Rotation of a Lamina Falling in Air.

IN your issue of March 20, Dr. Johnstone Stoney, in reference to the behaviour of ice spiculæ in the clouds, instances the spinning of a card when dropped through the air.

I think Lord Rayleigh was the first person to point out how curious this phenomenon is and to show that the axis of a spinning lamina might be held between bearings without affecting the result. Also that a lamina so held and placed in a draught was equally ready to spin in either direction, thus precluding the idea that the rotation might be due to some want of symmetry in the lamina itself.

A few years ago I made some experiments on the rotation of laminæ in air currents.

The laminæ were mounted in bearings as frictionless as I could make them, and the experiment consisted (*a*) in measuring the speed of the air and the angular rotation of the lamina, (*b*) in mapping the flow of the air past the lamina. This was done by the use of smoke and intermittent illumination.

It would take too long to describe the apparatus in detail, but some of the results may be of sufficient interest for publication.

To calculate the magnitude of the couple *a priori* is, I believe, beyond the power of mathematical analysis at present.

The experiments just alluded to were made with light rectangular laminæ, but these conditions are not essential—pennies spin very nicely when dropped from a great height.

I have not succeeded in making a lamina spin in a current of water, probably because the densities of the fluid and solid are not sufficiently different, but if a flywheel were fixed on the axis of the lamina, so as to be out of the water, and thus increase the moment of inertia of the turning body without altering the fluid friction, &c., rotation might perhaps be obtained in this case also. A. MALLOCK.
March 22.

Mathematics and Science at Cambridge.

To those who have at heart the advancement of scientific knowledge in Great Britain it is impossible but to acknowledge that the country owes a profound debt of gratitude to the University of Cambridge. During the dark ages of education her colleges formed the stronghold of modern culture; and the
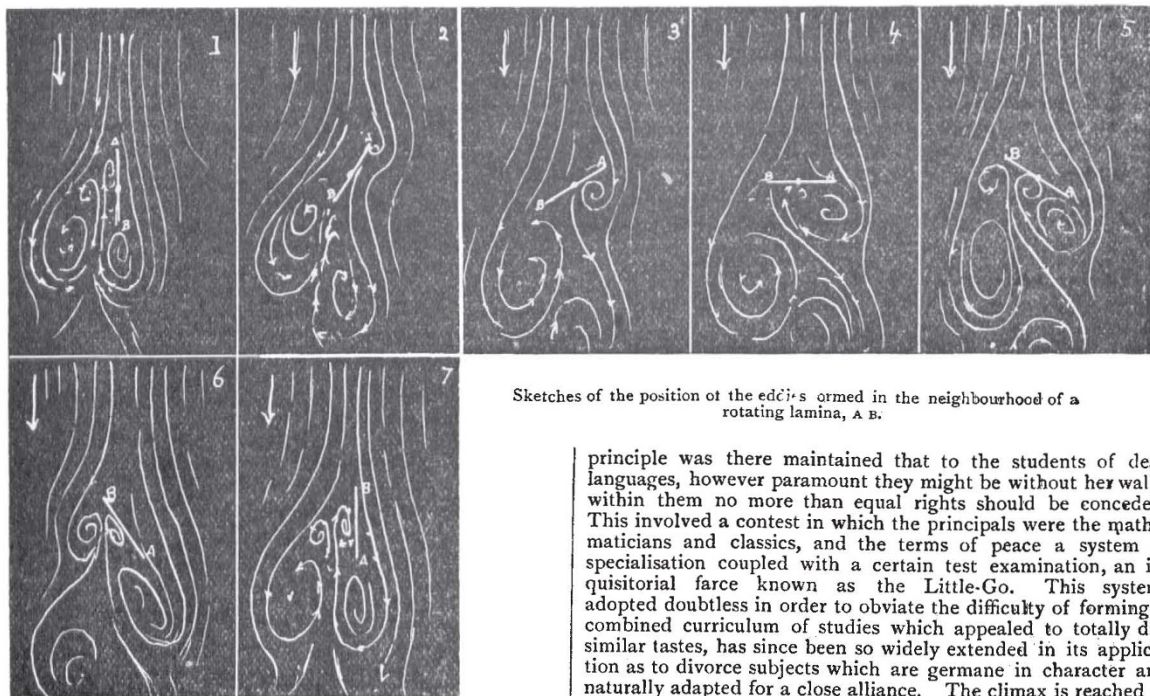
Sketches of the position of the eddies formed in the neighbourhood of a rotating lamina, A B.

Thus, the angular velocity of the lamina was found to be (through a considerable range of air speed, *v*, and breadth of lamina, *b*) = constant $\times \dfrac{v}{b}$.

There is a limit, however, to the smallness of the lamina which will revolve (*e.g.* small laminæ of gold-leaf a tenth of an inch long and two or three hundredths broad do not revolve, but oscillate as they fall).

The cause of the rotation depends on the way in which the eddies are formed on the downstream side of the lamina.

The changes which occur, in the eddy making, during half a revolution are shown in the accompanying sketches.

From these it will be seen that the spin causes the air to flow unsymmetrically with regard to the axis of the lamina, and that there will be, on the whole, a transverse force on the axis tending to press it in the direction of rotation of the leading edge.

It can be seen also that *before* the lamina reaches the positions 1 or 7, there will be a couple acting on it tending to accelerate the rotation, and that the couple will certainly be positive from position 1 to 3. It may be negative from between positions 3 and 4 to 6; but at any rate for more than half the total time the rotation is being accelerated.

principle was there maintained that to the students of dead languages, however paramount they might be without her walls, within them no more than equal rights should be conceded. This involved a contest in which the principals were the mathematicians and classics, and the terms of peace a system of specialisation coupled with a certain test examination, an inquisitorial farce known as the Little-Go. This system, adopted doubtless in order to obviate the difficulty of forming a combined curriculum of studies which appealed to totally dissimilar tastes, has since been so widely extended in its application as to divorce subjects which are germane in character and naturally adapted for a close alliance. The climax is reached in the ever-growing barrier which separates mathematics from natural science, and which is year by year made more impassable by the examinations for entrance scholarships. These are of high value; and without this aid from the funds which the college authorities hold in trust for educational purposes many a brilliant man would be unable to consummate his work at school by a university career. It is, therefore, necessary that school curricula should be arranged in strict accordance with their requirements.

In view of their future careers, schoolboy mathematicians are divisible roughly into three classes—those who will make a profession of mathematics, those who will apply mathematics to science, and those who will, after obtaining academic honours, entirely sever their connection with the subject. To the last of these the question of syllabus is of comparatively small importance. But to the first and second it is of the utmost importance, and especially to the second, as it is essential to a man who for several years studies mathematics with an ulterior object in view that, while he should acquire a thorough grasp of the principles of the subject, he should not be forced by examining bodies to apply himself to what can only be regarded as intellectual pastimes; nor even in the case of the first can great skill in work of this class rank *pari passu* with a grasp of principle.