We thus have the paradoxical result that the rotation period is more than five minutes less at the equator than in the latitude of the red spot. The effect of the motion of matter from one part of the planet to the other would be to make the actual time of rotation longer as we approach the equator. The opposite effect noticed in the times of rotation of spots suggests the possibility that the latter may be endowed with a motion of their own; partaking, perhaps, of the nature of cyclones on the earth's surface.

RED SKIES A CENTURY AGO.

I VENTURE to suggest that recent phenomena are a re-appearance of those of 1783. It will therefore be interesting to give a sketch of the phenomena of 1783, in order to ascertain their similarities and differences.

In the spring of 1783 one of the greatest eruptions of Shaptar Jokul in Iceland resulted in the largest lava-streams ever observed, ten miles long, five miles wide, and a hundred feet deep. Obviously, great quantities of ash must also have been thrown up.

Towards the end of May, *höhenrauch* (dust-haze) was remarked first on the western coast of Europe. It was so thick as to render the sun invisible on the horizon, and even at mid-day it was only a red indistinct disk. It was first noticed, May 29, at Copenhagen, then in England, on July 6 and 7 in France, and rapidly spread over Europe, northern Africa, and eastern Asia. Neither rain, heat, nor cold dispelled it; and, having reached a maximum at the end of July, it remained visible till Sept. 26, 1783, at Copenhagen, thus lasting four months.

There are numerous instances of volcanic ash being carried very great distances. The dust from Coseguina in Central America was carried a hundred and seventy miles, towards Jamaica, and was so dense there as to darken the sky. Hence meteorologists concluded that the *höhenrauch* of 1783 was due to dust from Shaptar Jokul.

The similarity of the 1783 phenomenon with the present seems to me extraordinary. The frightful volcanic explosion of Krakatoa in the Sunda Straits, which began on Aug. 26, 1883, supplies, as did Shaptar Jokul, the material. The splendid redness at sunrise and sunset was first reported from India; and it will be an interesting inquiry to study the spreading of the phenomenon, as was done in 1783.

It was first seen in Japan at the end of August, but only reached Germany in November; and, from the dates of the various records, it seems evident that the ash was thrown into the upper regions of the atmosphere in the tropics. The extraordinary duration corresponds with that of 1783, and is to be explained by the fineness of the dust.

The differences are, that in our country the obscuration of the sun is less than in 1783, which would accord with the greater proximity of Iceland than Java.

It seems probable that rain and snow may bring some of the dust to the earth. I have therefore examined the residue of the rain-gauges from the 1st of December, but thus far without any positive results. Hence I infer that the dust is at present too high for it to be brought down: it is therefore most necessary that such observations be made in many places.

These views have been advocated by Lockyer, who, through spectroscopic research, has been led to the same conclusion.

Before, however, a final decision upon one or another hypothesis can be given, it will be necessary to collect observations, researches, and investigations, from as many points of the earth's surface as possible, which will doubtless be done in meteorological journals.

G. KARSTEN.

Kiel.

BROWNE AND BEHNKE'S VOICE, SONG AND SPEECH.

A practical guide for singers and speakers; from the combined view of vocal surgeon and voice-trainer. By Dr. LENNOX BROWNE and EMIL BEHNKE. New York, *G. P. Putnam's Sons*, 1884. 322 p., illustr. 8°.

A CAREFUL perusal of this work must establish the conviction in the mind of the reader, that the authors thoroughly understand their subject. In reference to voice-formation, many hitherto obscure points are made clear, and many hitherto doubtful points are settled, on physiological, and therefore indisputable, grounds. Thus, the distinctions between the various 'registers' of voice are proved to be due to demonstrable differences in the adjustments of the 'voice-box' and the vocal ligaments. A great deal of information is communicated on the subject of voice-cultivation, and the prevention and treatment of the ailments of 'voice-users.' The precepts in regard to hygienic habits for singers and speakers, their diet, and their clothing, so as to secure unrestricted freedom for the chest and the abdomen, are both judicious and important. About one-half of the book is taken up with the single subject of respiration. The proper management of the breath is shown to be a matter of the highest possible value to singers and speakers. The conclusions arrived at, in reference to the healthful and efficient use of the lungs, commend themselves as thoroughly sound and practical; but condensation in the treatment of the subject would have been a great improvement, as the same principles are again and again repeated under different heads.

The use of the laryngoscope is recommended more than will be thought generally advisable, so far as practical results are concerned; but the authors have handled this instrument to

good purpose in illustrating their descriptions of the larynx by photographs taken from the reflected images in the laryngoscopic mirror. Thus, the chink of the glottis is shown in the act of forming sound. Photographs are also given of the interior of the mouth, showing the positions of the soft palate during the singing of certain notes. These and other illustrations greatly add to the interest of the elaborate descriptions of the processes of phonation.

The book commences with a plea for the study of vocal physiology. The importance of a knowledge of the *principles* of vocal physiology to singers and speakers, no one will dispute; but it may be doubted whether any practical benefit can be derived by voice-users from the anatomical detail of the structure of the vocalizing-apparatus, which is here so copiously exhibited. This part of the treatise might have been much condensed with advantage, so far as its practical applications to speaking and singing are concerned. This portion of the book may, perhaps, have its utility to voice-*trainers*, who ought fully to understand the mechanism which they undertake to direct; but voice-users could not 'govern the ventages' in speech or song with any better effect from knowing the shape and name of the individual cartilages which they set in motion.

In the chapter on defects and impediments of speech, both stammering and stuttering — very indefinitely distinguished — are traced to one common source: "A fault in respiration is at the root of all the mischief." No system is presented or advocated for the relief of stammerers, for the specified reason that "there is none that is honestly applicable to all cases." Something more definite might have been expected under this head. For facts relating to the vocal registers, and to the anatomy of the larynx and the chest, this book will be useful as a work of reference in the libraries of scientific teachers of speech or song; but it will not add much to their knowledge of practical vocal physiology.

M'ALPINE'S BOTANICAL ATLAS.

The botanical atlas: a guide to the practical study of plants, containing representatives of the leading forms of plant-life, with explanatory letterpress. By D. M'Alpine, F.C.S. 2 v. New York, *Century Company.* 1883. 52 pl. 4°.

It is difficult to see why this work should be entitled '*The* botanical atlas' (except to distinguish it from the other atlases compiled by the author), since many of its best plates are from an entirely different treatise, which may as fairly lay claim to being called '*The* atlas;' namely, that of Dodel. Judging by its size, it is apparently designed to be used in class demonstrations; but its sumptuous binding somewhat unfits it for the laboratory table, while, on the other hand, the figures are not large enough to be used in place of lecture diagrams. The work is in two volumes, one of which is devoted to phanerogams, the other to cryptogams.

The drawings in the volume on flowering-plants are, for the most part, very good, some of them possessing remarkable clearness of outline; and the coloring is above the average in delicacy of effect. The impression made by this volume as a whole is, that it has received an amount of care which could have been more usefully expended in a slightly different direction. With the exception of the words 'magnified' and 'highly magnified,' there is nothing to serve as a guide to the relative size of the figures of corresponding parts. Every practical teacher of botany would have suggested to the compiler the desirability of furnishing what is never out of place in an atlas of any kind, to wit, a scale of parts. This is always serviceable in the treatment of microscopic or of any minute figures: in fact, without it they are often misleading to the beginner. It may be said, that it is impracticable to state in every case the approximate amount of enlargement or reduction; but certainly in most cases it is not impossible to give a hint as to the relative sizes of the figures.

Drawings of the size given in this atlas are chiefly useful for individual and not class study. With a greater enlargement, the plates would have proved useful in classes of ordinary size. A few attempts have been made to provide plates of suitable size for class use; but the subjects have not always been so well chosen, nor so successfully treated, as those in this volume. The well-known series made by Professor Henslow is so crowded that the effect of the exquisite drawing is obscured. In the lack of good wall-plates, we have a want which ought to be supplied. If the plates in the present volume were larger, so that they could be employed for demonstration before classes of moderate size, they would go far to meet this need. Their size now restricts their employment to the individual student, and this necessarily lessens their utility; but this is a matter for publishers to consider.

The volume relating to cryptogams contains twenty-six plates, some of which include a large number of figures copied from standard