

Resultant-Tones and the Harmonic Series.

THE following method of recovering, by inspection of the harmonic series, the position of the differential resultant-tone of the first order for any given musical interval has occurred to me, and, as far as I have been able to learn, has not yet found a place in the text-books on musical acoustics which are in most common use. I therefore venture to hope that a brief statement of it may gain admittance to your columns and be the means of saving some time and trouble to students of the subject.

The harmonic series up to No. 10, with the order of each number placed below it, may be written thus :

C	C'	G'	C''	E''	G''	(B'' \flat)	C'''	D'''	E'''
1	2	3	4	5	6	(7)	8	9	10

the brackets of course indicating that No. 7 is not identical with the seventh note of the diatonic scale. As the "vibration numbers," or "frequencies," of these harmonics are proportional to their respective order-numbers, these latter may, for the purpose in hand, be treated as if they were the vibration-numbers of the corresponding harmonics. Hence the difference between any two order-numbers will give the vibration-number of the resultant-tone for the interval formed by the two corresponding harmonics, and the position of the resultant-tone in the harmonic series will thus be at once assigned.

Successive application of the above method to a series of intervals gives the following results:—

Minor tone D''' - E''', 10 - 9 = 1. Resultant tone C, 3 octaves and a major tone below the graver primary.

Major tone C''' - D''', 9 - 8 = 1. Resultant tone C, 3 octaves below the graver primary.

Minor third E'' - G'', 6 - 5 = 1. Resultant tone C, 2 octaves and major third below the graver primary.

Major third C'' - E'', 5 - 4 = 1. Resultant tone C, 2 octaves below the graver primary.

Fourth G' - C'', 4 - 3 = 1. Resultant tone C, a twelfth below the graver primary.

Fifth C' - G', 3 - 2 = 1. Resultant tone C, 1 octave.

Minor sixth E'' - C''', 8 - 5 = 3. Resultant tone G', major sixth below the graver primary.

Major sixth G' - E'', 5 - 3 = 2. Resultant tone C', fifth below the graver primary.

Octave C - C', 2 - 1 = 1. Resultant tone C, coincident with the graver primary.

Ninth C'' - D''', 9 - 4 = 5. Resultant tone E'', a major third above the graver primary.

In order similarly to treat semi-tones, sevenths and other dissonant intervals, it is only necessary to include higher numbers of the harmonic series, and the method is evidently as applicable to summational as to differential resultant-tones.

MARGARET DICKINS.

Tardebigge Vicarage, Bromsgrove, April 5.

Municipal Meteorology.

IN your notes in NATURE for April 3 (p. 518) you mention Dr. H. R. Mill's observations as to the length of the February frost, the period at Torquay being reported the shortest, viz. nine days.

I think it should be pointed out that for scientific purposes the Torquay temperatures should be treated with much caution, as those of an extremely sheltered spot, viz. Cary Green. Up to last year Torquay had two observing stations; but one of them, viz. that at Chapel Hill, was given up. On moving the adoption of the report advising, among other things, the discontinuance of the said station, a member of the Town Council very honestly remarked that "the range of temperature at Chapel Hill was greater than that at the Princess Gardens, and it was more satisfactory for the town to have as small a range of temperature as possible" (*Western Morning News*, March 6, 1901). According to the last meteorological report, the temperatures are still taken at one of the old stations, viz. Cary Green. The differences between Chapel Hill and Cary Green were often considerable, e.g. on March 18, 1900, Chapel Hill 23°'9, Cary Green 27°.

A. R. HUNT.

Torquay, March 10.

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A Gall-making Cynipid Fly in Jamaica.

THE Hymenopterous gall-makers of the family Cynipidæ, though widely distributed over the earth, have seemed to be totally absent from the West Indies, somewhat to the astonishment of entomologists. However, in February, 1892, Mr. W. Harris sent me a gall on *Bidens reptans*, collected by Mr. Nicholls at Cinchona, Jamaica. The gall was a large oblong swelling attached to the stem of the plant, and contained many cells. Unfortunately, I was not able to breed the flies, but I secured some immature fragments, which sufficed to show that they were Cynipidæ. Mr. W. H. Ashmead, to whom I submitted my notes and sketches, is of opinion that the genus must be Aulax or allied thereto. Although it is impossible to determine the species, it seems desirable to call attention to the occurrence of this gall-maker in Jamaica; and perhaps one of your West Indian readers will be able to supply us with complete information.

T. D. A. COCKBRELL.

East Las Vegas, New Mexico, U.S.A., April 3.

Criticism of "The Great Persian War."

MAY I call attention to one or two points in your critic's treatment of my work (p. 434)?

(1) Your critic says that at Thermopylæ "the mound and the Phocian Wall are the only debatable points."

I may mention that, among many other debatable points, some persons who have examined the pass have located the fight at the West gate.

(2) Your critic is apparently not aware that the site of Trachis is uncertain. Two sites at some distance from one another have been proposed.

(3) Of Aphetæ he says, "it is hard to reconcile Mr. Grundy's situation with the remark of Herodotus, that the wreckage of the first sea-fight drifted out (the italics are your critic's) to Aphetæ, which is badly misrendered in the words 'was thrust in upon the Persian fleet.'"

Either your critic or Liddell and Scott are guilty of a bad mistake in scholarship (*vide* L.S. sub. ἐκφορέω. 4. Pass, "to be cast on shore": with a reference to this very passage Herod. VIII. 12; cf. also ἐκφέρω in the same dictionary). If I sin, I sin in very good company.

(4) In reference to B.C. 479, your critic asks, "Why should they (the Persians) stop at Cithæron?"

I would ask in reply, (1) Why did not the Persians stop in Attica? (2) Why, above all, did the Greeks follow them into Bœotia?

(5) Your critic says, "It is absurd exaggeration to call Taurus 'an all but blank impassable wall.'"

In the part of that chain which separates Asia Minor from the Euphrates region between the pass between Laranda to Kelen-deris and the pass of Kiskisos, a distance of 170 miles, there is only one pass, the Cilician Gates. The two first mentioned afford circuitous and difficult routes to the Euphrates region. The Cilician Gates are by no means an easy pass. (For Map *vide* Ramsay, "Asia Minor," p. 330.)

(6) Your critic says that "for downright geographical nonsense" it would be hard to beat the description of Pteria as the chief strategic point in the Halys region, as commanding the middle portion of the valley through which the river flows.

He is apparently under the impression that in order to command a valley strategically, a town must be in it. On the importance of the position of Pteria the evidence of Herodotus is sufficiently striking (H. I. 76), "Now Pteria is the strongest position in the whole of this country."

(7) Your critic asks, "Are the Phrygians and the Bithynians still to be called Thracians in the days of Darius?"

His answer is obviously No! Another authority, Herodotus, however, speaking of the races which Cræsus ruled, mentions (I. 28) Θρήικες οἱ θυνοὶ τε καὶ Βιθυνοί.

(8) Your critic says, "On p. 378 a whole paragraph is based on a childish mistranslation of Herodotus."

This charge is based on a somewhat careless mistake of his own. I speak of a "decision." He refers to the "discussion" of chapter lxxiv. of Herod. VIII.

I have dealt with all the major charges brought against me. I cannot expect you to allow me space to deal with the minor charges, though I believe them to contain inaccuracies.

G. B. GRUNDY.