

in music and one on ARPEGGIO, by Mr. Franklin Taylor; an interesting account of the ACADEMIE DE MUSIQUE, by Mr. John Hullah; an excellent little treatise on ACCENT in music, with abundant musical examples, by Mr. Ebenezer Prout; another on ACCENTS in plain song, by the Rev. Thomas Helmore; instructions as to ACCOMPANIMENT, by Mr. Hopkins, of the Temple, supplemented by another article on ADDITIONAL ACCOMPANIMENTS, by Mr. Prout; ÆOLIAN HARP is from the pen of Mr. Hipkins; ANTHEM is given by Dr. Monk, of York; ARRANGEMENT, by Mr. Hubert Parry; BAGPIPE, by the writer of this notice. In the biographical department, which is especially full, a long and exhaustive account of the BACH family, by Herr Maczewski of Kaiserslautern, stands foremost. There are also interesting notices of ADOLPHE ADAM and of AUBER, by Mr. Franz Hueffer; of many Italian composers, by Mr. Edward H. Pember, Q.C., of DR. ARNE, and of ATTWOOD, by Mr. Husk, Librarian of the Sacred Harmonic Society; of DR. ARNOLD, and a sympathetic biography of MICHAEL BALFE, by the late Dr. Rimbault. Sir Frederic Ouseley and the Editor contribute several smaller notices. The names of English musicians appear to have received especial attention.

There can be no hesitation in saying that the work just commenced promises to fill a gap in English bibliography, and that it furnishes excellent material for reference. Besides this, it presents the collateral advantage of offering a charming combination of amusement and instruction for desultory reading in the many *horæ subsecivæ* which occur even in the lives of the most busy.

W. H. STONE

OUR BOOK SHELF

Pioneering in South Brazil. Three Years of Forest and Prairie Life in the Province of Paraná. By Thomas P. Biggs-Wither. Two vols. With Map and Illustrations. (London: John Murray, 1878.)

MR. BIGGS-WITHER has written two volumes of genuine and varied interest and much instruction, as a result of his three years' work in a little-known region of South Brazil. He went out as one of an engineering party to open up a road between the Atlantic and Pacific, and he traversed much of the country on the banks of the rivers Ivahy and Tibagy, tributaries of the Paraná. Much of his time was spent in the forests of this region, virtually unexplored, and presenting a splendid field for any enterprising naturalist. Mr. Wither is an excellent observer, and his book abounds with information on the natives, the natural history, and physical geography of the region. He met with many adventures, and suffered much from heat and insects, but altogether he seems to have had a thoroughly enjoyable time of it. He writes throughout in an attractive and simple style, and his work must be regarded as an important contribution to a knowledge of the luxuriant region with which it deals.

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.]

The Phonograph

WE shall be much obliged if you will allow us to draw the attention of your readers to a curious fact which the phonograph

has allowed us to prove, and which we announced last Monday at a meeting of the Royal Society of Edinburgh. We have seen no mention of the fact elsewhere.

Not only are vowels unaltered by being spoken backwards, but the same fact is true of consonants. Whether the pulsations of air be made in a given order or in the reverse order the ear accepts the sound as indicating the same letter. This is true of all the simple vowel sounds and of all the simple consonant sounds, including of course several combinations which in English are spelt with two letters, as *th* or *ng*, but which are really simple consonants.

We tried the experiment on single pairs of syllables separated by a single consonant, as *ada, aba, aja, etc.* A person coming from outside and ignorant of what consonant had been spoken was able to identify the consonants quite as well backwards as forwards. The chief difficulty was found in distinguishing *affa* from *assa*.

We find that this peculiarity is not limited to consonants between vowels, but that *ab* said backwards becomes *ba*. We have here a standard as to what does really constitute a single letter or element of articulate speech; it is any one reversible part. Your readers who possess a phonograph may most easily verify this observation by saying a word backwards, and hearing the phonograph say it intelligibly for words; for instance, *noshæesossa* produces *association* beautifully.

We shall be glad to learn whether this fact has been already published, and also whether it was foreseen as a possibility by any writer.

Edinburgh, March 25

FLEEMING JENKIN
J. A. EWING

The Age of the Sun's Heat in Relation to Geological Evidence

1. It is an admitted fact that the age of the sun's heat will not harmonise with the evidence of geology, on the supposition that this heat was *solely* derived from the approach of matter under the action of gravity. Dr. James Croll, in dealing with this question in a recent number of NATURE,¹ has suggested the existence of a previous proper motion in the colliding matter that formed the sun, whereby, in accordance with accepted physical principles, a store of heat adequate for any period might have been provided. However a difficulty is raised here by Dr. Croll, in the *Philosophical Magazine* (May, 1868), where this question is first dealt with, and as this difficulty would seem on examination not to be insurmountable, I venture to call attention to the subject here, more especially as attendant questions of interest would seem to attach to it.

2. Of course it is admitted that the age of the sun's heat is the limit to conditions of life on the earth, and the point in question is that if the sun had acquired such a store of heat as geological time would appear to demand, then the sun must have been (owing to the excessive heat) a very extensive nebula, probably extending far beyond the limits of the present solar system, and consequently, that even if such a store of heat had existed in the sun, it would not be available for geological time, since the earth could not then have existed as a separate planet, from the fact that the solar nebula would then have extended beyond the limits of the earth's present orbit. Dr. Croll says (p. 372): "But if the sun had originally possessed the amount of energy supposed, then his volume would have extended beyond our earth's orbit, and of course our earth could not at that time have existed as a separate planet." This, therefore, puts a difficulty in the way of the sun having possessed such a store of heat as would be available for geological time. The accepted principles of Laplace are, of course, admitted here, according to which the earth originally formed part of the nebulous mass of the sun, and became naturally detached through the rotation of the nebula at its contraction.

3. Here it seems to have been tacitly assumed (according to the quotations above given) that the present orbit of the earth was its *original* orbit. Is there, however, any necessity for assuming this? For in this lies all the difficulty. Are we not rather warranted in inferring from accepted principles that the present orbit of the earth was *not* its original orbit. For it is an admitted fact that resisting media (the ether, &c.) exist in space, by which, through friction, the orbits of the planets are gradually becoming contracted, so that they slowly approach the sun. It is a mere question of *time*, therefore, for the earth to have come in towards the sun from any distance, or its original

¹ NATURE, vol. xvii. p. 206; also *Quarterly Journal of Science*, July, 1877