and cannot be supposed to be a product of its disintegration.

It is not necessary to dwell on the admirable lucidity and suggestiveness of Prof. Rutherford's book, for that is no more than his readers have been taught to expect. The only doubt which can be felt is whether it meets any want which was not already satisfied by his previous work, "Radio-activity."

R. J. STRUTT.

VISIBLE SPEECH.

Lectures upon the Mechanism of Speech. By Alexander Graham Bell. Reprinted from the Proceedings of the First Summer Meeting of the American Association to Promote the Teaching of Speech to the Deaf. Pp. 129. (New York and London: Funk and Wagnall's Company, 1906.) Price 1.00 dollar net.

THIS interesting book consists of a series of lectures by Mr. Alexander Graham Bell, whose name in the future may be as honourably associated with his labours in the education of deaf mutes as with the invention of the telephone. His father, A. Melville Bell, many years ago, devised a method of representing, or rather symbolising, positions of the vocal organs. To this symbolic method he gave the name of "visible speech," because anyone acquainted with the symbols could place his vocal organs in the desired positions, and then, on emitting the breath and bringing the vocal cords into action, could produce the desired sound.

"These symbols of visible speech," remarks Mr. Bell, "bear the same relation to phonetics that chemical symbols do to the science of chemistry. In dealing with the mechanism of speech, it is as necessary nowadays to make use of my father's symbols, as it is to use chemical symbols in treating of the composition of matter."

The symbols, which are very simple and ingenious, indicate the position of the lips, the position of the tongue, the condition of the larynx, and the condition of the passage between the larynx and the tongue or lips. It is evident that to produce a given sound we might have a row of such symbols. Thus, to sound the vowel *oo*, at least three position symbols would be required, and to show how to pronounce the word *moon* would require nine symbols, namely, three for *m*, three for *oo*, and three for *n*. To avoid this difficulty the signs or symbols are abbreviated or condensed, so that the word *moon* is now represented by only three symbols, curious looking things, like old Gothic letters, but quite intelligible when one has, as it were, already studied their evolution. The only comment I would make on the abbreviated symbols is that they should be printed on a fairly large scale, as a very slight mark may be of great importance, and a sharp eye is required if the symbols are printed small.

Mr. Bell then proceeds to show how the meaning of the symbols may be conveyed to the deaf. They are exhibited on a large scale in a series of charts, and with infinite patience the teacher enables, by gestures and movements, the deaf mute to compre-

hend their meaning. Step by step the pupil is taught how to place the lips, the tongue, the soft palate, and how to modify the form of the mouth. The child has also explained how to produce various vowel sounds, which are divided by Mr. Bell into primary vowels, wide vowels, primary round vowels, and wide round vowels. Each of these is accompanied by a symbol. To show how much may be symbolised, take three of the primary round vowels, and we have symbols indicating (1) voice, back small aperture, lip small aperture; (2) voice, back mid aperture, lip mid aperture; (3) voice, back large aperture, lip large aperture.

The teacher must have a feeling of great delight when he hears for the first time the required sound coming from the mouth of the deaf mute. Mr. Bell's criticism of methods is both wise and interesting, as we show by the following quotation:—

"Now in teaching a deaf child you present to him a symbol for some difficult sound. If he has been taught to analyse the symbols in the manner shown, the symbol conveys to his mind a direction what to do with his mouth. That is what your pupil has to aim at, but in ninety-nine cases out of a hundred he may not get it, at least at the first shot. Now what are you going to do? Are you going to say, 'No, no! that's not right. Try again'! Let him try once more, and the chances are that he fails again to give the sound intended. The no-no method only aggravates the difficulty by discouraging the pupil and disgusting him with articulation. . . . The deaf child must know *what he did when he failed*. . . . The knowledge of that realism will guide him in his next attempt. For example:—If he knows that his tongue was too far forward in the mouth, in his next attempt he aims at having his tongue further back, and probably gets too far in that direction. If, then, he is told the result of this attempt also, he makes due allowance the next time he tries. He may fail a hundred times. Now the position may be a little too far forward, now a little too far back, or the tongue may be too high or too low, but his knowledge of the effect of each effort causes him to approach more and more closely to the exact position desired, till at last he gets it. The time spent in studying and representing the incorrect positions is not wasted, for it gives the pupil mastery over the instrument of speech itself, and the struggle to get exactitude of position with one difficult sound gives him power to get any other, just as the ability to hit one bull's-eye qualifies a man to shoot at any mark" (p. 70).

These wise remarks apply to many methods of practical instruction, in the laboratory and elsewhere. Mr. Bell's lectures were delivered to teachers of deaf mutes, and often at the close of a lecture Mr. Bell was interrogated. This Socratic method drew from the teacher many valuable remarks, and sometimes "asides," which showed the fertility of the lecturer's thought. Altogether this little book is full of interest to students of phonetics, a department of science often a wilderness of dreary discussion, but here, in the hands of Mr. Bell, a subject of living interest. To be able to teach deaf mutes how to communicate with their fellow mortals is an achievement worthy of one who has, in another province, made his mark on the technical science of the day.

JOHN G. MCKENDRICK.