

Injury to Plaster due to Osmosis.

FROM time to time, it has been suggested that osmosis plays a part in the weathering of building materials. A note on a failure of plaster work for which osmotic action is directly responsible may therefore be of interest.

Brick walls are sometimes found to which lime plaster cannot be made to adhere permanently.

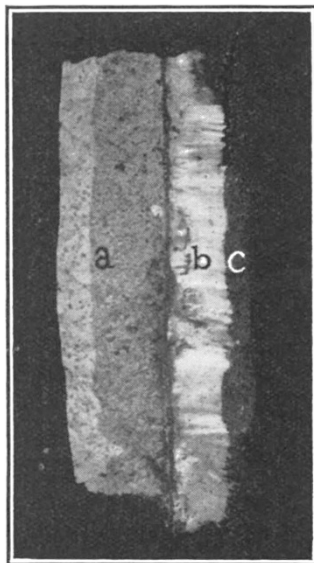


FIG. 1.—(a) Lime plaster; (b) magnesium sulphate; (c) brick.

Some time after the plaster is applied it commences to bulge and finally is pushed off the wall. Immediately behind the face of the brick is found a columnar crystalline growth which, in all cases so far examined, proves to be magnesium sulphate ($MgSO_4 \cdot 7H_2O$) in a practically pure condition.

It now appears that, when lime plaster is applied to bricks containing a proportion of magnesium sulphate, a semi-permeable membrane is precipitated in the face of the bricks. As the plastered wall dries out, magnesium sulphate is drawn from the body of the bricks, concentrates behind

the membrane, and then crystallises, forcing the plaster and a thin shell of brick away from the wall.

It has been found possible to precipitate membranes of magnesium hydroxide in the walls of porous pots. Using a half-saturated solution of magnesium sulphate, osmotic pressures so high as 100 cm. of water were developed in three days.

In Fig. 1 is shown the magnesium sulphate growth (b) between the plaster (a) and the main body of the brick (c). To the left of the layer of magnesium sulphate the thin layer of brick which supports the osmotic membrane may be seen.

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The Zeeman Effect and the Absorption Coefficients of the Hyperfine Structure Components of the Mercury Resonance Line.

THE investigations of McNair (*Phys. Review*, 31, 986; 1928) have shown the complicated behaviour of the Zeeman patterns of the mercury resonance line, 2537 Å., in emission. Some observations made in absorption five years ago by Wood appear to be in contradiction with the results of McNair. To clear up this difficulty I have made a more systematic study of the Zeeman effect of the mercury resonance line in absorption for magnetic fields from zero to 8 kilogauss and have obtained the following results:

The parallel components in absorption behave similarly to those in emission, with the exception of moderate intensities of the magnetic field, 1.3 kg., when, besides the five components, the light of intermediate wave-lengths is also absorbed. The scheme of McNair does not quite suffice to explain the be-

haviour of the components perpendicular to the field, because the -10.4 and $+21.5$ mA. components (transmitted through the absorbing vapour in the magnetic field) show for certain intensities of field an anomalous behaviour, not understandable from the point of view of McNair. However, generally speaking, the results of my investigations can be reconciled with the results of McNair rather than with the eventual existence of a Paschen-Back effect, and they lead to fairly good interpretation of the curve giving the intensity of transmitted light as a function of the field intensity, which was obtained two years ago by Schein.

These investigations have further shown that, for certain intensities of the field, the vapour transmits: (a) only the outer short wave-length component, -25.4 mA., or (β) one inner and one outer component, -10.4 and $+21.5$ mA., or (γ) two inner components, 0 and $+11.5$ mA. The absorption coefficients of the radiation, which was monochromatised in this way, was estimated by means of the decrease of the intensity of the resonance radiation along the beam. The measurements were made for the temperatures 0° and $16\frac{1}{2}^\circ$ C.

and have given the results: $\frac{\beta}{\alpha} = 1.25$; $\frac{\gamma}{\alpha} = 1.60$; which are in agreement with the estimates of intensity in emission lines made by Miss Schrammen. The estimated values of the absorption coefficients, which are less certain than the relative ones, computed in the ordinary way for the temperature 20° C. from the measurements made at 0° C., are: $\alpha = 3.3$; $\beta = 4.0$; $\gamma = 5.1$ cm.⁻¹. The estimated value for all five components, $k_{20} = 4.2$ cm.⁻¹, which differs only little from the average of these values, $\frac{\alpha + 2\beta + 2\gamma}{5}$, is less than

that obtained from the photoelectric measurements (Kunze, Kopferman and Tietze, Zemansky), probably because I was not able to extend my measurements close enough to the window through which the exciting light enters into the resonance vessel.

A full report of these investigations will appear in the *Bulletin de l'Académie polonaise* (Cracow).

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Two Modifications of Liquid Ethyl Ether.

THE changes of the dielectric constant of liquid ethyl ether with temperature studied by one of us (J. M.), and described in a recent communication in *NATURE*, suggest that at the temperature 105.4° C. the liquid undergoes some transformations analogous to that found for liquid helium by W. Keesom and M. Wolfke (*Comm. Leiden*, 190 b). To confirm this supposition

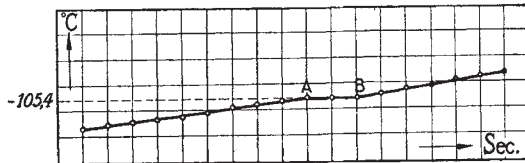


FIG. 1.

we have made a study of the change of temperature with time during the gradual heating of carefully purified ethyl ether.

Ethyl ether cooled to a temperature lower than -105.4° C. was contained in a Dewar vessel provided with a nickel covered refrigerator cooled with liquid air. We have studied the change with time of gradually increasing temperature of the ether, which was

isolated from all external disturbances. The platinum resistance thermometer was used as a stirrer.

The accompanying graph (Fig. 1) representing these observations shows a distinct slowing down of the rate of change of temperature at -105.4°C . (see the part A B of the curve). The transformation point is very clearly indicated in this heating curve. The parts of curve above and below the point -105.4°C . are to a high degree of approximation straight lines, making different angles with the temperature axis, which shows that the specific heat of ethyl ether undergoes a change at -105.4°C .

The transformation of liquid ether described above is the second observed case of such a phenomenon, the first one being the discovery of liquid helium I. and helium II. by W. Keesom and M. Wolfke (*Comm. Leiden*, 190 b).

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The Development of the Mesoderm in Gastropods.

In 1891 Erlanger reported that in the freshwater snail *Paludina* the mesoderm was formed as a hollow pouch budded out from the primitive gut or archenteron. From a portion of this pouch, which may be regarded as the secondary body-cavity or coelom, the pericardial sac was formed. Such a mode of the formation of the coelom, though normal in Echinodermata and Chætogonata and also in *Amphioxus* and the Enteropneusta, was hitherto unknown in Mollusca, and Erlanger's results were received with a storm of scepticism. Later, Tönniges (1896) examined the development of *Paludina* and denied the validity of Erlanger's results, and asserted that the mesoderm arose as small cells budded from the ectoderm. The most recent worker on the subject (Dautert, 1929) has confirmed Tönniges's conclusions.

It seemed as if Erlanger had been utterly discredited. During this summer Mr. Fernando, a student working in my laboratory, re-examined *Paludina*. He found all the stages figured by Erlanger and completely confirmed his results. But he also found the stages figured by Dautert and Tönniges and showed that the differing results of these two workers were due to the old embryological error of missing out stages in development.

Fernando's results may serve as a warning against accepting negative results in zoology. Positive results are a definite addition to our knowledge: they may be misinterpreted and later workers may supply better interpretations, but negative results which suggest that positive results are entirely imaginary are almost always due to defective observation.

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Vitamin A and Carotene.

RECENT work by Moore and others (see, for example, Moore, *Biochem. Jour.*, **24**, 692; 1930) has left little doubt that, in the rat, carotene can function as a precursor of vitamin A. Experiments which I have just carried out have indicated that the same holds true in the fowl also. White Leghorn chickens, six weeks old, were given a synthetic diet free from vitamin A to which irradiated ergosterol was added to supply vitamin D. Control birds receiving this diet succumbed in about six weeks, their livers giving negative tests for vitamin A either by the antimony chloride test or by the absorption spectrum. To other

birds, after a preliminary period of vitamin A depletion, daily doses of carotene (1 mgm.) or cod liver oil concentrate (10 mgm.) were given, with the result that complete cures were effected and satisfactory growth restored. The livers of all these birds, receiving either carotene or concentrate, gave positive tests for vitamin A, the oils yielding an intense blue colour with antimony chloride and showing a strong absorption band in the region of $328\ \mu$.

As well as indicating that the ability to transmute carotene into vitamin A may hold fairly generally throughout the animal kingdom, the experiments would seem to afford an explanation of the results of Palmer and Kempster (*Jour. Biol. Chem.*, **39**, 331; 1919), who found that while xanthophyll fed to fowl reared on a diet free from carotenoids quickly increased their pigmentation, carotene had no such effect. The transmutation of carotene into the colourless vitamin A would account for this very simply.

A full account of the experiments will be published elsewhere.

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Denaturation of Proteins by Urea.

THE important article by Sir Frederick G. Hopkins which appeared in *NATURE* on Aug. 30 and Sept. 6 records many valuable new observations on which he is to be congratulated. It has, indeed, only one defect, and, at his request, I write to make that good, namely, the absence of all reference to the observations made many years ago by myself and my delightful friend Dr. N. G. Chavasse, a man who was twice awarded the V.C., and whose loss is to me one of the major tragedies of the War. The fact that Sir Frederick knew nothing of these observations is, however, very intelligible, since the first paper (*Jour. of Physiol.*, **23**, pp. 23-26; 1902) appeared obscurely in the *Proceedings*, only, of the Society concerned, and the second (*Proc. Faraday Soc.*, March 1913; German translation in *Zeits. f. Kolloide*, **12**, pp. 250-252; 1913) was entitled "Graded Protein Sols".

Let me add that during the last two years Mr. J. Hatton has been working on this subject under my supervision, and that in 1929 we found, like Sir Frederick, that the rate of denaturation of approximately isoelectric egg-albumin by urea had a negative temperature coefficient. Other results of ours will now be found in the Proceedings of the Biochemical Society published in *Chemistry and Industry*, Oct. 10, 1930, p. 851. That account should be supplemented by the statement that, in the case of sheeps' wool, much, though apparently not all, of the substances the thiol or disulphide groups of which have become 'unmasked' passes into the urea solution.

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Oviposition of *Hæmatopota pluvialis*, Linné.

DR. CAMERON's interesting account, in *NATURE* of Oct. 18, p. 601, of the oviposition habits of Tabanid flies, and especially of those of *Hæmatopota pluvialis*, L., suggests that the following observation may be worth recording. On Aug. 24, 1925, at Waidbruck (Ponte all' Isarco), Italian Tyrol, I observed a female of *Tabanus glaucopis*, Mg., laying her eggs on the leaves of the common plantain, *Plantago lanceolata*. The plant was growing in a dry hay-field, not in the immediate vicinity of water.

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