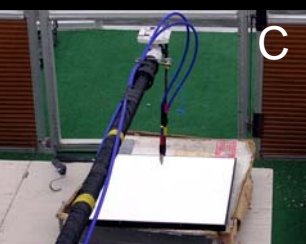
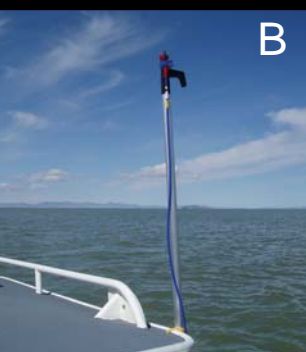
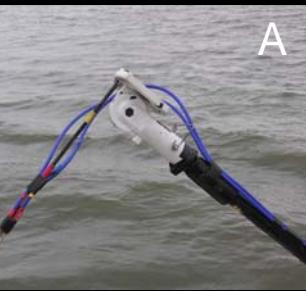


# The development of a remote sensing technique to monitor New England Lakes

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A

B

C

D

## Goals

- ➔ Build a library of hyperspectral reflectance from a variety of New England lakes
- ➔ Divide spectra into groups based on lake optical characteristics (chlorophyll, CDOM)
- ➔ Determine appropriate algorithms for detecting chlorophyll and phycocyanin

## Equipment

- A. Optic fiber to measure upwelling radiance from lake water
- B. Optic fiber and cosine collector to measure downwelling irradiance from sun.
- C. Spectralon 99% reflectance panel for spectral calibration.
- D. A pair of USB2000 hyperspectral radiometers to measure light intensity.

## Methods

1. 3-6 calibration scans at each of 42 lakes
2. Measurement of upwelling spectra at a series of 4-5 depths ranging from 5-85 cm.
3. Above water and sky spectral measurements
4. Conversion of data to reflectance spectra with CDAP program
5. Processing of spectra with Excel

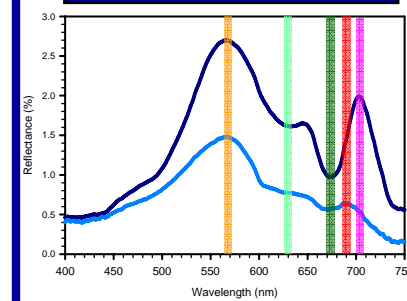
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## Lessons learned

- ➔ Reflectance equipment was sufficient to provide useful measurements in most lakes
- ➔ Most lakes were dominated by fluorescence, not absorption
- ➔ Blue end of spectra showed little variability among lakes
- ➔ Cyanobacteria absorption was detectable in some lakes
- ➔ Lakes yielding poorest spectra tended to be clear and dark

## A beginners guide to spectra



- Green scattering peak from algae
- Absorption by cyanobacteria (phycocyanin)
- Absorption by cyanobacteria (chlorophyll)
- Fluorescence peak (seen in low chlorophyll lakes)
- Scattering peak (seen in high chlorophyll lakes)

## Next steps

- ➔ Evaluate usefulness of existing chlorophyll algorithms
  - SeaWiFS, MODIS, MERIS
  - Dall'Olmo, Simims, Schalles
- ➔ Develop algorithm to predict cyanobacteria toxin levels
- ➔ Collect spectra from more lakes to provide more robust statistical analyses.
- ➔ Test algorithms on other remote sensing platforms
  - Aerial and satellite

