I have employed it as a subminiature endoradiosonde (0.5 cm^3), as a variety of surface mounted units, and as a driver for a long-range crystal-controlled transmitter.

Construction is straightforward, subminiature components being used throughout. Tuning can be accomplished by embedding ferrite chips in the potting wax near coil L_1 to lower the frequency slightly, or removing coil turns to raise it.

The thermistor probes used can be of two types. For most work Yellow Springs Instrument Co. precision thermistors are best, and permit the calibration of the telemeter with a decade resistance box. However, they are too large (> 2 mm) for rectal insertion in small animals or for endoradiosondes. Here I used bead thermistors (Philips or Noreleco No. B8 320 02P/470KS). These are less than 1 mm in diameter and are mounted in nylex catheter tubing after leads are attached; the lumen of the tube is filled with silicone rubber (Dow Corning Sylgard 184).

The telemeters are encapsulated in polyester resin applied over a layer of dental impression wax. For externally mounted units a limpet shape is best because it is extremely difficult for the animal to scratch off. Bear contact cement (Norton Assoc.), applied to the cleaned and shaven skin of the animal, and allowed to become almost dry to the touch before joining, is a very satisfactory adhesive for long-term use.

The telemeters described are cheap, simple, and accurate, and all but the subminiature types are easy to construct. They are eminently suited for use in both short- and long-term experiments on a routine basis—in almost any environment encountered in the laboratory or field.

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Obligatory Sperm Storage in the Skink Hemiergis peronii

Abstract. *Female* Hemiergis peronii *ovulate in the spring; males' testes are small and without sperm in the spring, enlarge to a maximum in late summer, and decrease in the winter. Females' oviducts contain sperm over the winter. It follows that females are inseminated in autumn and store sperm until they ovulate in spring.*

Females of several species of lizards store sperm in small pockets in the walls of their oviducts (*1*). In some chameleons and the iguanid *Uta stansburiana*, stored sperm can fertilize eggs for weeks after insemination (*2*). But in all these lizards the males are in breeding condition when the females ovulate, so sperm storage is not essential to their reproduction.

In the Australian skink *Hemiergis peronii*, by contrast, the males are out of breeding condition when the females ovulate (Fig. 1). Females bear two to four young in late February or early March, at the end of the Australian summer (*3*). At that time the ovarian follicles are small whereas the males' testes are large. Sperm can be found in stained smears of oviducts of some females each month from May to November. Females ovulate in October or November when the testes of the males are smallest. We infer that *H.*

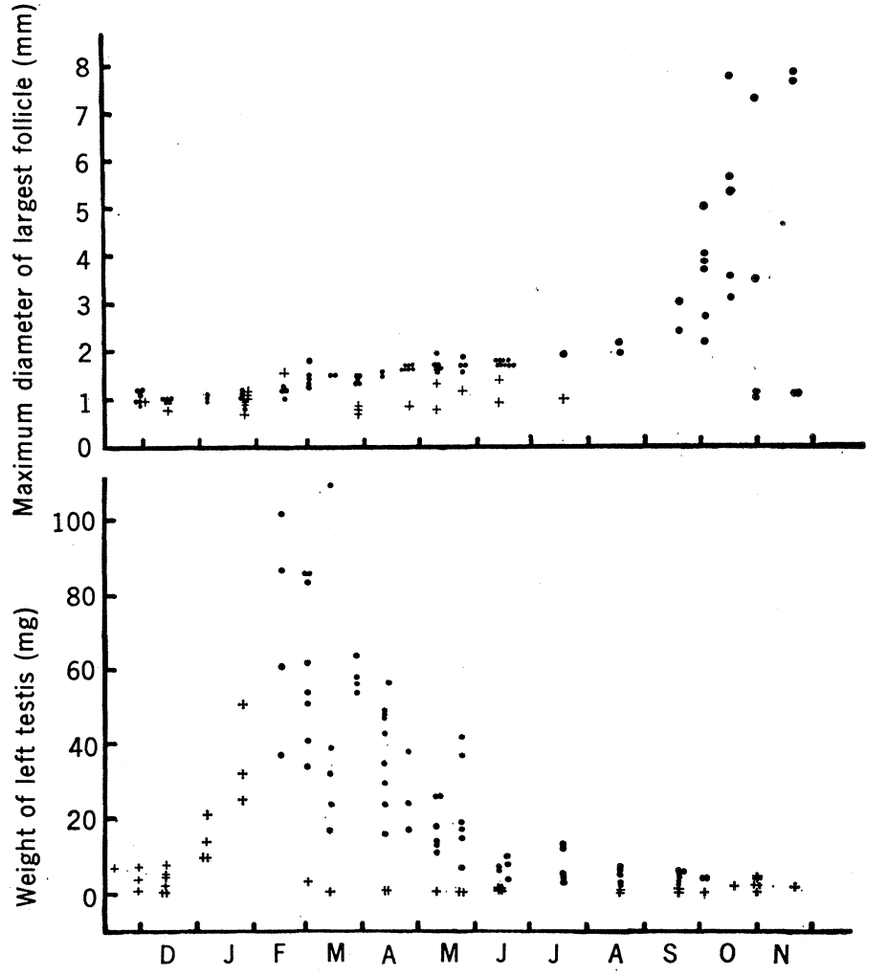

Fig. 1 (Top). The maximum diameters of the largest ovarian follicles of female *H. peronii* from Port Gawler, South Australia. Measurements for immature females are marked by a cross. Females were classed as immature if their follicles were small when those of other females were enlarged, or if they were not pregnant when other females were. They were in all cases smaller animals than those classed as mature. (Bottom) Weights of the left testes of male *H. peronii*. The right testis was smeared onto a microscope slide, stained, and examined for sperm; where no sperm were seen, testis weight is marked with a cross.

peronii copulate only in autumn and that sperm are stored in the oviducts during winter.

This pattern of reproduction, involving obligatory sperm storage, has not yet been described for any other reptile. We suggest that its adaptive value is that, by courting and copulating in the autumn, the females can ovulate earlier in the spring and so produce their young earlier. This gives the young a better chance to feed and grow before the winter.

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Ionic Interaction of Sulfatide with Choline Lipids

Abstract. *Aqueous systems of sphingomyelin-sulfatide and lecithin-sulfatide were compared with aqueous systems of the individual lipids. The acid capacity of the mixed lipids increased, a result of the formation of an ionic bond between the sulfate of one molecule and the positive nitrogen of the other, making the phosphate available for direct titration. Cholesterol reduces this ionic interaction, probably because of the increased spacing of the ionized groups.*

We now report that in aqueous dispersions ionic binding occurs between polar groups of sulfatide and choline phospholipids. This finding may be of importance in the understanding of the cohesive forces operating in biological membranes. The structural integrity of biologic membranes has been attributed to the forces acting between the long hydrocarbon chains of neighboring lipid molecules when the chains are parallel to each other (*1*). There is evidence that hydrophobic bonding between the hydrocarbon chains of lipids with hydrophobic portions of a structural membrane protein may occur (*2*). In addition, there may be bridging of negative-charge sites in the aqueous phase by multivalent cations or by positive sites of proteins. Pethica (*3*) calculated that the forces potentially present between the polar groups of adjacent lecithin molecules in a monolayer are a major factor in the stability of sheetlike structures. But the existence of intermolecular bonding in lecithin has been questioned by others (*4*). Our experiment offers direct evidence of ionic binding between lipids.

When phospho- and glycolipids are dispersed in water, they form lamellar structures 44 to 60 Å in width; these structures are probably lipid bilayers (*5*). In aqueous dispersions of the acidic lipids—phosphatidylserine, phosphatidic acid, phosphatidylinositol, and sulfatide (*6*)—all of the acidic groups are available for titration or ion binding; this suggests that the lipids are oriented with the ionic group exposed to the aqueous phase. Thus, these lipid aggregates or micelles may have characteristics analogous to those of the lipid portion of the biological unit membrane.

The lipids used in our experiments include sphingomyelin purified from beef brain as described (*7*); sulfatide (*8*) converted to the sodium salt, as reported (*6*); egg lecithin (*9*) purified by silicic acid chromatography; and cholesterol. All of the lipid preparations were pure, as judged from thin-layer chromatograms as described below. Analyses of the sphingomyelin and sulfatide preparations used have been reported (*6, 7*).

Aqueous dispersions of the lipids were produced (*6*) by placing the lipid or mixture of lipids in a mixture of chloroform and methanol (2: 1 by volume) in a 20-ml glass tube. The organic solvent was evaporated, 5 ml of water (conductivity $< 10^{-6}$ ohm^{-1} cm^{-1}) was added, and the system was exposed to gentle ultrasonic radiation.

The aqueous systems were titrated at 24° ± 1°C at least twice with an expanded-scale *p*H meter (Corning model 12), and combined glass and reference electrodes were used; stirring at a very slow constant rate was provided, and a rapid stream of nitrogen was passed over the system. Additions of 1 to 3 μl of 0.100*N* HCl or NaOH were made, and sufficient time was given for the system to reach a stable *p*H. All titrations were corrected.

After completion of a titration, a 0.1-ml sample was evaporated to dryness and dissolved in a mixture of chloroform and methanol (2 : 1 by volume). A thin-layer chromatogram was obtained with silica gel G (Merck), developed with a system consisting of chloroform, methanol, water, and ammonia (29 percent) (70 : 30 : 4 1 by volume); it was then stained with iodine vapor and charred with sulfuric acid. Lecithin systems showed a small amount of degradation (<5 percent); therefore, titrations were not carried into the alkaline regions.

The increase in titration capacity of the sphingomyelin and sulfatide mixtures as compared to individual lipids is shown in Fig. 1. The small titration capacity of sulfatide from *p*H 7 to 3.5 is due to the strong acid ionization of the sulfate, whereas in sphingomyelin or lecithin the ionic bonding of the phosphate and positive nitrogen limits its acid capacity. The mixed sulfatide-sphingomyelin systems exhibit titrations comparable with that of phosphatidyl inositol (*6*) (Fig. 1). The increased acid capacity of lipids in the mixed systems over their individual capacities can result from the formation of an ionic bond between the ionized sulfatide molecule with the positive nitrogen in the choline portion of sphingomyelin.

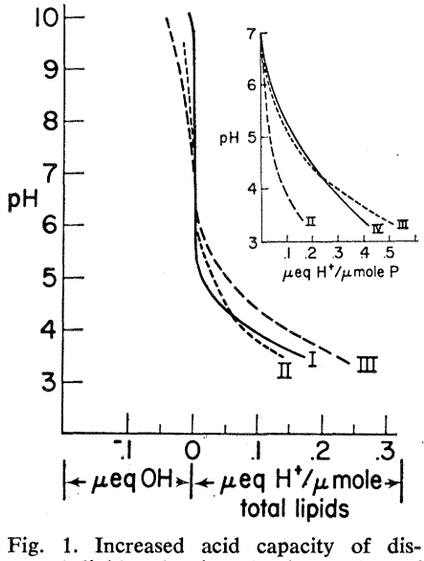

Fig. 1. Increased acid capacity of dispersed lipids, showing the interaction of sulfatide with sphingomyelin. Each system containing the lipid dispersed in 5 ml water was titrated with 0.100*N* HCl or NaOH. Curve *I*, 7.63 μmole of sodium sulfatide; curve *II*, 10.0 μmole of sphingomyelin; curve *III*, 7.9 μmole of sphingomyelin + 7.9 μmole of sodium sulfatide, mixed and dispersed. The inset compares *III*, a 1 : 1 complex of sphingomyelin-sulfatide with *IV*, phophatidylinositol, and *II*, sphingomyelin alone. The similarity of *III* and *IV* indicates that the ion titrated in the complex is the phosphate of sphingomyelin, made available by the interaction of the sulfate with the positive choline.