the kings whose names have been recovered at Bubastis, Cheops and Pepi, are mentioned in a text of a much later epoch relating the construction of the temple of Denderah. We read there in two Ptolemaic inscriptions the following words: "The great foundation of Denderah. The repair of the monument was made by King Thothmes III., as it was found in ancient writings of the days of King Cheops." And further: "The great foundation of Denderah was found on decayed rolls of skins of kids in the time of the followers of Horus. It was found in a brick wall on the south side, in the reign of the King Pepi." We must not attribute too great an importance to inscriptions which have a legendary character, but they indicate that the authority of Cheops and Pepi extended over Upper Egypt: and we know now, through the excavations at Bubastis, that Cheops and Chefnen reigned

also over the Delta, certainly over the eastern part. Before our excavations their names had never been found north of Memphis; it appears now that at this remote epoch their kingdom had already reached what I should call the natural limits of Egypt.

The Fourth dynasty,—the dynasty of Cheops and Chefred,—was one of the most powerful of the Old Empire, and it seems that under the succeeding one the kingdom was rather weakened; but there is a marked revival under one of the first kings of the Sixth dynasty,—Pepi Merira. As I said before, his cartouche has been found twice at Bubastis, in a different form from what it is at Tanis. There he gives himself only as the son of Hathor, the goddess of Ant (Denderah). At Bubastis, on the contrary, he is anxious to affirm that he is son of Tum, the god of On (Heliopolis), and of Hathor, the goddess of Ant. The geographical names must not be taken in a literal sense, as meaning only two cities; they must be interpreted in their mythological sense, as meaning the two parts of Egypt. Pepi indicates in this way that he is lord of the whole country.

Under the Old Empire there was a temple at Bubastis, but although we found traces of it in the two first halls, it is not possible even to conjecture what were its forms and dimensions. It lasted very late down to the Twelfth dynasty; one of its kings,—Useratesen I.,—wrote on one of the stones a small inscription, not very deeply cut, such as the kings often did to record that they had gone through a city and presented offerings to the gods, but not that they had made any great building. The venerable sanctuary of Cheops and Pepi was still standing at his time.

Here arises a question which I am obliged to answer in a different way from what I have recently seen printed in several papers. Among the numerous statues discovered at Bubastis—Is there one which may be considered as a work of the Old Empire? The opinion that this is the case has been expressed at a meeting of the Egypt Exploration Fund. It has been said that we have a portrait of Cheops in one of the statues now in the British Museum. Among the monuments brought from Bubastis you will notice the colossal torso, in red granite, of a standing king who holds in his left hand a standard. The statue has no head-dress; it has very thick and crisp hair, not unlike what we see on sculptures or statues of the Old Empire. The figure was destined to support something, for the top of the head is quite flat, showing that some piece of architecture rested upon it. It is not the only one of its kind. We found four absolutely

alike in type, workmanship, and size; two of them have been carried away, one to Boston, the other to the British Museum; two others are still *in situ*. They all bear the name of Rameses II., but we know well enough that this does not prove anything as regards their origin. However, I do not believe that they belong to the Old Empire. What strikes one in looking at those monuments is the total absence of all that constitutes the portrait: there is nothing individual, nothing characteristic of one person. The face is broad, very short, rather flat with projecting eyes: there is no finish in the workmanship. It is true that the statue being of colossal size, the features were to be seen at a distance, and the effect would probably be better if we saw them replaced at the height at which they originally stood. It is very likely that they were placed on each side of two doors in the festive hall. Statues of the same kind have been found at Sān, at Ramleh, at Tel el Yahoodieh; one which is in the museum of Turin is supposed to come from Sān; thus, they were all discovered in the Delta. In my opinion they are statues which had only an architectural purpose, and which are no more portraits than the caryatids which adorn some of our buildings; they are mere ornaments on which Rameses II. wrote his name, although the features are as different as possible from the fine type of the Ramessides. I am ready to admit any amount of usurpation from Rameses II.; but I do not believe in the high antiquity of those statues; theirs is a style which dates from the Nineteenth dynasty, from Rameses II., and which was continued by his son Menephtah, and even later; and this peculiar style was executed by artists of the Delta, whose skill at that time was still sufficient for the requirements of architecture. I am led to this conclusion by the fact that these statues are too much alike; they are all cast in the same mould, it is a common type of face, which is copied from the one to the other without individual character. It is in accordance with the custom of Rameses II., whose main desire was to have a great number of monuments; he did not look too closely at the artistic side, provided they were numerous. In this case, when he wrote his name on these statues, he did not speak an untruth; they are his work. As for the workmanship, it must not be forgotten that such statues are seen only in the Delta. Local taste and local fashion are very important factors in Egyptian art, which have been too often overlooked; they existed in former times as they are still to be found at the present day. Evidently the taste of the sculptors of Bubastis or Tanis was not exactly the same as among the artists of Thebes or Abydos.

The Twelfth dynasty is certainly one of the most powerful in Egyptian history. Let us consider its political action—its conquests carried far on the Upper Nile—and we shall form a high opinion of the character of its kings; but our admiration will be increased if we look at the immense constructions raised by them all over the country. Manetho calls them Diospolites, giving them Thebes as birth-place. They were the founders of the great temple of Amon, and they worked most actively in the province called the Fayoom. I need only mention the Labyrinth and Lake Moeris. The recent excavations made by Mr. Flinders Petrie and myself have shown that they gave a great importance to the Delta, especially to its eastern part. Tanis was already known as a locality where their monuments were abundant; but we have added three more: Amem, a dependency of the nome of Tanis excavated by Mr. Flinders Petrie, and some monuments of which are at the British Museum; Khataanah, of which we do not know the old name; and lastly, Bubastis. It is probable that further explorations will reveal more monuments of the Twelfth dynasty in the Delta, either by actual discoveries or by showing that usurpation has been practised on their work by later sovereigns, who attributed to themselves the work of their glorious predecessors.

Amenemha I. is the first king of the Twelfth dynasty whose name occurs at Bubastis. It is engraved on a stone removed from its original place, and employed by Nectanebo I. in the construction of the western part of the temple. The name is not complete; we have only the standard and the beginning of an inscription saying that "he erected a statue to his mother Bast; he made the hall. . . ." Evidently he enlarged in some way the sanctuary of the Old Empire. After him Usertesen I., well known by the obelisk of Heliopolis, did not go on building; his name occurs on what was very likely part of the temple of Cheops and Pepi.

The most important transformation of the temple seems to have been made by Usertesen III., whose cartouche occurs several times and in very large proportions. Not only did he enlarge the two halls, of which this temple consisted, but he added to it what must have given to the whole building that character of beauty which struck Herodotus so vividly, for the Greek traveller says that "though other temples may be grander, and may have cost more in the building, there is none so pleasant to the eye as this of Bubastis" (Rawlinson, *Herod.*, ii. ch. 137). In my opinion, Usertesen III. added to the temple the hypostyle hall, the magnificent building of which remains are now in the British Museum and at Boston.

Unfortunately it is now so much ruined, having been so long used as a quarry, that it is difficult to obtain an exact idea of its form. It is nearly certain that the roof was supported by alternate rows of columns and square pillars, ending in a Hathor head. In the centre were four large columns of red granite, with capitals in the form of lotus buds, and with shafts representing a bundle of those plants. The inhabitants of Liverpool had the opportunity, a short time ago, of seeing on the quay two fragments of one of those columns, a perfect capital, and the piece of the shaft fitting immediately underneath, the whole having a length of about 20 feet; and I dare say they will have been struck, not only by the size of the monuments, but also by the vigour of the work and the beautiful polish, which has lasted to the present day. Outside of those columns were square pillars surmounted by the head of the goddess Hathor, a woman's face surrounded by great locks and having ears of a heifer. The head was sculptured on two opposite sides of the pillars; on the two others was seen the plant of Upper and Lower Egypt standing between two crowned asps. One specimen only of these fine pieces of art has been preserved complete; it is now in the Museum at Boston. Next to these pillars came again columns of polished red granite, with graceful capitals representing palm-leaves. One of them is in the British Museum; it is nearly complete. We read on it the names of Rameses II. and Osorkon II., but the column is much older, for an inscription of Rameses is cut through an ornament of the shaft. These columns bear witness to the changes which took place in the gods to whom the temple was dedicated. Rameses II. had the name of Set sculptured on the top; Osorkon changed the figure of the god, made him a lion's head, and gave him the appearance of Mahes, the son of the cat goddess Bast. To the palm columns belonged a second set of pillars with Hathor's head, but neither so large nor so beautiful as the others. One of them has gone to the Museum at Sydney.

At the end of the Twelfth dynasty the temple consisted of the first two halls and the hall of columns (some of them were gigantic monoliths). I shall only mention that the Thirteenth dynasty, a series of princes very little known, appears also at Bubastis. The first king, Sebekhotep I., has engraved his cartouche on some large architraves. It is the first time that his name is met with in a temple. It is inscribed also on rocks in Nubia, showing that under his rule the power of Egypt was not diminished. In excavating buildings like the temple of Bubastis, it is impossible not to be struck by the facility with which the old Egyptians carried enormous

blocks of granite from the quarries of Assooan to localities in the Delta, which, no doubt, were then more accessible than now, but which could only be reached at the cost of much labour. We know what the difficulties are in our time of steam-engines and railways; my friend, Count d'Hulst, might write a book on all the troubles he experienced in the ungrateful task of transferring monuments of a total weight of about a hundred tons from Tel Basta to an English steamer in Alexandria. But in the time of the ancient Egyptians, thousands, tens of thousands of enormous blocks, colossal statues weighing near nine hundred tons, obelisks, etc., were taken out of the quarries of Assooan, floated down the Nile, and dragged through the marshes of the Delta, where they adorned the temple of Sān, Bubastis, or Behbeit. I can assure you that when I unearthed the magnificent columns of Bubastis I did not know which was most to be admired, the perfection of the work or the power of the men, who, with scanty and imperfect mechanical means, had achieved such stupendous results.

Let us now give the dates of the principal facts which we have ascertained. In opposition to the generally-prevailing opinion, we saw that Bubastis went back as far at least as King Cheops; that is, to the year 3700 B.C., according to Brugsch's chronology. After him, Pepi, about 3200 B.C., has left important traces in the temple. We described the transformation which took place eight hundred years afterwards under the kings of the Twelfth dynasty. With the end of the Fourteenth dynasty, we have reached the 24th or 23rd century B.C., one of the most obscure periods of the history of Egypt, but also one of the most interesting, and on which the excavations of Bubastis have given us most unexpected information—I mean the invasion of the Shepherds, or Hyksos.

We read in Manetho, quoted by Josephus, the following words: "The so-called Timaos became king. Egypt during his reign lay, I know not why, under the Divine displeasure, and, on a sudden, men from the East country of an ignoble race, audaciously invaded the land. They easily got possession of it, and established themselves without a struggle, making the rulers thereof tributary to them, burning their cities and demolishing the temples of their gods. All the natives they treated in the most brutal manner; some they put to death, others they reduced to slavery with their wives and children.

"Subsequently also they chose a king out of their own body, Salatis by name. He established himself at Memphis, took tribute from the Upper and the Lower country, and placed garrisons in the most suitable places . . . The general name

of their people was Hyksos, which means shepherd kings; for *Hÿk* signifies in the sacred language a king, and *Sōs* in the demotic is shepherd and shepherds. Some say they were Arabs . . .”

Arabs or Phœnicians are the names most frequently applied to them by the ancient authors. Recent researches seem to point as their native place to Mesopotamia, where at that time important events took place. We know that about that epoch, the King of Elam, Khudur Nankhundi, invaded Babylonia, plundered the country and carried away from the city of Uruk to his capital Shushan a considerable number of statues of divinities. We cannot affirm that the invasion of Egypt by the Hyksos is connected with this particular war; but it is probable that the struggles between the Elamites and the Mesopotamians brought about the invasion of Egypt. I do not suppose that the Elamites went as far as the Nile, but they drove out of their country a mixed multitude belonging to different races, and it overran Egypt, too weak to resist. If, as I believe, the Hyksos were Mesopotamians, they were not barbarians: they belonged to nations which had already reached a high degree of civilization, and which in particular were well skilled in the art of sculpture. There is no doubt that the conquest of Egypt must have been signaled by devastation and ruin; it never was otherwise in the wars of Eastern nations; but as the invaders were not barbarians, as they came from a civilized country, it explains why they soon submitted to the influence of the more refined Egyptians, and why they easily adopted the principal features of Egyptian civilization, which was not unlike their own.

The chronographers have preserved the name of several of their kings; they are called Silites, or Salatis, Beon, Apachnas, Jannas, or Janras, Asseth and Apophis, in Egyptian Apepi. The interesting point to ascertain was whether the Egyptian documents agreed with the statements of the Greek writers as to the barbarity of the Hyksos. Were they the cruel and brutal conquerors described by Manetho? Very likely they were at first when they attacked the country, but certainly not at the end of their domination. The name of Apepi was known long ago from a papyrus relating his struggle with a Theban prince. To Mariette belongs the honour of having first discovered his name on stone monuments. In his very successful excavations at Tanis he found the name of Apepi written on the arm of a statue, evidently older than the Hyksos king. At the same time he noticed the name on monuments of a special kind, which have since been called Hyksos monuments. They are

sphinxes with bodies of lions and human faces. The head is surrounded by a very thick mane, and the type of the features is quite different from the Egyptian. The cheek-bones are high and strongly marked, the nose wide and flat and aquiline, the mouth projecting forward with stout lips. At first sight, it is impossible not to be struck by the fact that we have there the image of a foreign race and not of native Egyptians. Thus there has been an art of the Hyksos, or rather the conquered have made the education of their masters ; for, except the characteristic foreign type, the workmanship, the style, and the attitude are absolutely Egyptian, and these monuments must have been made by Egyptian sculptors.

Besides the art, the Hyksos adopted also the writing, the language of the Egyptians ; the names of their kings are written like those of the native Pharaohs with two cartouches, the first of which was taken by them on the day of their coronation, and always contained the name of Ra. Nevertheless, they remained faithful to the worship of Set, an Asiatic divinity often called also Baal, and worshipped as well by Semites as by nations of another race like the Khetas or Hittites. Thus, under the reign of the last Hyksos rulers, except that the sovereign belonged to a foreign race, Egypt must have presented an appearance very much like what it was before : a well ordered and governed state.

It has been questioned whether the Hyksos had really attained a high degree of civilization, and whether the monuments attributed to them by Mariette were really their own work. Some Egyptologists have suggested that the strange monuments of Tanis were, perhaps, the produce of local art, or that they belonged to a much older period ; in this last case Apepi would only have usurped what had been done before him, and there would be no Hyksos style. I must say that when I went for the first time to Tanis, I very nearly adopted this view ; but the discoveries made in the excavations of 1888 have convinced me that Mariette's opinion was the truth. There has been a Hyksos art, and kings of later time have not hesitated in taking possession for themselves of what the so-called barbarians had made. I had the good fortune in 1888 of finding three of the most interesting Hyksos monuments which have been preserved.

We were working in the eastern part of the temple of Bubastis near the entrance, when the workmen unearthed first the head-dress of a statue, in black granite, wearing the royal asp ; underneath were only the forehead and the eyes, for the head had been broken horizontally at the height of the origin

of the nose. The head-dress was absolutely that of an Egyptian king, and the height of the whole head could be estimated as more than three feet. The next day, to our great joy, the lower part of the head was discovered; it was complete, except a fragment of one of the cheeks and one of the ears, and we recognised at once the Hyksos type; there was the projecting mouth, the thick and curved nose, the strongly-marked cheek-bones, the cheeks themselves being rather hollow. It was the first time that the head of a Hyksos king was discovered wearing a thoroughly Egyptian head-dress, which rendered more conspicuous the strange type of the foreign race. At the distance of a few feet a broken fragment of black granite was emerging out of the ground, and on digging a few inches it was easy to recognise that it was the lower part of the legs of a colossal statue, which clearly belonged to the same monument as the head. I could not excavate immediately. It was the beginning of March, and the soil was still so full of infiltration-water that beyond a certain depth we were in ponds of water, which hampered the work considerably. I waited a few weeks; the water sank, and my impatience grew in proportion. At last, although there was still much water, I ordered that the base of the statue should be cleared and dragged out. The first thing to be done was of course to make room around it. Our surprise was immense when this revealed to us the lower part of a colossal torso close to the base we were endeavouring to drag out; and a few feet to the south, very near the place where we had found the broken head, the base of another statue of the same size, lying on the side and showing the whole of one leg. Thus it was not one but two statues which had stood there; we had two bases, we could reasonably hope that we should discover another head. The one we had, the Hyksos, was broken, perhaps the other might be intact. From that moment the researches grew intensely interesting. I promised a good baksheesh to the workmen if the head was discovered; and a few hours afterwards, while I was in another part of the temple, I suddenly heard them shouting: *rās, rās*,—the head, the head! I shall never forget this sight, nor this hour, perhaps the most impressive I went through during my five winters of excavation. It was late in the afternoon; out of a pond of water, between the base and the torso, emerged the top of a head and the royal asp, the upper part only had been cleared and was visible above the water. There was no place for us to stand, or rather to kneel, except on that head, which we did in turn, Count d'Hulst and I; and while the excited workmen drove out with their hands the water which was coming

out of the earth in streams, or took away the mud in which the face was buried, we felt anxiously with the hand how far the features were preserved. There is the forehead, the eyes, the origin of the nose, but here a fracture. . . I had one instant of despair, but no, it is only a slight wound; here are the nostrils, the mouth, the beard! The head is perfect! It was nearly dark; we let the water cover it again entirely, and the next morning we raised triumphantly our treasure, which now stands in the British Museum.

A few days afterwards two illustrious visitors,—Dr. Schliemann and Dr. Virchow,—came to see the excavations. Dr. Virchow had careful measurements taken of this head, which he published shortly afterwards in his paper on the royal mummies. His conclusion is that the Hyksos monuments must be considered as representing Turanians, without being able to determine with which branch of this very large stock they must be connected. It was the same as the conclusion put forward in this country by Prof. Flower, who sees in the monuments of Sān a Mongoloid type. Turanians or Mongols,—such is the racial origin attributed to the Hyksos by high authorities; but that does not mean that the population itself was Turanian. The worship of Set Baal, the influence of the Hyksos invasion over the customs of Egypt, and especially over the language, points clearly to a Semitic element which was prevailing among the conquerors, though their kings,—at least those who left us their portraits,—were evidently not Semites. I believe, generally speaking, that too much importance has been given to the question of race; too often sharp distinctions have been drawn between nations, or, in the midst of one people, distinctions which were perhaps true originally, but which afterwards, if they were not quite obliterated, were only to be traced in political or social life. Races have become mixed and have amalgamated much earlier than we think. I said that I believed the Hyksos to be Mesopotamians. The researches of Assyriologists all agree that from a very early epoch the population of Babylonia consisted of several strata of populations having each a different origin. It was then what it is now; and I believe that the conquest of Egypt by the Hyksos is not unlike what would happen at the present day if the population of Mesopotamia overran the valley of the Nile; you would have masses, in great majority of Semitic race, speaking a Semitic language, having a Semitic religion, and being under the command of Turks, who are not Semites but Turanians.

I revert to the two Hyksos heads. The first, which was broken in the middle, is in the Boulak Museum; it is of exactly

the same type and proportions as that in the British Museum, but the face is not quite the same; it is evidently an older man; it has the advantage of having preserved the curve of the nose. If the two heads represent the same man at two different ages, the Boulak head was made the last. We took also to Boulak all that remains of the statue, the base, which turned out to have been split in two in the direction of the height, so that there is only one leg left. As for the statue of the British Museum, unfortunately it is not complete. Although last winter we left not an inch of ground unturned in the vicinity of the place where we had found the other fragments; although we went to a great depth; we could not discover the only piece wanting, the upper part of the torso from the waist to the neck. Nevertheless, I have no hesitation in saying that such as it is the statue is one of the most precious Egyptian monuments which have been preserved. Allow me to recommend you to go to the British Museum to look at it. You will notice that the Hyksos artists, or at least the Egyptians who worked for the Hyksos, followed the traditions of the early sculptors who had portrait statues to make. The workmanship of the lower part of the body is much inferior to that of the upper part, and especially of the head. This fact is general in the statues of the Thirteenth dynasty, whether they have preserved their original name, like the Sebekhotep of Paris, or whether they have been usurped by Rameses II., like the statue of this king which I found at Bubastis, and which has been given to my native city. All the care of the artist has been bestowed on the head, all his skill has been devoted to making a likeness as good as possible. Consider attentively the face, look at the beautifully-modelled features, the special care which the artist has taken to reproduce all the characteristic signs of the race, the strongly-marked cheek-bones, the stout and projecting lips, the somewhat hollow cheeks, the fleshy corners of the mouth; if you bear in mind that this has been cut in an extremely hard stone, you will agree with me that this head, regardless of its historical value, is a work of art, and even a masterpiece.

But whose portrait is it? which name are we to give to this statue? There is no doubt that it represents a Shepherd king, but has his cartouche been found anywhere on the monument? Unfortunately not. The two statues which were near each other at the entrance of the temple had both the cartouches of the king who raised them engraved on the throne along the legs. But they shared the common fate which befel so many interesting monuments; the names were cut out.

Rameses II. when he worked at Bubastis, finding that the two statues made a good effect, and that it was unnecessary to have new ones of such a large size, erased the name of the Hyksos king, and put his own instead. A long time afterwards, Osorkon II. treated Rameses II. in the same way as he had done his predecessor; he erased Rameses II., but not so completely that we may not discover a few signs, and he put his own on the base. What has completely disappeared is the name of the Hyksos king, which would be most interesting to us. Fortunately, in another part of the temple I discovered on a door-post a very large cartouche containing the name of Apepi, the same who had been found by Mariette at Tanis, with a fragment of inscription saying, that "he raised pillars in great number and bronze doors to this god,"—we do not know which. Quite recently, in the first hall not very far from the great statues, I discovered the first part of his name, what is called his standard. As Apepi was a powerful king, though he was one of the last Hyksos, and as we know from the inscription that he raised important buildings at Bubastis, it is probable that it was he who erected the great statues, and that the fine head which is now at the British Museum is the portrait of Apepi. This interests us particularly, because the Byzantine chronographer, Syncellus, relates that Apepi was the king in whose reign Joseph rose to the high position described in Genesis. According to the Christian tradition, Apepi was the Pharaoh of Joseph.

But we were not at the end of our surprises. Close to the block bearing the name of Apepi, there appeared one day the corner of a black granite stone, which, after being cleared, turned out to be the base of a sitting statue of natural size, but broken at the waist. The cartouches were intact; the coronation name reads Userenra, which is not unknown, but the second Raian, or Ian-Ra, was absolutely new. The style of the statue pointed to the Thirteenth or Fourteenth dynasty. When I afterwards showed the cartouche to a learned Mohammedan, Ahmed Effendi Kemal, the only Egyptian who can read hieroglyphics, he exclaimed at once: "You have found the king of Joseph"; and when I answered that in my opinion it was Apepi, he explained to me, what I totally ignored, that, according to Arab books, the king of Joseph was an Amalekite, called Raian Ibn el Walid. I must say that I have no great faith in Arab traditions, and although at the time of the discovery my eminent countryman, Dr. Rieu, of the British Museum, wrote a letter in the *Times*, saying that he believed that there was some historical fact at the bottom of the Arab tradition, I am not quite convinced;

there are some details of the legend which shake one's confidence ; for instance, this fact, which is mentioned by one of the Arab authors, that Joseph converted the king to the faith of the Mohammedans. However, it is certainly a curious coincidence to have found at the same spot the two kings who are considered as the protectors of Joseph, one by the Christians and the other by the Mohammedans. This valuable base, which is all that remains of Raian, is now in the Boulak Museum.

Between the two traditions I incline to adopt that of the Christians, as reported by Syncellus, who adds that on this point the historians are unanimous. I know we have no Egyptian monumental evidence that it was so, but until the contrary is proved, I see no reason to question the statement of Syncellus. Apepi was the Pharaoh in whose reign Joseph became the powerful minister described by Scripture. I need not dwell at great length on this subject, which was laid before this society a few years ago in a learned paper by the Rev. H. G. Tomkins. Let me only mention that Joseph was a purely civil officer, entrusted with the control and collection of revenue and of rents chiefly paid in kind. Such officers frequently occur in Egyptian inscriptions, or even in pictures, and they bear this telling title : "The Eyes and the Ears of the King."

We saw that the Hyksos raised at Bubastis great constructions, probably larger than at Tanis, the city which had been called their capital because of the monuments discovered there by Mariette. Bubastis was an important Hyksos settlement, and we have every reason to believe that the kings often stayed there ; that it was one of the places of resort of Apepi and the other kings. They were thus very near the land of Goshen. I think I have proved through the excavations which I made at a short distance from Zagazig, in 1885, that the original land of Goshen was the region situate between the present city of Belbeis and Tel el Kebir, and that at the time when the Hebrews settled there it was not part of one of the provinces of Egypt. It was an uncultivated district, not divided among Egyptian inhabitants regularly settled and governed, a kind of waste land sufficiently watered to produce good pasturage, and which might be assigned to foreigners without despoiling the native inhabitants. This agrees with the information given by the two most ancient Arab translators of the Bible,—Saadiah and Aboo Saïd. I believe even that there is an allusion to it in an Egyptian inscription of the time of Menephtah, the king of the Exodus, in which it is said that "the country

near Bailos (Belbeis) was not cultivated, but left as pasture for cattle because of the strangers." Thus there was only a short distance between the royal residence and the territory allotted to the Hebrews. Joseph settled his family near himself, in the part of the country which was best fitted for the breeding of cattle, and where probably dwelt the herds of the king, with the keeping of which they were entrusted.

But the Hyksos domination was drawing towards its close, and it is likely that Apepi was the last of the foreign rulers. We have only very scanty information on the wars which broke out between the native princes who had maintained themselves in Upper Egypt and the foreign invaders. In spite of the successes of the kings of the Seventeenth dynasty, Sekenen-Ra and Amosis, the expulsion of the Hyksos and the restoration of the Egyptian rule over the Delta took place only gradually. A queen of the Eighteenth dynasty alludes in one of her inscriptions to the harm done to the country by the strangers, and which she endeavoured to repair. An alleged proof of the fact that the Egyptian dominion was not yet regularly re-established was the supposed total absence of monuments of the Eighteenth dynasty in the Delta. Until now there was only one known,—a stone serpent found at Benha,—or a few scarabs of Amenophis III. dug out by the fellaheen at Tel Basta. The desire to settle, if possible, the question of the presence of the Eighteenth dynasty in the Delta, was one of the chief reasons which induced me to dig at Bubastis; and in this respect my expectation has not been disappointed; we have discovered important monuments of the Eighteenth dynasty at Tel Basta. Last summer, also, the fellaheen came across a large tablet of the same dynasty at Samanood, further north. In both places the monuments are later than Thothmes III. It seems very probable that the final conquest of the Delta, and the complete expulsion of the Hyksos, dates from the great wars of Thothmes III., justly called "the great," or sometimes the Alexander of Egypt. His campaigns had lasting results, not only in Egypt, but also abroad, as we know now from the curious find of cuneiform tablets made by the Arabs at Tel el Amarna last year,—that under the successors of Thothmes III. a great many Syrian cities were still tributary to Egypt, and had Egyptian governors. The most ancient mention of a king of the Eighteenth dynasty, at Bubastis, is on a stone of Amenophis II., who is sculptured standing before Amon Ra and making him offerings. We notice here, as under the following kings, that the chief divinity of the place is not Bast, but Amon. The king of the Eighteenth dynasty, who seems to have taken the

greatest interest in Bubastis, is Amenophis III. We discovered four monuments of the reign of this king: two of them are statues of the same man; unfortunately they are both headless. They are unequal in workmanship; one of them,—the largest and the finest,—is in the Boulak Museum; the other is in London. They both represent a man sitting with crossed legs, and who unrolls on his knees a papyrus, on which is written his title and his employment. The man was “prince of the first order, a friend loving his lord, chief of the works of his king in the provinces of the marsh land of the North, the chancellor and city governor, Amenophis.” The name of his king is found on the back; the braces which support his garment are tied together by a brooch, on which is engraved the name of Amenophis III.; another statue has it engraved on the shoulder, as has also a very graceful torso of a woman, which was part of a double group of a priest and priestess. Thus the Eighteenth dynasty is well represented at Bubastis,—its high officers and priests put their images in the temple. Even the heretical King Amenophis IV., or Khuenaten, who endeavoured to destroy the worship of Amon, desired his name to be at Bubastis. On a stone, usurped afterwards by Rameses II., we read the name of his god, his one cartouche having been erased.

In what state did the Eighteenth dynasty find the temple of Bubastis? Had it been ruined by the Hyksos? Not likely; on the contrary, we have seen that Apepi raised there, as he says, pillars in great numbers and bronze doors. If it did not suffer in the wars between the Hyksos and the Theban princes, the temple must have been standing and even of a remarkable beauty when the contemporaries of Amenophis III. put their statues in its halls.

Seti I., the second king of the Nineteenth dynasty, and the father of Rameses II., inscribed on the stone of Amenophis II. that “he renewed the abode of his father Amon.” He seems to have made some repairs to the temple. But with his son Rameses II. we reach a period of great changes, which consisted chiefly in usurpations. There is no name which occurs so frequently in the ruins of the first three halls, which up to the Thirtieth dynasty constituted the whole building. As is the case in Tanis, the local divinity seems to have occupied only a secondary rank; all the principal offerings or acts of worship take place before the great gods of Egypt, Amon, Phthah, called Phthah of Rameses, and chiefly Set, the god of the Hyksos, who had the most prominent place. Enormous architraves in the second hall bear dedications to Set; elsewhere he is styled Set of

Rameses, and his face was engraved on all the palm-capital columns, where it was afterwards transformed to Mahes. Nevertheless, Bast appears sometimes in the inscriptions of Rameses II.,—for instance, on a great tablet, of which we found only a part, and which is a dialogue between the king and the goddess, who makes his eulogy in words like the following: "I take in my hand the timbrel, and I celebrate thy coming forth, for thou hast multiplied the sacred things millions of times." There is no question that Rameses II. worked much in Bubastis, but in the way which best illustrates his personal character and the tendency of all his acts. An extraordinary vanity and self-conceit, a violent desire to dazzle his contemporaries by his display, and posterity by the immense number of constructions bearing his name, seems to have been the ruling power of his conduct during his long reign. In the second hall of Bubastis there are many colossal architraves where his cartouche is engraved in letters several feet high; but there is not one of them where an older inscription has not been cut out—sometimes the old signs are still visible. In one instance, very likely because something concealed the end of the stone, the workman did not take the trouble to erase completely, and at the end of the cartouche of Rameses II. appear the first letters of the name of User-tesen III. of the Twelfth dynasty.

There is no doubt that Bubastis was a place for which Rameses felt a special liking; he was anxious that the whole temple should appear as built by himself, from the great statues of Apepi at the entrance to the columns of the hypostyle hall at the western side. I do not believe that there is any other temple with so many statues bearing the name of Rameses II. as Bubastis. Undoubtedly they have not all been made for him; two of the finest which we discovered, both in black granite, were certainly not his portrait. One of them, which is complete, has been given to the Museum of Geneva; the head of the other, a fine piece of art, has gone to Sydney; none of them has any likeness to the well-known type of Rameses; they are kings of the Thirteenth or Fourteenth dynasty. Besides those statues, there were a great number in red granite, of various proportions, and standing in different parts of the building, which have merely an ornamental purpose; we are not to look for portraits on any of them. I spoke before of the four statues with crisp hair, one of which is in the British Museum. Another, now at Boulak, wears a fine head-dress called the *atef*, two feathers resting on the horns of a ram. There were also groups representing the king sitting with one or two gods; groups of that kind were

often put outside the entrance on each side of the road. Generally speaking, it is near the entrances that the statues were more abundant. A great many disappeared already in old times, or were broken in the destruction of the temple, which must have taken place between the Ramessides and the Bubastites; a large number of them were employed by Osorkon I. and Osorkon II. as building material when they repaired the temple.

The more we study the remains of Bubastis, the more we are convinced that the place must have been one of the favourite resorts of Rameses II., where he stayed repeatedly. Bubastis and Tanis were the two great cities of the Delta, and no doubt the court came frequently to both. Rameses was accompanied by his sons; one of them, Khaemuas, who had a high rank in the priesthood, and who was inspector of the temples, has recorded his visit to Bubastis on a statue of his father. We found also mention of two others who had military commands. One, whose statue is in Boston, was "first cavalry officer of his father, the chief of the horse of his majesty, Mentuhershopshef;" the other, Menephtah, who became the king of the Exodus, was at that time a general of infantry, and he appears several times on sculptures making offerings to the god Amon.

Not far from Bubastis was a foreign nation, which from a small tribe had grown to be a large multitude, and which had never amalgamated with the Egyptians. I have already alluded before to the vicinity of the land of Goshen, only a few miles distant; but the restricted limits of the original land had been broken through, and the Israelites must have spread in the south towards Heliopolis, and in the East in the Wadi Tumulât, the road through which foreign invaders would enter Egypt. One may well conceive that Rameses who, in spite of his outward show, must have felt how much his kingdom was weakened, grew rather anxious at the presence of a great number of strangers occupying the very gate of Egypt, and that he desired to turn their presence to a benefit for Egypt. Therefore he employed them to build fortresses destined to protect the land against invaders. The Exodus describes in the following way the fear which took hold of the king: "And he said unto his people: Behold, the people of Israel are more and mightier than we: come let us deal wisely with them; lest they multiply, and it come to pass that, when there falleth out any war, they also join themselves unto our enemies, and fight against us, and get them up out of the land. Therefore, they did set over them taskmasters to afflict them with their burdens. And they built for Pharaoh store cities,

Pithom and Raamses" (Exodus i. 9-11). It was the result of my first campaign of excavation to discover the site of Pithom, not very far from the present city of Ismailiah; Raamses is not yet known; it is very likely between Pithom and Bubastis in the Wadi Tumilat. I cannot dwell at great length here on the events of the Exodus; yet I should like to mention that the successive discoveries made in the Delta have had the result of making the sacred narrative more comprehensible in many points, and especially in showing that the distances were much shorter than was generally thought. For instance, I consider it important to have established that Bubastis was a very large city and a favourite resort of the king and his family. It is quite possible that at the time when the events preceding the Exodus took place, the king was at Bubastis, not at Tanis, as we generally believed.

Menephtah, the king of the Exodus, who is represented as general of infantry, also executed statues in the temple after he became king, but they are very much broken.

The Twentieth dynasty, the dynasty of the Ramessides, whose kings all bear the name of Rameses, is also represented at Bubastis. It is natural that the most powerful of them, Rameses III., should not be absent; but what is more interesting, we met with one of the later ones, who was thought to be an idle prince reigning only nominally, and entirely in the hands of his vizier, the high priest of Amon. For the first time monuments of Rameses VI. have been discovered in the Delta, showing that the power of the king still extended over the two parts of the country. I found three statues of this king: one of red granite of heroic size, standing, has been removed to the Boulak Museum; another, in black granite, is headless and is still on the spot. The kings of the Twentieth dynasty seem to have erected a construction of their own in the western part of the temple, a kind of entrance to the hypostyle hall.

After them, in the obscure period of the Twenty-first dynasty, the temple must have gone through great vicissitudes; I believe that for some reason which we do not know, perhaps in some war or rebellion of which no record has been left, it was destroyed and partly ruined. I said before that in my opinion the beautiful Hathor capitals of the hypostyle hall must be attributed to a period much more ancient than the Twenty-second dynasty. Several of these capitals have underneath, on the part which rested on the square pillow, a dedication to Bast, written by Osorkon I., a king of the Twenty-second dynasty. This dedication was not visible, and could not be

read, but it is a lasting record of the fact that Osorkon I. had done some work in connexion with these capitals. In the same way also Rameses II. put his name under the base of the obelisks he erected, in order that his memory should not perish altogether in case one of his successors should erase all the visible inscriptions of the sides. In my opinion, the inscription of Osorkon I. records, not that the king had these capitals sculptured, but that he raised them a second time, and he could not have done it if they had been standing, while if they were overthrown, and the temple was more or less in ruin, the fact is easily to be explained.

The Twenty-second dynasty is called by Manetho the dynasty of the Bubastites. It is most likely that these kings were strangers of Libyan origin; their family had the hereditary command of the guard of Libyan mercenaries, called the Ma or the Mashooash; and it is natural to suppose that it was with the aid of his foreign troops that Shishak, the first of the Bubastite rulers, succeeded in ascending the throne of Egypt. Shishak is well known as the successful enemy of Rehoboam; he conquered Jerusalem and pillaged its temples; he made great constructions at Thebes, but he does not seem to have done anything in what is considered as his native city. His name has been found only on a small fragment of limestone. The first king of the Bubastites who adorned the temple with fine sculptures is a king who was little known until now, Osorkon I. As I said before, very likely the temple was in ruins in his time; he rebuilt it, or at least he began doing so; he raised again the beautiful Hathor capitals, and went to work in the first hall, building up the walls and covering them with finely-carved sculptures, for which he used the material already on the spot, as one may judge from blocks engraved on both sides; which under Rameses II. were part of the basement, while under Osorkon I. they were at a certain height in the wall. I believe it was in his reign that a change took place in the dedication of the temple. Instead of being a place of worship for the great gods of Egypt, and chiefly for Set, of whom Rameses II. seems to have been a fervent adorer, it became the temple of Bast, the lion or cat-headed goddess, with her accompanying gods, Mahes or Nefertum, called her son, and Horheken, a special kind of Horus. I should think also that the religious custom of keeping cats in the temple and of burying them in holy ground dates from his reign. There is a considerable space in the mound of Tel Basta, which is nothing but a cemetery of cats, rectangular pits made of raw bricks, which are full of the bones of these animals, among which some bronzes have

been thrown, representing either cats or the god Nefertum, a god with a human form wearing as headdress a lotus-flower, over which are two feathers. The cemetery of cats has been known for many years to the fellahen, who dug it out entirely, and supplied the dealers in Cairo with the bronze cats which fill their shops. I attempted this year an excavation in the cemetery; I was obliged to go very deep, as all the upper pits have been rifled; under such circumstances the digging is very ungrateful business, as the water and the salt have nearly destroyed the bronzes. I emptied several pits entirely full of bones, which are quite calcined, as they are the residue of bodies burnt in furnaces still visible close to the pits. It is incredible what an immense number of cats must have been burnt, judging from the number and the size of the pits. After many difficulties we succeeded in rescuing a few skulls, which are now in the hands of the illustrious naturalist, Dr. Virchow, of Berlin. It is very likely that the holy cat of Bubastis was not the ordinary domestic cat, but some larger animal of the feline tribe, either the wild cat or a kind of lynx.

Under Osorkon I. Egypt was not an impoverished country; we may judge of it from inscriptions which are unfortunately in a very bad state, but which are due to Osorkon I. Herodotus says that about three furlongs from the great temple, towards the east, is the temple of Hermes. I found the remains of it, a few scattered blocks in a clover-field, at a short distance out of the tell. I dug there several days; there is very little left: a large architrave, with a cartouche of Rameses II., and a great many fragments all bearing the name of Osorkon I. There are fragments of a large size, belonging to a long inscription, in which Osorkon I. relates the weights of silver and of *asem* (silver gilt) which he gave to several temples; and the large quantities which he mentions remind one of the considerable offerings made to the religious establishments in the time of the great prosperity of Egypt. I believe that this second temple was the treasury of the other, and that being, as were all treasuries and libraries, under the protection of Hermes Thoth, it was taken by Herodotus for a temple of Hermes.

Osorkon I. did not finish the rebuilding of the temple, and it was Osorkon II. who completed it, and who worked chiefly in the second hall. This part of the building seems to have suffered most grievously in the destruction which I presume to have taken place before the accession of the Bubastites to the throne of Egypt. When we began rolling the blocks of the enormous heap which marked the site of the hall, nearly

every one of them was found to be a fragment of a statue, or of a group which had been cut up, sometimes partly erased and afterwards walled in; one of the sides being flattened in order to engrave on it the sculptures of Osorkon II. Most of these fragments bear the name of Rameses II. Sometimes the remains of the old statue are in a fair state of preservation, such as, for instance, the block which has been given to the Museum of Liverpool, where there is on one side a very good head of Rameses; on the other, a sculpture of the sacred boat in which the emblem of Amon was carried; the piece of statue was used simply as building material, for when it was walled in, the head was turned upside down. Sometimes also we come across the feet of a colossal statue; on the base, what would be under the feet, if the statue were standing, there are sculptures of Osorkon. I do not believe all this wanton destruction was done by Osorkon intentionally; although he usurped a good number of the cartouches of Rameses, I cannot fancy that it was he who broke such a great number of statues, while he respected others bearing also the name of Rameses. I presume that the Bubastites found the temple in a state of ruin, and that they made use of what they found on the spot, leaving intact the statues which had not suffered any damage, and taking what was broken for their building, instead of fetching granite blocks all the way from Assooan. Osorkon II. was also a king very little known. I had already discovered some constructions of his at Pithom. At Bubastis he recorded one of the principal events of his life, a great festival given in the temple in the 22nd year of his reign, on the 1st of the month of Choiak. It is extraordinary that the festival is not given in the honour of Bast, but of Amon. It is evidently an old tradition which Osorkon had to follow, something which "took place since the days of his father," as he says in the inscription. It was very likely for the purpose of this festival that he re-built the second hall to which he gave the name of the "festive hall." The walls are covered with sculptures representing the scenes of the festival; unfortunately, although every block on which there was an inscription or a sculpture has been stamped or photographed, it will never be possible to make a connected description of it. The king is generally represented as a god; he sits in a sanctuary, the goddess Bast is standing before him, or he has with him his queen, Karoama, as may be seen on a large sculpture now in the British Museum. Sometimes they are accompanied by three of their daughters, whose names are given. The gods of Egypt are supposed to be present at the festival, and there are long series of them

standing each in his shrine. The priests, of whom there is a great variety, carry offerings of fishes and birds, vases,—very likely of precious metals,—or sacred standards. Sometimes they seem to execute dances, sometimes they lie quite flat on the ground, sometimes also they are accompanied by ugly dwarfs. The emblem of Amon is in his sacred boat, and is carried on the shoulders of the priests, and the king himself is sometimes borne on a litter. It is not impossible that this great festival, which, as I said, was based on an old tradition, had something to do with the calendar. Though he celebrated it in honour of Amon, Osorkon II., who in his cartouche calls himself the son of Bast, completed the dedication of the temple to the goddess; it was he who erased the name of Set, where it was still visible, and replaced it by Mahes, as it is seen on several of the columns. He had also a great desire to inscribe his name as often as possible, for it is met with nearly as often as Rameses II.

I do not insist on monuments of small importance of the Twenty-fourth and the Twenty-sixth dynasties. The most western hall, and the largest, was built by the first king of the Thirtieth dynasty,—Nekhthorheb,—the last king of the last native dynasty. In spite of the long wars which they had to wage against the Persians, the princes of the Thirtieth dynasty, said to be Sebennytes, have left us very large and important constructions, especially in the Delta. They seem to have taken as the object of their imitation the kings of the Twelfth dynasty; under their reign there is a revival of Egyptian art which is quite marvellous, and they have left us monuments which can be compared only to the works of the best period. The decoration of the western hall was not finished, but, in order to show that it was to Bast that it was dedicated, Nekhthorheb changed his cartouche, and, instead of calling himself son of Isis, as everywhere else, he is styled son of Bast. The most beautiful part of the hall was the shrine of red granite, which was at the end. Three fragments of it are now in the British Museum; the religious sculptures which cover them are of the most exquisite workmanship, and were worthy of the beautiful temple in which the shrine was deposited.

If we add to this long catalogue of monuments two Greek inscriptions referring to statues being erected by two higher officials of the time of Ptolemy Epiphanes, we shall have reached the lower limit of the period over which extend the annals of Bubastis, such as we recovered them in the excavations. We are able now to trace some of the principal events in the history of the city and the country during 3,500 years,

from Cheops down to the Macedonian kings, and we have found inscribed on statues or on the walls of the temple the names of twenty-six kings, one of whom, one Raian or Ian-ra, was absolutely unknown; besides, we have now in several museums monuments of great value, some of which, like the large statue of Apepi in the British Museum, are quite unique.

Such is the net result of a work of about six months on a spot which was thought to be absolutely exhausted, and where nothing was said to remain. This instance shows how many treasures lie still hidden in the soil of Egypt; there are even large historical cities where no serious exploration has ever been made. It is dangerous to play the prophet in matters of excavation; but who knows what may be concealed in many mounds of the Delta or of Upper Egypt, which it would be easy to name? There are still great gaps in the history of Egypt, which we hope to fill up some day, and the work of excavation is far from being closed. I trust that in relating what has been done at Bubastis I may have kindled in your minds a desire that more should be done in that way; and I beg to be allowed to warmly recommend to your interest and to your practical support the work of Egyptian Exploration.

The PRESIDENT (Sir George Gabriel Stokes, Bart., M.P., P.R.S.).— I have now to ask you to return your thanks to Monsieur Naville for this most interesting paper, although you have already practically done so by anticipation in the applause with which the paper has been received from the beginning to its conclusion.

M. NAVILLE expressed his thanks for his cordial reception and the way in which his paper had been received.

The PRESIDENT.—I will now call on any present who may have made this subject their own to speak to the paper. Perhaps Sir Charles Newton will begin the discussion.

Sir CHARLES T. NEWTON, K.C.B., D.C.L.—All that I can claim with reference to Egyptian Exploration is the fact that I have supported it with such influence as I possess; but as for offering any remarks on the results which M. Naville has so ably put before us, I confess myself quite unfit. I think all will agree that M. Naville, having gone through all this toil in investigating and pushing his discoveries to the very farthest point that he could go, and then presenting to us this most lucid statement, makes us feel what a deep obligation he has laid us under (cheers). I can only

hope that he may have the help, health, and energy to follow up his researches, and that we, the British public, will provide him liberally, without stint, with the means to go on. I say this because I have too often seen, with extreme regret, the manner in which the public of this country take up a thing, and then drop it when half finished, in contradistinction to the extraordinary perseverance of the German people, for when they make excavations they do them thoroughly. Let us try to show the same dogged perseverance, and go on with these Egyptian discoveries (cheers).

Mr. REGINALD STUART POOLE, LL.D.—I have been extremely gratified by this paper, which is the best justification, if it were needed, of the work of M. Naville. It is not only a learned paper, but the most cautious one I have ever heard from a learned discoverer, and herein lies M. Naville's great merit,—he never takes you beyond where he can safely go. All I can add with reference to the paper is, that with all that M. Naville has said I cordially agree, and where I have, unfortunately, differed from him I am perfectly sure that he is right and I am wrong. As to the places where the monuments he has discovered have gone to, I think I ought to say that the Americans contributed, last year, £1,000 towards the Egyptian Exploration Fund, and England £1,100. The arrangements made were to give the artistic monuments to the Art Museum at Boston and to retain the historical ones ourselves; for, although we gave £1,100, and were supported by a strong committee, with names like my colleague amongst them, they had only an able secretary, Dr. Schliemann, and they trusted their £1,000 to us without any conditions whatever. It was very hard to send away what we did, but, under the circumstances, we could not do otherwise. I am exceedingly gratified that the fine statue referred to by M. Naville in his paper has been given, with great heartiness, to his native place. With great satisfaction he will set up that monument in his native town, which will record what an eminent archæologist has done for England and other countries (applause).

Mr. W. ST. C. BOSCAWEN (F.R.Hist.Soc.)—The paper that has been read this evening is one of particular interest, for by it M. Naville has done a great deal to weld together two of the oldest civilisations in the world. More than ten years ago I expressed in the rooms of this Institute the opinion that we should find that the Elamite invasion of Babylonia was an element exercising con-

siderable influence in the Hyksos invasion in Egypt. It was the beginning of a great tidal wave which swept across Western Asia and burst in the lower provinces of Egypt. The discoveries which M. Naville has made seem thoroughly to confirm that opinion. The head which is now in the British Museum I regard as one of its greatest treasures, and the importance of which we cannot too highly estimate. I think we shall find that it is a monument which will take its place side by side with those remarkable statues found by M. de Sarzec in South Chaldea. The more one studies the early civilisation of Chaldea, the more one is convinced that there was an Egyptian influence in Babylonia at the time of Gudea and the Kings of Sergul, and I am persuaded it will be found that there was a very early and close intercourse between the Babylonian and Egyptian people at that period. One point that M. Naville has referred to is extremely interesting, and that is, the fact that those early kings fought in Sinai for the possession of the copper mines and for the possession of the stone quarries, and of this there seems to be no doubt, as out of a number of Assyriologists there are only two who hesitate to identify the land of Maggan, of which he spoke, with the Sinaitic inscriptions. It is called the land of the Turquoise, which we know was found there in ancient times, and we know that the turquoise is always associated with copper, and that copper is found there, and these facts are confirmed by the discoveries of Professor Hull in his investigations into the Sinaitic peninsula referred to by him in a paper read before this Institute.* It was from this region that the stone for the statues I referred to came, and it was in this region of Sinai that the contact between the two civilisations took place. Then there is another point in this paper of particular interest, not only to Egyptologists, but to all students of the history of Western Asia, and that is a point which M. Naville has hardly emphasised as much as he might have; viz., the fact of the certainly isolated position which the Hebrew people held in Egypt. Though they were in power at court at the time of the Hyksos, and during the period when the Semites were in power in the Delta, yet they came very little into contact with the thoroughly highly-educated Egyptians, and this accounts in a great measure for the little Egyptian influence that has been found in the Pentateuch, and the discovery is made still more important to us in another point of view. What

* *Transactions*, vol. xxi. p. 11.

has been done is about one-tenth of what may be accomplished. There are mounds throughout the whole of the district of the Delta which will yield, probably, as much as these have yielded. There are mounds, not only in Northern Egypt, which require to be excavated, but, as Professor Sayce said in his Annual Address, throughout the whole of Southern Palestine. Any one who has travelled through the country cannot doubt for a moment that the mounds in the south of Palestine, and even Hebron itself, have something to yield if the spade of the explorer be applied to its great mass of artificial as well as natural mounds.

Mr. T. H. BAYLIS, Q.C.—I was much gratified to receive an invitation for to-night. I was asked this evening by a very learned man how it came to pass that Bubastis had been so long neglected. Why were discoveries not made at an earlier period? Professor Naville has given us an answer at the commencement of his most interesting paper. Discoveries in connexion with Scripture should interest every man who takes an interest in the Bible.

Captain FRANCIS PETRIE, F.G.S. (Hon. Sec.)—A very large number of letters have been received from those distinguished in science and literature who at this time of the year are on the wing, and, therefore, deeply regret that they are unable to be present to hear M. Naville—who was only able to arrive in England six days ago—give an account of his discoveries. At this late hour I will only select one to lay before you, it is from Major C. R. Conder, R.E.; who is well known in connexion with the splendid work of the exploration of Palestine, and also his investigations as regards the early inhabitants of the East:—

Southampton, 4th July, 1889.

“M. Naville’s paper is most interesting, and the existence of a Turanian ruling caste in the Delta seems to me to be supported not only by the valuable discoveries he has made, but also by the existence in the Egyptian language of about 150 Turanian words, apparently loan words, for the language itself is certainly not Turanian. I believe that Mariette’s view, which connects the Hyksos with the Hittites, has been much strengthened by recent discovery.

“I have, however, been unable to discover any very forcible argument in favour of placing the Exodus as late as Egyptologists who have followed Dr. Brugsch are inclined to suppose.

“While the existence of this Turanian population in Egypt is, I believe, beyond dispute, it must not be forgotten that Semitic loan words also occur in the language (some sixty or more have been discovered), which show that there was a Semitic (probably Phœnician)

element in the Delta before the time of the Nineteenth dynasty. This has been recognised by Dr. Brugsch and by Pierret.

“M. Naville’s suggestion that these Asiatic immigrations were due to the contemporary troubles in Mesopotamia seems to me interesting and important.”

The Institute is to be congratulated on having had two such papers from its members in one week as the Annual Address of Professor Sayce and this paper by M. Naville. The one bearing on early Assyrian, the other on early Egyptian, history ; and it is an additional gain that they should have been brought together in the Transactions of our Society, whose objects, I may add, they both further.

The PRESIDENT then announced the meeting closed, and the members and their guests adjourned to the Museum, where refreshments were served.

ORDINARY MEETING.*

THE PRESIDENT, SIR GEORGE G. 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 :—

ASSOCIATES :—Rev. N. G. Clark, D.D., Knox College, LL.D., Vermont University, United States ; Rev. F. W. Chatterton, New Zealand ; Rev. H. M. B. Marshall, New Zealand ; Rev. President G. F. Magoun, A.M., D.D., Iowa College, United States ; F. C. Watson, Esq., London.

The President having congratulated the Institute on overcoming all the difficulties which had been encountered as regards finding new apartments, and on securing such satisfactory and bright ones as they were now assembled in for the first time,

A Paper “on the Babylonian Legend of Creation,” by Dr. C. B. Warring, was then read by Mr. H. Cadman Jones, M.A. A discussion then took place, in which Mr. W. St. Chad Boscawen, the Rev. S. M. Mayhew, the Rev. Principal A. Cave, Major Freeman, and others took part, after which the meeting was adjourned. The publication of this Paper is unavoidably delayed.

* April 1, 1889.

ORDINARY MEETING.*

THE PRESIDENT, SIR GEORGE G. 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. John Z. Armstrong, Ph.D., United States ; J. Brown, Esq., C.E., Spain.

ASSOCIATES :—Captain J. du Boulay, D.L., J.P., Salisbury ; H. L. Reynolds, Esq., Entomological Bureau, United States.

The following Paper was then read by the Author :—

NOTES ON THE ETHNOLOGY AND ANCIENT
CHRONOLOGY OF CHINA. By Surgeon-General
C. A. GORDON, M.D., C.B., Honorary Physician to Her
Majesty the Queen ; in France, Officier de la Légion
d'Honneur, &c., &c., &c.

ETHNOLOGY.

WHENCE came the word *China* to designate the vast empire to which, together with its people, the following remarks are intended to refer ? The Chinese themselves have no such name for their Fatherland. The most ancient name applied in their nomenclature is *Tien Hia*,—that is, “ Beneath the Sky ” ; also *Tien-sha*, signifying “ under, or inferior only to heaven.” At a later period, that of *Chung Kwoh*, or “ Middle Kingdom,” was given to the country, namely, by CHING-WANG, second monarch of the Chow dynasty, about B.C. 1150. The Buddhists of India called the land *Chin-tan*, or “ The Dawn.” But the dynasty now reigning distinguishes the country by the name of *Ta Tsing Kwoh*,—that is, “ Great Pure Kingdom.” † Whether the SINIM ‡ of the prophet Isaiah,

* April 15, 1889.

‡ Chap. xlix. 12.

† Williams, vol. i., p. 2, et seq.

who wrote about B.C. 800, should be interpreted of the Chinese appears not to be susceptible of decision, but the context appears to indicate a people of the extreme east or south.

According to the *Laws of Menu* and to the Aryan epic poem the *Mahabharata*, the name *China* was applied to a country with which the Hindoos held intercourse B.C. 1200. The more generally received account assigns the name to about B.C. 250, and as derived from the family of *Tsin*, whose chief about that period obtained sway over the feudal principalities or petty kingdoms into which the country had previously been divided. But the patronymic of the founder of that dynasty had existed during several centuries prior to that event. There is reason to believe that the name *China* was introduced into Europe by Malay and Arabian traders so recently as about A.D. 1500.* The Persian name *Cathay*, and its Russian equivalent *Kitai*, are of modern application,—modern in the sense of being not long prior to the thirteenth century, A.D.

The particular portion of China to which, in the first century of our era, the term *Sericum* (Silk) was applied, appears to have been that which now constitutes the province of Sechuen. The inhabitants, named “*Seres*,” were described as being “a mixture of Scythians and Indians”; as being just and gentle in character, loving tranquillity and comfort; as being isolated from the world, though addicted to commerce, and avoiding intercourse with strangers. In carrying on their commercial transactions “they inscribed the prices of their goods upon the bales in which they were packed, and deposited them in a solitary building called the Stone Tower. The Scythian merchants then approached, and having deposited what they deemed a just price for the goods, retired. After their departure the *Seres* examined the sum deposited; if they thought it sufficient they took it away and left the goods; but if not enough, they removed the goods and left the money.” In these particulars we recognise some characteristics and customs of the modern Chinese.

Arrian (A.D. 140) speaks of the *Sinae* or *Thinae* as a people “in the remotest parts of Asia,” by whom were exported raw and manufactured silks by way of Bactria,—that is, Bokhara, westwards. At the same date *Ptolemy* (Claudius) described the *Seres* as “a nation between the Ganges and the modern Tibet”; the silk exported by them as material for gar-

* *Thsing*, pure, the title assumed by the Manchow conquerors. The word is believed to have been by the Malays turned into *Tchina* and from them, through the Portuguese traders, into *China*.

ments for Roman ladies of that period, having been looked upon as "collected from the leaves of trees."

Whence came the people by whom the country so named is now inhabited; and who are they? The few particulars relating to this question which are about to follow may, perhaps, throw some light or, at least, afford materials wherewith those interested in the subject may further prosecute their investigations in regard to it.

According to the authority* whom I desire to follow on the present occasion, the tawny-coloured, olive, and yellow families of mankind, which include the Manchus of Central Asia, the Chinese, Japanese, and Hyperboreans, as the Laplanders, Samoides, and Esquimaux, are referred to the parent stock of SHEM, the Scythians and Tartars to that of JAPHETH.† The various peoples so enumerated have acquired distinctive characteristics in the course of their migrations, circumstances of locality, and general surroundings; their modes of life and national distinctions being also largely due to the same influences. Nor are the variations in type thus alluded to confined to man; changes of an allied nature are observable in respect to the zoology and botany of geographical regions, even, also, the physical aspect of territories undergoes continued change. And there are modifying circumstances of another nature, the influence exerted by which is not to be overlooked, namely:—

Chinese history supplies examples of the influence of wars and invasions as leading to migrations of particular septa or clans. One such instance must here suffice. In the second century before our era the tract of country which comprises the north-western portion of Kansuh, Kokonor, and a part of the south of Gobi was inhabited by a people called YUECHI, or YUETI; ‡ they had towns in their possession, and were ruled over

* White's *Universal History*.

† Perhaps, therefore, if, as we may reasonably believe they did, the descendants of Shem, Ham, and Japheth commenced to colonise shortly after they began to form families, three centuries would not be too long a time for some of them to settle in China, offsetting presumably from Elam, Asshur, and other descendants of Shem in Persia.* It is true that in sacred genealogy the origin of great peoples in Eastern nations cannot be traced with similar clearness as Moses adopted in regard to the western divisions of the human family, more especially the Arabian and the Phœnician branches. The fact, however, that Moses adapted his record in this respect, while it leaves the subject open to investigation and conjecture, makes more clear the intention with which that portion of this record was so written.

‡ The original seat of the tribe so-called is believed to have been Ghuznee. Under the name of *Scythians*, they have been known since about B.C. 800.

by a king of their own race. In the year B.C. 165 they were attacked by the HIONGNOU TARTARS, who were to be known in subsequent centuries as the HUNS; they were by the latter defeated, and compelled to seek elsewhere their independence. In their migration they retreated along the Tian Shan range to the countries of Trans-Oxiana; and having established themselves in Central Asia, there, some years afterwards, they came into conflict with the Parthians,* whom, after a continuous struggle of several years' duration, they overthrew. Other bands of Yuchi Scythians, or, more correctly, *Scoloti*, attacked and destroyed the Greek kingdom of Bactria (Balkh), one of the last relics of Alexander's Asiatic conquests. Between the years B.C. 126 and 120 various migrations of the same people took place into India, culminating in the establishment of the empire of Kanishka about B.C. 50-30.† The name *Chinapati*, given to a place about ten miles to the west of the Beas‡ river, indicates a town to which Chinese hostages were taken as recently as A.D. 629-645.§ It is believed that the Jats|| of the present day are related by descent to the Yuchi of whom we have just spoken. History records numerous other instances in which migrations of tribes have taken place on a large scale, sometimes westward, at others eastward; and even in our own day migration-streams are flowing more or less copiously towards various destinations. As with the present, so in past time similar currents were set in movement by similar causes, and regions became occupied by foreigners; the so-called aborigines,—because history gives no clue to their actual origin,—being more or less completely replaced by immigrants. Thus, in relation to China, although the people now known by the name of “the Chinese” claim our first attention, there are others throughout that great empire who merit our notice, including the Miaotze, Li-mou, Kakyens, and other aborigines in the southern provinces; the Manchus, Mongols, and various Tartar tribes in the north, and the “wild” tribes in the island of Formosa.

The Li-min, or Chinese, properly so-called.—Twenty-two centuries before our era a band of immigrants advanced in an easterly direction through Central Asia, along the valley of

* The Parthians inhabited what is now the Persian province of Khorassan.

† The name of Kanishka, a Turk or Tartar King of India, has been found in inscriptions at Muttra, Manikiala, and Bhawalpore.

‡ Beas river—the ancient *Hyphasis*.

§ Boulger's *China*, vol. i.

|| See Note 1.

the Tarim, or Ergu river,* and across the desert to Kansuh, which province they are believed to have entered at a point near lat. 408° N., long. 108° E., from whence in due time they spread themselves amidst the forests of Shansi that skirt the left bank of the Hoangho, where the great bend of that river occurs, through the provinces of Kansu, Shensi, and Shansi. Having arrived in that region, they had to fight their way against the aboriginal inhabitants much as some eight centuries later (B.C. 1451) the Jews fought their way into Canaan. Partly by driving the aborigines into the secluded mountain ranges, partly by intermingling with and colonising among them, communities arose, out of which, in the course of generations, the descendants of those immigrants became possessors of the great empire whose name they now bear.

Several migrations, similar in character to the above, have taken place into China since the early date first mentioned. Of those more especially noticed in history one occurred in the ninth century of our era (860-873), and with regard to it we learn that the descendants of the early immigrants had by that time forgotten all trace of their original country; they looked upon themselves as aborigines, upon the new invaders as belonging to a different race, and as being therefore their natural enemies.

We endeavour still further to trace up to its earlier source the people whose immigrations are here related, and what do we gather with regard to them? In the first place, that they represented the "Scythians," a portion of whom struggled into Media, the geographical position of which is southward of the Caspian Sea, and to the eastward of ancient Elam and Susiana; that is, the modern Khurdistan, a portion of the ancient Persian empire.

Recent investigations in Mesopotamia,—that is, the country between the rivers Euphrates and Tigris,—have discovered sculptures representing a people the type of whose features was distinctly Mongolian; and, moreover, we learn that the primeval men, who spoke an *archaic* or monosyllabic language, are by tradition referred to the valley of the Euphrates as their original seat. "We must,"—so writes Baron Bunsen,— "we must picture to ourselves this primitive archaic people, few in number, their wants few, their tongue limited, leading their wandering life. At length, a branch separating from the archaic stock departed to the eastward, and arrived at last in a smiling country, well watered with rivers, and

* The river Tarim flows into the Lob-Nor.

flowing with verdure. Here they settled themselves, and called the land *Sin*, which we have called China.”*

There are authors who see in the similarity of some of the customs of the Chinese and of the ancient Egyptians sufficient reason for the belief that a connexion anciently existed between those two peoples. With each, agriculture was held in high repute; astronomical science early cultivated; respect for parents inculcated; the dead worshipped; hieroglyphic and symbolic writing practised. In the opinion of an eminent Sinologist of the present day:—“In all probability the outbreak in Susiana of some political disturbance in about B.C. 2283 drove the Chinese from the land of their adoption, whence they wandered eastward until they finally settled in China and the countries south of the region so named.”†

That theory is supported by various arguments and circumstances. For example, the migrations of the three primitive‡ historical races are for the most part acknowledged to have begun about B.C. 2614, namely, at a period antecedent by more than five centuries (541 years) to the Noachian deluge. Nor are there wanting writers who accept the view that in still earlier times migrations took place of tribes which can only be referred to as “non-historical.” Such migrations of the “historical” races as are above alluded to continued during the period mentioned down to the twenty-second century B.C.; in their course colonies and distant communities may be considered to have been established, and various forms of society and of government instituted, those of China among others.§

“It would be a hopeless task to attempt to explain, on any certain grounds,”—so wrote an eminent historian,||—“the

* *Lectures on the Origin and Migrations of the Human Race.* London, 1865. See Note 2, p. 193.

† Douglas.

‡ The theory of Isaac de la Pierère, A.D. 1655, adverts to *Pre-Adamites* with whom Cain intermarried, and produced a black progeny.—Hales, vol. i., 365. See also *Nouvelle Biographie Universelle* for further details in regard to that theory.

§ As the Phœnicians, Arabians, Egyptians, Ethiopians, and Libyans southwards; the Persians, Indians, and Chinese eastwards; the Scythians, Celts, and Tartars, northwards; the Greeks and Latins, even as far as the Peruvians, and Mexicans of South America, and the Indian tribes of North America, westwards.—Hales’s *Chronology*, vol. ii., p. 50.

|| Sir John Davis, *The Chinese*, p. 122.

NOTE.—Adverting to the allusion made above to the migration of non-historic races, *Lawrence* wrote to this effect:—“Cain, after slaying his brother, was married, although no daughters of Eve are mentioned before this time.—Cain went out from the presence of the Lord and dwelt in the land of Nod, on the east of Eden (Genesis iv. 17), where he married a wife and by her had a son, Enoch, though no daughters of Eve were mentioned before this time.”—*Lectures on Man*, p. 168.

mode in which China first became peopled. The only thing like testimony that we possess out of China relating to this subject occurs in the *Institutes of Menu*. It is there written that 'many families of the military class, having gradually abandoned the ordinances of the Veda and company of the Brahmins, lived in a state of degradation as the *Chinas* and some other nations.' Evidently with reference to the later immigrants, and to a period B.C. 1200, a native historian observes that 'the Chinese nation was small and feeble; the Eastern foreigners, namely, the people between them and the east coast, numerous and strong; and the former gradually obtained a settlement in the middle of the country. This, so far as it goes, might be construed into a proof that China was originally peopled from India.'

Considerable discrepancy, amounting to, absolutely, contradiction exists between the accounts given by writers in respect to the actual condition of those immigrants. According to one class of historians, they consisted of a "small horde of wanderers, destitute of houses, of clothing, ignorant of the knowledge of fire, and consequently of the art of cooking food; skins of animals slain by them formed their only covering, the raw flesh of those animals, insects and roots their only food. On the other hand, it is asserted of the early immigrants that they brought with them the resources of Western Asian culture, a knowledge of writing, and astronomy, as well as of the arts which primarily minister to the wants and comforts of mankind."*

What say native historians on the subject? MUNG TZE, otherwise MENCIOUS, who wrote in the fourth century prior to our era (B.C. 375-368) mentioned governors of provinces by the designation of "pastors" and "herdsmen," and princes as being "pastors of men." In Chinese history there occur other expressions, and also written characters which point to the belief that the earliest Chinese immigrants were pastoral.†

The Miaotze.—The people so called have been mentioned in

* Douglas.

† Thus, their descendants at the present day continue to call themselves *li min*, a designation by which they have been known since the commencement of the Chow dynasty (B.C. 1121). Sinologists observe that the written characters for *plough* and for the Chinese people are nearly alike; also that as at the period mentioned, so it is still the duty of every man, from the chief downward, "to hold the plough"—in other words to engage in the work of agriculture. The Chinese themselves explain that the term *li min* means "the black-haired people," which may have come to be its secondary meaning, as distinguishing them from the nomadic tribes of a lighter complexion. In Northern Asia, and in the neighbourhood of the Himalayas, there occur races having light hair and relatively light complexion.

Chinese history during 4,000 years. As the early immigrants spread in China they found that country already occupied by tribes of aborigines, a description of whom as originally given remains to the present day. In the regions southward of Shansi they were pictured as "fiery dogs," those in the east as "great bowmen," on the south as "ungovernable vermin," and on the west as "mounted warriors." The language of those tribes differed from that of the "black-haired" invaders. Step by step the MIAOTZE were driven to the mountains, where their descendants still continue to maintain their independence, having on various occasions defeated the Chinese forces that have been sent against them.

The mountain ranges of Yunnan, Kiangsi, and Kweichow are their principal strongholds at the present day, several tribes inhabiting different portions of the 360 geographical miles from east to west, over which these ranges stretch. Allied in physical aspect, on the one hand, to the Shans and Karens of Upper Burmah, on the other to the Mishmis of north-eastern Bengal, their language has strong affinities with that of Siam and Annam. Their complexion fair for Asiatics, their features softened Mongolian in type, even approaching the Aryan; yet they are contemptuously called by the Chinese "I-jin," or black barbarians, "Yaou-jin," or dog-men, and "Lâng-jin," or wolf men.*

They are described as in disposition bold and warlike, naturally averse to agricultural pursuits, and to the restraints of settled life. Certain of them have fixed dwellings; their houses consist of two stories, the lower being occupied by their cattle, while the upper is set apart for the family.

Towards the frontiers of Burmah, in Yunnan, and having various characteristics of the inhabitants of the Irawaddy Valley, are the *Lolos*, a branch of the *Miaotze*. Their history dates back to no earlier a period than A.D. 250, when a *Shan* nation came under Chinese influence. In the interior of the island of Hainan are to be found the *Li-Mu*, another off-shoot from this same aborigines. The inhabitants of that island comprise two other classes, namely, Chinese proper, and a cross between those and the "Black Li," or aborigines.

The *Mongols* and *Manchus* belong to the same family, but during centuries of separation, under different circumstances, have altered much. The *Mongols* are essentially nomadic; the *Manchus* are agricultural or a hunting people, according to locality. The *Manchus* seem to partake of both the *Mongol* and of the *Chinese* characters in about an equal degree, and

* See Note 3, p. 194.

when, during the Kin dynasty (A.D. 1123-1260) they ruled the Northern provinces, they amalgamated with the inhabitants of those regions. It is, moreover, said of the Mongols that the "skill with which they have governed the Chinese Empire, and readiness with which they have adopted a civilisation higher than their own, give promise of still further advances when they become familiar with the civilisation of Christian lands." *

Under the term Mongols a great many tribes occupying the steppes of Central Asia are comprised under the general name of Tartars—a word unknown among the people themselves. †

Bordering on China, and owing fealty to that empire, is Tibet, the people of which country partake of the characteristics of the Mongols and Hindoos. Of the Tibetians it is said that "they are mild in disposition, have a stronger religious feeling than the Chinese," and never have left their own highlands for emigration or conquest. ‡

The *Manchu Tartars* are scarcely distinguishable from the Chinese by external appearances. The Chinese are rather taller and of more slender and delicate frame than the Tartars, who are in general short, thick, and robust. The small eye, elliptical at the inner extremity, is a predominating feature in the cast of both the Chinese and Tartar countenance. They both have the same high cheek-bones and pointed chins; in complexion also they are alike, of a yellowish brunette.

The *Ortous* comprise a tribe whose region extends between the Hoangho and Great Wall to a distance of 100 leagues from east to west, and seventy from north to south. The tribe so called has been alternately subject to the Tartars and to the Chinese. About A.D. 1696 the Manchus were described by the Emperor Kanghi as "a very civilised nation who have lost nothing of the old manners of the true Mongols." "Their princes live in perfect union among themselves. No one ever heard of a thief among them, although they take not the slightest precaution for guarding their camels and horses."

In the 9th century, A.D., three nations appeared roaming about the northern side of China and Corea; in the west or modern Mongolia the Mong-u, who in the sequel were called Monk-kos and Mongoles; farther to the east the Kitanes; and beyond Corea, as far as the Eastern Ocean, the Niudsches, or Kin, who are, generally speaking, the same people with the Tunguses and the Manchus, the present sovereigns of China.

* Williams, vol. i., p. 44.

† Klaproth confines the appellation TARTARS to the Mongols, Kalmucks, Kalkas, Eleuths, and Buriats, while the Kirghis, Usbecks, Cossacks, and Turks are of Kurdish and *Turkoman* origin.

‡ The remark does not refer to immediately recent times.

In the 10th century A.D. the Kitanes first subdued the two other nations just named, and then the northern provinces of China. The Niudsches soon rose in rebellion against the Kitanes, and then, being called by the Chinese to their assistance, they obtained the upper hand of both Kitanes and the Chinese. Upon this a part of the Kitanes retreated westward, and took possession of Upper Bokhara; where they have since borne the name of Karakitans or Karaktayans. In the meantime, the Niudsches ruled over the north of China, and Mongolia as far as the Eastern Ocean. The Mongolians, however, were divided into several classes, each with its own Khan, notwithstanding the supremacy of the Niudsches; and it was one of those petty princes, TEMUDCHIN, who, under the name of GENGHIS KHAN, became in A.D. 1176, the founder of the new monarchy of China.

Other tribes, or septs, there also are, but on this occasion the following only can be alluded to:—

The island of Formosa is divided longitudinally by a ridge of high mountains. The western portion, colonised by the Chinese early in the seventeenth century, is now held by them as a portion of the opposite province of Hai Fokien. The region eastward of the mountain range continues to be inhabited by the aborigines, a savage race, bearing some resemblance to the Malays, and to the inhabitants of the islands in the Pacific, since they blacken their teeth like the former, and tattoo their skins as a distinctive mark of rank, after the manner of the latter.*

The *Amois*, or *Amis*. A tribe of those "savages" are scattered over the eastern portion of the island. Tradition assigns their origin to a shipwrecked crew, who subsequently formed connexions with the islanders, with the understanding that the descendants of such unions were for ever to be in a position of slaves to the chief tribe of the island. The *Amis* of the present day are described as a quiet and gentle people, who chiefly live by agriculture and fishing; who seldom hunt, and have little desire for field sports.

On the other hand, the *Paiwans*, who live in close proximity to the *Amis*, are a turbulent and warlike people; fond of the chase, and of out-door amusements. In disposition, they are proud and independent; in their habits, cleanly and neat. Their language approaches the Malay, and like their congeners of Borneo, they are noted head-hunters. They appear, moreover,

* As do also the *Chins* of Upper Burmah.

to have more affinity to the people of Luzon, and thence southward, than to the Chinese.

The *Tanka*, or *Boat population*, constitutes in a sense a class apart. They exist on rivers near the chief cities, more particularly Canton, where they inhabit "the flower boats," at one time so well known there. Two hundred years B.C. Loo Tsun, a general in the Chinese army of that day, and chief of a clan, raised the standard of rebellion, succeeded in capturing Canton, which city he held for thirty years and until his death. His descendants were persecuted by the Chinese, and forced to seek safety away from land; during many centuries succeeding generations of their countrymen continued similarly to act towards them, nor was it until A.D. 1730 that their lot was ameliorated, the Emperor YUNG CHING having then issued a proclamation in their favour. Of late years their numbers have diminished, but they are still looked upon as a *pariah* class. In physique and in general appearance, however, more particularly of their women, they are much superior to the dwellers on land.

In concluding this section, here is the picture presented to us of domestic and social life among the early immigrants, whose descendants were to become the people to whom we now apply the term Chinese:—

"The people principally applied themselves to the education of their children, and to agriculture. They were laborious to excess. The judges and governors of provinces were grave and sober, and by equity of their decisions gained the love and respect of the people. The Emperor placed his highest felicity in rendering his subjects happy, and did not so much consider himself the sovereign of a great empire as the father of a numerous family."

CHRONOLOGY.

Students of Chinese chronology divide the history of that people into periods, arbitrary in themselves, but convenient for purposes of investigation.* The following enumeration of those periods will best suit our present purpose, viz.:—

1. The mythological,—its date uncertain and vague.
2. The traditional,—connecting the preceding with:—
3. The period of ancient history beginning with the institution of the *Hea* dynasty B.C. 2356, and ending with the *Han* dynasty, A.D. 265.
4. The middle ages, from the commencement of the *Tsin* dynasty, A.D. 265, to the end of the *Yuen* dynasty, A.D. 1367.

* By Gutzlaff into 4; by Medhurst into 3.

5. Modern history, from the commencement of the *Ming* dynasty, A.D. 1368, to the present time.

To the *first* of these periods are assigned six different eras,* the duration of the whole extending over many thousands of years,—sufficiently long to satisfy the most ardent believer in “the antiquity of man.” In the first, PWANKOO was “produced,” after the first division of heaven and earth, and the settlement of chaos. In the second, *Teen Hwang-she*, “Imperial Heaven,” settled the years. In the third, *Te Hwang-she*, “Royal Earth,” fixed the months. In the fourth, *Jin Hwang-she*, “Sovereign Man,” divided the land. In the fifth year, *Chaou-she* invented dwellings. In the sixth, *Suy-jin-she* “invented” fire.

The period thus indicated is considered to extend backward in time till lost in remotest antiquity, and down to a date variously assigned to B.C. 3369; 3254, and still later when the next era is said to open, namely:—

The *second*, or traditional period, called also the period of the “Five Kings,” is considered to include that which extends from the dates above given to about B.C. 2204, namely, the date of accession to power of the Emperor YU; but in respect to the several rulers to be named as belonging to it, the actual times in which they respectively lived are undefined, if, indeed, the names to be mentioned represent real and not mythological personages. With regard to each, a brief notice only can here be given, namely:—

FUHE† was “assisted” by a female principal called WA. To him is assigned the credit of introducing the elements of civilisation among the Chinese. He taught hunting and fishing; he invented music; instituted a distinctive dress for men and for women; established marriages, and in relation thereto laid down a list of prohibited degrees.

SHINNONG taught the arts of husbandry and medicine, was, like Cain, “a tiller of the ground” ‡ (Gen. iv. 2). He introduced markets and established commerce.

HWANGTI, or “The Yellow Emperor,” is credited with the invention of the “Chinese cycle” of sixty years; with

* Somewhat similar to the four ages or *Yugas* of the Hindoos; the fourth of which corresponding to the present age or *Kali Yuga*, is held to date from B.C. 3101.—According to Menu, *Noah* (corresponding to *Fohi* of the Chinese) lived in the third or beginning of the fourth *yuga*, when the life of man, previously 1,000 years, had been shortened to 100.

† The date assigned to Fuhe is B.C. 2953. According to usually accepted chronology, Noah died B.C. 1998, aged 950 years; the Noachian deluge happened B.C. 2348.

‡ To Shinnong is attributed the discovery of the properties of the tea plant.

the discovery of written characters; the manufacture of silk; the invention of boats with oars; of wheeled carriages, and the training of horses to draw them; also with having designed various implements, and as having wrought in metals. Under him the nation emerged into the light of a sound social organisation. He erected an astronomical observatory; rectified the calendar; introduced coined money, and established a system of weights and measures. He built cities for his people, divided his country into principalities, the population into families, and organised communities. He appointed physicians to examine and prescribe for the sick, for it is recorded by Chinese historians that even in his day people suffered from without by the rigour of the seasons, and within from the passions which disturbed the mind; they died before their time.

CHUN HU is credited with having "joined the priesthood to the State," in other words instituted an "Established Church," albeit he reserved to himself the right of making "Sacrifices to Heaven." He was versed in the science of Astronomy, and directed that the new year should be considered thenceforward to coincide "with the passage of the sun through the 15th degree of Aquarius." According to the Chinese record, "about this time divine and human personages mixed together and produced confusion."*

TE KWUH enjoys the reputation of having been a musician and a polygamist; his only recorded public act, the appointment of "masters to teach his people virtue." The brief record, as it stands, indicates the social condition which, even in those far distant times, prevailed among them.

Two more names of primeval monarchs need here be given,—those of YAO and SHUN, the last of these so-called "Five Sovereigns and Three Emperors." To YAO is assigned the conjectural date B.C. 2356; his reign extending to 102 years; a period less than that given to some of the Patriarchs, but far exceeding the limits recorded in authentic history. He it was who divided the early Chinese Kingdom into twelve provinces, presided over by as many "pastors." He instituted law courts and principles of procedure, such as continue in force at the present day; and he began a plan for the systematic improvement of his country and people.

To SHUN† is assigned the credit of having instituted the great agricultural festival which continues down to the present

* The sons of God saw the daughters of men that they were fair.—Genesis vi. 2.

† Began to reign B.C. 2254; died B.C. 2207.

day, to be celebrated as originally ordered by this emperor at the commencement of the Chinese new year. The ceremonies attending that festival bear some resemblance to the procession of the bull Apis in ancient Egypt, which in like manner was connected with the labours of agriculture and hopes of an abundant harvest. Astronomical observations were taken, and instruments for the purpose made. From the days of SHUN his successors on the throne have continued, like him, literally to put their hands to the plough, and to "sow the five kinds of grain"* as he did, thus intimating the honour they accord to manual labour, and especially to that connected with the tillage of the land. In the reign of SHUN also the first mention occurs of religious worship in the shape of "sacrifices to SHANGTE; † to hills and rivers, and to the hosts of spirits."

In those early days, also, tradition informs us that Governors of Provinces were under special obligation to show kindness to strangers and travellers, and see to their suitable accommodation and general care while passing through the districts under their charge and administration.

The particulars now given illustrate the kind of materials from which is woven the web of so-called History throughout the periods, indefinite in duration, which preceded the discovery of symbols and other written characters, by means of which it became possible to record actual events in their order and manner of occurrence. With reference, however, to the "sovereigns and emperors" whose names have been given, there are capable writers who look upon them simply as Chinese travesties of antediluvian patriarchs, an opinion the more plausible if we accept the theory already expressed, that the people we are dealing with had their birthplace in or near the territories adjoining the Euphrates.

Neither is the circumstance to be ignored that the history of China, like that of other nations, mythical or fabulous in its earliest stages, is not therefore necessarily altogether devoid of truth as some critics assert it to be, the truth being more frequently in respect to manners and customs of the people than to actual events.

The third PERIOD enumerated is held to date from the accession of YU THE GREAT, founder of the first, or Hea dynasty (B.C. 2204); that is, the year assigned to the institution by *Nimrod* of the first Assyrian empire; and to extend to A.D. 264, corresponding to the time in which lived ignobly GALLIENUS the Roman emperor; when Zenobia reigned in

* Namely, maize, pulse, millet, sesamum, and sorghum.

† *Shangte*, = Jehovah of the ancient Jews. See Note 4, p. 194.

Palmyra; and only a few years subsequent to the martyrdom of St. Cyprian of Carthage.

Six different dynasties* and 120 monarchs had during this long interval occupied the throne of China; the empire was much enlarged and consolidated; manners, customs, and trains of thought of the people,—all according to models differing absolutely from those of Western nations,—had become fixed and stereotyped in many respects, though not in all. Waves of conflicting opinions regarding political and religious affairs have since then successively passed over the people; in other respects, however, no change has occurred throughout the many generations that have meantime played their parts in the drama of Chinese life. Reverence to parents,† and submission to constituted authority, have ever been held as established tenets among them, the few exceptions to the rule which history records having been marked by general disapproval and execration.

With reference to the dynasties here alluded to, no more than a few scanty particulars may now be given, viz. :—

The *Hea*, founded by YU, as already alluded to, about B.C. 2204, had a duration of 439 years; it included 17 sovereigns, and passed away B.C. 1765, the period thus included corresponding to times in which took place the call of Abraham (B.C. 2093); the flight of Jacob to Mesopotamia (B.C. 1916); and Joseph's elevation in Egypt (B.C. 1885).

The great event connected with the monarchy of YU, and already alluded to, had its commencement in that of the second preceding monarch, namely YAO; it has been variously described by different writers on Chinese history, but the following account is that selected for our present purpose :—

During the reign of YAO (B.C. 2293)‡ a tremendous deluge occurred, from the overflow of the rivers in the north of China, more especially of the Hoangho, called even then, as ever since, "China's sorrow." According to tradition, YAO inquired: "Is there a capable man to whom I can assign the correction of this calamity?" His advisers presented KWAN as a proper man, but he laboured without success for nine years to drain off the waters. YAO was then advised to employ SHUN, who called in YU, a son of KWAN, to his aid, and the floods were assuaged by deepening the beds of the rivers, and opening new channels.§ According to the records,

* Or eight according to other writers.

† See Fifth Commandment.

‡ Era of Noachian deluge. B.C. 3155.

§ Williams, vol. ii. p. 147.

as YU had assisted SHUN in his government during his lifetime, he was unanimously called to the vacant dignity, and so became founder of the *Hea dynasty*.

A record of the inundation referred to has been stated to exist in the form of an inscription traced in "tadpole characters" on the rocks of *Kau lan shan*, one of the peaks of Mount Hang, in the province of Hunan.*

According therefore to the records quoted, large tracts of country having thus been reclaimed, they were rendered habitable. Communities had to be formed, and a system of government elaborated, for which purpose history states that YU sought for his ministers "servants of God, the supreme Ruler." He divided his territory among his chiefs or nobles, and so instituted a feudal system, while he himself retained the regal power and drew the Imperial revenues from the entire empire. The system so established in China thus anticipating by upwards of a thousand years the introduction of feudalism into our own country.

Even at this early period certain of the arts had made considerable progress. "The black-haired race," as the Chinese were even then called, were acquainted with the growth of the mulberry tree, and with the culture and manufacture of silk. If also we are to credit early history, the art of shipbuilding,—that is, of vessels to be propelled by means of sails,—dates from the same period. History relates that during this reign the manufacture of wine, or, more probably, ardent spirits, was discovered; that no sooner did the monarch taste it than he exclaimed, "This liquor will cause the greatest trouble in the empire." He forthwith banished its discoverer.†

But, according to the records of the time, the high qualities of YU did not descend to his immediate successors. Thus we learn that his son, who came to the throne B.C. 2188, neglected his public duties, abandoned himself to "pleasure," music, wine,† and hunting, with the not unnatural result, even in those early times, that he was detested by his people, and by them dethroned, although not until he had reigned twenty-nine years.

A somewhat romantic episode of the ancient period we are now concerned with may be here recounted:—About the year B.C. 2146, TE SEANG, contemporary with the date of ABRAHAM, occupied the throne of China. A weak prince and ruler, he fell completely into the hands of a clever and designing minister, named HANTSU, who ultimately usurped the regal

* Williams, vol. ii. p. 149.

† It thus appears that this particular vice was not suppressed by the banishment of E TEKH, the discoverer of wine.

power, and killed SEANG in battle. The empress MIN, widow of the deceased emperor, fled to a distant city where she gave birth to a son, whom she named SHAU KANG. As that son grew to boyhood he was employed to tend flocks, in view thus to conceal his royal origin; but reports of the existence of the boy reached the usurper, HANTSU, and orders were issued by the latter that the lawful heir to the throne he occupied should be brought to him dead or alive. The better to avoid the search thus instituted for him SHAU KANG was placed in the capacity of under-cook in the house of a neighbouring governor, and there soon distinguished himself by a spirit and temper so superior to the humble station he appeared to occupy that suspicions with regard to his birth and name were aroused, and led in time to the discovery of both. The governor, his employer, kept the secret for thirty years, and meanwhile gave to SHAU KANG a small government in a secluded situation, where he conducted his administrative duties satisfactorily, alike to the people under him and to his patron. At the end of that time he was in a position to declare himself. Having gathered round him a powerful body of adherents, he proceeded against the usurper, whom he defeated; then with his mother he entered the capital, where he ascended his rightful throne and, it is said, reigned 61 years.

But there came a time when the dynasty to which YU and KANG belonged had run its course, and it may be interesting even now to trace the causes of its downfall. History records what they were, and briefly enumerates them as "dissipation, neglect of public duties, and tyranny." KEÂ KWEI, the last of the dynasty, ascended the Imperial throne B.C. 1818. His cruelty, exactions, and prodigality led to a combination of the "Barons" against him. He was by them deposed, and being deserted even by his profligate favourites, he died in exile B.C. 1766.

In that year the second, or SHANG, dynasty was established by the most powerful of these "Barons," named CHING-TANG. The dynasty so named continued to rule during the succeeding 644 years, and down to B.C. 1122. It comprised 28 sovereigns, some of whom appear to have left a special mark in history. In the reign of the founder of this dynasty a severe drought occurred in China, contemporaneous, and believed to have been directly connected with that of Egypt in Joseph's time.* Other important events, the dates of

* Genesis xli. 54. The use of written characters by the Chinese is assigned to the Shang dynasty, consisting at first of little more than rude representations of common objects. Prior to about B.C. 1600 the records of government were said to have consisted merely of knotted cords.

which come within the period of this dynasty, were the birth of Moses (B.C. 1571); the exodus of the Israelites (B.C. 1491); their settlement in Palestine (B.C. 1451); the siege of Troy (B.C. 1184); the death of Samuel (B.C. 1122).

A very serious political mistake is attributed by Chinese writers to the founder of the Chinese dynasty in question, namely, that he divided the empire into a number of petty states, thus destroying the "ancient pure monarchy," and leaving himself only a small portion of territory and of power. In fact, he broke up the unity of the empire as up to his day it had existed. The result, as we shall presently see, was the conquest of China by a foreign Power.

As an example of the rules of conduct laid down in those early times, the following may here be quoted:—"Order your affairs by righteousness; order your heart by propriety, so shall you transmit a grand example to posterity. He who finds instructors for himself comes to the supreme dominion; he who says that others are not equal to himself becomes small. He who likes to ask becomes enlarged; he who uses only himself becomes small. To revere and honour the way of Heaven is the way to preserve the favouring regard of Heaven."

And yet, excellent as were the precepts laid down by the sages of that time, the rulers belonging to the SHANG dynasty ignored, or acted in disregard of them. In addition to famines, earthquakes, and other calamities due to natural causes, the six centuries during which the dynasty existed were characterised by successive wars, by impiety, cruelty, and licentiousness on the part of the rulers. The stories of profligacy and cruelty of the period, as related in history, are in their details atrocious. Alienation of the people was the natural consequence. As happened at the end of the previous dynasty, so now, a confederation of Barons, on this occasion (B.C. 1134) led by WU WANG, defeated and threatened the dethronement of CHAU SIN, the last emperor of the dynasty. That monarch, "feeling the contempt he was held in, fled to his palace, where he voluntarily perished in the conflagration which at the same time destroyed his treasures,—like another Sardanapalus, though his immolation preceded that of the Assyrian by five centuries."

The third, or *Chow* dynasty, set up by WU WANG, "the martial king," the leader of the conspiracy alluded to, B.C. 1122, had a duration of 873 years, the longest period related in history of any dynasty,—that is, down to B.C. 249,—and

* From the *Shoo King*.

included thirty-five sovereigns. Civil wars and commotions continued throughout a great part of that long period. In the course of those wars some of the vassal princes sought and obtained the aid of the Tartars against others, and thus introduced into the heart of the empire a Power which was destined to undermine each in turn, and at a later period to conquer the Chinese Empire for itself.

Contemporaneous with that dynasty there happened the accession of Saul (B.C. 1110); of David (B.C. 1070); the revolt of the Ten Tribes (B.C. 975); the capture of Jerusalem by Nebuchadnezzar (B.C. 586); the accession of Cyrus (B.C. 551); the battle of Marathon (B.C. 490); and the accession of Alexander the Great (B.C. 336).

History records with regard to the early monarchs of the *Chow* dynasty that they were "impersonations of everything wise and noble"; also that certain maxims laid down by the founder of the dynasty continue at the present day to command obedience in China; including such as relate to duties of ministers to their sovereigns; of children to parents; brother to brother; and friend to friend.*

During that long-continued dynasty oscillations took place in respect to the deference to ethical subjects paid alike by the *classes* and by the *masses*. In the eighth century B.C. religion and morality had been relegated to neglect. Then came a time, extending over several centuries, when sages and philosophers who, for "conscience sake," had previously to flee to mountains and deserts, were recalled, and their counsel sought by those in high places. The public mind having been thus prepared to receive new systems of philosophy, doctrines severally enunciated by two sages who lived contemporaneously during the sixth century B.C. were readily accepted, although the principles so taught differed among themselves, namely, LAO TSE, the founder of *Taoist* philosophy, and KUNGTSE, the author of Confucianism. The doctrine of the former was said to be dominated by *Tao*, otherwise "Reason"; its principles to ignore everything that interferes with selfish tranquillity, including the pursuit of business, the desire of honours or riches, affection towards those united by blood, friendships, and all other earthly ties. No wonder that such principles led their disciples to indulge in such pursuits as those of alchemy, mesmerism, spiritualism, *et cetera*; and subsequently to doctrines of which the following, expressed by a *Taoist* philosopher about the year

* During the *Chow* dynasty the use of surnames by the Chinese was introduced.

B.C. 330, are examples:—"Crime is due simply to the measures taken for its repression; immorality is an invention of moralists; if all laws were abrogated crime must necessarily cease; if weights and measures were abolished the people could not cheat each other in the exchange of commodities." Is it subject of wonder that the advocates of such doctrines were in those days described as charlatans! As opposed to the doctrines of so-called "Reason" thus presented, those taught by CONFUCIUS inculcated reverence to the gods (authorities of the land); the discharge of duty to all mankind, and to relations in particular. He taught men "to treat others according to the treatment they would themselves desire at their hands"; also to guard their secret thoughts as the sources and origin of action: all of which maxims are, in theory at least, observed by millions of Chinese at the present day, nearly 2,500 years after the time when they were first enunciated.

Ultimately conditions arose under which the great dynasty of CHOW came to an end. During several reigns prior to that in which the final catastrophe occurred, timidity and inaction were observed in administration; then followed the imposition on the people of taxes and other burthens which they were unable to bear; maladministration which led to the withdrawal of allegiance by tributary princes, and, finally, to intestinal war and general tumult.

In vain did MENCIOUS (MUNG TZE, B.C. 371-288), successor of CONFUCIUS, follow up the endeavours of the former to check the prevailing vice and immorality of the time. It is interesting to observe that in early youth this sage was by no means an ardent student, a circumstance which led his anxious mother to address him thus:—"Without diligence and effort," such were her words of advice, at the same time that, as to give her expressions due emphasis, she rent asunder the material she was weaving at the time,—“without diligence and effort,” attendance at school “would be as useless to progress in learning as her beginning a web and destroying it when half done would be” for the purposes of clothing. The principal maxims expressed by MENCIOUS himself in subsequent years had reference to the prevailing spirit of avarice at the time in which he lived. “From avarice,” so he spoke, “mutual strife and anarchy must result. Benevolence is all in all. The hearts of the people are the only legitimate foundations of empire, or of permanent rule. He who subdues men by force is a tyrant; he who subdues them by philanthropy is a king.” “There are employments,” MENCIOUS further added, “proper to men of superior station, as well as to those of inferior conditions. Some labour with their minds; some

with their bodies. Those who labour with their minds *rule*; those who labour with their bodies are *ruled*." About A.D. 1730, that is, one-and-twenty centuries subsequently to the time when MENCIUS thus expressed himself, POPE wrote:—"And those who think still govern the world."

For a short time "the seven rival States"* into which China had been during the dynasty of *Chow*, and was then, divided, remained at war among themselves. The States of *T'sin* on the north-west, *Ts'oo* on the south, and *Tsi* on the north, having vanquished the other States, they engaged against each other, with the result that victory rested with the State of *T'sin*, and in B.C. 255 CHAO-SEANG WANG became the acknowledged ruler over the "black-haired" people.† To him succeeded CHWANG SEANG WANG, who, in the year B.C. 246 was followed by CHE WHANG-TE, founder of the *Tsin* or fourth dynasty of China, a dynasty in which it is usual to include the "*After Tsins*,"‡ and which, so extended, was to end B.C. 206, thus having a duration of no more than forty years,§ a period during which wars in the far East were to be no less destructive to human life than were those in Europe, as between Carthagenians, and Romans; the Syrians, Greeks, and Egyptians.

CHE WANG-TE, otherwise "the First Emperor," or the first absolute sovereign of the dynasty of *Tsin*, as he claimed to be considered, having brought under his sway the different States above alluded to, and thus re-united the empire, his first public measure was the abolition of feudalism, which prior to his day had been established as a system in China; his next to make a tour through the thirty-six provinces of which, under him, that empire consisted. His most important military feat was a successful campaign against the *Hioung nu* or *Huns*, whose country, situated to the west of the modern province of Shensi, extended beyond the Oxus and Jaxartes (Amoo Darya and Syr Darya). He ordered the erection of many public buildings; he caused roads and canals to be opened up. In the year B.C. 214 he began the work of uniting the portions of wall that, prior to his day, had been erected at intervals along the frontier, his object thereby

* See Note 5, p. 196.

† The Chinese Empire at that period extended from lat. 33° N. to 38° N., and long. 106° E. to 119° E. It included the southern portions of the province of Chih-li, Shan-se, and Shen-se, the northern portions of Ho-nan and Keang-soo, and the western half of Shan-tung. The capital was fixed at Chang-yan Heen, in Shen-se.

‡ Sometimes described as the 5th Dynasty.

§ Douglas.—It is to be observed, however, that different accounts of the chronology of this period occur in the works consulted.

being to avert future incursions by his Tartar neighbours. The gigantic work thus begun was not finished in B.C. 209, when "the First Emperor" died; it was subsequently completed, and at the present day has stood for more than 2,000 years, its extent 1,500 miles, from the Eastern Ocean to Western Tartary.

This brief reign is remarkable as having witnessed the destruction of literary works even more extensive than that which was to happen in subsequent years at Alexandria.* The First Emperor "desired that all records of the past should be destroyed, and history commence with and from himself. With this object he ordered the destruction of all existing literature, excepting only such works as referred to medicine, agriculture, and civilisation." To the credit of the *literati* of that period, great numbers refused to give up their precious volumes, notwithstanding that six hundred of them suffered death for refusing to comply with the Imperial edict. Many books, however, escaped the sentence against them through the zeal of those who cultivated learning; and from the records so preserved Chinese history came in subsequent years to be reconstructed. The death of HWANGTI (B.C. 209) was the signal of an outbreak among the deposed feudal princes. EUL-SHE, his son, only enjoyed sovereign power three years. Dissolute and immoral himself, his government fell into the hands of a worthless favourite, who imposed heavy taxes upon, and subjected the people to oppressive regulations in other respects. Under such conditions rebellion occurred, a private soldier named LIEU PANG, otherwise CAOU TSOU, who was destined soon to make his way to Imperial power, having early become a leader of the disaffected, a spirit of revolt spread to the army, dissensions occurred within the palace, and EUL-SHE fell, among other victims. For a few months a successor who had been chosen to the throne ineffectually held his position. At the end of that time, his influence having completely gone, the rebel leader LIEU PANG ascended the throne as First Emperor of the fifth dynasty, or that of Han.† That dynasty, dated from B.C. 206; it continued till A.D. 220, when it came to an end with HIEN-TE, the twenty-fifth Emperor of the line, having meanwhile occupied a period the most famous in China's history, and in that of the world. In its later years

* B.C. 47, when the library of the Bruchion, which contained 400,000 volumes, was destroyed during Cæsar's hostilities against Alexandria, or the burning of the Alexandrian library by the Caliph Omar, A.D. 641.

† According to the order of succession usually adopted.—See Du Hulse vol. i.

the Han family degenerated with each successive representative, and, finally, the last of their race gave himself up so completely to indolence and pleasure that he was forced to abdicate in favour of the son of one of his own ministers.

As a result of conditions existing in "the Middle Kingdom," however, considerable difficulty arises in presenting a picture in which the order of events may be strictly followed. Thus, we learn that towards the end of the Han dynasty China proper consisted of three separate States,* the transactions relating to which are still a favourite subject of historical plays and romances in that country. The States referred to were named respectively *Wei*, *Wu*, and *Shuh*. The first, under the son of TSAO TSAO, at Loh-yang, whence he ruled the northern country. The second, under SIUN KIEN, occupied the northern provinces from Shantung to the Yellow River down to the mountains of Fuhkien; that Prince holding his court at Nankin. The third, under LIU PI, was regarded as the legitimate dynasty, from his affinity with the Han; he held his court at Chingtu, in Sechuen. Under the latter the fortunes of the dynasty revived as the After Han dynasty, by some writers reckoned as the 8th.

It was about the middle period of the Han dynasty that events occurred in Judea the importance of which is transcendent in the spiritual history of the human race,—those events the birth and death of Jesus Christ. When the birth of our Saviour took place in Bethlehem the throne of China was occupied by PING TI, otherwise "The Prince of Peace," eleventh† emperor of the dynasty,—the coincidence of title furnishing subject of comment to subsequent writers.

As a result of the divided condition of the empire already noticed as existing at the period alluded to, we again find that difficulty occurs in following events in their proper sequence. But according to the authority‡ now followed, the reigning monarch at the date of the Crucifixion was KWANG WOO, fourteenth of the same dynasty. In his reign a remarkable solar eclipse was recorded, the precise date of its occurrence "the last day of the seventh moon, in the twenty-eighth of the fortieth cycle," and Du Halde has left it to astronomers to decide from the data so given whether that event coincided with the darkness which happened at the death of Christ.

* Known as "the period of *Sankwo*, or Three States."

† The Empress LIUCHI,—who, from B.C. 186 to 178, although nominally Regent, was virtual ruler,—is not reckoned in this enumeration.

Sir John Davis.

It is related in reference to MINGTI, seventeenth emperor of the same dynasty that:—Remembering the words of *Confucius* that “The Holy One is in the West,” he sent ambassadors in that direction in search of the true religion. When they had reached India they found that the followers of BUDDHA were being persecuted by the Brahmins, and ready to take advantage of the opportunity thus afforded them of proceeding to a new field. They accordingly declared that they were priests of the new doctrine which the ambassadors sought; a body of their class accordingly accompanied the messengers on their return journey. Thus was introduced among the millions of China (A.D. 64–68), a *philosophy* which teaches that “from nothing all things proceed; into nothing they will return”; whereas the *religion* they sought was that of Christianity.

Under MINGTI, and his successor CHANGTI, the Chinese extended their conquests westward, to the Caspian Sea, overcoming in their progress various tribes on the confines of the Desert, and at the foot of the Tianshan mountains. In those distant conquests the Chinese came for the first time in contact with the Romans, whose merchants then traded with India and Persia.

From that time to the present, dynasty has succeeded dynasty, but the political tradition has remained unchanged; though Mongols and Manchous have at different times wrested the throne from its legitimate heirs, they have ultimately been engulfed in the homogeneous mass inhabiting the empire, and, instead of impressing their seal on the country, have become but the reflection of the vanquished.* Judging from the past, are we not justified in expressing the belief that a great future is in store for China, and that the teeming multitudes of that vast country are destined to play a very important part among nations, as heretofore they have done in Eastern Asia?

* Douglas.

NOTES.

THE limits within which such a paper as the present must of necessity be restricted render it impracticable to do more than briefly glance at certain points of the general subject in hand, which, from their very nature, could only be satisfactorily dealt with at greater length than is thus possible. Even with the aid of the following *notes*, no more than a very partial view can be conveyed of conditions pertaining to the ancient periods referred to; but it is hoped that the additional information now to be added may be deemed sufficiently important to justify the insertion of it in this form, namely:—

1. *Jats*. Several clans of the tribe so called inhabit the North-western provinces of India, including Delhi, the Upper Doab, and the Punjab. The origin of the name is by some authors referred to *Xanthii*, thus assigning to them a Mongolian ethnology. Other authors, however, consider that in race they are purely Aryan; and refer their birth-place to a small district situated to the south-east of the Caspian Sea, and westward of ancient Sogdiana and Bactriana.

2. *The Chinese, properly so called*, page 172.—Adverting to the text, and adopting the theory that the original home of the Chinese people was in the West, that their line of migration eastward was by direct route over the passes over the Hindoo Kush, and through Tibet, we may reasonably assume that a separation took place among them as they reached the Kwan-lun Mountains; that thus the Huns or Turks became separated from southern families by that mountain-range and the Gobi desert, till both divisions met again long afterwards about the northern bend of the Hoangho; whereas the Siamese, Burmese, Assamese, and the northern and southern Chinese would be one people till they separated with the five great rivers that take their rise in the table-land of Tibet, namely, the Brahmaputra, Irawaddy, Mukong, Yangtze-kiang, and Hoangho. Of the tribes who descended by the two last-named rivers, those who chose the course of the Yangtze became “the ungovernable vermin” of the south. By the spread of a knowledge of writing from the tribes on the Hoangho, north and

south, by intermarriages, and other causes, the several tribes or families became in time one people,—the Chinese,—who now occupy the region which extends from the Great Wall to Canton, and from Tibet to the Pacific Ocean.

The 35th parallel of north latitude from the borders of Tibet to Shan-tung marks very nearly the course of the earliest Chinese civilisation. And a parallelogram extending two degrees north and south of this line, and from the western border of Shensi to within fifty miles of the coast of Shan-tung, thus measuring north and south about 250 miles, and east and west about 600, will include all that part of China where we have reason to believe that letters were cultivated early in the Chow dynasty, and about B.C. 1000. The area thus indicated is not much greater than that of the British Isles, and scarcely equal to three of the eighteen provinces, or one-sixth part of China proper.

3. *The Miaotze*, page 176.—The civilised people of “The Middle Kingdom” alluded to in the preceding *note* were, at the early period described, hemmed in on all sides by hostile barbarians. On the east *the great-bow men* held possession of the promontory of Shan-tung, and the whole coast-line to the mouth of the Hwae river, where, turning south-westward, they occupied a great portion of the modern provinces of Kiang-su and Ngan-hwai. On the south all along the Yangtze were the “Mān,” *ungovernable vermin*, also called *Mé, Bé*, or Bleaters. On the west were the *mounted warriors*, of whom came the Ts’inities, those named “Jung,” though translated “western barbarians,” meant also “weapons.” On the north, within and without the northern bend of the Hwang-ho were the “Tih,” *fiery dogs, tykes*, distinguished also as *red tykes* and *white tykes*, as if in reference to their complexion as contrasted with the *Ti-min*, or Chinese proper.

The Ts’inities must have occupied the borders of Tibet before they displaced the Chowites from Shen-si. The States of Ts’oo and Woo embraced the whole of Central China, watered by the Yang-tze and the Han rivers. Woo does not appear in history till B.C. 584. It embraced the modern Nan-king and Shanghai. Farther south still was Yueh, where, according to tradition, the Great Yu investigated the principles of government on the top of a mountain (as if he were a counterpart of Moses on Mount Sinai), and where afterwards he died and was buried.

4. *Religious Worship, &c.*, page 182.—Not only in relation to the manner and object of their worship, but in various other

respects a connexion has been traced between the customs of the Chinese and those of more westerly nations.*

Shangti and Tien of the Chinese.—The ancient Persians worshipped “the whole circle of Heaven”; they took from the Phœnicians the worship of “the Most High, the God of Heaven,” the *Shangti* of the Chinese, with whom also *Ti* and *Tien* (Heaven) must be correlatives, Heaven in the largest sense, infinitude; *Ti*, the God of Heaven.

Sabeism.—The worship of the sun, moon, and stars seems to have been objects of earliest worship from Egypt to China.

Practical Dualism.—The antithesis of “Father Heaven” and “Mother Earth,” or more generally *yang* and *yin*, originally *light* and *shadow*, made use of in early Chinese writings, is nothing more than a repetition of what has been found in ancient India, Persia, and Greece.

The Worship of Ancestors and Sacrifices to the Dead.—These were introduced into China by the race of Shang, from the west about B.C. 1600, and have continued to prevail. In the Sama-Veda, Indra is invoked “with invitations, as we would the *manes* of a father.” In the Vedas the sacrifice of a hundred horses is supposed to be sufficient to gain heaven. The Chinese have, from very early times, sought to propitiate Shangti by the shedding of blood of bulls and goats.

Suttee.—A practice similar to that of India, happily unknown in China before and since, was introduced by the Tsinites about B.C. 620; that is, nearly 400 years before that race attained imperial power.

Burnt Offerings.—These were made by the Chinese as by the Jews, entire animals being consumed in a pile of fire, the fire being obtained for the purpose by means of boring wood, as is still practised in Burmah and also in New Holland.

Soma Spirit.—Prepared from the *Sarcostemma brevistigma*, N. O. Asclepiadaceæ. “The drink of Indra” and of “the gods” of Vedic India, “the liquor of immortality” in ancient China.

Fasting and Bathing.—These observances are mentioned by Mencius (B.C. 450) “as a proper preparation for sacrificing to God,” which also is according to Jewish law.

* This subject has been well discussed by Mr. John Chalmers in his brochure on “The Origin of the Chinese,” published at Hong-kong, 1866, to which work I am indebted for much that is given in these notes.

Casting Lots.—The land of Canaan was divided among the children of Israel by casting lots. In China, more especially in the northern provinces of that empire, very many of the ordinary transactions of every-day life are similarly decided.

Lucky and unlucky Days.—These are observed by the Chinese at the present time. They were so by the ancient Indians and Romans, and our own almanacs two centuries ago. The idea of the horoscope is substantially the same in China and in Burmah now, as “once upon a time” it was in England.

5. “*The Seven Rival States*,” page 189.—Considerable difficulty has been experienced in the arrangement of details connected with the condition of China at the period referred to in the text; it is, therefore, deemed advisable to add in this form the following particulars obtained from the work of Père Du Halde:—

About B.C. 478 cruel wars between tributary princes began again, and lasted nearly 300 years. The kingdom of Tsin had been divided among four princes, one of whom overcame the others, and so got the whole kingdom into his own hands. His son, TEHI SONG, quarrelled with the kings of Han, Guot, and Chao, but they, having united their forces, defeated the army of TEHI SONG, whose kingdom was accordingly taken possession of by the king of Chao. The kings of Lou and Tsi were also at war with each other, but after a time an amicable arrangement or peace between them was brought about. During the reign of HIEN WANG, 32nd emperor of the Chou dynasty, B.C. 367–319, the tributary princes strove severally to usurp the Imperial authority. In the reign of CHUN TSIN WANG, 33rd emperor of the same dynasty, B.C. 319–313, the king of *Tsin* defeated the combined armies of the kings of *Tsou*, *Tchao*, *Han*, *Guei*, and *Yen*. He sent his forces to aid a prince, in the western part of Sechuen, who was at war with a neighbouring chief; and subsequently cleared his own way to empire by fomenting discord among the various tributary princes named, so that they might destroy each other. Thus the kingdom of *Song*, which had existed 380 years, was destroyed by the kings of *Tsi* and *Tsou*; the principality of *Lou* was destroyed by the king of *Tsou*, who also made tributary to him the king of *Guei*. After those events CHAO SEANG no longer concealed his own designs upon the Imperial throne. He defeated the king of *Tsi*, the only prince who was powerful enough to stand in his way. Shortly afterwards he defeated the reigning emperor NANG WANG, 34th of his dynasty, permitting him, however, to retain the nominal power.

Meantime the king of *Han* gave his formal allegiance to *Chao Seang*. Several princes in the south of China, however, elected to the title of emperor TCHOW KIUN, a prince descended from KAO WANG, 28th emperor. On being so elected, CHOW KIUN appealed for aid to the kings of *Tsi*, *Tsou*, and *Gusi*. But these princes declined to give the assistance sought for, and, accordingly, the titular "emperor" abdicated, thus leaving the succession, and the establishment of a new dynasty, namely that of *Tsin*, to the successful usurper CHAO SEANG WANG.

THE PRESIDENT (Sir George Gabriel Stokes, Bart.).—I am sure we ought all to render our thanks to the author of this paper. There is one matter I might mention which is referred to on p. 191 as being coincident with the darkness that happened at the death of Christ. The Passover, I think, was held at the full moon, and a solar eclipse could only occur at the time of the new moon. If so, that would settle the point in question.

PROFESSOR S. BEAL, B.A., D.C.L. (Professor of Chinese at University College).—Not being a member of the Institute, I feel some reluctance in offering any comments, but I am sure I, in common with all who have heard the paper that has been delivered to-night, must agree that it is a most valuable one. It has brought together a number of facts, each of which would require separate study. Perhaps you will allow me, as a Buddhist student, to make a few remarks upon my special study. In the first place (I will begin at the end of the lecture), I do not think it is a proper description of Buddhism to say that Buddha advocated the origin of everything from nothing, to which it is to return. I do not know upon what ground that assertion is raised. I believe he taught the eternal succession of causes, the beginning of which he could not, of course, define, but he laid it down to ignorance. He was ignorant of the first cause, but that first cause was an existing cause, and certainly not "nothing"; and as to advocating the idea that we return to nothing, I think, on the contrary, he thought we should return to a primitive state of excellency,—a primitive state of happiness and bliss,—but he could not define what it was. One of his maxims was, as every scientific scholar will allow, that the beginning or supreme cause was un-

definable, and Bishop Lightfoot, in his excellent treatise on St. Paul's Epistle to the Corinthians, considers that the remark of St. Paul, "and though I give my body to be burned, and have not charity, it profiteth me nothing," was derived from the Brahmins during the reign of Augustus; and I will go further, if you will allow me to do so, not as claiming the scholarship of Bishop Lightfoot, but I think it has reference to the unknown God mentioned in Acts xvii. 23, and Professor Plumtree appears to advocate the same principle. Perhaps you will allow me to say in regard to the Yuechi people mentioned on the third page of the paper, that I think, from their name, they are by no means an aboriginal race belonging to Central Asia on the borders of China, and I think it is allowed by most scholars that these Yuechi were really Scythians, and the word "Scythian" is a very comprehensive one. Karl Blind, in a late number of the *Asiatic Review*, says that the Goths were Scythians. These Yuechi he believes, had invaded that part of Central Asia, and were a blue-eyed and fair-haired race, and were driven back by the Hiongnou race or the Huns. I do not know whether I am right in saying the Huns, but it is said they were driven back to their original country, and that when on the borders of the Caspian Sea there they met with the Parthians, and finally helped to overthrow the Greeco-Bactrian kingdom. As Dr. Gordon says, these people were called *Scoloti* as well, and they are spoken of as having golden cups round their necks, and there have been several discoveries of these *Scythians* or *Scoloti*. They were accustomed to make their drinking-cups out of skulls when denuded of the skin. I would say as to *Chin-tan* being "The Dawn" that in Hiouen Thsang the word *Chin-tan* constantly occurs for China, and by it is understood nothing but *Thina*. Dr. Gordon spoke of *China-pati* as bearing on a period as recent as A.D. 629—645. From the records of Fa Hian and Hiouen Thsang, whose travels I have had the honour of translating, it would appear that a temple was erected there, near the Beas river as early as A.D. 150. Then, again, Dr. Gordon referred to hostages being taken there at so late a date as A.D. 600 or 700, the empire of Kanishka being established about B.C. 50; but I venture to say that it was not B.C. 40 or 50, but A.D. 500 or 600, and I think that is shown by the inscriptions at Muttra, Manikiala, and Bhawulpore, thus bringing a time claimed to be B.C. 50 or 60 down to about A.D. 500 or 600. As a stranger here, I should be sorry to take up further time, but there are one or two points I should like to refer to as to the Scythians.

I cannot suppose for a moment, though Mongolian types were found in Mesopotamia, as were found the Hyksos in Egypt, that the Scythians were Mongols. I think there is every authority for believing that they were originally a mixed race, probably a pure Aryan race, but that they became intermixed with the Shemites, and the Mongolian race was produced, and that very probably they branched off into different tribes, some of which were savage and some civilised; but the Aryans, from whom they sprang, must, if Karl Blind is right, have had qualities which we do not find, as a rule, in the Mongolian races. There is one little remark about the *Seres* or *Sechuen*. I think we may trace the origin of that word to a simple derivation; we know that *Syr* means yellow, there is the river called the Syr river, and I think the Chinese are called *Seres* because they are a yellow race, from that simple word *Syr*. With these remarks I beg to conclude.

Mr. W. GRIFFITH remarked upon the great interest attaching to the questions taken up by the author of the paper.

Rev. F. A. WALKER, D.D., F.L.S.—I should like to ask the author if he attributes the similarity of customs between the Chinese and the Egyptians, page 174, to the fact that Mongolian rulers held sway, in a part of one dynasty, over Egypt. I remember when the Rev. H. G. Tomkins gave his interesting lecture on Egypt and Assyria, and the different races that have from time to time inhabited those countries, there was a very Mongolian look in one of the kings of Egypt shown. There is not a doubt with regard to all these customs that they did exist in ancient Egypt. Every one of those which Dr. Gordon has mentioned, I think, is abundantly illustrated in the peculiar monuments and sculptures, which have come down to our time, from Egypt. With regard to agriculture being held in repute by the Chinese and ancient Egyptians, you see many representations of them cutting the corn with the sickle; and in regard to hieroglyphic and symbolic writing, the signs of the zodiac are cut on the roof of the chapel of Denderah, only they substituted a Scarabæus for the Crab. You see Cyrus represented in a very uncomfortable position round three sides of a square, where the priests gave bread to the people on New Year's Day. You see over and over again these matters recorded on Egyptian monuments; but I should like to know through whose influence it was, whether it was through the influence of Mongolian rulers that the similarity of custom of those two great nations was brought about.

ERRATUM.

Page 199, line 7 from end,
for Cyrus read Sirius.

The Hon. Secretary, Captain F. PETRIE, F.G.S.—As regards the communications received from those unable to be present, the first is from Sir Thomas Wade, K.C.M.G., Professor of Chinese at Cambridge University: he expresses his regret at not being able to be present, and bears testimony to the value of the recent labours of Baron Richthofen and his work on China (in German), Dr. Bretschneider's *China*, and a new work on the Formosan aborigines.

Dr. LEITNER writes, regretting that illness "prevents his being present at the reading of so good a paper as Dr. Gordon's."

The AUTHOR.—In the first place, I thank those who have been so good as to comment on my paper for the spirit in which they have expressed themselves. The difference of opinion that strikes me as being apparent among Chinese students* illustrates some of the difficulties I have had in preparing this paper, during which process I have consulted so many works that I am afraid to enumerate them; and in the course of the comments made on my remarks, I think you recognise the difficulty I had, out of the materials at my disposal, in weaving such a web as I have been able to produce. I tried, as far as possible, to give the authorities from whom I have quoted. Many of these are given in the footnotes, and others are given in the series of notes at the end of my paper, and I think that if my critics had consulted the notes which I give in the shape of an appendix, perhaps they would not have made some of the remarks they have. I may observe that the data from which I have taken my chronology included, as far as has struck me during the time their remarks have been made, such as are contained in works by Gutschlaff, Edkins, Du Halde, Williams, Boulger, Giles, Davis, Douglas, and the *Encyclopædia Britannica*. All of these authorities give more or less different dates; so it will become apparent what great difficulty I have had in formulating the remarks I have made. In several instances I specially notice that the dates I give are approximate. I am afraid I shall not be able to answer all the comments made, but I will endeavour briefly to make such remarks as occur

* The difficulties of Chinese students are increased by the Chinese characteristic disregard of accuracy. There is no accuracy in their system of statistics, and no uniformity in their standards of weights, measures, money, length, &c. A man becomes 80 years old after he stops being 70, their habit being to reckon by tens. Their whole system of thinking even has a basis different from that to which Europeans are accustomed.—*Ed.*

to me. One speaker, talking of what I said with regard to the doctrine of Buddhism, namely, that all things come from nothing and return to nothing, is well aware from his reading that the Indians, the Brahmins, the Chinese, and the Singalese all give different accounts of what the doctrines of Buddha were, and I observe that this speaker when remarking on those notes of mine did not actually say what the doctrine of Buddha was, so that one individual sets up one conjecture in the place of another, an observation which applies to those I have taken my remarks from. Then about the Yuechi. I look to my paper and see that I did not say anything about their having been aborigines; but in another part of my paper I see the word "aborigines" is mentioned, not as indicating a people so called, or as the actual original people of that place occupied by them, but as indicating that we have no history of any race preceding them. In a footnote I quote from Hale's *Chronology*, p. 174. I allude, rather vaguely, to a subject in itself so extensive that I really am afraid to make more than a passing allusion to it, namely, a division of the human race as handed down to us in history, sacred and profane, into historical and non-historical races. Many of the tribes I have mentioned in my paper belong, I believe, to the non-historical races. I invite your attention to the few notes relating to this point which I have inserted at the foot of page 174, and those who have done me the honour of being present on this occasion, and are interested in the subject to which I have so briefly alluded, will have an opportunity of investigating it for themselves. It is too long to be entered on here. In reference to the remark made with regard to my making use of the word "Chintan," and the question asked regarding it, my authority is Williams. With regard to Chinapati, the position of which, as I remarked, is close to the river Beas, as far as I am aware I make no allusion to the actual date when it was named. I merely mention the particular with regard to it having been named. Then, in regard to the empire of Kanishka, I have carefully examined the data on which I have based my remarks, and the period stated therein is quoted *verbatim* from the work consulted by me in the Royal Institution. I can only again refer, as perhaps offering some interpretation of these remarks, to the notes which I have inserted at page 174. I was asked on what authority I made the remark on the similarity of customs between China and Egypt. In the notes which I have given in the shape of an appendix to my paper various points are given, and quoted *verbatim*, that will probably further elucidate the subject,

and I may mention that they are abstracted from a very interesting work by the Rev. John Chalmers. The title of that work is "The Origin of the Chinese." It was published at Hong Kong in 1866, and to it I am indebted for much that is given in these notes. I mention these particulars so that those interested in the subject may know where to find the work alluded to. Another remark has been made about *Chin-tan*, or "the dawn," and different opinions have been expressed by different speakers as to whether the word means *dawn*. It is the common means of expressing Japan rather poetically as "the Land of the Rising-Sun"; so it may have been with China, and there is no reason why it should not.

The meeting was then adjourned.

REMARKS BY THE REV. JAMES LEGGE

(Professor of Chinese at Oxford University).

I. As to the origin of the name *China*. There can be no doubt that this name originated in India, and came into general use through the employment of it by the Buddhist missionaries. Dr. Gordon says, on the first page, that the Buddhists of India called the land *Chin-tan*, or "The Dawn." In Nien Châng's *History of Buddhism*, he gives a conversation between Matangha, one, and probably the first, of the Buddhist missionaries, and the Emperor Ming, who first brought Buddhism to his country, as having taken place in A.D. 69. Their discourse having turned on a mysterious building in the capital, Matangha tells the Emperor that it was one of the nineteen places in the country of "China or Chin-tan" to which King As'oka had lent relics of Buddha. This is the earliest occurrence, so far as I know, of the name "China," and *Chin-tan*, the synonym of it, means nothing about "the dawn." It is merely a contracted form of the phonetisation "*China-sthana*," meaning "The Land of China." It will remind many of a common termination of Sanscrit names of countries, such as Beloochistan, Afghanistan.

How the Indians came to call the country "The Land of Chin" we do not know. It may have been from the feudal state of Tsin, in the North West, which in B.C. 221, attained to the sovereignty of the whole country. The initial *Ch* instead of *Ts'* is against this conclusion; but I need say no more on this point. There is the fact that the Buddhists called the Empire *China* in our first century, and this came gradually to be adopted by other countries generally, as Buddhism and its literature came to be known.

I have said more than was necessary on this point, because it is an instance of what I consider certain errors which I could point out as lessening the value of Dr. Gordon's paper; for example, the notion to which he alludes on p. 170, that the name was introduced into Europe, by Malay or Arabian traders, so recently as about A.D. 1500, from *Tá ts'ing* or *T'ai Ts'ing*, the name of the present dynasty. Again, I do not agree with the quotation from Baron Bunsen on pp. 173-4, that "the primitive

archaic Chinese settled themselves in the land, and called it *Sin*, which we have called *China*," the fact being that the Chinese do not yet call it *Sin* or *China*, except as they are learning to conform to foreign custom by doing so.

II. As to where the first Chinese settlers came from I will say very little, because I have got very little to say. All that Dr. Gordon has brought together on the point is necessarily speculation. I cannot call to mind a single hint about it in Chinese literature.

About 2,300 years B.C. the settlers occupied a small extent of territory on the east and north of the Ho or Yellow River, the more southern portion of the present province of Lhan-hsi. Thence they directed their course eastwards, southwards, and by-and-by westwards also, and we can hardly come to any other conclusion but that they had come into China from the north-west. From what western region, and by what route they came, we do not know. There is a wide field for speculation to choose from, but I have not yet read any theory that has to my mind the semblance of probability, or is supported by arguments grounded on ancient monuments or words in which a thoughtful inquirer can rest.

Nearly, one might rather say fully, 2,000 years elapsed before the rule of the Chinese race was extended to the limits of the present eighteen or nineteen provinces that form the present "China Proper."

III. As to how long ago the earliest Chinese settlers entered China there is more to say. I have said above that about 2,300 years B.C. we find a monarchy, which appears to have been elective, on the east and north of the Ho. I say this on the authority of the best historical documents which the literature of China supplies.

We have the twenty-four dynastic histories, the earliest of which is the "Historical Records of Sze-ma Ch-ien," who died in or near the year B.C. 85. He was grand historiographer to the dynasty of Han, the dynasty which dates from B.C. 206. His materials were all the classical literature before his time, and all the historical documents contained in the archives of the Empire. His work embraces the long period of time from the ancient Hwang Ti to rather more than 100 years of the dynasty of Han.

According to the best chronological Chinese tables, the first year of Hwang Ti's reign was B.C. 2697, so that Ch-ien's history would seem to cover a period of nearly 2,800 years. But let it not be

thought that he vouches for all the dates or eras in that long space. The first year to which he ventures to annex the cyclical expression of its chronological date is B.C. 842. I cannot go into the reasons which he had for doing so. They were abundantly sufficient; and his history from that year downwards will not, I think, be questioned by any one capable of forming a judgment on such a matter. From that year Ch-ien was left to push his way among the abundant materials in his possession. And he did so, carefully and skilfully, up, as I have said, to Hwang Ti. But the cyclical or chronological expression for his reigns and eras was not introduced into tables till the year 1077 A.D., when the arrangement of them was first completed by a Sháo Khang-chieh, one of the great scholars of the Sung dynasty.

The results for the earlier time given to us by those tables conduct us to the commencement of the dynasty of Chow, the third of the feudal dynasties of China in B.C. 1122; of the second dynasty, or that of Shang (called latterly Yin), in B.C. 1766, and that of first, or Hsiâ in B.C. 2205.

A somewhat shorter scheme is found in what are called the "Bamboo Books," discovered after the death of Ch-ien, and the genuineness of which has been much questioned, but the difference between the two is not very great. The dynasty of Hsiâ, according to these books, began in 1961. The founder of it was "the Great Yü," who cleared away the waters of the great flood of Yâo, a terrible inundation of the Ho and other rivers with which the documents of the Shû king commence, and which to many have seemed a Chinese version of the Flood of Noah. Yü also was the founder of the feudal monarchy which displaced the elective, and continued till B.C. 221, or fully 2,000 years.

To help him in his records from Yü to Yâo, Ch-ien had still the earliest books of the Shû King, though they are not so valuable as the documents posterior to Yü. Still, according to the tables made out from them, Yü's reign begins in B.C. 2205; that of Shun, who preceded him, begins in 2255; and that of Yâo in 2357.

We have now to plunge into the shadowy ages before Yâo, and see if we can find in them traces of what we can consider historical narrative. There must have been men,—subjects and rulers,—anterior to Yâo. I do not think, indeed, that Sze-ma Ch-ien had written documents with dates in them earlier than those of the Shû King; but he has prefixed a chapter to his account of Yâo professing to give an account of five Tis, generally, though erroneously, called

"Emperors," whose reigns begin in B.C. 2362, 2432, 2510, 2594, and at last Hwang Ti's in 2697. At this point we have done with Ch-ien, but the chronological tables, containing a good many other names, and among them especially Yen Ti, or Shǎn-nǎng, called by many "The Divine Husbandman," and Thai-háo or Fû-hsí, or Fo-hí, who used always to be called the Founder of the Chinese Empire. Where in chronology are we to place these two? I have often amused myself with putting together the figures supplied in various compendia of the most ancient history and have brought out for Shǎn-nǎng the date of B.C. 3072, and for Fo-hí 3322. My judgment is that if we put down the beginning of the Chinese kingdom at B.C. 3000 we are within, rather than beyond, the proper limit. I cannot in these desultory observations enter into a detail of my reasons for that judgment.

My principal one is connected—

IV. With the formation and nature of the Chinese written characters.

I consider Dr. Gordon has been led into error on this subject, but for which he would have come, I think, to a very different conclusion from that which his paper indicates about Chinese chronology. In a note on page 185, he says: "The use of written characters by the Chinese is assigned to the Shang dynasty, consisting at first of little more than rude representations of common objects. Prior to about B.C. 1600 the records of government were said to have consisted merely of knotted cords." The only classical witness about such cords that I have seen is in one of the appendices to the Yih King, where it is said that "in the highest antiquity," prior, that is, as we see from the context, to Fo-hí, Shǎn-nǎng, Hwang Ti, Yáo, Shun, and Yü, government was carried on by the use of knotted cords, and subsequently the sages substituted for these written characters and bonds. The Yih King does not say who the sages that substituted these written characters were. It is a pity, for the system of its written characters is, I think, the greatest thing that the Chinese race has done,—greater than the Great Wall of Shih Hwang Ti, greater than the Grand Canal of Kublai. The honour is ascribed to Fo-hí himself, or to a Tsang Chieh before him, or at latest a minister of Hwang Ti.

Dr. Gordon thinks they were the work of the Shang dynasty, because my friend, Dr. Chalmers, a very great Chinese scholar indeed, but liable to err, like all other men, has speculated to that effect.

But in the Shû King we have two short memorials "in writing" by the premier of the founder of the Shang dynasty to his son, probably in B.C. 1753. The written characters were not invented then; they were then in use. They were framed before the time of the Great Yü, for we find him using four of the cyclical characters, all of which are among the primitives, or the earliest formations. The written characters are a great fact, which have always stood in the way of my accepting many speculations as to where the original Chinese came from, and how long ago they found their way to what has been the home of their descendants so long. The state of society indicated by the primitive characters cannot have arisen in less than a thousand years from the time of the knotted cords.

Dr. Gordon has much to say about the earlier tribes whom the Chinese found in the country, and representatives of which still continue to subsist in parts of it, and in the regions west and north of it. The names of more than twenty of such tribes may be collected from the classical literature, as still subsisting under the Chow dynasty, but in B.C. 559, the chief of one of them, at hostilities with one of the great feudal states, addresses its commander in these words:—"Our food, our drink, and our clothes are all different from those of the Flowery States. We do not exchange silks or other articles of introduction with their courts: *their language and ours do not admit of intercourse between us and them.*"

So it is; until our own times the Chinese have dwelt as a race alone; and it has not been possible to trace satisfactorily the affinities between them and other races, in respect of their origin, duration, and language. I must with this conclude the remarks suggested by Dr. Gordon's paper. I have read it with the greatest pleasure, and thank him for it. I only wish I had been better prepared by recent studies to review it, and more truly to do justice to it. May I end what I have found to say with the following excellent critical canon of Confucius?—"Hear much. Put aside the points of which you stand in doubt, and speak cautiously of the others."

[Some remarks, sent in by another student of Chinese history, coincide to a certain extent with Professor Legge's. They were placed in Dr. Gordon's hands, but the author having asked for their return they cannot appear here.]

THE AUTHOR'S REPLY.

I would express my thanks to so high an authority as Professor Legge for his remarks upon my paper. With respect to certain objections which he has brought forward, I would briefly observe as follows :—

I. Name of China, "*Chin-tan*, as signifying the Dawn." See Williams's *Middle Kingdom*. On a merely abstract question such as this opinions differ so greatly that it becomes equally difficult to assert positively which of them are erroneous, which correct.

II. "Quotation from Baron Bunsen." See authority quoted in foot-note, page 174. It does not appear to me that the circumstance that the modern Chinese do not call their land Sin necessarily implies that the immediate descendants of the early immigrants did not do so.

III. "The origin of the Chinese people." The authors quoted in my paper evidently bestowed much attention upon the work of formulating a theory from sources other than Chinese history, regarding their ethnology.

IV. "Origin of Chinese written characters." From the interesting and valuable comments made on this subject, the fact is made very evident that authorities who have studied the question are divided among themselves with regard to it. This is not to be wondered at considering its complexity and obscurity.

A careful comparison of views contained in the remarks of the several men who have done me the honour to comment upon my paper suffice to indicate the difficulties attending the task I set myself in the preparation of my paper.

ORDINARY MEETING.*

H. CADMAN JONES, Esq., M.A., in the Chair.

The Minutes of the last Meeting were read and confirmed, and several Elections took place.

The following Paper was read by the Author :—

ON CUTS ON BONE AS EVIDENCE OF MAN'S EXISTENCE IN REMOTE AGES. By Professor T. MCKENNY HUGHES, M.A.

IN the *Reliquiæ Aquitanicæ* Professor Rupert Jones has given an interesting account of implements of wood, bone, and ivory, bearing marks indicative of ownership, tallying, and gambling. There can be no doubt that all these are of human workmanship. Some of them are recent; some are found associated with abundant traces of primæval man; and some occur on harpoons, and on other bones worked into useful forms.

Cuts and scratches have been made on bone in many different ways and for many different reasons. Sometimes, as shown by Dupont, a hunter who had been successful, and brought down some big game, which he was unable to carry away, cut off a few good steaks, and, if not the hide, at any rate the tail, the long hair of which he required for many purposes. But the flesh was not so easily removed, and, where the large muscular portions clung closest, he had to draw his knife frequently across to detach it, and thus made grooves and scratches on the bone. So also, as pointed out by Professor Rupert Jones, the foot bones of deer and horse and the bones

* May 6, 1889.

*** The bone alluded to in this Paper was laid before the Meeting, and the accompanying illustration is a reproduction, by the Collotype process, of a photograph thereof. The work was executed by the Cambridge Philosophical Instrument Company, and has been justly admired.—*Ed.*

of birds have been scored by man when cutting off the sinews to get thread for sewing. Besides these, however, some solitary specimens of bone, or wood, or stone, dressed, and cut, and scored, have been found in deposits in which there is no other trace of man, and where these specimens themselves are the only evidence adduced of man's existence at the time. It becomes a question of much importance, therefore, to ascertain the various ways in which such markings are produced. I have already commented* upon the manner in which sticks get worn down in water, so that they appear as if cut across the grain to a tapering point; I have shown how teeth, and bones, and shells get perforated so as to resemble those strung by savages as beads.† Jukes explained the indentations on some bones of an Irish elk, found under peat near Legan, in Ireland, by pointing out that pieces of the antler lay against the bone or bone against bone, exactly fitting, so that the indentations on the one corresponded to projections on the other.‡ I now propose to criticise the evidence to be derived from scorings at regular intervals, and cross-cuts, and such-like markings.

It is difficult, when examples of this kind are brought forward, and are represented as the work of man, to prove the negative, however convinced you may be of the improbability or even impossibility of man's having been where they are found. It is not always possible to bring forward at once satisfactory evidence that they were not made by man, whose work they often exactly resemble; or, to answer the question, if they were not made by man, what then can have produced them? It is useful, therefore, when one happens to meet with such a bit of evidence, to place it on record, so as to have it ready for reference when the particular point on which it bears is under discussion. I now exhibit two saurian bones distinctly scored at regular intervals by cuts, such as might be produced by a flint knife. For comparison I show also a pointed bone which I brought from the palæolithic cave of Gourdan in the Pyrenees, near Montrejean, which is scored by very similar markings. I would refer, in illustration to figs. 75§, 76, 77§, p. 194 of the *Reliquiæ Aquitanicæ*, and to pl. B. xiii., f. 13.

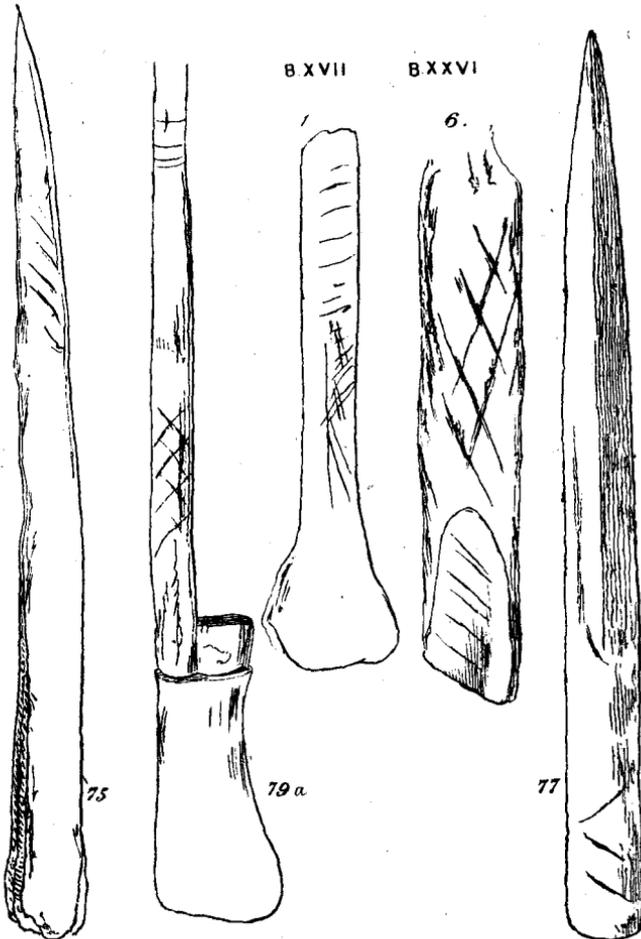
* *Vict. Inst.*, vol. xiii., 1879, p. 316.

† *Journ. Anthropol. Inst.*, April 8, 1872, p. 93. *Geol. Mag.*, vol. ix., 1872, p. 247.

‡ *R. Geol. Soc. Ireland*, Dec. 9, 1863; see also *Geol. Mag.*, vol. ii. 1865, p. 28; Carter, *R. Geol. Soc. Ireland*, March 8, 1865; *Geol. Mag.* vol. ii., 1865, p. 216.

§ Reproduced in outline, *vid. inf.*, p. 211.

The larger saurian bone now exhibited (*see PLATE*) is, moreover, marked along one side by crosses at regular intervals. Similar crosses are seen on the bone from Gourdan for comparison with which I refer also to the *Reliquiæ Aquitanicæ*,



The numbers refer to plates and figs. in the *Reliquiæ Aquitanicæ*, from which these figs. are, by permission, reproduced.

pl. B. xvii., f. 1, and pl. B. xxvi., f. 6. I would call attention also to figs. 74 and 79a; pl. ix., figs. 2 and 5; pl. B. xxv., figs. 1, 2, 5, and 6. There is sufficient ground for admitting the human origin of all these cut bones figured in the *Reliquiæ Aquitanicæ* from the cumulative evidence of their

surroundings. Some are recent and were obtained from native tribes who still make them.

But I would submit that if these saurian bones now exhibited had been found in a cave with harpoons and various carved and manufactured objects, there would be no question as to their being of human workmanship. These bones would be thrown in with the rest as scored and cut by man, though for what purpose we might not be able to tell.

But I procured this bone 17 feet down in the *Kimmeridge Clay*, near Ely.

The first suspicion is, of course, that there must be some mistake; that it was a bone from the *Kimmeridge Clay* lying on the surface, which had got scored by man or striated by ice action, and that it had fallen from the top as the workmen were excavating,—a very common source of error. Although there is boulder clay about, we may dismiss the suggestion of ice action, as the marks have not the character of glacial scratches; but they certainly do resemble the work of man.

We are, however, able to prove that they are due neither to glacial nor human agency, and that there is no mistake as to the derivation of the specimen, but that the cut bone really did lie in the *Kimmeridge Clay*; for here and there on the scored surface there are shells of a small oyster (*Eoogyra nana*), and a *Polyzoon* [*Berenicea* (*Diastopora*)], of Jurassic age, which attached themselves to solid bodies on the sea bottom, and grew on them, taking their form. So these fossils have the impress of the cuts upon them, which were in this manner stereotyped, as it were, in the Jurassic sea, and still survive to teach us caution.

The other saurian limb bone which I exhibit is from the same series at Ely. It is similarly cut and grooved; while overlapping the striæ there extends a calcareous incrustation not uncommonly found on bones in place in the *Kimmeridge Clay*. This also must have received the markings in the Jurassic sea.

Now for a few words of speculation. What can have made the marks? In talking the matter over, Baron von Hugel told me he once saw sharks playing with large bones thrown out to them, not bolting them at once, but now one and now another catching them. He could not tell what the bones looked like when they had done with them, but we may infer that a fresh bone would certainly yield to the bite of the conical-toothed fish and saurians of the *Kimmeridge* age, even though we may not credit them with the cutting power of the hyæna jaw, the toughness of the otter's tooth, that

will mark an iron trap, or even the keen edge of a rodent's incisor, which will deeply score any bone that lies across its burrow. The bones in the badger earth at Barnwell were cut and scratched.* So we have fish and reptiles suggested as the agents which might have produced such marks.

In the Woodwardian Museum I find a Kimmeridge Clay fish, the intervals between whose pointed teeth exactly agree with the intervals between the cuts on the saurian bone. There are many saurian jaws also of which the same might be said. Perhaps, therefore, even before the paddle was detached, and while there was still some flesh on it, shoals of hungry fish and reptiles kept biting, and tearing, and leaving teeth-marks when the bone was reached. But this is guess work. What is certain is that the cuts are not the work of man.

The CHAIRMAN.—I presume I need hardly put it to the meeting that we should return our thanks to Professor Hughes for his very interesting paper, which it has been a great pleasure to listen to. It is now open to those present who have studied the subject to commence the discussion.

Mr. PARK HARRISON, M.A.—I need scarcely ask whether Professor Hughes, who is so completely up in his subject, can answer me this question: I remember that not very long ago there was a disputed point, in the Eastern Counties, I think, of this kind. Those present will remember what I am referring to. There had been some boulder clay, supposed to be *in situ*, and the Professor detected that this boulder clay had been washed down, or had been brought from rather higher ground. It had covered certain works, supposed to be the work of man, and I think that was accepted. I was merely going to ask him this question, and, as I say, I must almost apologise for worrying him; but I think the meeting will like to hear anything that can be disposed of as a possible objection. Is there any higher ground beyond this Kimmeridge Clay from which it might be dissolved and washed down, and then appear quite as if it had never been washed down?

Admiral J. H. SELWYN, R.N.—In my naval experience I have known sharks capable of biting bones in two, the thigh bones of man yielding to them like so many tobacco-pipes, and I can well believe

* See *Geol. Mag.*, Dec. 2, vol. x., p. 454.

that saurians would score bones in the manner the Professor has described. I think the evidence of the marks is very good indeed, and I should be more disposed to attribute them to that cause, which is constantly acting even in the present day among the larger crocodiles, sharks, &c., than to any other. As to Professor Hughes' reference in the title of his paper to the antiquity of man, perhaps he does not intend to imply that all these evidences, even if proved to correspond with the existence of man, would be any real evidence as to his antiquity. We have heard much of the remains of man in the gravel deposits, but such deposits may be brought about in short time. We all know what water is when once set in motion by upheaval from the bottom of the sea, such as at Krakatoa, producing gigantic effects even to the moving of rocks 200 tons in weight. Of the suddenness of some of its effects we have evidence also in the sandstone, where fish have been suddenly overwhelmed without any disruption, every scale being perfect; and they may be now examined in the sandstone-rock in the order in which they swam. Darwin has alluded to evidences of the sudden upheaval of the Andes in America, and this may have brought about a sudden catastrophe such as may have produced that flood of which we find traditions in various parts of the world.

Professor T. RUPERT JONES, F.R.S.—I ought to make no remarks at all or else a great many. At all events, I will thank Professor Hughes for bringing forward this instance of the necessity for caution. It is a very good pleading that one should be very careful indeed in coming to conclusions. But I hope I do not understand the last speaker as having any particular objection to hearing anything about the antiquity of man (hear). It seems to me it is a question we should investigate, and avoid treating in any sentimental manner, as some do. Our friend, Professor Hughes, I think does not take the view that the antiquity of man should be put down or reduced to a minimum. We do not wish to make it of incalculable extent; but so far as the evidence will take us let us go. With what our friend has noticed I really have nothing to find fault with, excepting perhaps that he has not made his own case quite so strong as, if he had had time, he could have made it. He could have brought forward other matters; for instance, that very curious set of bones in the peat of Ireland which are scored, and apparently cut, and chiselled, and notched; and yet this was the effect of the sharp edge of a limb bone, lying across another bone or an antler of the gigantic deer in Ireland. From the tremor of the

peat bog a slight movement had been continuous, so that one bone rubbing upon another had produced incised marks, which were very similar to those which could have been produced by an instrument. Then he might have added examples of the effect of fish upon bones. I never heard before what our esteemed friend Admiral Selwyn said just now,—that a shark can bite a thigh in two. It had escaped my observation; I do not mean personal observation, but I have read that the flesh would be stripped off the thigh-bone by the bite of a shark, and necessarily some scoring would be left on the bone even in that simple operation,—simple so far as the shark is concerned. Then, again, there are accounts of sailors being pulled to pieces by sharks within sight of their vessels, and in such cases certainly some of the bones, perhaps many of them, must have suffered these scratchings and markings. The markings found on the saurian bones are very curious indeed. They look artificial in one or two instances, seeming as if little crosses had been made. At first sight a cross seems a very artificial mark, but if a great saurian or other animal held such a bone in his teeth and then just slipped it round, or another pulled it from him, there might be such a change in the position of the bone that the next scratch upon the bone might cross the older scratch at an angle, and the two scratches might then appear like a cross. There are a great many crosses upon antique pottery, made as symbols of sun-worship no doubt. Long before the Latin cross was used the Greek cross was used by our predecessors in connexion with their religious faith and the worship of the sun. The crosses on that bone are very noticeable. Of course, the history of the Kimmeridge Clay is in good hands when dealt with by our learned Professor. He can tell you a great deal more about it than I can; and he can tell you, no doubt, that there is no probability of the bone having been found in anything else but the solid unmoved mass of the clay. I think he was rather hard upon one point in the *Reliquiæ Aquitanicæ*, if I understood him rightly. He said that one of the illustrations in the book showing some shells strung together as ornaments, the holes had been naturally made on the sea-shore by wear and tear. I do not see how those shells could have naturally received the holes (which were necessary for allowing the thread, sinew thread, of course, in those days, to be passed through them) in that nice, symmetrical manner which is necessary for making a necklace, except they were made by man; and, as people in those days did really use flint tools for making holes in bone and antlers and

teeth, there is no reason why they should not have made holes in the shells. That is all, I believe I may say, in finding any fault with our friend's very learned and able discourse, although so very short and concise that I really wish he had enlarged upon it (hear, hear). I should have liked to have seen some of the pointed sticks he mentioned. I had not the opportunity of hearing the paper in which he dealt with the wearing down and tapering of sticks; but I dare say he will give us the reference to the paper where we may see the description and perhaps the illustrations of these. There is a very curious incident (if I am not detaining you too long) with regard to such sticks.* There was a group of sticks found at Dürnten, in Switzerland, thought to be the remains of a basket. These bundles of fir sticks looked very much like interlaced twigs, made and arranged for the purpose of carrying things; but it was clearly pointed out that the interlacement was accidental, the twigs having fallen one over another, and what seemed to be artificial marks where they cross were really the little nodes on the fir sticks. You know little twigs of fir have very symmetrical buds and nodes. I think that adds to our friend's argument that you must be very cautious indeed in receiving evidence. Mr. Skertchley's old flint implement under boulder clay we can also leave in Professor 'Hughes' hands; as I dare say we might a great deal else. With regard to the geological facts referred to by the Admiral, some of them have been very well handled by others. I think Dr. Buckland years ago took up some arguments explaining the effects of local deluges; and I would recommend those people who are interested in knowing about the matter to read that interesting chapter in Mr. Belt's book *A Naturalist in Nicaragua*. I do not say it must all be taken as the permanent result of investigations, but it is very suggestive and no doubt very true so far as his knowledge went. He died before he could fully carry out his researches, but in that chapter there is much that is interesting, and a foundation is there laid for further observation on the effects of deluges not only in Central America and the north part of South America, but all over the world.

* See paper on "The Present State of the Evidence bearing upon the Question of the Antiquity of Man," by Professor T. McK. Hughes, M.A., *Transactions of the Victoria Institute*, vol. xiii., p. 321.—ED.

Mr. ARTHUR SMITH WOODWARD, F.G.S.—I think, sir, I should not like to say much in regard to this subject except to call attention to the collection of Mr. Leeds near Peterborough. Mr. Leeds has made an enormous collection of bones from the Oxford Clay near Peterborough, bones of the same character as these, and it is really remarkable, on looking over that collection, to find so great a number of records of accidents that happened when these creatures were fighting one with another. He has several of those bones which have been broken and mended again, and many others which show teeth-marks. In one particular instance he has a crocodile femur with a hole pierced right through it where the teeth of one of these large saurians must have bitten the bone and left its impression. That hole is quite obviously made by these teeth. It is scratched all round, and has nothing like the polish and finish and symmetry of the holes which are artificially made by man.

The AUTHOR.—A question which is very much to the point was raised by Mr. Park Harrison when he said, Can that bone have come out of a pocket or out of any derived deposit whatever? That is the kind of thing I have always been looking out for, and that is the kind of question I anticipated being asked, because I have so often asked other men, when they have produced flint implements from what I considered to be improbable places, whether they might not have been procured from washed down material; and in many cases I have proved this to have been the case. It is only after looking carefully into the question that I am going to reply. If I have any means of judging of undisturbed rock from the manner of the occurrence of fossils in sequence, and from the manner of occurrence of the clay between the layers of septarian nodules, it was certainly undisturbed Kimmeridge Clay from which the scored bone was procured. I have no hesitation whatever in saying that. It is not one of those doubtful points, upon which I think you will allow I am generally sufficiently cautious in making statements. So also, in reply to the remarks of Admiral Selwyn with regard to the material heaped up by cataclysms such as the earthquake waves of Lisbon or Krakatoa, I would point out that there are a great many tests to be applied to beds of gravel, by which you know how they are formed. If you find gravel with beds of clay and loam and young shells in this bed and old shells in that bed, with fresh-water plants here and bones there you cannot refer that to anything like an earthquake wave. The

tumultuous deposit formed by waves of that sort is totally different from the kind of deposits we have to deal with in most of these cases. We are obliged to say of a great many there is a doubt about it; it is not clear. But in many it is perfectly clear. You know the physical geography of the country for successive ages, as you have traced the history back. You see there, perfectly coinciding with all the evidence you get from other sources, deposits forming layers of different material, showing different transporting power; water of one velocity carrying the coarse stuff; water of another velocity carrying the fine stuff; floating bodies collected in the eddies, and so on, and the whole story can be read if you get a sufficient number of sections in the gravel beds. We are not speaking of gravel beds in the case before us, but a question has been raised as to the value of the kind of evidence we are dealing with when we approach this question from the geological point of view. No cautious man would make any very strong statements founded on evidence derived from gravel about which he could not tell you more than that it was gravel and carried at some time, he could not tell you when, or carried by some waves, he could not tell you how produced. Generally speaking, you can get better evidence than that.

I was very glad to hear the Admiral's confirmation of the biting power of sharks, but if somebody could give us direct evidence in the shape of a bone which he saw a shark bite, that is what we want. That is what I asked Baron Von Hugel to give me. He said he thought he had somewhere a bone fish-hook which had been scored by a large species of ray caught in some of the Pacific Islands, and the natives told him the scorings were due to the teeth of the fish they caught; but I could not get one to bring here, and as we are all extremely sceptical people we should like just to have one which somebody saw in the mouth of the shark. It is an interesting fact that the distances between the points of the teeth in some of the jaws of fish and of saurians from the Kimmeridge Clay of the Ely district, are exactly the same as the intervals between the furrows on the scored saurian bone. We may get over the difficulty as to the markings being seen on one side only, by the suggestion of the probability that the flesh was not removed down to the bone on both sides, and it was only when the teeth touched the bone that the cuts would be made. I am very glad to have been instrumental in bringing Mr. Smith Woodward here. Mr. Smith Woodward is one of the best authorities in England on fish

and might have told us a great deal more as to the power of these different fish, and the sort of fish they were. However, he also has quite confirmed the fact that fish could do this kind of work, and has told us that a great many bones are found in other formations scored in the way described. The one important point in which my bone is better than all those other bones is that on it we see a little oyster and polyzoon which grew on the place which was scored, thus proving the contemporaneity of the cuts with the deposit in which the bone was found. If I had gone on to the general subject, I should have brought in the cut and sawn bones described by Capellini and Prestwich, but I am very fond, when I have a good strong point, of sticking to it. I know I have here a thing on which no one can upset me. Therefore I did not bring in other things about which there might have been a great many questions raised. That is the excuse I give for not having enlarged the scope of my argument.

But the general question of the antiquity of man* is, of course, raised by this subject, and I will endeavour to answer the questions that have been put to me, even when they do not bear directly upon the matter before us, which does not itself admit of much discussion.

* Professor M'Kenny Hughes has more than once done valuable service by carefully examining the geological evidence upon which arguments in favour of the extreme antiquity of man have been founded, and has shown that that evidence "has completely broken down in all cases where it has been attempted to assign him to a period more remote than the post-glacial river gravels." Speaking on the advent of man, Sir W. Dawson, K.C.M.G., F.R.S., says:—"How man came to be, is, independently of Divine revelation, an impenetrable mystery—one which it is doubtful if in all its bearings science will ever be competent to solve. Yet there are legitimate scientific questions of great interest relating to the time and manner of his appearance, and to the condition of his earlier existence and subsequent history, which belong to geology. . . . While we have no certain data for assigning a definite number of years to the residence of man on the earth, we have no geological evidence for the rash assertion often made that in comparison with historical periods the date of the earliest races of men recedes into a dim, mysterious, and measureless antiquity. On the basis of that Lyellian principle of the application of modern causes to explain past changes, which is the stable foundation of modern geology, we fail to erect any such edifice as the indefinite antiquity of man, or to extend this comparatively insignificant interval to an equality with the long æons of the preceding Tertiary. The demand for such indefinite extension of the history of man rests not on geological facts, but on the necessities of hypotheses which, whatever their foundation, have no basis in the discoveries of that science, and are not required to account for the sequence which it discloses."—ED.

With regard to the shells which my friend has taken me to task about, I have already stated that I have not the slightest doubt that all these things he has described in the *Reliquiæ Aquitanicæ** are the work of man. The plates he has been so good as to lend me are here somewhere; they were handed round. In the remarks to which he refers, I was speaking, not of his figures, but of the teeth of sharks and other fossils perforated by lithodomous molluscs. But another kind of evidence comes in in these cases. In some very old deposits, such as the gravels of St. Acheul and Amiens, there are a number of fossil sponges, *Coccinopora globularis*, washed out of the chalk. These are small bead-like objects, with a hole through the middle, which are found together in such number and arrangement, that, although it is certain man did not make them, it is supposed he may have collected them, and that they were strung together and worn as a necklace; and if the fact that they were found all together in that manner when confirmed by competent observers, it would be very strong evidence.

Another case referred to is that of sharks' teeth perforated as if intended to be strung together, but when they were exhibited I found that a very small number were perforated in the same part of the tooth, and a great many teeth were perforated in all sorts of irregular manners. I next found that other objects besides these teeth,—pieces so large they could not be strung for necklaces at all, pieces of heavy bone,—were perforated in the same manner, but not always quite at right angles to the surface. Thus suspicion was raised at once. If that is the case, what is it that would bore a little way in and give the cavity its peculiar form? What is it that would bore obliquely into one and straight into another? I selected a portion of one tooth in which there was a small hole which did not go through. I had this carefully sawn across. I found it was of the soda-water-bottle-shape in which the pholades and other lithodomous molluscs commonly live. The suspicion was raised because of the want of symmetry and selection of the same part. But I do not therefore maintain that no people have worn teeth and other objects bored and strung together as ornaments. I have frequently seen myself amongst civilised people beautiful shells worn as necklaces with the outside off so that there is a pearly appearance. I have no doubt if you look round at the next party you go to you will find, here and there, there are such

* Williams and Norgate. London, 1875.

shells worn. It is a question of evidence. It is not the fact of there being a hole, or the fact of not having found the string, which I dwell upon as evidence for or against; but you must in each case ask what is the evidence upon which you rely. Is it juxtaposition? Is it the selection of the place where the hole is bored? Is it the general association and arrangement of the specimens?

There is no doubt the bones carved by man are commonly found together with other remains proving the antiquity of the deposit. These scored things are found right down in the deposit. You will find it clearly proved in this book, *Reliquiæ Aquitanicæ*, with full illustrations, a large number of which, by the courtesy of my friend, Professor Rupert Jones, I have been able to hand round, and you will find here a full description of the age and origin of the caves themselves, a most important point in such a question. If the cave or gravel terrace is high up and you refer it to the action of a river which is now far down in the valley below, that requires explanation, and you must consider probable length of time required for such geological changes. The paper referred to was one I had the honour of reading before this society some time ago.* The wood which I described was from a place called Dürnten, on a terrace which runs round the Lake of Zurich, on which there were in some places old lacustrine formations, ancient lake beds appearing to be overlapped by the later glacial deposits of the Alps. It was out of those that the matted and twisted twigs and pointed sticks were procured, but I showed that they could be accounted for by natural agencies. Then Mr. Kinahan's observations upon the antlers of the Irish elk impressing the bone in the peat, of course, are very important. And I have myself observed similar cases among bones found in Pleistocene gravels. I should carry the antiquity of man back to a very, very remote period. If you ask me what period in years, I would not be so rash as to say. I give no numerical estimate, but certainly he goes back to the time when the geographical conditions of this part of the country were entirely different. Some of our friends say they have found traces quite satisfactory to them in beds dating just before the glacial period. All I ask them to do is to give me a better proof than hitherto before I can admit that evidence,—not that I disbelieve we may

* March 3, 1879. See *Transactions of the Victoria Institute*, vol. xiii. p. 321.

some day find that man belongs to a much more remote antiquity than the evidence now before us would place him in. We may find that man existed in warmer climates during the period when our area was unsuited to man because of extreme glaciation. However it may turn out, all I do is to say we must have the very strongest evidence; and as we are discussing this matter from year to year, whenever a good case like this comes under my notice I bring it forward, in order that by-and-by nobody may beg the question by saying, "Here is a bone scored in the manner you allow man does score bone; and it is only man that can score a bone so." There is the point where I want to challenge him. Is it the fact that only man can score a bone so? No; there are other ways in which a bone can be cut and scored. That is the point I have taken up in this paper. I believe we must sum up the general question thus: As far as the evidence at present brought forward shows, no remains of man have as yet been found in this country in deposits of earlier date than the close of the glacial age.

The meeting was then adjourned.

REMARKS ON THE FOREGOING PAPER.

REV. J. M. MELLO, M.A., F.G.S., writes :—

Professor M'Kenny Hughes' paper on "Cuts on Bone" shows us that the mere occurrence of such cuts, however regularly disposed, is no absolute proof, *per se*, of the agency of an intelligent being such as man.

Professor Capellini's discovery in the Pliocene of Monte Aperto of the bones of a whale bearing rectilinear and circular incisions, may be cited in illustration of this subject. It was argued that the nature of the cuts on these bones was such that they could be ascribed only to intelligent agency; that had they been made, as was urged, by fish, then the two jaws of the fish would have left traces opposing each other, whereas none such were found, and the incisions were only on the convex side of the ribs, and on one side only of the carcass of the *Balœnotus*, as would have been the case had man discovered the stranded beast and attempted to deprive it of its fleshy covering. It was denied that the teeth of Squaloid sharks, which are found in the same deposit, could have made the incisions, as the direction of some of them was stated to be incompatible with such bites. On the other hand, M. Mortillet says that it has been shown that these teeth, with their finely-serrated edge, have actually left the trace of these delicate serrations in the bottom of the incisions; besides this, there are also other fish which are armed with isolated weapons capable of giving marks identical with some of those found, whilst they could not have been made by flints. In addition to this, we have the fact that no flint implements have been found with the *Balœnotus*, no other bones have been so marked, and the climax is reached when we are told that, at the time when the *Balœnotus* perished, the Tuscan hills had not even emerged from the sea. M. Delfortrie, as long ago as 1867, found incised bones in the Tertiary deposits of Léogran, and showed that they could be attributed to the numerous carnivorous fish whose remains abound in the same beds. These considerations have led to the abandonment of the supposed evidence of man's existence in Pliocene times derived from cuts on bone, and, unless such cuts were

found accompanied by other circumstances excluding the probability of other agency than that of man, it would be very rash to rely upon them in support of the antiquity of the human race.

Mr. N. WHITLEY, C.E., writes:—

As an illustration of the need of caution, I may mention that the late Dr. Falconer was of opinion that the high antiquity of man was indicated by an artificial incision on part of a reindeer's horn found in Brixham Cavern. But Mr. Busk, after examining the evidence, came to the conclusion that it was an accidental impression on the rib of a bear.—*Trans. of Roy. Society*, vol. clxiii. p. 564

ORDINARY MEETING.*

H. CADMAN JONES, Esq., M.A., in the Chair.

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

ASSOCIATE :—G. W. Lonsdale Barraclough, Esq., London.

The following Paper was then read by the Author :—

*THE BUTTERFLIES AND MOTHS OF AFRICA.** By
W. F. KIRBY, F.E.S., Assistant in the Zoological Department, British Museum.

AFRICA, the southern continent of the Old World, is quite as interesting, in many respects, as regards its natural history, as the northern continent of Asia-Europe. The northern continent cannot be divided, except artificially; and, speaking roughly, we may regard it as possessing three distinct Faunas, though they mingle on the boundaries. There is the Northern Fauna, extending from the west to Japan, and including the Arctic and Alpine species; there is the Steppe Fauna, or Western Fauna, extending from Central Asia to the western shores of the Mediterranean; and the Tropical Fauna, including South-eastern Asia, from India to Japan.

Africa has two distinctive Faunas of its own; on the Eastern and Western coasts; and the various Faunas of Asia-Europe likewise impinge upon it on the north and north-east. The islands to the east, especially Madagascar, have a distinctive Fauna of their own, allied to that of East Africa, but with more decided East Indian affinities.

It is generally recognised that Northern Africa belongs to what is called the Palæarctic Region,—*i.e.*, its productions have little or no resemblance to those of Africa south of the Sahara, but are related to those characteristic of the Northern and Steppe Faunas of Asia-Europe, and more especially to the latter. This is evidently due to the former geographical conformation of the Old World. There is not much doubt

that at no very remote period, geologically speaking, the Mediterranean only existed in the form of two or three landlocked lakes, continued by a series curving north-east through Asia to the Arctic Ocean. At the same time, the country now occupied by the Sahara Desert was probably covered by a broad sea, similar to the Mediterranean, and possibly open on the west, and landlocked on the east in the same way. Even now, many of the lakes of Central Asia are rapidly drying up, and thus the geographical changes in the character of that country are still in progress.

It will, perhaps, be better to consider the relationship of the various Northern Faunas to Africa, before discussing the character of the more characteristic African Faunas.

In the first place, the strictly Northern Fauna, including the Alpine, hardly touches North Africa at all. Many of our most characteristic Central European insects become mountain insects in the extreme south of Europe, and many others do not cross the Mediterranean. Thus, our familiar Peacock Butterfly (*Vanessa Io*), though common from Ireland to Japan, is a great rarity in Sicily, and is quite unknown in North Africa. Two of the most characteristic of the Europeo-Asiatic Alpine genera of butterflies, *Parnassius* and *Erebia*, are each represented by a single species only in the mountains of South Spain, and I am not acquainted with a single representative of any truly Alpine species which occurs in the mountains of North Africa, though the genus *Erebia* is replaced in Southern Africa and Madagascar by the closely-allied genus *Pseudonympha*. The genus *Colias*, which includes the Clouded Yellows, is represented in Northern Africa by the two common European species *C. Edusa* and *C. Hyale*. *C. Edusa* occurs throughout the deserts of North-Eastern Africa, but disappears in Central Africa, though in Southern Africa we meet with it again under the slightly modified form of *C. Electra*. And, what is perhaps more singular, *C. Hyale*, though less widely distributed in Northern Africa than *C. Edusa*, likewise reappears in South Africa, where, however, it is far from common. And here I may say that I believe that the reputed occurrence of our common Small Cabbage White Butterfly, *Pieris Rapæ*, on the West Coast of Africa, requires confirmation. Hewitson, indeed, received two specimens from thence; but I am inclined to think that they were either mixed with African species in error, or else were simply derived from some missionary's garden.

The disappearance of the Northern and Alpine Europeo-Asiatic Fauna renders the Fauna even of South Europe much poorer than that of Central Europe, and that of North Africa

is naturally poorer still. This would seem to indicate that the Northern Fauna spread originally from north to south in comparatively recent times.

The so-called Mediterranean Fauna is clearly identical with the Steppe Fauna of Western and Central Asia, where it seems to have originated, and to have spread westward. At present it extends from North-western India and Central Asia to the Western Mediterranean. Of the species belonging to the Mediterranean, or Steppe Fauna, some are met with on both sides of the Mediterranean, like the white silver-marked *Euchloe Belemia*, the genus *Thais* in the *Papilionidæ*, *Thestor*, a *Lycænide* genus allied to the Coppers (*Chrysophanus*), and various remarkable species of brown butterflies (*Satyrinæ*). Others, like the curious yellow group of *Euchloe*, represented by *E. Charlonia* and allies, do not enter Europe, but extend along the southern shores of the Mediterranean, and the group which I have mentioned extends from North-western India even to the Canaries. Others, again, like the desert genus *Idmais*, which is allied to our genus *Colias*, take a more south-easterly direction, avoiding North Africa proper, but curving round from North-western India into Arabia, and sometimes crossing the Red Sea to the opposite African coast.

The Indian Fauna does not greatly affect either Europe or Africa. A few insects belonging to characteristically Indian genera (*Neptis*, for instance) extend to South-eastern Europe, and two wide-ranging species, *Danaus Chrysippus*, and *Hypolimnas Misippus* which mimics it in the female, are abundant both in Southern Asia and Africa. *D. Chrysippus* is found over the whole of Africa, except Morocco and Algeria, and in Europe extends to Greece, while *H. Misippus* does not extend to Europe or to any part of the north coast of Africa, though we find it again, probably introduced, on the north coast of South America, where *D. Chrysippus* does not occur. Again, there are one or two representatives of the green-striped group of *Danaus* so common in the East Indies, both in East and West Africa; but, as a rule, characteristic Indian genera are represented in Africa by allied but distinct African genera, or at least by species belonging to different groups of a large genus, such as *Charaxes*, when it occurs in both countries.

The Fauna of Western Africa is by far the richest and most characteristic of that continent. Perhaps the species of *Nymphalidæ* may be considered the most remarkable. Many genera peculiar to the African continent abound in very handsome species on the west coast, but are only sparingly represented, if at all, on the eastern coast. The Western Fauna,

however, extends eastwards almost to the highlands of Abyssinia; and some years ago a traveller brought back a large collection of butterflies from the Bahr el Ghazal which contained nothing but well-known West African species and a small admixture of Abyssinian forms. Unfortunately, he had fallen into the usual error which besets all collectors except those of considerable scientific knowledge and experience, and had limited himself to collecting only the largest and handsomest species. His collection was of great interest as showing the range of the West African Fauna, but if he had collected smaller and less conspicuous species as well, not only its scientific but even its money value would have been tenfold greater.

Among the most characteristic forms of *Nymphalidæ* which predominate on the West Coast we may mention the genera *Euphædra*, *Cymothoe*, and *Aterica*. *Charaxes* is also very richly represented, though this genus is not exclusively African. The Indian forms, however, represent different sections to those of Africa. A single species, *Charaxes Jasius*, is one of the few insects belonging to typical African forms which have reached the Palæarctic Region. It is not a native of tropical Africa, but is found in most of the countries bordering on the Mediterranean Sea, where its caterpillar feeds on the arbutus. It is most nearly allied to an Abyssinian species, *C. Epijasius*, and may possibly have originally reached the Mediterranean from that country.

Hamanumida Dædalus is a very characteristic African Nymphalide. It is brownish grey with white black-edged spots, and its colouring has been compared to that of the Guinea fowl. The shade of the under-surface is said to vary according to the character of the soil in the localities where the butterfly is found.

The sub-family *Acraeinæ* is peculiarly characteristic of Africa, though a few species are met with in India, Australia, &c., and South America. These are long-winged butterflies, generally reddish or semi-transparent and spotted with black. Among the most remarkable species of *Papilio* which inhabit the West Coast of Africa are two which much resemble species of *Acraea*, both in form and colour. One of these is *P. Ridleyanus*, which is very like *Acraea Egina*, and the other is the famous *P. Antimachus*, which is eight or nine inches in expanse of wing, and much larger than any known *Acraea*, or indeed than any other butterfly found in Africa. Although figured by Drury as long ago as 1782 from a specimen which is now in Australia, no second individual was obtained till 1864. This butterfly, though still rare, has since been obtained at inter-

vals, and can now be bought by those who are willing to pay a high price for it, which was not the case a few years ago. I am not aware, however, that anything authentic has yet been recorded respecting its habits. Smeathman's observations on the subject, quoted by Drury, are said to have been intended to apply to *Charaxes Pollux*, and not to *Papilio Antimachus*; and one account of a later capture, which I remember reading, looks as if it were only an imitation of Mr. Wallace's well-known account of his capture of *Ornithoptera Cræsus*.

I have already mentioned *Danaus Chrysippus* as an inhabitant of nearly the whole of Africa. This insect is very remarkable for the number of butterflies and moths belonging to other groups more or less resembling it. Among these are the females of *Hypolimnas Misippus* and *Papilio Trophonius*, as well as *Euphædra Eleus*, and *E. Ruspina*, *Aletis Helcita*, &c.

Among the *Lyceuidæ*, Africa possesses many species of Blues similar to European species, and also various genera of Blues, Coppers, and Hairstreaks, either peculiar to itself or found elsewhere only in South-western or Southern Asia.

Besides these, there are many genera peculiar to Africa, which have no close allies elsewhere, such as *Axiocerces*, *Pentila*, *Liptena*, *Epitola*, &c.

Turning to the *Pierinæ*, or White Butterflies, we find many genera which are almost peculiar to Africa. Orange Tips of the genus *Teracolus* are extremely numerous, and one species is even found in Algeria. They are not quite confined to Africa, however, for a few species are met with in India. The delicate satiny-white or pale yellow butterflies belonging to the genus *Belenois* and its allies, are likewise very characteristic of Africa and Madagascar.

The *Papilioninæ* are only represented in Africa by the genus *Papilio*, of which, however, many interesting species are met with, both on the East and West Coasts. We have already referred to *P. Ridleyanus* and *Antimachus*; but among the most remarkable species are those allied to *P. Merope*. The males are cream-coloured butterflies with black markings, and long tails on the hind wings,—true swallow-tail butterflies, in fact; but the females are tailless, and both in shape and colour much resemble various African species of the genera *Danaus* and *Amauris*, belonging to the sub-family *Danainæ* of the *Nymphalidæ*, which have structurally no very close relationship with the *Papilionidæ*. However, in the case of some species of the *Merope* group found in Madagascar and Eastern Africa, the females closely resemble the males in shape as well as in

colour. It should, of course, be mentioned that the *Danaïne*, as is usually the case in such instances, is a group which is protected from some of its enemies by the toughness of its integuments and its disagreeable smell.

Among the Skippers (*Hesperiidæ*) the West African *Ismene Iphis* (one of the largest of the family) and a few allied species may be mentioned. There are also one or two genera such as *Leucochitonea*, which are peculiar to Africa.

Turning to the moths, I have only time to allude to a few, for they are far more numerous than the butterflies, and are much less known at present. Among the *Sphingidæ*, the peculiar dull green species of *Nephele* are rather numerous, more so than in India, though the genus is likewise represented there. One or two wide-ranging and probably more or less migratory species which are common throughout the warmer regions of the Old World are found all over Africa, such as *Acherontia Atropos* and *Daphnis Nerii*.

Two of the most beautiful moths in the world, *Chrysidia Rhipheus* and *C. Cræsus*, are natives of Madagascar and East Africa respectively; and their nearest allies, though not very closely related, are species of *Urania* which inhabit the West Indies and Tropical America. A smaller form of *Chrysidia* is said to have been taken in St. Helena; but this is very doubtful, and if the genus ever occurred there it has probably long been extinct. The small family, *Uraniidæ*, to which this genus belongs, is of doubtful position, and was originally referred to the butterflies; now, however, it is generally considered to be allied to the *Geometridæ*.

In the *Zygænidæ* several beautiful species of *Euchromia*, a genus which likewise occurs in India, are common, as well as transparent-winged species allied to our European *Zygæna Phegea*, but smaller. There are several species of Burnets (*Anthrocera*) in South Africa, very similar to our European Burnets, but, although ours are gregarious, and if you take one you can take any quantity, they are scarce in South Africa, and are still very imperfectly known. It appears that at some period or other, these Burnets, like the *Pseudonymphæ*, the African representatives of *Erebia*, must have found their way to Southern Africa, where they are now isolated. In America, too, isolated species of butterflies and moths which resemble northern forms occur in Chili. Burnets are abundant round the Mediterranean, but I believe that none occur in Equatorial Africa.

There are many other beautiful species of day-flying moths belonging to genera characteristic of or peculiar to Africa, such as *Eusemia*, *Phægorista*, *Aletis*, &c.; but I will now

turn to the splendid group of the *Saturniidae*, or ocellated Silk-worm Moths, allied to our Emperor Moth (*Saturnia Pavonia-minor*). These are represented in Africa by a great variety of species, and though gregarious, are in many instances very scarce in collections, owing perhaps to their nocturnal habits, and to many of the larvæ feeding on forest trees. Natal is rich in peculiar species, not found further north. Among these is *Actias Mimosa*, a green species with long tails. All the other species of this genus are found in South-Eastern Asia and North America, except *A. Isabella*, which occurs equally isolated from its allies in Spain. At Sierra Leone we meet with two very remarkable tailed brown species, the nearest allies of which are found in South America. These are *Eudæmonia Argus* and *E. Argiphontes*, the latter of which has a tail on the hind wings of the male which measures nearly six inches in length, the expanse of the fore wings being only about three inches. Both these insects are very rare, although *E. Argus* has been known for more than a century; but I believe that there are more species of this peculiar group to be found in Western Africa than have yet been discovered. I am glad to add that one of the most beautiful species of the African *Saturniidae*, *Henucha Grimmia*, which has hitherto been only known from a figure published fifty years ago, was rediscovered last year in an out-of-the-way district in South Africa. It is not a large insect, but has brown fore wings mottled with white, and ornamented with zigzag white markings, and the hind wings are red at the base.

The Fauna of East Africa possesses many remarkable species of butterflies and moths peculiar to itself, but comparatively few peculiar genera. As I have said, it is much poorer than that of the West Coast, and its affinities with India are stronger. Madagascar, too, is richer in peculiar species than in peculiar genera.

And now I have only to thank you for the attention with which you have listened to what I fear has been far too much a mere catalogue of names. I have endeavoured to make my subject interesting, but unless you have a full series of illustrative specimens before you, it is difficult to make the best of any technical subject. I might perhaps have extended my paper to a greater length; but I fear you have found it quite long enough already.

The CHAIRMAN (H. Cadman Jones, Esq.).—I am sure we are all much obliged to Mr. Kirby for his paper, and if there are any present who have studied the subject and would desire to offer criticisms, we shall all be glad to hear them.

Rev. F. A. WALKER, D.D., F.L.S.—I will just make a few remarks on Mr. Kirby's most interesting paper.

Page 225.—The affinity here mentioned between the Fauna of Madagascar and that of East Africa is an undoubted fact, but surely a certain relationship between the butterflies of West Africa and those of Madagascar is equally evident. Of the three species of genus *Godartia* that I possess, two, *Eurinome* and *Trajanus*, are from West Africa, *Trajanus* being from the region of the Cameroons, and the third, as its name *Madagascariensis* imports, from Madagascar. I note that Mr. Kirby, in his synonymic catalogue of "Diurnal Lepidoptera," styles this genus *Euxanthe*, and only enumerates two species,—*Eurinome* and *Madagascariensis*,—but in the appendix to the same work mentions a third,—*Ansellica*,—from Kinsembo. I may add that there is greater similarity of marking between the West African species, *Eurinome*, and the Madagascar ditto, *Madagascariensis*, than between the two West African species, *Eurinome* and *Trajanus*.

Again, in the tribe of *Papilios* known as the "Nireus" group, the West African species, *Erinus* from the Gaboon, *Bromius* from the Cameroons, and *Charopus* from Calabar, are as closely allied to the species *Oribazus* and *Disparilis* from Vohama, in Madagascar, as are the East African kinds, *Hornimani* and *Nireus*, which is the commonest of the tribe.

Page 226. "Slightly modified form of *C. Electra*."—The white variety of this, the only specimen that I possess of the species, is smaller than *Helice*, the corresponding pale variety of *C. Edusa*, and of a dusky white, *Helice* being more of a creamy tint. Also the orange spot in the lower wings of *Helice* is replaced by a white ditto in those of the variety of *C. Electra*.

Page 227. *Anthocharis Belemia*.—Two specimens of this pretty little species were captured by me towards the end of March, between Jaffa and Latroon, probably on the plain of Sharon; and a third in the second week of April in the outskirts of Beyrout. It resembles our *A. Cardamines* in the green markings of the lower wings on the under side, but has stripes, whereas *Cardamines* has spots of that colour.

"The desert genus *Idmais* striking across from North-western

India."—Most species of this genus are of a rich fawn colour, inclining in some instances to orange.

All the kinds that I possess are Asiatic, e.g. :—

Idmais fausta, Syria.

„ *amata*, Trincomalee and Bombay.

„ *dynamene*, India.

Page 228. *Papilio Antimachus*.—The late William Chapman Hewitson, Esq., who bequeathed his magnificent collection of butterflies,—unequaled by any amateur during his lifetime,—to the British Museum, informed me respecting this extremely rare West African species, that he calculated that its acquisition cost him from first to last not less than £500, which he accounted for as follows :—The pay and keep of a number of negroes for a considerable time sent into the forests to search for and capture this particular butterfly. Ditto of armed guard to protect these negroes meanwhile. Also because, though these negroes captured and transmitted to him many other species as well, he had all the other kinds before. When resident at Notting Hill six or seven years since a splendid specimen of this insect was brought round to me by a well-known dealer, in the hope that I should purchase it for £30, and since that date I could have bought a very tattered representative, nearly half of the wings of which were replaced with coloured paper to match, for less than as many shillings. I need hardly say that my collection is still minus this species. Those familiar with the *Acræidæ* of Africa and Madagascar will be of the opinion that in colouring and markings it resembles nothing so strongly as an *Acræa*, only of gigantic size compared with that genus, for *Papilio Antimachus* with its long and narrow wings measures more than any other butterfly from tip to tip.

Page 229. Genus *Teracolus* or *Anthocharis*.—The African species of this tribe in my collection outnumber the Asiatic ditto by about three to one.

For example :—

<i>Ione</i> ,	}	<i>Evippe</i> , Congo.
<i>Evarne</i> ,		} Natal.
<i>Achine</i> ,		
<i>Eupompe</i> ,		} Unnamed sp. Madagascar.
<i>Omphale</i> ,	<i>Etriia</i> , Bombay.	
	<i>Danaë</i> , India.	

Most of these are orange-tips, but the Indian *Danaë* has crimson patches, and the Natal *Ione* purple ditto in the extremity of the fore wings.

As examples of small *Lycænida* resembling our own British kinds in general appearance,

Lycæna hintza, Natal.

„ *palemon*, Cape.

„ *acca*, Kuysua River,

may be mentioned among the African species in my collection.

And also *Bæticus*, which, to my certain knowledge, has a very wide distribution over Europe, Asia, and Africa. I have purchased specimens of this insect from India, and taken it myself in Egypt and Nubia. It was not known in England even as a summer visitant till about thirty years since.

Page 229.—Small species of *Chrysophanus*, all more or less nearly allied to *C. Phlaeas*, are numerous in South Africa. For instance, I possess

<i>Zeritis</i>	...	{	<i>Orus,</i> <i>Mars,</i> <i>Lara,</i> <i>Harpax,</i> <i>Alpheus,</i>	}	...	Natal.
„					...	South Africa.

And an unnamed species from Kaffraria.

Mr. Kirby records that *Danaïs Chrysippus* is found all over Africa. I can testify to its abundance in and about Cairo in the first half of December, when it frequents the poinsettias, zinnias, &c., in the palace grounds, public gardens, &c. It is probably the most widely distributed of all the *Danaidæ*, its range extending even to Australia.

Page 230. *Urania Rhipheus*.—This singularly handsome Madagascar species and a closely allied kind on the opposite coast of East Africa, are by far the most beautiful of all the *Uranidæ*. Other species of this tribe occur in the New World; for example, the *Urania Sloana* of the West Indies, and the *Urania Leilus* of South America. Mr. Bates records that during his stay at Caripi on the southern shore of the Pará River, the *Urania Leilus*, a strange and beautifully-tailed and gilded moth, whose habits are those of a butterfly, commenced to fly in flocks over the tree tops. It was the remembrance of this fact that gave rise to an idea for the mounting of seventeen specimens of *Urania Rhipheus*, which I endeavoured to carry out as nearly as possible to resemble its natural surroundings.

I first bought a specimen of a Madagascar orchid, *Angraecum viride*, in Covent Garden, and then had an exact copy of its flower and leaves taken in wax, while retaining the real root of the orchid, as not liable to wither. I then had the plant, thus formed, as one of a parasitic nature, affixed to the supposed topmost bough of a dead tree, round which *Uranias* are flitting, while the foreground, intended to represent a plateau on the summit of the hill in front of the tree ascending from the vale beneath, is covered with a mountain *Lycopodium* accordingly. I also directed the bird-stuffer as to the attitude and position of each of the insects thus enclosed in a glass case.

Page 231.—In reference to the particular species here mentioned as tending to illustrate my friend, Mr. Kirby's paper, I shall be happy to show them to any one interested in the subject. I possess, and would have brought with me to-night, the greater part of the kinds that he speaks of, only for the risk involved in removing them from cabinet drawers for the purpose.

Mr. W. J. SLATER, F.E.S.—Mr. Kirby will doubtless have noticed the beautiful modifications which *Daphnis Nerii* takes in South Africa. The pretty green which the European specimens have on their wings, is there more of an olive colour, so that certain English collectors, to whom I have shown specimens I have received from Zululand, have declared they were not *Daphnis Nerii*, but a totally different insect. The question is, whether this change depends on climate or on difference of food, for I have not ascertained whether it there feeds on the oleander or some different plant. I may mention in connexion with the subject that the moth is also found in Ceylon, and there feeds on the Peruvian bark tree, though it belongs, botanically and chemically, to a totally different group from the oleander.

A VISITOR asked a question in regard to the disposition of butterflies, and whether the different species were confined to different zones.

The AUTHOR.—With reference to Dr. Walker's observations respecting Madagascar, I did not intend specially to discuss the question of Madagascar in the present paper; but I may say that there is a considerable connexion between its Fauna and that of India. Only the other day I was looking over some dragon-flies from Madagascar, and to my surprise I found a new species of a genus which I thought to be exclusively Indian, and also a new genus very peculiar in form and nearly resembling two genera

found, I think, only in New Guinea and the Philippines ; there is nothing else among dragon-flies that it resembles in its denticulated wings, which is an exceedingly rare character in *O. donata*. With reference to what Mr. Slater has said, it is difficult to tell whether it is the difference of climate or the difference of food plants that affects insects ; but *Daphnis Nerii* is found from the south of Europe to the south of Africa, as well as in the East Indies, and is only an occasional visitor with us. With regard to the interesting question asked by another speaker, I may say there is a disposition of butterflies north and south as well as east and west, both in Europe, Asia, and America, and we find many Arctic species re-appearing far to the south on Alpine summits. Perhaps that is less strictly so in Europe than in some other countries. For instance, there is an Arctic species, *Colias Nastes* (Boisd.), which is confined, in Europe and Asia, to the extreme north ; but there are southern representatives in the Himalayas. One of the most famous of the North American butterflies is *Eneis Semidea* (Say), which belongs to an almost exclusively Arctic genus. There are one or two Alpine or Steppe species, but they are exceptions ; but *Æ. Semidea* is found in various localities in the extreme north of America, and then appears again on the summit of Mount Washington, and then again in a district to the west. I forget whether it is in Colorado, but you can see it referred to in the accounts given by Grote, Scudder, and other American writers.

The meeting was then adjourned.

ORDINARY MEETING.*

THE PRESIDENT, SIR GEORGE G. 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 Mr. W. Johnson, in the Author's unavoidable absence in Ireland.

THE FACTORS OF EVOLUTION IN LANGUAGE.

By JOSEPH JOHN MURPHY, ESQ.

A VERY able friend of mine, now departed, on being told of the title of my book *Habit and Intelligence*, said, "Ought it not to be 'Intelligence and Habit' ? Intelligence is the originating, and habit the perpetuating agency." From a truly philosophical point of view, my friend was right.

" But we upon a wintry clime
Have fallen—on this iron time
Of doubts, debates, distractions, fears."

Although the knowledge of the laws and forces of nature which is embodied in our physical, chemical, and biological science; and the knowledge of the processes of evolution, which is contained in our geological science and our theory of vital development; are true gifts of God, yet for the present generation, to whom they are comparatively new, they appear to have the effect of obscuring the highest intellectual as well as spiritual truth. In the science of organic life, an attempt is made to explain the evidence of

* February 4, 1889.

organizing intelligence as a mere semblance and illusion, due to the unintelligent agency of natural selection among spontaneous unguided variations; and in the science of mind a similar attempt is made to resolve mental intelligence into a resultant from unintelligent elements, put together and moulded into form by the unintelligent agency of the association of ideas. Consequently, when, in opposition to this phase of opinion, I endeavoured to vindicate the old truth of the existence of intellectual and spiritual principles discernible in nature and in mind, though derived from a source transcending nature, I was compelled to begin by inquiring how much can be accounted for by unintelligent agencies, and especially by the laws of habit and variation; and then to make intelligence,—both organizing intelligence and mental intelligence,—appear as a residual ultimate fact, which must be recognised as the explanation of phenomena which are inexplicable without it.

Habit is defined, for my purpose, with the utmost possible generality; including, in the organic sphere, the law of heredity; and in the mental sphere, memory, or the perpetuation of impressions in consciousness, with the laws of the association of ideas. To give a full account of my conclusions as to the relation between habit and intelligence, would be to give an abstract of a great part of my book on the subject: and this would be neither desirable nor admissible on the present occasion. What I purpose to do is to show how the relation between intelligence, as the originating factor, and habit, as the perpetuating factor, exists in language as well as in the evolution of living individuals and species; and how this relation bears on the principles expounded in Prof. Max Müller's recent work on the Science of Thought.

It is scarcely a metaphor to call language an organism. The definition of organization is, that the parts of the organism are all in functional relation with each other; and the words of a sentence are thus functionally related. But there are living species, such as those of the genera *Gromia* and *Amœba*, to which we do not refuse the name of organisms, in which, nevertheless, the most powerful microscopes show no trace of structure or organization, and the perfect independence of the life of their every part makes it almost certain that they really have neither, although they show their living nature in motion, nutrition, growth, and reproduction. These, however, are the lowest kinds of living beings; in all but the very lowest, the living forces of the organism construct an organized body, consisting, according to our definition, of functionally distinct parts; and the increasing efficiency of

the vital functions, in the ascending scale of organic nature, is due to the increasing development of this organization. To mention one of the most striking instances; the efficiency of the power of vision is altogether due to the development of the optical and nervous organization of the visual organs. Life constructs the organism to be the means of its action; life is the cause of organization, and not its effect.

Moreover, it has been made known by microscopic research that minute masses of unorganized though living matter, or protoplasm, are to be found in the highest organisms; this, in its general properties, appears to resemble the gelatinous substance called sarcode, which constitutes the entire bodies of the lowest structureless organisms. Not only is this protoplasm living, but life appears to depend upon it; and it appears highly probable that every particle of the organized structure of the body has been in the form of protoplasm before being converted into organized tissue.* The relation of protoplasm to tissue is consequently somewhat like that of a solution to the crystals which are formed from it; and Prof. Cope has advanced the opinion that the protoplasm is the seat of the organizing intelligence, and, to use his own expression, is itself intelligent.† This, probably, does not admit of proof; but, fantastic as it may seem at first sight, I believe that the more it is examined the more probable it will appear.

The relation of language to thought is parallel with the relation of organization to life. It is no longer necessary to insist on the truth that language is not conventional, but is a natural product of man's thought when acting in society. Prof. Max Müller admirably remarks that "language is not outside thought, but is the outside of thought."‡ The evolutions of thought and of language act and re-act on each other. As he elsewhere remarks,§ "The growth of reason and language may be said to be coral-like,—nay, even more simultaneous than the growth of corals. Each shell is the product of life, and becomes in turn the support of new life; in the same manner, each word is the work of

* See Beale's edition of Todd & Bowman's *Physiology*. "Germinal matter" is Beale's name for protoplasm.

† See the essay "Consciousness in Evolution" in his volume, *The Origin of the Fittest*. He thinks protoplasm is not only intelligent, but conscious; but my belief is that its intelligence is unconscious.

‡ *Science of Thought*, p. 215. The author has written "the mind" where I quote "thought."

§ *Ibid.*, p. 298.

reason, but becomes in turn a new link in the growth of reason."

As organization is necessary to any high development of life, so is language necessary to any high development of thought. But it is an exaggeration to say, with Prof. Max Müller, that thought cannot exist without language. As life precedes organization and produces it, so thought precedes language and produces it. We often have a thought in the mind for an appreciable time,—sometimes a long time,—before we succeed, to use an expressive colloquialism, in "getting it into shape" by formulating it in words. Tennyson's lines describing the conversation of intellectually sympathizing friends,—

"When thought leaped out to answer thought
Ere thought could wed itself with speech,"

represents a common experience. And it is a familiar truth, that those whose judgment is the soundest are not always those who state most easily and clearly the reasons for their judgment in words. To deny this power of thought to be partly independent of language, appears no less untrue to fact than it would be, on the other hand, to deny that language is necessary to any elaborate train of thought.

Prof. Max Müller has done injustice to his subject of the Science of Thought, by refusing to take into the scope of the science the minds of animals. It must be freely granted that no light whatever is thrown on the psychology of the conscious mind of man by those wonderful instincts which guide the actions of insects towards ends whereof we cannot believe that they have any consciousness; such as, to mention the best known instance, the instinct that guides the bee to build its cells in that hexagonal form which stores the most honey with the least expenditure of wax; or the still more wonderful instinct that directs the larva of the *Saturnia Pavonia minor*, or Emperor moth, so to construct its cocoon as to be protected against pressure from without, yet able easily to open the cocoon and escape when the time comes for its final transformation.* Such instincts as these are rather to be classed with the formative intelligence which constructs the organism, than with the conscious intelligence of the mind of man and of the higher animals. But no conscious intelligence ought to be excluded from the Science of Thought. Prof. Max Müller justifies the exclusion of animal intelligence from his science by saying that we know it only by analogy

* Autenrieth, quoted by Müller, p. 13.

(p. 125). This is quite true ; but it is equally true that it is only by analogy we know, or can know, anything of the minds of other men, or whether they have minds at all:—it is only by the analogy of other men's forms, features, and actions with my own that I know myself not to be

“Unter Larven die einzige fühlende Brust,”

the only sentient being in a world of masks.

But before he finally dismisses the subject of the intelligence of animals, by a fortunate inconsistency he quotes an instance which most clearly shows the nature and the limitations of the lowest conscious intelligence:—

“A pike, which swallowed all small fishes which were put into his aquarium, was separated from them by a frame of glass, so that whenever he tried to pounce on them he struck his gills against the glass, and sometimes so violently that he remained lying on his back as though dead. He recovered, however, and repeated his onslaughts till they became rarer and rarer, and at last, after three months, ceased altogether. After having been thus in solitary confinement for six months, the frame of glass was removed from the aquarium, so that the pike could again roam about freely among the other fishes. He at once swam towards them, but he never touched any one of them, but always halted at a respectful distance of about an inch, and was satisfied to share with the rest the meat that was thrown into the aquarium. He had therefore been trained so as not to attack the other fishes which he knew as inhabitants of the same tank. As soon, however, as a strange fish was thrown into the aquarium, the pike in nowise respected him, but swallowed him at once.” *

Here is reasoning, with its result in action, just as we practise it ourselves. The pike, having tried to eat his companions, got badly hurt in the attempt, and left it off. The reasoning was sound in substance, and—only the pike did not know it—was syllogistic in form; the major premise of the syllogism was the truth of the uniformity of nature; or, to put it into simpler words, that what has happened once will probably happen again under the same circumstances. This, as Mill has remarked, is the major premise of all reasoning whatever respecting the world that surrounds us; and, though it cannot be doubted, it does not admit of proof. The belief in it is an instinct, common to all animals whose actions are guided by sensation. Prof. Max Müller quotes the saying of Mill, that “not only the burned child, but the burned dog

* Professor Möbius, quoted by Prof. Max Müller, p. 11.

dreads the fire"; and we see the same instinct in Prof. Möbius's pike. It is impossible to doubt that the instinct is fundamentally the same in all,—fishes, dogs, children, and men.

But this, in animals and young children, is only what Mill calls reasoning from particulars to particulars. Indeed, this pike, although he happened to be right as to fact, was almost ludicrously narrow in its generalization, when he ventured to eat those individuals among his companions which were not associated in his memory with a blow on the head. A dog or a child would probably have generalized more widely and more rapidly. But although in such a case as this there is reasoning, and a first step in generalization, it is all done without self-consciousness. There is consciousness of the objects of perception, perhaps we may say of the objects of thought, but not of thought itself; and the "universal major premise" of the uniformity of nature guides action without itself coming into consciousness. Reasoning, self-consciousness, and language arise with the power of consciously forming general propositions; and these powers appear to be the characteristically human ones. This is Mill's account of the origin of the reasoning faculty, and, as a mere description of fact, it seems perfectly sound. It occurs in his *Logic*, and logic requires only a description of the reasoning process; but the Science of Thought should at least attempt to give an account of its genesis. But Prof. Max Müller does not attempt this; indeed, by dismissing all questions of animal psychology almost as soon as he has begun his work, he has virtually refused to make any such attempt.

He begins by distinguishing four stages in the evolution of thought,—namely, Sensations, Percepts, Concepts,* and Names; but he says that these four, though distinguishable in thought, are inseparable in fact. It must be observed that by sensations he means perceived or recognised sensations only, though he admits the existence of what by some are called unperceived sensations, but by him only impressions.† But even with this limitation, it surely cannot be sustained that these four stages in thinking are inseparable from each other. It is quite true that there can be no names without concepts, nor concepts without percepts, nor percepts without sensations. But there are sensations

* *Percepts* and *concepts* are distinguished from *perception* and *conception* as the product of the process from the process itself; e. g., as thought from thinking.

† *Science of Thought*, p. 3.

without percepts (unless sensation and perception are so defined as to make them synonymous); there are percepts without concepts; and, though it may be that definitely-formed concepts are impossible without names for them, yet, as I have already remarked, it is a fact of common experience that thought often anticipates language, and attains to results which we cannot always perfectly express in language.

Prof. Max Müller says that he was an evolutionist before Darwin, because every student of the formation of language is necessarily an evolutionist. This is quite true; yet by refusing to study mind in its manifestations in animals, and by studying it only in one of its highest manifestations and products, namely in the languages of the Aryan race of mankind, he has abandoned the position of an evolutionist, and gone back to one resembling that of a physiologist who should insist on studying the bodily frame of man only, without any light from the lower orders of the animal creation.

By Prof. Max Müller's own admission, however, the enumeration of terms in the above series,—Sensations, Percepts, Concepts, and Names,—is incomplete. Between Perception, which is a power enjoyed, almost certainly, by all animals that have the sense of sight, and probably by many that have only the sense of touch; and Conception, which in its full development involves thought and language; there is an intermediate term in mental development, for which no name has yet come into general use. Generalization is the best I can think of, but it must be understood that scientific generalization is not meant; only such generalization as can be spontaneously effected in the mind of any animal endowed with visual perception and memory of its perceptions. When many similar impressions are made on the sense and leave their traces on the memory, similar impressions tend to combine and form a generalized image, like Mr. Galton's composite photographs, in which what is common to the several impressions on the sense is preserved, while what is special to each is lost or forgotten.* To the formation of such a generalized mental image, it is as needful to forget what is unimportant in the visual perception as to remember what is important. I suppose this must be what Prof. Max Müller means when he says† that "Obliviscence is often more important than Memory." He recognises‡ the process just described, but, I think,

* See Morell's *Psychology* (Longman, 1862): a work which is less known than it deserves.

† *Science of Thought*, p. 20.

‡ *Ibid.*, pp. 45+, 501.

fails to see its importance. It can scarcely be doubted that the higher animals have such generalized ideas of the classes of objects surrounding them which are of the most importance to their lives;—that a wolf, for instance, has a generalised idea of sheep, and a cat of mice.

This is a purely spontaneous process; and probably animals never get beyond it. The next stage in the evolution of thought, and the distinctively human one, occurs when, by the self-directed energy of the mind, actions are ideally separated from their agents, and qualities from their substances. Thus, to the merely animal intelligence, fire is probably only an object of perception; but the human intelligence forms concepts of the act of burning and the quality of brightness; and these concepts demand and receive names. The work before us is an account of this process. The great service which Prof. Max Müller in this work has done to science, consists in enforcing and illustrating the truth, which, as he points out, was insisted on by Locke, "that words were never the signs of things, but that in their origin they were always the signs of concepts; that language begins where abstraction begins; and that the reason why animals have no language is that they do not possess the power of abstraction" (p. 295). The entire work, in fact, consists of illustrations of this truth from the facts of language.

It is a familiar doctrine this, that the faculty of language is the distinctively human power. But the special character of man's mental activity itself requires to be accounted for. What is that in the mind of man which makes the production of language possible and inevitable? Prof. Max Müller, following Locke, in the passage just quoted, says it is the power of abstraction; and no doubt he is right. But is this reducible to anything still more elementary? I think it is. He makes* the luminous suggestion, without appearing fully aware of its importance, that the mental actions of animals differ from ours as impulse differs from will; and I believe that the root of man's superiority consists, not in any heightening of the spontaneous instinctive intelligence which he has in common with other animals, but in acquiring the power of directing thought at will.

The root of Consciousness is sensation. The root of Will is muscular action. Intelligence has no corresponding root, but the first manifestations of Intelligence that we meet in

* *Science of Thought*, p. 593.

the ascending scale of life, like those of insects already mentioned, are unconscious. The full development of mind, as found in man, consists in the union and interpenetration of these three elements,—namely, Consciousness, Intelligence, and Will. But among animals, especially among the higher domestic animals, there is much development of mind which is not merely unconscious and instinctive, but evidently conscious. Many dogs manifest a degree of mental power which probably marks the highest that can be attained by any being without the faculty of abstraction and language, and astonishes us by its near approach to our own. It is altogether misleading to lump together all the mental powers of animals under the name of instincts. It not only explains nothing, but it suggests what is certainly untrue,—namely, that the most intelligent actions of the highest animals inferior to man are performed like those of many insects, without the guidance of conscious purpose. These remarks may be scarcely relevant, yet I think it worth while to make them, because the intelligence of animals is so mysterious and difficult a subject, that there is a great temptation for systematic writers to set it aside and pass it by, as Prof. Max Müller for the most part has done.

The conclusions at which we have aimed are the following :—

1. The stages in the evolution of thought are not simultaneous, but, as in all evolution, successive. They are thus enumerated :—

Sensation.

Perception.

Formation of generalized mental images.

Abstraction with conception.

The last is the distinctively human power. It depends on the power of directing thought at will, and its result and product is language.

2. Language is related to thought as organization is to the bodily life. Organization is the result of life, and language of thought; organization reacts on life, heightening its efficiency, and language on thought, heightening its efficiency. But organization does not exist at the origin of life, nor language at the origin of thought. As in vital evolution there are two factors; on the one hand, the organizing intelligence which produces organic adaptation and guides evolution, and, on the other hand, hereditary habit or the principle of permanence, in virtue of which organisms on the whole resemble their parents;—so in language there are two factors;

on the one hand, mental intelligence; and on the other, habit acting in memory, whereby the knowledge of words and grammatical forms is preserved.

The present essay is partly controversial, and I have been compelled to dwell on those parts of the subject where I cannot agree with Prof. Max Müller. But I wish to conclude with a tribute of gratitude for the great ability and wonderful knowledge with which, in this as well as in his former works, he has expounded the new and most interesting science of Language. Like all science, it is certain to make progress; and I hope and believe that he, or his successors, will hereafter not confine their researches to comparative etymology, or the origin and derivation of words, but go on to lay the foundation of a science of comparative syntax, giving the origin and *rationale* of grammatical forms, and showing how the principles of the logical intelligence have embodied themselves in the grammatical structure of different languages. It is, perhaps, too much to hope that we shall ever know anything with certainty about the origin either of language or of life; but this does not prevent the study of language, like that of life, from having the profoundest interest and charm of its own; though I cannot agree with Prof. Max Müller that it will ever absorb or supersede either Psychology or Philosophy. But I am convinced that the science of Language, in so far as it bears at all on the nature of Thought, will tend to confirm the fundamental truth which Prof. Max Müller has learned from Kant, and which I regard as of the very highest importance,—that Intelligence is an independent endowment, not resolvable into any unintelligent element whatever.

The PRESIDENT (Sir G. G. Stokes, Bart., P.R.S.).—I will now ask you to return thanks to the author of the paper.

Captain F. PETRIE, F.G.S. (Hon. Sec.).—In regard to this paper the following communication has been received from Professor Max Müller, who says:—"I have read Mr. Murphy's remarks with great interest; they are thoughtful and useful."

COMMUNICATION:—I. The author says, page 240, half-way down,—
"To deny this power of thought to be partly independent of language, appears no less untrue to fact than it would be, on the other hand, to deny that language is necessary to any elaborate train of thought."

This criticism is just when we take thought, *cogitare*, in the wide sense in which Descartes uses it. "Qu'est-ce qu'une chose qui pense? C'est une chose qui doute, qui entend, qui conçoit, qui affirme, qui nie, qui veut, qui ne veut pas, qui imagine aussi, et qui sent" (*Méditations*, ed. Cousin, vol. i., p. 253). But why should we not distinguish real thought, *logos*, from perception and imagination? Perception and imagination are very valuable, they are the *sine qua non* of actual thought,—at least, with human beings. But why not keep them apart from thought, which deals, not with perception and images only, but with conceptual words?

II. Page 242.—From "It occurs" to end of paragraph.

I do not assert or deny anything about the intelligence of animals. I am simply an Agnostic. It is different with the minds of other men, for I know them, not by analogy only, but by the communication of language. To judge from Plutarch, Ælian, and others, animals must have been much cleverer in ancient times than they are now.

III. Page 243, first seven lines.

I admitted the possibility of percepts without conceptual names, because Mr. Galton asserted that he possessed some specimens of such concepts, and I did not like to contradict his inner consciousness. But, for myself, I deny their possibility. We have only to try to become conscious of any percept,—ask ourselves what we perceive,—and we can only answer by a conceptual name. Helmholtz has come to the same conclusion.

IV. Page 243, last twelve lines.

I look upon the composite photographs, or receipts, as Mr. Romanes calls them, as spurious metaphors. I should like to see a composite photograph of a blood-hound, greyhound, dachshund, and spaniel. No mind ever harboured such a monster.

The meeting was then adjourned.

THE AUTHOR IN REPLY.

In reply to Prof. Max Müller's last remark, I do not think such a concept as that of the species dog, including such unlike varieties as the greyhound and the spaniel, can have been formed by any process like the formation of composite photographs; it must have

been formed by the voluntary and conscious activity of the mind in comparing. But the impression of a single familiar word on the memory,—which, I think, is properly called a concept,—does appear to consist of the impressions made on the mind by the countless number of times it has been heard, which impressions have coalesced into one by a process comparable to the formation of a composite photograph, without any higher mental activity than is implied in all remembered sensation.

ORDINARY MEETING.*

THE PRESIDENT, SIR GEORGE G. 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 MEANING AND HISTORY OF THE LOGOS OF
PHILOSOPHY.* By the Rev. H. J. CLARKE.†

EFFORTS, made in times remote, to discover some fundamental principle which should account for all things but itself, thus unifying the sum total of facts and phenomena and harmonising their inter-relations, originated an intellectual pursuit which, if defined with reference to its purely scientific aim, and apart from ethical considerations, may be called *Ætiology*, but which the ancient Greeks significantly named *Philosophy*; that is to say, the study of Wisdom undertaken *lovingly*, and therefore with the intention of following it up as far as the utmost attainable limit. Not, however, at the fundamental principle did the votary of Wisdom propose to himself to rest from his labours: the ultimate truth, if he believed he had reached it, established itself in his intellect as a germinating principle, a prolific seed of thought, pregnant, as it seemed to him, with innumerable interpretations of

* March 4, 1889.

† Vicar of Great Barr, author of *The Fundamental Science*.

phenomena and developments of theory. With it no less comprehensive answer to philosophic inquiry could in his judgment bear comparison : it was at once an absolutely conclusive and an endlessly suggestive *word* ; it was pre-eminently the Logos.

These preliminary remarks may suffice to elucidate the significance which this well-known term, destined to hold for ever an imperial rank in philosophic terminology, assumed when first utilised in the most notable of the early and necessarily rude attempts to construct on a stable foundation, and in place of poetic myths, a scientific cosmogony.

Heracleitus, a native of Ephesus, who flourished towards the end of the sixth or early in the fifth century before the Christian era, in figuring to himself the primordial condition of the universe, conceived a notion which, although conjectural and loosely formed, foreshadows,—dimly, it is true, yet still perceptibly in certain salient features,—theories that date from modern astronomical and chemical discoveries. Thales had imagined Water to be the primal element ; by Diogenes of Apollonia and Anaximenes this rank was assigned to Air ; but, according to Heracleitus, cosmic evolution has for its point of departure something which may be represented as Fire.* The object I have in view has left me free from the obligation to give a systematic and complete exposition of his philosophy. Indeed, to attempt this would be to undertake a by no means easy task ; for the extant sayings ascribed to him, being few and fragmentary, and having probably, in the process of citation, been to some extent accommodated to doctrines either held or repudiated by the writers in whose works they appear, and, moreover, not being always perspicuously worded, may be compared to pieces belonging to a difficult Chinese puzzle, some of which have been mutilated, while other pieces are altogether wanting. He seems, however, to have conceived of the Cosmos as having been evolved out of an ethereal kind of igneous vapour.† How the condensation was effected which is necessarily assumed to have taken place in the process, namely in the transformation of the igneous vapour into the liquid and solid materials that constitute the earth, and into the atmosphere which covers it, and how, on the other hand, the rarefaction which is observable in numberless phenomena may likewise be accounted for,

* Clem. Alex., Cohort., 43 : “ τοῦτό τοι καὶ οἱ ἀμφὶ τὸν Ἡράκλειτον, τὸ πῦρ ὡς ἀρχέγονον ἐβούτε, πεπόνθασιν.”

† Aristot., De Anim., i. 2, 19.

consistently with a theory which presupposes an original tendency to condensation,—these are questions with which, apparently, he did not see his way to deal.* But respecting the transformation, considered as a fact, he entertains no doubt; and, indeed, he takes for granted that even those substances which yield no sensible evidence of an igneous nature are not only of igneous origin, but reducible to their original form. Each has its equivalent in the igneous element, its price, so to speak, just as goods may be exchanged for gold and gold for goods.† Thus, putting sensible manifestation out of view, and limiting his conception to a certain constitutive principle, operative in all things and imperishable, he applies to the Fire the epithet *ever-living*. The sensible flame, it is true, at one time flashes up, at another dies down; and this, we must of course presume, is what he means when he represents the Fire as both kindling and extinguishing itself. Accordingly, in these phenomenal changes he sees no fluctuations of energy in the fundamental element, but, on the contrary, illustrations of punctual conformity to settled laws: in every igneous flow and ebb, as it appears to him, strict measure is observed.‡

Further, he makes it evident that he imagines the material whence the Cosmos derives its existence to be not only an essence of extreme tenuity, but even of a *psychic* nature. This, in fact, he plainly teaches, terming the First principle “the Evaporation,” and at the same time identifying it with Soul,§ a representation which implies that, in evolving psychic life it exhales its pure substance into material more remotely derived from its original self, and in which its proper attributes come into association with such as are comparatively ignoble. Such, apparently, is the force of the word *evaporation*, as Heraclitus used it. We may be sure it was not suggested by a belief that *aqueous* vapour was present in the original igneous and gaseous element; for he expressly taught that water is the death of the soul,|| and that the absence of moisture is indispensable to psychical perfection, and its excess, as in intoxica-

* He simply imagines a way downwards (ὄδος κάτω) and a way upwards (ὄδος ἄνω). Diog. Laert., ix. 8.

† Plutarch, De Ei apud Delphos, 8.

‡ Clem. Alex., Stromat., v. 599: “πῦρ αἰζῶον, ἀπτόμενον μέτρα καὶ ἀποσβεννόμενον μέτρα.”

§ Aristot., De Anim., i. 2, 19: “τὴν ἀρχὴν εἶναι φησι ψυχὴν, εἴπερ τὴν ἀναθυμῖσιν, ἐξ ἧς τὰλλα συνίστησιν· καὶ ἀσώματόν τε καὶ ῥέον αἶ.”

|| Philo, De Incorrupt. Mund., 21.

tion,* destructive to reason. But, as presupposing mobility in an all-pervading essence, it has an important significance; it suggests incessant movement and activity, the uncontrollable restlessness of a ubiquitous energy, in presence of which there is no possibility of an existing state, nowhere permission to enjoy one moment's absolute repose, and no condition can be named as that which *is*. The term, indeed, is one that science cannot recognise; and philosophy knows it no more, but it may remind us that the doctrine which adopted it gave prominence to the truth that all nature is, as it were, an ever-flowing stream, or, as we might represent it, a perpetually dissolving view. Heracleitus, however, in his philosophical contemplation of the changing scene, could not but discern more than can at any time be the object of sensuous perception; could not but perceive that Being must somehow underlie Becoming; Order, endless strife; and Harmony, the seeming coincidence of incompatibilities. Imagining an ever-living Fire, he was under the impression he had now discovered the object of his search; and this, regarded as containing potentially all those orderly developments and activities which, as he believed, constitute the universe, he named the Logos.†

But obviously the name, as thus applied, denotes no property or function which belongs to intellect; nor can it signify an individual subject to which intellect may be ascribed. Rather, it indicates a materialistic conception of the source of intellectual energy, an inability to perceive that the nature and attributes of Mind of necessity transcend the conditions of existence to which all such things are subject as have extension in space. In this point of view the Logos of Heracleitus claims attention as being a very ancient import into a species of philosophy not yet antiquated, but still held in considerable repute, whose cardinal doctrine has found memorable expression in the following words:—"Matter may be regarded as a form of thought; thought may be regarded as a property of matter. Each statement has a certain relative truth; but, with a view to the progress of science, the materialistic terminology is in every way to be preferred."‡ Here I am forcibly reminded of the cosmogony of Heracleitus,

* Fragm. apud Stobæum, Floril. 5, 120. Vid. Zeller, "Pre-Socratic Philosophy," vol. i., p. 81.

† Sextus adv. Mathemat., vii. 132. Vid. Heinze, "Die Lehre vom Logos," p. 9.

‡ Huxley, "Lay Sermons, Addresses, and Reviews," p. 160.

which I regard as a striking type of systematised materialism. To him the Logos represented no over-ruling Mind; it simply denoted material subject to certain dynamic tendencies, exhibiting Unity, Law, and Order. It signified, not intellect, properly speaking, but merely the fundamental principle of the intelligible. Thus conceived it was termed *common* (*κοινός*),* as being relative to common apprehension. By the Logos, Heraclitus appears to have meant the comprehensive *rationale* of all things; with this word, in effect, as a title he published that *account* of itself which, as he believed, the universe, considered simply as an object of investigation, renders to the enlightened and successful philosophical inquirer.

Passing on from this physical conception of the Logos we come to a system of philosophy in which materialism assumed a form still more pronounced, but in which, if for a moment we limit our view to the material universe, we shall not fail to perceive in one important respect, I venture to think, a further and unmistakable step in the direction of a truly scientific conception of the constitution of nature. I allude to the theory originated by Leucippus and elaborated by Democritus, which resolves all space-occupying bodies into ultimate atoms, and postulates a void wherein these may find room for the movements they must needs execute in effecting their manifold combinations. In the immense region of physical exploration these last-named theorists have distinguished themselves not a little as pioneers. Physics, however, are but a subject realm in the imperial domain of philosophy. If then, pursuing the course of investigation on which we have started, we look about for some advance in *philosophic* thought, our attention is now claimed by a doctrine which, so far as it differs as a philosophy from those which preceded it, will, although associated with a loosely speculative and utterly untenable physical theory, commend itself to all earnest thinkers, except such as prefer the materialistic to the spiritualistic terminology.

The Pythagoreans had been inculcating the doctrine that the First Principle, which they appear to have conceived as a cause at once material, formal, and efficient, is Number. In its fundamental conception this was their God. But the fundamental conception of Number is not reached until the

* Sextus adv. *Mathemat.*, vii. 133.

object of thought has become something absolutely unconditioned, save in respect to the conceivableness of repetition. In the perception of relativity in this solitary particular the Unit as such is recognised, and thereby is opened up a way for the intellectual representation of an unlimited diversity of arithmetical complications. Thus it will be evident that, in the process of philosophic analysis which these teachers adopted, the universe resolves itself ultimately into the emptiest of all conceivable abstractions. Upon this they had lighted in their laborious inquiry after a cause which should account for all things, and, believing they had found the object of their search, they had gone no farther afield. But in the philosophy of Anaxagoras, the lurid fog, in which conjectures both inanely metaphysical and grossly materialistic, as it were cold vapour charged with heavy clouds of smoke, had veiled in deep obscurity the Fundamental Cause, begins to roll away. A gleam of sunny, but still chilly, light is visible in the distinction he expressly draws between Mind and Matter, and, in his assumption, that the former gives the impetus from which proceeds all movement, and at the same time knows what it is doing.* His doctrine is, as will be seen, not that matter is a form of thought, or that out of it, in process of molecular development, degrees and kinds of psychic energy evolve themselves, and therefore were potentially inherent in it, but that it is essentially inert, that its inertia is overcome by something of a nature higher than its own, and that here is to be found the ultimate account of every indication of design, method, and arrangement which may be discovered in the universe. Accordingly, his Logos, although not like that of Heracleitus, undistinguishable from matter, virtually comprises the supposition that it exists. But seeing that the term, if comprehensively applied in strict conformity with the requirements of his speculations, would not have been sufficiently explicit for his purpose, he avails himself of another in naming the Psychic Essence, and one which brings out clearly into view the chief distinctive feature of his system: he calls it Nous (νοῦς), † that is, Mind or Intellect.

Now, *things*, considered as *significant*, thereby admit of being designated *words*. But if, in sober earnest and with philosophical intent, an *intellect* applies its own distinctive

* Aristot., De Anim., i. 2, 17.

† Plato, Cratylus, 400 A: "τὴν τῶν ἄλλων ἀπάντων φύσιν οὐ πιστεύεις Ἀναξαγόρῳ νοῦν τε καὶ ψυχὴν εἶναι τὴν διακοσμοῦσαν καὶ ἔχουσαν."

title to anything objective to itself, it proves indisputably that in that object it perceives a *person*. The conception of personality may even, it is true, in such a case be feeble and loosely formed, and it may be quickly crowded out by notions amid which it cannot find a place; but, respecting the thought which deliberately selected and appropriated the term, no doubt can be entertained. I therefore hold it idle to discuss the question whether the assumption, otherwise obviously reasonable, that the *Nous*, as conceived by Anaxagoras, denotes a personal Being, is warranted by the general tenor of his speculations. Physics, however, having engrossed his attention to the virtual exclusion of Ethics and the absorption of energies that might have been more usefully employed, his nascent theism remained undeveloped, and in the elaboration of a system of philosophy it availed him nothing. The region he essayed to cultivate he left, as he had found it, for the most part a desert. He had opened a mine without being aware of it; he had picked up and utilised a lump of precious ore, and, having unconsciously facilitated future explorations, had departed, to be followed, in due time, by seekers destined to prove somewhat more successful in extracting treasure from the vein of hidden wisdom.

Indeed, after no long interval; for in Greece a fruitful and ever-memorable development of the theistic conception soon began to manifest itself in philosophic thought. It received, however, its originating impulse, not from physical but from ethical investigations. Preceding inquirers, in so far as they experimented in metaphysical analysis, had, for want of due knowledge of the conditions of thought, unwittingly constructed, for the bewilderment of themselves and of succeeding thinkers, labyrinths out of the terms they used, chiefly such words as represented elementary conceptions; they had failed to see their way to recognise philosophically both being and becoming, and had lost their road amid such antitheses as rest and motion. In these wearisome mazes some minds wandered idly, aimlessly, and without seeking to escape; and here, moreover, charlatans professing the dialectical art exhibited their ingenuity in bringing to confusion earnest efforts to arrive at truth. The aim of Socrates was thoroughly honest, intensely earnest, and profoundly practical. That he himself and his hearers might be sufficiently enlightened to perceive, and effectually moved by the desire to become, what it was, in the nature of things, fitting they should be,—this was the worthy object, this was the noble ideal which gave consistency, authority, and force to his words and to his actions. Hence,

not only had he at command, for the exposure of puzzle-headed sophistry, the resources of a clear and imperial intellect, but philosophy, to the extent to which it thenceforth bore the impress of his mind, was characterised by a splendour and a sublimity such as it had never manifested before.

Upon the specific characteristics of the philosophy of his illustrious disciple, Plato, I need not dwell: it may suffice if I call attention to the significance of his conception of an original and eternal Being, whose attributes he sums up in the designation "the Good," and in whose existence he finds an ultimate ground and unifying principle for those ideas which constitute the intelligible, and for their manifestations under the conditions of space and time. He thereby furnishes a weighty testimony to the immense superiority of the *ethical* method of carrying an investigation up to the Fundamental Cause. Yet it must not be overlooked that the epithet he thus applies does but reflect the notion he himself had formed of goodness,—a notion which had been, doubtless, in a measure stunted and distorted in the process of development by conventional maxims, and had not been determined by adequately expanded views of moral obligation and a proportionably deep sense of the need of inward purity, and which, therefore, left much to be desired. To what extent it may, in the range of indeterminate desire and aspiration, have transcended the ethical teaching on which it sheds a lustre cannot be known; but beyond that limit it offers to the grasp of thought, and as the characteristic of a philosophy, nothing but shadow.

Further, it must be remarked that ideas and metaphysical conceits can never satisfy the demands of the rigorously inquisitive searcher after causes. But Plato has nothing better to offer, his inventive intellect having played him the common trick of forcing him to take unwittingly the subjective for the objective, a species of dialectical legerdemain which has often proved successful, but cannot in the end, when scrutinised attentively, and with due knowledge of the laws of thought, escape detection. But while to Ideas he ascribes reality, this his philosophy forbids him to concede to the vehicle of their sensible manifestation, which, as he conceives it, is ever becoming, never is. The intellect, however, of his pre-eminently famous pupil could not be satisfied without some definite conception of a really existent, although passively concurrent, *material* cause for all things of which the senses take account. Aristotle, accordingly, assumed the existence of something which he

designated ὕλη. In this nondescript stuff or substratum the several specific things which are to arise out of it exist in the way of δύναμις, that is potentially, until their respective εἶδη, namely, their constitutive principles, which in themselves are purely intelligible forms, develop actual forms (μορφαί); and then, to the extent to which this change or movement has proceeded, they exist in the way of ἐνέργεια; that is to say, they have an effectual existence; and, in so far as anything has passed from the stage of the potential, which was one of privation (στέρησις), to that of the actual, the change which has taken place is its ἐντελέχεια. For thus it has its due completion (τὸ ἐντελέε), it has attained the end (τὸ τέλος) with a view to which it was designed. The originating intellect (νοῦς), which has determined the τέλος, and whose purpose, therefore, is the Final Cause, finds its sphere of operation in the formative process alone: it is not the author of the material in which it works.

Now this intellectual system, which, as we perceive, has been ingrafted on a defective theism, is without doubt ingeniously elaborate, its most conspicuous feature being a terminology which, like that of legal documents, shows a mind habituated to punctilious exactness in specification. Yet, after all, it does but represent a certain way of looking upon the phenomena of nature; it is the profound analysis of a superficial speculation; it accounts for nothing. And for a still more cogent reason it cannot be accepted, for it is committed to an assumption void of meaning. Manifestations which presuppose *space* are to be accounted for. If, then, it is to be assumed that suitable material exists, this must needs be conceived as *occupying* space; otherwise, the assumption is plainly gratuitous; the supposed material possesses no relevant property, and is in effect undistinguishable from the essence of the purely intelligible forms. But has it *limits* in space? The answer is, and of course must be, in the negative; otherwise, it contradicts the assertion that the material is absolutely formless. Again, if we propose to consider by what contrivance a boundless space-occupying medium may be so disintegrated as to allow mobility within itself, or how, even on the supposition that movement is possible, the system happens to have been so constituted as to prove available for the production of all natural phenomena,—a definition which, virtually excluding from the thing defined all indications of design, precludes the discussion, moves, in fact, the previous question; and then we learn that we are asked to yield assent to the unthinkable hypothesis that there is a kind of

substance which has no attributes whatever, something for which, whether we look below, within, or above ourselves, boundless possibilities can find no place.

Such, however, is the strictly logical representation of a hypothesis which obtained a secure and a very conspicuous position in that species of theistic philosophy which comprehends in an eternal duality the antithetical principles, Mind and Matter. The object I have in view requires that I should direct attention to this hypothesis only in so far as its association with the word Logos may help us to determine the philosophic import of the latter. Of all the schools of thought which arose under the spreading influence of outgrowths from Socratic teaching, or in which older philosophies, Socratically modified, made their appearance, the most pronounced in its ostensible repudiation of pure materialism is that which was founded by Zeno, of Citium, whose disciples, from the fact that they recalled to the public mind the porch in which he used to lecture, came to be known as Stoics. Unlike his earlier namesake, Zeno, of Elea, he seems to have had a profoundly earnest, practical aim, and, as was natural, the philosophy which took its rise from his teaching shaped itself into a rigidly-exacting ethical system. It was, in one point of view, antipodal to materialism; for its dominant ethical principle was contemptuous indifference to the conditions to which the experiences and operations of the spiritual element in man are subjected by its sensible environment. Man, as connatural with that Being who pervades and governs all things, was assumed to have within himself a sufficiency that may be found in acquiescent submission to the laws which his reason, duly exercised, acknowledges, and in apathetic inattention to all solicitations of opposing appetite, and all counsels of dissuasive fear. Now, I venture to think we shall be doing no injustice to the virtues of such Stoics as Epictetus if we take for granted, as assuredly we must, that the sort of apathy affected by the members of this school was, in its relation to life's busy cares and pleasures, a flattering ideal, much more largely productive of elevated moral precepts and choice aphorisms, and a transparently self-conscious dignity of deportment, than of "truth in the inward parts," or even of veritable illustrations of sublime indifference to surroundings. But what it immediately concerns me to remark is this, that a philosophy which referred the weary seeker after inward rest and peace to resources assumed to be discoverable in himself, and which thus, to all practical intents and purposes, assured him that he was potentially a god, allowed no place whatever for a worthy conception of the Almighty and Eternal Being.

Hence the inability of the Stoics to liberate effectually their theistic views from the traditional dualistic conception of origination, is sufficiently accounted for; it was congenial with the spirit of their religious teaching to continue to posit as first principles, Mind and Matter; the one the active and formative, the other the passive and receptive. And, by an admission they are constrained to make, still more evident is it rendered that the Logos, as it appears in their cosmogony, has not yet acquired that thoroughly comprehensive and absolute significance which could not be wanting if the application of the term were truly philosophical. The best reply they can make, when challenged to reconcile the existence of seeming blemishes and anomalies in the sensible world with the supremacy of perfect Reason, is the following unmistakably materialistic apology: "The artificer cannot change the nature of the material."* To urge this plea is virtually to admit that the so-called Logos alone does not fully account for all phenomena.

Further tendencies in the direction of materialism likewise find their interpretation in that ethical kind of egoism which constitutes the distinctive feature of the Stoic philosophy. A so-called God, who, regarded as a sovereign, was practically synonymous with Fate and universal Law in operation, and whose love, like that of Spinoza's deity, was neither looked for nor desired, lacked those attributes which, from a practical point of view, may be considered indispensable to *personality*. Thus, the conception of such a being would naturally tend towards pantheism, and might easily degenerate into notions in which materialism would be developed and pronounced. In point of fact, a distinctly materialistic pantheism may be discovered at a glance, through the transparent language of the Stoics. The Deity, as conceived by Zeno, is Ether; that is to say, a kind of Fire which, reaching upwards and outwards in all directions beyond all bounds, is "circumfused from every quarter, girding and encompassing the universe." † Thus is the teacher's thought expounded by his disciple Cleanthes, who further says that "the world itself is God." ‡ In strict conformity with this notion, human souls were represented as being parts (*μέρη*) of the divine essence, and portions torn off from it (*ἀποσπάσματα*). § The term *body* (*σῶμα*) was applied indifferently to the formative power in nature and to the passive material, || and it was assumed that,

* Seneca, De Provid., 5, 9: "Non potest artifex mutare materiam."

† Cicero, De Nat. Deor., i. 14.

‡ *Ibid.*

§ Epictet., Diss., i. 14, 6; and M. Aurel., ii. 4.

|| Sext. Pyrrh., iii. 33.

as "that which makes will come up close to something," namely, some material to which it is to give form, "it carries on its operations also by contact."* Body, in short, whether the term denoted the substance of the sensible world or that of its imagined soul, was understood to imply extension in space; and nothing was conceived as having real existence but such essence or material as admits of having its mode of existence in some way defined by the help of some mental picture.

But in the days when Stoic doctrine was still among the most potent of moral forces in the world of advancing thought and progressive culture, a new departure in the conception of the Logos gave a fresh stimulus to philosophic speculation. In the course of the first century of the Christian era certain notions which had been generated in the commerce that took place between Hebraic and Hellenic thought attained an exuberant development in the writings of an Alexandrian Jew of large gifts and liberal culture. A devout upholder of the authority of the oracular utterances of Moses and the Prophets, but a Greek in intellectual ethos and training, Philo sought to harmonise with his philosophic views the interpretation of those sacred Scriptures which he sincerely revered. The outcome of his efforts, however, it is no disparagement of his dialectical skill to compare to a mixture of oil and water. There was no possibility that intellectual energy and enthusiasm, together with eloquent facility in the use of a copious vocabulary, might render the product of an undertaking such as this either durable, or, indeed, profoundly lucid. He had hoped to produce a homogeneous whole, but he had attempted to combine incompatibilities; and therefore it was not to be expected that Philonism, if we may give his philosophy that name, would be a consistent and intelligible system, or would, otherwise than in his writings, long survive the mental operation by which it had been elaborated. But the majestic rank it has assigned to the Logos, and the significance of the attributes it has associated under this designation, constitute for its leading principles a claim to careful investigation.

Of the manifold effects of that bias which Philo's mind received from the fascinating study of the Greek philosophies, the most radically important in relation to his own was the deeply-rooted conception of an unoriginated substratum for all sensible existence,—a material devoid of quality and form. It is true, he in one place represents the Almighty as

* *Simplic. Scholia on Aristot. Categ. O, B, vid. Heinze, p. 88.*

being not only an Operative (*δημιουργός*), but also a Creator (*κτίστης*);* but it is easy to understand, in accordance with the tenor of his doctrine, that what he has in view is the creation, not of the *material*, but of the *form*. It would be gratuitous, therefore, to assume that here he contradicts himself. His deepest sense of what was right and fitting forbade him to conceive that, in the process of creation, God, who ranks alone in intellect and blessedness, had even *touched* the rude and confused material;† and therefore he dogmatically assumes the mediate operation of incorporeal powers.‡ For these a mind impregnated with Platonic notions was, of course, at no loss for a name: he called them *ideas*. Being Platonically conceived as having a subsistence independent of their contact with matter, they are not identical with the *λόγοι ἔνυλοι* of Aristotle,§ which were, in fact, but physical properties, considered as accounting for phenomena. He does, however, name them *λόγοι* as well as *ιδέαι*, and in their intermediate agency he finds, in his allegorical application of Scripture history, an interpretation of the angelic apparitions therein recorded. The atmosphere, however, in his imagination, contains and actually nourishes innumerable unseen beings of a psychic nature,|| some of whom may on occasions manifest themselves to mortals in dreams or visions. The materialistic tendency which in this product of his lucubrations glaringly betrays itself, crops out, moreover, in the casual utterance of a distinctly pantheistic thought no less at variance with his ordinary language; for he represents the Almighty as being Himself One and the Universe.¶ The fact is, vagueness and confusion were the inevitable result of his attempt to utilise Plato and the Stoics as expositors of Holy Scripture; and accordingly, as might have been expected, his speculations as regards the nature of the *λόγοι* vacillate between personal agents and forms of thought conceived as hypostatically real and objectively operative.

But it is not only in speculations which play fast and loose with archetypal ideas, and even virtually materialise them, that Philonism shows itself to have seceded from the fundamental principle of Platonism; its most striking distinctive

* De Somn., i. 13.

† De Victim. offer. 13: "ὁ γὰρ ἦν θίμις ἀπίρου καὶ πεφυρμένης ἕλης ψάσειν τὸν ἴδιμονα καὶ μακάριον, ἀλλὰ τοῖς ἀσωμάτοις δυνάμειν," κ. τ. λ.

‡ *Ibid.*

§ De Anim., i. 1, 15. The *λόγοι σπερματικοί* of the Stoics are virtually the same dialectical abstractions, but regarded as productive energies, and at the same time as indicative of design.

|| De Somn., i. 22.

¶ Leg. Alleg. i. 14: "εἷς (sc. ὁ θεός) καὶ τὸ πᾶν αὐτὸς ὤν."

feature is a peculiarity which remains to be noticed. We find the λόγοι subordinated to One who bears this title, and who, although himself subordinate to the Supreme Being, holds towards them the relation of Father,* their existence and functions being in some way, vaguely indicated rather than scientifically defined, derived from and summed up in His. Their occupation is to minister to the souls of mortals who still suffer defilement from contact with the gross material of their bodies, and thus to promote their purification;† it is the privilege of those who have reached the highest degree of purification to hold immediate intercourse with Him. Naturally the intervention of a superior medium of illumination renders the presence of inferior media superfluous; therefore, when the Logos rises upon the mind, the light which shines from his angelic agents sets.‡ These, the several ideas, are of course manifold and partial: He is the Idea of the ideas,§ the archetypal Model, the archetypal Seal,|| of which the visible Cosmos is the impress, and is thus Himself the purely intelligible Cosmos.¶ But an expressed idea may be contemplated simply as an idea, or as finding its expression: Philo, accordingly, recognises the Stoic distinction between the λόγος ἐνδιάθετος and the λόγος προφορικός, namely the word implied in the indwelling thought and the word conceived as having its place in the vehicle of utterance, comparing the former to a spring, the latter to a stream.** Such then, briefly, is his conception of an ultimate Logos which is to account for all existent things inferior to itself, apart from nondescript material.

Fertilised, however, by the study of the Scriptures and of expository lore, it grew apace and spread out into speculations more luxuriantly fanciful than philosophically compact. Very remarkable, therefore, are the coincidences that may be observed in respect to certain titles and functions of the Logos between Philonism and a philosophy of which it knew nothing, but in which alone is to be found the true Wisdom. In the former the Logos appears as the Firstborn †† and the Image of God, ††† the Image after which man was created. §§

* De Somn., ii. 28: "πατήρ λόγων ἱερῶν." † De Somn., i. 12.

‡ De Somn., i. 13.

§ De Migr. Ab., 18.

|| De Opif. Mund., 6.

¶ De Opif. Mund., 4; and De Somn., i. 32: the Logos is the κόσμος νοητός.

** De Migr. Abr., 13.

†† De Confus. Ling., 28.

††† De Monarch., ii. 5; and De Opif. Mund., 8.

§§ Quis Rer. div. hæc., 48; and De Opif. Mund., 6.

Imitating the ways of his Father, he formed such and such species, looking to his archetypal patterns.* His titles include also Mediator,† Advocate,‡ and High Priest;§ and he is ever the Suppliant|| to the Immortal on behalf of the mortal creation, the Ruler's Ambassador to the subject people. Such is the language of a thinker who was evidently very much in earnest, but quite unconscious of the real import of those words and phrases in which he was anticipating a revelation of truths that were far beyond the range of his speculations. If it be accounted prophetic, and I see no reason why it should not, it may remind us of the saying of a certain high priest who, in expressing his opinion that it was expedient that one man should die for the people, uttered, as we are well assured, a prophecy,¶ but unquestionably was far from being aware of the true drift and bearing of his words. That Philo, however strikingly his language may have touched the truth at certain points, knew not what he was saying, is made apparent by a passage in which, after representing the Divine Word as delighting in and priding himself upon the work of mediation which has been assigned to him, he puts into his mouth the following remarkable words:** "And I stood between the Lord and you, being neither unoriginated as God, nor yet originated as you are, but midway between the two extremes, as hostage to both; to the Progenitor, for security that the race shall never wholly fall away and revolt, having chosen disorder instead of order; to the offspring, for a warranty of hope that the merciful God will never overlook his own work. For I am about to proclaim the conditions of peace from God, who has decreed to put an end to wars, being ever the guardian of peace."

In this philosophy the Mediator finds his place and occupation in a chasm over which no human mind can pass; and thus, although his functions render possible communication between God and man, his person separates the one from the other, and cannot properly be designated by either title. He is not God and man, he is neither God nor man. The truth is, the Philonic Logos is the personification, or quasi personification, of the sum-total of the purely intelligible under a

* De Confus. Ling., 14. Compare John v. 19.

† Quæst. in Ex., ii. 68: "Dei Verbum . . . mediator," etc.

‡ De Vit. Mos., iii. 14: παράκλητος.

§ De Gigant., 11: ἀρχιερεύς.

|| Quis Rer. div. hæ., 42: ἰκέτης.

¶ John xi. 49-52.

** Quis Rer. div. hæ., 42.

limited aspect. In it the conception of a universe conditioned by time and space is converted into an objectively real idea, and then credited with a certain ministerial and subordinate power of expressing itself in pre-existent material. Its farthest confine is a limit beyond which nothing can be known, except that something exists which admits of no intellectual representation. Excluding from the conception of the Deity everything but being, Philo affirms that God, namely, *That which is*, considered as being, is not to be reckoned among the things which have *relation to something*,* and even goes so far as expressly to deny that He has any *quality*.† Thus, as in that conception of matter which he had adopted from earlier speculations, he shows himself unaware that the separation of substance and attribute can only have place in the way of logical distinction; and, indeed, he lays himself open to the charge of inconsistency in characterising the Almighty as good, wise, and so forth. This error, however, determined his conception of the Logos, whom, accordingly, he regards as an inferior being, qualified by limitations and conditions to hold relations with the finite and changeable; in some sense God, it is true, yet not essentially one with the Father, but a *second God*.‡ In short, his philosophy betrays, —although it thereby shows a sort of hesitating feebleness in its inevitable collision with his religious ethos,—a tendency to Agnosticism.

But while philosophers still found absorbing occupation in the task of intellectual world-production, and for the needful agencies and material went on drawing *ad libitum* from the copiously supplied store of intellectual abstractions, a few unlettered men, predestined to take the lead in introducing a novel culture of the highest kind for both head and heart, were, as the event has proved, more profitably employed. One among them Who, by His words and deeds, had acquired dominion over their spirits, and Whom they followed as disciples in wondering awe, was directing their aspirations to eternal life and glory by teaching them to humble and deny themselves. His bearing was that of a King of men; but, as a subject, He ministered and served. At length His patient endurance of an excruciating death, followed by an astonishing revival, and not long afterwards by a marvellous disappearance of unmistakable significance, having completely

* De Mutat. Nom., 4 : "τὸ γὰρ ὄν ἢ ὄν ἐστὶν οὐχὶ τῶν πρὸς τι."

† Leg. Alleg., i. 13 and 15.

‡ Quæst. in Gen., ii. 62.

opened the eyes of His faithful adherents to the meaning of His transient apparition in this visible world, they became fully conscious that the life they now realised in their magnificent hopes,—a life incomparably more exalted than that of flesh and blood,—had been imparted to them by the self-sacrificing Love which had revealed itself through Him, and was the fundamental principle of His unique authority over all flesh. Had they not, then, sufficing reason for the belief that they owed to it also their lower and provisional life,—that, in short, this same self-sacrificing Love is the Author of life in its several grades and stages, and of the manifold conditions of its manifestation,—is the Energy whereby the universe was originated, and has been, and ever will be, governed and preserved? This was their firm belief; and, as will easily appear, if the facts which warrant it are once admitted, they reached it by a route much more direct than any upon which philosophers had ever lighted in their endeavours to arrive at stable conclusions: it was involved in their intuition of the essential attributes of Him in whom they perceived the Life; they came to it, or rather it came to them, by *revelation*.

A revelation, however, which, as this did, quickly spreads, and a spiritual power which brings beneath its sway, as time goes on, innumerable varieties of intellect and culture, must soon invade the realms of philosophic thought, and there effect at length a world-wide *revolution*. Near the end of the first century, if not before, the inevitable invasion commenced, and its progress from that time to this has been a continued illustration of the well-known Scripture saying, "The foolishness of God is wiser than men, and the weakness of God is stronger than men" (1 Cor. i. 25, R.V.). In the appointment of a visible leader of the expedition the Divine choice fell upon a man who had been prepared for the task by no dialectical training and no literary culture: his special qualification was the *soul* of a philosopher, but this he possessed in a superlative degree. In the original band of select disciples there was one whose habit and tone of mind were such as rendered him, above the rest, susceptible of sympathetic touch with the unfathomable thoughts and boundless purposes of the mysterious Teacher; in which respect, perhaps, though not in others, he may be likened to the Apostle who was "born out of due time." For the specific work in question, however, the chosen instrument was the disciple whom Jesus loved, the Apostle John, in whose writings we find statements virtually challenging for

the doctrine they propound a comparison with all *speculative* efforts to discover first principles, and implicitly asserting that it is the true Philosophy.

In his visits to Ephesus, where he must have had opportunities of conversing with philosophers, both Hellenic and Hellenistic, including probably not a few Alexandrian Jews, St. John could not have failed to become familiar with the term Logos in its philosophic application. With a thorough grasp of its significance, and, may we not also say? with some presentiment of the immeasurably important consequences of its evangelical appropriation, he took, so to speak, possession of it for the service of that Truth which he had been commissioned to proclaim, and to which it rightfully belonged. Thus, then, we may imagine him to be speaking, as the bearer of a message to the multitude of wandering seekers after Truth, "That which, in your search for an intelligible originating principle, you fancy in your ignorance you have discovered, that which under this impression you have named the Logos, that Being whom you have long been groping after in the dark, Him declare I unto you."

The Logos having been reclaimed from fruitless speculations and installed in its proper place, the exposition of the term distinctly meets each of the four queries which ætiological inquiry had devised in formulating its demands. For if it be asked what are respectively the efficient, formal, material, and final causes of all things conditioned by time or space, St. John replies, "In the beginning was the Logos, and the Logos was with God, and the Logos was God. The same was in the beginning with God. All things had their origin through Him, and apart from Him not even one thing originated that has had an origin" (John i. 1-3*). And St. Paul, who, if the term Logos had found a place in his philosophy, would, it is evident, have made it the subject of similar predicates, virtually amplifies and completes the answer in the words, "In Him was the universe created, namely, the things in the heavens, and the things upon the earth, the visible and the invisible, whether thrones, whether dominions, whether principalities, whether authorities, through Him, and with a view to Him, the universe has been created, and He Himself is before all, and in Him the universe subsists" (Coloss. i. 16, 17*). In these philosophically-worded

* I have given, as I believe, a close and exact translation of these passages, but have substituted philosophically significant equivalents for certain words which appear in the A.V.

expositions of the only cosmogony that is entitled to be called profound, the Cosmos, now at length ascribed to the true Logos, is in all respects accounted for. It is the *effect* of His eternal power and divinity. Its *form* is the unfolding of His mind. Its *material* is equally His creation, for until creative energy began to operate through Him nothing was in existence but the Godhead. Lastly, the *purpose* for which it exists is the endless revelation of the glory that was latent in His ineffable goodness and grace. Therefore, as will now be seen, the revealed Logos, assumed to be the last word that may be hoped for by the ætiological inquirer, leaves nothing unaccounted for, save that for which, it is evident, no cause can ever be assigned, namely, the existence of the One Cause that had no beginning, the Being Who is because He is.

In the course of this historical sketch I have found occasion to draw attention to the comparative value of the *ethical* method of getting at a conception of the First Cause: what we have now under contemplation is such an illustration of the superiority of this method as, I may be permitted to say, leaves nothing to be desired. You will see, therefore, what I mean when I ask you to observe the philosophic import of the statement that "the Logos became flesh" (John i. 14: "ὁ λόγος σὰρξ ἐγένετο"). It is assumed that a type of character, whose nature and property, as manifested in the life of an individual Man, is to sacrifice self in well-doing, has been from everlasting, and that, through the operation of a power inherent in it, all origination and movement are effected. The philosophy which the revelation of the Logos teaches we truly understand when our hearts confess the immediate influence of this fundamental and all-sufficing Power, the primal and indissoluble Life. In life-giving, hope-inspiring, regenerative experiences is made known the true secret of that authority to which unconscious nature yields a never-wavering obedience, and which, as time goes on, is overthrowing and demolishing those baseless speculations wherein Creator and creation are confounded, and is absorbing, slowly indeed, but surely, every realm of thought into the Kingdom which shall have no end.

The PRESIDENT (Sir G. G. Stokes, Bart., M.P.).—I am sure all will join in thanking Mr Clarke for his interesting paper (cheers). It is now open for any one to offer remarks thereon.

Mr. R. NIVEN.—May I ask for information (I am not wishing to take a hostile view) on what grounds you would justify the reassuring statement which occurs in the last sentence of the lecture, “the true secret of that authority to which unconscious nature yields a never-wavering obedience, and which, as time goes on, is overthrowing and demolishing those baseless speculations wherein Creator and creation are confounded, and is absorbing, slowly indeed, but surely, every realm of thought into the kingdom which shall have no end”? Does not that, in view of the state of modern thought, whatever it is called, or modern science, seem rather at variance with the actual fact?

The AUTHOR.—I admit, of course, that in the progress of that absorption there are fluctuations,—the progress is not steady; yet still I cannot myself but believe that the process of absorption is going on,—that fundamental Christian principles are gradually transforming scientific conception.

Mr. NIVEN.—Does not it rather seem as if Christian apologists, as I suppose they would still be called, have been obliged, in view of recent supposed discoveries, to form new theories, and theories that would not have been held by old Christian authorities, to govern supposed new facts, and that you can hardly say, that being the state of things, that the Christian position is actually at this moment (whatever it may do ultimately) absorbing these new schools?

The AUTHOR.—By the Christian conception I mean the fundamental Christian conception; but it seems to me to be embodied in the word “Logos.” Of course, so long as philosophy is infected by materialism, there remains something which still has to be transformed into the Christian conception; but I believe myself that the Logos (that is to say, the true conception of the first principle of all things) is so transforming scientific conception that in the end materialism will be abandoned,—it will be a thing of the past. I think that change has gone on to some extent already in this country and in Germany, where, I think, the spiritual view of origination is powerful.

Mr. NIVEN.—I suppose you admit that the great representatives of scientific thought, or at least three of the greatest representatives, have been Darwin, Tyndall, and Huxley. Would you kindly show me in what degree this conception has transformed or even affected their conception?

The AUTHOR.—I admit that it has not produced any sensible effect upon their conception. No doubt there are scientific men who call themselves agnostics, and who do not, perhaps, hesitate to admit that they are materialists, or adopt materialistic language. That I admit; but I think there is not in it so much of what is called scientific thought as there is philosophic thought.

Mr. NIVEN.—I thought you implied rather the reverse.

The AUTHOR.—I believe Christian thought will transform philosophic thought and render it fundamentally Christian in the end; but the process is going on slowly.

Mr. P. V. SMITH, LL.M.—Whatever opinion we may have of the justice or correctness, or immediate relation of the prophecy with which the writer has concluded the paper, we must all feel grateful to him for the very able and interesting way in which he has traced the difficulty of the idea of the Logos and the ultimate completion of a system of Christian philosophy given us by the writings of St. John. He has alluded to the two distinct meanings of the word Logos in the original Greek, which are expressed by the epithets *ἐνδιάθετος* and *προφορικός*; the former meaning corresponding to our word *reason* or *intellect*, and the latter to *speech* or *utterance*. Now, it is quite clear that those two meanings are, to a certain extent, distinct. On the other hand, they are naturally combined, and are almost necessarily united in some way or other in thought. I think that natural and necessary union is shown by the mere circumstance that in so clear and precise a language as Greek the same word is used with both meanings. At the same time, however, I think on the whole we must come to the conclusion that in philosophic thought the word is very rarely, if ever, used in both senses in an equal degree or intended to express both meanings together, or, at any rate, in the same proportion, and I think we shall see from a study of Greek philosophy (and this paper has shown it) that the Greek philosophers formed their conception of Logos almost entirely in connexion with the former meaning—viz., the meaning of *intelligence* or *reason*, and that they did not regard it as involving the idea of utterance, or the revelation of the Divine Being. On the other hand, amongst the Jewish writers we find this latter idea prevailing to the exclusion of the former. “By the word of Jehovah” (lxx., τῷ λόγῳ τοῦ κυρίου), says the Psalmist, “were the heavens made, and all the host of them by the breath of his mouth”; and again, in the eighteenth chapter of the Book of

Wisdom, v. 15, there are these remarkable words : “Thine Almighty Word (*ὁ παντοδυναμὸς σου λόγος*) leaped down from Heaven out of Thy royal throne as a fierce man-of-war” (*πολεμιστῆς*). It is clear in both passages that the Logos is depicted as the exponent of the will of God. We find the same idea in the Targums, in which the Word (Heb. *Memra*) of God frequently stands almost for God Himself. It is said that “the Lord protected Noah by His Word when he entered the Ark”; that He made a covenant between Abraham and his Word”; that at Bethel, Jacob made a covenant “that the Word of the Lord should be his God”; and that Moses, at Sinai, “brought forth the people to meet the Word of God.” In the passage from the Psalms which I have quoted, there is clearly no impersonation of the word, and in the passage from Wisdom the language is probably to be taken as metaphorical, and not implying a personal Logos. Opinions, however, may vary as to this, as they may on the question whether wisdom, in Prov. i. and ix. and the *λόγος* in Heb. iv. 12, are intended to be personal or impersonal. The same doubt arises as to the Logos of Philo Judæus; but it is perfectly clear, when we come to his writings, that the Logos is now invested with the two meanings of Intelligence and Utterance. His Logos is, at the same time, an embodiment of Wisdom and Reason, and also an exponent of the will and power of God. The Jewish and Greek ideas are, in short, found united in him; but it was reserved for the inspired Christian writers to set forth the complete fusion of these two meanings in the only way in which such fusion was logically possible,—namely, by asserting the Logos to be an inherent portion or person of the Deity.

Mr. NIVEN.—I should like to make a few remarks in regard to some of the suggestions which the author of the paper has considered, which, if they should lead him in any instance to make a correction, may, I think, be of service. It seems to me, if I may say so, that one of the defects in the paper is this,—that it is couched too much in the words of an honest Christian advocate, who, from his point of view, really is hardly in a position to do justice to those ancient schools of thought; and if it would not occupy too much time, I would like just to refer to a few points, which it appears to me he has either not completely seen, or which, having seen, he has not done full justice to. The first remark I will make refers to page 255. I do not think that he does complete justice to Anaxagoras when he repre-

sents him as abandoning the moral line of reasoning which he introduced for the physical, and that in this he lost the opportunity of doing the good which he might have done by following up the ethical line of teaching. The author says:—"I, therefore, hold it idle to discuss the question whether the assumption, otherwise obviously reasonable, that the *Nous*, as conceived by Anaxagoras, denotes a personal being, is warranted by the general tenor of his speculations. Physics, however, having engrossed his attention to the virtual exclusion of ethics, and the absorption of energies that might have been more usefully employed, his nascent Theism remained undeveloped, and in the elaboration of a system of philosophy it availed him nothing. The region he essayed to cultivate he left, as he had found it, for the most part a desert." It is very remarkable that we can put our finger on a statement of Plutarch's that the celebrated statesman, Pericles, owed a great deal of his influence over the people to his acquaintance with and study of Anaxagoras. Plutarch distinctly states that he meditated on the teaching of Anaxagoras on the absolute reason, and that in that way he was able to bring his ideas before the people with such impressiveness and dignity in speaking that he was said to lighten and thunder like Jupiter. It, therefore, had its influence on this great statesman, and, through him, on the people, this philosophy of Anaxagoras, which, according to the author of the paper, was so fruitless of practical results. Then, at the foot of the same page, the author says, "The aim of Socrates was thoroughly honest, intensely earnest, and profoundly practical." I am glad to see that he does something like justice to Socrates. I think Carlyle, in dealing with Socrates, does not quite do him justice. He does not blame Socrates, but he seems to think that he did harm by attempting to break down old religious notions; but he could not avoid such a result. A man such as he was, when he spoke at all, must speak according to his own view, and I think the author, in what he has said of Socrates, has done him no more than justice. Speaking of Plato, he says, at p. 256, "He thereby furnishes a weighty testimony to the immense superiority of the *ethical* method of carrying an investigation up to the fundamental cause. Yet it must not be overlooked that the epithet he thus applies does but reflect the notion he himself had formed of goodness." Of course no one can apply that epithet, "the good," except in such a way as would but reflect the notion he himself had formed of

goodness. All a man can be expected to do is to be well in advance of, or in harmony with, the best ideas of his day. Plato had not got to the stand-point of people who consider the interests of the lower animals or slaves. That, of course, he was defective in; but I do not think that he is to be blamed for that; and I want to point out that his idea of goodness was really, to a very great extent, nearly the same as our own, and surely, to a great extent, the same as that of Christianity. The author explains that philosophers prior to Plato had all been explaining the origin of the universe on physical grounds. He himself says, "Let us declare the cause which led the Supreme Ordainer to produce and compose the universe. He was good; and He who is good has no kind of envy. Exempt from envy, He wished that all things should be as much as possible like Himself." That is surely a central attribute of the Divine Being—goodness. I think the words of the author, on page 256, admit of some modification: "Aristotle, accordingly, assumed the existence of something which he designated *ὕλη*." But surely the author does not seek to distinguish Aristotle from Plato on that ground, for they both assumed that. One point the author omitted, I think, as regards Plato and Aristotle, is, that they both regarded matter as eternal; even Milton did this. I will pass over all I could say, for it would take me far too long to express my opinions on those matters in which I agree with the author in his admirable paper. I will next speak of the Stoics, to whom I think the author of the paper has not done justice. No doubt there was a great deal of, I will not say false profession, among the Stoics, but a great deal of inconsistency among them, as the author will admit there is among Christians and all religionists; but I think that the remark he makes towards the close of page 258 is too sweeping, viz.:—"Now, I venture to think we shall be doing no injustice to the virtues of such Stoics as Epictetus, if we take for granted, as assuredly we must, that the sort of apathy affected by the members of this school was, in its relation to life's busy cares and pleasures, a flattering ideal, much more largely productive of elevated moral precepts and choice aphorisms, and a transparently self-conscious dignity of deportment, than of 'truth in the inward parts,' or even of veritable illustrations of sublime indifference to surroundings." I maintain that Stoic philosophy is not fairly represented by Milton, it having produced some of the greatest men we have had on the face of

the earth. I say, too, not that Stoicism is equal to Christianity, but in some respects superior to some Christian types of character. The Christian can look forward, and does look forward, of course, if he is, in the true sense of the word, a Christian, to beatification, when he shall see God and shall have commune with Him in perfect bliss. He is certain of a hereafter. I do not say that the *true* Christian is influenced by the desire of the attainment of any pleasure, however refined it may be. The best Christians, even humble people, have got into a much higher stage than that; but I say the prospect of future happiness is contained in the Christian conception, and I say it seems to me a higher revelation of the Divine nature in a man which enables him to say, like the Stoic Epictetus, "What can I, a poor lame old man, do but sing praises to God?"—looking to no future whatever,—to no such future as the Christian would; it seems to me to resemble the attitude taken by the author of the Book of Job, and that is about the highest conception of the moral position which is attainable by the human mind,—boundless submission to God for his own sake, without any reference to any sort of enjoyment, physical, moral, or spiritual. I do hope, if he can, that the author will reconsider what he says on the Stoics; I am greatly indebted to them myself, and if he can see his way to modify his statement about them, I shall be glad. The next point to which I will refer is half-way down page 259, where the author says, "A so-called God, who, regarded as a Sovereign, was practically synonymous with Fate and universal Law in operation, and whose love, like that of Spinoza's deity, was neither looked for nor desired, lacked those attributes which, from a practical point of view, may be considered indispensable to *personality*." I should like to say that I had the same opinion, until within the last year and a half, of Spinoza, and of what he says of the attitude of a "true lover of God towards God," as the author has; but I believe now that Dr. Caird was correct in saying, "I think Spinoza was not rightly understood," and I do not know that he was rightly understood even by Goethe, when he considered that Spinoza's "lover of God" did not really wish for love from God. I do not wish to go into that, but simply to invite the author, before he publishes this, to reconsider what he says on the subject of Spinoza.

The AUTHOR.—First of all in reference to the remarks which fell from the last speaker but one, I may say that in treating

the meaning of the Logos I limited myself to an exposition of the *philosophical* import of the word. Of course I could not, having imposed that limitation on myself, say much in reference to the Logos *Prophorikos*; in fact, I could do no more than just allude to it, and I could not deal with the application of the word that might have been made had I enlarged upon the Alexandrian conception of a sort of person,—a quasi person,—named the Word of God as the instrument by which he had acted, and upon the fact that Philo had, in fact, identified the Logos under that conception with the Logos of the Stoics; that is to say, in so far as his philosophy was that of the Stoics. The word Logos, in its philosophical import, as it seems to me, is suggested by the derivation of the word. It comes from the Greek term meaning “to lay,” and that is used in the sense of to arrange with order and method. It implies, therefore, the rational arrangement of thought, and hence it comes to mean the account of a thing, or the *rationale* of it. In its first philosophical use it certainly did not imply the rationality of the Being to which the word is applied. The Logos of Heraclitus was not a rational being,—was not a person. That, I think, must be quite clear from various expressions which he has applied to it, which show that his conception of the Logos was thoroughly materialistic,—was not that it is itself possessed of reason, though it was the originator of psychic properties. It seems to me, therefore, that the word, in so far as it is to be treated as a term in philosophy, may be rendered “the account of the universe.” The object of all philosophers seems to be to account for phenomena which constitute the universe, and for all other things which they might conceive as existing, though not objective to the senses. In respect to the remarks of the last speaker, I may say I did not intend to depreciate Plato’s conception of goodness in my assertion that it was by no means a perfect conception. Of course it is not to be supposed that his conception could be perfect. It was determined in a considerable measure by the immorality which prevailed in his age and nation. It was a very noble conception indeed,—a wonderful conception,—if we bear in mind the time at which, and the circumstances under which, he lived. I was disposed to do full justice to him; I regard him as having been not only a large-minded man, but a true philosopher; but I could not help bearing in mind, at the time I was speaking of him, how far

his conception of goodness necessarily falls below that which we have acquired through the higher teaching that has come to us from above. I hope I did no injustice to the Stoics in the remarks I made in reference to their apathy. I called it an "affected apathy." I did not mean by that that the apathy was pure affectation. I rather intended to imply that their flattering ideal is, after all, above the reach of every human being,—that no one can be absolutely indifferent to his surroundings, whatever he may profess to be. At this late hour, I think, I shall not be expected to enter into all the particulars to which my attention has been called, in respect of which explanations were asked,—indeed, it would be impossible for me to go over the ground in detail. If I have omitted anything to which my attention was called by either of the two speakers, I should be glad if they would mention it now; but I cannot think that I do, in any material respect, differ from either of them in regard to the statements I have made in my paper. My object was to show that we are indebted to the Christian Faith for the noblest conceivable conception, and for the noblest conceivable representation of the character of the First Cause; that we have a conception now, as we understand it, which is truly philosophical; and we may challenge, I think, any persons who have adopted any system of philosophy which does not fall in with the Christian system, to produce, in their exposition, a Logos which may be compared with ours (cheers).

The meeting then adjourned.

FURTHER REPLY BY THE AUTHOR.

In reference to matters touched upon in the course of the discussion which followed the reading of my paper, a few supplementary words from me will, I hope, suffice to justify the statements I have made and the opinions I have expressed.

My allusion to Spinoza was suggested partly by the tenor of his philosophy, and partly by reminiscences of explicit assertions which I had met with in his works.*

* As samples I may instance the following:—"Deus proprie loquendo neminem amat" (*Eth.*, part v., prop. 17, coroll.). "Qui Deum amat, conari non potest, ut Deus ipsum contra amet" (*Id.*, prop. 19). "Si roges: An Deus hunc non odio habeat, illum vero diligit? . . . respondeo Quod non" (*Epist.* xxxvi.).

That the teaching of Anaxagoras had an ethical value I would not be understood to deny, nor do I doubt that in the words and actions of religiously disposed disciples it bore wholesome fruit. But I still hold it probable that the immediate product of his speculations would have been an intellectual system more truly philosophical and more extensively fruitful than he succeeded in elaborating, *if* his theistic conception had been determined by a deeper insight into ethical necessity than we are warranted in ascribing to him.

The writings of Plato not only give evidence of mental qualifications, both dialectical and literary, of a very superior order, but also, as it seems to me, bear witness to the introduction of an improved method of investigating the fundamental truth. His intellect, indeed, even thus aided, was doubtless hindered by an impenetrable veil from finding entrance into the Holy of Holies and beholding face to face the glory which is there revealed. It was given to him virtually to foretell what would befall the ideally Righteous Man, were He to appear; how, after suffering all kinds of outrages, He would be crucified.* But Plato comes far short of conceiving adequately either the character of such a man or the significance of his manifestation.

Among the Stoics were men who, with unquestionably honest purpose and nobly persistent courage, sought to realise the ideal in their own persons; but their conception of it was incompatible with that unselfconscious spirit of trustfulness in which souls, when quickened from above, wake up from the death of sin to the life of righteousness, and thankfully discover that their sins are forgiven. The righteousness aimed at by those dimly-enlightened votaries of wisdom was essentially inhuman; for the cost of acquiring *apathy* must needs be the extinction of *sympathy*. But this was not easily perceived when the choice appeared to lie between *apathy* and despair. Given a world in which to live is to suffer: how is its existence to be accounted for on the supposition that death ends all? To deal with this repulsive problem the Stoics resolutely braced their minds, and their Logos was the outcome of a desperate attempt to solve it. But the advent of the true Logos is the revelation of an eternal plan for opening up beyond the seeming final limit an endless life, and for making all things new.

* *Repub.*, b. ii, ch. 5.

ORDINARY MEETING.*

THE PRESIDENT, SIR GEORGE G. 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 :—

MEMBER :—Rev. Principal A. Cave, D.D., St. Andrew's, B.A., London, Hackney College.

ASSOCIATES :—His Excellency A. C. S. Barkly, C.M.G., Governor of Heligoland ; Rev. S. L. Dixon, London ; Rev. S. M. Mayhew, Vice-Pres. Arch. Assoc., London.

The following Paper was then read by the Author :—

THE DAWN OF METALLURGY.

By the Rev. J. MAGENS MELLO, M.A., F.G.S., ETC.

THE origin of Metallurgy amongst the races of mankind is involved in much obscurity. How was the art of smelting the metallic ores discovered? When, by whom, and in what country? These are difficult questions to answer. The Hebrew record in the Book of Genesis contains what appears to be the earliest written notice of the discovery, in the passage which says that one of the descendants of Cain, Tubal Cain, was "a sharpener or instructor of every artificer in copper [or, as it may be read, bronze] and iron." Lenormant and other writers tell us that the more recent results of archæological and philological study tend to show that metallurgy had been invented long before the dispersion of the sons of Noah, and that whilst they were acquainted with the use of metals, they had derived that knowledge from people who were anterior to, and even, it may be, unconnected directly with themselves. It is said that the cuneiform inscriptions "give us a glimpse of an ancient civilised Asia at a period when the Aryans and Semites were still living a pastoral life, an Asia which was in all respects non-Aryan."

* March 18, 1889.

One of the most prominent features of primeval civilisation was the use of metals. The Turks and the Mongols both say that their ancestors dwelt in a valley of the Altai Mountains, from which they extracted metal by means of fire. To the south of the Altai, and as far as Thibet, the manufacture of iron was carried to great perfection in very early times, even before the Chinese migration. In primitive Chaldea, peopled by Accadian tribes, we are told that there are traces of an ancient and abundant metallurgy, which influenced Assyria, Syria, and Arabia.

If we turn to Europe the results of archæological research show us that there was in this part of the world a gradual replacement of the stone implements of the Neolithic age by those of metal, and as far as Europe is concerned, the vast majority of the metal tools and weapons were at this period made of bronze, an alloy of copper and tin, containing, roughly speaking, on an average about nine parts of copper to one of tin.

The discovery and use of tin in the manufacture of bronze marks, it is well said, a great epoch in the history of human culture, for this metal is never found in a native condition. Its ore is dull, and non-metallic in appearance, having nothing about it to attract attention, whilst it is by no means widely distributed; a very considerable exercise of intelligence must have been required to discover its valuable properties. That the use of pure copper preceded that of tin appears to be beyond serious question, although, as compared with bronze, objects made of pure copper are strangely rare as compared with those of bronze, which was known in many parts of the world long before our era: it was in use amongst the ancient Egyptians certainly 2000 B.C. and probably even at a period far anterior to that. But before bronze was invented, it is only natural to suppose that there must have been a time, at any rate in copper-producing districts, when the unalloyed metal would have been employed. We should conclude this to have been the case even had we no actual proof of the fact; but proofs have gradually been accumulating, and Sir John Lubbock has very justly observed that "Copper seems to have been the metal which first became of real importance to man"; its ores are abundant, and they are easily smelted, besides which it frequently occurs in a native state, when its properties are manifest, for it can then be hammered into shape. The North American Indians utilised the great copper deposits about Lake Superior and made both implements and ornaments of this metal. Native copper was used in Santorin

before the destruction of the island by earthquakes. It is true that comparatively few objects made of pure copper have been found; they do not appear to have been carried far, as was the case with those of bronze, from the place of manufacture, but there is abundant evidence now that unalloyed copper was widely used. M. Ferencz Pulsky has stated that the most ancient interments in Hungary, as well as those in the North of Europe, contained only objects made of copper. But some of the most important evidence of the existence of what may almost be termed a Copper age, has been recently derived from the remarkable discoveries made by MM. H. and L. Siret in South-east Spain, between Carthage and Almeria. A number of pre-historic stations have been explored in this locality, in which were found not only numerous remains of the Neolithic age, but also those of a transition period, between the ages of Stone and Metal; which was followed by a third stage, in which both copper and bronze were simultaneously used, amongst a people who had evidently made very considerable advances in culture.

A brief sketch of some of the chief features of these discoveries will show the important bearing which they have in relation to the history of metallurgy in Europe and the condition of its primitive inhabitants.

The transition period,—characterised by an indigenous copper metallurgy,—was one in which the rude huts of the Neolithic men had been improved upon; and when regularly-built houses were constructed, houses built with stone walls, cemented with clay. In building them the rough boulders, from the neighbouring water-courses and hill-sides were used,

It appears, from the ground-plans of some of these dwellings, that they had turrets, perhaps of a defensive character, and the roofs were made of beams resting on wooden supports and covered with thatch. Thanks to the destruction of some of these houses by fire, several of those details have been made known to us; thus, the burnt clay, still bears traces of the thatch, together with the impress of the binding cords of plaited esparto grass. Some of the houses seem to have had an upper story. It has been observed that, even now, many of the peasants' huts in Almeria are constructed in a very similar way to that of these pre-historic dwellings.

It was amongst the ruins of these houses that a great number of metallic objects were found, and it is from them that we conclude that there then existed an indigenous metallurgy, implements of copper having been manufactured

on the spot in large quantities. In form, these early copper tools very closely resembled the contemporaneous stone implements, and were, doubtless, copies of these; and, it is to be noted, that these first attempts at metallurgy were not moulded, but were hammered into shape. Numerous implements, both of stone and of bone, together with other objects of a more or less ornamental character, were discovered in the same locality. Flint arrow-heads and knives were numerous; also polished celts, and wedges made of diorite, fibrolite, &c., and many bone awls and needles; a curiously-shaped bone object occurred which is said to resemble some found by Dr. Schliemann at Hissarlik, and which he thought were idols. Many perforated shells were found, together with specimens of *fusus* and *trochus* broken off at the apex, which may have been used as whistles, as similar shells are used to this day by the miners and hawkers of the district. Stone mills and pestles, also stone hammers, were discovered; for the most part, these were of a more advanced type than those found in the purely Neolithic stations. We may learn something too of the food of this early Spanish race from the remains of the goat, wild boar, and ox; and from beans, rye, barley, chestnuts, &c., which were dug out of the floors of their dwellings. The people were, probably, both pastoral and agricultural, and occasionally roamed over the district as hunters in search of the wilder animals.

But the chief feature of the age, and that which now most concerns us, is the evidence afforded as to the practice of metallurgy. This evidence is abundant. Cinders and slag, the ores of copper, both the blue and the green carbonate, lumps of metallic copper, and, finally, copper implements, show in the clearest way that the Metal age had now begun, in this part of Europe. The copper ores had been obtained from the neighbouring mountains, where they are still found.

Amongst the copper objects were triangular unbarbed arrow-heads, small awls, one of which was still fixed in a bone handle, a knife-blade, and several axes. There can, then, be no doubt whatever as to the existence of an indigenous metallurgy here; but we have now to note a fact which has an important bearing on the origin of this metallurgy. Whilst copper was thus extensively used and manufactured into implements on the spot, bronze appears to have been known at the same time, although it was not made in the district; it appears solely in the form of ornaments at this period, and these are of a higher type than that of the rude copper industry then prevailing. Thus it is most probable that whilst

(SOUTH EAST SPAIN)
COPPER IMPLEMENTS, ETC.



Arrow Head
 $\frac{1}{2}$



Knife
 $\frac{1}{2}$



Axe
 $\frac{2}{10}$



Awl
 $\frac{1}{2}$



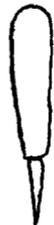
Chisels
 $\frac{1}{2}$



$\frac{1}{2}$



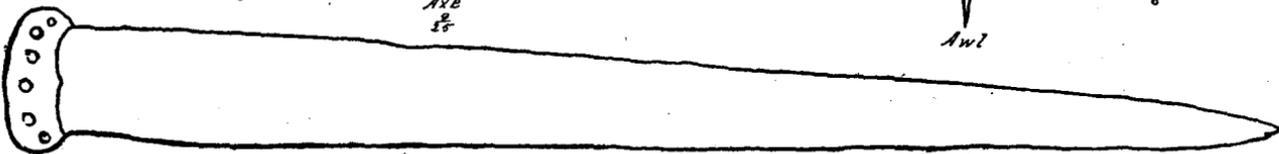
Arrow Heads.
 $\frac{1}{2}$



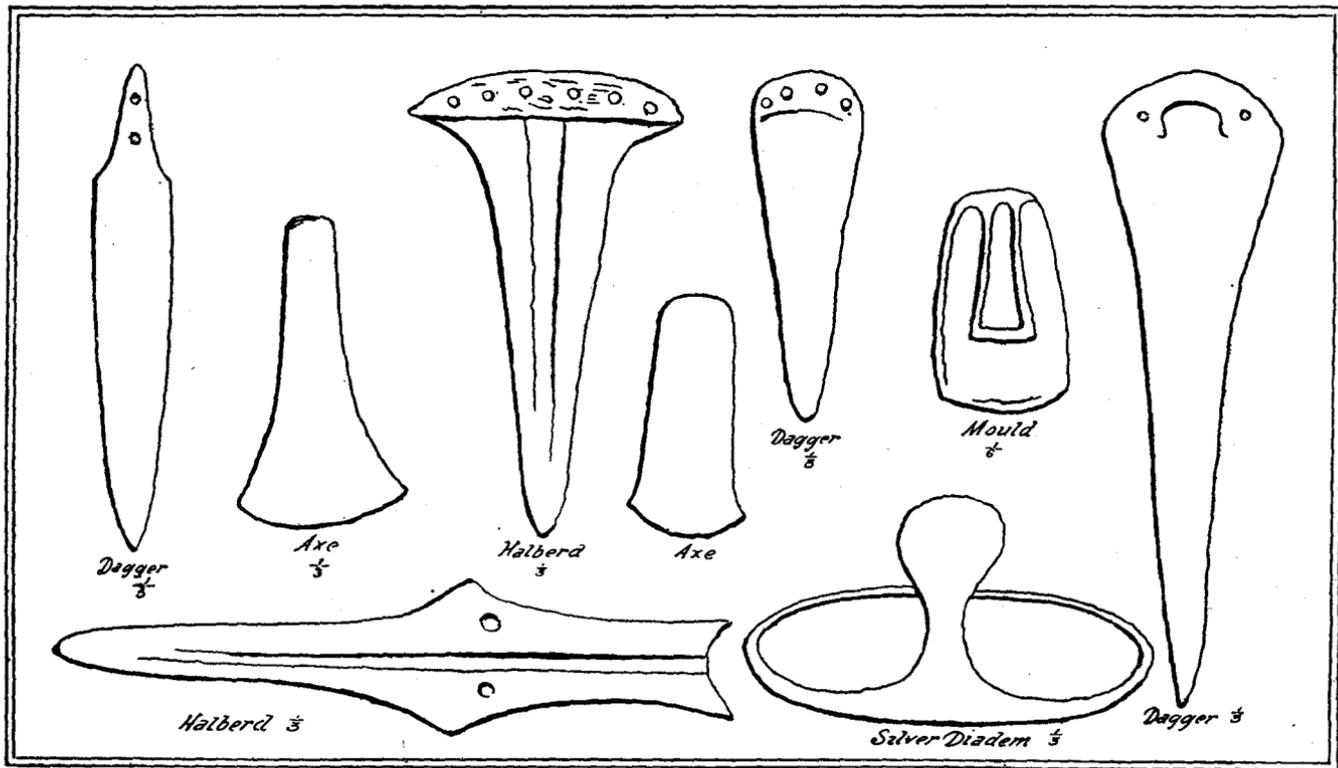
Awl



Crucible
 $\frac{1}{2}$



Sword $\frac{1}{2}$



These figures are taken from MM. Siret's work, "Les premiers Ages du M \acute{e} tal dans le Sud-Est de l'Espagne."—J. M. MELLO.

there was in this part of Spain an indigenous copper metallurgy, visitors from other districts more highly cultured introduced the ornaments, bracelets, beads, and rings, &c., and may possibly have taught the people the use of their copper ores.

Cremation as well as ordinary burial was practised at this time, showing a foreign influence at work amongst the Neolithic peoples; but ordinary burial was in use at the same period, and it has been suggested that the honours of cremation may have been reserved for the men, as no weapons or implements are found in the graves with unburnt skeletons, but only ornaments, which appear to denote that the bodies were those of females. A similar practice, with a probably similar interpretation prevailed, it has been pointed out, in Switzerland; the Moraine of S. Prex contained regularly-interred bodies with bronze ornaments, and alternating with the skeletons were urns filled with a black substance surrounded by cinders.

MM. Siret, in calling attention to the fact that there is no tin in the district which they explored, also point out that certain carnelian beads found in the graves are of foreign origin, and they suggest that the art of metallurgy was probably introduced into the locality by strangers who were acquainted with bronze and its production, but could not impart the art, having no tin; all that they could do would be to instruct this Neolithic people how to smelt their copper ores, and they probably also taught them an improved mode of constructing their houses.

Let us now approach the question as to the original source of the bronze manufacture. We find it in general use in Europe at the close of the Neolithic age, the late Stone and the Metal ages overlapping one another; but as far as we can judge, the first bronze workers did not make the discovery of this material in Europe, but introduced it from some other region of the world, and the workers in bronze were themselves of a different race to those amongst whom they first came. Copper may have been known and used in certain districts where it occurs plentifully even before the coming of this race, as the characteristic properties of the native metal are easily discovered, but, as far as we know, there is as yet no direct evidence that the metal was used before the foreign visitors made their appearance with the more perfected forms of metallurgical art.

What we want to know, in order to solve some of the questions as to the origin of metallurgy in Europe, is whence

the tin was derived which was employed in the bronze manufacture? M. Germain Bapst observes that philology and geography may aid us in replying to this question.* He remarks that it has been said that the Chaldeans and Egyptians, and, at a later period, the Phœnicians or some other maritime people, brought the tin from the Caucasus, but that, unfortunately for this hypothesis, it has been ascertained that this metal is not found in the Caucasus. Mr. V. Baer considers that the neighbourhood of Mesched, in Khorassan, may have produced it. M. Ogorodnikoff has stated that the inhabitants of that place had told him there were mines of tin as well as of copper and iron, &c., near to their city, and that he himself had actually seen many vessels of tin which the owners said had been made of the tin of that locality. But M. Bapst doubts the truthfulness of the Tartars as to this; he says that all the tin they use is imported in bars from England, and considers it beyond question that there are no tin mines near to the Caspian Sea, and that if there were any at Mesched that metal would certainly not be imported from so distant a place as England.

Another hypothesis makes India the source of the tin used in antiquity, and the Hindoo Kush and the Malacca peninsula are said to be localities whence it may have been derived. M. Lenormant is in favour of the Hindoo Kush, as is also M. Bapst. It is a fact that tin is found in that mountainous region which separates the Chinese empire from India and Central Asia, and the valley of Hilmend may have been, at any rate, one of the original sources of that metal, which, in the prehistoric ages and down to a far later period, was distributed far and wide in all directions. According to M. Bapst, philology supports the views thus advocated; he says that Humboldt and Burnouf have observed that the word "κασσίτερος" bears a resemblance to Arab, Illyrian, and other words used for tin, all of which find a common root in the Sanscrit "Kastira"; but it has lately been shown that Sanscrit may not be such an ancient language as it has hitherto been reckoned, and, according to Mr. Sayce, "Kastira" is not the original root: he suggests the word "Kasduru," which is found in the primitive Accadian of Babylonia; it is right, however, to say that M. Oppert and some others dispute this. But there is yet another region,

* "L'Étain dans l'Antiquité," *Revue des Questions Scientifiques*. Brussels, 1888.

almost unexplored, from which some, if not all, the tin of the earliest epoch may have been obtained, and that is the Altai range. M. Pavet de Courteille says that in the Turkish language tin is called *calai*, a word which has no representative in any other ancient language, and he argues that the Turks must, therefore, have been acquainted with tin in the first home of their race, since they did not borrow its name from any other people. Now, according to their traditions, the Turks had the cradle of their race in the neighbourhood of the Altai mountains, a range which is known to be extremely rich in metallic ores. A singular fact is also noted, — viz., that in India the modern word for tin, "Kulu," seems to have been derived from the Turkish "Calai." The fact that the early navigators went to the head waters of the Black Sea to get their tin, and which probably led to the idea that it was obtained from the Caucasus, is readily explained by the hypothesis that it was brought from the interior of Asia. In old Chinese documents tin is stated to have been brought from the north-west of China; and Chinese bronzes are known to which at least a date of 2000 B.C. can be assigned.

We are thus brought to the following conclusions that the first tin discovered in antiquity was probably either in the Altai or the Hindoo Kush. But we have now to ask whether it is necessary for us to suppose that the tin used in the European bronze manufacture was brought from such distant regions: may it not have been found nearer home? In order to meet this question, we must see what possible European sources existed whence this metal may have been obtained. It is well known that the Phœnicians were in Spain as early as 1100 B.C., and they may have entered it at a still earlier date, and it is a well-known fact also, that this people derived, at any rate at one period of their history, a large amount of tin from the Cassiterides, or the tin-producing district of Cornwall, which they are said to have discovered. It is certain that in early times this was one of the great sources of tin known to the ancient European peoples. But it is equally clear that this was not the only source: Spain itself has its tin mines, which were worked by the Phœnicians and the Carthaginians, and there are other European localities in which tin was worked at an early date. MM. Mallard and Simonin have discovered traces of tin workings in France in the districts of Limousin and La Marche, also in Brittany, near Ploërmel, as well as near the mouths of the Vilaine and the Loire. Why, then, should not the bronze-workers of ancient Europe have

obtained their tin from such sources as these, rather than from the distant East? That in the course of time they did so is pretty clear, but the invention of bronze,—indeed, of metallurgy in any form,—did not, as far as we can judge, originate in Europe; the first bronze, then, was not of European manufacture, but was a foreign importation, brought in by a foreign race, who, in the course of time, instructed the original inhabitants of this part of the world in the art of smelting the metallic ores, and thus led in due course to the discovery of independent sources of the various metals which they used. All progress in civilisation in this part of the world appears to have travelled from East to West and not in the contrary direction. Thus it is hardly likely that the manufacture of bronze was invented by the Phœnicians simultaneously with the discovery of tin in Spain, and that they should have made there so great a stride at a time when the highly-cultured Egyptians were ignorant of the bronze alloy. Another objection to this view, that bronze was invented in Spain, is the fact that the Murcian graves which have been described contained much more pure copper than bronze, the bronze appearing at first only in the form of ornaments of a far higher type than that of the accompanying copper implements. The tin mines of Spain are all on the western side of that country, and all the evidence we have seems to show that it was not until a comparatively late date that the mines of Spain and the more distant ones of Cornwall were discovered and used.

The conclusion we arrive at is, that the bronze metallurgy originated at a period long anterior to its introduction into Europe, probably in the central region of Asia, in the supposed cradle of the human race itself, and that thence it spread by slow degrees far and wide in every direction, as an accompaniment of advancing civilisation; and that whilst Europe was still in the rudeness of the Stone age, metal-working people far advanced in culture were to be found in the central parts of the Asiatic Continent, who should push their way both East and West and gradually displace or blend with the older populations, bringing with them the arts and appliances of that higher culture which was the dawn of our present civilisation.

We may note in passing that although copper and tin seem to have been the metals which first came into use in pre-historic times, it is probable that at a very early date gold and silver were also utilised in localities where they were found in a native state. It has been commonly supposed that

silver was unknown until the introduction of iron, but MM. Siret have found in some of the Murcian graves belonging to what they call the third or Metal age, a considerable number of both gold and silver ornaments, as rings, beads, brooches, pendants, and diadems, made either of wire or of beaten plates of the precious metal; and some of the bronze swords or daggers belonging to the same age were decorated with silver rivets. In their search for copper the early miners would come across the silver, which was till recently obtained in abundance at Herrerias de Cuevas, in the province where the discoveries alluded to were made, and it does certainly appear from these discoveries in Spain that wherever native silver was sufficiently plentiful to attract attention, as is the case in the district in question, then it would naturally have been made use of. The same thing may be said of the gold which was found in the same district. M. Recaredo de Garay also describes some discoveries of primitive workings for copper in the province of Huelva, and ascribes to the miners of this locality certain tombs which contained not only copper implements, but also ornaments of gold and silver of rude workmanship. Again, in Andalusia, in a cave containing many human skeletons, on the skull of one was found a gold diadem, whilst numerous stone implements as well as objects of bone and of other materials were discovered with them; it is, however, not easy to assign any definite age to these remains, which may belong to a comparatively late date.

There are two other metals which came into use in early times, one of which, iron, soon became of such importance as to give its name to the age in which it replaced the bronze in common use. The other was lead. With regard to lead we have no certain indications as to when, or by whom, this metal was introduced; we may surmise that the first discovery was made accidentally through the reduction of its ore at some surface outcrop. The silver, which, as we have seen, was known at an early period in Spain, was not derived, as was that of a later date, from lead ores, but from veins of the native metal, otherwise we should have found lead simultaneously used; but in the bronze of Spain, as in that of North-Western Europe, there is no admixture of lead unless it be accidental or infinitesimal in quantity. But we now come to a remarkable fact: both the ancient Egyptians, the Greeks, and the Etruscans of Italy used lead in making their bronze, as did also the Romans, but the Swiss bronze, in common with all the bronze of Northern Europe, has none.

This is of importance when we discuss the origin of the bronze industry in this part of the world. The use of bronze in Germany, Switzerland, France, and Spain without any intentional lead alloy, seems to show that the importation was, in the first instance, independent of the Southern influence, and may have travelled directly from the East; any way the Etruscans and Phœnicians could not have been the first introducers, although at a later date the Etruscans, who came into Italy ten or twelve centuries before Christ, and were acquainted, not only with bronze, but with iron also, had undoubtedly a great influence upon the bronze as well as upon other industries of neighbouring countries. There was, we know, a magnificent bronze metallurgy flourishing in Italy during prehistoric times. A race closely connected with, if not identical with, the Etruscans, made use of bronze for weapons and implements as well as for ornaments; they also worked the bronze into urns, some of which have been found enriched with bas reliefs representing both animals and men. That this primitive Italian race should have been able to bring their metal work to so great perfection, may, in part, be attributed to the fact that they had, within their own territory, both copper and tin in abundance. M. Blanchard discovered that the tin mines of Cento Camerelle in Monte Valerio, in Tuscany, were worked by the Etruscans, whilst the copper mines of Montieri (Mons *Æris*) are not far away. The somewhat later Etruscan art was similar to theirs, and their influence extended far beyond the confines of Italy, whilst they themselves were evidently much affected by early Greek as well as by Egyptian civilisation.

The earliest records of the Mediterranean peoples bring before us a highly civilised Egypt, an Egypt possessed not only of bronze, but also of iron, whilst the Egyptians at the same time made use of flint for various purposes, such as engraving their granite monuments. It has been noted that in Southern Italy bronze daggers identical with the Egyptian have been found, and remains of a similar type to the Egyptian have been discovered at Hissarlik. The Phœnician work was probably only a copy of the Etruscan. The same Palæo-Etruscan art appears also at Mycenæ, and it seems on the whole evident that the bronze metallurgy which displaced the Neolithic civilisation cannot be traced beyond Egypt, and we can only assume that it came originally from the East.

The Etruscans were acquainted, as were the Egyptians, with iron; and the admixture of iron with bronze objects which was found in the great transition cemetery of Hallstadt has

been assigned to this people, who were the great masters of metallurgy during the height of their power. As to the first introduction of iron into Europe, we are much in the dark. Before the coming of the Romans we know that it had taken the place of bronze for weapons in most countries; and just as we found the Neolithic Stone age and the Bronze age overlapping each other, so do we find an overlapping of the Bronze and Iron ages, not only at Hallstadt, but in Switzerland, and in France and in other places a period of transition is clearly denoted by the character of the remains found. The lake cities of Switzerland appear to have been attacked, and destroyed in some instances, by strangers possessed of iron weapons. Besides this a period of transition is denoted, both there and in other places, by the discovery of iron implements, the design of which was copied from those of bronze, just as in the earlier period we found bronze copies of those of stone. Iron first appears in Europe as a luxury, as a more precious metal than bronze; thus we find iron blades with bronze handles.

Early tradition tells of fires on Mount Ida, either the Phrygian or the Cretan Ida, which melted the iron ores, and so led to the discovery and use of this metal in Europe; but at a far earlier date iron was known in Asia.

Three stages have been made out by M. Chantre, in the history of European metallurgy, which have been named the Cevennian, the Rhodanian, and the Mœringian.

I. The Cevennian marks the transition from stone to bronze, bronze appearing mostly in the form of ornaments.

II. The Rhodanian is that in which bronze was in common use, although stone was still employed for various purposes.

III. The Mœringian is the transition period from bronze to iron. The cemetery of Hallstadt belongs to this age, as does also what is known as the treasure of Reallon, a find of all sorts of objects,—knives, sickles, bracelets, rings, &c.,—which appear to have been a merchant's stock-in-trade, lost on the road from Etruria, the general type being, as that of Hallstadt, decidedly Etruscan.

In conclusion, let us see whether it is possible to ascertain who were the real originators of metallurgy in Europe.

It is pretty generally allowed that, during the Neolithic age, the inhabitants of Europe, at any rate of its western portion, were of non-Aryan stock. An examination of their remains show that they were a small, long-headed race, who were in the habit of burying their dead in caves and chambered tombs. Great Britain and Ireland, France and Spain,

have yielded very numerous skeletons of this age, all of them clearly belonging to one and the same race, a race which has been identified by anthropologists with the modern Basques and the small, dark men of Aquitaine, who, together with others of a similar type, may be regarded as the survivors of this once widely-distributed pre-historic people, who occupied, not Europe only, but were also found in Asia Minor, in Sicily, in Sardinia, and in Northern Africa.

During the Neolithic age the principal implements and weapons were made of stone, often polished after having been carefully chipped into shape; others of bone, and antlers of deer were also used. It was amongst these Neolithic peoples that the use of metals was introduced; but by whom? The question is not easily answered. That the manufacture of bronze and the smelting of metals was not the independent discovery of the Neolithic inhabitants of Europe, but was introduced from without, and by a different race, is evident from many facts. One important one that has been pointed out is that over the whole of the Continent, wherever bronze implements have been found, they are everywhere nearly identical in form, although "each country has certain minor peculiarities."

Sir John Lubbock, in his work on "Prehistoric Times," observes that the bronze swords found in Scandinavia must have been introduced by a smaller race than those now inhabiting Europe, as the hilts of those weapons could not be grasped by hands as large as ours. He also says that Nilsson considers that the ornamentation of the age, as shown on Scandinavian finds, is Semitic rather than Aryan, and his opinion seems to be that the Phœnicians introduced the bronze into the North of Europe: this, however, has been questioned, on the ground that when the Phœnicians appeared in Europe they must have been acquainted with iron, and had they been the introducers of bronze they would, at the same time, have introduced iron and probably also lead. As to the smallness of the hands, Sir John Lubbock remarks that "the Indo-European (Aryan) Hindoos share this peculiarity with Egyptians, and this characteristic is, therefore, equally reconcilable with an Indo-European origin of the bronze civilisation as with a Phœnician." It is to be noted that the use of bronze did not prevail in Scandinavia until a comparatively late part of the Bronze age; the Stone age was prolonged there, and when bronze appeared the various objects made of that material were of a very high type; we do not meet there with the primitive forms characteristic of the earlier metal age,

whilst the use of bronze continued in Denmark as late as the third century before our era, or even the second, according to Sir A. Franks.

We have already observed that the art of metallurgy seems to have originated amongst a race which was neither Semitic nor Aryan. At a period when the Aryans and Semites were pastoral nomads, the Accadian population of Chaldea were well acquainted with metals; and it is stated that it is always in branches of the so-called Turanian and Altaic families of mankind that the use of metals is found as an *original* possession, that these races link their own origin with metallurgy and give this art a preponderating place in their mythologies,—a thing which is unknown amongst those of other races. If this be so, then we must conclude that both the Semites and the Aryans, and, according to some authorities, also the Hamites, learnt the art of metallurgy before their migrations, and carried with them a knowledge of the smelting and working of metals into the various countries where they settled. It is said, however, that philology proves that the Aryans were unacquainted with the use of iron until after their dispersion. The able Belgian reviewer, who writes under the *nom de plume* of Jean d'Estienne, says that the Hamitic tribes who entered Egypt before the dawn of history, and mingled there with the aboriginal race, brought with them the use of metals, metallurgy there appearing plainly to have been introduced from the North-East. Whether the aboriginal tribes had any implements other than those of stone we do not know; but it is considered fairly proved that the first Egyptian dynasty resulted from the fusion of the Hamitic and negro races, and that it was the Hamitic race which introduced metallurgy into the valley of the Nile. Then, again, the Semitic peoples attribute the invention of metals to a period so remote as to go back, as we have seen, to the very origin of mankind; and there is, it is said, nothing in tradition, or in their language or customs, to denote a time when they were ignorant of the use of metals, the invention of which they ascribe to a descendant of Cain. Philology is also said to prove that metallurgy existed in an advanced state amongst the Aryans before the separation took place between the Eastern and Western branches. In India, we are also told that, before the Aryan immigration took place, both bronze and iron were in use, and a remarkable fact is dwelt upon, viz., that the average proportions of copper and tin used in the bronze were identical with those found in the bronze of all pre-historic antiquity. This cannot have

been due to accident, but clearly points to a common origin of the manufacture; but we are still in the dark as to the actual race which introduced metallurgy into Europe, and whether those non-Aryan peoples who seem to have been the occupiers of the soil at the time of its introduction, and who themselves came from an Eastern home, left the cradle of their race before the discovery of metallurgy; either they must have done so, or else must have fallen back into barbarism. As to when their first migrations took place we are utterly in the dark; at the time when we first meet with them other races, such as the Celts, were already pressing upon them. In Gaul, and also in Spain during the Neolithic age remains of a taller race than the small Iberian were mingled with these latter. We do not know whether the men who brought in the use of metals,—those men, for instance, who entered Spain in the South, or Scandinavia in the North,—were Semites, Aryans, or neither the one nor the other. Nor is it easy to understand the exact route taken by the introducers of metallurgy, nor whether they all belonged to the same race, as Sir John Lubbock has noted a curious fact: bronze swords, he says, which have been found in such large numbers in the North of Europe, have been very rarely met with in Italy; and then there is that other circumstance previously mentioned, viz., the use of lead in their bronze alloy by the Etruscans and Egyptians.

Turning once more to Spain. MM. Siret call attention to the fact that the men who introduced the art of metal-working also brought with them, as we have seen, the practice of cremation and urn burial, and, quoting from Rougemont, say that “the urn appears to have been unknown to the Egyptians and the Semites.” The cinerary urn “is altogether Aryan, Indo-European, Japhetic”; and Dr. S. Müller tells us that the Phœnicians did not burn their dead, but buried them in coffins. Cremation and urn-burial, he adds, is one of the features of the ancient Greek civilisation; he also says that the ornamentation of the pottery, &c., by the use of straight lines can be followed from Italy through Europe, as far as Scandinavia, in the series of remains, more recent than those in which spiral and curved line ornamentation prevails; and with the adoption of this straight line ornamentation, carried from Greece to the North, came in the new funereal usages, viz., the burning of the dead and the storing of their ashes in urns in common cemeteries and in tumuli. At a very early period there appear to have been commercial relations between the people who inhabited Greece, Italy, and Spain, and

MM. Siret think that the period they have named "Transition" was anterior to that when the first navigators made their expeditions to Spain, and that probably the discovery and use of silver in that country was one of the great attractions which drew these voyagers to its shores. The actual race which introduced metallurgy into Spain during the Transition epoch does not appear to have been permanently established there, although probably some admixture with the Neolithic inhabitants took place; but in the immediately succeeding age, when metallurgy was fully practised and when bronze and silver were in common use, the strangers who taught the new art seem to have disappeared for a time, as cremation was no longer practised and the old Neolithic custom of burial was resumed. The character of the ornaments also underwent a change, whilst, at the same time, metallurgy, domestic architecture, and the pottery taught by the visitors or invaders were retained and even improved upon; and the general advance in culture was great. All that we can therefore conclude as far as we have got, is that the race which taught the Neolithic Spaniards metallurgy was probably Aryan; and that the same race imparted the art to the other peoples of Europe where a similar bronze industry existed. As to when this was we have no means of knowing; we know that not in Europe only, but also in Asia Minor, there was a Neolithic age, which was gradually replaced by one in which bronze was the prevailing material, from which both implements and ornaments were manufactured; and this substitution took place by degrees all over Europe. The valley of the Rhone is rich in remains of the Bronze age, no fewer than thirty-nine foundries having been found; the French museums, as well as those of other countries, are full of specimens of the art, showing the spread of the new civilisation. All the evidence shows that the metallurgy of the Bronze age travelled from an easterly and probably southerly direction, and during the later part of the Bronze age Etruria was one great centre, whence it spread to Northern Europe. There is much to show that the change at first began in a peaceful way through the ordinary channels of commerce: amongst the earliest objects found are personal ornaments, whilst implements and warlike weapons seem to have been introduced at a later date; then, as time went on, the high art of the Etruscans gradually influenced the neighbouring countries, and travelled northward as far as Scandinavia and the British Isles. In the wake of the merchants would come in due course the actual makers of the bronze in various

places, and thus such foundries as those in the Rhone Valley, in Germany, and in Great Britain would be established for the repair of broken objects or the casting of new ones.

As to the actual origin of metallurgy we can, as has been seen, only obtain faint indications, which are almost lost in the obscurity of ages still more remote than those in which the Neolithic men of Europe learned to beat the copper into shape and to smelt its ores, and mould the alloyed copper and tin into those varied and graceful forms which characterise the Bronze age of human civilisation.

The PRESIDENT (Sir G. Stokes, Bart., M.P., P.R.S.).—I am sure all present will join in thanking Mr. Mello for his most interesting paper. I now invite discussion upon it.

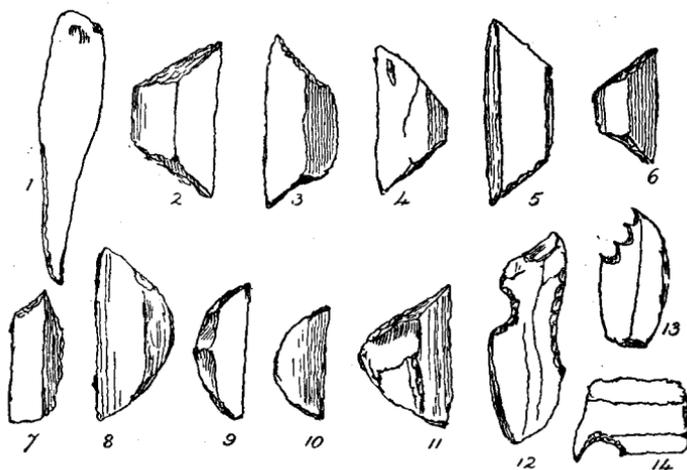
Major T. A. FREEMAN.—May I ask Mr. Mello whether I am to understand, by what he says at the bottom of page 287—"both the ancient Egyptians, the Greeks, and the Etruscans of Italy used lead in making their bronze, as did also the Romans,"—that they used both lead and tin; or that the tin was supplanted by the lead?

The AUTHOR.—As far as I know, tin was used as well as lead. The two metals were used together, to the best of my belief. I am not perfectly certain about it, but believe so.

Mr. J. ALLEN BROWN (F.G.S., F.R.G.S., &c.).—Mr. President: When the Institute was good enough to send me a proof copy of this excellent paper, with the suggestion that I should append to it any notes relating to the subject, I found that it gave me an opportunity of throwing, possibly, a little light upon the origin of the earliest people who wrought in copper. I will endeavour to explain what I mean.—It is worthy of notice, as showing the Eastern origin of the early workers in copper and bronze, that, associated with the metal objects discovered by MM. H. and L. Siret in the pre-historic stations between Carthage and Almeria, and figured and described by them in their elaborate work, *Les premiers Ages du Métal dans le Sud-Est de l'Espagne*,* are, in addition to polished celts, &c., some diminutive stone implements

* "Anvers, 1887. Ouvrage Couronné au Concours MARTORELL de Barcelona (Prix 20,000 francs), et ayant obtenu une médaille d'or à l'Exposition Universelle de Toulouse de 1887."—Copy in British Museum (press mark 1703 A 21 & 1703 c 9).—ED.

of unusual and very distinctive types; they are of crescent, quadrilateral, triangular, and other forms, drawings of some of which are here figured.



SMALL FLINT IMPLEMENTS (*actual size*).

(From MM. Siret's work.)

FIG. 1.—VERY FINELY-WORKED SPIKELET FLAKE.

„ 2, 3, 4, 5, 6.—QUADRILATERAL FORMS WHICH MM. SIRET SUGGEST MAY BE
ARROW POINTS.

„ 7.—INSTRUMENT WORKED TO A FINE POINT.

„ 8, 9, 10.—CRESCENT-SHAPED IMPLEMENTS.

„ 11.—TRIANGULAR-SHAPED IMPLEMENTS.

„ 12.—INSTRUMENT WITH CHIPPED DEPRESSION, OR SMALL SPOKESHAVE.

„ 13, 14.—FINELY-POINTED INSTRUMENTS WITH CHIPPED DEPRESSIONS.

I have referred to these peculiar types of implements in a paper, read at the Anthropological Institute last year,* in which I showed that it appears probable these diminutive implements indicate the occurrence of a particular industry, or custom of some kind, for which they were made towards the close of the Neolithic age. It will be noticed that these diminutive

* "On some highly specialised Forms of Stone Implements found in Asia, North Africa, and Europe." *Jour. Anthropol. Inst.*, Nov. 1888. MM. Siret's work did not come before me until after I had written it.—*J. A. Brown.*

implements of crescent, trapezoidal, triangular, spikelet, and other forms are all trimmed into shape by very neat secondary chipping, and are not simply flakes unworked, which may be of any form when detached from the core or nucleus. Now it is very remarkable that small implements of these peculiar types have been found in certain places,—in Central India, Syria, the Crimea, and along the shores of the Mediterranean, Portugal, in France, and also, I believe, they may be traced into Britain. Thus they have been discovered in caves and rock shelters of the Vindhya Hills (in large quantities), in Baghelkand and Bundelkand associated with pictographs on the walls and pieces of hematite, in Banda, Rewa, &c., and in Syria (near Bethlehem),* abundantly near Kizilkoba (Crimea),† in Egypt, Tunis, and, I believe, in other places in North Africa. In Italy, Portugal (in Kjockkenmoeddings), also in France, as at Hedouville and Coincy L'Abbaye.‡ Those from India were originally discovered by Mr. A. C. Carlyle, late Archæologist to the Indian Government, who presented examples of all the forms to me. Very small cores and flakes of obsidian have been found on the Isle of Melos and other islands in the Greek Archipelago, indicating the same industry. It is curious that those from the rock shelters of the Vindhya Hills were often found associated with ground hematite and pieces of the same substance evidently used as a pigment, perhaps for tattooing, and that the walls were decorated with pictographs, possibly early endeavours to form written language. Since my paper directing attention to the subject was written, a carefully-trimmed, crescent-like implement has been shown to me from the Surrey hills, and I believe Canon Greenwell has one of the scalene triangular form, from Yorkshire or Lancashire. With regard to the two latter, of course it would not be safe to trust to the discovery of two specimens, though I have little doubt that others will be found. In most of the other places,—in India, the Crimea, Africa, &c.,—they have been found abundantly. I have a large number of these highly-specialised forms in my collection. As I have

* "Collections from the Holy Land," &c., Captain Burton. *Jour. Anthropol. Inst.*, vol. i.

† *Premières Recherches sur l'Age de Pierre en Crimée en Russe*. M. Merejkowski, St. Petersburg.

‡ *L'Homme*, M. G. de Mortillet, Directeur, for August and November 1885, &c.; also for 1884, p. 145.

pointed out, these very interesting, diminutive instruments appear to be characteristic of a particular race or people, whose migration may be traced by the various sites at which they have been found; and by the light of MM. Siret's remarkable discoveries in Spain, it would appear as if the fabricators may be identified with the earliest workers in copper in Southern and Western Europe, a race which, emanating, possibly, from Central Asia, penetrated into India, and also migrated and spread out through Syria to the Crimea and along the fertile regions of the Mediterranean to Spain, Portugal, France, and probably even into England. At any rate, they afford a clue to the home of the early metal-workers which may hereafter be followed up, as these forms are so distinctive in character as to afford almost as good evidence as the occurrence of a particular kind of pottery or other object: hence I have thought them of sufficient importance in relation to the discoveries in S.E. Spain to which the author alludes in his excellent paper, to make these remarks before the Institute, and as they may probably afford him and others a line of investigation which may be useful. It would be remarkable, as confirming the hypothesis I have suggested, if the carnelian beads found by MM. Siret should be proved to be made from the Indian variety, which is harder and in some other respects differs from the ordinary red carnelian. MM. de Lisle have also discovered diminutive implements of precisely the same forms, crescent, trapezoidal, triangular, and finely-worked spikelet or lancelet, instruments, at Begrol and Cléons (Loire Inférieure), drawings of which have been kindly furnished to me by Mr. Charles Seidler, late of Nantes, under whose fostering care and enterprise the very interesting and important collection of prehistoric and anthropological objects now possessed by that city was accumulated. MM. Siret's discovery of stone implements of late Neolithic age associated with objects of copper and bronze showing that metal was then coming into use, is an important one, and goes beyond the well-known fact that stone was employed in arrow-heads, &c., long after the introduction of bronze and even iron in localities where less civilisation existed. The hypothesis of the Eastern origin of the earliest metal workers in Europe is supported through other lines of investigation. The disposal of the dead by cremation, and the employment of cinerary urns, to which Mr. Magens Mello has alluded, appears to have been a custom characteristic of the bronze-using race, which is confirmed by the discoveries of MM. Siret, a practice which was not in vogue with the earlier Neolithic people, who interred their dead often in a

sitting posture in the long-chambered barrows. Much can be said tending to show that the practice in use in the Bronze period was of distant Eastern origin. Again, Dr. E. B. Tylor and others have shown that rude stone monuments (Dolmens as well as Cromlechs, and stone circles) may be traced in a remarkable line from India, through Syria to North Africa, and up the west side of Europe; such monuments are considered by many archæologists to be of the Bronze age, like the round or bowl-shaped barrows. If we regard the early metal workers in Europe as an Aryan stock, philology becomes an important help to prehistoric archæology. From the roots of words in the Indo-European languages we are able to obtain some conception of their mode of life, &c., while the most ancient literature of Aryan origin and cult embodies solar myths and fire worship, which there can be no doubt formed the essential elements of their religion; a sun or fire worship which under various forms entered so fully into the faith of the Kelt, Greek, Latin, &c. M. Chantre has confirmed these views as to the religion of these ancient metal workers, by his investigations into the ornamentation employed during the Bronze age, for pottery and other objects. In it may be traced several symbols of sun or fire worship, such as concentric circles, and above all the "Swastika," an essential portion of the fire drill. Professor Sayce has lately alluded to the existence in Syria of an aboriginal white race, which it is suggested may be of Aryan origin, and which he believes to be a remnant of the Amorites of the Scriptures. He also points out that a similar white race exists in isolated groups in North Africa, *i.e.*, the Kabyles, the Libyans of antiquity, whose white faces, &c., it is said, may be noticed in the wall pictures of ancient Egypt, and can be distinguished from those of reddish hue representing the Egyptians themselves, and others. There is another point which I wish to notice briefly, and that is in reference to the early use of tin as an alloy in making bronze. Besides those described by MM. Siret, objects of pure copper have been found in some of the Dolmens of Aveyron, and in certain caves and other places believed to be of late Neolithic age, but such objects are rare, and judging by the very few which have been found, it would seem that pure copper was very soon superseded by bronze. The proportion of tin employed as an alloy, although generally stated as one-tenth to nine parts of copper, really varies from rather under 10 to 14 or even 15 per cent. It would be interesting to know whether the earliest bronze articles contain a greater or less

proportion of that metal. With regard to the puzzling question as to how metals were first discovered and how it arose that the alloy of tin became afterwards so soon known, it has been suggested to me that in the stream tin deposits of Cornwall, &c., which were worked by the Phœnicians, and probably at an earlier date, rounded fragments of copper as well as tin are found in them. If it happened that such pebbles of stone and metal were heated for use as pot-boilers, *i.e.*, thrown into holes in the ground, &c., for cooking purposes, it may very well have been noticed in the late Neolithic period that they both melted; the discovery of the bronze alloy may then have quickly followed that of copper.

Rev. F. A. WALKER, D.D., F.L.S.—In the highly interesting paper which we have had the privilege of listening to, a great deal has been said about Spain, and I think more about Spain than any other country in Europe, and also about smelting in Spain, and the links between Spain, Italy, and Greece, connected with metallurgy. It is rather a remarkable fact that in the present day, as regards the lead mines at Laurium, in the southernmost part of Attica, eleven out of the fifteen shafts now worked existed in ancient times; although I am not prepared to say, one way or the other, whether there are any signs of prehistoric metallurgy there still. Looking back through the centuries, we read how that when a proposal was made in the Athenian Assembly to divide the rich proceeds of the mines at Laurium among the populace at the rate of a *mina* per head, Themistocles diverted his countrymen from their purpose, and by his urgent representations persuaded them to devote the money instead to building the fleet which subsequently stood them in good stead against the Persians at Salamis. We know too that a generation later Alcibiades had lead, and probably also silver, mines there. We are likewise aware that metal at Laurium now, instead of being smelted on the spot, is sent to the south of Spain; and it is the more remarkable when we consider how the people of many European nations are engaged there, either as day labourers or as possessing an interest in the proceeds of its mines. For example, the Scotch people and the Germans, two races closely corresponding as regards industry and frugality, who, one would think, would have every means of smelting it on the spot, at this late age, send the metal to Spain, as we have just been told they did in former time. The aspect of Laurium, with its vegetation of stone pines and undergrowth of *cistus*, &c., withered and blackened by the smoke, and its rows of dwellings for miners of different

nationalities, more closely resembles some Cornish mining village, as Redruth or Camborne, than an ordinary Greek country hamlet. I think it is a wonderful thing how custom lasts, that at this time they should take the trouble to send the ore to the Spanish coast to be brought into use.

Mr. DAVID HOWARD, F.C.S.—There is one point that I think it will be well to consider in treating this very important question, and that is the very high pitch of civilisation which the use of metal means. It is to us so natural that we do not very often consider the intelligence that must be required to introduce metal at all. No doubt the origin of the discovery of metal was by some chance; but given that chance discovery of metal, perhaps on the fire-hearth, the intelligent observation, skill, and thought required to work and combine these metals is something wonderful. It is not one of those industries which grew naturally, and it is not surprising that the ancients thought it required some Hephæstos to teach the working of metals. The precise reason why bronze differs so from copper and tin is, I believe, at present a mystery: we do not know exactly why bronze is so much harder than the two metals singly, or why the admixture of lead or tin with gold renders gold so brittle that you can powder it; but the fact remains so, and countless ages ago they had found it out, and executed work which seems hardly possible to us now; in fact, we do not know how bronze was brought to the perfection of hardness of those days;* and when we consider the difficulties of working steel and iron without blasting furnaces in those days, it is evident that an amount of skill and thought which it is very difficult to estimate was shown by those men,—those unknown forefathers of metal work who first thought of it and worked with such perfection.

Mr. E. CHARLESWORTH, F.G.S.—In looking over the paper, there is only one thing on which I would venture to make a suggestion. Mr. Mello says:—"The discovery and use of tin in the manufacture of bronze mark, it is well said, a great epoch in the history of human culture, for this metal is never found in a native condition. Its ore is dull and non-metallic in appearance, having nothing about it to attract attention, whilst it is by no means widely distributed." Now it is perfectly true that mineralogists, and

* It has been considered that meteoric iron must have been the first man began to use.

metallurgists too, have no knowledge of tin in a native state; but I would suggest to the author of the paper that that is simply a matter of negative evidence, and in connexion with natural science, there is no more dangerous principle to go on than to trust to negative evidence. Although mineralogists and metallurgists are not, in the present day, acquainted with tin in a native state, those who organised the metallurgy of bronze may possibly have known of its existence in that state. I do not put this forward for a moment as a conclusion that is to be accepted, but merely as a possibility. Then, with regard to the fact that the ores of tin do not present any metallic appearance, that is perfectly true; but there is one thing about these ores of tin which, I think, ought not to be lost sight of by the author of the paper, and that is their great weight. A very prolific source of the metal tin is what is termed *stream tin*. I have been in Mexico, and have here, on the table, to-night, specimens of stream tin ore from Durango, in Mexico, and also from Cornwall; and if any one will take one of these tin pebbles,—for such they may really be called,—I think he will be astonished to feel the extraordinary weight; in fact, they feel as though they were really of the same specific gravity as gold. Now, if we suppose that a people acquainted with the properties of copper fell in with one of these pebbles, they would at once, I think, infer from their great weight that there must be metal of some kind in these pebbles; therefore, the next step would be to experiment with the pebbles and endeavour to get the metal, whatever it was, from the pebble and the ore with which it is combined, which is the ordinary combination of oxygen with the metal. That is the idea here that occurs to me, and perhaps it is a matter which the author may say a word about in his reply. May I, in conclusion, express my special obligation to him for his interesting and instructive paper?

The AUTHOR.—In regard to what has just been said and the first question that was asked, it may be interesting to mention what is to be found in Evans's work on *Ancient Bronze Implements of Great Britain* with regard to the use of lead. It seems to imply that in Egypt lead was used sometimes in the place of tin. There is one sentence here which bears on it:—"The argument, however, that the Phœnician bronze would have been lead bronze, because the Phœnicians derived their civilisation and arts from Egypt and had continual intercourse with that country, where lead bronze was early known, appears to me wanting in cogency. The copper dagger analysed by

Vanquelin gave copper 85, tin 14, and iron 1 per cent. and showed no trace of lead." That would be the tin bronze, I presume. There are one or two analyses that I might read as to the presence of lead and tin together :—

	Copper.	Tin.	Lead.
" Flat celt, Ireland	86.98	12.57	—
" Flanged celt	90.18	9.82	—
" Palstrave (mean)	89.33	9.20	—
" Palstrave, Fife	81.19	18.31	0.75
" A bronze trumpet found at Dowris	79.34	10.87	9.11"

Here it would appear that the lead could hardly be introduced accidentally in that quantity.

" A caldron from Scotland 92.89 5.15 1.78"

These seem most important analyses. Then in respect of Mr. Charlesworth's remarks, I think they are of extreme value with regard to the suggestion of the first discovery of tin as utilisable ore, for the extreme weight of tin ore must, I should say, attract attention at once. Any one picking up a pebble from the stream would say, I should think, "Here is an extraordinary pebble," and would contrast the weight with the ordinary ones, and it would probably suggest to him that there was something metallic in it, as Mr. Charlesworth said; knowing, from his experience of copper and other metal ores, that metals are, as a rule, heavier than ordinary stone. Apart from that, it seems difficult to understand what could have led originally to the use of tin in conjunction with copper. The whole thing suggests a great deal of experiment and intelligence on the part of the first discoverers, and a very long line of experiments must have been carried out before the most suitable methods of working were hit upon. With regard to perforated bronze axes, I am aware that some copper axes, perforated, have been found in Hungary. I think I ought to express my obligation, if you will allow me, to Mr. Brown for so kindly coming here this evening, and I am extremely obliged to him for the most interesting remarks, and also for those specimens which he has brought before us, for I think, with him, that these discoveries of flints (and most remarkable flints they are), and the fact that they can be traced from India into Europe, does show a possible connexion between the makers of these Indian objects and of those we find in Europe, and possibly, as some one has suggested, the early manufacturers of bronze may have been Indian tinkers,—a gipsy sort of people who travelled with their art and

carried it from East to West; and possibly these implements, which no one seems to know exactly what they were used for, would be implements used by these men from India, whoever they may have been, whether tinkers or men of a more highly skilled nature; but it would be extremely interesting if we could discover their use. Some have suggested they were used for tattooing.

Mr. J. ALLEN BROWN.—I find no tattooing in India at present, even among the Hill tribes; but it does not follow that it might not be so.

The PRESIDENT.—Our thanks have already been accorded to Mr. Mello, but I think we should also offer them to Mr. Allen Brown and Mr. Charlesworth, and, indeed, to all the speakers, for their important contributions to the discussion on Mr. Mello's elaborate and interesting paper (cheers).

The meeting was then adjourned.

REMARKS ON THE FOREGOING PAPER.

PROFESSOR A. H. SAYCE, LL.D., has written as follows:—

“So far as the Accadians are concerned, we only know that they were the earlier inhabitants of Babylonia before the arrival of the Semites; that Sargon of Accad, the founder of the first Semitic Empire there, lived B.C. 3800. It is probable that the Accadians belonged to the Mongolian race, but only probable. Direct evidence is still wanting. Their language was agglutinative, and seemed to represent an early form of Turko-Tartar speech.”

MAJOR C. R. CONDER, R.E., writes:—

“I think the conclusions that metallurgy and knowledge of bronze existed first among the Turanians of Central Asia, who were settled when the Aryans and Semites were nomads, will be generally admitted. The use of tin and other metals can, among them, be traced to an earlier date than any mentioned in this paper. Akkadian is thought to have become obsolete by 1500 B.C., yet we have in Akkadian texts notice of tin, *anna*; copper, *urud*; lead, *abar*; gold, *guskin*; silver, *azag*; iron (*anbar* ?); and bronze, *zabar*. One hymn specially speaks of bronze as a mixture of copper and tin, and as this text is bilingual, no doubt exists as to the meaning.

“The Akkadian word *anna*, for ‘tin,’ appears still to survive in the Hungarian language as *ón*, and in Armenian as *anak*. The

Mongol words for tin are quite different, and in Chinese it is *sek*. The Hungarian often retains Akkadian words in recognisable form. I venture to doubt if the Phœnicians reached Spain before the foundation of Carthage in 900—800 B.C. Phœnicians bearing bronze vases are, however, represented on an Egyptian monument as early as 1600 B.C.

“The knowledge of lead, as above mentioned, seems to be of great antiquity among Akkadians. It may very probably be from Turanians that the Phœnician arts were derived, but hardly from Etruscans, who only reached Italy about 800 B.C. It was rather from the Turanians of Northern Syria,—such as the Hittites,—who dwelt in and near Phœnicia, and whose deities (Istar, Tammuz, Nergal, &c.) the Phœnicians worshipped.

“There were, no doubt, long-headed tribes in Europe before the Aryans; but it should not be forgotten that round-headed races also existed there. The Etruscans are very generally regarded as a Turanian, or round-headed race, and the Basque language is recognised as of Turanian origin, both grammar and vocabulary showing an affiliation to the Akkadian. Nor was cremation quite peculiar to Aryans; many Turanian tribes had this custom.

“Tin appears to exist in the Lebanon. I have seen samples, but no important mines are known. It may, however, have been exhausted at an early historic period. It would seem that the discovery of tin was later than the separation of the Turkic, Mongol, and Ugric stocks, since the word is not the same in these various groups of Turanian speech. The Assyrians adopted the Akkadian word (*anaki*); the Hebrews used one quite distinct, viz., אֲנָקִי (Num. xxxi. 22; Ezek. xxii. 18). The early Aryans, who knew gold and silver and a third metal (either copper or iron), did not apparently know tin. This evidence seems to restrict somewhat the anterior date of the knowledge of tin among early peoples, though bronze cannot be supposed to have been first known later than 2000 B.C. at least. In the early Buriat-Mongol dialects tin is called *sagan-tuluguiñ*, or *cagan-tulga*, or simply *tuluguiñ*. Finally, I venture to doubt if safe evidence of Chinese bronze as early as 2000 B.C. has been found, for Sinologists do not admit that the civilisation of China can be traced with any certainty to so early a date.”
