The behavior in an electrical field of the egg of the frog *Rana pipiens* reveals marked electrokinetic properties in this cell, which is enormously larger than the microscopic cells whose charge has been determined. Freshly stripped eggs were introduced into a trough 8 mm wide and 5 cm long, containing pond water, pH 6.8. A potential of 10 volts was applied by a $Zn–ZnSO_4$–agar system in which the agar bridges completely occupied the ends of the trough, so that the lines of current flow were parallel to the walls and floor of the chamber. The current intensity used was 1 milliampere.

When the current is passed, the egg within its jelly layers begins almost immediately to move toward the cathode, at the rate of about 10 microns per second. This occurs regardless of whether the animal or the vegetal pole of the egg faces the cathode. The egg migrates as far as possible within the jelly, often distending it at the cathodal end, and sometimes being flattened against this end by its pressure.

When dry eggs, *i.e.*, those with jelly unswollen, are introduced, or any eggs whose jelly is not too sticky, the whole egg, jelly and all, moves toward the cathode. This motion begins after the migration within the jelly, and, although it is irregular because of the fact that the egg lies on the bottom of the chamber, it has about the same or even a higher velocity. Observed values range from 8 to 19 microns per second. As the jelly moves, the egg appears eccentrically located within it, at the cathodal end. Because of the narrowness of the trough, the movement can not be ascribed to endosmotic current due to the charge upon the walls, for the currents in both directions impinge upon the egg. The fact that the jelly too migrates to the cathode precludes the possibility that electroosmosis through the jelly is the cause of the movement of the egg within it. The truly "cataphoretic" nature of the migration can further be verified by using eggs whose jelly has been removed with KCN. Eggs so treated move toward the cathode very clearly, although they lie on the bottom of the chamber.

In all cases the jelly swells to many times its normal volume during the passage of the current. When dry eggs are introduced, the jelly does not swell uniformly, as it does when the eggs are simply placed in water. There occurs immediately a very rapid swelling at the anodal end, none at the cathodal. Since the egg has migrated during the course of the swelling, it appears pressed against the original thin layers at the cathodal end, backed at the anodal end by a great swollen mass of jelly. Within the inner jelly layer at the anodal end, large sacs or vacuoles are seen to form, evidently by the pressure of the water moving anodally.

Cataphoretic movement of cytoplasmic granules within plant cells has been observed by Hardy[2] and others. Hardy clearly demonstrated movement toward the cathode. A similar movement can be seen within the frog egg. When the current is passed through water in which the egg lies, there appears, after a short time, a narrow clear margin beneath the membrane at the anodal end, and this clear space widens until it occupies about one tenth the diameter of the egg. The appearance is the same whether the animal or vegetal pole or the equator of the egg faces the anode. The contents of this clear space are easily distinguishable from the yellowish yolk. If now the direction of the field is reversed, the granules move back through the clear space, obliterating it. Then a similar space is formed at the new anode. This behavior on reversal demonstrates that the phenomenon is a true movement of granules toward the cathode, and not a breakdown of colored material at the anode.

These observations, repeated many times on eggs from different frogs, are purely qualitative, since the condition of free suspension demanded for cataphoresis measurements is not satisfied. They do, however, indicate a positive charge upon the egg as a whole and upon the internal granules, a charge whose magnitude may be exactly determined in later studies.

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[2] W. B. Hardy, *Jour. Phys.*, 47: 108, 1913. Older literature in Heilbrunn, "Colloid Chemistry of Protoplasm," 1928.