jection from any quarter. There are very few students of science who are not familiar with one or other of these idioms. And the choice will be made generally acceptable by the fact that they very fairly represent the two great Indo-European branches of language, the Teutonic and the Romanic, in which at least nineteen-twentieths of all scientific publications are likely to appear for many years to come. If the time should arrive when the addition of another language may seem advisable, it can readily be made by the proposed congress or any other authority then governing the Central Bureau.

It would, of course, be understood that the deliberations of the congress and of its sections, and the papers read before them, would not necessarily be restricted to the two idioms of the catalogue, but might be in any language which the congress or any section should at the time decide to admit. This decision, it may be assumed, will always be considerate and liberal to the largest possible degree.

I am your obedient servant,

HORATIO HALE.

The Secretaries of the Royal Society,
BURLINGTON HOUSE, LONDON.

SCIENTIFIC LITERATURE.

A Primer of Mayan Hieroglyphics: By DANIEL G. BRINTON. Ginn & Co., Boston. 1895. 8°, pp. 152.

The public mind is becoming more and more interested in the archæology of Mexico and Central America. At once symptomatic of and a cause of increasing this interest are the numerous explorations of recent years, the exhibition from this region collected for the Exposition, and the notable works published in Mexico, Spain and Germany in connection with the Quadri-centennial celebration of America's discovery.

Nevertheless, students in our own country are somewhat at a disadvantage in this matter. The literature of the subject is not only scattered, but is in various languages, —Spanish, French and German—and it is not easy to keep track of progress. This little volume, by one who has devoted years to the study of 'the American Race,' and who is a specialist in the languages, literature and life of Isthmian people, will therefore be particularly welcome. It not only summarizes the work done, but is a guide to the original publications wherein discussions have been published.

The Mayan hieroglyphic system was in wide-spread use, being represented on monuments of Yucatan, Tabasco, Chiapas, Guatemala and Western Honduras. Though so often compared with that of the Aztecs, it is certainly more fully developed. On the whole, it can not be said to comprise a very great number of simple elements; these, however, are variously combined and united, and the composite *glyphs* are many. The material for study varies. There are books —Codices—written on long strips of paper, which were folded screen-wise. Four such codices are known, called the Codex Troano, C. Cortesianus, C. Peresianus and C. Dresdenis; they are in libraries at Madrid, Paris and Dresden. There are also mural inscriptions cut in stone; elaborate series of calculiform characters chiseled on altars and monoliths; pretty cartouches engraved on amulets or ornaments; symbols or characters painted on pottery; glyphs on hard, firm grained boards of wood like those from Tikal.

Are these characters ideograms or phonetic? There are those who believe they are entirely the former; there are others who claim that many are phonetic. Some admit that both occur. Brinton himself invented, years since, the word *ikonomatic*. He believes that there are some true ideograms in the Mayan texts; very many of the characters, however, he believes are in the nature of rebuses. They still betray

their origin as pictures, but are not to be considered as pictures but as characters representing sounds—either the name of the object pictured, used as a phonetic element, or a sound suggested by that. Looking at the whole field he recognizes three groups of elements:

1°. Arithmetical signs, numerals, numerical computations—Mathematical elements.

2°. Pictures of men, animals, fantastic beings, ceremonies, objects, etc.—Pictorial elements.

3°. Graphic elements, proper.

To each of these our author devoted a division of his work.

Numbers, day signs, month signs, are so common in the Codices as to suggest that these are mainly time-counts. The Mayas counted by twenties, and had distinct terms for higher orders of numerals up to at least the sixth power of twenty. They were able to write numbers, even the highest; dots were units, lines were fives, and there were special characters for the score and for higher orders. Förstemann appears to have found that they had a zero sign, and that numbers were written upward, a higher order of units being indicated by position. Maya time divisions are complicated, and a variety of numbers are used in their tables. Thus the numbers 4, 5, 13, 20, 24, 52, 65, 104, 115, 260 and others occur in grouping days and months into years, cycles, &c. The Maya idea of a complete number seems to have been the multiple which should contain all these numbers used in reckoning days. Förstemann claims to find the number 1,366,560 days (= 3744 years) in the Dresden Codex. The eminent German believes the Codices were largely astronomical treatises, and in this opinion Brinton agrees. This is, as he says himself, world-wide distant from the theories of Seler or Thomas. Aside from theories, however, Brinton presents the necessary information, which is gained so far, regarding numbers as they occur in the Codices; he also presents briefly and simply a sketch of his own and Förstemann's astronomical views, and calls attention to the fact that other views exist.

The bulk of the pictorial elements have to do apparently with religious ideas and represent deities, ceremonies or religious objects. Schellhas' paper upon the representations of the gods in the Maya writings will ever remain the foundation for such study. In some cases Brinton agrees with Schellhas; in others he reaches a different identification. A considerable number of the gods are satisfactorily made out; that is certain. Influenced as he is by Förstemann's strongly astronomic views, Dr. Brinton feels that among these representations of deities there should be some of the planet Venus. In all parts of the Codex Troano there are many curious representations of a bee; this he connects with Venus as the *evening star* and merges the latter into the old woman, so often represented with Cuculcan, as the earth goddess. In all the Codices, Brinton counts 825 representations of male deities and 125 of females; he believes that 638 of these have been made out. He says: "This is a satisfactory result and shows that, as far as these pictographs go, the contents of these once mysterious volumes are scarcely an unsolved enigma."

The graphic elements are and long must be the most difficult. The signs of the days and months have long been known; those of the cardinal points have recently been pretty surely identified; the 'monograms' of the gods are fairly agreed upon. In studying the graphic elements the composite glyphs must be analyzed. They consist usually of one main element, with infixed, prefixed, superfixed, postfixed or sub-fixed secondary elements. Then one must, if possible, find the things which these simple elements originally represented. The ideogrammatic force may be gone, but

the name of the thing pictured may suggest the phonetic value. The work is not easy. Brinton takes up one after another such as have been most studied, or for which he has a meaning to suggest. That we are still far from final conclusions is shown by the variation in interpretations of different authors. A group of signs which Seler considers are derived from 'man' and signifying 'person,' others distribute among crescent, ear, a serpent's mouth, eye and eye-lash, comb, claw, feather, part of a plant, etc. One of the commonest of glyphs, believed by Brinton to be derived from a picture of a feather ornament, and with the phonetic value of *yax*, and meaning (by metaphor) green, new, young, strong, fresh, virile, etc., is by others variously identified as representing a gourd, a tree, a *zapote* fruit, the phallus, etc. Such diversity of opinion is not discouraging; it only shows that much remains to do.

Our author does not slavishly follow authority. The bee-god sign and the *yax* character already mentioned show independence. His recognition of the *pax* (drum) sign is ingenious and probably strong. He introduces much new argument in identifying the deities. His suggestions in reference to day and month signs are thoughtful.

In so new a field we must have conflict of ideas. Dr. Brinton fairly aims to present all sides. The Primer shows the real position of knowledge on the question as resulting from the labors of Seler, Thomas, Schellhas, Förstemann and a host of other students. It is a good summary of present knowledge with a considerable addition of new and thoughtful material. It points the way, gives suggestion and help. The beginner must have the book, and every worker must recognize that Dr. Brinton by its publication puts all under genuine obligation, whether they agree with all his arguments or not.

Frederick Starr.

University of Chicago, Feb. 16, 1895.

Steam and the Marine Steam Engine. By John Yeo. London and New York, Macmillan & Co. Illustrated. 105 Engravings. Pp. xiv, 196. 8vo. $2.50.

This is a book written by a Fleet Engineer of the British Navy, for use at the Royal Naval College and elsewhere, embodying lectures prepared by Mr. Yeo for a course addressed to Executive Officers. It is thought that it may prove also useful for officers of the merchant service, and for students in engineering. It is a very compact presentation of the subject, and, as might be expected, coming from an officer of long service, abounds especially in well-made illustrations exhibiting the construction of the marine engine in its various usual forms and all its details. Of these engravings we can hardly speak too highly. They are largely reproductions of the diagrams and drawings employed in the lecture-room, and reductions of working drawings made especially for the book. The introduction gives an abridged account of the history of the marine engine, from the time of Watt to the present, and indicates, in a general way, the methods of improvement which have brought about the enormous gain, meantime, in economy and power of steamships.

The structure of engines and boilers, and of all their minor parts and accessories, including the slide-valve and its gearing, indicator-diagrams and their interpretation, and the condenser, the screw, and the powering of ships, are subjects treated of with evident knowledge and with brevity and accuracy. Little space is given to theoretical discussions of the thermodynamics or of other principles, mathematical or physical, illustrated by the action of the steam engine, and the special value of the book lies in its presentation of the forms of parts and its descriptive account of the machine. It is well made; paper, type, style and binding all being excellent; and the publishers