

## The Benefits of Robots and Rovers in Applied Scientific Research



**Above:** Demarius Clemons

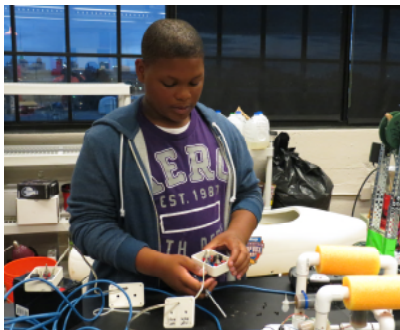
Doing field level research is important, but at times it can be difficult or even impossible to gather scientific data due to the ruggedness of the environment (e.g. water depths, frigid temperatures). Advancements in robotic technology such as unmanned aerial vehicles (drones), unmanned underwater vehicles (UUVs) and “smart” land rovers has grown significantly in recent years, so how do scientists capitalize on this opportunity?

On September 27, 2015, Demarius Clemons and Cess Jackson spent the day on Kelley’s Island in the middle of Lake Erie looking for ways to expand the use of autonomous robots to improve the way scientists make observations and collect data. Kelley’s Island was chosen as the test site because of its environmental diversity (i.e. massive glacial fossil, limestone rock quarry, inland forest, surrounded by water).

The duo kicked off their day in the lab at 5:30am going through the last minute details of their field testing plan. After a short two hour drive to Marblehead, Ohio, the student scientists along with Mr. Keith Young, founder of the Ecotek Lab YoungXplorers Program, boarded a ferry bound for Kelley’s Island. Once on the island Demarius started testing out the land rover. His first test involved using the rover to collect plant samples. The second test he conducted involved driving the rover along the side of a 400 feet long glacial fossil to evaluate its ability to scale and travel over uneven terrain. The rover was powered by a 12 volt rechargeable lithium battery. It included 5 actuator motors, 4 tread wheels made of durable thermoplastic and a 1.5 foot long robotic arm (.45 meters) with an adjustable motor powered gripper at the end.

Cess oversaw the field testing of the submersible remotely operated vehicle (ROV) in Lake Erie. He setup a test site on a beach near Kelleys Island State Park. The scope of his field testing work was limited to maneuverability, buoyancy, thruster power, and sample collection. The ROV was powered by a 12 volt rechargeable lithium battery pack and included three DC powered thrusters. The ROV was driven using a 25 foot tethered cable that was connected to a control box. The water depth for testing was 2 meters.

The student scientists worked through a number of setbacks while on the island. For example, Demarius learned that the wireless navigation of an autonomous device can be affected by changes in environmental factors. Cess faced other challenges. He had to come up with ways to maneuver the ROV through Lake Erie’s choppy waves to collect water samples. Regardless of the roadblock, Cess and Demarius kept forging ahead. Their experience on Kelleys Island has given them a new perspective on the use of robots and rovers in conducting scientific research.



Cess Jackson working on ROV gearbox



Demarius using rover to collect plant samples



Kelley's Island ferry transporting motor vehicles across Lake Erie

### About the Ecotek Science Program

Ecotek is a science research lab program for young inventors and researchers in grades 5 thru 12. Student scientists work on projects aligned with the issues being addressed by world leaders at the United Nations. To learn more about Ecotek Lab go to <http://www.ecotek-us.com>