

Brooklyn Atlantis



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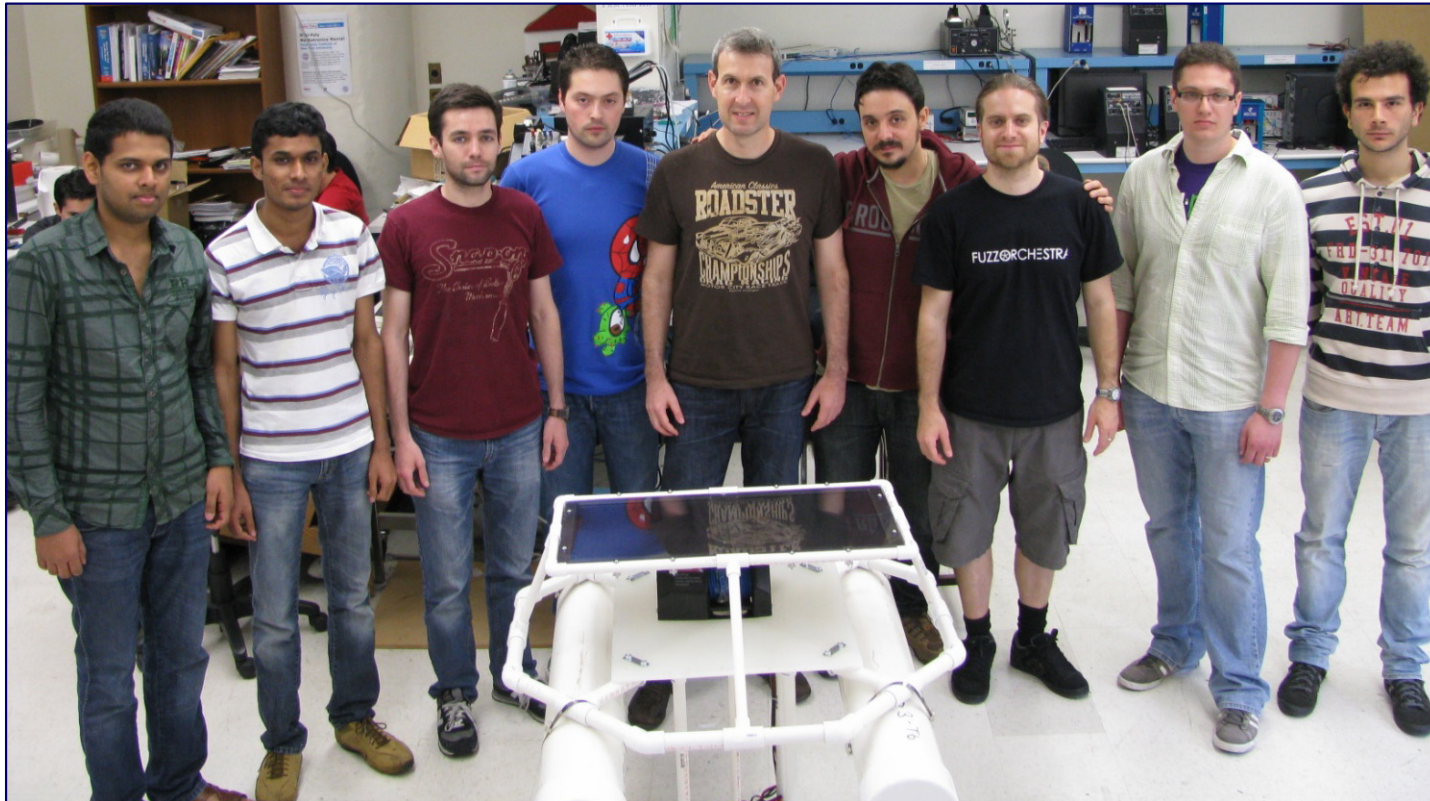
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<http://brooklyatlantis.poly.edu>



The Brooklyn Atlantis team

Lead by Profs. Nov and Porfiri, The Brooklyn Atlantis team consists of 8 graduate students in Mechanical Engineering and Computer Science, as well as 6 undergraduate researchers.



Team members, left to right: Nitin Narasimhan, Aditya Guntupalli, Jeffrey Laut, Fausto Del Sette, Prof. Oded Nov, Prof. Maurizio Porfiri, Emiliano Henry, Vladislav Kopman, and Andrea Clerico.

Not pictured: Sohan Gharpure, William Quigley, Kamran Khan, Jakub Cichon, Nagpal Kshitij, Matthew Conte, and Vivin Raj

What is Brooklyn Atlantis?

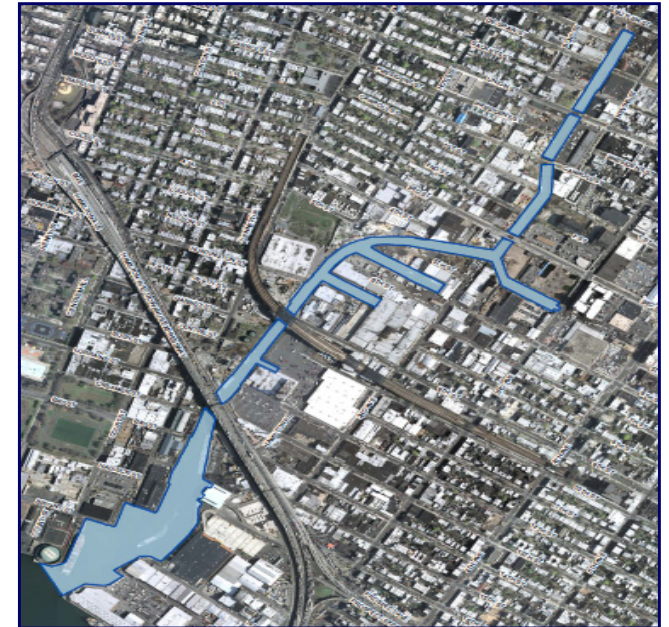
- Brooklyn Atlantis is a National Science Foundation (NSF) funded project
- It consists of socially interacting volunteers and a wireless sensor network jointly performing tasks
- Citizen scientists help with environmental monitoring and control in the polluted waters of the Gowanus Canal
- A system of mobile instrumented buoys with wireless capabilities analyze the waters, take pictures, and gather data using a variety of sensors



Our project is focused on the Gowanus Canal.

So what is our effort?

- Help monitor the water quality by supplying data to the EPA
- Provide images of above water and below water animal presence
- Provide an online platform (website) for citizen scientist social participation
- Investigate human-machine interaction, and its effects on the performance of a sensor network

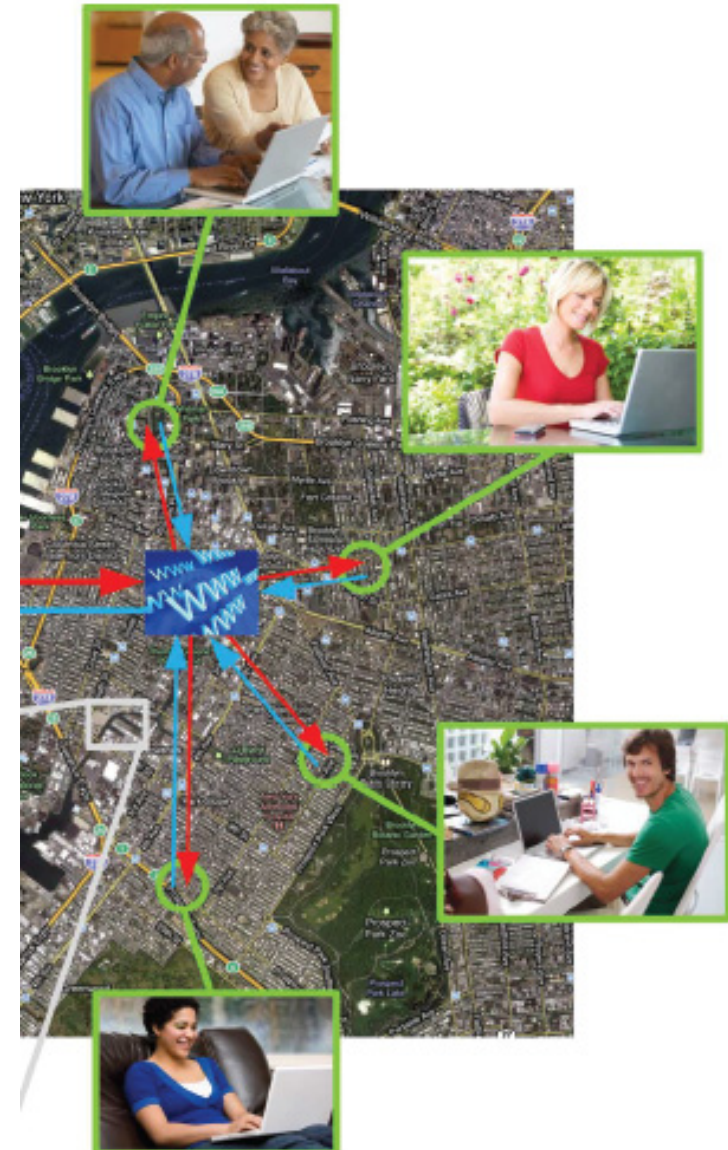


What is Citizen Science?

Research conducted, in whole or in part, by amateur or non-professional scientists as part of a scientific research effort

Who are the Gowanus Citizen Scientists and how can they help?

Potentially YOU! By participating on the Brooklyn Atlantis website, volunteers can help researchers monitor the wildlife and the conditions in the canal and collaboratively make the Gowanus environmental recovery a reality



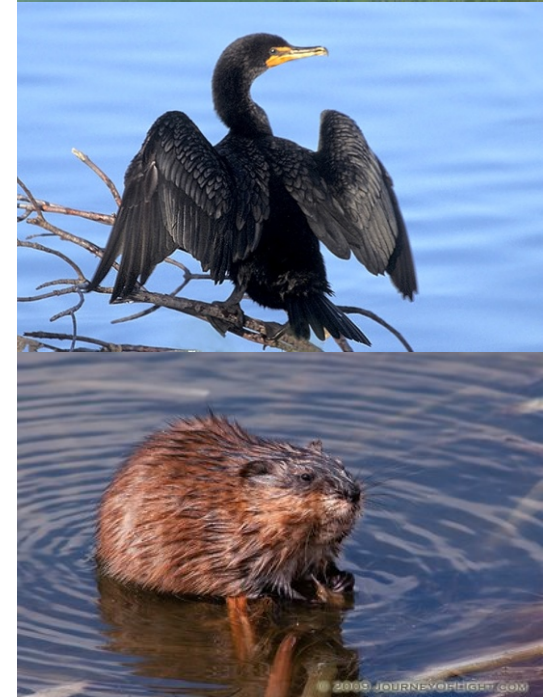
The Gowanus Canal is populated with fish, birds and small mammals

The EPA has observed the **aquatic life** to include:

- Annelid worms
- Sand worms
- Amphipods
- Small mollusks
- Blue crabs
- Copepods
- Mummichogs
- Atlantic tomcods
- American eels
- Striped bass
- White perch
- Muskrats

The **avian life** typically encountered includes:

- Black ducks
- Blue herons
- Crested cormorants



How are we going to monitor the waters?

With a self-contained mobile buoy,
a device with the following abilities:

- Move about the canal
- Test water quality
- Take pictures above and below water
- Upload data to our website
- Maintain position using an anchor
- Recharge its batteries using solar energy



How do Citizen Scientists participate?

By logging on to our website,
participants can:

- Browse images of canal snapshots
- Classify wildlife discovered in pictures
- Access sensor data for different canal locations for assessing water quality
- Gain points by correctly identifying objects
- Compare tagging results with a network of friends

The screenshot shows the Brooklyn Atlantis website interface. At the top, there is a navigation bar with the site logo, the name "Brooklyn Atlantis BETA", and links for "About", "Participate", "Tutorials", and "Media". Below this is a user status bar showing "Welcome Jeff. Not you?", "Notifications(0)", and "Logout".

The main content area features a navigation menu with "Settings", "Profile", "Start Participating", and "Forum", along with a search bar. The central focus is a photo of a canal with a building in the background. Above the photo is the instruction "Just click an item in the picture below to tag it!". Below the photo are "More Images" and "Next Image" buttons.

Below the photo is a "Sensor Data" section with four input fields:

- pH: [H]J0 (range 0 to 14)
- Dissolved Oxygen: -23.7647% (range 0 to 100)
- Conductivity: -26.3648468708μS (range 0 to 5000)
- Temperature: 0 °C

On the right side, there is a sidebar with game mechanics:

- ★ Points: 0
- ⊙ Friends: Find friends
- ⊙ Time Contributed: Hours: 0 Mins: 00
- ⊙ Missions: newmission, newtype, fish Identifying, Metal Objects Finding

Images are captured from above water and below water cameras: these images get uploaded about once every minute, where they can then be accessed on the project's website


Users can then tag the photos:


- Participants scroll through different snapshots sent from the buoy cameras
- Once an object is identified, it is tagged with a name and a description



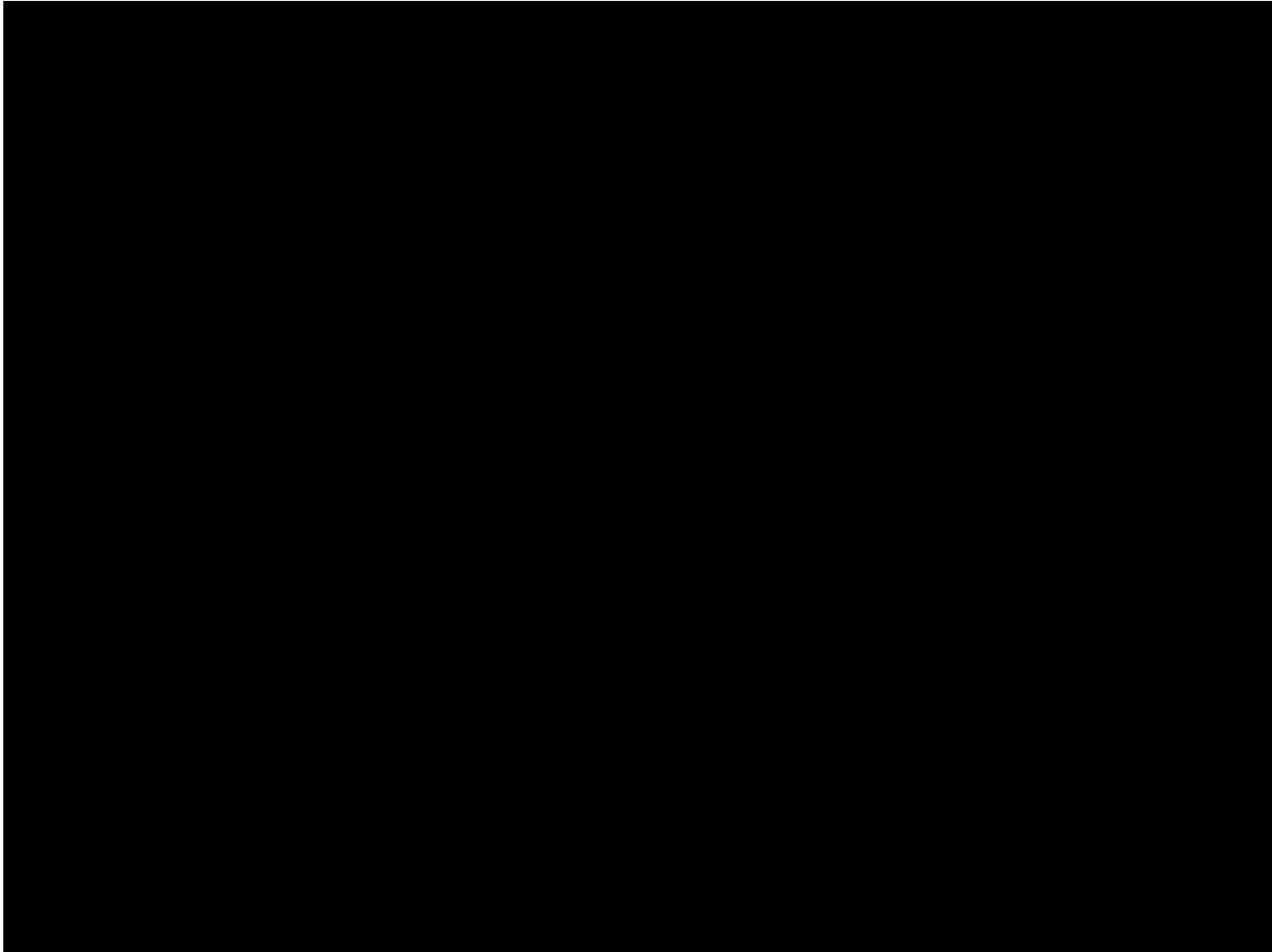
Just click an item in the picture below to tag it!



 More Images

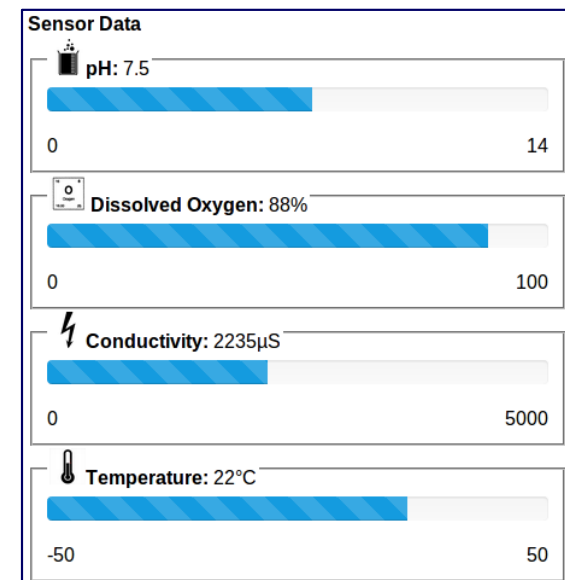
Next Image 

How does tagging work?



The sensor data is collected by the onboard computer and uploaded to the project website where it is displayed graphically

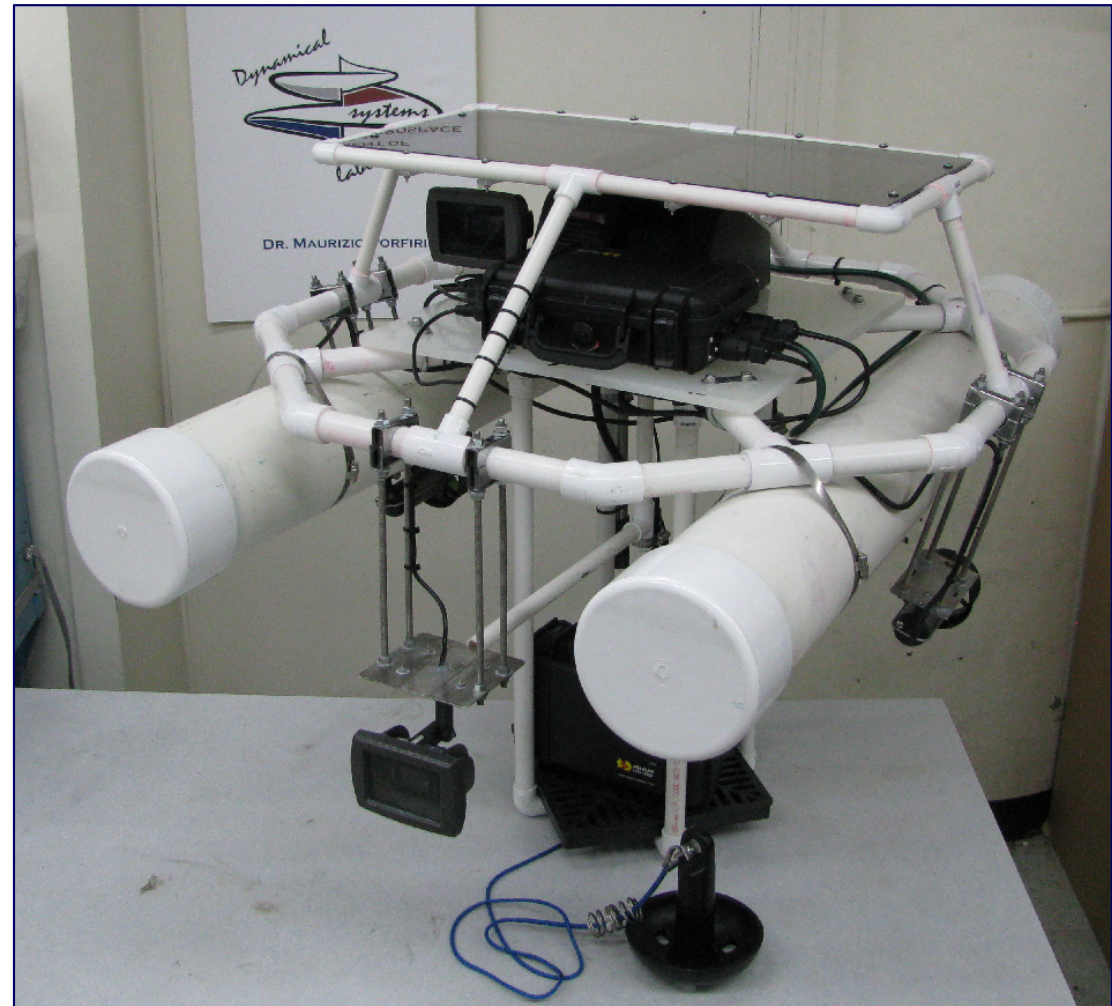
- The **dissolved oxygen sensor** gives a measure of the oxygen content in the canal.
- The **pH sensor** measures the acidity and alkalinity of the water.
- The **conductivity sensor** tests the concentration of certain pollutants.



These sensors are used to assess the canal's ability to sustain life, and monitor the progress of the environmental cleanup

How can the robot monitor different areas of the canal?

- Two thrusters allow the buoy to maneuver about the canal, while GPS provides location data
- The motorized anchor allows the robot to remain stationary for extended periods without the use of thrusters
- Either of the cameras can also stream video for controlling the robot from a remote location



The prototype has been tested in several controlled environments, and more recently, in the Gowanus Canal, where it successfully maneuvered and uploaded image data to our server remotely

More short-term deployment trials will be performed before the robot's permanent deployment.

We then plan on developing more to make a network of five robots in total throughout the canal



Beyond the scientific insight this project will produce, we also expect Brooklyn Atlantis to

- **Inspire** non-scientists to become involved and interested in science
- **Raise awareness** of the clean-up effort at the Gowanus Canal and the status of the canal
- **Promote** research and education in **Brooklyn**
- Be used as an educational tool in **outreach** programs



Thank you!
Questions?