1. The Antiar is a paralysing poison.

2. It acts in the first instance and with great rapidity (in 5 to 10 minutes) upon the heart, and stops its action.

3. The consequences of this paralysis of the heart are the cessation of the voluntary and reflex movements in the first and second hour after the introduction of the poison.

4. The Antiar paralyses in the second place the voluntary muscles.

5. In the third place it causes the loss of excitability of the great nervous trunks.

6. The heart and muscles of frogs poisoned with Urari may be paralysed by Antiar.

7. From all this it may be deduced, that the Antiar principally acts upon the muscular fibre and causes paralysis of it.

So much for this time. My experiments with the Antiar upon warm-blooded animals have only begun, and I am not yet able to draw any conclusion from them. As soon as this will be possible, I shall take the liberty to submit them to the Royal Society, together with the results of my experiments with the *Upas tieuté*, which poison I had also the good fortune to obtain through the kindness of Sir Benjamin Brodie and Dr. Horsfield. With regard to the Antiar I may further add, that experiments made independently, and at the same time, by my friend Dr. Sharpey with this poison, have conducted to the same results as my own.

II. "On some Physical Properties of Ice." By John Tyndall, Ph.D., F.R.S. Received December 17, 1857.

(Abstract.)

In this paper the following points are considered:—

1. The effects of radiant heat upon ice.
2. The effects of conducted heat upon ice.
3. The air- and water-cavities of ice.
4. The effects of pressure upon ice.

For the experiments on radiant heat, slabs of Wenham Lake and Norway ice were made use of. Through these a solar beam, con-

densed by a double convex lens, was transmitted. At the moment the beam crossed the transparent solid, the track of the beam became instantly starred by little lustrous spots, like shining air-bubbles. Round each of these a figure, shaped like a flower of six petals, was formed. The petals were manifestly liquid water. When the beam was permitted to traverse different portions of the ice in succession, the sudden appearance of the stars, and the formation and growth of the flowers around them, could be distinctly observed through an ordinary pocket lens.

To test whether the brilliant spots at the centres of the flowers contained air or not, portions of ice containing them were gradually melted in warm water. The moment a liquid connexion was established between the cavities and the atmosphere, the bubbles collapsed, and no trace of air rose to the surface of the water. The formation of each liquid flower is therefore accompanied by the formation of a vacuum at its centre.

The perfect symmetry of these flowers at once enables us to infer that ice is a uniaxal crystal, the line perpendicular to the planes in which the flowers are produced being the optic axis.

For a long time during the investigation it was found that the flowers were formed in planes parallel to those of freezing; but some apparent exceptions to this rule were afterwards noticed, which are described in the paper.

In some masses of ice, apparently homogeneous, the flowers were formed on the track of the beam, in planes which were in some cases a quarter of an inch apart. This proves that the interior portions of a mass of ice may be melted by radiant heat which has traversed other portions of the mass without melting them.

In a second section of the paper the author describes the gradual liquefaction of masses of ice by the formation of drops of water within them; and he infers from his observations that the melting-point of ice oscillates within small limits on each side of the ordinary standard. Through weakness of crystalline texture, or some other cause, some portions of a mass of ice melt at a temperature slightly under 32° Fahr., while others of stronger texture require a temperature slightly over 32° to liquefy them. The consequence is, that such a mass, raised to the temperature 32°, will have some of its parts liquid and some solid.

In a third section the air- and water-cavities observed in ice are examined. These the author observed in lake ice, and they are manifestly the same as those described by M. Agassiz, the Messrs. Schlagintweit, and Mr. Huxley, as occurring in the ice of glaciers. The hypothesis of M. Agassiz and the Messrs. Schlagintweit is, that the air-bubble absorbs the heat which the ice, as a diathermanous body, has permitted to pass, the solid surrounding the bubble being liquefied by the heat thus absorbed. Mr. Huxley makes the supposition most in accordance with the facts known at the time of his observations, namely, that the water in the cavity has never been frozen. It is shown by the author that the water-cavities examined by him have been produced by the melting of the ice.

But the hypothesis of M. Agassiz and the Messrs. Schlagintweit, which appears to have received general acceptance, leads to the following consequences:—Taking the specific heat of water and of air into account, the author shows that a bubble of air, in order to raise its own volume of water 1° in temperature, must lose 3080°.

Taking the latent heat of water into account, the author shows that, to melt its own volume of ice, an air-bubble must part with 3080×142·6, or 439,208° of temperature. Now M. Agassiz states, that when a piece of ice containing bubbles is exposed to the sun, the water formed soon exceeds the air in volume. Hence, if his hypothesis be correct, the quantity of heat absorbed by the air in the brief time of an observation, would, if it had not been communicated to the ice, be sufficient to raise the bubble to a temperature 160 times that of fused cast iron. The author further infers, from the experiments of Delaroche and Melloni, that the quantity of heat absorbed by a bubble of air at the earth's surface, after the heat has traversed our atmosphere and been sifted by it, is absolutely inappreciable. This conclusion becomes stronger when the absorption by the ice in the case before us is added to the absorption by the atmosphere.

Regarding heat as a mode of motion, the author shows that the liberty of liquidity is attained by the molecules at the surface of a mass of ice before the molecules at the centre of the mass can attain this liberty. Within the mass each molecule is controlled in its motion by the surrounding molecules. But if a cavity exist at the interior, the molecules surrounding that cavity are in a condition similar to those at the surface; and they are liberated by an amount of motion which has been transmitted through the ice without prejudice to its solidity. The conception is helped when we call to mind the transmission of motion through a series of elastic balls, by which the last ball of the series is detached, while the others do not suffer visible separation.

The author proves, by actual experiment, that the interior portions of a mass of ice may be liquefied by an amount of heat which has been *conducted* through the exterior portions without melting them.

The converse of this takes place when two pieces of ice at 32° Fahr., with moist surfaces, are brought into contact. Superficial portions are by this act virtually transferred to the centre; and as equilibrium soon sets in between the motion of the tenuous film of moisture between the pieces of ice and the solid on each side of it, the consequence is shown to be that the film freezes, and cements the two pieces of ice together. The fourth section of the paper is devoted to these considerations.

In the fifth section a series of observations bearing upon the conductivity of ice for heat is recorded.

In the sixth section the influence of pressure upon ice is examined. A cylinder of the substance was placed between two slabs of boxwood, and subjected to a gradually-increasing pressure. Looked at perpendicular to the axis, cloudy lines were observed drawing themselves across the cylinder. Looked at obliquely, these lines were found to be the sections of dim surfaces which traversed the cylinder, and gave it the appearance of a crystal of gypsum whose planes of cleavage had been forced out of optical contact by some external force.

The surfaces are not of plates of air, for they are formed when the compressed ice is kept under water. They also commence sometimes in the centre of the mass, and spread gradually on all sides till they finally embrace the entire transverse section of the cylinder. A concave mirror was so disposed that the diffuse light of day was thrown upon the cylinder while under pressure. The hazy surfaces produced by the compression of the mass were observed to be in a state of intense commotion, which followed closely upon the edge of the surface as it advanced through the solid. It is finally shown that these surfaces are due to the liquefaction of the ice in planes perpendicular to the pressure.

The surfaces were always formed with great facility parallel to those planes in which the liquid flowers already described are produced by radiant heat, while it is exceedingly difficult to obtain them perpendicular to these planes. Thus, whether we apply heat or pressure, the experiments show that ice melts with peculiar facility in certain directions.

The Society then adjourned over the Christmas holidays, to January 7, 1858.