

to four or five significant figures, and in consequence expects to get greater credit than his more indolent neighbour who has been content with two or three significant figures. Instances might be multiplied; they constitute the daily purgatory of every teacher. Something surely is to be said for a method which avoids these absurdities.

Analytical methods have so dominated the elementary text-book that many boys have the idea that statics is practically useless. They have no notion, for instance, that graphic statics lies at the foundation of bridge construction. Besides, in how many questions in the elementary text-book is the principle involved wholly obscured, because a trigonometrical conundrum is required and not an application of the conditions of equilibrium to give the unknown forces? In a popular text-book one-third of the questions at the end of one of the chapters are of this character. Is it to be wondered at that the average boy gets the idea that mechanics is a subtle epilogue to trigonometry?

Each question treated graphically should be regarded in the light of an experiment, in which the student should get the best result available with the means at his disposal. In any actual problem the *data* themselves are not correctly known, and the *quæsita* are therefore subject to all sorts of cumulative errors. This he quickly finds out by comparing his result with that of his neighbour, and he readily gets a notion of the degree of accuracy that he himself with pencil and ruler is capable of.

Mr. Larden writes:—"a student well trained in analytical methods can always pick up graphical methods rapidly when he needs them for special work." But will he do so? The engineer is not trained in analysis and allowed to adopt a graphical method when a specific problem arises. My experience is that the student, who has mastered analytical methods, is apt to consider graphical work as drudgery, and when called upon to solve a question graphically does not treat it with sufficient respect, and gets an indifferent result. A certain amount of finesse and judgment in choice of scale and of position of the initial force or load is required "to fit the diagram on to a given sheet of paper." This can be acquired only by practice.

Unfortunately it is too true that "graphical work consumes an amount of time that seems out of proportion to the mental training and knowledge of principles gained," but only when applied to too many similar questions. This, however, is misusing, not using the method.

I believe the best results will be obtained when the two methods are used side by side. They are strictly complementary, and the merits of each supply the deficiencies of the other.

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R. M. MILNE.

Asser and the Solar Eclipse of October 29, 878.

UNDER the date DCCLXXIX, Asser, in his "Life of King Alfred," gives the following entry:—"Eodem anno eclipsis solis inter nonam et vesperam, sed proprius ad nonam, facta est." The oldest manuscript of the Anglo-Saxon Chronicle also notes an eclipse in 879, but it cannot be doubted that in each case the reference is to the eclipse of October 29, 878, which was total in South Wales and southern England. Particulars of the eclipse are given by Mr. Maguire in the *Notices of the Astronomical Society*, vols. xlv., 400, and xlvi., 26. The sun rose totally eclipsed in 73° N. and 42° 8' W. at about 9.53 local time, and the central line of the eclipse, after passing near Dublin, Aberystwith, Dover and Fulda, went off the earth at sunset about 130 miles south of Moscow at 4.20 local time; St. David's, Winchester and London were within the limits of totality. With regard to the hour of the eclipse, it is needless to consider not only mean time and apparent time, but also natural time, which was the kind of time then in use, according to which the period between sunrise and sunset was conceived to be divided into twelve hours, which were, of course, much shorter in winter than in summer. As the sun rose at London on the day of the eclipse about 7.20, the natural hour would have contained only about 47 minutes of mean time. Mr. Maguire gives the middle of the eclipse at St. David's about 1.12, and at London about 1.18 mean time, and subtracting the equation of time, about 15 minutes, we have 12.57 and 1.3 for the apparent time as shown by a sundial; correcting for natural

time, we obtain 1.13 for St. David's and 1.20 for London. Finally, making allowance for the difference of longitude, we see that totality occurred at St. David's at 12.46, and at London at 1.20, according to local time as shown by a waterclock, or some other time-keeper, properly regulated to mark the natural hours. We now have to consider what Asser meant by *Nonam* and *Vesperam*. Those who have written about the passage have taken *Nonam* to be identical with *Nonam Horam*, but probably they have not been right in doing so. It is shown in the "Dictionary of Christian Antiquities" (i. 793) that the day and night were divided into four equal parts, and that each quarter of the day was named after the last hour in it. "None embraces the seventh, eighth and ninth hours; and the last called Duodecima contains the tenth, eleventh and twelfth, ending at Sunset." Asser, however, evidently uses *Vespera* for *Duodecima*. *Nona* is, in fact, noon, the point when the sun is on the meridian, the beginning of the seventh hour, and *Vespera* is the point half-way between noon and sunset, in this case 2.20 mean time and 3.0 natural time. Thus what Asser says is this, that the eclipse was total at a point of time between noon and 1.30 natural time, and we see that the statement is true for any point in England or Wales. If we could be sure that the sentence about the hour of the eclipse was written by Asser of St. David's, it would be a very strong argument, indeed, for the genuineness of the book which is called by his name, for it fixes the moment of the eclipse correctly to within seventy minutes of mean time for any place at which it is possible that the book could have been written.

C. S. TAYLOR.

Banwell Vicarage, April 23.

"Abdominal Ribs" in Lacertilia.

It is usually stated in text-books that among living reptiles only the Crocodilia and Hatteria are furnished with abdominal ribs or parasternum: that is, of course, in the condition of thin pieces of bone lying between the ventral muscles and underlying the true ribs, for no one doubts that the plastron of the Chelonia is the same structure exaggerated. There has been some little confusion between the abdominal ribs and the ventral moieties of the true ribs in Lacertilia, which is cleared up by Dr. Gadov in his contribution to the "Cambridge Natural History." Dr. Gadov correctly observes of the geckos that they possess very long and slender post-thoracic ribs, "which meet each other in the middle line, in this case bearing an extraordinary resemblance to the so-called 'abdominal ribs' of other Reptiles." The statements as to "abdominal ribs" made by M. Boulenger in his catalogue of the lizards in the British Museum appear to me to refer to true ribs. Of the Scincidae, he remarks that ossified abdominal ribs are absent." Curiously enough, it is precisely in this group that I find a parasternum. In *Tiliqua scincoides* the ventral musculature is divided by the usual tendinous septa into successive "myotomes," the tendinous intervals being distinctly ossified; there are several pairs of these bonelets which seem to be exactly like those of Hatteria, with which I have compared them. That they are not the ventral moieties of the true ribs is shown by the fact that they overlap the latter, the two series of structures lying at a different plane in the musculature. I intend to make a more detailed communication to the Zoological Society upon this subject immediately.

FRANK E. BEDDARD.

Inheritance of Acquired Characters.

REGARDING the "non-inheritance of acquired characters," the following is interesting:—

I was recently visiting a sugar plantation near Ottawa, Natal, and there was shown four fox terrier pups about a fortnight or three weeks old, two of which had been born with quite short tails, and one with a tail shorter than the normal. The fourth pup had a full-length tail. The mother was an ordinary fox terrier with cut tail. When the circumstance of these dogs being born with short tails was first mentioned to me I refused to believe it; but examination showed that the short tails were really naturally short tails and not tails that had been cut, that is to say, the short tails had at their ends the usual tapering vertebrae of a normal dog's tail, and, of course, at this age it was easy to see that the tails had not been cut or bitten off.

Cape Town, April 7.

D. E. HUTCHINS.