Research Philosophy

"For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled."

~Richard Feynman

Research must be focused on fundamental mechanisms that have a high probability of leading to practical applications. After everyone has access to safe water, food, shelter, and education, then we can conduct research for the shear beauty of learning. In the meantime the goal of making the world a better place guides our research.

Guiding principles

- use your eyes. They are the best sensors we have.
- when exploring a new independent variable, conduct a small number of experiments over a wide range. For example vary the independent variable over 3 orders of magnitude.
- for initial experiments always analzye the data while acquiring it to reduce the risk of wasted effort
- learn how laboratory research system works. This includes sensors, data acquisition, process control, mechanical components, data analysis.
- conduct literature reviews to make sure that we are building on previous knowledge
- develop approaches for getting unstuck when it is unclear how to move forward.
- seek expert advice
- identify causes of failures and take steps to prevent those failures from recurring
- write about your methods, results, and your insights. The writing process provides a context to reflect on what you are observing and thereby gain new insights.

Checklist

- Calibrate turbidity meters and pumps before conducting experiments
- Clean the turbidity meter sample cells daily when conducting experiments
- Never leave an experiment running if it has a leak. Fix the leak first.
- Evaluate failure modes for your experimental setup and upgrade the design of your system if it is prone to failure
- Save your data files and method files on the AguaClara server
- Save process controller method files every time you make a change so you can go back to previous version if there is a problem
- Compare sensor readings with expectations and your own observations