

apparatus, not only at the sectional meeting, but later on in the evening at the conversazione which was held in the Leicester Museum.

Owing to the very full programme of papers, the section was forced to meet again on Wednesday, August 7, when four papers were discussed. The first, a short paper by Mr. J. F. Brooks, described a machine for weighing the forces on a cutting tool; the author exhibited and explained one of his machines, and the values of the forces on tools with cutting angles of 65° and 70° when cutting cast-iron and mild steel with small cuts at moderate speed were shown by means of diagrams.

Mr. R. S. Ball, in his paper on the governing of hydraulic turbines, dealt with the problems involved in the speed control of hydraulic turbines for a wide range of head. He showed that such regulators may be divided into two classes:—(1) disengagement governors (mechanical), which come into action when an assigned departure from the normal speed is attained, being otherwise out of gear; (2) continuous governors (mechanical and hydraulic), which are always connected to the gate-controlling mechanism, and which begin to operate at the moment the speed rises or falls from the normal. The action of various types of governors was described by figures and diagrams plotted from the results of tests.

Prof. H. T. Barnes, of McGill University, Montreal, then read a paper on the ice problem in engineering work in Canada. He showed that in Canada there is always great steadiness of the temperature of the water throughout the ice season, and that there are three varieties of ice to be distinguished—surface or sheet ice, spicular or frazil ice, and anchor or ground ice. Prof. Barnes explained that by an intelligent use of artificial heat, especially at night time, when super-cooling is most common, the interference of ice with the normal operation of a power-house may be largely prevented. The most favourable condition for a power-house is when it is situated on a river normally frozen over on its surface and with no stretches of open water above.

The section concluded its business with the reading of some notes by Mr. J. Smyth on the application of water-power and how to secure the greatest efficiency in working same.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE sum of 50,000 dollars has been appropriated by the Kansas Legislature for the erection of engineering buildings in connection with the State university.

THE Sunderland Technical College is to be extended by the addition of a day training college and engineering laboratories at a proposed cost of 10,000l.

DR. JAMES E. TALMAGE has resigned the professorship of geology in the University of Utah in order to devote himself to investigation work in mining geology. Dr. F. J. Pack has been appointed to succeed him.

THIS year's scholarship of the Institution of Naval Architects has been awarded to Mr. A. M. Robb, Glasgow. The scholarship of the annual value of 50l., and, subject to the regulations, is tenable for three years.

MR. SIMON FLEXNER has been made a member of the Rockefeller Institute for Medical Research, New York, and director of the pathological laboratories; and the following have been appointed members of the institute:—Mr. S. J. Meltzer (physiology and pharmacology), Mr. E. L. Opie (pathology), and Mr. P. A. Levene (biological chemistry).

THE calendar of the Manchester School of Technology and Municipal School of Art for the session 1907-8 has just been issued by the firm of John Heywood, Ltd. In it are to be found particulars of the courses of instruction, and the scholarships, prizes, &c., at the institution. Many of the laboratories and workshops are pictorially represented in the volume.

THE following appointments abroad have recently been made:—at the Rush Medical College, Chicago, Dr. Robert R. Bensley to be professor of anatomy, and Dr.

Edwin O. Jordan professor of pathological anatomy and bacteriology; Dr. Francis Huber has been elected to the chair of medicine at the New York College of Physicians and Surgeons, and Dr. Frederick Peterson to that of psychiatry in the same institution; at Yale University, Dr. J. M. Flint has been appointed professor of surgery; at Würzburg, Dr. Faust has been made professor of pharmacology.

THE remarkable progress accomplished by the Japanese during the last thirty-two years in the field of public education is brought out very clearly in the thirty-second annual report of the Japanese Minister of Public Instruction, which has been published recently. This report deals with the year 1904-5, the date of the war with Russia. It is instructive to note that this time of stress was allowed to interfere in no way with educational activity. The Emperor, indeed, proclaimed it to be a national duty that the zeal and efforts of educational administrators and teachers should be redoubled. Despite the financial difficulties to which a great war gave rise, the expenditure on education was not diminished. While in 1873 only twenty-eight out of every 100 children were under instruction in public schools, the ratio had risen in the year under review to the remarkable one of 97 boys and 91.5 girls out of every hundred, and the number of children in the schools had reached 7,551,445. Higher education, too, was in an equally flourishing condition. For example, the number of students in the University of Tokyo had reached 3500, and in Kioto 1300. Numerous special schools, technical schools for engineers and for agricultural specialists, medical schools, and schools for the study of modern languages, were all in a high state of efficiency. Moreover, a point of special interest in our country to-day, the hygiene of schools, is scrupulously watched, and medical officers are charged specially with the duty of keeping the pupils under examination. Altogether the report provides abundant evidence of the success with which Japan is educating her people.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 6.—“The Osmotic Pressure of Compressible Solutions of any Degree of Concentration.” By Alfred W. Porter.

An exact equation is obtained connecting osmotic pressure with the vapour pressures of solvent and solution, viz. :—

$$\int_{\pi_{\pi}}^{\rho} s d p + \int_{p-P_p}^{\pi_{00}} u d p = \int_{\pi_{\pi}}^{\pi_{00}} v d p,$$

where

P_p is the osmotic pressure when the hydrostatic pressure of solution is p ;

π_{00} is the vapour pressure of the solvent when under the hydrostatic pressure of its vapour alone;

π_{π} is the vapour pressure of the solution when under the hydrostatic pressure of its vapour alone.

v and u are the specific volumes of vapour and solvent; s is the diminution of a very large volume of the solution when 1 gram of solvent is removed.

The equations given by van 't Hoff and the Earl of Berkeley can at once be derived from this general one by taking the liquids as incompressible and considering respectively the cases in which (1) the solvent, (2) the solution, is under the pressure of its own vapour alone.

It is shown that if two solutions in the same solvent have the same osmotic pressure, they have also the same vapour pressure provided the values of these pressures be measured for the same hydrostatic pressure of the solution. They have also the same freezing point.

It is shown that when a solution is in equilibrium with the pure solvent across a semi-permeable membrane the vapour pressure of the solution is necessarily equal to the vapour pressure of the solvent, each being measured for the actual hydrostatic pressure of the fluid to which it refers.

The above involves a recognition of the variation of vapour pressure with the hydrostatic pressure of the fluid to which it relates; an equation giving the mode of variation is derived.

A graphical solution of the osmotic-pressure equation is given.

June 13.—“Some Points in the Development of *Ophiothrix fragilis*.” By Prof. E. W. MacBride, F.R.S.

The paper contained a preliminary report on the result of researches on the development of the British Ophiurid *Ophiothrix fragilis*. The eggs of this species are small (0.1 mm. in diameter) and opaque, and the development until the completion of the metamorphosis occupied twenty-six days. The full account of the research, which will shortly appear in the *Quarterly Journal of Microscopical Science*, will contain the first complete description of the formation of all the organs of an adult Ophiurid from their rudiments in the *Ophiopluteus* larva. In the preliminary account two points of special interest are emphasised:—(1) the varying character of the early development according to the conditions under which the egg was fertilised; and (2) the indications of metamerism in the coelomic sacs of the larva. With reference to (1), if the eggs were artificially fertilised, *i.e.* if the ovary were removed from the body and the eggs shaken out and then mixed with sperm, a larva resulted in which there was a precocious formation of mesenchyme, so that the blastula stage was practically solid; this was succeeded by an invagination in which the endodermic plate was many layered. As a result, the gastrula had a wedge of cells projecting into the gut which was slowly absorbed. A similar wedge seems to be a normal feature of the development of *Ophiura brevis*, according to Dr. Caswell Grave. If the animals were allowed to spawn naturally, a hollow blastula was formed, and invagination was normal; in addition, at the anterior end of the larva a vacuolated crest of cells was formed, which later disappeared. With regard to (2), the coelom on both sides of the larva became divided into three somites. Of these, the middle one on the left side gave rise to the hydrocoele, or rudiment of the water-vascular system; its fellow on the right is the homologue of the “dorsal sac” or “madreporic vesicle” of Asteroidea and Echinoidea, but in *Ophiothrix fragilis* it sometimes assumes a form similar to that of its left antimeric, showing that the water-vascular system was originally paired.

PARIS.

Academy of Sciences, August 26.—M. A. Chauveau in the chair.—Study of the spectrum of the comet 1907d. Peculiarities of the tail. H. Deslandres and A. Bernard. The spectrum of this comet has been studied by two methods, with and without a slit. The present note gives an account of the results obtained working without a slit. The spectrum shows bands in the yellow, green and blue corresponding to hydrocarbons, and, in addition, the characteristic ultra-violet band of cyanogen. Differences were observed between the spectrum of the tail and that of the head, but further observations are required to elucidate the exact meaning of these differences.—Parthenogenetic developments in solutions isotonic with sea water: Yves Delage. All the principal salts of sea water, employed separately, including the chlorides of sodium, potassium, magnesium, calcium, the sulphates of sodium and magnesium, and magnesium bromide, can determine parthenogenesis of the eggs of sea urchins; these vary greatly in their effects, and the best solutions for each are given in detail. One unexpected result is noted: a pure solution of saccharose sometimes allows of strong development of the egg. As regards the stage to which it is possible to raise the eggs, the author has at last been able to obtain true sea urchins furnished with all the characteristic organs by a purely chemical action.—Propylene oxide: Louis Henry. It is known that primary alcohols arise from the action of alkyl magnesium compounds upon ethylene oxide, and in a previous paper the author has shown that the symmetrical dimethyl-ethylene oxide behaves differently. In the present communication it is shown that methylethylene oxide, or

propylene oxide, resembles ethylene oxide in its reaction with ethyl-magnesium-bromide, normal methylpropyl-carbinol being formed.—The ephemeris for the search for the comet 1907d on photographic negatives: P. Stroobant.—The root of the least modulus of an algebraic equation: Léopold Fejér.—The theory of the radiation of incandescent mantles: M. Foix. The conclusion is drawn from the mathematical investigation given that the yield of light may be increased either by diluting the cerium oxide in thorium oxide or by reducing the thickness of the cerium oxide. The latter result has been confirmed by experiment.—The probable formation of thorianite and uraninite: B. Szilard. The amounts of uranium and thorium in these two minerals are in practically inverse ratios; the proportion of uranium in thorianite is the same as the proportion of thorium in uraninite, and inversely. From this fact hypotheses are deduced as to the mode of formation of these two minerals.—The action of cold in the treatment of coffee trees against the Indian borer (*Xylorechus quadrupes*): Louis Boutan. The momentary cooling of the stem of the tree by such a substance as ethyl chloride presents no inconveniences from the point of view of the life of the plant, and is sufficient to kill all the larvæ in the interior of the wood. The price of ethyl chloride, however, is too high for any practical use to be made of these results.—A newly born hippopotamus at the menagerie of the Natural History Museum, fed by goats: E. L. Trouessart. The mother of the infant hippotamus had always on previous occasions refused to feed her young. In the present case the young animal was removed, and has been successfully reared for eleven days by goats, eight of whom serve as foster-mothers.—The mechanism of the closing of the appendicular canal: R. Robinson.

CONTENTS.

PAGE

Marignac's Collected Papers	465
The Blood-Sucking Gnats. By R. N.	466
Commercial Organic Analysis. By T. A. H. . . .	467
Scientific Aspects of Photography. By C. J. . . .	468
Our Book Shelf:—	
Milne: "Surgical Instruments in Greek and Roman Times"	468
Lundbeck: "Diptera Danica. Genera and Species of Flies hitherto found in Denmark"	469
Letters to the Editor:—	
Radiation of Meteors.—W. F. Denning	469
Experiment on the Rusting of Iron.—Geo. A. Watson	469
The Explosion of Gases. (Illustrated) By L. B. . .	470
The Seventh International Zoological Congress . .	471
Notes	473
Our Astronomical Column:—	
Daniel's Comet, 1907d	476
Solar Observations at Cartuja, Granada	476
Discovery of Seventy-one New Variable Stars	477
The Electrical Action of the Sun	477
Micrometer Measures of Double Stars	477
The May or Gorsedd Year in English and Welsh Fairs. By Rev. John Griffith	477
Kathode Rays and the Aurora. (Illustrated.) By Dr. C. Chree, F.R.S.	481
Chemistry at the British Association	482
Geology at the British Association. By J. L. . . .	484
Engineering at the British Association	485
University and Educational Intelligence	487
Societies and Academies	487