of a size sufficiently great to be visible under the microscope. But in many other instances I have failed to detect any such indication, even with much higher powers. The small ramifying tubules might at first sight be taken for some traces of a vegetable tissue, but my colleague Dr. Scott assures me that they do not in the least resemble any tissue found in the bamboo. I have myself no doubt that it is an inorganic structure. It is not improbably analogous to the peculiar ramifying tubules formed in a solution of water-glass when a crystal of copper sulphate is suspended in it, as shown by Dr. Heaton (Proc. Brit. Assoc., 1869, p. 127). Similar forms also occur on a larger scale in some agates, and the artificial cells of Traube may probably be regarded as analogous phenomena.

The aggregates of globular bodies seen in the section so greatly resemble the globulites of slags and natural glasses, and in their arrangement so forcibly recall the structures seen in the well-known pitchstone of Corriegills in Arran, that one is tempted to regard them as indicating the beginnings of the development of crystalline structure in the tabasheer. But I have good grounds for believing the structure to have a totally different origin. They seem in fact to be the portions of the mass which the fluid Canada balsam has not succeeded in penetrating. By heating they may be made to grow outwards, and as more balsam is imbibed they gradually diminish, and finally disappear.

I must postpone till a future occasion a discussion of all the structures of this remarkable substance and of the resemblances and differences which they present to the mineral opals on the one hand, and to those of the opals of animal origin found in sponge spicules, radiolarians, and the rocks formed from them, some of which have recently been admirably investigated by Dr. G. J. Hinde (Phil. Trans., 1885, pp. 425–33).

I cannot, however, but think that it would be of the greatest service to botanists, physicists, and mineralogists alike, if some resident in India would resume the investigations so admirably commenced by Dr. Patrick Russell nearly a century ago; and it is in the hope of inducing someone to undertake this task that I have put together these notes. There are certain problems with regard to the mode of occurrence of this singular substance which could only be solved by an investigator in the country where it is found.

Most parcels of the commercial tabasheer appear to contain different varieties, from the white, opaque, chalk-like forms, through the translucent kinds to those that are perfectly transparent. It would be of much interest if the exact relation and modes of origin of these different varieties could be traced. It would also be important to determine if Brewster was right in his conclusion that the particular internodes of a bamboo which contain tabasheer always have their inner lining tissue rent or injured. The repetition of Dr. Russell's experiment of drawing off the liquids from the joints of bamboos and allowing them to evaporate is also greatly to be desired. My colleague Prof. Rücker, F.R.S., has kindly undertaken to re-examine the results arrived at by Brewster in the light of more recent physical investigations, and I doubt not that some of the curious problems suggested by this very remarkable substance may ere long find a solution.

JOHN W. JUDD

EXHIBITION OF MARINE METEOROLOGICAL INSTRUMENTS

THE eighth Annual Exhibition of the Royal Meteorological Society was held in the Library of the Institution of Civil Engineers, 25 Great George Street, Westminster, from Tuesday, March 15th, to Friday, the 18th. The exhibition was specially devoted to marine meteorological instruments and apparatus, and such new instruments as have been invented and first constructed during the past twelve months.

A very interesting and valuable collection of instruments from the *Challenger* Commission, the Scottish Marine Station at Granton, the Scottish Meteorological Society, and Mr. J. Y. Buchanan, were brought from Edinburgh under the charge of Dr. H. R. Mill, who showed several in action. This set included various forms of deep-sea thermometers, from the early pattern of the Miller-Casella to the Scottish frame for Negretti and Zambra's reversing thermometer, which has been adapted from Magnaghi's by Dr. Mill. Two specimens of the Miller-Casella thermometer, after four months' immersion in brackish water, were shown, with the following results: in No. 1, which was placed at the surface, the copper case was clean, but the scale figures were entirely obliterated from the porcelain; in No. 2, which was suspended in 9 fathoms, and at 1 foot above the bottom, the copper was entirely covered with a green crust, but the scale figures were not rendered illegible. Various forms of piezometers for ascertaining the depth when the temperature is known, or the temperature when the depth is known, were also exhibited. These were nearly all constructed by Mr. Buchanan on board the *Challenger*. Water-bottles for obtaining samples of water at the bottom, or any required depth below the surface, were suspended from the gallery to show their action when in use. The most interesting were Buchanan's sounding-rod and water-bottle for great depths, and Mill's self-locking slip water-bottle for moderate depths.

The Meteorological Council contributed sets of instruments as supplied to merchant ships and the Royal navy; the Royal Meteorological Institute of the Netherlands exhibited a set as supplied to the Dutch navy; and the Deutsche Seewarte sent a set as issued to the German navy.

The Rev. C. J. Steward exhibited a set of instruments as used at the Lochbuie Marine Institute, Isle of Mull, which, among others, included a dimenuion thermometer in a box for river temperatures, the box being suitable for the bottoms of pools, or rough stony bottoms; and a large disk for ascertaining the transparency of the sea.

In connexion with the deep-sea thermometers Mr. Casella showed some apparatus originally employed in testing these instruments for the Admiralty and the Royal Society, and damaged during the experiments; viz., a bottle broken at a pressure corresponding to 2½ miles of sea-water, a steel bar bent at 3 miles, and an iron plug broken at 4 miles. Specimens of almost every pattern of deep-sea thermometer were exhibited, including Johnson's registering metallic, the records of which are obtained by the varying expansion of brass and steel bars acting upon indices; Miller-Casella maximum and minimum; and Negretti and Zambra's turnover thermometer.

The barometers exhibited included patterns used in the British, Dutch, French, and German navies. The English marine barometer has an iron cistern and contracted scale, and the gun barometer is mounted with india-rubber packing to prevent breakage caused by gun-firing. MM. Richard Frères, of Paris, sent one of their self-recording aneroids, for use on board ship; and Mr. Abercromby showed several curves taken at sea by one of these instruments in various parts of the world.

The anemometers shown were: Sir Snow Harris's, which is an improved form of Lind's; Hagemann's, Robinson's, Black's pressure, and Whipple's maximum pressure, the latter being quite a new instrument. Dr. Black exhibited his marine rain-gauge and evaporator. Among the miscellaneous instruments were various forms of patent logs, current meters, clinometers, and a model of a section of a vessel fitted with lightning conductor.

In addition to the instruments, a number of charts

diagrams, &c., were exhibited, showing the meteorological conditions prevailing over the various oceans of the globe. The advance made in synoptic meteorology over the North Atlantic was clearly shown by comparing Leverrier's charts (1864) with the daily synchronous weather charts just published by the Meteorological Council. The specimens exhibited of the latter were (1) August 1-6, showing the meteorological conditions in the summer; (2) February 9-14, showing the conditions in the winter; and (3) February 24 to March 4, showing the conditions in early spring, and the persistence of the European anticyclone, producing cold dry winds over England. The Meteorological Council also exhibited a set of large charts showing the mean temperature of the sea surface round the coasts of the British Isles for each month. Dr. Mill had several interesting diagrams showing the distribution of temperature in a section of the Clyde sea area at seven periods from April 1886 to February 1887. Mr. Abercromby exhibited forty-six photographs and diagrams of clouds taken in various parts of the world; and Mr. Dyason showed a number of coloured drawings of clouds, &c. The Astronomer Royal sent the photographic registers of magnetic declination and horizontal force at the Royal Observatory, Greenwich, showing the earthquake shock which occurred on the morning of February 23.

The most interesting of the new instruments was the Watkin aneroid with open scale, by Mr. Hicks. Instead of the usual one-circle of figures, the scale of this instrument consists of a spiral of three complete turns. On the aneroid being put under an air-pump or taken up a mountain, the point of the index is gradually drawn *towards* the centre, so that it follows the *decreasing* spiral scale; but when the index moves in the opposite direction, the point moves *away* from the centre, thus following the *increasing* spiral. This is effected by the index-hand being made to slide in and out, so that one end may advance or recede from the centre, and thus follow the spiral scale. Attached to the spindle is a cross-piece, in which the index slides, and a hollow drum fixed to the dial-plate has a flexible chain or cord wound round it, the ends being fastened on the projecting pins riveted to the index. Consequently, if the spindle and the piece attached to it are revolved, one portion of the chain or cord winds off the drum, the other is wound on to the same extent, and the index is caused to slide through the cross-piece, the direction of motion being controlled by the direction in which the spindle is revolved.

MM. Richard Frères sent specimens of their self-recording thermometer, hygrometer, dry and wet bulb thermometers, and rain-gauge.

GEOGRAPHY AT THE UNIVERSITIES

AT last, after years of apparently fruitless labour, the Royal Geographical Society have been eminently successful in persuading almost simultaneously the two great English Universities to recognise geography as a University study, and to make definite provision for teaching it. In pursuance of a proposal made by the President and Council of the Royal Geographical Society to the Vice-Chancellors of the two Universities, and of the replies thereto, a deputation of a few members of their Council visited Oxford and Cambridge in turns, to meet delegates appointed by those Universities, in order to explain their proposal more fully, and to discuss any modifications that might be suggested. The main features of the proposal were, that the Royal Geographical Society offered to give 150*l.* annually to each University if they would establish a Lectureship or Readership in Geography, giving the Lecturer an adequate University status, and contributing, on their part, an equal sum, so as to raise the stipend of each Lectureship to 300*l.* They also offered to give the two Universities a Scholarship or Exhibition of 100*l.* in alternate years for geographical students. The Royal Geographical Society was to be represented on the Board that selected the Examiners, and on that which adjudged the Scholarship.

The meeting at Oxford with delegates from that University, including the present and past Vice-Chancellors, took place five weeks ago, at which the proposal was well discussed and favourably entertained, subject to the foreseen difficulty of finding adequate funds from the University resources; nevertheless everything seemed in train for its being eventually carried out, though after a little delay, in the intended manner. An unexpected incident, however, gave a new and collateral impulse, and has hurried the Lectureship into existence at once. It happened that the Readership in Ancient History became vacant, and it seems to have occurred to those with whom the election of a successor rested, that as there was a great difficulty in finding funds for geography, and as a Professorship of Ancient History was already in existence, and, again, as ancient history was taught by most classical tutors, the Readership in Ancient History might be abolished without much loss, and one in geography might be with propriety established in its place. There was a nearly even division of opinion on the matter, but the vote for geography prevailed and carried the day, and the advertisement inviting candidates has already been published. So Oxford now takes an independent line, and accepts only the offer of the Scholarship.

The Cambridge meeting took place about three weeks ago. The proposal was carefully discussed, and modifications were asked for. At Cambridge, as at Oxford, the University funds are seriously embarrassed by engagements already entered into, chiefly connected with building operations; and there seemed no way, so narrow was the available surplus, of raising the whole of the annual amount of 150*l.* in a direct form, but only 50*l.* of it However, it appeared that indirect means existed by which this nominal sum would indirectly and eventually be raised to even something more than the proposed amount, and an amendment specifying only 50*l.* was therefore provisionally accepted. After this had received the approval of the Council of the Royal Geographical Society, it was submitted to the Council of the University of Cambridge, and adopted by them in the terms of the following recommendation:—

"That the approval of the Senate be given to the delivery in the University in the ensuing academical year of one or more courses of lectures on geography by lecturers selected by the Royal Geographical Society, that a teacher of geography be appointed by a Committee on which the Royal Geographical Society is represented, and that the Senate accept the proposal of the Royal Geographical Society to award in alternate years an Exhibition of 100*l.* or prizes of 50*l.* and 25*l.* That before the end of the Easter Term, 1888, a University Lecturer in Geography be appointed, for a period of five years, at a stipend of 200*l.* a year, of which sum 50*l.* is to be paid out of the common University fund and 150*l.* by the Royal Geographical Society. The appointment of the Lecturer to be made by a joint Committee of the representatives of the Royal Geographical Society and of the Council of the Senate, subject to the confirmation of the Senate; the Lecturer to submit his scheme of lectures to the Committee of Management; and power is to be given to the Council of the Senate, with the concurrence of the Committee of Management, to cancel the appointment of the Lecturer at any time."

This recommendation has to be submitted to the Senate at the beginning of next term, but its ultimate acceptance is placed almost beyond doubt through the very favourable reception given to the proposals of the Royal Geographical Society by the Council of the University.