beginners we should expect to be confined to the very simplest deductions, and these should be most carefully graduated, whereas the exercises before us do not seem to be arranged in any very clearly-defined order. For instance, at one time we are in the first book, in the next question in the sixth book, and then back to the third, and so on. The references are apparently to Euclid, but not to editions in use in this country, as our author inserts on pp. 118, 120, 121, propositions which figure as Euc. vi. B, C, D, in Simson's text; on p. 126 a solution is given from Lardiner's (*sic*) Euclid.

The solution on p. 112 strikes us as not being the neatest that can be given of the exercise, and the figures on pp. 109, 110 are a little wrong. Having had our grumble, we must now say that we think Mr. Constable has produced a very fair book, with neat solutions and good figures, but we do not consider such a book called for. Every mathematical master has such a collection either in manuscript or ready for *visà voce* teaching, and has the more advanced works of McDowell and Casey on his shelves. We can, however, suggest that the little book may be of use in preparation for University Local, and other examinations, though we do not see its suitability for *beginners*.

Algebra. Part II. By E. J. Gross, M.A. Second Edition. (London: Rivington, 1882.)

WE are glad to see that this work has been so appreciated, that a second edition has been called for. The main defect of the first edition, in our opinion, was the plentiful crop of errata. This volume, we notice, has not been at all altered in the text, but very many of the errors have been corrected; we wish we could say that all errors had been removed, but this is not so. There are one or two curious slips: thus, for instance, in the Answers, p. 313, a correction is retained from the earlier edition, whilst the indicated alteration has been made in the text. Barring the errata, we again confidently commend Mr. Gross's book.

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.]

Pronunciation of Deaf Mutes who have been Taught to Speak

THE conclusions arrived at by M. Hément (*Comptes Rendus*, xciii. pp. 754, 861, 1095) and Mr. Axon (*NATURE*, vol. xxv. pp. 101, 409; *Comptes Rendus*, xciii. p. 904) concerning the influence of heredity upon the speech of the deaf cannot be accepted unless it can be shown that the peculiarities of utterance to which they have directed attention *could not have arisen in the ordinary way by imitation of the speech of others*.

Before we can decide whether any observed peculiarity in the utterance of a deaf person is due to inheritance or to imitation, we must know (1) at what age he became deaf; (2) whether the deafness was total or partial; and (3) whether, since the acquisition of speech by the sense of sight, the deaf subject has associated with persons who speak with the accent of his native district.

The remarks of M. Hément are valuable as the result of personal observations, but he has failed to be explicit upon these important points.

The cases referred to by Mr. Axon are equally inconclusive for the following reasons:—

1. In the first case noted (*NATURE*, vol. xxv. p. 101)—which is also the one to which Mr. Axon directs special attention in his recent letter to *NATURE*, vol. xxv. p. 409—we have a case of undoubted imitation through the sense of hearing.

Indeed it is stated in the *Phil. Trans.* No. 312, that some

weeks after recovery from an illness, this young man (Daniel Fraser) "began to *hear* and in process of time to understand speech. This naturally disposed him to *imitate* what he heard and to attempt to speak."

The account from which this is quoted, is evidently intended simply as a record of a case of recovery of hearing in a deaf mute, with subsequent acquisition of speech; and Mr. Axon himself admits that the writer mentions the inheritance of the Highland accent "in a purely incidental manner."

With due deference to Mr. Axon's opinion, it appears to me that this is not a case in point, and that it is not entitled to the same consideration as that of a person who, remaining deaf, acquired speech through the sense of sight, and has no opportunity of imitating by ear the pronunciation of others. It must also be remembered that this case is quoted from an old number of the *Phil. Trans.*, and cannot now be verified.

2. The circumstances quoted from the "Life and Journals of George Ticknor" (*NATURE*, vol. xxv. p. 101) are unreliable, because Ticknor *assumed* that all the pupils in the deaf and dumb schools he examined could never have heard a human sound,¹ whereas it is now known that a very large proportion of the deaf and dumb (probably more than 50 per cent.) could hear in infancy, and that of these a large proportion could also speak before becoming deaf.

3. In regard to the case of "E. R.," who had been taught articulation by Mr. Alley, of Manchester, Mr. Axon says, "that he became deaf and dumb *at a very early age*" (*NATURE*, vol. xxv. p. 191), but neglects to state at what age, which is very important—nor had Mr. Axon himself heard the articulation of this young man.

These are all the instances I know of, in which it is claimed that the pronunciation of any deaf person was due to inheritance, and I think I have shown that in all these cases the necessary data for such a conclusion have been wanting. I have already stated in a former communication (*NATURE*, vol. xxv. p. 124, *Comptes rendus*, xciii. p. 1036) that I have examined the pronunciation of at least 400 deaf children who have been taught to speak, without finding a single instance of peculiarity that could correctly be attributed to heredity. If any further argument is needed against inheritance of pronunciation, it is to be found in the universal fact that children who are born deaf are *always also dumb*.

That there is no incapacity of the vocal organs to account for this is evident, for these so-called "deaf-mutes" are now taught, through the medium of the sense of sight, to control the movements of their vocal organs so as to give utterance to intelligible words.

When we examine the languages and dialects of the world, I think we find that they have something in common, while each retain distinctive characteristics of its own. There seems to be a universal tendency to express the *emotions* in the same way. We speak, in fact, two languages at the same time:—One—the language of thought—arbitrary and conventional, acquired by imitation and not hereditary, consisting of articulations constituting words and sentences which can be recorded and preserved in written books; the other—the language of the emotions—natural and universal, consisting of looks and gestures, and of intonations of the voice. There seems good reason for the belief that this natural language of the emotions is instinctive, and therefore hereditary. From my own personal observations I feel sure that those who are interested in questions of heredity will find a rich field for inquiry in the study of the facial expressions and gestures of very young blind children; and in the natural sounds and the modulations of the voice of deaf infants.

Rome, March 6

ALEXANDER GRAHAM BELL

IN his letter on the above subject in *NATURE* (vol. xxv. p. 409) Mr. Axon appears not to appreciate the value of negative testimony in scientific investigation.

The citation of cases in support of M. Hément's statement that deaf mutes who have been taught to speak do so with the accent of their native districts, obviously implies the promulgation of a theory that dialectal accent is due to physiological peculiarities (? of the verbal organs), and that these are hereditary. This is shown by the objections raised to Prof. Graham Bell's statement that all such phenomena are due to "the unconscious recollection of former speech, and cannot be

¹ "Not one of the pupils of course can ever have heard a human sound," &c. "Life and Journals of George Ticknor." London, 1876. Vol. I. p. 196.