he would gladly embrace the first chance to escape from the country. Given up by his government, there was no hint in these letters what course the Pacha would follow. These few hints of mine, however, will throw some light on my postscript, which here follows; and, in my state of mind after reading these letters, I wrote a formal letter which might be read by any person, — Pacha, Jephson, or any of the rebels, — and addressed it to Jephson, as requested; but on a separate sheet of paper I wrote a private postscript for Jephson's persual, as follows: —

Kavallis, January.

My Dear Jephson, — I now send thirty rifles and three Kavallis men down to the lake with my letters, with my urgent instructions that a canoe should be set off and the bearers be rewarded. I may be able to stay longer than six days here, perhaps ten days. I will do my best to prolong my stay until you arrive without rupturing the peace. Should we get out of this trouble, I am his most devoted servant and friend, but if he hesitates again, I shall be plunged in wonder and perplexity. I could save a dozen pachas if they were willing to be saved. I would go on my knees and implore the Pacha to be sensible of his own case. He is wise enough in all things else, even for his own interest. Be kind and good to him for his many virtues, but do not you be drawn into the fatal fascination the Sudan territory seems to have for all Europeans in late years. As they touch its ground, they seem to be drawn into a whirlpool, which sucks them in, and covers them with its waves. The only way to avoid it is to obey blindly, devotedly, and unquestioningly all orders from the outside.

The committee said, "Relieve Emin with this ammunition. If he wishes to come out, the ammunition will enable him to do so. If he elects to stay, it will be of service to him." The Khedive said the same thing, and added, that, if the Pacha and his officers wished to stay, they could do so on their own responsibility. Sir Evelyn Baring said the same thing in clear, decided words; and here I am, after 4,100 miles of travel, with the last instalment of relief. Let him who is authorized to take it, take it and come. I am ready to send him all my strength, and will assist him; but this time there must be no hesitation, but positive yea or nay, and home we go.

Yours sincerely,

Stanley.

In the course of his correspondence Mr. Stanley says, —

"On Feb. 6, Jephson arrived in the afternoon at our camp at Kavallis. I was startled to hear Jephson, in plain undoubting words, say, 'Sentiment is the Pacha's worst enemy. No one keeps Emin back but Emin himself.' This is the summary of what Jephson learned during the nine months from May 25, 1888, to Feb. 6, 1889. I gathered sufficient from Jephson's verbal report to conclude that during nine months neither the Pacha, Casati, nor any man in the province, had arrived nearer any other conclusion than what was told us ten months before. However, the diversion in our favor created by the Mahdists' invasion, and the dreadful slaughter they made of all they met, inspired us with hope that we could get a definite answer at last, though Jephson could only reply, 'I really can't tell you what the Pacha means to do. He says he wishes to go away, but will not move. No one will move. It is impossible to say what any man will do. Perhaps another advance by the Mahdists will send them all pellmell towards you, to be again irresolute and requiring several weeks' rest.'"

Stanley next describes how he had already sent orders to mass the whole of his forces ready for contingencies. He also speaks of the suggestions he made to Emin as to the best means of joining him, insisting upon something definite; otherwise it would be his (Stanley's) duty to destroy the ammunition, and march homeward. He continues, —

"On Feb. 13, a native courier appeared in camp with a letter from Emin, and with the news that he was actually at anchor just below our plateau camp. But this is his formal letter to me, dated the 13th: —

Sir, — In answer to your letter of the 7th instant, I have the honor to inform you that yesterday I arrived here with my two steamers, carrying a first lot of people desirous to leave this country under your escort. As soon as I have arranged for a cover for my people, the steamers have to start for Mswa Station to bring on another lot of people. Awaiting transport with me are some twelve officers anxious to see you, and only forty soldiers. They have come under my orders to request you to give them some time to bring their brothers from Wadelai, and I promised them to do my best to assist them. Things having to some extent now changed, you will be able to make them undergo whatever conditions you see fit to impose upon them. To arrange these, I shall start from here with officers for your camp, after having provided for the camp; and if you send carriers, I could avail myself of some of them. I hope sincerely that the great difficulties you had to undergo, and the great sacrifices made by your expedition on its way to assist us may be rewarded by full success in bringing out my people. The wave of insanity which overran the country has subsided, and of such people as are now coming with me we may be sure. Permit me to express once more my cordial thanks for whatever you have done for us,

Yours,

Emin.

BARNACLES.

Among the curious myths which in the middle ages did duty for natural science, one of the longest-lived, and yet one of the most extraordinary, was that which not only conceived the common shell-fish, the barnacle, to be the fruit of a tree, but went on to allege its transformation into the sea-bird known as the barnacle-goose. The successive changes from fruit to fish and from fish to fowl which the myth involved proved no obstacle to its wide acceptance and long-continued credence. According to an article by S. Heywood Seville, published in a recent number of *Knowledge*, it was widely current before the end of the twelfth century. Giraldus Cambrensis, writing in the reign of Henry II., gives, in his "Topographia Hiberniæ," a detailed account of it. "There are in this place," says he in one passage, "many birds which are called barnacles. Against nature, nature produces them in a most extraordinary way. They are produced from fir timber, tossed along the sea, and are at first like gum. Afterwards they hang down by their beaks as if from a seaweed attached to the timber, surrounded by shells in order to grow more freely. Having thus, in process of time, been clothed with a strong coat of feathers, they either fall into the water or fly freely away into the air. They derive their food and growth from the sap of the weed or the sea by a secret and most wonderful process of alimentation. I have frequently with my own eyes seen more than a thousand of these same bodies of birds hanging down on the seashore from one piece of timber, enclosed in shells and already formed. They do not breed and lay eggs like other birds, nor do they ever hatch any eggs, nor do they seem to build nests in any corner of the earth." After this account, Giraldus proceeds to inveigh against the custom, which prevailed in some parts of Ireland, of eating the barnacle-geese during Lent, — a custom which was justified by those who followed it by the argument that the geese were "not flesh, nor born of flesh," and which affords striking proof of the credence accorded to the story.

Though contradicted from time to time by some of the bolder writers and observers, the fable kept a strong hold on the popular mind, and even the educated were not ashamed to avow their belief in it. Sir John Maundevile alludes to it in his "Travels," where he speaks of the "trees that bear a fruit that becomes flying birds." Sir John somewhat naïvely adds, that the people "towards Upper India," to whom he recounted the story, "had thereof great marvel that some of them thought it was an impossibility." The "Travels" appeared about 1370, and more than two centuries later the subject was treated with considerable fulness, and in the most obvious good faith, by John Gerarde, who, in his "Herbal," published in 1597, devotes to it a chapter entitled "Of the Goose-tree, Barnakle-tree, or the tree bearing Geese," in which, after narrating the current belief as to the barnacle-geese being produced in the north of Scotland from shell-fish growing on trees, he proceeds to pledge his own credit as to the main facts of the story. Clearly, the myth was current in Shakspeare's time; and although, in an edition of the "Herbal" published in 1636, the editor added a note of caution to the reader at the foot of the chapter, yet eighty years after Gerarde wrote, a scientific writer was to be found, who, writing for scientific readers, asserted, of his own knowledge, the existence of the birds within the shells. This was Sir Robert Moray, who describes himself as "lately one of His Majesty's council for the Kingdom of Scotland," and who contributed to the "Philosophical Transactions" of 1677–78 a paper entitled "A Relation Concerning Barnacles," from which the following passages are transacted: "Being in the Island of East, I saw

lying upon the shore a cut of a large fir-tree, of about 2½ foot diameter and 9 or 10 foot long, which had lain so long out of the water that it was very dry; and most of the shells that had formerly covered it were worn or rubbed off. Only on the parts that lay next the ground there still hung multitudes of little shells, having within them little birds perfectly shaped. . . . The shells hang on the tree by a neck longer than the shell; of a kind of filmy substance, round and hollow, and creased, not unlike the windpipe of a chicken, spreading out broadest where it is fastened to the tree, from which it seems to draw and convey the matter which serves for the growth and vegetation of the shell, and the little bird within it. . . . This bird in every shell that I opened, as well the least as the biggest, I found so curiously and completely formed that there appeared nothing wanting as to the internal parts for making up a perfect sea-fowl; every little part appearing so distinctly that the whole looked like a large bird seen through a concave or diminishing glass, color and feature being everywhere so clear and neat. The little bill like that of a goose, the eyes marked, the head, neck, breast, wings, tail, and feet formed, the feathers everywhere perfectly shaped and blackish colored, and the feet like those of other water-fowl to my best remembrance."

Such was the old belief existing during five centuries, at any rate, and probably accepted at periods both earlier and later than those from which the preceding examples are taken. To modern observers it seems utterly absurd. Science has shown its absolute groundlessness as natural history; and Professor Max Müller, to complete the rout, has put forward, in his "Lectures on the Science of Language," a very interesting theory of its probable origin from the point of view of philology. But the latest researches have shown that the barnacle has been deposed from his place in a mythical metamorphosis, only to take part in his life-history as now ascertained in another transformation scene quite as wonderful, and this time vouched by the careful observations of our best naturalists.

In the adult state, Mr. Seville goes on to say, the barnacle consists of a shell-fish permanently attached, by a fleshy peduncle or stalk, to a piece of timber or rock or some other object in the sea. The shell opens by a peculiar valve-like arrangement, and, through the aperture thus formed, several pairs of long, many-jointed "cirri," or feelers, are put forth, which, by their constant waving motion, whirl to the creature's mouth the small particles which form its food. Huxley's description is concise and expressive: "A crustacean fixed by its head, and kicking the food into its mouth with its legs." It is not the change of this creature into a goose that science can now surprise us with: that story must be given up along with the accounts of griffins, phœnixes, and dragons. The fruit theory as to its origin must also be abandoned; but, though the new account does not involve quite so violent a transition as that from the vegetable to the animal kingdom, it is still in the steps by which the adult form is reached that those changes are revealed which almost entitle the barnacle to the reputation for facile metamorphosis with which our forefathers credited it. The steps in question are (besides the egg) the two stages known respectively as the *Nauplius* and *Cypris* stages. Immediately on its escape from the egg, the young barnacle appears as an animal of microscopic size, active and free-swimming, equipped with a broad shell or shield on its back, and having three pairs of legs, a single eye, a mouth, and a forked tail. This is the *Nauplius*, and in outward appearance the young creature exhibits at this stage no single point of resemblance to the parent form. It feeds and grows apace, and moults several times. It then enters the next condition of its existence, — the *Cypris* stage. The broad shield-shaped carapace becomes folded together, somewhat after the pattern of a bivalved shell, and almost encloses its owner. The foremost limbs are transformed into a very peculiar pair of suctorial or adherent feelers, and the two hinder pairs are cast off, their place being taken by six pairs of powerful swimming-legs with bifid extremities. A pair of compound eyes is another new feature of this stage; and altogether the *Cypris*, while still quite distinct from the adult barnacle, presents a very different appearance from the *Nauplius*. The mouth is wanting, or at least is functionless, being covered by an integument without aperture. Existence in this stage is therefore necessarily short, and the *Cypris* soon fixes upon its future abode by attaching itself by its suctorial feelers to some piece of drift-wood, pile, or rock. A kind of cement, which it secretes by means of special glands, pours out round the base of attachment, and quickly hardens, gluing the ends of the feelers firmly to the surface on which they rest. The compound eyes are shortly afterwards moulted, the body straightens out, and the shell thus comes to stand almost perpendicularly to the surface of attachment. Other changes follow: the shape of the shell is modified, and the position of the animal within alters in such a manner that the under surface of its body is turned directly away from the point of attachment; the integument covering the mouth is cast off; the legs cease all swimming ambulatory functions, and soon become mere cirri, sweeping the water for prey; the feelers are gradually covered with a fleshy pulp, and, losing all trace of their old form, are converted into a single stalk of attachment; the new parts of the shell which are to form the valvular opening, and other protecting plates, begin to form, and, for all practical purposes, the barnacle, though still very minute, has attained its adult form, future development being mainly in the matter of size.

The old legend involved a double change from fruit to fish, and from fish to bird; the new history also deals with a double change, from *Nauplius* to *Cypris*, and from *Cypris* to barnacle. For one series of wonders another has been substituted, and, if this is not sufficient to restrain us from too hastily condemning our forefathers' credulity, it will be well to remember how recently we have arrived at the truth. Little more than fifty years ago the position of the barnacle in the animal kingdom was still completely unsettled. Agreeing in most of its outward characteristics with the *Mollusca*, it was commonly classed with them. The *Nauplius* and *Cypris* were not connected with the parent form, but, if described at all, were treated as distinct animals. In 1830 J. Vaughan Thompson's description of his observations of their metamorphoses cast a new light on the subject; but the question still remained somewhat open ground for naturalists, and it was not until 1851–53 that Darwin, in his "Monograph of the Cirripedia," definitely settled the barnacle's claim to be classed with the *Crustacea*, and established beyond dispute the facts of its complicated and peculiar life-history.

BOOK-REVIEWS.

The Development of the Philosophy of the Steam-Engine. By ROBERT H. THURSTON. New York, Wiley. 16°. 75 cents.

THIS historical sketch, which relates not only to the steam-engine, but also to the various heat-engines embodying the same principles, was originally prepared by Professor Thurston some five or six years ago, and was presented in the form of a paper to the British Association for the Advancement of Science in 1884, at its Montreal meeting. The paper was favorably received, and was incorporated in full in the association's "Transactions" of that year. Believing the time appropriate for the publication of such a sketch, he now gives it to the public in a more permanent and accessible form. Though the author does not hold that the theory of the steam-engine is yet in its final perfect and complete form, he believes that the main principles and essential facts of a complete theory are well determined and well recognized by advanced thinkers and intelligent practitioners. This view of the case, we think, will not be disputed; and all persons concerned in engine-designing will find this sketch of the development of the philosophy of the steam-engine a valuable guide in working out future improvements.

Oceania: Linguistic and Anthropological. By Rev. D. MACDONALD. Melbourne, M. L. Hutchinson; London, Sampson Low. 16°.

THE author takes the stand that the ancient Oceanic mother-tongue was a branch of the Semitic family, and that while, like the other languages of this stock, it had much in common with all the rest of phonetics, grammar, and vocabulary, it had certain peculiarities, and that therefore the modern Oceanic dialects are Neo-Semitic, "somewhat as Modern Syriac." The author compares Malagassy, Malay, Efatese, and Samoan with many Semitic dialects, and calls his new family Semitic-Oceanic. The author can hardly claim to have succeeded in proving such a relationship.