OstraCam II CDR

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OstraCam I

- The purpose last year was to design a system that is able to record low-light video of bioluminescent ostracods and document data about the oceanic environment at the time
- Data saved to be analyzed later
- Issues they ran into on the field
  - Camera re-calibration and maintenance
  - Lack of feedback from device
  - Ease of use by someone in full diving gear (IR remote, etc..)
  - Poor quality from the cameras in-situ
  - Overall weren't able to produce much valuable data

The Ostracod:

The size of a sesame seed

Bioluminescent

Thousands of species


Ammonite/TerraMatter
CNN

The Science:

- By cataloging the bioluminescent properties of different species of ostracod and sequencing their genome, we can identify the genetics behind bioluminescence.
- Being able to control and implant bioluminescence would give biology researchers another tool for genetic research.
- Unforeseen medical and scientific benefits.

Team members

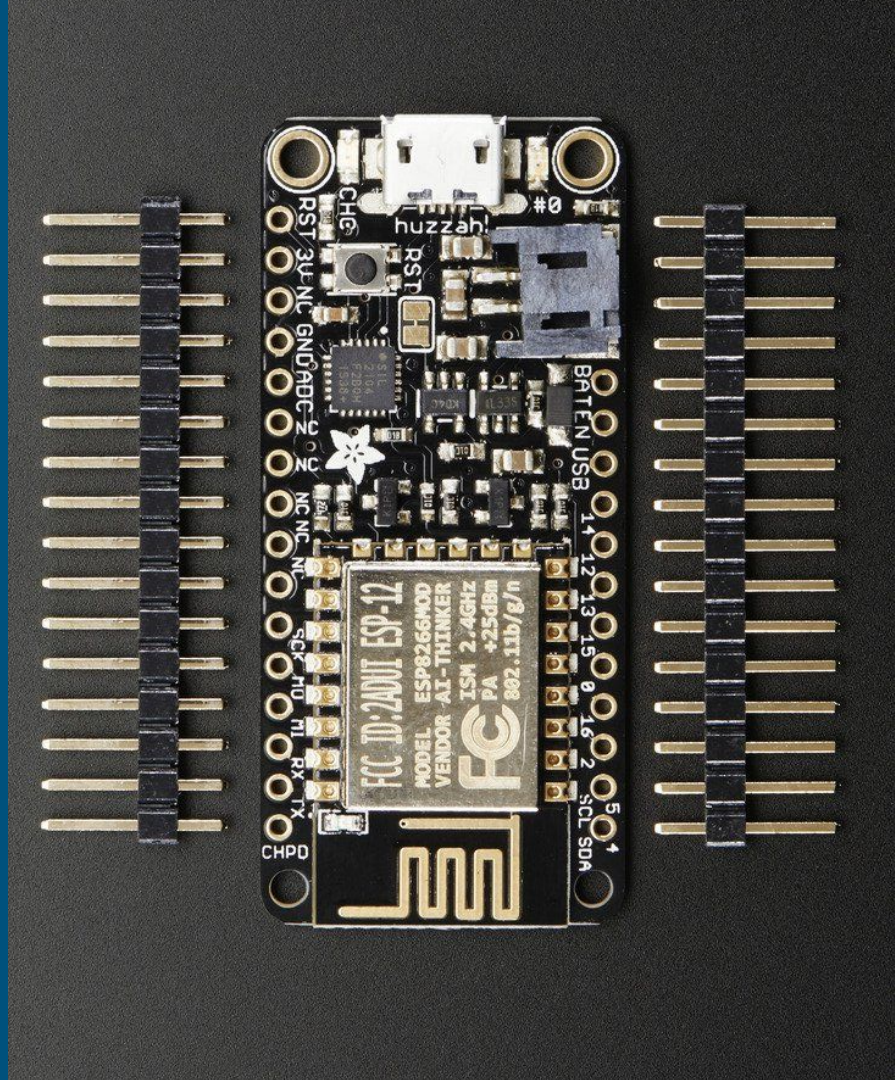
- Paul Killam - Team lead, Firmware, Computer Vision
- Oliver Thio - Software, MATLAB, Computer Vision
- Christina Lim - Hardware, DxDesigner, ExpeditionPCB

Goals for OstraCam II

- How we’re improving it
  - Transitioning to a more appropriate microcontroller
  - Adding additional sensors for more data collection
  - Adding power indicating LEDs
  - Developing external IR trigger system
  - Working on distortion issues with the cameras
- Convincing the Marine Biology Department this is a good idea
  - Developing image processing techniques to enhance already-present data
  - Extract useable data from last year's images

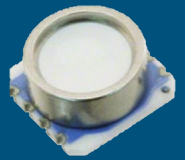
Processor

- New microcontroller: ESP8266
  - Adafruit feather HUZZAH development board with USB programming
  - Board to be mounted into PCB headers
  - Arduino compatible
  - Has embedded RTC
  - 500 mA peak output current
  - 3.3V logic



Sensors

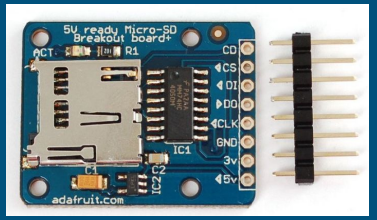
- Underwater pressure and temperature sensor
  - MS5803-30BA
  - 0-30 bar
  - Low power, 1uA



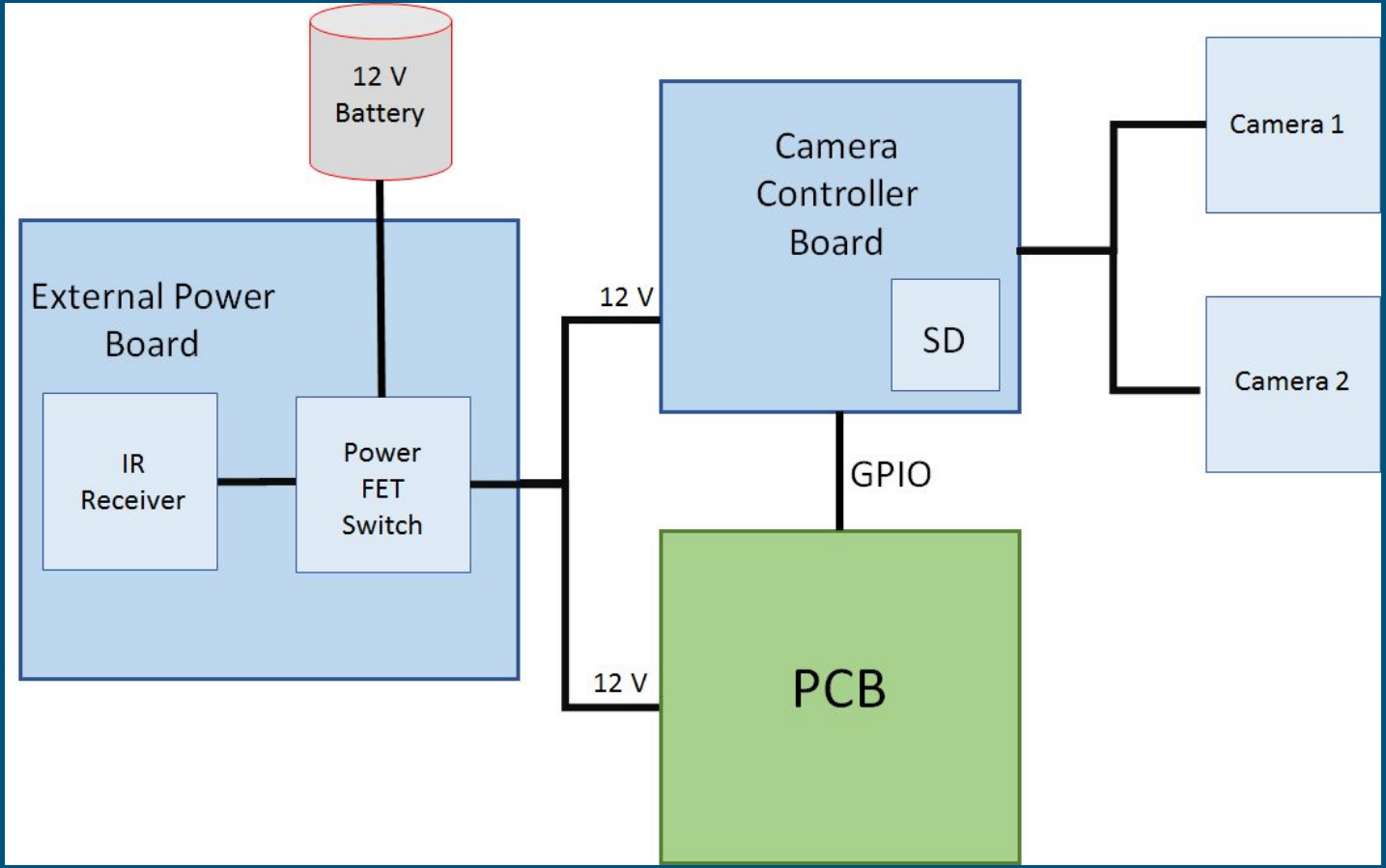
- EZO Sensors
  - pH
    - Max 14.5 mA
  - Salinity
    - Max 35 mA
  - Interface to external probes through BNC connectors

Other Modules

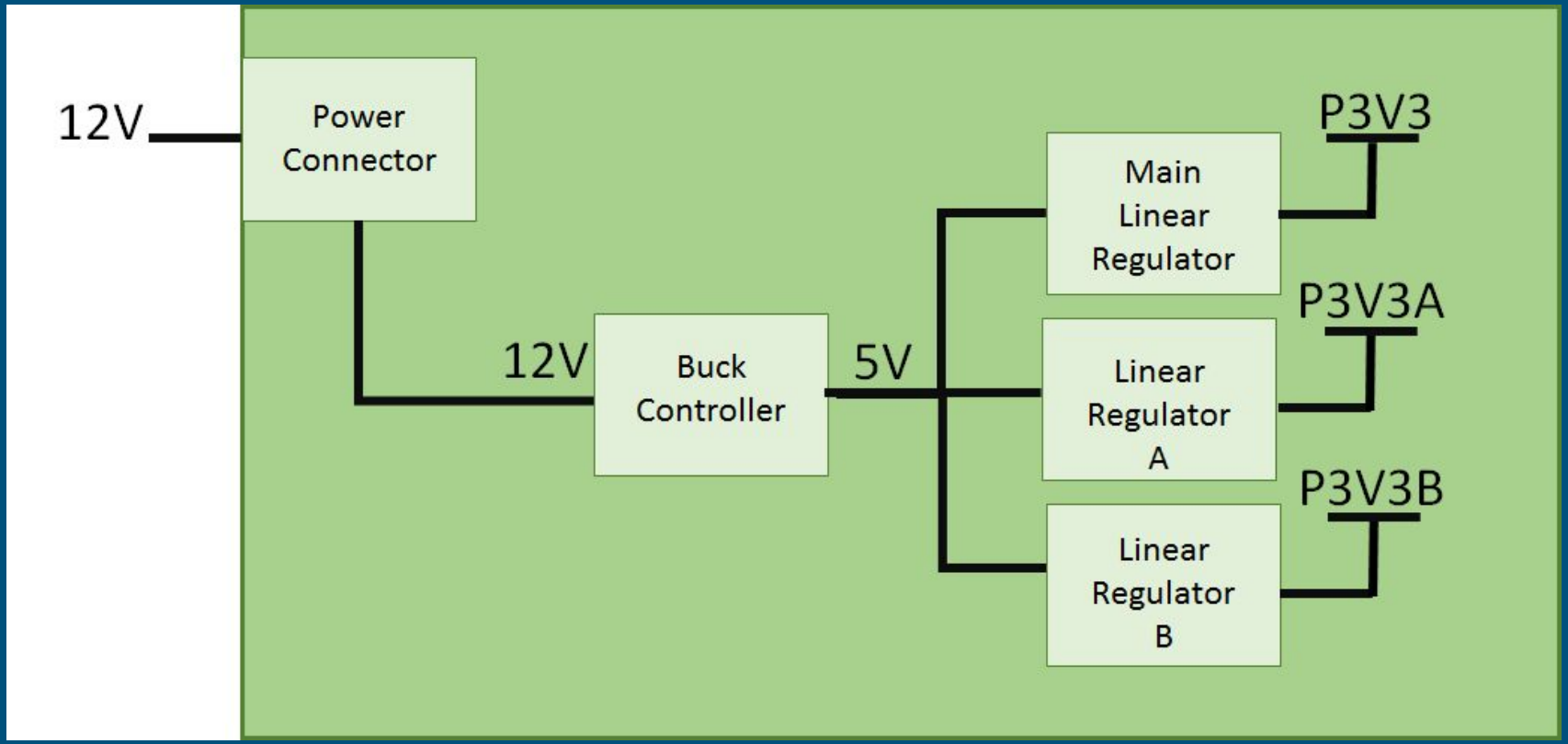
- LCD Display
  - Menu interface to indicate status
- GPS
  - Triggered above water before submerging the system
- SD Board
  - MicroSD 4GB
  - SPI
- IR Receiver
  - External to PCB
  - Triggers power to system from 12V battery



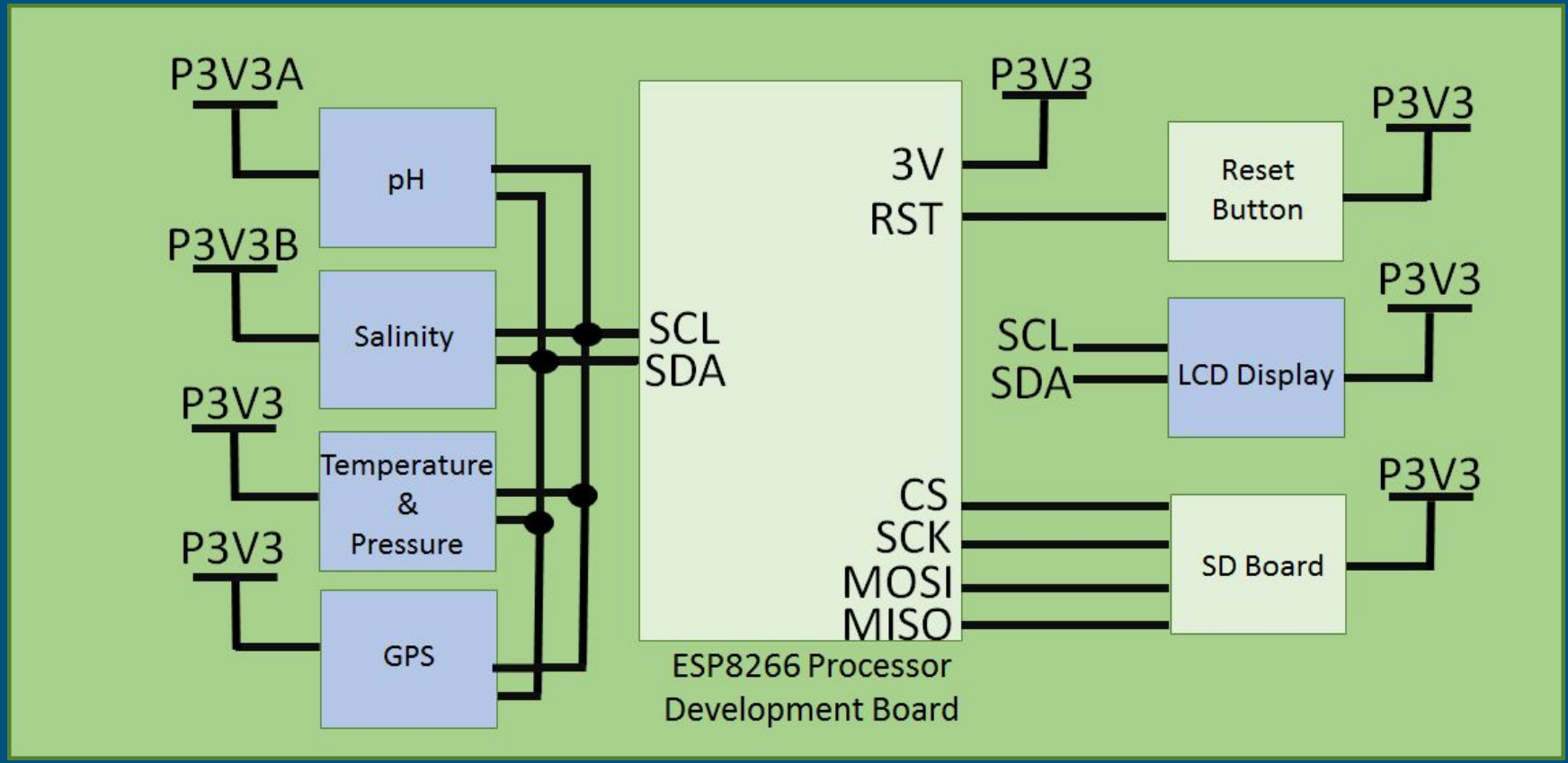
Block Diagram of External Components



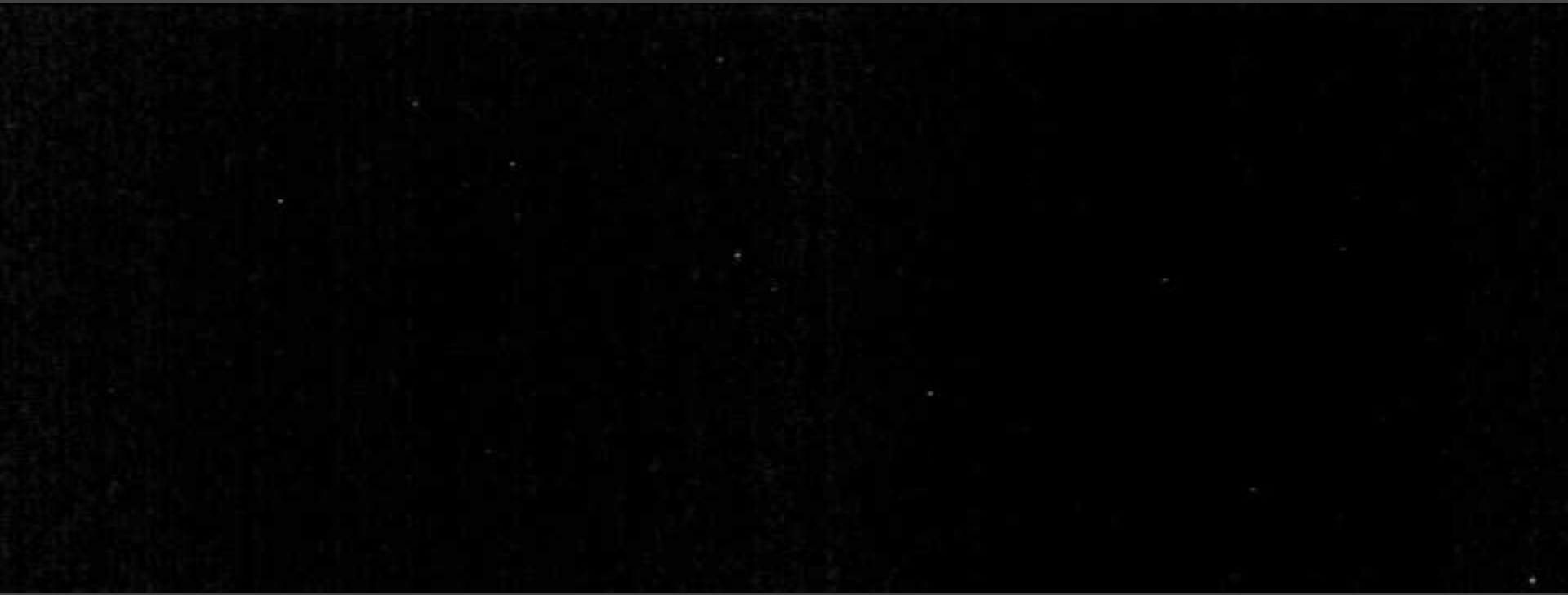
Block Diagram of PCB Power



Block Diagram of PCB Main



Raw Footage from OstraCam I



Postprocessed Footage from OstraCam I

Camera System Variants

- The current camera system is not living up to expectations, so we've begun looking into alternatives:
  - Tweak the current camera system to get images of the expected quality.
  - Replace one of the cameras with a higher quality (more expensive) one, creating an asymmetrical stereo system like in some modern camera phones.
  - Add a new camera without removing another one, creating a triple-camera system.

Software and firmware issues to be addressed this year

- Recalibration for every data set due to bad 3D-printed camera mountings
- Frame synchronization
- Postprocessing fishbowl distortion correction
- Sub-pixel interpolation to maximize image quality
- 3-D mapping