

really an accurate portrait of the Korean envoy who visited Japan in 1877.

It is impossible to do justice to Dr. Rein's important book in the space at our command. Its construction is eminently scientific, and its thoroughness will excite the admiration of all who know the difficulty of obtaining, and especially of selecting, information upon many of the matters so exhaustively treated. The errors are few and seldom important, and will probably disappear in the next edition. One powerful recommendation is the absence of the *ego* from its pages; the author everywhere studiously keeps his own individuality concealed, and in the discussion of most points he is nearly always contented with such a statement and grouping of the principal facts as will leave the inference well within the grasp of the reader's mind. In conclusion, it is the best of the many publications upon the subject of Japan that have appeared in the last ten years, and, unlike most of the number, supplies a real want, and will be received gratefully by all who seek for solid, trustworthy information. We trust that the completion of the work will soon be issued.

OUR BOOK SHELF

Études géométriques et cinématiques. Note sur quelques Questions de Géométrie et de Cinématique, et Réponse aux Réclamations de M. l'Abbé Aoust. Par E. J. Habich. 80 pp. (Lima, 1880.)

M. L'ABBÉ Aoust, author of the "Analyse infinitésimale des Courbes planes," and our author put forward conflicting claims as to priority of discovery.

The polemics have fired off their powder in *Les Mondes* (tome iv., 1880, Aoust: tome I., 1879, Habich; see also the *Comptes rendus*, lxxxv., 1877, and lxxxix., 1879), and the object of the present pamphlet is "de réduire à leur juste valeur les assertions" of the Abbé. The matters in dispute can be inferred from the three divisions of the present work:—

"1. Développoides—considérations historiques, étude des enveloppes des droites par la considération du centre instantané de rotation, développoides des divers ordres et développoides inverses.

"2. Coordonnées tangentielles-polaires.

"3. Mouvement géométrique d'une figure plane dans son plan—considérations générales, mouvement géométrique déterminé par deux systèmes d'enveloppées et d'enveloppes, mouvement d'une droite sur un plan."

We have, of course, but one side of the quarrel presented to us, but leaving polemics on one side there is a great deal of interesting matter put before us. Time will, no doubt, settle the question of priority.

A Synopsis of Elementary Results in Pure and Applied Mathematics. By G. S. Carr, B.A. Vol. i. part. viii. (C. F. Hodgson and Son, 1880.)

WE recently noticed with approval the volume containing the first seven parts. This eighth part carries on the articles from 1400 to 1868, and is concerned with the differential calculus. It contains an abstract of the usual processes, and besides gives a succinct account of the theory of operations, and an analysis of matters which are treated of in the higher algebra, as Jacobians and quantics, and closes with maxima and minima, the geometrical applications being reserved for the parts on Co-ordinate Geometry.

These fifty-six pages are very correctly printed, at least we have not detected more than three or four trivial typographical errors.

This part maintains the handy character for reference of its forerunners.

The Practical Fisherman. By T. H. Keene. (London: The Bazaar Office.)

THIS book deals with the natural history, the legendary lore, and the capture of British freshwater fish, together with the art of tackle-making. The author has bestowed great care on his work, and seems to have studied every book written or published on the charming subject from Oppian to the present time. Mr. Keene is besides an enthusiastic fisherman, and has thus produced a treatise of great interest to the practical angler. We may add that this work is almost the only one on angling which treats of the natural as well as the traditional history of fishes.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Movements of Leaves

FRITZ MUELLER has sent me some additional observations on the movements of leaves, when exposed to a bright light. Such movements seem to be as well developed and as diversified under the bright sun of Brazil, as are the well-known sleep or nyctitropic movements of plants in all parts of the world. This result has interested me much, as I long doubted whether paraheliotropic movements were common enough to deserve to be separately designated. It is a remarkable fact that in certain species these movements closely resemble the sleep movements of allied forms. Thus the leaflets of one of the Brazilian Cassiæ assume when exposed to sunshine nearly the same position as those of the not distantly allied *Hæmatoxyylon* when asleep, as shown in Fig. 153 of "The Movements of Plants." Whereas the leaflets of this Cassiæ sleep by moving down and rotating on their axes, in the same peculiar manner as in so many other species of the genus. Again, with an unnamed species of *Phyllanthus*, the leaves move forwards at night, so that their midribs then stand nearly parallel to the horizontal branches from which they spring; but when they are exposed to bright sunshine they rise up vertically, and their upper surfaces come into contact, as they are opposite. Now this is the position which the leaves of another species, namely *Phyllanthus compressus*, assume when they go to sleep at night. Fritz Müller states that the paraheliotropic movements of the leaves of a *Mucuna*, a large twining Papilionaceous plant, are strange and inexplicable; the leaflets sleep by hanging vertically down, but under bright sunshine the petiole rises vertically up, and the terminal leaflet rotates by means of its pulvinus through an angle of 180°, and thus its upper surface stands on the same side with the lower surfaces of the lateral leaflets. Fritz Müller adds, "I do not understand the meaning of this rotation of the terminal leaflet, as even without such a movement it would be apparently equally well protected against the rays of the sun. The leaflets, also, on many of the leaves on the same plant assume various other strange positions." With one species of *Desmodium*, presently to be mentioned as sleeping in a remarkable manner, the leaflets rise up vertically when exposed to bright sunshine, and the upper surfaces of the lateral leaflets are thus brought into contact. The leaves of *Bauhinia grandiflora* go to sleep at an unusually early hour in the evening, and in the manner described at p. 373 of "The Movements of Plants," namely, by the two halves of the same leaf rising up and coming into close contact: now the leaves of *Bauhinia Brasiliensis* do not sleep, as far as Fritz Müller has seen, but they are very sensitive to a bright light, and when thus exposed the two halves rise up and stand at 45° or upwards above the horizon.

Fritz Müller has sent me some cases, in addition to those given in my former letter of March 3, of the leaves of closely-allied plants which assume a vertical position at night by widely different movements; and these cases are of interest as indicating that sleep-movements have been acquired for a special purpose. We have just seen that of two species of *Bauhinia* the leaves of one sleep conspicuously, while those of a second species appa-