

originality with which they are discussed, much valuable information on many intricate points which it would be difficult if not impossible to find elsewhere. The influence of Lake Ontario is seen in the diurnal changes of the wind, which in July is nearly S. from 10 A.M. to 3 P.M., W. at 5 P.M., nearly N. at midnight, about which it remains till 9 A.M., when it rapidly shifts to S.W., and ultimately to S. at 10 A.M. From October to March, when storms are most frequent, the greatest depression of the barometer and increase of vapour occur with winds from N.E. to S.S.E., and the greatest rise of the barometer and diminution of vapour with winds from W. to N.N.W. On the other hand, in summer the greatest depression of the barometer occurs with winds from E.N.E. to E.S.E., but the greatest increase of vapour with winds from E.S.E. to S.S.W. Most of the light falls of rain occur with winds from N.E. by S. to W., and of snow with winds from S.W. by N. to N.E.; most of the moderate falls of rain with winds from N.E. to S.S.W., and of snow with winds from N.N.W. to S.E.; and most of the heavy falls of rain with winds from N.E. to S.S.E., and of snow from N. to E.S.E. The important bearing of these facts on the question of North American storms as well as on the climate of no considerable portion of that continent is evident. Tables II. and XX. giving by interpolation-formulæ the mean temperatures and mean pressures of different days of the year, while of very slight scientific value, may be found to be useful in a meteorological office, but a simpler and in every way more preferable table of normal daily values for pressure and temperature could be constructed from the arithmetic means of the thirty-one years' observations treated by Bloxam's method of averages.

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.]

"Tone" and "Overtone"

IN the very favourable estimate of the work I have done in my translation of Helmholtz, in your number for Sept. 23, I am aken rather severely to task for my use of "Sensations of Tone" on my title-page, and my refusal to use the expression *overtones* in the body of the work. The title was long a matter of anxious consideration to me, and I have not yet seen my way to improving it. True, practical musicians, physiologists, and artists have each their own, very different, technical meanings for *tone*. The two last generally use it without an article, and in the singular; but musicians are accustomed to speak of "a tone," or of several tones, when they allude to musical intervals. In common speech, however, all three agree with the outside world in speaking of a "loud and soft, gentle and angry tone of voice," of a "fine-toned instrument," of the "splendid or miserable tone produced by a violinist," of the "magnificent tones of the organ." That is, we are all accustomed to use *tone*, as I have done on my title, for "a musical quality of sound." I know no other single word in English which expresses the same conception. In the original German, Prof. Helmholtz (and after him Prof. Tyndall) endeavours to use *tone* for a "simple tone" only. Neither have contrived to be consistent in so doing. I have had to correct the text several times in my translation on this very point, and instead of using *tone* for "simple tone" only, which is a new conception, and *clang* (in English, a *din*) for "compound musical tone," which is also a new and not an easy conception, I have invariably used the word *tone* (except when distinguished by a capital letter—thus, *Tone*, for the interval) in the usual general sense of the word, and distinguished the particular cases by the prefix "simple" or "compound." It seems to me that this is not so much "a little waywardness" on my part, as a desire for scientific accuracy.

As to "overtones," it is well known to those who, like my reviewer, are acquainted with the work in the original, that Helmholtz's expression "Obertöne" is a mere contraction for "Obertheiltöne" or "Oberparzialtöne," both of which terms he

not unfrequently uses, and these are literally rendered by my "upper partial tones." Waiving my strong linguistic objection to the term "overtones" as an English word, my scientific justification for not using it in my translation must be sought for in the fact that even the German "Obertöne" has led Prof. Helmholtz himself not unfrequently to its inaccurate use for "partial tones" simply, including the lowest partial tone, which the word was especially invented to exclude. Singularly enough, even my reviewer has many times fallen into the same error (NATURE, p. 451, col. 2) in speaking of the "overtones" of a piano-forte string. Thus he says, "the first six overtones are all audible," which is not correct; but he means "the lowest partial tone and first five of the upper partial tones," or briefly "the first six partial tones," which is correct. Again, he says, "the seventh and ninth (overtone) which are *inharmonious*, &c., which is not correct, for the seventh and ninth overtones are the eighth and tenth partial tones, and are perfectly harmonious; but he meant the seventh and ninth partial tones. Again, he cites from p. 126 of my translation, the relative force of the first six "partial tones," as they are there called, but refers the table to the first six "overtones," which is altogether incorrect. Now if such men as Helmholtz, who invented the term, and as my reviewer, who uses it familiarly, can be led by it into what with them are mere inaccuracies of expression, must we not look to the utmost confusion of thought among persons to whom the whole subject is new, and who employ the term with a very vague or loose conception of its meaning? In point of fact, many such cases have come to my notice. Hence, again, I cannot agree to think that my deliberate rejection of the word "overtones" is "the chief fault" or "a blot on the translation," but rather submit that it is a consistent endeavour to attain scientific accuracy of expression, and avoid confusion of thought.

I thank the reviewer for his generally favourable estimate, gladly accepting his rectification of the accidental Germanism "the musically beautiful" for "the beautiful in music," and I apologise for the length of this communication on the ground that it is not a merely personal vindication,

Sept. 25

ALEXANDER J. ELLIS

Colours of Heated Metals

I HAVE just watched the casting in gun-metal, in an engineering establishment in this town, of what is intended to be the rudder-post of a large vessel, which when completed will weigh about three tons. As the casting was a simple one, it was accomplished very quickly, and as the contents of the huge four-ton ladle were emptied into the mould, the dazzling stream of the metal flowed in a large volume over its lip. Brilliantly glossy it appeared as it broke through the folds of thin dross with which its surface was encrusted; and this it did at the lip of the vessel, while fold after fold of the encrusting pellicle was swept down the stream, and left behind it a straight or ragged edge of the thin film, from underneath which the metal welled out for a moment with an appearance on the surface of perfectly transparent purity. The appearance was a deception arising from the strong bluish-green colour of the light emitted by the pure surface of the metal, which I have never seen exhibited under similar circumstances by melted iron or steel. It extended also for only a short distance from the encrusting edge, the green colour soon passing into white, or paler green, where exposure to the air enveloped the metal again in a rapidly increasing film of oxides that tarnish its surface and render the stream white, or nearly so, in every part, excepting in a bluish-green ring, or border where the fresh metal made its appearance, and flowed over in a beautifully coloured stream from the mouth of the ladle. The strongest patches of the colour there were transient, the film of oxide apparently soon thickening enough to eclipse it, and by connecting itself to the broken edge of the thin film in the pot to tear away another fold, when the characteristic greenish glow of the metal immediately presented itself along the freshly-broken edge. I had watched and thus interpreted this beautifully varied play of natural colours in the molten stream for some time before it occurred to me that the peculiar hue of the freshly-exposed surface of the metal, glowing as it does with the brightness of what in the black film of oxide appears as white heat, is no other than the very colour of the heated metal which the theory of exchanges would lead us to expect. For as the colour of gun-metal in a cold state is yellow, the selective absorption of its surface in that condition must be exercised chiefly upon rays occupying the blue portion of the spectrum, and consequently in the heated state these rays