

PBR Hackathon - QTB

March 2–4, 2016

Contents

1	PBR Hackathon Projects	2
1.1	Gasometer (Gas Flux)	2
1.2	Spectrometer (Light Flux)	2
1.3	Continuous Culture (Liquid Flux)	2
1.4	Microfluidics Device (Single Cell Biology)	2
2	Program	3
2.1	Day 1 <12:00 : Building Bioreactors	3
2.1.1	Rob's DIY Reactor - the beginnings	3
2.1.2	Dougie's DIY Reactor - 20 yrs later	3
2.1.3	Avantes - Spectrometry	3
2.1.4	CellDeg - Optimizing Photosynthetic Growth	3
2.2	Day 1 >13:00 : Hackathon I	3
2.3	Day 2 <12:00 : Photobioreactors in Research	3
2.4	Day 2 >13:00 : Hackathon II	4
2.4.1	Hardware I	4
2.4.2	Software I	4
2.5	Day 3 <12:00 : Hackathon III	4
2.5.1	Hardware II	4
2.6	Day 3 >13:00 : Consolidating	4
2.6.1	Software II	4

1 PBR Hackathon Projects

1.1 Gasometer (Gas Flux)

Extend the existing setup (co2meter+arduino+screen):

Sensor calibration routine via touch-screen (use PSI gas mixing system)

Add Aalborg mass flow meter (arduino hardware serial Tx3,Rx3) and/or

Valve control to measure several reactors (arduino software serial connections), perhaps attach to PSI Multicultivator

1.2 Spectrometer (Light Flux)

Simple measuring tool: AvaSpec-Mini2048l-U25 + arduino or raspi

Advanced: with LED for absorbance, reflectance, or fluorescence, built light paths and perhaps a reactor probe for online recording

1.3 Continuous Culture (Liquid Flux)

Balance and peristaltic pumps + arduino

Build simple reactor with gassing system measured by 1.1

Perhaps combine with 1.2 to make turbidostatic control

1.4 Microfluidics Device (Single Cell Biology)

Scratch microscope slide + 2-3 pumps + arduino/screen

Connect to Ilka's lab microscope

2 Program

2.1 Day 1 <12:00 : Building Bioreactors

Talks, 30-60 min:

2.1.1 Rob's DIY Reactor - the beginnings

2.1.2 Dougie's DIY Reactor - 20 yrs later

2.1.3 Avantes - Spectrometry

Spectrometry applications, incl. NIR for metabolite measurements and OD

Software interface to Avantes spectrometers

2.1.4 CellDeg - Optimizing Photosynthetic Growth

Introduction to CellDeg's 2.5 k algal growth setup (overnight 30 g/L cyano biomass)

2.2 Day 1 >13:00 : Hackathon I

Introduction to the gasometer: connecting sensors with Arduino, making an autonomous measurement device via Sainsmart's Touch Screen

Introduction to Rob's reactor: complete setup for photosynthetic growth

Self-organizing into teams: lab hardware (tubing etc.), control hardware (soldering etc.), software

2.3 Day 2 <12:00 : Photobioreactors in Research

Talks, 30-60 min:

Nir Keren, Hellingwerf, Jan Cervený, Dougie Murray, something microfluidics?

2.4 Day 2 >13:00 : Hackathon II

Perhaps in teams, either by projects (1.1–1.4) or in software vs. hardware (soldering/tubing) vs. biolab (cell cultures), or – most likely – in dynamic self-organisation, working parallel on all projects.

2.4.1 Hardware I

soldering, tubing

2.4.2 Software I

probe/sensor/pump \Leftrightarrow arduino/raspi interfaces

2.5 Day 3 <12:00 : Hackathon III

2.5.1 Hardware II

Integrate projects 1.1, 1.2 & 1.3 into a simple DIY reactor and/or with PSI FMT150 or Multicultivator

Integrate project 1.4 with the simple microscope in Ilka's lab, or a more advanced system (CAi?)

Visit HHU's fine mechanics and glas blower work-shops, place orders for stuff missing for above goals

2.6 Day 3 >13:00 : Consolidating

2.6.1 Software II

arduino/raspi \Leftrightarrow master/server interface

Standard formats and interfaces

Brain storming: relation of data and models

Beer: relation of data and models and beer