

## 2004-Undergraduate Student Project Description

### Department of Bioresources Engineering

**Project Title:** Design and Testing of a Sensor for Measuring Embryo Temperature during the Incubation of Avian Eggs

**Faculty/Staff Sponsor:** James Glancey  
J.K. Rosenberger and S. Cloud, Dept. of Animal and Food Science

**Area of Study:** Electronics and Instrumentation

### **Project Description:**

#### Background:

Conventional avian incubation methods on Delmarva still rely on traditional measurement techniques to determine ambient air temperature for the control of the incubator environment. In some hatcheries, as few as one air temperature sensor is used to characterize and control an entire hatchery room environment. Previous work at U of D has demonstrated that significant differences exist between the ambient air in the incubator and the actual embryo temperatures. During the growth and development of the embryo, temperature differences as much as 3.5° F have been measured using temperature sensors placed in the egg. These differences and the potential for elevated embryo temperatures that are detrimental to chick quality have raised concerns over the current methods used to control environmental conditions in conventional hatcheries.

#### Proposed Research:

The overall goal of this project is to develop an innovative method for measuring and controlling embryo environmental conditions. Specific objectives include:

- 1) Develop a non-invasive sensor for the measurement of avian embryo temperature during incubation.
- 2) Develop a new control algorithm design that integrates multiple embryo temperature sensors with existing sensors for humidity and CO<sub>2</sub>.
- 3) Demonstrate the effectiveness of this new sensing and control system in a commercial hatchery.

Students interested in this project can choose to work on one specific objective, or on several different parts of the project.

#### Intended Benefits:

Improving the incubation environment is essential for improving chick quality. Developing a sensor that measures actual embryo temperature (rather than ambient air temperature) will provide the opportunity for a better approach to hatchery management in which ambient conditions are controlled to maintain true optimal embryo condition. In addition, once multiple embryo temperature sensors are implemented within an incubation room, management strategies can be developed that reduce variability in embryo temperature thus improving the overall average chick quality from an incubator.

Students can work for credit during winter session or the spring semester

**Student Qualifications:** completion of EGTE 344 or EGTE 443