**MESTECH Research Project**

**Project Title:**

Sensor platform integration, system modification and development and modelling

**Project Researcher:**

Dr. Kevin Murphy

**Funding Body:**

Marine Institute – Beaufort Marine Research Awards

**Project Summary:**

The use of *in-situ* sensors, capable of continuously monitoring chemical and physical parameters, has been increasing in recent years and can provide real-time information and contribute to a better representation of long-term trends in aquatic environments. Due to recent progress it is now conceivable to envision a network of sensors being deployed at key spatial locations, capable of autonomous operation in the field for a year or more and providing real-time alerts for key events. The communications and data gathering abilities of the network need to be of a high quality and suit the tasks at hand. Despite the promise of such a system many challenges remain using currently available technology including: a limitation in the number of factors measurable, interferences, bio-fouling issues, expense, power requirements and the need for frequent calibrations.

If these networks of sensors are to become not only a reality but commonplace it is necessary to produce reliable, inexpensive *in-situ* sensors. This means costs need to be considerably reduced and anti-fouling measures tested and introduced while also retaining and increasing the accuracy of the measurements. It is this field of research that this work is concentrated on developing.

This research is focused on developing a low-cost, robust, simple, re-deployable and flexible sensor for the monitoring of aquatic environments, which can enable high spatial and temporal data resolution. A multi-wavelength optical sensor has been designed so that it can be operated on a standalone basis or in a network of sondes and is equipped with communications abilities. The sensor is capable of measuring changes in opacity and colour in water by making use of five separate LED light sources and two photodiode detectors. The sensor was designed to give qualitative data on bulk water property changes and is called the Optical Colourimetric Sensor (OCS). The application of low-cost colorimetric

optical sensors may potentially be very beneficial in detecting events such as Harmful Algal Blooms and serving in early warning and decision support systems with more sophisticated sensors.

**Key Outputs:**

- To characterise and deploy the Optical Colourimetric Sensor in a variety of aquatic environments
- Develop generic communications platforms capable of being used with many sensors
- Use advanced data analytics to assess the usefulness of the data acquired
- Apply anti-fouling strategies to completed systems
- Apply fluid dynamics modelling for bio-fouling research on completed systems
- To publish scientific papers and attend and present at scientific conferences