

a practised mesmeriser, and was able to produce on my own patients almost the whole range of phenomena which are exhibited in public as illustrative of "mesmerism" or "electrobiology." I carried on numerous experiments in private, and paid especial attention to the conditions under which the phenomena occur. During the last seven years I have had repeated opportunities of examining the phenomena that occur in the presence of so-called "mediums," often under such favourable conditions as to render trick or imposture simply impossible. I believe, therefore, I may lay claim to some qualifications for comparing the mesmeric with the mediumistic phenomena with especial reference to Mr. Tylor's suggestion, and I find that there are two great characteristics that broadly distinguish the one from the other.

1. The mesmerised patient never has doubts of the reality of what he sees or hears. He is like a dreamer to whom the most incongruous circumstances suggest no idea of incongruity, and he never inquires if what he thinks he perceives harmonises with his actual surroundings. He has, moreover, lost his memory of what and where he was a few moments before, and can give no account, for instance, of how he has managed to get out of a lecture-room in London to which he came as a spectator half an hour before, on to an Atlantic steamer in a hurricane, or into the recesses of a tropical forest.

The assistants at the *séances* of Mr. Home or Mrs. Guppy are not in this state, as I can personally testify, and as the almost invariable *suspicion* with which the phenomena are at first regarded clearly demonstrates. They do not lose memory of the immediately preceding events; they criticise, they examine, they take notes, they suggest tests—none of which the mesmerised patient ever does.

2. The mesmeriser has the power of acting on "certain sensitive individuals" (not on "assemblies" of people, as Mr. Tylor suggests), and all experience shows that those who are thus sensitive to any one operator are but a small proportion of the population, and these almost always require previous manipulation with passive submission to the operator. The number who can be acted upon without such previous manipulation is very small, probably much less than one per cent. But there is no such limitation to the number of persons who simultaneously see the mediumistic phenomena. The visitors to Mr. Home or Mrs. Guppy all see whatever occurs of a physical nature, as the records of hundreds of sittings demonstrate.

The two classes of phenomena, therefore, differ fundamentally; and it is a most convincing proof of Mr. Tylor's slender acquaintance with either of them, that he should even suggest their identity. The real connection between them is quite in an opposite direction. It is the mediums, not the assistants, who are "sensitives." They are almost always subject to the mesmeric influence, and they often exhibit all the characteristic phenomena of coma, trance, rigidity, and abnormal sense-power. Conversely, the most sensitive mesmeric patients are almost invariably mediums. The idea that it is necessary for me to inform "spiritualists" that I believe in the power of mesmerisers to make their patient believe what they please, and that this "information" might "bring about investigations leading to valuable results," is really amusing, considering that such investigations took place twenty years ago, and led to this important result—that almost all the most experienced mesmerisers (Prof. Gregory, Dr. Elliotson, Dr. Reichenbach, and many others) became spiritualists! If Mr. Tylor's suggestion had any value, these are the very men who ought to have demonstrated the subjective nature of mediumistic phenomena; but, on the contrary, as soon as they had the opportunity of personally investigating them, they all of them saw and admitted their objective reality.

ALFRED R. WALLACE

Development of Barometric Depressions

IF I have misrepresented Mr. Ley's views, the misrepresentation was certainly unintentional; but after fairly considering his letter in NATURE of February 29, I am unable to see that I have misrepresented his views, so far as they are exposed in his "Laws of the Winds prevailing in Western Europe." Part II., of course, I ignored. It is not yet published; for aught I know, is not yet written; and as I have not the pleasure of a personal acquaintance with Mr. Ley, it is difficult to understand how I could be expected to express any opinion on a book which is still in the womb of the future. But as to the present work,

Part I., which I read and reviewed, it is mainly occupied with instances, ingeniously worked out, in illustration of the rule which he distinctly enunciates, that revolving storms are due to the depression of the barometer caused by a heavy rain over a large area. Perhaps, in the same way, Part II. is to be mainly occupied by an examination and discussion of the still more numerous instances in which revolving storms have not followed heavy rain over a large area; and if so, I shall be glad in due time to give it my best attention. But for the present, having before me merely the author's existing work, I repeat what I have, in effect, already said, that the occasional or even frequent sequence of rain and storm does not establish between the two a relationship of cause and effect.

A very casual examination of our own registers, and those of Western Europe generally, would show that instances of rainfall quite as great as any that Mr. Ley adduces, happen very frequently without any storm following; and clearly if Mr. Ley's rule is sound, it must apply to all instances which cannot be claimed as exceptions, and that not only in our own latitudes, but in other parts of the world, and especially in those parts where the rainfall is excessive. It was certainly not "necessary" to travel to Khasia for instances of the failure of this rule; but its failure was exhibited in the most full and clear manner by a reference to that extraordinary rainfall.

Mr. Ley speaks of some "fact" relative to the Himalayas which "may be denied." I do not quite understand what fact he means. The facts I have spoken of are the "heavy and long-continued precipitation," and a very great depression of the barometer." If it is either of these that he wishes to deny, I can only say that his doing so confirms my former statement that he has confined his investigations too exclusively to Western Europe. But when I spoke of the one as causing the other, it was not as stating a fact, but as suggesting a probability; whilst whether there is or is not "a region in which Ballot's rules are contravened" I am unable to say; if there is I have not discovered it, and I don't know where it is, but it is not near the Himalayas, where, so far as we know, the circuit of the wind is quite in accordance with Buys Ballot's Law, though on a scale of extreme magnitude—of such magnitude indeed that our observations do not extend to the end of it. It is curious that an author who, like Mr. Ley, writes sensibly within his professed boundaries, should have limited his studies so closely as he appears to have done; but as the remark to which I have just referred shows pretty conclusively that he has not examined into the range of the barometer in India, so the remark which he makes about the advance of cyclones "in the West Indies, *e.g.*," shows that he is strangely in the dark as to the variations of temperature in the tropical Atlantic.

The columns of NATURE are not the place to discuss at length such well-worn subjects as either Buys Ballot's law or the influence of the earth's rotation, and certainly whether the earth's rotation does or does not produce the effect attributed to it, was quite beyond the scope of my former allusion to it; but I said and repeat that its influence is not "obvious," that an argument based on it is not a "truism," and that to apply these words to a point that is at any rate doubtful is both objectionable and improper.

J. K. L.

Solar Intensity

I HAVE read with interest the criticism in your last number of Padre Secchi's Solar Intensity Apparatus. With reference to the single point of the discordant results obtained by thermometers with bulbs of different size, I would observe that I encountered a similar difficulty some years ago in investigating the adaptability of the instrument invented by Herschel, commonly called the "black bulb *in vacuo*," to regular comparable meteorological observations. I found that the large bulbs always gave a higher reading than the small bulbs. I supposed this to proceed from the colder stem depriving the blackened bulb of its heat, the larger bulb, of course, losing less than the smaller, and I overcame the difficulty entirely by having about an inch of the stem as well as the bulb coated with lamp-black. I am not sure, however, that this would answer so well in a non-exhausted chamber. Probably a small bulb will always be cooled by convection more rapidly than a large one.

In the excess of the temperature indicated by the improved instruments I have referred to over the temperature of the air, at the same height—usually 4ft.—above the soil (which is also very

nearly the temperature of the outer glass in which the blackened thermometer is enclosed), we have not indeed an absolute measure of solar intensity; for all measures of that must, it would seem, depend on the substance exposed and the conditions as to cooling, &c., under which the exposure takes place, but a sensitive test by which slight variations in its amount can be determined, and the amount at different places and different times compared.

F. W. STOW

The Aurora of February 4

THE following is an account of the aurora of February 4 as seen by a gentleman living in Russia, at Anspatti, in the province of Vitebsk. After stating that the barometer had risen very high (30.2), he says:—"To-night, as I drove home from Reugarten, there was the most beautiful aurora borealis I ever saw. It began in the north-west, and gradually rose higher and higher, till at last it reached the horizon a little north of east, and such a broad band, or rather succession of bands, that it covered half the heavens. It was a bright rose colour, and its light and colour were reflected by the snow, so that the whole earth was rosy; though it was between nine and ten o'clock, and there was no moon, it was nearly as light as day. It is still in full force as I am writing, and I can see it from my window, but it constantly changes its form and colour." I think the latitude of the place is 56 or 57.

J. M. H.

Aurora Island

NATURE for May 25 (which has only just reached this part of the world) contains a note respecting the reported disappearance of Aurora Island in the New Hebrides. In that note the small upraised coral island of that name north-east of Tahiti is confounded with Aurora—a high volcanic island—more than 40° to the west of the former. It is scarcely to be wondered at that the mistake should be made when the name of the island is alone given; but when "Aurora Island, one of the New Hebrides group," is spoken of as being to the "north-eastward" of the well-known island of Tahiti one feels surprised at the misconception.

Has it yet been clearly defined to which Aurora the report refers, and is it not more probable that the captain's chronometer was out, or that his reckoning was incorrect, than that either island has really been submerged? A few months ago Dr. George Bennett, F.L.S., of Sydney, New South Wales, showed me a sketch which he made of Aurora in the New Hebrides some years ago. From that the island appears very mountainous, and the map of Melanesia, in Petermann's Geographische Mittheilungen (1870), makes it about twenty miles long and 2,000 ft. high.

S. J. WHITMEE

Samoa, South Pacific, Nov. 4, 1871

P.S.—The following notes of earthquakes in the Samoa group may be of interest to some of your readers:—

May 14, 1871.—2.5 P.M. First a vertical, followed by a horizontal, shock.

July 1, " —9.30 A.M. Slight horizontal shock.

" 16, " —12.10 P.M. Vertical shock.

Aug. 3, " —12.15 P.M. Slight horizontal shock, accompanied by a loud rumbling noise.

Sept. 23, " —6.45 A.M. A slight horizontal shock.

I was absent from Samoa from September 1870 to April 1871. During that time there were eight shocks of earthquake in the group; but the dates and other particulars were not noted. One is reported as having been the most severe shock known here. Earthquakes have been more frequent in Samoa for the past year or two than formerly.

FOUL AIR IN MINES AND HOW TO LIVE IN IT

I.

I BEG to forward you for publication in NATURE an account of some very interesting experiments recently made at Chatham, on the employment of a respirator in military mining. They were conducted in a

thoroughly practical manner by Mr. J. Edward Gibbs, a highly intelligent young officer of Engineers, who, I may add, has given the respirator a very convenient form, and, I trust, will continue the work he has so well begun.

It is to be borne in mind that the cotton wool employed in the respirator is not to be steeped in glycerine, but moistened with this substance; the wool ought to be well teased until all its fibres are wetted, at they must not form a clot.

JOHN TYNDALL

"When on duty at the Defensive Mines one day during the mining operations of July and August 1871, three men were brought out in a fainting state, caused by a rush of foul air in untamping. Thinking some means might be devised for preventing such accidents, and the consequent loss of time and panic, I consulted with Captain Malcolm, R.E., who proposed Prof. Tyndall's firemen's respirator for consideration. Colonel Lennox sent me to the maker to inquire, and I returned with one.

"With the assistance of Quartermaster-Sergeant Ingram of the Chemical Laboratory, and several books of reference, I have collected the following notes:—

"After exploding a charge of gunpowder at a gallery-head, it becomes dangerous to untamp, because of the poisonous gases produced by the combustion of the powder. These gases are CO₂, N, CO, HS, C₂H₄, and H. The only gases that are present in sufficient quantities to harm are CO₂ and CO. CO₂ to the amount of $\frac{1}{300}$ ('005) of the bulk of the air at the gallery-head would render it unfit to sustain life. CO to the amount of $\frac{1}{100}$ ('01) would do the same. 100 lbs. of powder evolve 22559.38 cubic in. of gas at 60° F. and 30" B., of which 9429.7896 are CO₂, and 2249.848 are CO.

"Miners working in the presence of the foul air from the explosion suffer in two ways. If affected suddenly, they feel a burning at the nape of the neck, and their limbs tremble, they turn giddy and faint. This is to be attributed chiefly to the CO. The miners are also affected in a slower manner by the CO₂. They feel their breathing becoming difficult, as if there were a weight on their chest, with a tight feeling in the head; if not brought into the fresh air they are in time overcome and faint. This also brings on headache, on coming into fresh air.

"Any method of getting rid of the foul gases by chemical means must interfere greatly with the progress of the work. In any case there would be considerable difficulty in destroying the CO, as it has neither acid nor basic properties. A good system of ventilation through hose would clear the galleries of the foul air, but would not overcome the difficulty of untamping, because at any moment of the process there may be a rush of foul gas, which would take effect on the men at work, before the ventilation could carry it away.

"A good respirator worn by each of the men employed at untamping might overcome this difficulty. Prof. Tyndall's respirator for firemen is constructed with a view to enable the men to inhale pure air when at work in a burning house, by separating the smoke and noxious vapours. It consists of two parts; (1) the mouth-piece; (2) the body of the respirator.

"The mouth-piece is an invention of a Mr. Carrick, hotel-keeper at Glasgow, who had patented it.* It has two valves, *i* and *e*. (See NATURE, June 15, 1871.) The air inhaled comes from below, up through the body of the respirator and through *i*. The exhaled breath closes *i*, and escapes through *e*, thus keeping the contents of the body of the respirator cool. There is an aperture *o*, which fits closely round the lips, and to prevent respiration through the nose, there is a nose-pad fixed on top of the mouth-piece. A wire-gauze partition separates the mouth-piece from the contents of the body of the respirator.

* This is not the mouth-piece now adopted.—J.T.