# OCN418 Proposal: Open Source Potentiostat (Nico Fröhberg)

## Environment:

Nomilu Fishpond, Kaua’i:

* Max 8m depth, hypersaline, anoxic bottom water below 6.5m (steep pycnocline)

## Rationale:

* Characterize redox geochemical cycles in an environment characterized by anoxia and potentially anoxygenic photosynthesis
* Identify and quantify electron donors involved in these cycles (e.g. NO3/NH4/N2, SO4/H2S, Mn(II), Fe(II))

## Challenges:

* Very steep concentration gradients require high spatial resolution of measurements
* Redox regime is not stable when sampling
  + In-situ measurements necessary
* The pond is small and only a small boat is available for sampling/measurements
  + Operation of large instruments in titanium underwater housings is difficult (and expensive)

## Proposed Method:

* Construction of a small affordable potentiostat based on the open source D-Stat design (<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0140349> )
  + 80x80 mm PCB board
  + Operation by Raspberry Pi
* Waterproofing in PVC pipe

## Materials:

* Custom PCB board (supplier Seeed Studio, cost ~15 $US per board)
* Off the shelf electronic components (supplier Digikey, cost ~115 $US per board)
* Raspberry Pi
* PVC pipe
* Hg/Au working, Pt counter, Ag/AgCl reference electrodes (already available)

## Sampling Regime:

* Vertical profiles of the water column and potentially sediment porewater
* Fieldwork at Nomilu fishpond in November/December 2018 and early 2019
* Additional measurements with probes for conductivity, temperature, pressure, and oxygen concentration
* Samples for DIC/TA & nutrients
* Timeseries for diurnal cycles over minimum 24h (preferably multiple days)
* Seasonal comparison between different trips