Observations on embryos of Common Loons.—A recent perusal of the late Dr. William Rowan's field notes, which are now housed in the library of the University of Alberta, reminded me of the spring of 1932 when I assisted him in collecting embryos of the Common Loon, *Gavia immer*. At that time Rowan felt that if the loons were direct descendents of *Hesperornis* they might show vestigial tooth buds in their embryos.

Numerous embryos of various stages of development were collected from around the little muskeg lakes in central Alberta. The embryos were fixed in Bouin's fluid in the field and bills of up to 10 mm in length were sectioned serially. Some of the slides are still extant.

The sections failed to show tooth buds or anything unusual, as a recent examination has confirmed. As far as is known Rowan did not publish these negative findings.

These notes are written not only as an historical record but also to show the wider interests of the man who did so much pioneer work in the field of photoperiodism.—ROBERT LISTER, *Department of Zoology, University of Alberta, Edmonton, Alberta, Canada.*

A flight-time integrator for birds.—This note provides a preliminary account of our efforts to facilitate studies of flight behavior by designing and developing a device for measuring the total time spent in flight by birds. In conjunction with our developing interest in studying the bioenergetics of the Laysan Albatross (*Diomedea immutabilis*), we wanted specifically to learn what proportions of the total time at sea were spent in flight and on the water. Our instrument provides this measurement by responding electrochemically during the individual periods when a bird to which the unit is attached rests on the water; these response times are accumulated, or (mathematically speaking) integrated, to provide the total period of activity. Accuracy is increased by a second, continuously operating circuit which records the total time and thus makes calibration possible. Additional information with respect to the time of day during which the recorded activity occurs is, within broad limits, obtainable. The unit therefore provides the following minimum information: (1) the total time of operation (*i.e.*, for our intended use, the total time the birds are away from the nests and out to sea); (2) the total time of daylight (or some preselected level of illumination); (3) the total time spent on the water; and (4) the total time of activity (on-water) with the selected level of illumination (daylight).

Several alternative methods were considered for gathering the desired information and we concluded that the use of a minaturized electroplating system for measuring the time intervals was most promising and least demanding in terms of cost and effort. The principle of operation is based on one expression of Faraday's law which states that the number of ions liberated from solutions of various electrolytes is directly proportional to the total current passing through the solution. That is, if one has an electroplating solution and conducts a current through it, a part of the ions in solution will be deposited on one of the electrodes (the cathode or negative electrode) in an amount related to the current being conducted. If the rate of the current is constant, the deposition of ions will be proportional to the duration of current flow. Hence, the length of time of the current flow can be determined by weight changes of the cathode. With careful weighing, we could obtain 99 per cent accuracy.

Our unit, which we call a flight-time integrator, is composed of several sub-assemblies; each sub-assembly estimates, by the above method, the time involved in one of