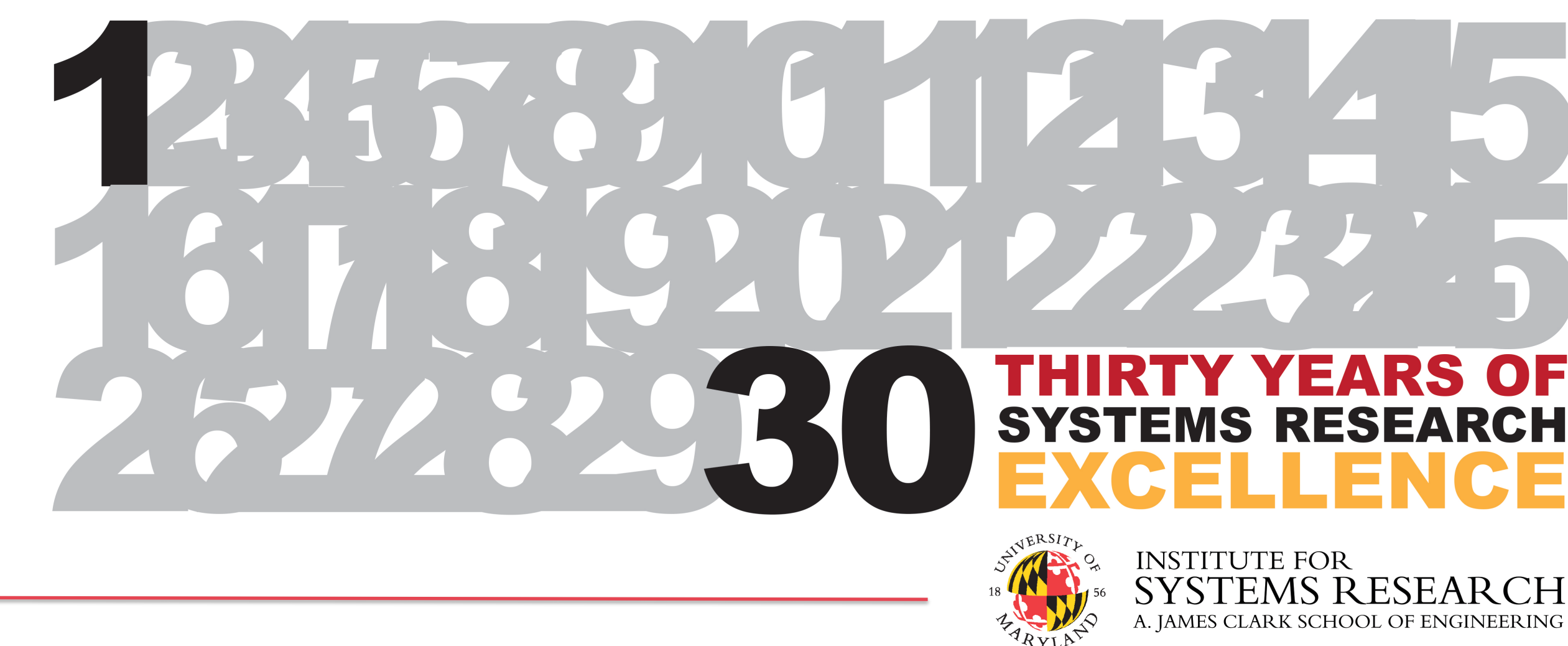


# W-Crittercam System: Animal-borne Wireless Camera Networks

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## Objective



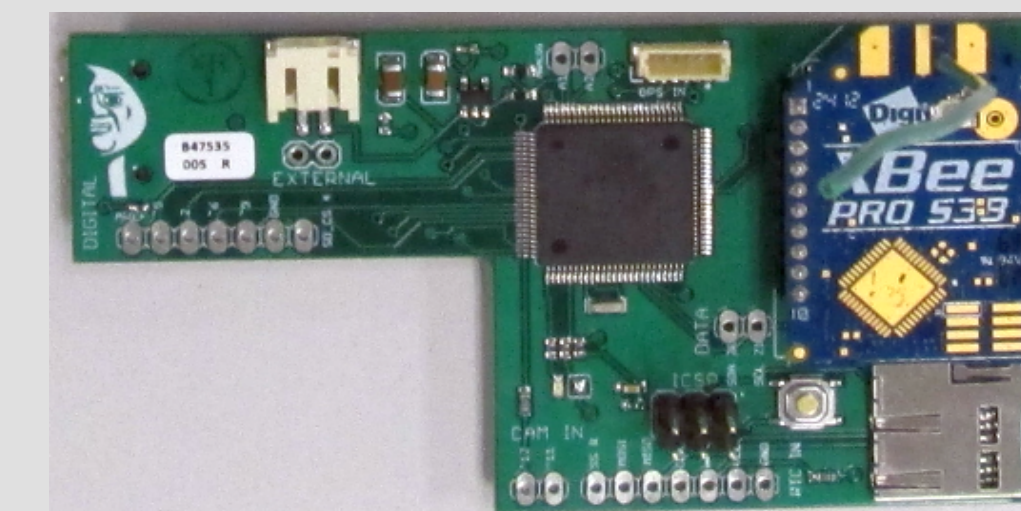
Our NSF-funded project aims to enhance the capabilities of the Crittercam system (originally developed at NGS) to study social interaction in animal groups.

## Research Goals

- Cooperative data collection to extract group behaviors of sociobiological significance
- Support networked team decision strategies to save power and extend deployment life
- Real-time remote access to data and remote reprogramming and adaptability
- Development of test-bed to validate and foster the development of new model-based principles for the design of power-constrained networked CPS

## Future Plans

### New Hardware



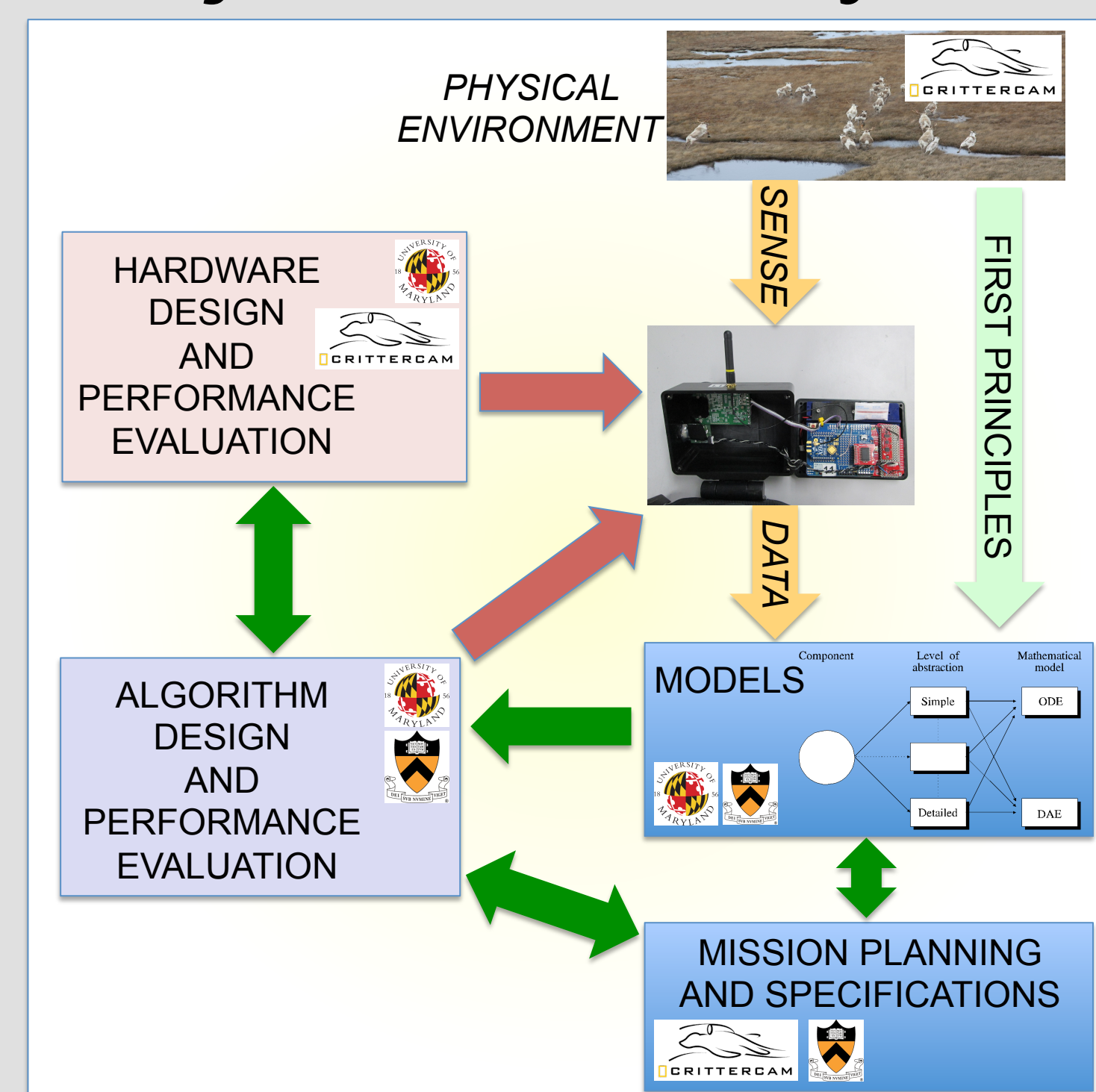
- Expected volume reduction by 60% from the previous generation
- The enhanced firmware and miniaturized hardware will lend itself to use on agile predators

### Deployment in African Safari



- 2 week-deployment at the Gorongosa National Park in central Mozambique
- Species of interest include water buck and buffalo, which congregate in large numbers in the floodplain
- Video footage and GPS/IMU data of the social and foraging behavior will be unique resources for sociobiological studies

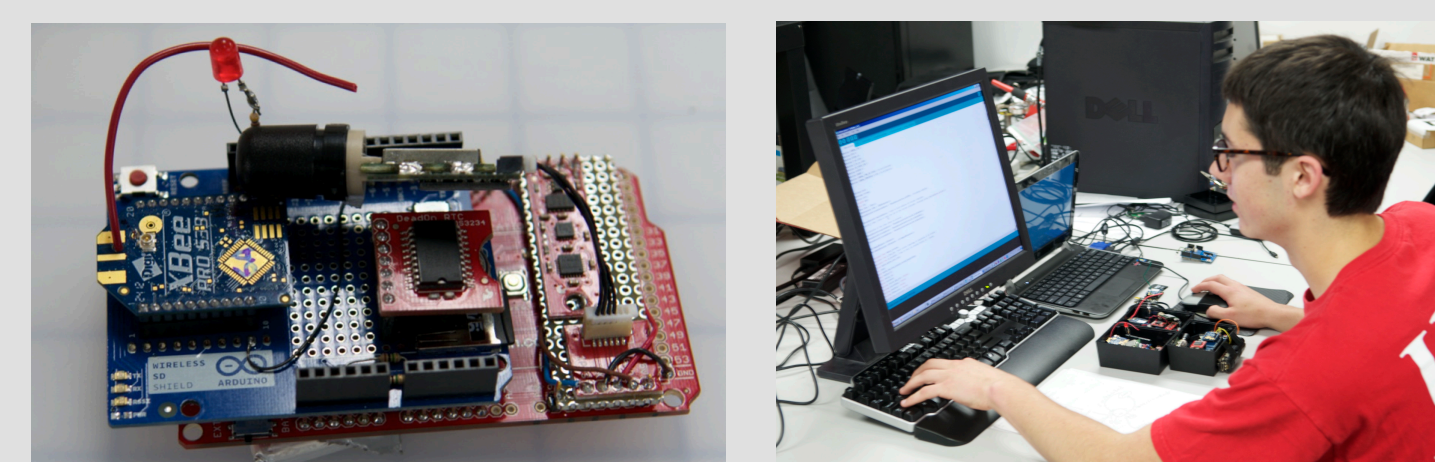
## Project Anatomy



## Basic Principles

- Significant research on algorithms for distributed tracking and coordination under severe power constraints was developed.
- Fundamental research has been developed on modeling of animal group behavior that will enable the analysis of foraging behavior from the data collected during our deployment.
- We created a system formed by multiple animal-borne tracking devices that sustain their own wireless communication network. They operate autonomously and cooperate to save battery power and coordinate to capture biologically meaningful information.

## Broader Impact



- **Intellectual:** Monitoring of endangered species and creation of a new system for sociobiological studies
- **Educational:** These ARDUINO-based devices are designed not only to optimize performance, but also to be an effective platform for undergraduate CPS research.

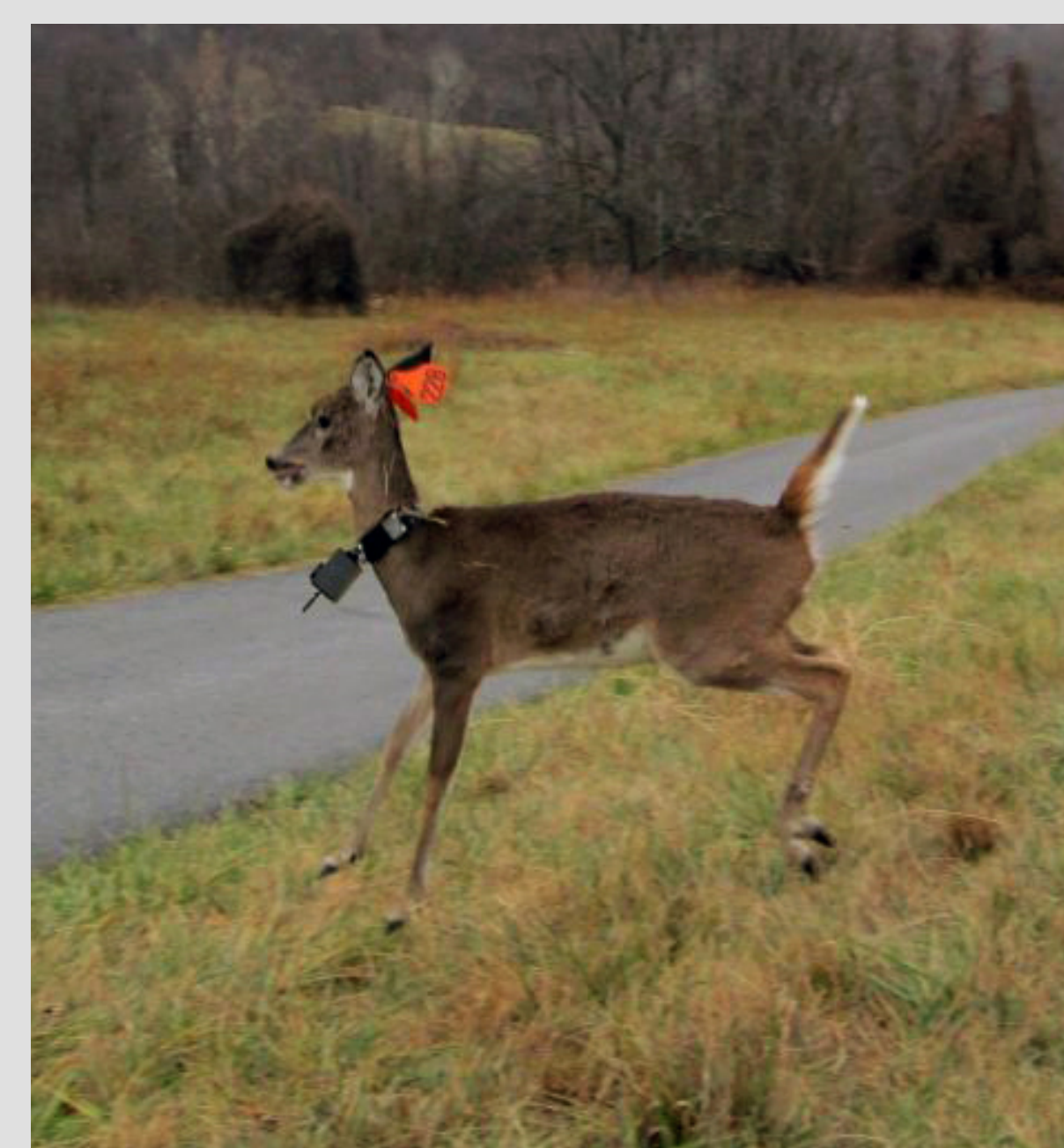
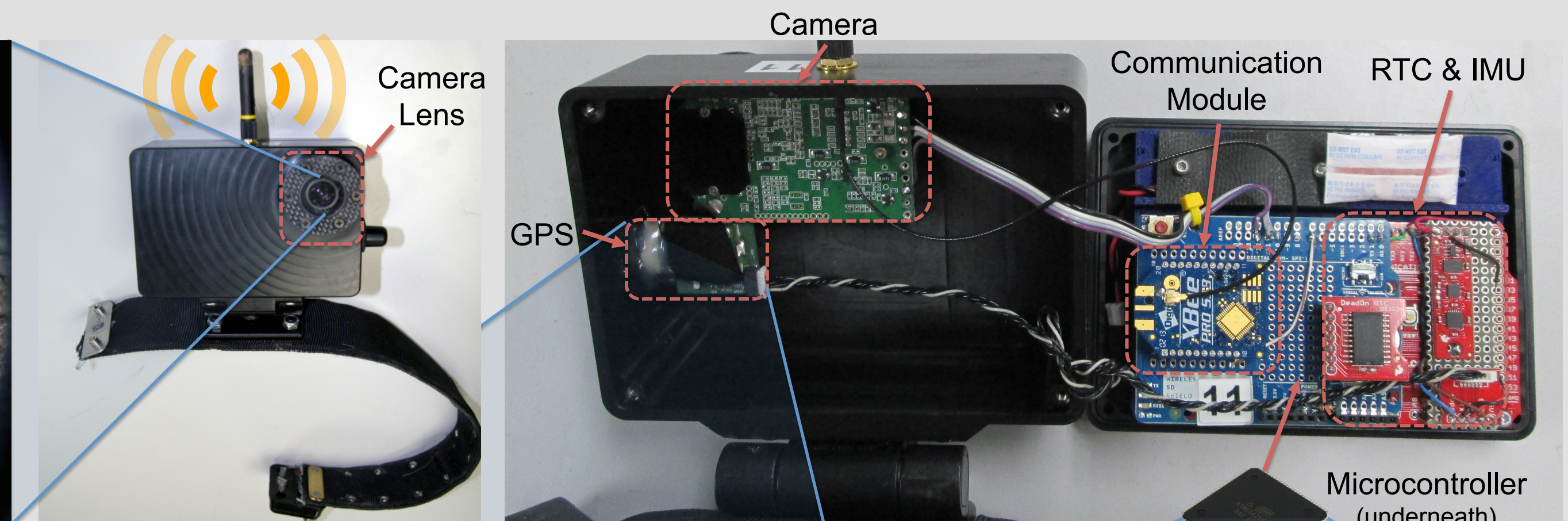
## Accomplishments

- The first version of the tracking devices was concluded, and 10 prototypes were constructed and tested.
- A deployment was carried out in collaboration with the Smithsonian Conservation Biology Institute in Front Royal. 10 units were mounted on white-tail deer for 12 days during which we validated the performance of algorithms, hardware, and firmware.

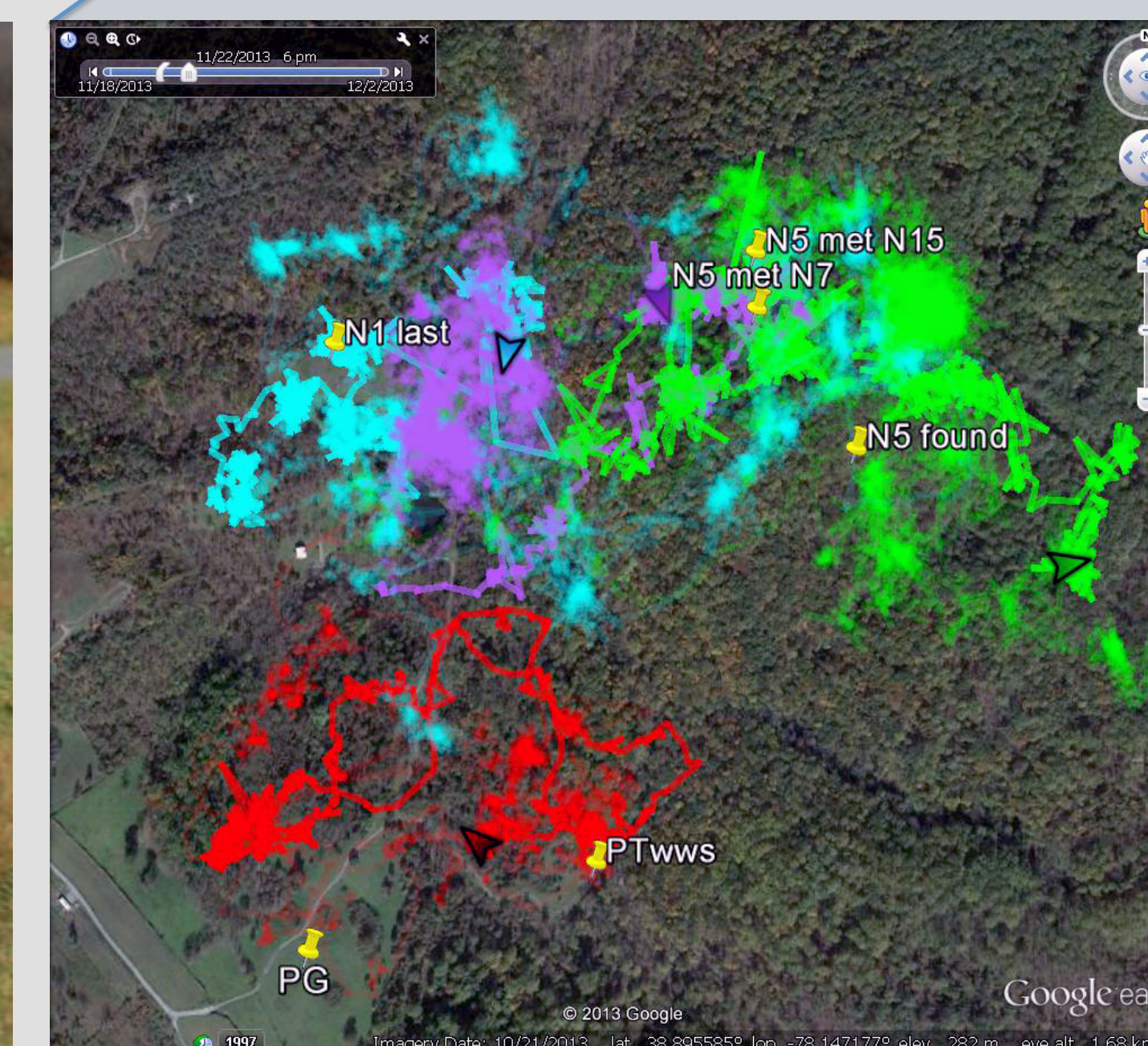
## W-Crittercam System



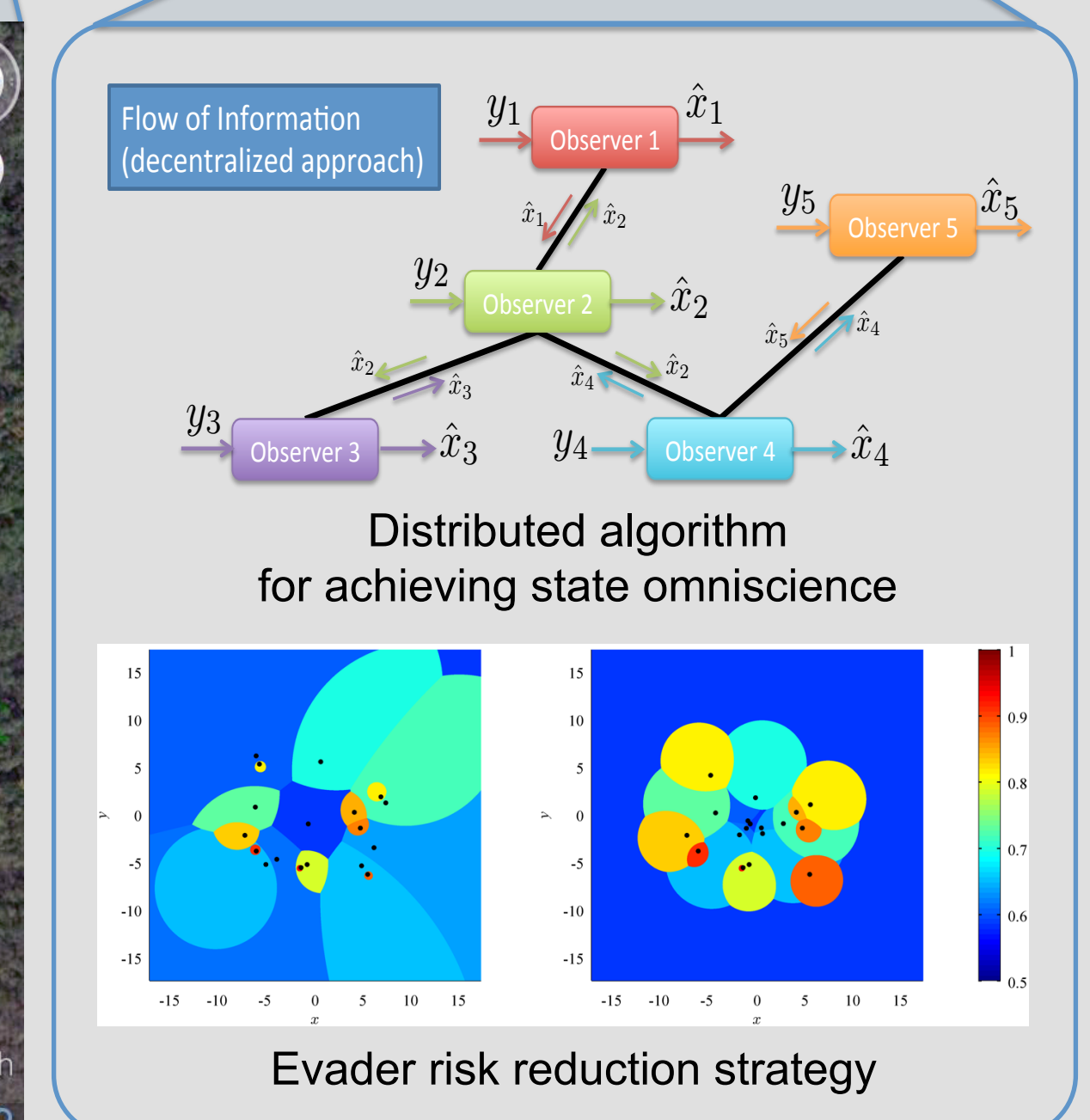
Animal point-of-view screenshot



Prototype device installed on deer



GPS Data Visualization



Distributed tracking and Animal Group Behavior Modeling