ture. They treat of the general principles of combustion, the functions of the locomotive boiler, and the theory of the blast. The remaining twenty-one chapters are by Mr. D. H. Clark, who informs us, in his modest preface, that he is also responsible for the general matter of indices and contents. It is a responsibility which does him great credit. The table of contents prefixed to the volume is full, clear, and well arranged. The list of fifty-nine plates, five diagram plates, and 240 woodcuts, refers the reader in a moment to the proper page, either in the text or in the handsome and well-engraved atlas that forms the second volume. The index is not very full, but is fairly adequate to the need of the professional reader.

The part of the work possessing the most general interest is, of course, the historical and descriptive portion furnished by Mr. Colburn. It bears evidence of painstaking research, of thorough acquaintance with the subject, and of much impartiality. The degree of attention that is given to the history of the locomotive in America is unusual in works published in this country; but does not appear to be disproportionate. The language is perspicuous; exact statement of fact being more kept in view than literary style. But, with the exception of a slight uncertainty in the use of foreign words (as in deriving locomotion from *locus* and *motio*, and in repeatedly speaking of the "*Sanspariel*," which is correctly spelt in the index), the manner is not unworthy of the matter. It was the aim of the author to furnish a perfectly exhaustive work on railway locomotion, so far as it has at present advanced, and to confine his attention to the subject as closely as if it comprised the whole of mechanical engineering. This is the true method in which such a subject should be approached. We only regret that a couple of chapters were not added, to give the history of steam locomotion on roads, descriptions of the tractor-engines, which are now attracting such deserved attention, of the steam-roller, and of the locomotive propeller of the steam-plough. These important machines are germane to the subject of the work. The early pages of the history of the railway locomotive are also those of the road-steamer. Indeed, in Mr. Colburn's *précis*, the introduction of the blast, which is the very life of rapid steam traction, is said to be due to the inventor of a road-engine.

It is not stated how much of the letter-press, or what portion of the admirable cuts and engravings, have been already published in the weekly journal which was for some time edited by Mr. Colburn. The value of the complete treatise is not diminished by such precedent publication, but the fact should have been stated in the Preface. The additional chapters which we suggest might well be appended to a new edition of this work, or published as an Appendix to match it.

For the non-professional, but commercially interested, reader, no less than for the large class of semi-educated inventors, the Introduction has words of practical counsel, which they will do well to lay to heart. Thus, it is useful to bear in mind that the importance of perfecting the mechanical details of the locomotive is greater, financially considered, than that of saving fuel. Locomotive repairs cost, in England, more than all the fuel consumed in locomotion. The coke and coal now burned on British railways costs rather more than a million per annum; and, if the half of it could be economized, the reduction would only increase the average dividends by about one-third of one per cent. In the mechanical construction of the engine is involved not only the question of its own costly repairs, but that of the structure and maintenance of the permanent way. In fact, the key to economical working, so far as it comes within the province of the engineer, and is not affected by the character of the accommodation offered to the public, lies here.

While entering into full explanatory detail, amply illustrated by diagrams, of the working parts of the locomotive, the author of the volume before us purposely abstains from attempting to formulate rules of construction. None of the sets of rules which are to be found in so many works on the steam-engine are implicitly adopted by successful engineers. Ratios between weight on driving-wheels, piston area and travel, area of fire-grate, of other heating surface, of blast orifice, of chimney, &c., are matters desirable to be known as abstracts of successful practice, but are not to be laid down as canons. Every railway, or combined group of railways, has its own peculiarities of traffic, and thus demands special qualities in its locomotives. From the four-wheeled engines of Mr. Bury, with which the London and Birmingham Railway was opened, to the twelve-wheeled monsters constructed by MM. Gouin et C^ie. for the Northern Railway of France,—from the ten-feet driving-wheels which Mr. Brunel placed in the Hurricane in 1837, to the 3 ft. 6 in. driving-wheels, which Eugerth coupled under the 66 ton engine that labours up the gradients of the Semmering (rising 1 in 40 for 2½ miles),—every variety of arrangement may be studied in Mr. Colburn's treatise. The better the outcome of this wide-spread practice is grasped, the more fully will the student be able to appreciate the pregnant hint (which tells us how great a loss the profession has sustained in the premature removal of the writer), "Should we ever realize what now appears to be the latent capabilities of the steam-engine, its weight and the cost of working, it would be greatly diminished, and its proportions would differ widely from those which now prevail."

THE MOABITE STONE.

I.

YOUR article headed "Moabite Stones" (*Athen.* No. 2310) induces me to request that you will insert this paper, whose object is not so much controversial as explanatory. A few hints may teach future discoverers to avoid mistakes, which, amongst Bedawin and other bandits, too often lead to catastrophes.

Possibly some of your readers may not object to a short *résumé* of what has been stated by others, *bien entendu*, not by myself, concerning the Moabite Stone, this "peerless triumphant pillar," the "very oldest Semitic lapidary record of importance," this "giant page of a previously unknown tongue," the "first fragment of Moabite literature," which, "like a lucky actress or singer, took the world of 1870 by storm."

Students do not differ much about the date of our "Eben-ezer," which may roughly be placed before B.C. 900. The Count de Vogüé (extract from the *Times*, Feb. 22, on the Count's Pamphlet) remarks, "If my conjectures are well founded, the pillar was engraved in the second year of the reign of Ahaziah, King of Israel; that is, following the chronology usually adopted, the year 896 before the Christian era." Prof. Wright (p. 29 *North British Review*, October, 1870) prefers about the second year of Ahaziah's reign, or at the beginning of that of his brother, Jehoram, B.C. 896 or 894; Prof. D. H. Weir, of Glasgow (*Athen.* No. 2221), to the beginning of the reign of Jehu, B.C. 884. Thus numbering upwards of two millenniums and a half, our "memorial" or monumental stone is senior to Homer and Hesiod, who are supposed to have composed *circa* B.C. 850–76, writing being unknown to Greece before the first Olympiad. It dates between two and three centuries before the inscribed sarcophagus of Eshmunazar, *circa* B.C. 600, long held to be the most ancient specimen of Phœnician epigraphy. It is the only præ-Maccabean document in a language almost identical with Biblical Hebrew; and its style has been pronounced to be older than two-thirds of the entire Old Testament, and purer than that of the other third. Finally, it shows us the very characters in which, possibly, the Law was written, and in which, probably, appeared the Psalms of David and the correspondence of Solomon with Hiram.

We cannot be surprised if this "bulletin of victory" has, as our neighbours say, "made epoch," when we consider that it is at present unique and unrivalled. But the importance attached to it by Continental scholars contrasts strangely with the comparative indifference of English students: let me quote but two—Sir Henry Rawlinson and the Dean of Westminster. The former, who, it will be remembered, was the first in England to identify the Omri of the Diban inscription with the king whose name appears upon the famous black obelisk now in the British Museum, warns me in vain "not to take an exaggerated view of the Moabite Stone." The latter thinks that the special value of the discovery is its promise that "there are more Moabitish and Jewish stones than this which has been found at Dhiban."

I venture to hold with Continental scholars, that its smallest details are deeply interesting, that it is a real gain to palæography, philology and linguistic studies, to theology and mythology, to history, geography, and anthropology, whilst the general considerations which it suggests are of the highest importance.

This specimen of a new dialect, the Moabitish, introduces us to a syllabarium, the "prototype of modern writing," which was probably the only cursive character* then known to the "Semitic" world. It has been remarked that there is no sensible difference between it and the alphabet used on the metal weights and the clay tablets of Assyria, whilst it resembles the letters acting masons' marks lately found upon the stones at the north-eastern and south-eastern angles of the Jerusalem Haram. Prof. Rawlinson has shown its identity with the alphabet of Assyrian tablets and gems (ab. B.C. 750—650), with the Ehsmunazar alphabet (ab. B.C. 600), and with the ordinary Phœnician—which Mr. Deutsch would call Cadmean—alphabet of the Persian, Greek, and Roman times. Evidently dating in Phœnicia and Canaan from at least B.C. 1000, it proves the unity of the alphabet common to the "Semitic" populations, extending from Egypt to the foot of the Taurus, from Nineveh westward over the Mediterranean basin, and bounded only by the colonies of Tyre and Sidon, of Greece and Carthage.

In its presence the views of Aristotle and Pliny, before universally received, concerning the eighteen or sixteen "Cadmean letters," become obsolete as Palamedes with his four extra characters, his art of besieging, and his invention of dice and discus, of measures, scales and lighthouses. All the twenty-two letters of the Hebrew alphabetical Psalms and the Book of Lamentations are here embalmed. Many of them, especially the A, D (a perfect

* The square Hebrew character did not exist even in any modified form until the return of the Jews from their captivity (Palestine Exploration Fund, Quarterly Statement, No. VI. p. 349). On the other hand, Mr. Hyde Clarke, who has long studied the subject, asserts "the Phœnician alphabet with Hebrew names is relatively modern; and strangely enough the square Hebrew is in its origin much more ancient."

Delta, H, K (or Q), L, M, N, O, R, T, V (Vau, *i.e.* U and O), so resemble the Archaic Greek and Roman forms that we at once see the origin of our modern writing. And this is indeed the great palæographical value of the inscription, "it takes us nearer to the fount and origin of our written characters than any other document or monument that has as yet been found."

The stele thus becomes a fixed *point de départ* in "Semitic" palæography, which will serve as a standard to calculate approximately the dates of any similar monuments that may be found. It converts into mere theory the old "fact" that the "more primitive the characters the more complicated they were, in consequence of derivation from some pictorial prototype" (Mr. Deutsch, *Times*, March 3, 1870). The "oldest epigraphic document in this species of writing" suggests that the short vowel points which appear in parts of the inscription,* and which are popularly supposed to be a far later invention, were then known. It establishes the fact that from the earliest days the four vowel-consonants, or *matres lectionis* (the mnemonic "Ehevi" of Hebrew grammar), were sometimes used (*scriptio plena* of the Massorah) and sometimes neglected (*scriptio defectiva*), the final being general and the internal rare. Long ages before the now obsolete practice of writing *continuâ serie* became prevalent, it separates words by points and sentences by vertical strokes or bars: the same system appears in certain Cuneiform, Phœnician and Himyaritic inscriptions, whilst I found the hexameters and pentameters upon the Tower of Bassus near Shakkah (Saccæa) similarly divided.†

There are certain shades of meaning in this chapter of Moabite history which are real acquisitions to "Semitic" lexicography. The *vau conversivum*, once generally regarded as peculiar to Hebrew, evidently existed in the sister dialects. The dual termination, "-im" (if correctly read in line 15), connects the Moabitish with the Phœnician and the Hebrew: in other places, it appears to become "-ân." The plural ending in "-an" for "-in" approaches it like the Himyaritic to the Aramean (or Syrian), and to the Neo-Arabic tongues. Other Arabisms are Madaba for Medeba, Neba for Nebo, and Máb for Moab, modifications still preserved by the Bedawin. "Máb" (Meáb ?), personified like Israel and Judah, was, it has been observed, probably changed to Moab (Mu-ab, *i.e.* "from the father," or "water of the father,"—Gen. xix. 37) by one of those opprobrious distortions of national and tribal names to which Orientals are still so much addicted. Again, we find the 5th Arabic conjugation a veritable يتفعل instead of Hithpael, and the 8th a true اجتمع. The terminal Phœnician and Arabic "T" is also common. Hence I would suggest that in line 15 בללה, Arabic ﻟﻴﻠﺔ, must not be translated, with Ganneau, "*pendant la nuit*," nor with Wright, "by night," but "in a (single) night," holding the "h" to be that technically called in Arabic Grammar, Há el Wahdah.

The style of this "unparalleled relic" is not its least peculiarity. It proves that the Koranic high diction was common to the Moabites, and possibly to the Ammonites, as to the Hebrews; it was known to the Phœnicians, as we learn from one of the most pathetic of epitaphs, the Eshmunazar inscription. In it we see the *oratio directa* and *indirecta*, perhaps the prophetic perfect. It is startling to find the hyperbole, the parallelism and the symmetry of sense which form the true biblical style. Let us compare, "And Chamosh drove them out," with Gen. iii. 24; "Before the face of Chamosh," with 1 Kings xiii. 6; "I will oppress Moab" (line 6); with Ezekiel vi. 3, and many others; "And I built this high place (Bamat) for Chamosh" (line 3), with "Then did Solomon build an high place for Chamosh" (1 Kings xi. 7); "And Chamosh was angry with his land" (line 5), and a multitude of places alluding to the anger of the Lord, with 2 Macc. viii. 5.

It names Yahveh (Jehovah) without a trace of mystic reticence, showing that the superstitious belief about the Tetragrammaton, whose utterance afterwards doomed men to death in this world and in the next, was then unknown to the people of Israel and Judah as to the Moabites. Jehovah here becomes a local god, bearing the same relationship of the Jews (Israelites) as Chamosh bore to Moab, Moloch to Ammon, and Baal to the Phœnicians. The men of Ataroth,* probably a great religious and strategic centre of trans-Jordanic Israel, are killed for the well pleasing of Chamosh (lines 11–13), as a wrathful and vindictive deity, jealous and powerful, by way of *représailles*. Kings were hewed to pieces before Jehovah; men, women and children were "consecrated": the men and wives of Jabosh-Gilead, and the men of Jericho and Ai, of Makkeda and Libnah, were slaughtered, and generally warriors taken with arms in their hands were doomed to death—we have improved of late, despite the danger of *balles explosives* being adopted. The inscription speaks familiarly as a contemporary might of "Arial,"—M. Ganneau assured me that he had found the word in the inscription,—the mysterious Ariel, or Lion of God, usually supposed to mean the altar of burnt-offering. The Kali Jahveh or "vessels of Jehovah," captured by the Moabite, may either prove, with Dr. Ginsburg, that the trans-Jordanic Hebrew tribes, Reuben, Gad and half Manasseh, had a separate and complete ritual, or simply that the altars, knives, brass musical instruments, and articles used in slaughtering victims, and adapted for camp purposes, were in those early days carried with the armies when taking the field. It mentions the deity Ashtar (masculine), apparently the Athtar of the Himyaritic inscriptions, but evidently not Ashtarah of the Phœnicians, nor the classical Astarte. Finally, it suggests that human victims offered to the sun-god were slain as well as burned in Asia, whereas in Peru, Mexico, and Polynesia, they were simply blood-offerings.

Geographically speaking, our "memorial" revives with curious clearness the familiar biblical names of Medeba, Baal-Meon (Baal-Meon, Numbers xxxii. 38, and Beth Baal-Meon, Joshua xiii. 17), Kiriathaim, Ataroth, Nebo, Dibon, Beth Diblathaim (Jeremiah xlviii. 22), Horonaim, and Beth-Bamoth, the biblical Bamoth-Baal, or Baal-Bamoth, "Sun-god of the high places."

The interest of the inscription culminates in the fact that King Mesa, or Mesha, the Dibonite, breaks new ground. This regulus ruled a country not so large as our county of Huntingdon, and the re-subjugation of Moab under the rule of Omri (B.C. 924–919, or 6–10 years), after the seven days' reign of Zimri (ob. B.C. 930–929), made him the vassal of intolerable masters. Omri imposed upon Mesa a tribute as exorbitant as that of Brian Boroimhe, who compelled the Danes to contribute a yearly quotum of 365 tuns of claret. Omri himself, the founder of the third Samarian dynasty, may be compared with Cissa, Saxon King of Winchester, or with the mighty rulers of Essex, Wessex, and so forth.

Mesa, the "sheep-master," recounts in balanced speech and in the most dignified terms, how after forty years of spoiling and oppression, the hour of deliverance was brought to Moab by the almighty, but long-forgotten Chamosh. 1. He begins by making a high place (Bamat) in gratitude to his God. 2. He relates how Omri tyrannized over Moab. 3. He records the wrath of Chamosh against his land. 4. He relates how Omri and his son, the unfortunate Ahab, who ruled twenty-two years (B.C. 919–897), and his son's son, Ahaziah (B.C. 896–895), took the land of Moab and occupied it forty years. He neglects or despises, however, the names of Ahab and of Ahaziah, whose two years' reign completed the forty years,* and of course he says nothing of Jehoram, son of Ahab (B.C. 896–884). 5. He describes his campaign against the house of Omri, and perhaps Ahaziah (lines 18–19). 6. He enumerates his public works,—how he founded and rebuilt fortified cities, threw a road (dyke?) over the Arnon, and generally improved the country. We observe that in those days the palace contained its prison, like the Serai of Damascus in the present age, and that every house had its rain-cistern; the same is now the case at Jerusalem, and I found an ancient well when excavating in the ruins of Palmyra. 7. He records his campaign against the Horonaim (Isaiah xv. 5), or Edomites, who had united themselves to invade Moab with Jehoram of Israel, and with his vassal, Jehosaphat of Judah.

We thus obtain a view of sacred history almost identical in terms, but in tenor very different, from that offered by 2 Chronicles xx., by 2 Kings i. 1, and especially by 2 Kings iii. It is not merely an "interesting comment," but an explanation and a new version. I wonder when I read,—"The differences between the two narratives are such as might be expected in two records of the same events emanating from two hostile parties, and are far less striking than the conflicting descriptions given by the English and French of the battle of Waterloo; by the English, French, and Russians of the capture of Sebastopol; by the Prussians and Austrians of the battle of Sadowa; or by the French and Germans of the battle of Woerth" (Ginsburg). Nor can I agree with Mr. Wright (p. 36), "That it" (the Stone) "was not set up after the joint expedition of Jehoram and Jehosaphat is *certain* (the italics are mine), because in that case it would *inevitably* have contained a paragraph referring thereto. Mesha would *assuredly* have told how his foes besieged him in Kir Moab; how he sacrificed his first-born unto Kamosh; and how his god, thus propitiated, dispersed his enemies, and made them flee again to their own land." The inscription, fairly read, means that Mesa was not besieged in Kir Moab, and did not make a holocaust of his son.

The stele emphatically relates events which are far too euphemistically treated by the sacred writers. The apparently causeless departure of the hated Israelites† and their return to their own country is shown to have been not an act of humanity and pity (pity from a Jew for a Gentile!), as the Jew Josephus explains (Antiq. 9, 3, § 2), but simply an ignominious flight. The absolute defeat of the allied host, the sacrifice of their soldiers and citizens, and the capture of their women and children, must have been sore blows to the worshippers of Yahveh. Hence, in the reigns of Uzziah, Ahaz, and Hezekiah, the so-called Isaiahnic writings (B.C. 808–697) deal freely in threats which are enlargements of Numbers xxi. 27–30. We read of the pride, haughtiness, and wrath of Moab (xvi. 6), of the "burden of Moab" (xv. 1–9), and of the bringing down of Moab (xv. 11). The latter, together with the captivity of Moab and Chamosh in the later days, is evidently copied in the imprecations of Jeremiah (chap. xlviii.), who wrote between B.C. 638 and 586, when Jerusalem and Judah fell under Nebuzadan the Chaldæan.

On the other hand, we hear nothing, as might be expected, about the devoting of Mesa's son to Chamosh, which, by-the-by, suggests the unconsummated sacrifice of Isaac and Jephtha's horrid vow; nor do the Moabites mistake for the blood of the allies who had slain one another, the water miraculously supplied to Elisha. Do we not freely own to our desire for a supply of that "double evidence which so often tantalizes the student of ancient history," especially in one of the most ancient of all histories? We sorely long for more Moabite Stones which will cry out to us *audi alteram*

* For instance, over the last word of line 1, and in the beginning of line 37.

† Burckhardt copied one of the three inscriptions, and five lines of the second, but he or his editor have neglected to insert the bars.

* I cannot explain how Dr. Ginsburg (p. 35) tells us that at Ataroth, "every one was destroyed, men, women, and children, also property." The inscription (lines 11—12) suggests only the warriors of the wall being killed, and the spoil being removed —probably to Dibon. Nor is it likely in those days, and in such places that a large town like Nebo, the headquarters of Baalphegar and of Chamosh worship, should be left unfortified.

* "The occupation of Medeba by Omri and his house would thus coincide with the duration of the dynasty of Omri, which, calculated from the close of the war with Tibni, extended, according to the received chronology, exactly forty years" (Winer, B.C. 294—884).

† Why does M. Ganneau (p. 15) translate "Against the Israelites" "Parmi les Israëlites"?

partem. It is only the conflicting version that can explain such legends as that of Lot and his daughters, possibly, as in the case of Ammon, the result of some blood-feud, and that of Balaam, which may have been borrowed from a Moabitish chronicle. We would willingly also see the test of an *altera lectio* applied to the raid of David against the Moabites so laconically told (in 2 Sam. viii. 2, and 1 Chron. xviii. 2), an apparently causeless onslaught upon a people connected with him through Ruth by blood-ties, and to whom his father Jesse owed so much gratitude.

To measure the amount of difference, let us compare the statements found in 2 Kings iii. with the Moabite Stone, this chapter of realistic local history; the collation will prove how much the latter corrects and supplements the former.

2 Kings iii.	*Stele.*
4. And Mesha King of Moab was a sheep-master, and rendered unto the King of Israel an hundred thousand lambs, and an hundred thousand rams, with the wool.	Lines 4 and 5 mention only despoilers, enemies, and Omri, his son and his grandson, the oppressors and destroyers.
6–9. And King Jehoram went out of Samaria the same time, and numbered all Israel. And he went and sent to Jehosaphat the King of Judah, saying. The king of Moab hath rebelled against me: wilt thou go with me against Moab to battle? And he said, I will go up: I am as thou art, my people as thy people, and my horses as thy horses. And he said, Which way shall we go up? And he answered, The way through the wilderness of Edom. So the King of Israel went, and the king of Judah, and the King of Edom; and they fetched a compass of seven days' journey. . . .	Lines 7 and 10 mention only Israel and the men of Gad.
17. For thus saith the Lord, Ye shall not see wind, neither shall ye see rain; yet that valley shall be filled with water, that ye may drink, both ye, and your cattle, and your beasts.	No mention of this miraculous water-supply.
22–24. And they rose up early in the morning, and the sun shone upon the water, and the Moabites saw the water on the other side as red as blood: And they said, This is blood: the kings are surely slain, and they have smitten one another: now therefore, Moab, to the spoil. And when they came to the camp of Israel, the Israelites rose up and smote the Moabites, so that they fled before them. . . .	No mention of this phenomenon, which is recounted as if the semi-Bedawin Moabites had never seen a mirage.
25. And they beat down the cities, and on every good piece of land cast every man his stone, and filled it; and they stopped all the wells of water; and felled all the good trees: only in Kir-haraseth left they the stones thereof: howbeit the slingers went about it, and smote it.	No mention of the barbarous tactics referred to by the sacred writer.
26. And when the king of Moab saw that the battle was too sore for him, he took with him seven hundred men that drew swords, to break through even unto the king of Edom: but they could not.	No mention of a failure more glorious to a warrior-king than many a victory.
27. Then he took his eldest son that should have reigned in his stead, and offered him for a burnt-offering upon the wall. And there was great indignation against Israel: and they departed from him, and returned to their own land.	No mention of this sacrifice.
No mention of this terrible loss to the tribe of Gad.	Lines 11–12. Storming of Ataroth by Mesa, slaughter of the warriors, dedication of the spoils to Chamosh, and re-colonization by the Moabites.
No mention of this terrible loss to the Israelites.	Lines 14–18. Capture of Nebo, slaughter of 7,000 men, women, maidens, and vessels of Jehovah devoted to Ashtar-Chamosh.
Ditto.	Lines 19–20. Capture of Jahaz, which had been fortified by the king of Israel.
Ditto.	32. Attack upon the Horonaim, allies of the Israelites.

The "strong remark" that the Moabite Stone reads like a page of the Bible might have been made stronger. It is evident that in the Book of Kings we tread upon enchanted ground, whereas, in the stele, we find a chapter of realistic, local, and contemporary chronicle. The former offers, in a single chapter, a "prophet," a miracle, and a phenomenon so inexplicable as to be *quasi*-miraculous; the latter deals throughout with the world as we still know it. And the unprejudiced will find no difficulty in answering the question, Which is history, and which is the romance of history?

RICHARD F. BURTON.

'THE HIGHER MINISTRY OF NATURE.'

WITH reference to our review of Mr. Leifchild's 'Higher Ministry of Nature,' the author sends us a letter, in which he says—"My critic says that 'only in the last few chapters of a work of about five hundred pages does Mr. Leifchild offer us anything positive, except the most general positions of Natural Theisms, supported by the most familiar arguments,' &c. . . . I have written twenty-three chapters in this volume. Suppose I take 'the last few' as being *five*. The subjects of these five are, (19) 'Death'; (20) 'Immortality of the Human Soul'; (21) 'The Continuity of our Knowledge of God in Nature'; (22) 'Ultimate Realities—Conceptions of God'; (23) 'Evil and Goodness—the World of Spirits.' These five chapters extend from p. 424 to p. 543, that is, 120 pages, as you will see in the Summary of Contents. This entire mass of 120 pages of studiously considered matter my kind critic dismisses contemptuously as 'the last *few* chapters'! And he further depreciates them as unverifiable suggestions, and as 'meagre results.' . . . When I am charged with having presented only 'meagre results,' the question arises, what are, and are not, meagre results in such a field of research? In the supra-phenomenal region, it is plain that little or nothing can be formulated with scientific precision. Not even in the natural is scientific precision attempted as to many things believed. Whoever moves in the supra-phenomenal world walks in it by faith, and not by sight. Apart from all questions of direct revelation, the very basis of certitude is in doubt and dispute. The whole results must necessarily be matters of opinion, of belief, of sentiment, of analogical, and not demonstrative, reasoning. How, under such limitations, are my results meagre? Are extrications from Pantheistic and Spinozistic subtilities, clearer views of man's individual significance and his destiny, of his direct and personal relations to his Creator, of his distinct mental and moral endowments, of his noble ascent as well as his zoological descent, of the system on which the Divine Being works by certain factors, which I claim as his factors only, and as illustrated by later physical knowledge, of the uniformity and unity of his plans, of what physical law is and is not in relation to him, of the energizing, universal presence and omnipotence of Divine will, of the correlative sentiments in man produced by the observation of the unity of all natural science, by the perception of a perfect purity as well as unity, of the resolution of the physicist's ultimate reality, viz., *Force*, into something, or some entity, that must be the living, one, sole, eternal, immutable, omniscient Being, and that one Being immutably good as well as almighty, and, lastly, in this brief note, of the habitudes of thought which such convictions ought to produce in us, and instances of some of the numerous analogical conceptions of a high and spiritual character which they will suggest to others, or have suggested to me?"

In saying that Mr. Leifchild's "results" were meagre, we credited him (chiefly on the ground of a semi-apologetic passage which we quoted from p. 498) with a somewhat clearer conception of the difference between suggestion and proof than this letter seems to indicate.

THE PHOSPHORESCENCE OF THE SEA.

THE phosphorescence of the transparent compound, ascidian-pyrosoma, which occurs floating in occasional shoals both in the Atlantic and Pacific Oceans as well as the Mediterranean Sea, has long excited the admiration of voyagers. The fishermen of Naples know the pyrosoma by the name of "lanterne." Though its phosphorescence is so intense, yet zoologists have not hitherto rightly ascertained what are the organs which produce the light. Prof. Paolo Panceri, of Naples, in the course of his admirable researches on the phosphorescence of marine animals, has lately studied that of pyrosoma, and conclusively demonstrated, to the satisfaction of Dr. Krohn and other naturalists now at Naples, that the light-emitting organs are two large granular patches, placed on either side near the mouth of each of the tunicate constituents of the compound mass. By cutting a section of the pyrosoma, placing it in fresh water, and then under the microscope in a darkened room, it is at once seen that the light is produced by these two masses. Prof. Panceri has, at the same time, made important observations on the development and anatomy of pyrosoma, which were also studied during his voyage in the Rattlesnake by Prof. Huxley. Prof. Panceri has found that from a single egg not only do four embryos develope, but that the "cap" to which they are attached represents a fifth, which attains its development first, has a mouth, nervous system, and a heart, that pumps blood into the chain of four embryos encircling it. It is, in fact, a "nurse." The Italian Professor has also discovered a so-called "colonial" muscular system in pyrosoma, by which it is probable that the excitation causing a wave of phosphorescent light as observed in these animals is transmitted. In his entirely novel and ably worked-out investigations of the phenomenon of phosphorescence (he has already published memoirs on that of Pennatula, Pholas, Beroe, and Chætopterus), Prof. Panceri is doing a work worthy to be ranked with the researches of the great Neapolitan naturalists, Cavallini, Poli, and Delle Chiaje.

SOCIETIES.

ARCHÆOLOGICAL INSTITUTE.—*April* 5.—Lord Talbot de Malahide in the chair.—The Secretary read a letter from Sir J. Lubbock, giving some particulars of the acquisition by him of the land at Abury, on which the great Druidical monument is placed.—Mr. Kershaw sent 'Notes on the recently discovered portion of the Mazarin Bible, in the Archiepiscopal Library at Lambeth,' which were read, and in the discussion which ensued, Mr. Loftie added some bibliographical details, and made remarks on the early printed and MS. books exhibited by Sir W. Tite and others in illustration of the subject.—Mr. Micklethwaite, on behalf of Mr. Scott, gave 'Particulars about the Discovery of the Remains of the Substructure of the Shrine of St. Alban,' which were illustrated by drawings and photographs. Nearly the whole of the substructure had been found built up into the east end of the church, and this had probably taken place early in the reign of Elizabeth, when the grammar school of the town was formed in the Lady Chapel of the Abbey. Mr. Talbot Bury and others joined in an animated discussion upon several points of the account given by Mr. Micklethwaite.—The Lambeth portion of the Mazarin Bible was exhibited, by permission of the Archbishop of Canterbury.—Mr. Henderson brought two beautiful metal caskets of Persian work, damascened with gold and silver; one was of late thirteenth century work, and on it were the outlines of seated figures which had been covered with gold; the other was of the fourteenth century, and of unusual form.—Mr. Gheoghegan sent a Roman fibula and spear-head of bronze of good, but not unusual, type, also a brooch of silver and a boss or ornament found at Bishop's Castle, Orkney.—Mr. Corbet sent some early Norwegian coins; and Mr. Sparvel-Bayly exhibited three Anglo-Saxon urns, one of large size, various bowls and fragments of Samian ware, some having potters' marks, and fragments of other pottery which had been found on the shore of the Thames, near the ancient ferry at West Tilbury, Essex.

CHEMICAL.—*March* 30.—*Anniversary Meeting.*—The President delivered his address, congratulating the Fellows on the increase of their numbers, but pointing out at the same time the comparatively