

then passes up the valley of the Indus, but without watering that large extent of desert lying between Scind and the Punjab, so it is not till within a short distance of the hills that the body of air begins to part with its moisture.

I say this is all a very interesting subject to study, but it is not my intention at present to go into it, but simply to state that this season Bengal has not had its average rainfall, while in the Punjab the rains were later than usual in setting in, yet the general fall has been on the whole seasonable, for though the cotton crop is a failure compared with other years, yet the cereals have been plentiful, and hence grain is cheap.

In Fig. 1 I have tried to show the price of grain along the line of the railway from Umritsur to Bhaugulpore, a distance of 1,047 miles. The full black line shows the actual prices at which grain is now selling in all the several districts through which the railway passes, it being least at Umritsur, which is in the centre of the Punjab, and greatest at Dinapore, in the Patna district of Bengal. At the right-hand side is a scale of rupees showing the cost per maund, which can be easily reduced to English values by considering a maund equal to $\frac{2}{3}$ cwt. and a rupee equal to 2s. This will approximately give the present English value of wheat during November last as published in the several gazettes. The lower dotted line shows how the price of this grain goes on increasing by the distance transported. The usual railway rate was $\frac{1}{4}$ pice per maund per mile, which by a late order of Government has been reduced to half this rate, or approximately 3s. 6d. for 100 tons a mile.

If to this be added 15 per cent. profit to meet losses and deterioration, the thick dotted line indicates what grain could probably be sold at by Government without any loss, if it became a large dealer; and, as before said, the upper full line shows the actual prices with the large margin there is for profits.

Fig. 2, however, shows this much clearer, and proves that the demand must be greater than the supply; or, in other words, that as much as over some 2,000 tons daily of grain, which was grown more than 700 miles away from the point where the famine is most severe, along the line of railway, is sent down from the Punjab, and the highly irrigated lands of the North-West Provinces, enough to sustain a life as many as there are inhabitants in London, or some four million souls; for $1\frac{1}{4}$ lbs. for each man, woman, and child, is considered enough to sustain the life of a native of India.

But what is this to the millions of Bengal that are now threatened with famine? It is hardly one-seventh, I am led to understand. So with all our canals and railways, and the great good they are doing in the present state of things, yet there is a larger demand than can be supplied, or the profits could never mount up to 70 per cent., as at Dinapore.

Though the subject of this letter may not be considered exactly a fit one for the pages of NATURE, yet I feel sure that those who study Nature in her works and effects, will be interested in the facts now given.

T. LOGIN
Sup. Engineer, Punjab

Umballa, Dec. 12, 1873

Dr. Tyndall and Sensitive Flames

IN the last number of NATURE a report is given of the first of Dr. Tyndall's Christmas "Lectures to Juveniles," on the Motion and Sensation of Sound. In that lecture Dr. Tyndall shows how the reflection of sound can be made manifest to an audience by means of a sensitive flame; and, according to the closing words of your report, Dr. Tyndall states,—"Never before have these phenomena been made visible. Hitherto these effects have been investigated by the sense of hearing; I have now been able to prove them by appealing to your eyes."

In the *Illustrated London News* a short notice is also given of the same lecture, and there Dr. Tyndall is reported to have said, that no philosopher had ever before witnessed the reflection of sound until that afternoon. I presume, therefore, that the report you have given accurately represents Dr. Tyndall's words. And this being so, will you permit me simply to place the following facts before your readers. In January 1870 I published an article in the *Quarterly Journal of Science* on the "Analogy of Light and Sound." In that article I stated how a sensitive flame can be used as a delicate *phonoscope*, to reveal perfectly well the decay, the absorption, and the reflection, and (less perfectly) the refraction of sound-bearing waves. A sketch

is there given precisely the same as that which appears in Dr. Tyndall's lecture (Fig. 6), wherein a sensitive flame is placed in the conjugate focus of a pair of parabolic mirrors. This experiment was shown at a lecture I delivered on January 3, 1868, before the Dublin Royal Society. A copy of my paper in the *Quarterly Journal of Science*, and of the printed abstract of my lecture before the Dublin Society, I myself sent to Dr. Tyndall a few days after they appeared, and if I mistake not, drew his attention to these experiments.

Since 1868 I have so frequently shown to my own class and to large audiences the reflection of sound by a sensitive flame, that I have no doubt many of your readers will have been astonished when they heard or read Dr. Tyndall's assertion which I have quoted. Indeed, probably Dr. Tyndall himself will be able to recall the foregoing facts, and will gladly put his memory right on this matter.

W. F. BARRETT

Royal College of Science, Dublin, Jan. 19

The Potato Disease

SINCE October 1872 I have been growing potatoes, healthy and diseased, under test conditions, principally with a view to a further insight into the winter and subterranean life of the *Peronospora* and also in the hope of meeting with the (to me) apocryphal *Artotrogus*. The figures of the latter referred to by Mr. Berkeley, I am well acquainted with, as I have engraved them three times, once to illustrate Mr. Berkeley's own paper in the *Gardener's Chronicle*. I therefore well knew what to look for in the corroded cellular tissue of my diseased potatoes. I by no means wish to assert (or indeed asserted) that *Volutella ciliata* is positively the same with Montagne's *Artotrogus*, for I have never seen a specimen of the latter, (I know no one who has except Mr. Berkeley), and as far as I am aware no one has met with it since the time of its original publication between twenty and thirty years ago. As no one now (including Mr. Berkeley) ventures to suggest more than the "possible" or "probable" nature of *Artotrogus*, my note was meant to suggest another reasonable direction for future observation.

In my experiments, I have from the first been forcibly struck with the presence of *Volutella* with its mycelial threads, not only outside and just within spent potatoes, but also within the corroded cellular tissue. I have no doubt that the plasma of *Volutella* is equally disorganising with the plasma of *Peronospora* itself, and that the threads belonged to the former plant I have no manner of doubt, as I constantly traced young to mature specimens of *Volutella* from it, and that too from positions within buried potatoes. The strong external resemblance between some slates of *Volutella* and the figures referred to by Mr. Berkeley, suggested to me that this "will o' the wisp" *Artotrogus*, might perchance eventually turn out to be no other than some condition of *Volutella*.

So far from its being my desire to draw attention from *Artotrogus*, the paragraph in my first letter was written with a view to draw attention to it. Berkeley himself always speaks doubtfully of its nature, and Carruthers, in his recent paper on *Peronospora*, published by the Royal Agricultural Society, has not even referred to it.

Returning for a moment to the principal subject of my first note, viz. the failure of the essays submitted in answer to the offer of a prize on the part of the Royal Agricultural Society for the best essay on the potato disease and its extirpation. In NATURE, vol. ix, p. 212, I observe that the committee are now disposed to view the desired destruction of the potato disease from a different standpoint, and propose to offer three prizes of 100l. to dealers, who are to send in a ton each of "disease-proof" potatoes.

It appears to me as unreasonable to advertise for a "disease-proof" potato as for a "death-proof" man. Surely all organised bodies are liable to deviation from health, and though certain organisms may be made (by art) to more or less throw off or resist the attacks of disease, yet none can be said to be in themselves "disease-proof." As regards potatoes, I think I may say, without fear of contradiction, that at present no varieties whatever are either proof against the *Peronospora* or able to resist its attacks, neither is it at all likely that any such varieties will ever arise.

WORTHINGTON G. SMITH