found in Kashmir (*Proc. Indian Science Congress*, Bangalore, 1932, p. 329). (19) On the distribution of fresh-water plants in India (*Proc. Indian Science Congress*, Patna, 1933, p. 321). (20) Invasion of *Eichhornia crassipes* in the interior of the United Provinces (*Proc. Indian Science Congress*, Patna, 1933, pp. 321-322). (21) Some observations on the anomalous distribution and ecology of *Nymphæa tetragona* Georgi (*Proc. Indian Science Congress*, Patna, 1933, p. 322). (22) The rôle of *Parrotia Jacquemontiana* Dcne, in the forest ecology of Kashmir State (*Proc. Indian Science Congress*, Patna, 1933, p. 322).

S. K. Mukerji and T. C. N. Singh: (23) On the adaptation of some perennial plants of the Lucknow flora to the marked periodicity of the climate (*Proc. Indian Botanical Society*, Lucknow, 1923; *Journal of the Indian Botanical Society*, **3**, p. 262).

S. K. Mukerji, S. C. Verma and S. N. Asthana: (24) On the ecological investigation of twelve different kinds of seedlings belonging to ten families of flowering plants from the Lucknow flora with a view to find the causes of excessive seedling mortality in nature (*Proc. Indian Science Congress*, Bangalore, 1932, pp. 329-330).

Letters to the Editor.

Changes in Charge, Conductivity, Stability and Composition of Colloidal Arsenious Sulphide on Exposure to Light.

IT is known that arsenious sulphide sol when exposed to light becomes turbid and its flocculation value by electrolytes is lowered.[1] In our laboratory we have made simultaneous measurements of charge, conductivity, stability and composition of aresenious sulphide sol when exposed to electric light for different periods. It is observed that the charge on the colloidal particles continuously decreases while the conductivity of the sol increases with an increase in the period of exposure to light; the amount of free arsenious acid in the sol at the same time increases (the amount of total arsenic remaining the same) while the amount of total sulphur decreases somewhat. The stability of the sol as determined by flocculation values with KCl first increases and then decreases;[2] on the other hand, when $MgCl_2$ is used to coagulate the sol, the stability is found to decrease continuously.

The arsenious sulphide sol when exposed to light hydrolyses as on ageing into arsenious acid and hydrogen sulphide; the latter is photochemically oxidised to sulphur dioxide which again reacts with hydrogen sulphide to form pentathionic acid and sulphur. The sulphur adsorbs polythionate ions and passes into colloidal sulphur.[3] The decrease of the cataphoretic speed (charge) noticed by us is due to an increase of the amount of free arsenious acid in the sol produced as a result of hydrolysis of arsenious sulphide[4]. The increase of conductivity is on account of the production of free arsenious acid due to hydrolysis and of polythionic acids as a result of photochemical oxidation of hydrogen sulphide[5]. The smaller stability of the sol is due to a decrease of the charge on the colloidal particles, but the greater stability observed with KCl when the sol is exposed to light only for short periods cannot be explained on the same basis because the charge on the colloidal particles has continuously decreased; this anomaly with regard to KCl is being investigated. The fact that the total amount of sulphur in the sol decreases somewhat on exposing it to light is due to some hydrogen sulphide escaping as gas from the sol. Details of experiments and results will be published elsewhere in due course.

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August 3, 1934.

Development of Roots from the Petiole of *Ficus religiosa* Leaf.

WHILE investigating the influence of external environmental condition (*e.g.*, factors like light, temperature, humidity, etc.) on the formation of cuticle in *Ficus religiosa*, I had an occasion to pluck some

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[1] Freundlich and Nathansohn, *Kolloid Zeit.*, 1921, **28**, 258.

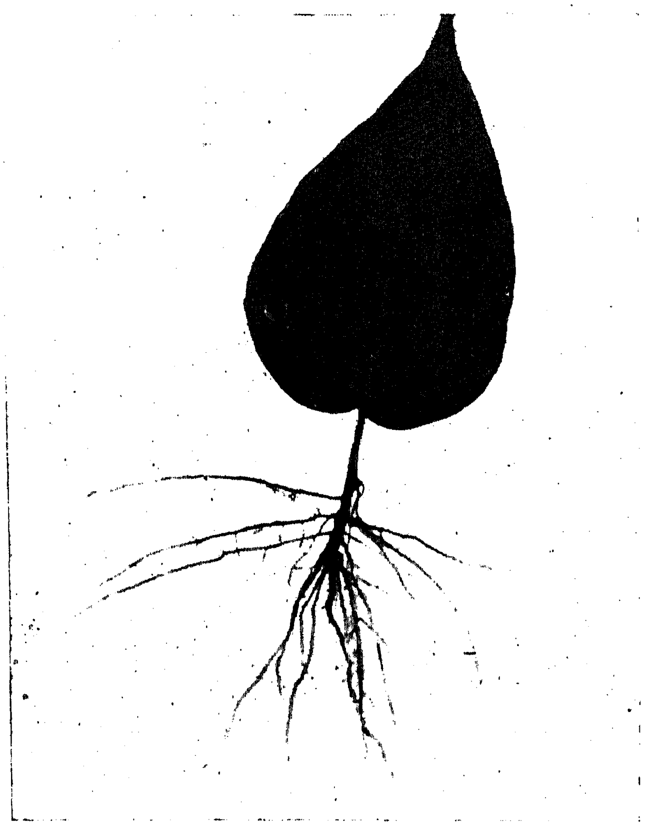
[2] *Cf.* Miss Sheila Roy, *J. Ind. Chem. Soc.*, 1929, **6**, 431.

[3] Freundlich and Nathansohn, *loc. cit.*

[4] *Cf.* Desai, *Curr. Sci.*, 1934, **2**, 473.

[5] *Cf.* Murphy and Mathews, *J. Amer. Chem. Soc.*, 1923, **45**, 16.

of the leaves from the lower region of the shoot, which appeared to obstruct the fitting up of the apparatus. On the same day (17th July 1934) those plucked leaves were placed in tap water. The cuticle experiment was conducted for a fortnight. During this period the leaves remained in the same water. They did not show any sign of senescence. The leaves were examined on 31st July 1934 to find a possible cause of their remaining healthy, when some root-like structures were found to come out from the callus formed at the base of the petiole. On closer examination they were seen to be real roots with root-hairs and root-caps. On 2nd August 1934, the leaves were placed in fresh tap water, to see if any further change would take place. After a couple of days the first-formed roots elongated and had developed root-hairs profusely. On 4th August 1934, one of the leaves with roots was placed in moist sand to see if any shoot would come out. This leaf remained healthy for 3 days, but from 7th August 1934, it began to show signs of decay. The other leaf in the meantime had borne several roots right from the severed surface up to the middle portion of the petiole. On the same date this was placed in very dilute nutrient solution (Pfeffer's). The roots elongated and fresh root-hairs came out from the elongated parts. Some roots gave out branches and the length of the individuals became gradually greater.



The leaf is quite healthy and is living till this day (17th August 1934) when the article is being sent to the press. But no shoot is coming out.

Further work on this is proceeding.

P. F. MALLIK.

Ravenshaw College,
Cuttack,
August 17, 1934.

Note on the Theory of Artificial Disintegration.

IN a recent publication[1] I (in collaboration with A. Ganguli) have given the following wave statistical formula for artificial disintegration of nucleus by α-particles.

$$\lambda = \mathrm{C}.\frac{\sqrt{\mathrm{E}_1\mathrm{E}_2}}{h^2 r_{01}^2\, r_{02}^2\, \mathrm{Cot}\mu_{01}\, \mathrm{Cot}\mu_{02}} \times \quad .. \quad (1)$$

$$\times \exp.-\{2k_1(2u_{01}-\mathrm{Sin}\,2u_{01})-2k_2(2u_{02}-\mathrm{Sin}\,2u_{02})\}$$

where the suffixes 1 and 2 are respectively for the bombarding α-particles and the disintegrating protons. The above formula has been shown to be in good agreement with experiment. The discontinuities in the curve lately found by Chadwick and others[2] can be explained from the above formula on assuming the existence of different groups of protons within the nucleus. Investigation in this direction has already been taken up by M. Ghosh. It should also be noted that the above formula is perfectly general and may be used for any other class of nuclear artificial disintegration.

Since the paper has been published, my attention is drawn to a recent article on the subject by Th. Sexl.[3] After elaborate analyses Sexl finds that the absorption coefficient (a) for the α-particles is given by (in the present notation).

$$a \sim e^{-2k_1(2u_{01}-\mathrm{Sin}\,2u_{01})} \quad .. \quad (2)$$

Since $\lambda \propto a$, formula (2) obviously corresponds to the first part of my formula (1), which follows directly from the assumption of a viscous phase space for the nucleus.

We should also note that the second part of equation (1) representing the disintegrating protons is taken with a positive sign in the

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[1] *Curr. Sci.*, 1934, **2**, 471.

[2] *Proc. Roy. Soc.*, **130**, 463 ; **135**, 48.

[3] *Zeit. f. Phy.*, 1934, **87**, 105.