with shoals, until in the reach where Bend is situated, and where the maximum volume has been abstracted for purposes of irrigation, the entire breadth of the Amú Darya is obstructed by a mass of sandbanks intersected by narrow and tortuous channels.

It appears, then, that such information as we have, regarding the change and the existent conditions of the old and new courses of the Amú Darya, presents a picture precisely the converse of that delineated in and quoted from Sir Charles Lyell's work. In lieu of a constant increase to the transporting capacity of the waters of the river, we see that in the Amú Darya such is replaced by a constantly diminishing transporting power, and that the old bed has been filled up and destroyed by the deposition of silt. This deposition of silt and deterioration of the bed can only have been caused by the abstraction of its waters for irrigation. Whether other circumstances assisted the consequent change of the flow of the Amú Darya is a question it is not my purpose to examine in this place. Enough has, I would submit, been adduced to show that the practice of irrigation, as conducted on the banks of the Amú Darya, produces phenomena whose action furnishes a probable explanation of a very curious and interesting geographical problem. HERBERT WOOD

THE PARIS INTERNATIONAL CONGRESS OF GEOGRAPHICAL SCIENCE

THE meeting of the International Congress, of which we published the programme a few months ago (vol. x. p. 267), has been postponed, owing to the large number of demands from foreign parts for room in the Exhibition. It will not take place in the beginning of spring as intended orginally, but will be opened on the 1st of August, perhaps by the President of the Republic, who seems to be deeply interested in the success of the enterprise. It will be held in the Pavillon de Flore. This magnificent building was left unfinished when the Empire was upset, and could not be burned by the Communists, as the woodwork had not been begun. It is now being decorated most tastefully, and will be inaugurated by the Congressionists.

An exhibition will also take place in the Pavillon de Flore and Orangerie situated close to the Place de la Concorde. All the Terrace du Bord de l'Eau, from the Pavillon de Flore to the Orangerie, will form part of the Exhibition. Temporary sheds of every description will be constructed in that splendid situation along the banks of the Seine and under the four rows of lofty trees. The *coup d'œil* will be splendid, and is sure to attract an immense number of spectators. The Exhibition will be opened on the 19th of July, and will last until the 4th of August. A very large number of gentlemen of all countries have been appointed members of the honorary committee. The president of the Congress is M. Delesse, a French engineer in the mining service, and a great geologist. M. Delesse is now the president of the Central Committee of the Geographical Society. Up to the present moment the vice-president has not been elected.

The Exhibition and Congress, as we formerly notified, have been divided into seven different groups: (1) Mathematical; (2) Hydrographical; (3) Physical; (4) Historical; (5) Economical; (6) Didactic; (7) Travels.

A programme of 123 questions has been published, and all these, as far as possible, will be discussed by the members of the Congress. The principal questions will be found in the article referred to.

ON THE ALTERATION OF THE NOTE OF RAILWAY WHISTLES IN TRAINS MEETING EACH OTHER

I AM not aware whether the following explanation of this curious acoustical phenomenon has ever appeared in print; if it has, it will, I think, bear repetition, as offering an interesting illustration of some of the laws of propagation of undulations through aërial media.

If two railway trains meet and pass each other at tolerable speed, and the driver of one of them is sounding his whistle, any person in the other train accustomed to music will notice that the moment the whistle passes him its note will be *lowered in pitch* in a marked degree.

It was at first supposed that, at the time of passing, the driver lowered his whistle intentionally, as a salute to the other train (like "dipping the ensign" at sea), but this was found not to be the fact, the driver himself being unconscious of any change. I believe the true explanation was first given by Mr. Scott Russell, but I do not know when or where.

It is an exactly parallel case to one which has recently attracted attention in astronomy, namely, the evidence afforded by the change in position of certain spectral lines, owing to the vapours which produce them approaching or receding from the observer. The explanation of this will be familiar to most of the readers of NATURE, and I have only to apply it to the case in question.

Every musical note propagates aërial waves succeeding each other with a known rapidity, corresponding to the pitch of the note; the higher the pitch, the greater the rapidity of succession of the waves, and *vice versâ*. Now, when a person advances to meet these waves, more of them will pass him in a given time than if he stood still, on the same principle that if a man meets a file of soldiers on march, more men will pass him per minute than if he were stationary. Thus the apparently increased rapidity of the waves will give him the impression of a *sharper* note.

On the other hand, when the trains have passed each other, the listener will be moving in the same direction as the sound-waves, and consequently a *less* number will pass him in a given time, causing the note to appear *flatter*.

The sum of these effects will be the sudden *drop* of the pitch of the note at the moment the listener passes the whistle.

We may reduce the effect to numerical calculation, premising that, in order to simplify the reasoning, we will suppose the source of the sound to be stationary, and the observer to move towards it with a given velocity.

Let n = number of sound-waves propagated by the given note per second; and let n_1 = the number which the listener will gain by his advance in the same time, which is the number he would pass *by his own proper motion* if the waves were standing still.

Then the effective number of waves per second which will meet his ear will be $= n + n_1$, this number determining the pitch of the note he hears. This may be called (by an astronomical analogy) the *apparent* pitch, as distinguished from the *true* pitch.

To find the value of n_1, let L = the *length* of the sound-wave $(= \frac{V}{n}$ where V = velocity of sound in feet per second). Then, if v = velocity of motion of the listener he would pass, by his own proper motion, $\frac{v}{L}$ waves per second; whence $n_1 = \frac{v}{L} = \frac{nv}{V}$.

Hence the apparent pitch of the note is what will correspond to the number of vibrations

$$= n + \frac{nv}{V} = n\left(1 + \frac{v}{V}\right).$$

But we may simplify this by applying the harmonic principle, that a musical interval is measured by the ratio of the vibration numbers of its higher and lower limiting sounds. Let therefore δ = the interval between the real and the apparent sound; then

$$\delta = \frac{n\left(1 + \frac{v}{V}\right)}{n}$$