owing to the decomposition taking place in such a solution, still the green colour from the modified chlorophyll will long remain. A single drop of hydrochloric acid added to the green extract, although it at once changes the bright green to a darker and browner green, enables the solution to resist this action of light to a much greater extent than it could have done if no acid had been added.

In the one-banded modification of chlorophyll we appear to have a body on which light has no action; solutions of this body have been, for the last three months, exposed continuously to all the light and sunshine we could get, and they are unchanged in colour and constitution; another proof of the really wonderful stability of this substance. Again, as a confirmation of the properties and formation of this form of chlorophyll, a single drop of sulphate of copper added to an ordinary chlorophyll extract renders the green colour of the solution permanent.

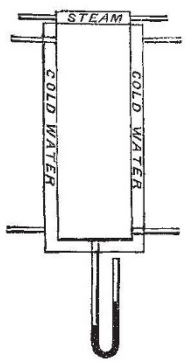
The very striking change of tint which occurs when a strong chlorophyll solution is very considerably diluted, whereupon it changes from a dark to a light yellowish-green, forcibly suggests to us the probability that the difference in shade of old leaves as compared with young ones, is due to the same cause, namely, the greater or smaller amount of chlorophyll in a given area.

ON A METHOD OF INVESTIGATING EXPERIMENTALLY THE ABSORPTION OF RADIANT HEAT BY GASES[1]

THERE are grave objections, which have been only partially overcome, to almost all the processes hitherto employed for testing the diathermancy of vapours. These arise chiefly from condensation on some part of the apparatus. Thus when rock-salt is used, an absorbent surface-layer may be formed; and, when the pile is used without a plate of salt, the effect of radiant heat may be to cool it (the pile) by the evaporation of such a surface film. The use of intermittent radiation is liable to the same objection.

Some time ago it occurred to me that *this* part of the difficulty might be got rid of by dispensing with the pile, and measuring the amount of absorption by its continued effects on the volume and pressure of the gas or vapour itself.

Only preliminary trials have, as yet, been made. They were carried out for me by Prof. Mac-Gregor and Mr. Lindsay.



Their object was *first* to find whether the method would work well, *second* (when this was satisfactorily proved) to find the best form and dimensions for the apparatus.

The rough apparatus is merely a double cylinder, placed vertically. Cold water circulates in the jacket, and steam can be blown into the double top. The changes in the pressure of the gas are shown by a manometer U tube at the bottom, which contains a liquid which will not absorb the contents. This apparatus was 4 feet long, with 2 inches internal radius. The results of a number of experiments show that it should be shorter and much wider. The former idea I was not quite prepared for, the latter is obvious.

The effects on the manometer are due to five chief causes:—

1. Heating of the upper layer of gas by contact with lid.
2. Cooling ,, ,, ,, ,, sides.
3. Heating of more or less of the column by absorption.
4. Cooling of do. by radiation.
5. ,, ,, contact.

(1) and (2) only are present in a perfectly diathermanous gas, and in a perfectly adiathermanous gas or vapour.

All five are present in a partially diathermanous gas or vapour.

The preliminary experiments show that the manometer effect is only *very slightly less* for dry olefiant gas than for dry air, while moist air shows a markedly smaller effect than either of the others.

This is conclusive as to the absorption of low radiant heat by aqueous vapour, but it shows also that the absorption is so small as to take place throughout the whole column.

Even with the present rude apparatus I hope soon to get a very accurate determination of the absorbing power of aqueous vapour, by finding in what proportions olefiant gas must be mixed with air to form an absorbing medium equivalent to saturated air at different temperatures.

I have to acknowledge valuable hints from Prof. Stokes, who, before I told him the results I had obtained (thus knowing merely the *nature* of the experiments) made something much higher than a guess) though somewhat short of a prediction, of the truth.

In these preliminary trials no precaution was taken to exclude *dust*. The results, therefore, are still liable to a certain amount of doubt, as Mr. Aitken's beautiful experiments have shown.

The *point* of the method is that there can be no question of surface-layers.

[Since the above was written, Messrs. Mac-Gregor and Lindsay have made an extended series of experiments with dry and moist air, and with mixtures of dry air and olefiant gas in different proportions. The cylinder employed was 9 inches in radius. The results will soon be communicated to the Royal Society of Edinburgh.—P. G. T.]

[1] Letter from Prof. Tait, read by Sir W. Thomson at the Southampton meeting of the British Association.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—In addition to the courses in Natural Science described in last week's NATURE, the following will be given during the present Michaelmas term:—Prof. Pritchard will give a course of six lectures on the Theory of the Transit Instrument, Equatorial, and Sextant, to be followed by six lectures on the Lunar Theory. There will be eight lectures on Instrumental Practice, and eight "Evenings with the Telescope," the latter being of a popular and untechnical character

Prof. Lawson has announced the following courses of lectures for the ensuing year at the Botanical Gardens:—

Course I. Vegetable Histology; Michaelmas Term, 1882.

Course II. Special Morphology; Lent Term, 1883, and Trinity Term, 1883 (continued).

Course III. Descriptive Botany; every Saturday in Lent and Trinity Terms, 1882.

Prof. Prestwich gives a course on Theoretical Geology at the University Museum, and Prof. Westwood on Certain Groups of Anthropoda.

The Regius Professor of Medicine gives notice that an examination for certificates in Preventive Medicine and Public Health will be held this term, and secondly that Bachelors of Medicine may proceed to the degree of Doctor in any term, on due notice being given.

Natural Science Scholarships are offered this term at Balliol and at Christ Church.

The notice issued by Balliol College states there will be an election to a sholarship on the foundation of Miss Hannah Brackenbury, "for the encouragement of the study of Natural Science," worth 80*l.* a year (55*l.* and tuition free), tenable during residence for four years: open to all such candidates as shall not have exceeded eight terms from Matriculation. This examination will begin on Thursday, November 16, at ten o'clock. Papers will be set in the following subjects:—(1) Mechanical Philosophy and Physics; (2) Chemistry; (3) Biology. But candidates will not be expected to offer themselves in more than two of these. There will be a practical examination in one or more of the above subjects, if the examiners think it expedient. There will also be an optional paper in Mathematics; and the literary qualifications of the candidates will be tested by an English essay, or by a paper of general questions.

At Christ Church *at least* one scholar will be elected in Natural Science. Papers will be set in Biology, Chemistry, and Physics, but no candidate will be allowed to offer more than two of these subjects. An optional paper will be set in Elementary

Mathematics. Candidates will be tested in Classics, and required to show sufficient knowledge to pass Responsions. The emolument is 80*l.* annually. The examination begins on November 23. Candidates must not have exceeded the age of nineteen. The election in the first place is for two years. The tenure will be renewed for another two years if the College is satisfied with the progress and good conduct of the scholar. For special reasons the scholarship may be prolonged for a fifth year.

The formation of the new Boards of Faculties will not be proceeded with this term; it is proposed to defer the elections till a day not later than February 3, 1882. The appointment of examiners will therefore rest this term with the Vice-Chancellor and Proctors as before.

Prof. Max Müller has been elected a permanent Delegate of the Clarendon Press.

CAMBRIDGE.—Mr. James Ward is appointed Lecturer on the Science of Education at Cambridge for the present year; Mr. W. N. Shaw, of Emmanuel College, is approved as a teacher of Physics, and Mr. J. N. Langley, of Trinity College, as a teacher of Physiology for the purpose of Medical Studies.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, October.—Mohr's geographical theory of earth-pressure, by G. F. Swain.—The platinum-water pyrometer, by J. C. Hoadley.—Experiments on the fatigue of small spruce beams, by F. E. Kidder.—Theory of the stereoscope, by W. Leconte Stevens.—Report on European sewerage systems, &c. (continued), by R. Hering.—The manufacture of potash alum from felspar, by H. Pemberton, jun.—Report of the committee on the Fowler cloth-cutting machine.

Revue internationale des Sciences for September, 1882, contains: On the psychology and writings of Broca, by M. Zabrowski.—On the structure and on the movements of the protoplasm in the vegetable cell, by H. Frommann.—On orientation and its organs in man and animals, by M. Viguier.

SOCIETIES AND ACADEMIES

SYDNEY

Linnean Society of New South Wales, August 30.—The president, Dr. James C. Cox, F.L.S., &c., in the chair.—The following papers were read:—By the Rev. J. E. Tenison-Woods, F.G.S., &c., Botanical notes on Queensland, No. 4. This paper contained the author's observations on some of the Queensland species of *Myrtaceæ*, chiefly of the *Eucalypti*.—By the Rev. J. E. Tenison-Woods, F.L.S., &c., &c., on a coal plant from Queensland. This is an account of a fossil species of *Equisetum* found in the Ipswich coal beds, and provisionally named *E. rotiferum*, from the wheel-like shape of the diaphragm. No *Equisetum* had previously been found in the Australian coal beds.—By William Macleay, F.L.S., &c., Observations on an insect injurious to the vine.

PARIS

Academy of Sciences, October 16.—M. Jamin in the chair.—The following papers were read:—On the shock of two balls placed on a billiard table, by M. Resal.—On the catalogue of six hundred tornadoes observed in the United States in the course of this century, by M. Faye. This relates to a report by Sergeant Finley, of the U.S. meteorological service. The rapid increase of tornadoes recorded shows the rapidity with which population has increased. Trombes and tornadoes are short epiphenomena of cyclones. *Inter alia*, the mean velocity of gyration in a tornado is about 174 metres per second; the usual diameter is about 300 m. to 400 m.; the mean velocity of translation 17 m. per second. Most go from S.W. to N.E. They traverse about 11 leagues on an average, and last three-quarters of an hour. Several tornadoes may occur in one cyclone. They are formed exclusively in the dangerous semicircle of a cyclone, and nearly always a little in advance. They show a marked predominance in April, June, and July, and from 4 p.m. to 6 p. m.—On the functions of seven letters, by M. Brioschi.—Rational conception of the nature and propagation of electricity deduced (1) from consideration of the potential energy of ethereal matter associated with ponderable matter; (2) from the mode of production and transmission of work arising from variations of this energy, by M. Ledieu.—On the processes employed for the construction and plan of the metric standards, by M. Tresca. He has been unwell, but promises a complete memoir on the subject shortly.—Brazilian missions for observation of the transit of Venus, by M. Cruls. These are four in number, and will act at St. Thomas, Magellan, Pernambuco, and Rio de Janeiro, the respective heads being Capt. Jeffé, M. Cruls, M. Lacaille, and Capt. Jacques. Each station will have a 6-in. equatorial, a 4½-in. astronomical telescope, a meridian instrument with collimator, an excellent compensated pendulum, electric chronograph, &c. A chronometric junction of Magellan with Montevideo will be undertaken.—On the comet 1812 (Pons) and its approaching return, by MM. Schulhof and Bossert.—On the metric and kinematic properties of a sort of conjugated triangles, by M. Stephanos.—Ordinary and extraordinary indices of refraction of Iceland spar for rays of different wave length as far as the extreme ultra-violet, by M. Sarasin. The measurements referred to the principal lines of the visible solar spectrum and the lines of cadmium (induction spark) between two cadmium points). M. Soret's fluorescent ocular was used for the ultra-violet lines. The columns for the two prisms used show satisfactory agreement, as do also the author's values for the ordinary index for D and F with those of M. Mascart and M. Cornu.—The forces of induction which the sun develops in bodies by its rotation vary, all other things equal, in inverse ratio of the squares of the distances, by M. Quet.—On M. Helmholtz's theory of double electric layers; calculation of the magnitude of a molecular interval, by M. Lippmann. The interval ϵ he calculates to be 1-35,000,000 mm., which it is interesting to compare with the number, nearly the same (1-30,000,000) arrived at by Sir William Thomson by quite another way, for the minimum distance separating copper from zinc.—On the electrolysis of hydrochloric acid, by M. Tommasi. He examines the two cases of concentrated and dilute acid, platinum electrodes being used.—On the reduction of nitrates in arable land, by MM. Dehérain and Maquenne. Nitrates, in being reduced in arable land, liberate under certain conditions protoxide of nitrogen. The reduction occurs only in arable land containing much organic matter, and has been observed only when the atmosphere of the ground was absolutely free from oxygen.—On the industrial richness of crude alunite, in powder, by M. Guyot. The proportion of the base varies considerably (17·5 to 32 per cent.).—On chronic poisoning by antimony, by MM. de Poncy and Livon. A cat weighing 867 gr. at first was made to absorb, in a regular progressive way, 0·628 gr. of white oxide of antimony between April 26 and August 13. The animal did not pass through a period of embonpoint (as with arsenic), but it gradually fell into disease, took diarrhœa and died. All the tissues were pale and colourless, and nearly all the organs showed fatty degeneration.—Two maps of part of the Newfoundland coast, by Admiral Cloué, were presented.

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