

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 CO<sub>2</sub>, N, CO, HS, C<sub>2</sub>H<sub>4</sub>, and H. The only gases that are present in sufficient quantities to harm are CO<sub>2</sub> and CO. CO<sub>2</sub> 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 CO<sub>2</sub>, 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 CO<sub>2</sub>. 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.