

tials which appeared in these columns a short time ago, but with some additional matter, must, from the clear explanation of the principles involved in the different methods of measurement, take a high position as an educational work, and, from the care with which details of manipulation are in many parts described, form a valuable laboratory guide.

The author begins by explaining Gauss's method of finding the horizontal intensity of the earth's magnetism. Instead of describing an "instrument-maker's" magnetometer, and showing how with this expensive luxury H may be determined, he gives simple, clear, and full directions for constructing, with such common materials as are to be found in any laboratory, all that is necessary for making this determination with great accuracy.

A description of the tangent galvanometer in some of its forms and an explanation of some of the units naturally follow. Here, by treating each unit separately with many illustrations depending on the aspect from which they are viewed, the author has succeeded in giving them a reality which students often find it difficult to believe they possess.

The next two chapters are devoted to a description of the construction and graduation of Sir W. Thomson's "Graded Galvanometers." These instruments possess so great a range, and are, when used carefully in the laboratory, so accurate and convenient, though rather delicate for an engine-room, that an exact description from headquarters of their construction, of the precautions which must be observed in their use, and of the means of graduating them is especially valuable.

The various methods employed in measuring any resistance from that of a thick copper rod to that of a piece of gutta-percha are given, and in many cases explained by numerical examples.

The methods by which the energy due to direct or to alternating currents may be measured is explained—in the latter case on the assumption that the current strength varies harmonically with the time.

The chapter on the measurement of intense magnetic fields is especially interesting, for the methods given, depending on the use of suspended bits of wire attached by threads to pendulum weights, or equally simple and easily contrived devices, show how the experimenter may in many cases be independent of the elaborate work of the instrument-maker.

C. V. B.

Field and Garden Crops of the North-Western Provinces and Oudh. By J. F. Duthie, B.A. F.L.S., Superintendent of the Saharanpur Botanical Gardens, and J. B. Fuller, Director of Agriculture, Central Provinces. Part 2. With Illustrations.

As a work of reference it will be very valuable, for it contains well-arranged details of some of the more important crops under cultivation, and the information is well and systematically arranged. Care has been taken in each case to secure a complete but still a concise statement, which is sufficient to guide the cultivator in all the specialities of management necessary to secure successful results. A good drawing illustrates each crop treated of, and its several cultivated varieties, and with these we have carefully-prepared descriptions of each plant in succession, and its general history. The districts within which the cultivation can be successfully extended are also set forth with great clearness and precision. For accuracy of details, in a very accessible form, this work leaves little to be desired.

A Treatise on Higher Trigonometry. By the Rev. J. B. Lock. (Macmillan, 1884.)

THIS is the promised complement to the same writer's "Treatise on Elementary Trigonometry," which we noticed very favourably in these pages at the time of its appearance (vol. xxvi. p. 124). It is concerned principally

with series, the errors which arise in practical work, and the use of subsidiary angles in numerical calculations.

A short chapter on the use of imaginaries is justified by the position this subject holds in the London University Examinations, and no apology is needed for the space assigned to an account of, and a collection of exercises upon, the hyperbolic sine and cosine. We have read the text carefully, and though almost of necessity there are numerous typographical mistakes, only one or two (for $2a \cos 2\theta$, p. 127, line 3, read $a \cos 2\theta$) will inconvenience a student. In addition to the numerous examples in the text, there are fourteen specimen papers from Cambridge and other examinations.

The only article to which we take exception is § 9, the proof of which may be, if we mistake not, considerably simplified. The book can be confidently recommended to the use of advanced pupils in our schools, and will meet the wants of most students in our Universities.

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 insure the appearance even of communications containing interesting and novel facts.]

Teaching Animals to Converse

YOU did me the honour some weeks ago (January 3, p. 216) to insert a letter of mine, containing suggestions as to a method of studying the psychology of animals, and a short account of a beginning I had myself made in that direction.

This letter has elicited various replies and suggestions which you will perhaps allow me to answer, and I may also take the opportunity of stating the progress which my dog "Van" has made, although, owing greatly no doubt to my frequent absences from home, and the little time I can devote to him, this has not been so rapid as I doubt not would otherwise have been the case. Perhaps I may just repeat that the essence of my idea was to have various words, such as "food," "bone," "water," "out," &c., printed on pieces of cardboard, and after some preliminary training, to give the dog anything for which he asked by bringing a card.

I use pieces of cardboard about 10 inches long and 3 inches high, placing a number of them on the floor side by side, so that the dog has several cards to select from, each bearing a different word.

One correspondent has suggested that it would be better to use variously coloured cards. This might no doubt render the first steps rather more easy, but, on the other hand, any temporary advantage gained would be at the expense of subsequent difficulty, since the pupil would very likely begin by associating the object with the colour rather than with the letters; he would, therefore, as is too often the case with our own children, have the unnecessary labour of unlearning some of his first lessons. At the same time the experiment would have an interest as a test of the condition of the colour-sense in dogs. Another suggestion has been that, instead of words, pictorial representations should be placed on the cards. This, however, could only be done with material objects, such as "food," "bone," "water," &c., and would not be applicable to such words as "out," "pet me," &c.; nor even as regards the former class do I see that it would present any substantial advantage.

Again, it has been suggested that "Van" is led by scent rather than by sight. He has no doubt an excellent nose, but in this case he is certainly guided by the eye. The cards are all handled by us, and must emit very nearly the same odour. I do not, however, rely on this, but have in use a number of cards bearing the same word. When, for instance, he has brought a card with "food" on it, we do not put down the same identical card, but another with the same word; when he has brought that, a third is put down, and so on. For a single meal, therefore, eight or ten cards will have been used, and it seems clear, therefore, that in selecting them "Van" must be guided by the letters.