A few years ago yet another theory was started, based on M. Quincke's discovery of the tendency of liquid films to expand rapidly upon wetable surfaces. The only advantage of this lay in accounting for the rapidity of the rise of sap; otherwise it was open to all the objections of the Jamin theory.

A theory has lately been propounded, and thoroughly worked out, by M. Joseph Böhm, which is characterised by good consistency, and offers perhaps a more satisfactory explanation of the phenomenon than any that have been referred to. It is based, like the osmotic theory, on the cellular structure of all sap-conducting plants, and it attributes an important *rôle* to the *elasticity of the cells*. "When the surface-cells of a plant," says M. Böhm, "have lost a portion of their water through evaporation, they are somewhat compressed by the air-pressure. Like elastic bladders, however, they tend to take their original form. This of course is only possible by their drawing in either air or water from without. Since, however, moist membranes are little penetrable by air, the cells draw from cells further in a portion of their liquid contents. These again borrow from their neighbours further down, which contain more water, and so on, either to the extreme root-cells or to those parts of the stem which are supplied with water from below through root-pressure."

To illustrate the action M. Böhm constructed an artificial cell-chain. A funnel closed by a bladder represented the evaporating leaf; to it were connected below several glass tubes about two ctm. wide, closed at one end with a bladder, and joined together in series by means of thick-walled caoutchouc-tubing. In consequence of the evaporation, the membrane which closes the funnel-mouth is bent inwards, and when it has reached a certain tension water is sucked into the funnel out of the next lower cell, which covers its loss in like manner. Manometers, connected with certain cells of the apparatus, indicate the amount of suction at different heights. To avoid fouling of the membranes carbolic acid was mixed with the distilled water in the cells. Since bladder membranes, with a not very great height of liquid column over them, admit passage of water by filtration, these artificial cell-chains (it is pointed out) must act much more imperfectly than the sap-conducting cells placed over one another in living plants, which cells, by reason of their narrow aperture, retain their liquid column by capillary attraction.

It is shown that this theory is in harmony with sundry phenomena which are contradictory of the imbibition theory.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE*

It will be proposed to confer the degree of D.C.L. *honoris causa* at the ensuing Oxford commemoration, upon Dr. William Spottiswoode, M.A., of Balliol College, F.R.S.

The following awards for proficiency in Natural Science have been made at St. John's College, Cambridge:—Foundation Scholarships to F. J. Allen, Marr, Slater, C. M. Stuart; Exhibitions to Fleming, Hart; the Open Exhibition to C. H. O. Curtis, from the Royal School of Mines.

The plans for the new University edifices at Strasburg have just been completed. They provide for over 100 rooms to serve as auditoriums, museums, the inevitable German singing hall and fencing hall, &c., and will meet the needs of all sections of the university, with the exception of the medical faculty, which retains its old quarters, on account of the propinquity to the hospital. The attendance, which has fallen off during the past year, is now greater than ever before, the number of students for the present semester being 710.

## *SCIENTIFIC SERIALS*

*Journal de Physique*, April.—In this number M. Vincent recommends chloride of methyl as a frigorific agent, and indicates an abundant source of it. He employs a cylindrical copper vessel having double walls, between which the liquid is admitted through a peculiar cock from an adjoining vessel. In the central part is put an uncongealable liquid such as alcohol. The outer wall is enveloped in cork. On opening the cock the chloride of methyl enters into ebullition, and the temperature of the alcohol bath sinks to − 23°. By connecting with an air pump and making vacuum, a much lower temperature may be obtained. One pretty experiment with this apparatus is the crystallisation of mercury.—M. Gariel explains the new system of numbering glasses of spectacles, in which a unit called the *dioptrie* is used, this being the power of a convergent lens of 1m. focal distance. The number of dioptries for a particular lens is got by dividing 1m. by the focal distance reckoned in metres and decimal fractions of a metre, since the power varies in inverse ratio of the focal distance. Let $N_D$ be the number of a lens reckoned in dioptries and $f_m$ the focal distance in metres, then $N_D f_m = 1m.$, which gives one of the quantities when the other is known.—M. Pellat contributes a mathematical paper on the specific heats of vapours, and the phonograph occupies some attention.

*Memorie della Società degli Spettroscopisti Italiani*, January, 1878.—Prof. Tacchini contributes a long paper on the appearance and constitution of the sun, based on the photographs of M. Jansen taken at Meudon; there is also another by the same author, giving the observations of the positions in which the magnesium and 1474 lines appeared on the limb of the sun in June, 1877. The appendix contains a paper by L. Gruber on the falling stars of the first part of last November.

February.—Notice of the death of Father Secchi, by the editor.—A paper by Prof. Rosetti on the temperature of the sun; a description of the thermopile and the necessary accessories, together with the results, is given at length.—A table showing the number of spots and protuberances, and the heights of the latter during the first half of the year 1877, and drawings of the chromosphere for the months of November and December made at Rome, by Prof. Tacchini.

March.—A note and table by Prof. Tacchini showing the position on the sun's limb when the magnesium and 1474 lines were seen during June, 1877. Also a summary of the positions of the same during the first half of the year 1877.

## *SOCIETIES AND ACADEMIES*

### LONDON

Royal Society.—"Note on the Specific Gravity of the Vapours of the Chlorides of Thallium and Lead," by Henry E. Roscoe, F.R.S., Professor of Chemistry in Owens College, Manchester.

Experimental difficulties of so serious a nature surround the attempt to ascertain the specific gravity of vapours at a high temperature that, in spite of the interest which attaches to this subject, but few additions have been made in our knowledge in this direction since the researches of Deville and Troost.

The present experiments, of which this notice contains the first results, have been made with the object of so simplifying the process as to render it easy to determine the specific gravity of the vapours of bodies possessing high boiling points with a degree of accuracy sufficient for the purpose of controlling their molecular weights.

The method consists in vaporising the substance under examination in long-necked glazed porcelain globes of known capacity placed in a muffle raised to bright redness. The temperature of the globe is ascertained by a calorimetric determination made with heavy platinum weights placed in the muffle, this determination being checked by the simultaneous insertion in the muffle of a second globe containing mercury.

The porcelain globes having a capacity of about 300 cub. centims., and containing from three to nine grams of substance, are closed by loosely-fitting stoppers of baked clay, and then gradually introduced in the muffle. After remaining there until no further escape of vapour is observed, and until the temperature has become constant, the globes are quickly withdrawn from the muffle and their contents removed and analysed, the temperature being in each case ascertained by the calorimetric method at the time of withdrawal of the globe. The following determinations of the specific gravity of mercury vapour serve to show the reliability of the method:—

| | Temperature determined calorimetrically. | Specific gravity of mercury vapour. |
|---|---|---|
| | ° | |
| Experiment I. ... ... ... | 1019 ... ... ... | 6·92 |
| ,, II. ... ... ... | 894 ... ... ... | 6·75 |
| ,, III. ... ... ... | 815 ... ... ... | 6·91 |
| ,, IV. ... ... ... | 972 ... ... ... | 5·77 |
| ,, V. ... ... ... | 1047 ... ... ... | 7·05 |

the calculated specific gravity (Hg = 198·8) being 6·728.

Before determining the specific gravity of the vapour of thallium chloride it was ascertained that this compound does not