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# Active Sodium Transport in the Short-Circuited Isolated Frog Skin as Source of Electric Current

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ACTIVE SODIUM TRANSPORT IN THE  
SHORT-CIRCUITED ISOLATED FROG SKIN  
AS SOURCE OF ELECTRIC CURRENT

Prepared by  
Daniel Paul Macklin

Final Report For Senior Design

EET 499

Adivsor: Professor D. Nold

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## Informative Abstract

The prime important factor in the frog skin is the active transport of ions. To determine the feasibility of measuring the sodium ion movement and have these measurements be electrically sound is the main purpose of this report. The frog is killed by pithing and then the skin is removed from the trunk and spread on a preparation dish filled with Ringer solution. The skin is then mounted between two parts of apparatus which are firmly screwed together to make a special chamber.

AG-AGCL electrodes at the extreme ends of the chamber are connected to a volt meter, and the PD of the frog skin is registered in millivolts. To complete the circuit so that the short-circuited current of the skin can be found an external voltage supply, parallel and series resistor are added.

Data was taken from these circuit parameters, electrically proved sound and the following conclusions were made:

1. By use of mesh equations the designed circuit can be proven to electrically work correctly.
2. More accuracy of measurements is needed for accurate readings.
3. Special care must be taken to keep from contaminating the skin.

4. All air bubbles must be removed from the electrodes to receive results.
5. When cutting the skin care should be taken so that exact square centimeters are cut for comparison purposes.
6. The inner surface is positive to the outer surface of the skin if Ringer solution on both sides.
7. Potential Difference between the inner and outer surface can be increased or decreased by adding small doses (one part in a million) of Adrenaline and Copper ions.
8. The designed circuit gives comparable readings to that of Hans H. Ussing and K. Zerahn of Copenhagen University.

For better results I recommend that digital meters be installed into the circuit then accuracy of measurements can prove the circuit unquestionably correct.

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