# JOURNAL OF THE TRANSACTIONS

OF

# THE VICTORIA INSTITUTE.

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VOL. XXVII.

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OF

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

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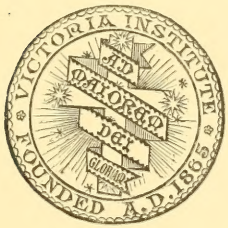


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# CONTENTS.

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# PREFACE.

THE Twenty-Seventh Volume of the *Journal of the Transactions* of the VICTORIA INSTITUTE is now issued. It is a record of the various important questions taken up in papers by competent authors, carefully investigated, and impartially discussed at Meetings by those who have studied the subjects considered; to whose opinions have been added the statements of others whom distance has prevented attending the Institute's gatherings in person. The papers and discussions in this volume are upon the following subjects:—"The work of the Institute in the present day," by the Right Hon. LORD HALSBURY, P.C., F.R.S., Vice-President; remarks by Sir HENRY BARKLY, G.C.M.G., K.C.B., F.R.S., Sir F. YOUNG, K.C.M.G., Sir J. FAYRER, M.D., K.C.S.I., F.R.S., Sir G. BUCHANAN, F.R.S., Professor E. HULL, LL.D., F.R.S., and others, are appended. "The principles of rank among animals," by Professor HENRY WEBSTER PARKER, M.D., &c., of the United States, in writing on which he, as an anatomist, briefly points out certain arguments for considering that man is "the only primate." A brief note "On the recession of Niagara Falls," by Mr. WARREN UPHAM, Assistant State Geologist. "How the waters of the ocean became salt," by Professor E. HULL, LL.D., F.R.S.; a letter from Professor TYNDALL, F.R.S.,

(the late), who saw an early proof of the paper, commences a discussion taken part in by Professor JOSEPH PRESTWICH, D.C.L., F.R.S., Mr. DAVID HOWARD, F.C.S., &c., and others. "The List of Shishak," by Monsieur G. MASPERO, being the third paper contributed by him towards the identification of ancient sites in Palestine (a map specially prepared by the author accompanies his paper); among those taking part in the discussion were Professor E. HULL, LL.D., F.R.S., Mr. F. J. BLISS, and Major CONDER, R.E., who has himself taken up the same field of enquiry, and considers that "M. MASPERO'S valuable paper throws light on a list which was previously very obscure." "An inquiry into the formation of Habit in Man," by ALFRED T. SCHOFIELD, Esq., M.D., M.R.C.S.; the discussion on which was taken part in by Dr. ALEX. HILL, M.A., Master of Downing College, Cambridge, Surgeon-General GORDON, C.B., Professor H. W. PARKER, M.D., Dr. GERARD SMITH, &c. "On the Alleged Scepticism of Kant," by W. L. COURTNEY, M.A., LL.D.; in considering which the Venerable Archdeacon W. M. SINCLAIR, D.D., the Venerable Archdeacon R. THORNTON, D.D., Professor J. H. BERNARD, D.D., Dr. T. CHAPLIN, Professor DUNS, F.R.S.E., the Rev. J. J. LIAS, M.A., and several others, took part. "On the Comparison of Asiatic Languages," by Major C. R. CONDER, R.E., D.C.L., LL.D., M.R.A.S.; Professor J. LEGGE, D.D. (of Oxford University), Mr. T. G. PINCHES, of the Oriental Department of the British Museum, the Rev. S. W. KOELLE, M.A., Ph.D., the Rev. KENNETH S. MACDONALD, M.A., D.D., and others joined in the discussion.

"A possible cause for the origin of the Tradition of the Flood," by JOSEPH PRESTWICH, D.C.L., F.R.S., F.G.S., formerly Professor of Geology in the University of Oxford; in which he treats the subject from a purely scientific standpoint: describing a mass of geological phenomena, at home

and abroad, which have long been carefully studied by him, he gives the reasons for considering that they are only to be explained on the hypothesis of a "submergence of vast extent," "an inundation of continental dimensions." A considerable number of geologists were present when the paper was read, the discussion dealt with the scientific issues presented in the paper, and was contributed to by Sir J. William Dawson, C.M.G., F.R.S., Sir H. Howorth, K.C.I.E., M.P., F.R.S., Dr. H. Woodward, F.R.S. (President of the Geological Society) Admiral H. D. Grant, C.B., R.N., Professor T. McK. Hughes, M.A., F.R.S., Professor E. Hull, LL.D., F.R.S., Professor T. Rupert Jones, F.R.S., Mr. J. Allen Brown, F.G.S., the Rev. J. M. Mello, M.A., F.G.S., Mr. Warren Upham, Assistant State Geologist, and others. Sir J. W. Dawson, in his remarks on the paper, expresses the "hope that the subject will now be followed up on both sides of the Atlantic, and will ultimately afford a sure link of connection between the geological record and the oldest historical documents of our species."

To all who have taken a part in the work done the best thanks of the Members and Associates are due; by their aid the Transactions of the Institute possess a unique value, for on each subject dealt with, these present the opinions, not of one author, but of many of those whose studies have lain in the direction of the matter taken up.

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

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## JOURNAL OF THE TRANSACTIONS.



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## ORDINARY MEETING.*

THE PRESIDENT, SIR G. G. STOKES, BART., F.R.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The PRESIDENT.—We had all hoped that Professor Prestwich—whose Paper I am glad to see is exciting such interest, to judge by the number attending this meeting—would have been with us to-day; but I am sorry to add that, to his great regret, he is unable to be present, his doctor having absolutely refused to allow him to face the journey in these east winds. Professor Rupert Jones, F.R.S., has kindly arranged with the author to read the paper, and I will now call upon him to do so. I am sure there are not any in this room who will not regret Professor Prestwich's absence more from a feeling of deep regard for him than even by reason of their own loss (applause).

Professor T. Rupert Jones, F.R.S., then read the following paper :—

### *A POSSIBLE CAUSE FOR THE ORIGIN OF THE TRADITION OF THE FLOOD.*† By JOSEPH PRESTWICH, D.C.L. (Oxon.), F.R.S., F.G.S., Corr. Inst. France, etc.

THE geologist has to interpret two very distinct classes of phenomena. Firstly, those connected with the great mass of stratified and solid Rocks, and secondly, those relating to the thin sprinkling of *débris* derived from those rocks and scattered over their surface. These latter, termed superficial or Drift deposits are, nevertheless of no less interest than the stratified rocks, as they are connected with the first appearance of Man and with the distribution of the existing Fauna and Flora on the surface of the Earth. These Drifts consist of beds of sand, gravel, and loam, sometimes showing stratification, at other times unstratified. At first they attracted but little attention, and were *all* included together under the general term of Diluvium, it being then supposed that they were due to "an universal and transient deluge," whereby the animals whose remains are buried in these beds were destroyed and their remains dispersed "by the waters

* 7th Meeting of 29th Session, 19th Mar, 1894.

† The facts on which this hypothesis is founded are only given in short abstract in this paper. The full evidence will be found in the two memoirs referred to in a note, p. 265.

of the same inundation which produced the deposits of loam and gravel in which they are imbedded."*

This view, which was held by many distinguished men, was however soon found to be untenable. An universal deluge was recognised to be a physical impossibility, while further research led to the conclusion that the superficial loams, gravel, and sand, instead of being the result of one rapid rush of waters over the surface, were due to the prolonged action of the several local agencies still acting on the surface of the globe. Such as (1) large spreads of gravel and sand are now known to have been deposited on the flanks and terraces of our valleys by the old Rivers, when, before they had excavated their channels to the present depths, they flowed at various higher levels. That this was their origin is shown by the fact that these deposits contain fluviatile shells, mostly such as now live in our rivers, together with the rolled and worn bones of the contemporary land animals. The preservation of such remains is, however, partial and irregular, because the beds in which they are entombed are in general so permeable that the percolation of the surface waters has very commonly removed the calcareous matter of the bed itself together with that of the embedded shells and bones, but, where these have been protected by beds of loam or clay, the organic remains are often well preserved. The higher and older the terrace, the more rare are the organic remains. (2) Another large series of these deposits contains rock *débris* and boulders, transported far from their native place. This was formerly looked upon as evidence of the rush of the diluvial waters, but now it is well established that these boulders have been carried to their present positions by the slow action of either land or floating Ice and not by any sudden transport by water. (3) Other portions of the Drift are of marine origin, as indicated by the presence of sea-shells, while subaërial processes, weathering, etc., have in places contributed to the general result.

In this way the origin of the larger proportion of the superficial deposits of loam, gravel, and sand has been accounted for, and shown to be due to the same agencies, though often acting with greater intensity and force than those which now act upon the surface of the land; and that so far from

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* Buckland, *Reliquiæ Diluvianæ*, pp. 184, 185.

being the result of a sudden and transient catastrophe, they result from the long continued and gradual action of known agencies, and represent the work of a long period of time.

## The Rubble-Drift.*

Nevertheless, it became evident to me, in the course of studying the Drift beds of the South of England and the North of France, that, besides the Drifts referable to known causes, there was a residue which could not be referred to any of the causes generally assigned for the formation of these deposits. Such was also the conclusion which Sir Roderick Murchison† was led to form, though he failed to eliminate some of the recognized valley-Drifts, and ascribed them generally to a wave of translation. More lately Professor James Geikie‡ has expressed a similar opinion. Speaking of certain accumulations of coarse gravels and detritus which have yielded mammalian remains and palæolithic implements, he remarks that they are spread continuously over wide districts in Southern England, and bear little or no relation to the present drainage systems of the country, and could not have been laid down by ordinary river action. In explanation of these deposits Professor Geikie adopts a suggestion of Darwin's—that their origin is to be attributed to the cold and snow of the Glacial period. Though it seems to me that in both cases reference is made to other drifts besides the Rubble-drift, and our explanations differ, still the essential fact remains of the recognition of an aberrant form of drift.

This Rubble-drift, as I have named it, is distinguished by a general want of that *wear and rounding* of the rock fragments, and of the included organic remains, which characterise the fluviatile and marine drifts, while none of the materials *are glaciated*, nor are any of them *transported from beyond the immediate vicinity of the place* of their occurrence, as is the case with beds of glacial origin.

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* I gave a short notice of this Drift in the South of England at the meeting of the British Association in Swansea in 1880, but fuller details will be found in the *Quarterly Journal of the Geological Society*, vol. xlviii, p. 326, while I have since described in the *Philosophical Transactions for the Royal Society* for 1893, p. 903, some of the chief localities where it occurs on the Continent.

† *Quart. Journ. Geol. Soc.*, vol. vii, p. 349.

‡ *Prehistoric Europe*, p. 140.

The explanation which I would suggest and which seems to me best to satisfy all the conditions of the problem is that the special character and position of this Rubble-drift are due to the submergence and subsequent re-elevation of a land surface, whereby the Fauna and Flora of the submerged area were destroyed, and their remains dispersed over the surface of the submerged land. As that surface emerged from beneath the waters, the scattered remains of that fauna, together with the loose land *débris*, were swept together down the slopes of the hills and into the valleys, leaving traces or isolated portions in any cavities or hollows over which the Rubble passed. The stone implements and weapons of Quaternary Man left and lost on the old land surface, would necessarily be mixed up with the general mass of *débris*, as would also human remains where Man had failed to escape. That such may have been the case is shown by the circumstance that the Rubble-drift contains the remains of the various Quaternary animals living at the time of its formation, together with, in places, Flint Implements of human workmanship, and in a few rare instances portions of the human skeleton itself. Although the several forms of the Rubble-drift differ widely in aspect and have been referred to different agencies, they are all concordant and admit of explanation by reference to one common cause. The following are the more common forms of this Drift in England.

*The Angular Rubble or "Head" over the Raised Beaches.*—This, which is the commoner form of this Drift in this country, has accumulated in hollows on the surface or under the lee of the old cliffs of the Raised Beaches. Owing to the existence, on the coasts of the Channel, of an old shore line, now raised 10 to 30 feet above the level of the present beach, those conditions are often present, the Old Cliffs being generally masked and hidden by a mass of this Rubble. The idea that it was a mere talus was soon abandoned, because the *débris* does not lie at the angle of repose assumed by a talus, and because it contains blocks of stone not belonging to the cliff, but that have come from beds at some distance inland. Amongst the best examples of the "*Head*," as it has been termed, overlying the Raised Beaches, are the masses of rubble exhibited in the cliff immediately east of Brighton, and on the cliffs at Portland Bill, Hope's Nose near Torquay, and at Baggy Point near Barnstaple.

The two most usual explanations that have been proposed to account for the *Head* are, 1st, that the rubble was driven over the old cliffs at a time of excessive rainfall during the late Quaternary or Glacial period; 2nd, that during the Glacial period, sheets of frozen snow or ice slid down the hill slopes above, and carried with them the *débris* of the surface. The objection to the first is that the rain draining off the land would have worn water-channels, and the *débris* would have been spread out in the form of cones of dejection and would also have been waterworn; whereas there are no special water-channels, and the *débris* is spread over the cliff edge in the form of broad sheets conterminous with the extent of the cliff itself. Nor, as a rule, are the rock or bone fragments in any degree worn. For these and other reasons given in the paper read before the Geological Society,* this cause must be considered inadequate.

The agency of Snow and Ice is open to fewer objections. It would in fact account for many of the phenomena. Where the slopes were sufficient, frozen masses of snow or sludge might carry down with them the surface *débris* and lodge it at the foot of the cliff or slope, but the angles of the slopes above, and the extent of the gathering grounds, are in most cases insufficient, and no instances are recorded where such *débris*, formed at the present day, contains perfect land shells and sharply fractured bones. The grinding of the mass, as it slid down, would be fatal to the preservation of fragile shells, and to the retention of the sharp angles of the bones. A still more serious objection to either of these causes is the distance to which the *débris* has been projected and the large blocks moved, of both of which we shall give instances presently. It must be borne in mind also that it is very unlikely that a surface subject to the frequent occurrence of these slides could contain organic remains of the character found in the *Head*. As often happens, explanations are tendered in consequence of their satisfying some of the conditions of the problem, but without satisfying others, or having regard to the consequences which must ensue were the assumption adopted.

*Ossiferous Fissures.*—Another feature connected with one phase of the Rubble-drift is that relating to the fissures, often

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* *Quart. Journ.* for 1892, p. 326.

of large size, so common in some limestone districts, filled to the brim with a breccia of limestone fragments, imbedded in a red earth or loam, and generally cemented by calcite. In this rubble, bones of extinct mammalia, and occasionally land shells, are not unfrequently met with. The only locality in England where these Ossiferous Fissures are common, is the neighbourhood of Plymouth. On the shores of the Mediterranean they occur in many places.

The origin of these Ossiferous Fissures has been attributed to the circumstance of rents in the rocks formed during the Quaternary period having been long left open. Into these it was supposed that, from time to time, animals fell, as they do now in similar unprotected pitfalls, or else that they were driven into them when pursued by beasts of prey. The washing in of the soil by streams and the fall of fragments from the side rock were supposed to have gradually filled the fissures. But there is nothing to show the presence and action of streams, or to indicate that the process was a long one. On the contrary, there are *no water-worn materials*, and the bones are all in the same *unworn condition*, nor do they show any of the ordinary effects of weathering. Besides, had the bones been those of animals *which had fallen into the fissures, the entire skeletons of those animals should be there*, though the bones might be displaced. So far from that being the case, the occurrence of an entire skeleton is a rare and exceptional event. It is rare even to find the bones of a single limb in relative position. The *bones are dispersed without order*, teeth largely predominating, and entire bones being comparatively scarce, whilst broken fragments and splinters abound. These, I conceive, are fatal objections to the explanation that the bones are those of animals which fell into the fissures whilst alive.

The following list, the result of the collection made by an early visitor to one of the Fossiliferous Fissures near Plymouth, will serve to show the character of the animals and the relative proportion and abundance of their bones.

| | Teeth. | Jaws. | Vertebræ and portions of skulls and bones more or less perfect. | Fragments of bones without distinct characters. |
|---|---|---|---|---|
| Cave tiger ....<br>Cave hyæna ....<br>Wild boar ....<br>Fossil horse ...<br>Ox ....<br>Deer ....<br>Wolf ....<br>Fox ....<br>Hare ....<br>Water rat .... | 1,587 | 147 | 279 | 1,000 |

In addition to the above, there have since been found by later observers, remains of—

| | |
|---|---|
| Mammoth. | Reindeer |
| Rhinoceros (two species). | Bear (two species). |
| Hippopotamus. | Bison. |

Human remains are also reported to have been found in one of the fissures, but this wants confirmation.

These fissures are sometimes spoken of as bone-caves, but the condition of the bones is entirely different from those found in true bone-caves, where they are in greater part more or less *gnawed by carnivora*, and also from those found in river deposits, where they are more or less *rolled;* but they agree exactly both in *species* and *condition* with those found in the *Head* or Rubble-drift. In both instances they are almost all broken, and the fractured surfaces *retain their sharp angles;* in both the bones occur detached and without order, and in both *land-shells* are occasionally found. It is to be inferred from this that the two deposits are closely related, though occurring under different conditions—not, however, so different in reality as in form—the one having been drifted into rents on the surface, and the other swept into hollows or over the face of old sea cliffs which were thereby swamped and hidden.

The structure of the Rubble-drift, as exhibited in the *Head* which overlies the beaches, suggests its origin. It is composed of alternate layers of *débris* of the adjacent rocks, and where the strata consist, as at Brighton, of a soft rock with

intercalated hard bands (of flint), these materials (or rather their *débris*) alternate in the *head*—not with the regularity of stratified strata, but irregularly, and with much confusion, the upper bed especially being rolled over and *thrown back*, as though by some sudden *strong driving force*. It is possible to conceive that a rubble of this character might have been projected on the old cliff by an ice or snow slide, were it not for the objections I have before urged, and the fact of finding, as at Brighton, large angular blocks of rock that have been transported from a distance of a mile or more inland, and must have required considerable force to move. At the same time there are intercalated beds of fine chalk silt, sometimes laminated, and at Sangatte containing uninjured fragile land shells, which could not have been subjected to rough treatment. A body of water acting under great pressure, and with varying velocity as the land rose, could, I conceive, alone have accomplished these variable results.

The late Mr. Hopkins* of Cambridge has shown that, if a considerable area at the bottom of the sea were *suddenly* elevated, *a wave of translation*, accompanied by a current, the velocity of which would depend principally upon the depth of the sea, would diverge in all directions from the central disturbance. Calculations, he says, "prove beyond all doubt that paroxysmal elevations, beneath the sea, varying from 50 to 100 feet in height, may produce currents of which the velocities shall vary from at least 5 or 6 to 15 or 20 miles an hour, provided the depth of the sea do not exceed 800 or 1,000 feet." In considering the magnitude of the blocks which might be moved, he found that the force exerted on a surface of given magnitude *increases as the square of the velocity*, and that it "varies *as the sixth power of the velocity of the current*." But the movements must be repeated for large blocks to travel beyond short distances.

It is evident that we have in this form of disturbance an engine of enormous power, and, though our hypothesis does not deal with the greater movements and powerful currents contemplated by Mr. Hopkins, we may infer what the results might be with changes having even only a fraction of such magnitude. Movements of this character would, like Nasmyth's hammer, be capable at times, when the uplift was rapid, of exerting enormous force; while at other times, when the

* *Quart. Journ. Geol. Soc.*, vol. iv, p. 90.

uplift was slow, the action might be of the most gentle description. It follows from these premises that the character of the deposits formed under such circumstances will afford an approximately relative measure of the velocity and duration of the currents under which they were accumulated. Where, for example, the sediment is fine, we may conclude that the velocity was slow and the rise which gave origin to it small. Where, on the contrary, the materials are coarse, we may suppose the rise to have been more rapid and the velocity of the current greater, though they might have been continuous.

These considerations, added to the circumstance that this rubble contains the remains of *a land fauna only*, led me to conclude that the South of England had been submerged at the close of the Post-glacial period to the depth of not less than about 1,000 feet, for to that height there are traces of this Rubble-drift. As the surface of the submerged area shows no marine terraces indicating periods of rest, it may be inferred that the submergence was comparatively slow and gradual, the only disturbance being the removal of the finer surface materials with which the waters would become charged. On the other hand, the alternation of fine and coarse materials in the *head* indicates that the upheaval was by movements alternately slow and rapid, during the latter of which the *débris* of the surface so submerged was swept down to lower levels, or lodged in the Hollows and Fissures of that surface, together with the remains of the animals and land shells that had inhabited the submerged land. I conclude further, from the absence of marine sedimentation and of marine shells on the area that had been submerged, that the submergence was of too short duration to admit of such sedimentation or to afford time for the immigration of a marine fauna from adjacent unsubmerged submarine areas.

*The Phases of the Rubble-drift on the Continent and Mediterranean Coasts.*—The Rubble-drift of the Continent, which is met with at various places over Western Europe and along the coasts of the Mediterranean, accords perfectly with that of the South of England. But it presents in addition other phenomena, which, although differing in detail, bear the same interpretation, and point to the same common origin, and are all explicable on the hypothesis of a comparatively recent, geologically speaking, submergence of the land. We may mention a few of these phases and places.

Passing by the fine specimen of Raised Beach and "*Head*"

at Sangatte, near Calais, which is identical with the section at Brighton, the old Beach in the estuary of the Somme, and the traces of "*Head*" on the coasts of Normandy, we come to the novel and very illustrative case furnished by the Channel Islands. Both Guernsey and Jersey consist in greater part of a table-land of granitic and metamorphic rocks 300 to 400 feet high, more or less covered by a deposit, 5 to 20 feet thick, of loam or Loess, and terminating in high cliffs. At the foot of these are occasional remnants of an old Raised Beach, 6 to 20 feet above the present beach, surmounted by a sloping "*Head*" composed of rock fragments and loam carried down from the hills inland. It is certain that it is not a mere talus, for the rubble has a base of loam identical with that on the central plateau, and the *débris* has often been propelled to considerable distance outwards from the foot of the cliffs.

The plateau loam or Loess deserves special attention, for, as there are no rivers to have originated flood waters, this Loess cannot have had a fluviatile origin; nor, as there is no higher ground, could it be the result of rain-wash; neither can it be the result of the disintegration of the surface rocks.* It must therefore have had an origin different from that usually ascribed to the *Loess*, and this I would attribute to the deposition of sediment from the turbid sea-waters during submergence, whilst the "*head*" results from the surface *débris*, together with portions of this loamy sediment, swept off by divergent currents in quaquaversal directions during upheaval. Considering the then isolation of these islands, no other explanation seems to me possible to account for the presence of Loess in such a position. The cause must have been continental, not insular.

*The High-level Loess of France and Central Europe.*—A great portion of the Loess of Europe is no doubt of fluviatile origin, and is confined to river valleys. But there is a still larger portion, to which such an origin cannot be ascribed, for this latter is not confined to the river valleys, but is found on the dividing watersheds and on the high plains separating the river basins. In the North of France it attains a height of 400 to 600 feet, and in the neighbourhood

* No land shells have been found in this loam in either Jersey or Guernsey, but they have been found in a similar deposit in the island of Bréhat on the coast of Brittany.

of Lyons of 1,300 feet, whilst in the great upper valleys of the Rhine and Danube it reaches an altitude of 1,500 feet, which is even exceeded further to the east. It likewise covers the high plains of Hungary and Southern Russia. Various theories have been proposed to account for this wide dispersion of the Loess, the principal of which attribute its formation :—1. To a depression of Central Europe whereby the gradient of the upper valleys was greatly reduced, while no change of level occurred nearer the sea.* 2. To the advance of the great northern ice sheet, blocking the large rivers of Central Europe, and damming back their waters, and so flooding the land.† 3. To high winds acting upon disintegrated rock surfaces.‡ There are grave objections, which I have specified in the papers before referred to, to all these views. Such an accumulation of silt would, however, necessarily be one of the consequences of the submergence suggested. It is such a sedimentation as would fall from the turbid waters as they slowly advanced or rested, whilst as they retreated those portions of the sediment most exposed to the effluent currents would again be swept away, and spread over lower levels. And in this case, as in those of the other phases of the Rubble-drift, the organic remains of this Loess are those of the Quaternary *land fauna* living in the respective districts at the time of the inundation, and include in several instances the remains of Man. It tells therefore the same tale as the Angular Rubble and "*Head*."

*The Ossiferous Breccias of the Continent.*—FRANCE. On some of the hill slopes in inland parts of France and again on the face of the precipitous hills on the coast near Mentone, there are masses of angular *débris* of local origin containing the remains of extinct Quaternary Mammalia with occasional traces of the works of Man. The same rubble masks some of the celebrated bone-caves of Belgium, and forms slopes covering the cave-beds at their entrance.

It is, however, where this rubble has been swept into Fissures and Cavities that it is best preserved and presents the most interesting features. As before mentioned, a few such fissures, occasionally ossiferous, occur in the limestone rocks around Plymouth, but they are more common on the Mediterranean

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* Lyell, *Antiquity of Man*, p. 383.
† Belt, *Quart. Journ. Geol. Soc.*, vol. xxx, p. 490.
‡ Richthofen, *Geol. Mag.* for 1882.

coast of France. Nor are they wanting inland. To take a few of the more illustrative cases, such for example as those of Nice, Pédémar, Santenay, &c. At all these places the breccia contains the remains of the *Mammoth*, the *Woolly Rhinoceros*, and other Quaternary animals. It is a remarkable fact that these fissures are generally situated on *isolated hills* often of considerable height. In explanation of the presence of the animal remains, it has been suggested that the bones are those of animals which fell into the fissures while still open, or else that they were remains brought together by predaceous animals. But neither of these opinions can be correct, for *no skeleton is found entire*, very few of the *bones are in their relative position*, and none of the bones *have been gnawed* by carnivora. As M. Gaudry asks in discussing the facts presented by the fissure on the "Montagne de Santenay"—a flat-topped hill near Chalons-sur-Saône—"Why should so many Wolves, Bears, Horses, and Oxen have ascended a hill isolated on all sides?" The members of the Geological Society of France present at the *réunion* at which this remark was made, seemed to agree that the animals had met their death by drowning, but in what way was left indeterminate.*

In most of these cases, those hills rise *in the midst of plains or low grounds*. At Nice the hills are 132 and 436 feet high, at Antibes, 250 feet, and at Cette, which resembles on a small scale the Rock of Gibraltar, the hill rises 355 feet above the sea level. Still more formidable are the hills inland. Mont Pédémar (Gard) rises to a height of 1,128 feet, whilst Santenay is not less than 1,640 feet high. Among the animal remains found in the Ossiferous Fissures are those of—

| | | | |
|---|---|---|---|
| 5 Carnivores | Felis.<br>Lynx.<br>Wolf.<br>Hyæna.<br>Bear. | 4 Ungulates | Mammoth.<br>Rhinoceros.<br>Wild Boar.<br>Horse. |
| 2 Rodents | Lagomys.<br>Hare. | 3 Ruminants | Ox.<br>Deer.<br>Antelope. |

Together with *land shells* of various living species. The breccia, which is composed of *sharp angular* fragments of the *local* rocks usually imbedded in a matrix of red clay or loam, is

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* *Bull. Soc. Géol. de France*, 3rd series, vol. v, p. 681.

generally cemented by calcite. The bones are mostly broken and splintered into innumerable sharp fragments, and evidently *are not those of animals devoured by beasts of prey; nor have they been broken by man.* It is not possible to suppose that animals of such different natures, and of such different habitats, could in life ever have herded together. Difficult as the alternative is, I see no other explanation of the phenomena than that of a wide-spread temporary submergence, accompanied by strong earth tremors. In such a case it is easy to conceive that as the waters gradually advanced over the low lands, the animals of the plains would naturally seek safety on the higher grounds and hills. Flying in terror, and cowed by the common danger, the Ruminants and other Herbivores, together with the Carnivores, would, as in the case of the flooding of large deltas in our days, alike seek refuge on the same safety spot. Where that spot was an isolated hill, they would, if it were not out of reach of the flood waters, eventually suffer the same fate. Subsequently the detached limbs and bones, carried, as the land rose again, together with the surface *débris*, by the effluent currents into the open fissures, were subjected to the clashing of the rubble and the fall of large fragments of rock from the sides of the fissures—whence the reason of their having been so generally crushed and broken.

An early French geologist—an able and acute observer—after noting the presence of land shells and bones in a state of disorder in the Ossiferous Fissures of Nice was led incidentally to remark that they seemed as if thrown in by an angry sea invading the land.

Gibraltar.* The Atlantic waves have left few traces of Raised Beaches and "head" on the Western Coasts of Spain and Portugal, but on the Rock of Gibraltar there are traces of several such beaches, covered in places by local angular rubble (or *head*). This rubble extends over the lower slopes of the Rock on both sides. On the Western side it is projected 550 yards seaward at an angle of 8° to 9° (sometimes even less) and attains a thickness of 100 feet. It is clearly not a talus, nor is it a cone of dejection. Its origin has been referred to two periods of severe cold and snow slides. The

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* Sir A. Ramsay and Prof. Jas. Geikie, *Quart. Journ. Geol. Soc.*, vol. xxxiv, p. 505. G. Busk, *Trans. Zool. Soc.* vol. x, pt. 2.

objections to this are the great volume of the detritus, the size of the blocks (some being 12 *feet in diameter*), and the distance to which it is projected compared to the very limited snow-collecting surface, and the *small angle of slope.* The Ossiferous Fissures of Gibraltar are on a very large scale, and contain remains of *Felis, Hyæna, Bear, Rhinoceros, Wild Boar, Ibex, Ox, Horse, Deer, Hare.* The bones are, as usual, much broken and splintered, and Dr. Falconer tells us that *none belonged to an entire skeleton.* A human molar tooth and some worked flint flakes were also found in this breccia.

It has been suggested that these remains are those of animals that had lived and died on the Rock, and were afterwards washed into the fissures by heavy rains. But this is difficult to conceive, and besides, there is the same incompatibility in the habits and resorts of the animals thus associated as in the other fissures before mentioned. The *Hyænæ, Felidæ, and Bears* might have frequented the dens and crags of the Rock, but the *Deer, Bovidæ, Horse,* and others must have lived in the surrounding plains, and it has not been suggested that they were carried to the Rock by carnivora. A great and common danger alone could have driven together the animals of the plains and of the crags and caves. As the Rock after its submergence was again upheaved, the currents swept down on both sides of it the *débris* of the limestone disintegrated by the previous long glacial cold, together with the scattered remains of the animals and men drowned by the inundating waters. That the propelling force of the effluent waters was great, is shown by the distance to which the breccia extends from the base of the Rock. The scale is different, and the materials are different, but in all essential respects the phenomena are analogous to those presented by the "*head*" at Brighton and Sangatte. There is the same restriction to local *débris* with large blocks, the same absence of wear, the same traces of rude bedding, and the same occasional presence of mammalian remains.

Sicily.* Traces of similar phenomena exist in Sardinia, Corsica, Italy, and on the coast of Dalmatia. The remarkable

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* Dr. Christie, *Phil. Mag.* for Oct. 1831, p. 1. Dr. Falconer, *Quart. Journ. Geol. Soc.*, vol. xvi, p. 99.

caves of Sicily arrest attention from the extraordinary quantity of bones of *Hippopotami* (most of them broken, and belonging to hundreds of individuals) which were found in connexion with them. Twenty tons of these bones were shipped from the one cave of San Ciro, near Palermo, within the first six months of working, and they were so fresh that they were sent to Marseilles to furnish animal charcoal for use in the sugar factories. How could this bone breccia have been accumulated? No predaceous animals could have brought together or left such a collection, and though Hyænæ lived on the island, they have left no traces of their presence, nor marks of their teeth, in this wonderful mass of bones. This breccia has been classed with the breccia of bone-caves, but the bones are *not gnawed* as is the case with the bones of the caves, and, besides, they are the bones almost exclusively of *Hippopotami*, of which the remains are very rare in caves. The only other suggestion that has been made is that the bones are those of successive generations of *Hippopotami* which went there to die. But this is not the habit of the animal, and besides the bones are those of animals *of all ages down to the fœtus*, nor do the bones show traces of weathering or exposure.

The explanation which suggests itself to me is founded on the local topographical features of the island. The plain of Palermo is encircled by an amphitheatre of hills, rising to the height of 2,000 to 3,000 feet, and presenting mural precipices towards the plain. The Caves are situated near the base of this escarpment, and at San Ciro the breccia extends to some distance *in front* and *on either side* of the cave. When, therefore, the island was submerged, the animals in the plain of Palermo would naturally retreat, as the waters advanced, deeper into the amphitheatre of hills until they found themselves embayed, as in a seine, with promontories running out to sea on either side, and a mural precipice in front. As the area became more and more circumscribed the animals must have thronged together in vast multitudes, crushing into the more accessible caves, and swarming over the ground at their entrance, until overtaken by the waters and destroyed. A few of the more agile animals may have escaped to higher unsubmerged ground inland, for, though the remains of *Deer*, *Ox*, *Bear*, and *Felidæ* occur, they are exceedingly scarce; but the unwieldy *Hippopotami* perished in hundreds. As the land afterwards emerged by intermittent

stages, the rocky *débris*, followed by large blocks from the sides of the hills, were hurled down, crushing and smashing the bones, which are, with few exceptions, broken into thousands of fragments. I would account for the enormous numbers of *Hippopotami* by the fact that, after the formation of the Raised Beaches, there was a considerable elevation of the coast, which led, as in more North-western Europe, to a large increase of the land area: so that the plain of Palermo may then have been of greater extent, and the rivers much larger.

Malta.* The drift deposits of Malta present on the whole the same general features as those of Sicily, but owing to its peculiar population of *dwarf Elephants* with the *small Hippopotamus*, and the absence of other usual Quaternary Mammalia, the faunal remains have a distinct local colouring. They indicate that Malta had been long isolated before the spread of the Rubble-drift; but, nevertheless, it is evident that it did not escape the catastrophe which affected the adjacent lands. On the south side of the island escarped rocks rise abruptly to the height of 200 to 300 feet. The lower part of these slopes is covered by a consolidated red breccia consisting of angular fragments of the adjacent rocks, mixed with the red earth which covers the hill tops. This breccia, which contains in places remains of the *pigmy Elephant*, I take to be the representative of the "*head*" at Brighton and Sangatte, only in this instance the height of the escarpment has prevented its being entirely masked as were the old cliffs at those places. It resembles closely the breccia on the Mentone slopes. It is probable that this island, no part of which exceeds a height of 800 feet, was entirely submerged, for not a single species nor even one genus of its Quaternary Mammalia are now living on the island, nor did any of its peculiar forms pass to the adjacent lands.

Greece. The surface deposits of Turkey and Southern Russia are seemingly in general accordance with those I have just described. The rubble beds are, however, better developed in Greece, and are there occasionally ossiferous. An angular rubble forms great sheets extending to the shore,

* Admiral Spratt, *Quart. Journ. Geol. Soc.*, vol. xxiii. Dr. Leith Adams, *The Nile Valley and Malta*, p. 161.

where it is worn back, and forms cliffs 30 to 40 feet high. The present torrents cut through this drift and carry down its *débris*, spreading it out on the coast in the form of cones of dejection, in which it has often become re-cemented like the older breccia from which it is derived. On the adjacent island of Cerigo, Ossiferous Fissures, said to contain *human* remains, occur on the summit of an isolated flat-topped hill. This discovery has never been followed up.

Asia Minor. A Raised Beach, 5 to 30 feet above the present sea level, surrounds Cyprus, but it does not appear to be accompanied by a *head*, though a sandy bed, "like Loess," overlies it in places. Nor is there any record of Ossiferous breccia or fissures. This may be owing to the submergence here having been small.

On the coast of Palestine* Raised Beaches range up to the height of 220 feet or more, but I cannot find any record of an overlying rubble or *head*, unless it be represented in part by a bed of red sand near Beyrout, described by Sir William Dawson. Traces of a bone-breccia, of uncertain relations, have also been found near Beyrout, and detrital deposits are alluded to. The best preserved bone-cave there appears to be of Neolithic age. No distinct Ossiferous Fissures have been noticed. I conclude that the submergence, if any, of this district must have been small, whilst of its extension eastward or northward we want further evidence. Monsieur L. Lartet states that stone implements of the Palæolithic type have been found near Bethlehem, and in some other places; but they were on the surface, and give us no clue to the circumstances which led to their being in their present position.

North Africa. The coast of North Africa presents confirmatory evidence. It is fringed by Raised Beaches—one in particular, 10 to 40 feet above the sea-level, is very constant. Ossiferous Fissures are met with on the coast of Tetuan, Oran and other places in Algeria. They present the same characters and contain the remains of similar animals as those found at Nice and Gibraltar. The fissures do not, however, seem to extend to the eastward of Algeria, for none have been recorded in the province of Constantine, though there is

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* Louis Lartet, *Géologie de la Palestine.* Prof. E. Hull's *Western Palestine.*

a breccia which is suggestive of a Rubble-drift. In Algeria* Palæolithic flint implements have also been found in a few places on the surface.

Eastward of Tunis, the country has been described as consisting of rolling hills of Cretaceous rocks in a sea of Quaternary drift, which, from the account given of it, resembles a Rubble-drift: but Osseous Breccias and Fissures seem absent. It would appear, therefore, that, just as on the north shores of the Mediterranean, the evidence of submergence becomes less as we proceed from west to east along the African coast.

Egypt.† It may in fact be a question whether the submergence extended in this direction beyond the Lybian Desert. The escarped limestone hills and long lines of quarries in Egypt show no Ossiferous Fissures, nor does there seem to be any Rubble-drift overlying the fluviatile terraces of the Nile, or underlying the river Alluvium. Nevertheless there is reason to believe that Palæolithic Man did exist there, for ordinary Flint Implements of the same type as those of the Thames and Somme Valleys have been found; but they were all on the surface, and none are from any deposit of well-ascertained Quaternary age. It is possible that they may have remained there, or in some fluviatile deposits since Palæolithic Man inhabited the land. It may further be noticed that several of the animals which disappeared with the Rubble-drift in the more western districts, such as *Lion*, *Panther*, *Spotted Hyæna*, *Hippopotamus*, *African Elephant*, *Caffir Cat*, survived in the Nile Valley to historic times.

## Conclusion.

In concluding I would observe that all the phases of the Rubble-drift have certain characters such as show a common origin. Briefly, whether it be the Rubble or *Head* over the Raised Beaches, the *Osseous breccia* on slopes, or the *Ossiferous fissures*, the materials of all of them present a complete absence of that wear which must result from river, sea, or ice action; in all cases they are of *local* origin, while all the faunal remains in these, and in one division of the *Loess*, are such as might have come from the wreck of a *land*

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* Sir John Lubbock, *Jour. Anthrop. Inst.*, vol. x, p. 316.

† Sir W. Dawson, *Egypt and Syria;* L. Adams, *op. cit.*

*surface*, and a land surface only. The bones of the animals have evidently been subjected to considerable but not lasting violence, for they are *broken* and *splintered*, yet *not worn;* and though these remains are associated together in as it were a common grave, it is impossible to suppose that, under the ordinary conditions of animal existence, such dissimilar orders could have been associated in life; nor, as the bones are *free from all traces of gnawing*, could those remains have been collected and left by beasts of prey. These concurrent conditions, together with the mode of dispersion of the Rubble-drift from many *independent centres*, seem to me, howsoever startling may be the conclusion, to be only explicable upon the hypothesis of a wide-spread, though local, and short submergence followed by early re-elevation, and this hypothesis will, I think, be found to satisfy all the important conditions of the problem.

In the first place the Rubble-drift overlies all the other superficial deposits, and is therefore clearly the result of the last geological event that preceded the recent Alluvial beds and Neolithic man. Nowhere between the Rubble-drift and the Alluvial beds have there been found any deposits of Quaternary age. Nor has there been any land-erosion indicating a long lapse of time, though we have a fairly definite measure of marine denudation in the wear of the Rubble-drift where it has been exposed to the action of the sea, as on the coasts of Cornwall, at Brighton, Barnstaple, Sangatte, and around the islands of Jersey and Guernsey, and on the shores of the Mediterranean. But the cliffs so formed would certainly require no very great length of time for their formation, as in no case do they seem to be worn back more than half-a-mile, whilst in many cases it is not more than 100 to 200 feet. Reckoning therefore a mean rate of wear on the coasts of the Channel say at one foot annually, this comes well within the limits of date I have assigned to the Rubble-drift.

On Croll's estimate, however, for which Geologists mostly have contended, a period of some 80,000 years intervened between the disappearance of Palæolithic Man, with the cotemporary extinct Mammalia of the Post-glacial period, and the advent of Neolithic Man. Many years ago I expressed an opinion, in which I am confirmed by the recent observations of American geologists, that the close of the Glacial period comes down to within about 10,000 to 12,000 years of our own times. Not only is there nothing on geological grounds

to sustain the opinion that a period of 70,000 to 80,000 years intervened between the close of the Glacial period and the appearance of Neolithic Man, but the same conclusion is forced on us on archæological grounds alone; for it is difficult to suppose that Palæolithic Man with his stone weapons and tools, his sculptured bones and rude but not inartistic sketches of the cotemporary animals, could in that long interval of time have made so little progress as that exhibited by the similar surroundings of Neolithic Man.

To those who have followed me in this enquiry it cannot have escaped notice that we have possibly in the wide-spread catastrophe involved in the foregoing hypothesis, a more adequate cause for the Tradition of the Flood than any local river or land flood, however great it may have been. Such floods, whether of the Euphrates, the Tigris, or any other large river, have been recurrent at comparatively short intervals, and have attracted but little more than temporary attention. Their limits also are restricted to the valleys, broad though they may be, and consequently would seem to involve no such wide-spread catastrophe as that indicated by the Tradition of the Flood. Even those of the Yellow River, extensive as its inundations are, make but little impression on a busy people, and are generally soon forgotten.

On the other hand we have in this submergence an inundation of continental dimensions, and destructive to large populations of men and animals. The few who resorted to heights and mountain summits, could alone have escaped, and, from those centres, peopled afresh the surrounding areas.

Although our knowledge of all the phenomena is still very imperfect, it is remarkable how in all the leading points the facts agree with the Tradition. In each area the few survivors may well, in their limited world, have looked upon the Flood as universal. To them, as the subsidence was slow, for the land movement would not have been apparent, and the only visible sign must have been the slow encroachment of the waters over their visible land. The geological phenomena have also led me to suppose that the submergence was, as in the Tradition, of short duration, and the retreat of the waters comparatively gradual, while the great destruction of animal life is sufficiently shown in the numerous remains preserved in the different forms of the Rubble-drift, wherever the conditions were favourable.

That Man lived at the time we are speaking of is now a question not necessary to argue, since the fact of the existence of Palæolithic or Quaternary Man over the whole of the area we have described, is, at the present day, a well-established fact. Therefore that Early Man must have suffered in this great catastrophe may be taken for granted, as the dispersion of the Rubble-drift took place at the close of the Quaternary period. At the same time, although portions of the *human* skeleton have been found in Quaternary bone-caves and in the high-level Loess, it is chiefly by his stone tools and weapons that the presence of Man in the Quaternary period has been proved. In the Rubble-drift there are very scarce records of human remains, but flint implements fashioned by the hand of Man have been discovered in it at Portslade near Brighton, at Sangatte, Mentone, Algeria, and other places. Little systematic search has, however, yet been made, and the field is a new one. Besides the older settled countries of Central Asia in which the tradition was preserved, that a not inconsiderable population was spread over Western Europe and the shores of the Mediterranean, at a time anterior to the Rubble-drift, is certain. Still further proofs of Man having been involved in this wide-spread catastrophe should be forthcoming, although, owing no doubt partly to his having known better how to avoid the threatened danger, his remains are rare in comparison with those of the cotemporary animals. It must also be remembered that at that time there were but few men compared with the vast number of animals to be affected by the event.

It is not easy to believe that any local river- or other land-flood could have given rise to so sustained a Tradition as that of the Flood, whereas a Submergence of this vast extent, and of so exceptional a character, would be in accordance with the magnitude of the recorded catastrophe, and of the deep and lasting impression produced on those cotemporary peoples who were sufficiently near to be cognisant of its results. Nor would it accord less well with the remoteness of the event, and the dimness of the Tradition.*

* It is many years since first I had occasion to notice the exceptional nature of the "*Head*" at Sangatte, but I did not then go beyond attributing its formation to some temporary but unknown *débâcle*; and it was on geological considerations alone I was led to conclude that the South of

The annexed short table will serve to show the chronological relation of the Rubble-drift to the other Drift and Alluvial beds:—

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|---|---|
| Alluvial Beds | Containing the remains of the *existing Fauna* and of *Neolithic Man*. |
| Rubble-drift .. | Containing the scattered remains of a Post-glacial Land surface and Fauna with scarce traces of *Palæolithic Man*. |
| Valley-Gravels and Caves of Post-glacial Age. | With abundant remains of the late *Quaternary Fauna*, including the great extinct Mammalia (Mammoth, Woolly Rhinoceros, various Deer, Horse, Bovidæ, &c.), together with a large number of rude Stone Implements of *Palæolithic Man*. This Fauna marks the close of the Glacial Period (taking its divisions to be Pre-glacial, Mid-glacial, and Post-glacial). |

England and North of France had undergone submergence and re-elevation at a comparatively recent period. Later on, it was the recognition of similar phenomena elsewhere on the Continent which led me to extend this conclusion.

The PRESIDENT (Sir G. G. STOKES, Bart.).—I am sure all present will join in according best thanks to Professor Prestwich for this very elaborate communication (cheers), and only regret that he is not able to be here himself to join in the discussion which I hope will now take place. (Cheers.) We must, however, not forget to thank Professor Rupert Jones for the part he has so kindly taken as reader. As a number of distinguished geologists are present, I hope we shall hear some of their opinions, after a communication has been read.

The HON. SECRETARY.—Several letters of regret have been received from those unable to be present, including one from the Duke of Argyll.

The communication which has been referred to is from Sir J. William Dawson, C.M.G., F.R.S.

MONTREAL,
*February 9th*, 1894.

To the Victoria Institute.

"I beg to thank you for your kindness in sending me an early proof of the interesting paper of my friend Dr. Prestwich. As you are aware, I have for years, on geological and palæontological grounds, maintained the existence of a physical break between the earlier and later portions of the Anthropic Age, and that this was of the nature of a temporary submergence which would probably prove to be identical with the historical deluge. The conviction of the truth of this theory has been growing upon me in recent years, owing to the accumulation of new facts. You may remember that I stated it distinctly in my paper of 1884 (vol. xviii), on the Lebanon caves, published in the Transactions of the Institute, and more recently in a note on another occasion. I have referred to the subject in my Address as President of the Geological Society of America, delivered in Boston in December last, and of which I hope soon to send copies to the Institute. In this Address I have noticed Dr. Prestwich's recent memoir in the Transactions of the Royal Society of London, and have directed the attention of the members of the Geological Society to the importance of similar observations in America, in relation to deposits resembling the Rubble-drift, but not yet satisfactorily separated from the Glacial beds.

"It is a source of much gratification to me that Dr. Prestwich has accumulated so great a mass of facts as to the results of this comparatively recent catastrophe, and I hope the subject will now

be followed up on both sides of the Atlantic, and will ultimately afford a sure link of connection between the geological record and the oldest historical documents of our species."

Dr. H. Woodward, F.R.S., a visitor, President of the Geologica Society.—I have been asked to move a vote of thanks to Dr. Prestwich. I am quite sure, sir, that no words of mine are needed to express the feeling which the name of Professor Prestwich must awaken in the minds of all those present. As a geologist he occupies a unique position as the father of our science at the present time. I have, when quite a boy, listened to him at the Geological Society, and ever since I have been in London I have had the advantage of his friendship and constant kindness. I cannot well find words to express the warm feeling of regard that I have for Professor Prestwich. As a worker he has, perhaps, done more than any other man to bring our science into the first position as an applied science. In his researches he has devoted himself especially to two subjects. His earliest investigation was on the geology of Coalbrook-Dale, and that, I presume, led to his taking a deep interest in all pre-existing land surfaces. The old land surface of the Coal Period first suggested to his mind the idea of working out a later exploration of the Tertiary Period, and he has, in these later researches, formulated an entirely new period of Geological History, viz., that of the Quaternary Period. It is remarkable that through Professor Prestwich's researches we have become, as it were, acquainted with a new chapter in the geological record, a chapter which had entirely escaped the attention of all the earlier geologists. He has spent very many years in the investigation not only of the Ossiferous caves and superficial deposits, the valley gravels and alluviums in this country, but also in France and Belgium, and his papers in the *Philosophical Transactions* and geological journals teem with matters of great importance on Quaternary Geology. His work with regard to the erosion of river valleys is, perhaps, one of the most important of his later investigations. He has shown that in our valleys we have a series of terraces, one above the other, and that, contrary to the ordinary way in which we reckon formations (that the lowest is the oldest and the highest the newest), the oldest terraces are the highest, and represent the earliest conditions of the land before the rivers had cut their valleys down to their present depth, so that we find the record of palæolithic man high

above the level of the present river on the old alluvial plain through which the river flowed before it reached the present excavation of the valley. This is another subject with which Professor Prestwich will be long associated in the history of geological science, namely, in connection with river terraces.

From the writings of Moses and from the Assyrian tablets, we know of the Deluge. We know too, that such records of floods have been common in the history of all nations. I do not suppose any occurrence has impressed our feelings so strongly as that of the risk of being drowned. I have, on two occasions, known those feelings, and I can imagine that anyone who went through the experience, in prehistoric times, would have retained a vivid recollection of such peril. That any flood was ever universal is, of course, a thing that must at once be dismissed from the mind of any philosophically disposed person, and the author, you observe, specially mentions that he does not for a moment assume any such condition, for it would be subversive of all possibilities of the conservation of the fauna and flora of the various countries as we know them to exist at present. It would be impossible that the fauna and flora of the tropics could have been preserved, or the fauna and flora of the temperate zone, if the whole of the terrestrial surfaces had ever been submerged at the same time. We must bear in mind that Dr. Prestwich has spent many years on these investigations, and in endeavouring to show that these deposits, which he classifies under the name of "Rubble-Drift," are one and the same deposit, and it would not be possible to discuss here all the circumstances which may induce other geologists to arrive at somewhat divergent views. These various deposits extend through France, along the shores of the Mediterranean, around our own island, and the Channel Islands, all of which the author has referred to as being contemporaneous. With regard to organic remains and the destruction of large numbers of terrestrial animals at one time, we are all perfectly aware that a number of circumstances may converge to the accomplishment of such events. For instance, my friend Dr. Forsyth Major has discovered, in the Island of Samos, the remains of hundreds of antelopes, giraffes, proboscidea, edentata, and carnivora, all herded together and destroyed in a common flood, probably due to the eruption of a neighbouring volcano, the ashes from which, and the water, forming a mud-débâcle, pouring into the valley, destroyed

those animals in the night. It is always in the night that the herbivora are overtaken, for at night they rest on the ground and sleep, and the floods catch them; whereas the carnivora, being astir at night, more often escape. So that when you find the remains of animals intermixed, the carnivora with the herbivora, it has doubtless been due to a very sudden local flood, as under such circumstances they would not have had time to escape. Then, of course, periods of drought drive animals long distances and cause them to make stampedes when they rush to the water, and thousands of them perish. So also in times of flood and prairie fires. All these events are clearly marked on the American Continent, as for instance at "Big-Bone-Lick," Kentucky, and many other well known deposits. No doubt a large number of animals went down to drink, or to lick the salt, and there perished. I will not occupy your time any longer as there are many present who are much more able than myself to address you. I will only beg leave to move that the best thanks of this Meeting be accorded to Professor Prestwich for his very valuable and interesting Paper (applause).

Sir HENRY HOWORTH, K.C.I.E., M.P., F.R.S., &c.—I beg to second the vote of thanks to Professor Prestwich, for this Paper. I am quite sure with regard to that part of my duty, it is an extremely light one. We should all have liked to have welcomed here the Nestor of geology, and we know that he would have much liked to have been present. To myself it is naturally a very pleasant occasion indeed, because, heretic as I am, and having written two or three rather large and heavy books on this subject, I am pleased to find myself so much at one with my friend. In other words, it is very gratifying to find a veteran geologist coming so closely to the conclusions that I have put forward for so many years. In fact, were it not for one postulate, which I cannot quite accept, we should be very nearly in absolute agreement. I do not quite accord with my friend that it is necessary to postulate a great and lasting upheaval and a great submergence of the land in order to produce the events he postulates himself. If a local submergence of the land took place over a considerable area, that is quite sufficient, according to the mathematical investigations of several competent writers, to produce the motive force to which some of us appeal.

Now the whole subject is one of enormous intricacy and

difficulty. It is extremely difficult to discuss it amongst a mixed audience, and still more so when several champions of very different views are prepared with grape shot on one's flank every moment. I hope you will pardon the simile, because I hold this, and I am sure you will hold it, every one of you, that no opinion deserves to live unless it can survive a very hard struggle indeed, and no scientific heretic has a right to expect quarter until he establishes his claim by testing every objection. That I hold strongly. I am not going to put you to the test to-night, but I will put one or two facts before you to turn over in your mind as you go home.

In the first place, I look upon this rubble drift of Professor Prestwich's as being only one out of a series of phenomena which all point in one direction. The rubble drift on the coasts of France right away to Normandy, shades off and passes on gradually into what the French call red and grey diluvium. This form of diluvium covers the north of France irrespective of the contour of the country, and lies in great homogeneous beds without stratification, and covers hill and dale irrespective of valley or hill, and this same great deposit of brick clay again passes insensibly into deposits of loess, and passes into the great valley of the Danube, and over two-thirds of Southern Russia, where my own observation stops, but according to Ermann and others, it extends right across Siberia until it reaches China. Beds of loess exist over the Pampas of South America, and Darwin says nothing struck him with such surprise and delight as the exploration of that immense mass of loam many yards thick with no stratification, which covers the whole Pampas district of South America.

I have always held, since I was a small boy, that no possible river action or any mere local force can explain this enormous spread of continuous loam and other associated deposits, without those signs of stratification which would be there if it had been deposited by rivers by annual layers of warp or silt—this formation which exists perfectly without any break whatever. This always seems to me to involve an appeal to some great continuous cause. Again, as to the remains that have been found in it. It is a most extraordinary thing that skeletons have been found, from the east part of Siberia right away to Mecklenburg, of the mammoth and great rhinoceros, without the disturbance of a single bone. In Siberia they have found carcasses with the flesh intact. In the north of Russia I have seen a skeleton, found *in situ* without

the disturbance of a bone. Is it possible to suppose that by any means these animals could have died by any ordinary current process, and that they should have been ultimately deposited under fourteen or fifteen feet of gravel, gravel which does not lie along the river bed, but which extends for hundreds of miles, apparently without a break? I hold that the wild animals would have torn them asunder if exposed, and if their bones had been exposed to the air they would be weathered, whereas it is not so.

Now it seems to me that this continuity of conditions is consistent only with one continuous cause, whatever it may be, and establishes the conclusion that the animals were drowned by a great diluvian catastrophe which also spread out the beds of gravel and loam for hundreds of miles as we find them.

Then take another side of the issue, take this question you have heard so much about, of Palæolithic and Neolithic man. It is very true that early man, who did not polish the weapons he made, but chipped them out with a rude stone, made it difficult in many cases to distinguish as to whether a particular stone weapon was made at one epoch or another, but you have this remarkable and extraordinary fact, that in one case you have the remains of man existing with those of extinct beasts, and in another you find the remains of man with the remains of domesticated beasts, and there is never a case, out of the hundreds of caverns which have been examined, where there is a mixture of these extinct beasts with domestic animals. There cannot be a mistake about that; you may mistake palæolithic and neolithic stone implements, but you cannot mistake the fact that the mammoth and two or three other absolutely extinct beasts, have never been found mixed with or intermingled with the remains of domestic beasts. Hence it comes about that amongst those who have studied these palæolithic remains of man there is an almost absolute opinion, especially amongst French authorities, that there was a great gap, or hiatus, between one set of people and the other, notably in regard to the European area, and I think the only explanation, the only cause which explains the facts is that some great catastrophe, involving the rush of a mass of water, must have occurred, which intervened between one set of men and the other set of men.

I am not going to prosecute this matter further. I have put before you a few salient facts on this very large and interesting subject, and will leave it there (applause).

The Resolution was carried *nem. con.*

Professor T. McK. Hughes, M.A., F.R.S.—I must commence with an expression of regret that we have not got Professor Prestwich with us to-day.

The points in this paper lead us over a very wide field of inquiry. Sir Henry Howorth has pointed out that we must not always take the simple explanation which presents itself to us from the examination of one section only, but that we must consider the whole question from a larger point of view, and we must see how the explanation of given cases fits in with the observations of others, made over a wider extent of country. That is perfectly true; but on the other hand, if we can prove a particular negative we overthrow the affirmative. The question is not whether the waters of the ocean ever rolled continuously round the whole earth—an hypothesis not impossible, as it would take about thirty-six times all the land above sea level to fill the ocean bed, but improbable, because inconsistent with what we know of the persistence of life, and for other reasons. We are considering the suggestion that there was in comparatively recent times a submergence of a transient nature, extending over a limited area, and giving rise to floods of a violent character and great transporting power. It has been observed that over the surface, not only of our own country, but in the north of France, and over wide areas in Central Europe and Asia, there is a superficial deposit of loam or gravel or mixed soil. But when in one case we hear of remains of the mammoth being found and in another of nothing but recent animals, we may be sure that the two deposits are not synchronous. There appears to be room to believe that some of the finer deposits are due to dust blown by the wind, as pointed out by Richthoven in China and by Drew in India. We must also bear in mind that there are agents of a very complex kind that move the soil and the rubble at a very low angle over the surface of the ground. It may be observed how changes of temperature and moisture will affect our pavements, pushing the kerbstone out, and how the soil travels down a slope and covers ancient foundations. In what does this differ from the material said to have been moved by a wave of translation? The principal point that is relied upon in proof that it was translated rapidly and is not the result of long continued action, is that both the stones in the rubble and the bones are angular and sharply fractured. But how can the rushing waters

have rolled these things together, without sorting them, or rounding them? We see how the pipes in the chalk are filled in. I have seen a rabbit and a trout caught in the same fissure in the mountain limestone—the most unlikely creatures to have lived together. These creatures were carried down stream and so got into one of the potholes or open caves.

I think we can hardly limit ourselves to the alternative explanations of the "Head" suggested on p. 267, and while recognizing that there is a widespread superficial deposit having many characters in common, cannot admit that "all the phases of the rubble-drift are such as show a common origin," p. 280. If we find in one place, in the rubble-drift of the surface or in the fissures, the older group of mammals, and in another place the newer group, we must refer the two deposits to different ages. If we find the two groups in the same deposit, we must infer that the fossils of the older deposit have been washed out into the newer. It was pointed out that in one particular case all the animals were driven into a *cul de sac* and died, but how was it that those whose remains are the most numerous were the best swimmers—the hippopotami?

While asking for further information on some of the points discussed, I must express my great satisfaction in following Professor Prestwich's advocacy of a great post-glacial submergence, though we may not refer it to exactly the same part of the period, and further, in finding that he contends for earth-movements of considerable magnitude continued down to very recent times.

Professor E. Hull, LL.D., F.R.S.—I join with all here in their great regret that the author of the paper was not able to be present. I cannot, however, expect Professor Rupert Jones to give replies to all the objections that have been made. I entirely concur in the view of Professor Hughes, that there has been a great submergence in very recent geological times. I thought, until I had the gratification of hearing a former colleague of mine express his faith in an interglacial submergence, that I stood alone in that belief. But that interglacial submergence which is shown so well in the soil, and gravel, and rocks of the British Isles, going up to a height of 1200 feet on the flanks of the Welsh and Irish mountains, is not the submergence to which the author of this Paper alludes or refers. It is entirely a more recent submergence, and it is very startling in this year, 1894, to have Dr. Buckland's *Reliquiæ Diluvianæ* unearthed from its tomb and brought up again

by so eminent an authority as Professor Prestwich. No doubt there is much to be said, as has been shown, in favour of his views; but a serious objection, and to my mind the greatest objection, is the entire absence of marine shells amongst the remains of these ossiferous fissures.

J. Allen Brown, F.G.S.—Professor Prestwich, as one of our most distinguished geologists, has added so much to our knowledge, that any theory suggested by him must necessarily carry great weight. I have looked up to him as my leader and master in Quaternary Geology, and it is with regret I find myself at variance with his opinion as to the formation of the rubble drift and associated surface alterations and deposits.

Like many other geologists, I can only see in these formations the result, but with considerable modifications arising from different geographical conditions, of that period of great cold, extending over a long period which, with its milder inter-glacial episodes, is generally accepted as the Glacial period. With such a condition of severe climate with intervals of milder temperature, the whole followed by a period of great rainfall or the Pluvial period suggested by Mr. A. Tylor, and accompanied by those changes in the level of the country, which we know have taken place, we have the series of causes which will account for the occurrence of the rubble drifts. Admitting that the evidences of ice action north of the Thames are much more pronounced than in the south, we may yet find, in the changes I have alluded to, sufficient for their formation and for the alterations in the sculpture of the land. In my opinion it is unnecessary to suggest a sudden catastrophe caused by rapid upheaval and subsequent as rapid submergence of the land to account for these accumulations and changes as may be seen in action in some parts of the world now, and are still going on, though to a lesser extent at present in the South of England.

Professor T. Rupert Jones, F.R.S.—I think, sir, this Paper has brought about a deluge! We have had a deluge of information, a great deal of it old, and a great deal that is well worth study. What Sir Henry Howorth said I should have liked to have gone over. I believe him to a great extent, but still fissures, rubble, cracks, and sediments have all to be separately taken at their own value. I am now trenching on Professor Hughes' observation, that we must have "caution"; but I must say that Professor

Prestwich has himself had caution. He has been very cautious in his facts and conclusions, though his conclusions are not all, perhaps, exact, more than other people's conclusions are.

There are one or two things to which I should like to allude—as to the physical impossibility that has been referred to. My notion is that Professor Prestwich has a right to say that. Professor Hughes says he has not. But I will refer to Professor John Phillips. I was under the impression that he measured the land and the sea with all the evaporation and found there was not enough water to cover the whole land to a sufficient depth. If so it was an impossibility.

Then with regard to the æolian method. The author referred to the opinions of others, therefore it did not escape him. I do not think that anything escaped him. A most interesting thing to which Professor Hughes alluded was the instance of the rabbit and the trout being found together. It shows exactly what Professor Prestwich would like to have—that things were thrown pell-mell into the fissures; but, like a wave, it may, in one case, be a small affair; and that reminds me that Professor Hughes did not give him credit for stating that waves of translation, even, might be of a different strength at different times, though comparatively continuous, more particularly with a decrease or increase in earthquakes, making the influx or efflux of water of different powers as they went on. I think if my friend will read the Paper quietly and write and tell Professor Prestwich what he thinks, a reply will come much better from him than from me. Then fissures of various ages are not treated in such a careless manner as our friend on the left says. There was a great deal of care bestowed on pointing out how the materials and fissures were not all exactly alike. They came in under different circumstances, and the conditions, of course, varied.

As to the hippopotami, I am glad that Professor Hughes said what he did, and I am sure we all feel quite a sympathy with these great creatures; but the reason of their crowded death is, I take it, there were so many that one swimming may have prevented the other. They were, probably, huddled up and prevented, before they thought of swimming.

What Professor Hull said was very good. I have a mark or two, in my notes, upon his observations on the deluge, and I should like to have been able to speak for a quarter of an hour on that

subject, but I would say—read Mr. Belt's *Naturalist in Nicaragua*, and there you will find another explanation of what is called the universal deluge, how the water from the ice and snow gradually accumulated over the lands which had become populous and civilized, and then gradually melted away, and only those people and animals that got on the tops of the hills in the consequent deluges were saved. I think Professor Prestwich has pointed out well that some submergence* had taken place in this part of the world. He does not go further, he does not go beyond that which he knows and what he has seen and learnt; but he does refer to a great many of those points that have been mentioned. He alludes to those other parts in the East, but he says carefully that he does not venture on them because he does not exactly know, and I doubt not he will learn a good deal yet.

The Meeting was then adjourned.

## REMARKS ON THE FOREGOING PAPER.

The Rev. R. Ashington Bullen, B.A., F.G.S., writes:—

I visited the fine sections at Portland Bill and at Sangatte, and can corroborate Dr. Prestwich's statements about the angular and subangular character of the flint and Rubble Drift.

The latter section is interesting as it shows that the main features of the land surface were (at the time of the deposition of the Rubble Drift) mainly what they are now. The tertiary strata had been already denuded from the chalk heights. The outlier of tertiary sandstone on Les Noires Mottes rests directly on the chalk.† Among other places mentioned in Dr. Prestwich's paper which I have visited was Broom Ballast Hole in January last. It is situated in the valley of the Axe. Here we have a low hill with higher land in the East and West. The accumulation of which it is composed does not appear to belong to the valley drifts, and standing as it does cannot be caused by rain wash.

It consists of much-rolled pebbles of quartz from older and higher beds, hard, dark grey siliceous rock and chalk flints mingled with chert fragments, which are *angular or subangular*. There are *seams of sand* such as at Sangatte, Brighton, Chichester, &c., occur in the chalk débris. There is also sandy clay mixed with the stones. I found no traces of shells or bones at Broom.

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* *Q.J.G.S.*, vol. xlviii., p. 263.

† The late Professor Challis touched on this question in his paper on "The Deluge and Physical Science" (*Trans. Vict. Inst.*, Vol. x, p. 66).—Ed.

In this pit, moreover, there are flint and chert implements of two or three periods. Few of them are possible valley types. There are (1) the plateau types, showing the usual wear; (2) high-level types, very few of which show any wear, but are sharp and unstained.* These implements occur, according to the quarrymen, at no particular horizon, and at no particular spot, but at all levels. They are mostly of chert. The depth of the section at its highest point was about 50 feet.

De la Beche described a mass of detritus close to Waddon Barton near Chudleigh, Devon.† He inclined to the opinion that it was suddenly accumulated by a wash of waters over the Haldon Hills. The accumulation occurs on a small limestone hill.

Dr. Prestwich's theory of submergence and sudden elevation in a series of uplifts gives the necessary explanation of the phenomena at Waddon Barton, at Broom Ballast Hole, at two other ballast pits between Broom and Axminster, and at many other places where similar conditions exist. There is evidence in these and similar cases of sudden water transport which carried older and newer gravels down the slopes whereon they reposed, and *angular and subangular débris of the local rocks which is the inland representative of the Head or Rubble Drift overlying the raised beaches.* This angular débris is very important as it is conclusive that we are not dealing with an ordinary river gravel. The rolled pebbles and the stained and worn implements from the highest levels and *the uninjured high-level implements* mixed with sand and clay and angular and subangular débris, is all evidence that we are not dealing with an ordinary but an extraordinary accumulation of material *derived by sudden action from higher ground.*

Sliding down an easy slope such as the hills bordering the Axe valley exhibit, borne by strong effluent currents such as Dr. Prestwich posits as the vera causa, the unstained and unrolled high-level implements have reached their present positions intact.

With regard to the Ossiferous Fissures near Plymouth some belong to the period postulated, and some possibly not.‡

There are important fissures at Oreston systematically examined by Whidby, Buckland, and others. I visited the spot last January. The bones of extinct mammalia in this case occurred pellmell, separately and unconnected with each other, amid angular masses of limestone. They were not the bones of com-

* See also D'Urban on Broom Pit, *Geological Magazine*, 1878, p. 37.

† *Geology of Cornwall and Devon* (1839), p. 410.

‡ The Cattedown fissure in which remains of fifteen human skeletons was found does not rest on sufficiently discriminating evidence. An oyster shell occurred in this fissure and is preserved in the Plymouth Athenæum. But the final catastrophe, judging from the character of the cave and the nearness to sea-level, may have been caused by a tidal wave entering Plymouth Sound. See R. N. Worth, *Transactions Devon Association*, 1878, p. 429.

plete skeletons occurring where the animals died. The bones were ungnawed, their fractures were sharp, and they were not rolled or waterworn. The series is well represented in the Plymouth Athenæum and among the bones, &c., was found a rolled stone.* The bones are those of B. Urus, E. primigenius, eq. fossilis, ovis, cervus, hyæna spelæa, R. tichorhinus, ursus spelæus, canis lupus, and cervus elaphus. The bones were introduced through the top of the fissure.

The summit of the Oreston quarries is now about 80 feet above the mean sea-level.

The theory of submergence and emergence of the land would well account for the introduction of the bones into the fissures.

The animals having crowded for safety to the highest ground in the immediate neighbourhood were drowned, their bones dropped one by one to the then sea floor as the bodies decayed, and when the uplift came the various fissures received whatever bones, limestone débris, and mud passed over them.†

Mr. R. N. Worth (*Transactions Devon Association*, p. 419, 1887) quotes Colonel Hamilton Smith as to the occurrence of a portion of a human humerus. Col. Smith (1848) says "it was immediately thrown away on being pointed out to the possessor. This is not the only instance of the kind. Collectors in the plenitude of their ignorance and prepossession determined that human bones were of no consequence." The bones in this instance as in others evidently drifted no great distance, their unworn condition being well accounted for by the little friction that such water carriage would entail as they fell into the fissure, though the masses of angular limestone‡ falling upon them fractured them.

At Oreston we have in miniature what happened at Santenay, Gibraltar, Mont Pédémar, &c, as our uniformitarian geologists will come to see when they have broken the fetters which at present hamper their judgment.

The suggestion that it is improbable that the hippopotamus, the best swimmer of the Palermo fauna, would remain to be drowned may well be dismissed. *For we have to account for the presence of a large number of bones broken in pieces, whose fractures are sharp and do not exhibit signs of rolling or wear, nor are the bones gnawed by carnivores.* It is contrary to the habit of these animals to die in any one spot. Moreover we find the same phenomena of local angular blocks in the same breccia as the bones as are noticed in so many other bone deposits of cotemporaneous fauna. Other possible explanations such as miring or drowning by volcanic waters are ruled out of court by the conditions of the problem. For in such cases whole skeletons ought to be found, but in the Sicilian and other deposits the conditions are the same, viz.,

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* Labelled "Boulder" in the Plymouth Collection.

† De la Beche, *op. cit.*, p. 413. ‡ Analogous to the Rubble-drift.

single bones and fragments mingled pellmell. The conclusion is that all these various cases are part of one great earth movement downwards and upwards, and that this theory offers the best solution and co-ordinates all the observed facts.

With regard to Mr. Allen Brown's suggestion during the discussion, that the phenomena considered by Professor Prestwich were caused during a "pluvial" period following the Glacial epoch, I would point out that such a period would not account for (1) the phenomena at Chesilton, for instance, where the slope of the nearest height is too abrupt to allow of such an explanation, since the natural drainage would be southward, and not towards Chesilton; (2) such a rainwash, however abundant, would sort the materials, whereas the Rubble-drift is unsorted; (3) a "pluvial" period does not account for the unworn character of the angular débris; nor, (4) can we imagine a sufficient mass of water to be dammed up on such ridges as exist at Les Noires Mottes or Portland to develop sufficient kinetic energy to produce such tremendous tumultuary results as the respective Rubble-drifts at Sangatte and Chesilton present.

I cannot conclude without expressing my admiration of the sagacity which marks Dr. Prestwich's papers to the Geological and Royal Societies, and the fairness which has led him scrupulously to reject evidence which to his mind was not absolutely conclusive.

Admiral H. D. Grant, C.B., R.N., writes :—

It will possibly be interesting to the readers of Dr. Prestwich's very valuable paper if I state the result of some observations I made in the Red Sea twenty-four years ago. I was surveying Ras Gharib, Gulf of Suez, for a lighthouse, and noticed to the north of the point a very remarkable beach of conglomerate composed of numerous small pebbles and stones unlike anything in the vicinity. The adjacent hillocks averaging 50 and 60 feet high were entirely sand, the point itself and hills in the neighbourhood were chiefly sandstone and limestone. The beach, now about 5 or 6 feet above high water mark, extended below the water for some distance.

In referring to this survey I should like to mention an interesting fact. On the island of Shadwan, at the entrance of the Gulf of Suez, are to be seen some extraordinary evidences of both violent upheavals and more gentle action—with very deep water-worn gullies—which caused much astonishment to our party, as the dimensions and formation of the island would not admit of such a storage of water as to form so great torrential streams, which the well-marked water-courses would indicate.

In one part of the island, in the centre of a well-marked crater, is a hillock of an elevation of about 50 feet, which is a mass of fossilised sea shells, embedded in argillaceous soil, and has undergone a process of disintegration. In breaking off a piece of the

rock one obtains not only the fossil shell but the matrix of the shell with, in the case of several varieties of cardium, the exquisite impressions of the shell in clear cut forms. The remarkable feature of this hillock was its intrusion through the volcanic formation, and near to huge masses of granite then in process of disintegration, many granite rocks, exfoliating in layers like slate and becoming fine granite gravel. I found also large beds of gypsum on the top of the mountains.

On other islands in the Red Sea, particularly Jebel Zooghur, the peculiar features of deep well-worn water-courses are observable.

The Rev. J. M. Mello, M.A., F.G.S., writes :—

Professor Prestwich has pointed out to us that there is at the present time geological evidence tending to show that a very remarkable submergence of a wide area of the earth took place "at a comparatively recent period"; that this was posterior to the glacial period, also to the appearance of Palæolithic man in Western Europe, but anterior to that of his Neolithic successors. This was the last of those great marine submergences, the records of which we read in the earth's crust, and this being the case, and considering that when it took place man was present, may it not be, as Prof. Prestwich suggests, that vast inundation the memory of which has been handed down to us from age to age in the traditions of our race? May it not also explain the existence of that mysterious break which, in spite of its existence having been disputed by a few geologists, does appear to be a fact, the break between the disappearance of Palæolithic man with the Pleistocene fauna, and the advent of Neolithic man and the established conditions which have since then prevailed amongst us? The "Rubble-drift" or "Head" and the Loess are certainly the last traces we have of a marine deposit on a large scale, and that these were, as Prof. Prestwich points out, the result of marine disturbance, although conjoined, it may be, with some glacial and terrestrial currents, seems to be beyond question, and that the phenomena embraced an area of vast extent is also clear, although the originating cause was apparently of short duration.

M. A. de Chambrun de Rosemont in his *Études Géologiques sur le Var et le Rhone, etc.*, has described certain post-pleistocene deposits in the ancient delta of the Var and Rhone and in its neighbourhood, beds which he says "lie in the hollows of erosion and are formed of coarser elements than the pebbles which build up the mass of the delta properly so called." These beds, he remarks, are composed of analogous materials to those of their pleistocene predecessors. Are these in any way similar to those deposits described by Professor Prestwich? M. de Rosemont ascribes their origin to an abnormal rainfall which succeeded the glacial period, a rainfall which he supposes to have been about one hundred times greater than that of to-day, and which would therefore cause floods

utterly unparalleled in their depth and extent, the culminating one of which, he suggests, may have been the flood *par excellence* of which mankind has preserved the memory. This, M. de Rosemont says, was the beginning of the "pluvial period," the flood itself which overwhelmed mankind being the climax. That there may have been during the post-glacial period an exceptionally heavy rainfall is not impossible nor improbable, and it may have left behind it visible traces upon the earth's surface; perhaps Professor Prestwich is acquainted with the deposits in question and can speak as to their origin, but that the scriptural flood should have been caused by rainfall alone, even had that rainfall been not only excessive, but embracing whole continents in its extent, does not appear to me to be an adequate cause for such a flood as that described in the Book of Genesis, where we must also remember it is expressly said "the fountains of the deep were broken up," pointing to marine as well as atmospheric action.

The chief difficulty, however, which now occurs to me in connection with Professor Prestwich's suggestion is the apparent limitation in area of the submergence indicated by the beds which he has described. That the flood was not universal in the geographical sense I cannot doubt, but still should we not expect, supposing that the tradition of it was connected with the submergence now under discussion that traces of that submergence would be found in those regions to which the highest authorities point as being the primitive home of our race, or at any rate the earliest home of some of its most important members. And it is also amongst the races which, at the earliest period to which we can trace their presence, dwelt in Asia especially in the Babylonian area, that we find the clearest and most detailed accounts of the flood and of its accompanying incidents. But Professor Prestwich speaks of the evidence of submergence becoming "less as we proceed from west to east along the African coast," whilst there seems to be little if any evidence of deep submergence on the coasts of Asia Minor or Palestine; here then there seems to be some difficulty, for we can hardly admit that the tradition of the flood originated on the European Continent; this part of the question therefore seems to demand some consideration, and perhaps as a more detailed examination of eastern lands is made, more light than we have at present may be thrown upon the matter, and some of the difficulties, if not all, which now surround it may eventually disappear in the presence of a more extended knowledge.

Mr. WARREN UPHAM, Assist. Geologist of the U.S. Government Survey, writes:—

In attempting to present brief notes of comment on the important paper by Professor Prestwich, I must thank him for such full descriptions of the "head" or "rubble drift" and associated

deposits in the south part of England, France, and the countries bordering the Mediterranean Sea, but feel compelled to differ from him in the view to be taken for their explanation. Although he ascribes the rubble drift in southern England and Wales to rapid emergence of the land from a marine submergence of about 1,000 feet, the only fossils found in the formation are those of land shells and land animals, and no shore line nor terrace of marine erosion or beach deposition has been detected, such as would mark the culminating limits or stages in the oncoming and waning, of the submergence. Professor Prestwich thinks that the effects observed indicate simply currents of the sea flowing down the hillsides while the land was quickly rising, rather than that the rubble transportation was due to waves of earthquake origin. It is very difficult, however, for me at least, to see how such currents could produce the observed results. The total rise being only about 1,000 feet, it would hardly have more effect than the flow of a powerful river current upon its banks during the few minutes in which the flow would advance 1,000 feet. If the emergence were at the rate of the fall of tides, as one or two feet in an hour, 25 or 50 feet in a day, and the whole amount in a month, more or less, requiring a longer time if subdivided by intervals of rest, it would evidently be quite inadequate to form the rubble drift. But so sudden, and not seismic, uplifting of extensive areas, as western and southern Europe, appears, at least in my opinion, to be physically impossible.

It seems to me, on the other hand, far more probable that the true explanation of the origin of the rubble drift is supplied by the second alternative hypothesis that has been held concerning it, which Professor Prestwich states but rejects, namely, "that during the Glacial period, sheets of frozen snow or ice slid down the hill slopes above, and carried with them the *débris* of the surface." The region lies south of the limit of the ice-sheet and the true glacial drift, but I think that during a short time, coincident with the European glaciation, this western side of the land areas in the eastern hemisphere was greatly but slowly uplifted (to the extent of the "2,000 feet or more" which Professor Prestwich mentions when referring to this hypothesis in his paper in the *Quarterly Journal of the Geological Society*, vol. xlviii, 1892), causing the southern part of Great Britain and all the countries of southern Europe and northern Africa to experience much more severely frosty and snowy winters than now.

The earliest statement of this view that I have found is by Mr. R. A. C. Godwin-Austen, who, in 1851, treating of the "Superficial Accumulations of the Coasts of the English Channel, and the Changes they indicate," concluded that there was "an elevation of great amount, such as would place the whole of the higher portions of this country in regions of excessive cold," and "that, with respect to movements of the earth's crust in this region,

during a period which geologists have agreed to consider as one and indivisible, the oscillations have been great, both of depression and elevation, and that there has been at several distinct periods a constant return to a level very near the present one." (*Quart. Journ. Geol. Soc.* vol. vii, 1851, pp. 130, 136). Later, Mr. W. A. E. Ussher in the same journal (vol. xxxiv, 1878, pp. 52, 454), and Professor James Geikie (*Prehistoric Europe*, 1881, pp. 224–227), have presented a similar opinion that the "head" or rubble drift was a subaërial deposit, belonging to the time of the Glacial period, and that this area was then uplifted several hundred feet, uniting Great Britain with the continent, though not, as they suppose, to so great altitude as had been suggested by Mr. Godwin-Austen. His early discussion of this question, similar conclusions for North America stated in Prof. James D. Dana's presidential address before the American Association in 1855, and a paper by Mr. T. F. Jamieson in the *Quarterly Journal of the Geological Society* (vol. xxi, 1865), clearly recognised not only great epeirogenic uplifts of drift-bearing areas, which, at their culmination bringing a cool high plateau climate, I think to have caused the Ice-age, but also the ensuing subsidence of the ice-burdened lands, which appears to have induced the rapid final melting of the ice-sheets.

The brevity of this time of uplift in southern England is well shown by the rubble drift, which was preceded and followed by slight submergence, and the formation of beaches that are now raised somewhat above the sea level. We thus have an excellent confirmation of Professor Prestwich's opinion that the Glacial period was geologically short, and not many thousands of years ago. In more northern regions the extensive preglacial erosion of the fjords implies that the gradually increasing uplift there occupied a far longer time, probably having begun during the Tertiary era.

## THE AUTHOR'S REPLY.

*August*, 1894.

Professor Prestwich writes to express his regret at not having been present to reply in person to the criticisms of his friends. They have however made his task an easy one. In answer to Sir Henry Howorth, he would observe that he does not postulate a great Submergence in order to produce the phenomena he has described, but he deduces from the character of the phenomena the conclusion that the whole of the area in question has been affected by a common cause, and exhibits results which indicate that they had a common origin. The *Diluvium gris* of French geologists

represents various *fluviatile* deposits all of *older* date than the Rubble-drift. With regard however to the *Diluvium rouge*, some of it probably represents a phase of the Rubble-drift.

In reply to Professor Hughes, it is not intended to mean that the flood was of a very violent character, on the contrary, the Submergence was apparently on the whole so quiet as to have been hardly perceptible. The great transporting power came into operation at intervals during the *re-elevation* of the land, and these have produced effects such as transporting blocks of twelve feet or more in diameter along small inclines, which none of the slight changes he refers to could have effected. Richthofen's views with regard to the origin of the Loess have been noticed in his Royal Society paper. He (Professor Prestwich) considers, however, that the Loess of China has had a different origin from the high-level Loess of Europe. The group of animals found in the surface Rubble-drift and in the Ossiferous fissures are always of the same and not of different ages (except where cavities have been used as newer bone caves), and are never mixed with neolithic remains. It is true that *Hippopotami* are good swimmers in rivers, but overwhelmed as they were in the rising sea waters, and crowded together in a breaking surf, they must have succumbed.

Professor Hull will find in the foregoing pages, but more particularly in the paper read before the Royal Society, reasons, too long to repeat here, to account for the entire absence of marine shells in the Ossiferous fissures or in the other forms of the Rubble-drift (*Phil. Trans.* for 1893, p. 981).

Professor Prestwich assures Mr. Allen Brown that he has not overlooked the causes to which he refers, but these mostly refer to an anterior period, and would be inadequate to explain the special phenomena of the Rubble-drift.

The Rev. J. M. Mello will find in the *Bull. Soc. Géol. de France*, 3-Ser. vol. iv, p. 692, a statement by M. de Rosemont on the agency of rain in connection with the Ossiferous fissure of Santenay, while the objections of the author, who considers the pluvial origin inadmissible, are given in the *Phil. Trans.* for 1893, p. 938. Without more minute description, he could not say whether the deposits of the Var and Rhone referred to belong to the Rubble-drift. It is possible they may. Professor Prestwich would by no means limit the area of Submergence to that embraced by him, but he only at present carries it so far as the geological evidence

allows him. As it is, it extends inland to Asia Minor, and coastwise to the shores of Syria; but he has little doubt of its extension further inland in the direction of Armenia and Babylonia. The inland forms of the Rubble-drift are however so obscure, and have been so little investigated in that area, that we must wait for further evidence. He only regrets that for the same reason he is unable to speak of the Red Sea and Siberian areas.

In reply to Mr. Warren Upham, who considers that the uplift of the land could not have produced currents of sufficient force, he would refer him to a paper by the late distinguished mathematician Mr. Hopkins of Cambridge, in which he shows that currents of extreme velocity and force may be produced by such uplifts. (*Quart. Journ. Geol. Soc.*, vol. vi, p. 90, and given in abstract in *Quart. Journ. Geol. Soc.*, vol. xlviii, p. 332.) The suggestion made by his (Professor Prestwich's) old friend, the late Mr. Godwin-Austen, that in the "Head" area, the land might have been raised to a height of 2,000 feet, was simply a suggestion made to obtain a supposed necessary degree of cold, but it was not supported by any facts. Professor Prestwich would ask Mr. Upham if a 2,000 feet uplift were required for the English coast, what would be the elevation needed to produce the same results on the coasts of North Africa, and what evidence is there of it? He has not overlooked the opinions referred to by Mr. Upham, of Mr. Godwin-Austen, and other geologists (see *Quart. Journ. Geol. Soc.*, vol. xlviii, pp. 305–323), and has stated his objections to them (pp. 326–328). They would be too long to repeat here.

He feels that there are yet many points of difficulty to clear up, but it would be better that the argument should be on new lines, rather than on objections already discussed and answered.

## NOTE.

As Professor Prestwich treats his subject from a purely geological standpoint, it was considered absolutely necessary that it should be similarly dealt with in the Discussion.

In the words of Sir J. W. Dawson's special communication one may now "hope that the subject will be followed up on both sides of the Atlantic."

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## ERRATA.

P. 144, line 7 from bottom.

The words *fortuitous evolution* should be within inverted commas followed by a note of admiration (!)

Two lines further on, a comma after *nature*.


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†Meldrum, C. Esq. C.M.G. M.A. LL.D. F.R.S. F.R.A.S., *Port Alfred Observatory, Mauritius.*
¶Mello, Rev. J. M. M.A. F.G.S., *Mapperley V. Derby.*
Merrill, Rev. Selah, D.D. LL.D., *Andover, Mass. U.S.A.*
Miller, Samuel King, Esq. Editor "Scrutineer," *Moss Vale, Albury, N. S. Wales.*

†Morris, Rev. J., *Posno St., Beaconsfield, South Africa.*
Morrison, M. A. Esq., *Bible Soc., Odessa.*
†Oates, Rev. W., *Somerset East, South Africa.*
†O'Donel, G. H. Esq., *Mission School, Seoni Chappara, C.P., India.*
¶Parker, Prof. H. W., 2234, *7th Avenue, New York, N.Y., U.S.A.*
†Peet, Rev. Stephen D. Editor "American Antiquarian," *Good Hope, Illinois, U.S.A.*
Petherick, Rev. G. W. B.A., *St. Bartholomew's Rectory, Salford, Manchester.*
Penrith, Rev. T. H., *Egremont, Cumberland.*
Phillips, Rev. T. B.A. T.C.D. F.R.G.S., *Hailsham, Sussex.*
Plummer, C. Esq., *Boissevain, Manitoba, Canada.*
Pope, Rev. G. U. D.D., *Indian Institute, Oxford.*
Postlethwaite, J. Esq. F.G.S., *Eskin Place, Keswick, Cumberland.*
Ragg, Rev. F. W. M.A., *Marsworth Rectory, Tring.*
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Reinmuth, P. W. Esq., 5, *Brunngasse, Zinzendorf Strasse, Gratz, Styria, Austria.*
†Robertson, Rev. Alex., *Ca St. Leonardo,* 30, *Calle dello Squero, Catecumeni, Venice.*
Ross, Rev. H. D.D. LL.D. F.C.S. Memb. R. Soc. of Arts of Port Louis, *Dallas House, Lancaster.*
Rous-Marten, C. Esq. F.R.G.S. F.M.S. M. Scot. Met. Soc.; M. Gen. Syn. N.Z., *Wellington, New Zealand.*
Rowley, Rev. A. C. M.A. F.R.H.S., *Sutterton, Boston, Lincolnsh.*
Sawyer, W. C. Esq. A.M. Harvard; A.M. Ph.D. Göttingen; Prof. Phil. and Rhetoric, *Lawrence University, Appleton, Wisconsin, U.S.A.*
Scott-Moncrieff, R. Esq., 5, *Mardale Crescent, Edinburgh.*
Shaw, Rev. G. A. F.Z.S., *Tamatave, Madagascar.*
†Shaw, Rev. W., *Cleethorpes, Grimsby.*
Shipham, Rev. Arthur, *Helston, Cornwall.*
¶Slater, J. W. Esq. F.C.S. F.E.S., 36, *Wray Crescent, Tollington Park, N.*
Smith, Armstrong, Esq. F.R.G.S. Govt. Educational Dep., *Hawaii, Sandwich Islands.*
†Souper, Rev. F. A. M.A. Cantab., *Brixham, Devon.*
Storrs, Rev. W. T. B.D., *Vicarage, Sandown, I.W.*
†Taylor, Rev. Canon R., *St. Stephen's, Newtown, Sydney, N.S.W.*
†Taylor, Rev. Stephen, B.A. 53, *Monton Road, Eccles.*
Thwing, Rev. E. Payson, M.D. Ph.D. M.A. Harvard, Prof. Rhet. and Voc. Cult., 156, *St. Mark's Avenue, Brooklyn, U.S.A.*
Van Dyck, Rev. C. V. A., D.D., *Beirut, Syria.*
†Vigors, Colonel P. D. late 11th and 19th Regts., *Holloden, Bagnalstown, Ireland.*
Waller, Rev. J. T., *Castletown Manor, Pallaskenry, Ireland.*
Watts, Rev. Prof. R. D.D., *Groomsport, co. Down.*
White, Rev. Hill Wilson, M.A. D.D. LL.D. M.R.I.A., *Wilson's Hospital, Multifarnham, Ireland.*

†Williams, Rev. C. L. M.R.C.S.E., *Ch. Ch. Vicarage, Ramsgate.*
Willis, Rev. N. A.B. T.C.D., *Rectory, Singlewell, Gravesend.*
Willis, R. N. Esq. M.B., 2, *Carlton Terrace, Rathmines, Dublin.*
Willis, Rev. W. N. B.A. Camb. Head Master, *Ascham House College, Eastbourne.*
Willis, T. Gilbert, Esq., 4, *Kildare Street, Dublin.*
Winslow, Rev. W. C. Ph.D. D.D. D.C.L. LL.D. D.Sc. L.H.D. S.T.D., 525, *Beacon Street, Boston, U.S.A.*
Wirgman, Rev. A. T. M.A. D.C.L., *St. Mary's Rectory, Port Elizabeth, S. Africa.*
Woker, Prof. Philipp, D.D. Prof. Eccles. Hist., *Wankdorf, Berne, Switzerland.*
Wood, Rev. Joseph, M.A. D.D., 9, *Stanley Terrace, Abbey Road, Grimsby.*
Wright, Rev. W. D.D., *Woolsthorpe, Upper Norwood, S.E.*
Wright, Rev. C. H. H. D.D. T.C.D. M.A. Oxon. Ph.D. *Leipsic*, Bampton Lecturer, 1878, Donnellan Lecturer, 1880–81, 44, *Rock Park, Rock Ferry, Birkenhead.*
Young, J. M. W. Esq., 10, *Minster Yard, Lincoln.*

## SOCIETIES EXCHANGING TRANSACTIONS WITH THE INSTITUTE.

American Academy of Arts and Sciences.
American Geographical Society.
American Geological Society.
American Institute of Christian Philosophy.
American Philosophical Society.
Antiquarian Society of Philadelphia.
Anthropological Society, New York.
Anthropological Society, Washington.
Barrow Naturalists' Field Club.
Canadian Institute.
Colonial Museum of New Zealand.
Geological Society.
Geographical Society of the Pacific.
Geographical Society of California.
Harvard Museum of Comp. Zoology.
Manitoba Historical and Scientific Society.
Michigan, Agricultural College of, U.S.
New Zealand Institute.
Newport Natural History Society, U.S.
Nova Scotian Inst. of Natural Science.
Numismatic Society of Philadelphia, U.S.
Ohio Mechanics' Institute.
Oneida Historical Society.
Royal Asiatic Society (Bombay and Ceylon Branches).
Royal Colonial Institute.
Royal Dublin Society.
Royal Geographical Society.
Royal Institution.
Royal Irish Academy.
Royal Society.
Royal Society of Canada.
Royal United Service Institution.
Smithsonian Institution (Washington).
Societé Scientifique du Chili.
Society of Arts.
Society of Biblical Archæology.
Society of Biblical Literature, U.S.
Soc. Bib. Lit. and Exeg., Boston.
Sydney Museum, New South Wales.
Sydney Observatory, New South Wales.
United States Bureau of Ethnology.
United States Geological Survey.
United States Government Geological and Geographical Survey.
United States Government Reports.
Warwickshire Natural History Society.
West Chester Philosophical Society, U.S.

# OBJECTS, CONSTITUTION, AND BYE-LAWS

OF

# The Victoria Institute,

OR

## Philosophical Society of Great Britain.

Adopted at the First Annual General Meeting of the Members and Associates, May 27th, 1867, with Revisions of 1874–75.

### § I. *Objects.*

1. The Victoria Institute, or Philosophical Society of Great Britain, is established for the purpose of promoting the following objects, viz.:—

First. To investigate fully and impartially the most important questions of Philosophy and Science, but more especially those that bear upon the great truths revealed in Holy Scripture; with the view of reconciling any apparent discrepancies between Christianity and Science.

Second. To associate together men of Science and authors who have already been engaged in such investigations, and all others who may be interested in them, in order to strengthen their efforts by association; and, by bringing together the results of such labours, after full discussion, in the printed transactions of an Institution: to give greater force and influence to proofs and arguments which might be little known, or even disregarded, if put forward merely by individuals.

Third. To consider the mutual bearings 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; and to examine and discuss all supposed scientific results with reference to final causes, and the more comprehensive and fundamental principles of Philosophy proper, based upon faith in the existence of one Eternal God, who, in His wisdom, created all things very good.

Fourth. To publish Papers read before the Society in furtherance of the above objects, along with full reports of the discussions thereon, in the form of a Journal, or as the Transactions of the Institute.

Fifth. When subjects have been fully discussed, to make the results known by means of Lectures of a more popular kind, and to publish such Lectures.

Sixth. To publish English translations of important foreign works of real scientific and philosophical value, especially those bearing upon the relation between the Scriptures and Science; and to co-operate with other philosophical societies at home and abroad, which are now or may hereafter be formed, in the interest of Scriptural truth and of real science, and generally in furtherance of the objects of this Society.

Seventh. To found a Library and Reading Rooms for the use of the Members and Associates of the Institute, combining the principal advantages of a Literary Club.

## § II. *Constitution.*

1. The Society shall consist of Members and Associates, who in future shall be elected as hereinafter set forth.

2. The government of the Society shall be vested in a Council, to which members only shall be eligible,* consisting of a President, two or more (not exceeding seven) Vice-presidents, a Treasurer, one or more Honorary Secretaries, and twelve or more (not exceeding twenty-four) Ordinary Members of Council, who shall be elected at the Annual General Meeting of the Members and Associates of the Institute. But, in the interval between two annual meetings, vacancies in the Council may be filled up by the Council from among the Members of the Society; and the Members chosen as Trustees of the funds of the Institute shall be *ex officio* Members of Council.

3. Any person desirous of becoming a Member or Associate shall make application for admission by subscribing the Form A of the Appendix, which must be signed by two Members of the Institute, or by a Member of Council, recommending the candidate for admission as a Member; or by any one Member of the Institute, for admission as an Associate.

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* *Exception:* If an Associate has been selected, it has been at an Annual General Meeting, and then only after the whole of the members had been consulted, and no disapproval signified.

4. Upon such application being transmitted to one of the Secretaries, the candidate for admission may be elected by the Council, and enrolled as a Member or Associate of the Victoria Institute, in such manner as the Council may deem proper; having recourse to a ballot, if thought necessary, as regards the election of Members; in which case no person shall be considered as elected unless he have three-fourths of the votes in his favour.

5. Application for admission to join the Institute being thus made by subscribing Form A, as before prescribed, such application shall be considered as *ipso facto* pledging all who are thereupon admitted as Members or Associates to observe the Rules and Bye-Laws of the Society, and as indicative of their desire and intention to further its objects and interests; and it is also to be understood that only such as are professedly Christians are entitled to become *Members*.

6. Each Member shall pay an Entrance Fee of One Guinea and an Annual Contribution of Two Guineas. A Donation of Twenty Guineas shall constitute the donor a Life Member.

7. Each Associate shall pay an Annual Contribution of One Guinea. A donation of Ten Guineas shall constitute the donor a Life Associate.

8. The Annual Contributions shall be considered as due in advance on the 1st day of January in each year, and shall be paid within three months after that date; or, in the case of new admissions, within three months after election.

9. Any Member or Associate who contributes a donation in one sum of not less than Sixty Guineas to the funds of the Institute shall be enrolled as a Vice Patron thereof, and will thus also become a Life Member or Life Associate, as the case may be.

10. Should any member of the Royal Family hereafter become the Patron, or a Vice-Patron, or Member of the Institute, the connexion shall be regarded as purely Honorary; and none of the Rules and Bye-Laws relating to donations, annual contributions or obligations to serve in any office of the Society, shall be considered as applicable to such personages of Royal Blood.

11. Any Member or Associate may withdraw from the Society at any time, by signifying a desire to do so by letter, addressed to one of the Secretaries; but such shall be liable for the contribution of the current year, and shall continue liable for the annual contribution, until all sums due to the Society from such Member or Associate shall have been paid, and all books or other property borrowed from the Society shall have been returned or replaced.

12. Should there appear cause, in the opinion of the Council, for the

exclusion from the Society of any Member or Associate, a private intimation may be made by direction of the Council, in order to give such Member or Associate an opportunity of withdrawing from the Society; but, if deemed necessary by the Council, a Special General Meeting of Members shall be called for the purpose of considering the propriety of expelling any such person: whereat, if eleven or more Members shall ballot, and a majority of those balloting shall vote that such person be expelled, he shall be expelled accordingly. One month's notice, at least, shall be given to the Members of any such Special General Meeting.

13. Non-resident Members and Associates, or others desirous of promoting the objects and interests of the Institute, may be elected by the Council to act as corresponding Members abroad, or as Honorary Local Secretaries, if within the United Kingdom, under such arrangements as the Council may deem advisable.

14. The whole property and effects of the Society shall be vested in two or more Trustees, who shall be chosen at a General Meeting of the Society. The Trustees are empowered to invest such sums as the Council may, from time to time, place in their hands, in, or upon any of the Stocks, Funds, or Securities, for the time being, authorised by statute for the investment of trust funds by trustees, and shall have the usual powers of trustees in regard thereto. [The President, Hon. Treasurer, and Hon. Secretary may officially give effect to such resolutions as a General Meeting may pass in regard thereto.]

14*a*. All moneys received on account of the Institute shall be duly paid to its credit at the Bankers, and all cheques shall be drawn, under authority of the Council, and shall be signed by the Honorary Treasurer and Honorary Secretary.

15. The accounts shall be audited annually, by a Committee, consisting of two Members,—one of whom may be on the Council,—to be elected at an Ordinary Meeting of the Society preceding the Anniversary Meeting. This Committee shall make a written Report to the Council at the first Meeting after such audit, and also to the Institute, upon the day of the Annual General Meeting,—stating the balance in the Treasurer's hands and the general state of the funds of the Institute.

16. Both Members and Associates shall have the right to be present to state their opinion, and to vote by show of hands at all General and Ordinary Meetings of the Society; but Members only shall be entitled to vote by ballot, when a ballot is taken in order to determine any question at a General Meeting.

§ III. *Bye-Laws* (Privileges).

1 A Member or Associate, when elected, shall be so informed by he Secretary in a printed copy of the letters, Form B, in the Appendix.

2. Members and Associates shall not be entitled to any privileges, or have the right to be present, or to vote at any of the Meetings of the Society, till they have paid the contributions due by them.

3. Annual subscriptions shall be considered as in arrear, if not paid on or before 31st March in each year, or within three months after election, as the case may be.

4. Should any annual subscription remain in arrear to the 30th June, or for six months after election, the Treasurer shall cause to be forwarded to the Member or Associate from whom the subscription is due, a letter, Form D, in the Appendix, unless such Member or Associate reside out of the United Kingdom ; in which case the Form D shall not be sent unless the subscription continues unpaid till the 30th September.

5. If any arrears be not paid within twelve months, the Council shall use their discretion in erasing the name of the defaulter from the list of Members or Associates.

6. Members shall be entitled to introduce two Visitors at the Ordinary Meetings of the Society; and to have sent to them a copy of all the papers read before the Society, which may be printed in its Transactions* or otherwise, and of all other official documents which the Council may cause to be printed for the Society ; they will also be entitled to a copy of all such translations of foreign works or other books as are published under the auspices of the Society in furtherance of Object 6 (§ I.).

7. Associates may introduce one visitor at the Ordinary Meetings, and shall be entitled to all the minor publications of the Society, and to a copy of its Transactions during the period of their being Associates, but not to the translations of foreign works or other books above referred to.† It shall, however, be competent to the Council of the Society, when its funds will admit of it, to issue the other publications of the Society to Associates, being ministers of religion, either gratuitously or at as small a charge as the Council may deem proper.

8. When it shall be found necessary to send the letter, Form D, to any Member or Associate who may be in arrear, the printed papers and other

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* And the Transactions issued in the years during which they have not subscribed may be purchased at half price.

† These, as well as the Transactions issued in the years during which they have not subscribed, may be purchased at half price.

publications of the Society shall cease to be sent to such Member or Associate till the arrears are paid; and, until then, he shall not be allowed to attend any Meeting of the Society, nor have access to any public rooms which may be in its occupation.

9. The Library* shall be under the management and direction of the Council, who are empowered to designate such works as shall not be allowed to circulate.

10. Each Member† shall be allowed to borrow books from the Library, and to have not more than three volumes in his possession at the same time; pamphlets and periodical publications not to be kept above fourteen days, nor any other book above three weeks.

11. Members who may borrow books from the Library shall be answerable for the full value of any work that is lost or injured.

12. Periodical publications shall remain on the table for a month, other books for a fortnight, after they are received.

13. When a book or pamphlet is wanted, and has been the stipulated time in the possession of any Member, the Secretary shall request its return, and a fine of threepence a day shall be incurred for every day it may be detained, which fine shall commence on the third day after the transmission of the notice in the case of town Members, and after the sixth day in the case of country Members; and until the return of such works, and the discharge of all fines incurred, no further issue of books shall be permitted to the Member applied to.

14. The books shall be ordered in for inspection at such times as the Council shall appoint, and a fine of half-a-crown shall be incurred for neglecting to send in books by the time required in the notice.

15. A Book shall lie on the Library table in which Members may insert, for the consideration of the Council, the titles of such works as they desire to be purchased for the Institute.

§ IV. *Bye-Laws* (General, Ordinary, and Intermediate Meetings).

1. A General Meeting of Members and Associates shall be held annually on May 24th (being Her Majesty's birthday, and the Society's anniversary), or on the Monday following, or on such other day as the Council may determine as most convenient, to receive the Report of the Council on the state of the Society, and to deliberate thereon; and to discuss and determine such matters as may be brought forward relative to the affairs of the Society; also, to elect the Council and Officers for the ensuing year.

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* For the use of Members and Associates.—*See 7th Object.*

† Members only are allowed to take books away.

2. The Council shall call a Special General Meeting of the Members and Associates, when it seems to them necessary, or when required to do so by requisition, signed by not less than ten Members and Associates, specifying the question intended to be submitted to such Meeting. Two weeks' notice must be given of any such Special General Meeting; and only the subjects of which notice has been given shall be discussed thereat.

3. The Ordinary Meetings of the Society shall usually be held on the first and the Intermediate Meetings on the third Monday evenings in each month, from November to June inclusive, or on such other evenings as the Council may determine to be convenient: and a printed card of the meetings for each Session shall be forwarded to each Member and Associate.

4. At the Ordinary and Intermediate Meetings the order of proceeding shall be as follows: The President, or one of the Vice-Presidents, or a Member of the Council, shall take the chair at 8 o'clock precisely, the minutes of the last Ordinary or Intermediate Meeting shall be read aloud by one of the Secretaries, and, if found correct, shall be signed by the Chairman; the names of new Members and Associates shall be read; the presents made to the Society since their last Meeting shall be announced; and any other communications which the Council think desirable shall be made to the Meeting. After which, the Paper or Papers intended for the evening's discussion shall be announced and read, and the persons present shall be invited by the Chairman to make any observations thereon which they may wish to offer.

> The claims of Members and Associates to take part in a discussion are prior to those of Visitors. The latter when desiring to speak upon any Paper, must first send their cards to the Chairman and ask permission (unless they have been specially invited by the Council "to attend, and join in considering the subject before the Meeting," or are called upon by the Chairman). 1875.

5. The Papers read before the Society, and the discussions thereon, fully reported, shall be printed by order of the Council; or, if not, the Council shall, if they see fit, state the grounds upon which this Rule has been departed from, in the printed Journal or Transactions of the Society.

6. The Council may at their discretion authorise Papers of a general kind to be read at any of the Ordinary or Intermediate Meetings, either as introductory lectures upon subjects proper to be afterwards discussed, or as the results of discussions which have taken place, in furtherance of the 5th Object of the Society (§ I).

7. With respect to Intermediate Meetings, the Papers read at which

are not necessarily printed nor the discussions reported,* the Council at its discretion, may request any lecturer or author of a paper to be read thereat, previously to submit an outline of the proposed method of treating his subject.

8. At the Ordinary or Intermediate Meetings no question relating to the Rules or General Management of the affairs of the Society shall be introduced, discussed or determined.

§ V. *Bye-Laws* (Council Meetings).

1. The Council shall meet at least once every month from November to June inclusive, or at any other time and on such days as they may deem expedient. The President, or any three Members of the Council, may at any time call a Special Meeting, to which the whole Council shall be summoned.

2. At Council Meetings three shall be a quorum ; the decision of the majority shall be considered as the decision of the Meeting, and the Chairman shall have a casting vote.

3. Minutes of the Proceedings shall be taken by one of the Secretaries, or, in case of his absence, by some other Member present, whom the Chairman may appoint ; which Minutes shall afterwards be entered in a minute-book kept for that purpose, and read at the next Meeting of the Council, when, if found correct, they shall be signed by the Chairman.

§ VI. *Bye-Laws* (Papers).

1. Papers presented to be read before the Society shall, when read, be considered as the property of the Society, unless there shall have been any previous engagement with its author to the contrary; and the Council may cause the same to be published in any way and at any time they may think proper after having been read. If a Paper be not read, it shall be returned to the author; and, if a Paper be not published within a reasonable time after having been read, the author shall be entitled himself to publish it, and he may borrow it for that purpose.

2. When a Paper is sent to the Society for the purpose of being read, it shall be laid before the Council, who shall refer it to two of that body, or of the other Members or Associates of the Society whom they may select, for their opinions as to the character of the Paper and its fitness or otherwise for being read before the Society, which they shall state as briefly as may be, in writing, along with the grounds of their respective opinions. Should one of such opinions be adverse to the Paper and

* So arranged when the "Intermediate Meetings" were commenced, 16th January, 1871.

against its being read before the Society, then it shall be referred to some other referee, who is unaware of the opinion already pronounced upon the Paper, in order that he may state his opinion upon it in like manner. Should this opinion be adverse to the Paper, the Council shall then consult and decide whether the Paper shall be rejected or read ; and, if rejected, the Paper shall be returned to the author with an intimation of the purport of the adverse opinions which have been given with respect to it ; but the names of the referees are not to be communicated to him, unless with their consent or by order of the Council. All such references and communications are to be regarded as confidential, except in so far as the Council may please to direct otherwise.

3. The Council may authorise Papers to be read without such previous reference for an opinion thereon ; and when a Paper has been referred, and the opinion is in favour of its being read in whole or in part, the Council shall then cause it to be placed in the List of Papers to be so read accordingly, and the author shall receive due notice of the evening fixed for its reading.

4. The authors of Papers read before the Society shall, if they desire it, be presented with twenty-five separate copies of their Paper, with the discussion thereon, or with such other number as may be determined upon by the Council.

§ VII. *Bye-Laws* (General).

1. The government of the Society, and the management of its concerns are entrusted to the Council, subject to no other restrictions than are herein imposed, and to no other interference than may arise from the acts of Members in General Meeting assembled.

2. With respect to the duties of the President, Vice-Presidents, and other Officers and Members of Council, and any other matters not herein specially provided for, the Council may make such regulations and arrangements as they deem proper, and as shall appear to them most conducive to the good government and management of the Society, and the promotion of its objects. And the Council may hire apartments, and appoint persons not being Members of the Council, nor Members or Associates of the Institute, to be salaried officers, clerks, or servants, for carrying on the necessary business of the Society; and may allow them respectively such salaries, gratuities, and privileges, as to them, the Council, may seem proper ; and they may suspend any such officer, clerk or servant from his office and duties, whenever there shall seem to them occasion ; provided always, that every such appointment or suspension shall be reported by the Council to the next ensuing General Meeting of the Members to be then confirmed or otherwise as such meeting may think fit.

# FORM A.

FORM OF APPLICATION *for the Admission of Vice-Patrons, Members, or Associates of the* VICTORIA INSTITUTE.

[*Date*]_____ 18 .

*I hereby desire to be enrolled a** *of the* VICTORIA INSTITUTE, OR PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.

* *Here insert* Vice-Patron, *or* Member, *or* Life Member, *or* Associate, *or* Life Associate.

*Candidate's ordinary Signature, and full name, if necessary.* _____

*Title, Profession, University degree, &c., or other distinction.* _____

*Address* _____

*If an Author, the name of the Candidate's works may be here stated.* _____

*When filled this form is to be sent to the*

Honorary Secretary of the VICTORIA INSTITUTE,
8, Adelphi Terrace, Strand, London, W.C.

## FORM B.

SIR, 18 .

I have the pleasure to inform you, with reference to your application dated the , that you have duly been elected a of the VICTORIA INSTITUTE, OR PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.

I have the honour to be, Sir,
Your faithful Servant,

To _____ *Hon. Sec.*

## FORM C.

(*Bankers*) Messrs. _____

* Please pay Messrs. RANSOM, BOUVERIE, & Co. my Annual Contribution of TWO GUINEAS to the VICTORIA INSTITUTE, due on the 1st of January, 189 , and the same amount on that day in every succeeding year, until further notice.

I am,
Your obedient Servant,

_____

_____ 189 .

If this Form be used, please add your Signature, Banker's Name, and the Date, and return it to the Office, Adelphi Terrace. Receipt-stamp required.

* The above is the form for Members. The form for Associates is the same except that the Subscription stands as "ONE GUINEA."

## FORM D.

SIR, 18 .

I am directed by the Council of the VICTORIA INSTITUTE to remind you that the Annual Contribution due by you to the Society for the year is now six months in arrear; and I have to call attention to the Bye-Laws of the Institute, § III, ¶ 4 and 8, and to request you to remit to me the amount due (viz., £ ) by Post-office order or otherwise, at your earliest convenience.

I have the honour to be, Sir,
Your faithful Servant,

To _____ *Treasurer.*

# FORM E.

## FORM OF BEQUEST.

I give and bequeath to the Trustees or Trustee for the time being of THE VICTORIA INSTITUTE, OR PHILOSOPHICAL SOCIETY OF GREAT BRITAIN, to be applied by them or him for the purposes of the said Society, the sum of £ , such sum to be wholly paid out of such part of my personal estate as may be lawfully applied to the purposes of charity, and in priority to all other legacies. And I declare that the receipt of the Trustees or Trustee for the time being of the said Society shall be a good discharge to my Executors for the said legacy.

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# THE JOURNAL OF THE TRANSACTIONS.

Since the Inauguration of the Society, the following Papers have been read :— The Quarterly Parts of the Journal are indicated by the numbers prefixed. (*The volumes are sold at One Guinea to Non-Members; Half-a-Guinea to Members and Associates; those issued during the years of subscription are not charged for.*)

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## FIRST SERIES, VOLS. 1 TO 5.

### VOL. I.

1. A Sketch of the Existing Relations between Scripture and Science. By the late GEORGE WARINGTON, Esq., F.C.S.
2. On the Difference in Scope between Scripture and Science. By the late C. MOUNTFORD BURNETT, Esq., M.D., Vice-President V.I.
   On Comparative Philology. By the Rev. ROBINSON THORNTON, D.D., Vice-President V.I.
   On the Various Theories of Man's Past and Present Condition. By the late JAMES REDDIE, Esq., Hon. Sec. V.I.
3. On the Language of Gesticulation and Origin of Speech. By Professor J. R. YOUNG.
   On Miracles: their Compatibility with Philosophical Principles. By the Rev. W. W. ENGLISH, M.A.
   Thoughts on Miracles. By the late E. B. PENNY, Esq.
   On the General Character of Geological Formations. By the late E. HOPKINS, Esq., C.E.
4. On the Past and Present Relations of Geological Science to the Sacred Scriptures. By the Rev. Professor JOHN KIRK.
   On the Lessons taught us by Geology in relation to God. Rev. J. BRODIE, M.A.
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   On Falling Stars and Meteorites. By the late Rev. W. MITCHELL, M.A., Vice-President V.I.
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