ENPH 459
Engineering Project I

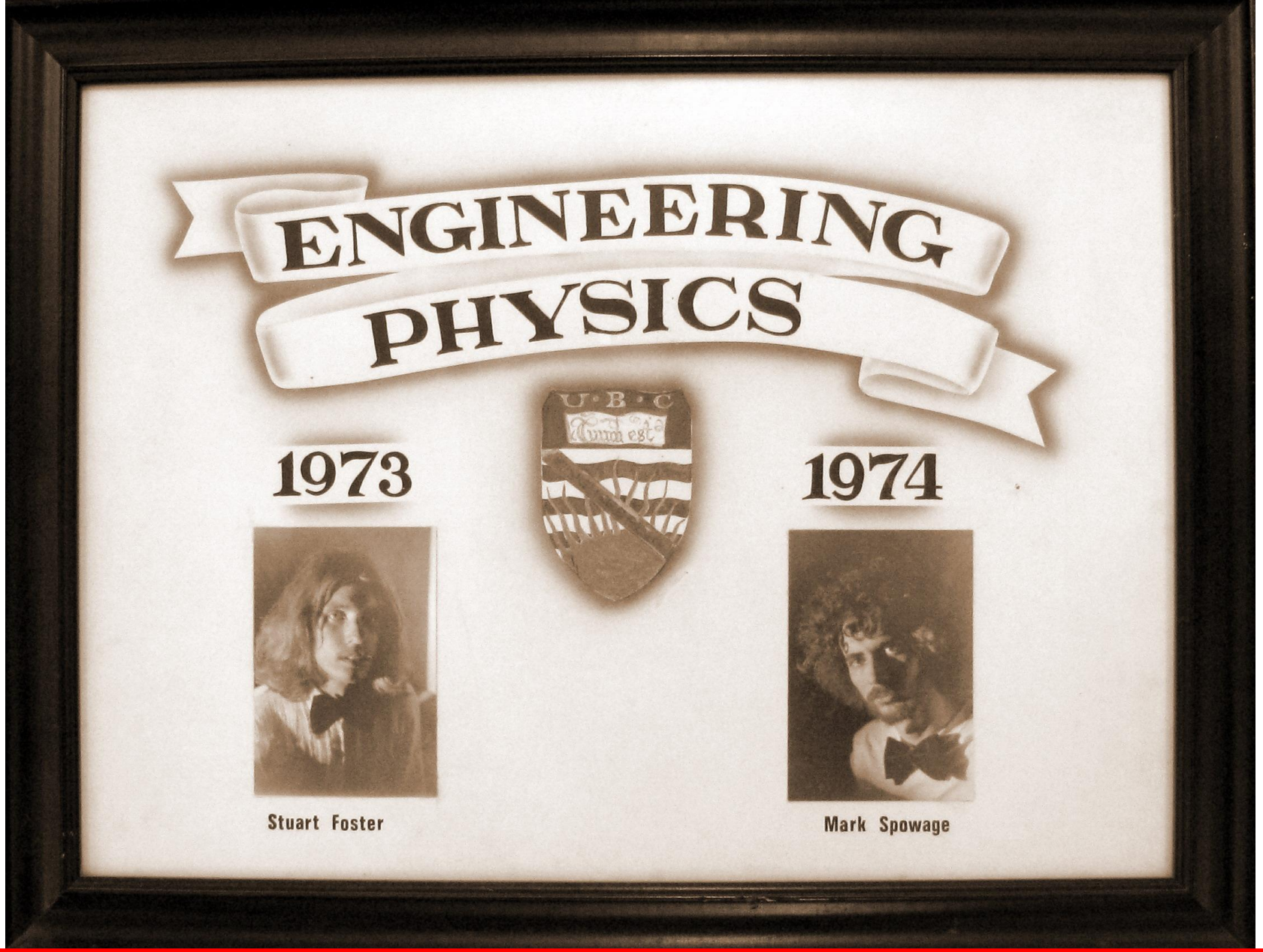
Info session for 2013/2014
Talks and links are online.

Google: ENPH 459 Kickoff 2013

Jon Nakane, Chris Waltham, Jeff Young,
Bernhard Zender
2013 March 14

History

1st Engphys Grad Classes 1948, 1949



Harder to develop teamwork skills in the mid-1970's.

EngPhys Project Lab started in 1988/89 to give students a full project experience:

Tech Experience

- Design experience
- Technical skills

Project Management

- Planning
- Management
- Resource Allocation (equipment + time)
- Professional Communication

Professionalism

Timeline for the next 12 months

ENPH 459 is a 2-term course. Treat it like a 1year experience

(don't believe SSC when it lists it as only a Term2 course)

April
May
June
July
Aug
Sept
Oct
Nov
Dec
Jan
Feb
Mar
Apr

Summer

ID potential team members (2-3 members per group)
Discuss self-guided projects, possible topics

Term 1 (4-6 hrs/week)

Confirm team members / Project by mid-September
Research and Proposals (3-4 drafts submitted)
Most students on co-op this term.

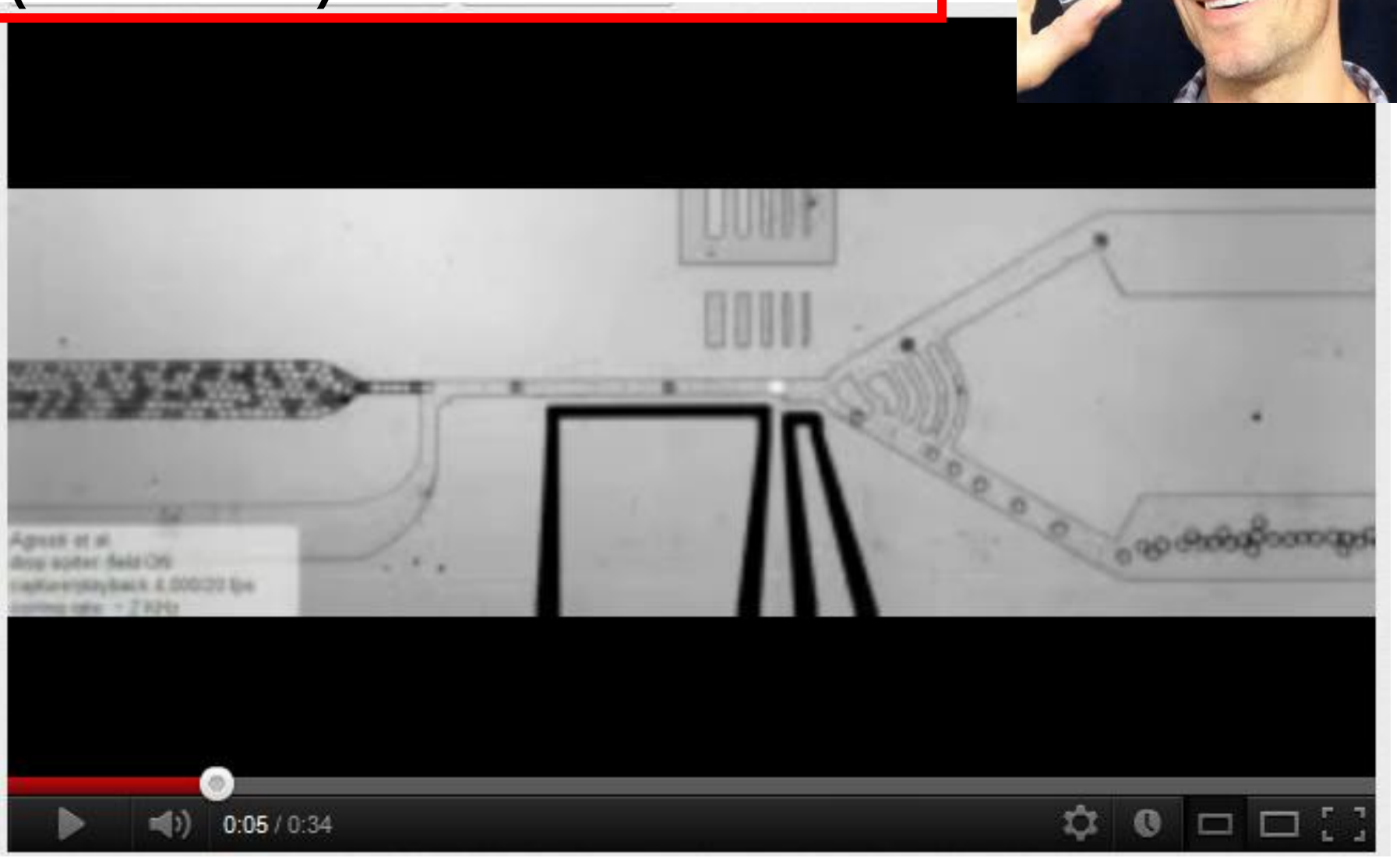
Term 2 (8-12hrs/week)

Project work underway
Final Reports submitted

Recent Projects in ENPH 459 (and 479)

Recent Projects with PHAS Faculty

Microfluidics Drop Sorter
(Carl Hansen)



http://www.youtube.com/watch?v=S1fEHLarRZk

Microfluidics + NMR

(Carl Hansen, Carl Michal)

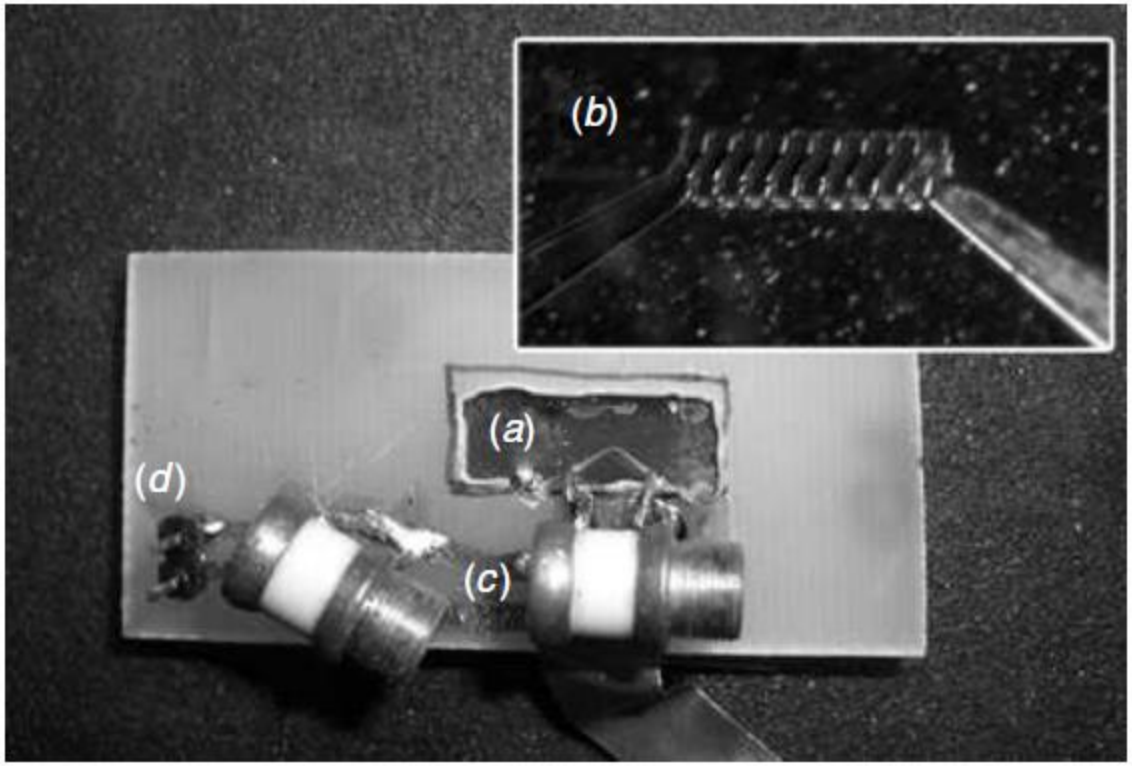


Figure 2. Photograph of the microcoil and tuning circuit, showing (*a*) a microfluidic chip with the coil beneath the printed circuit board, (*b*) inset with a close-up photograph of the microcoil (*c*) tuning and match capacitors, (*d*) electrical connection to coax cable.

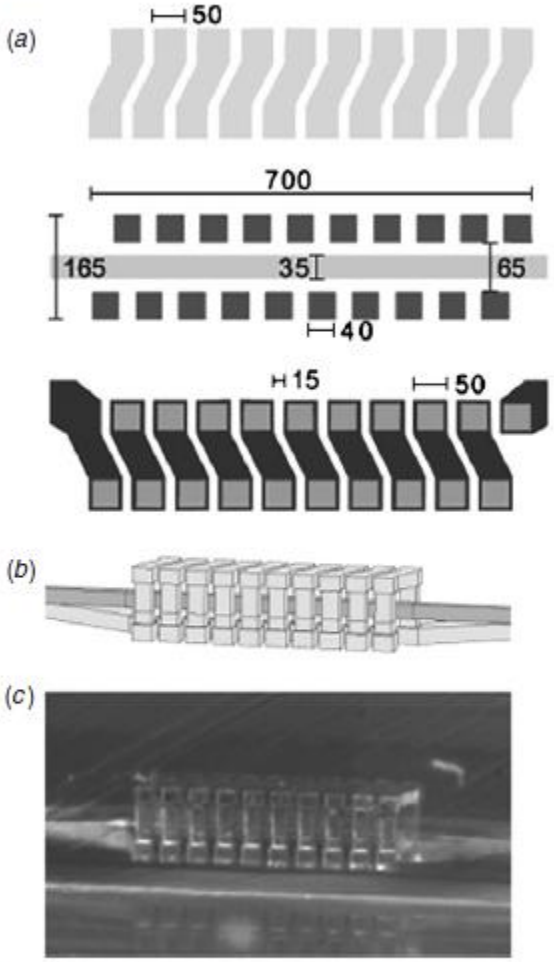


Figure 1. (*a*) CAD drawing of three individual layers used in constructing the coils. Dimensions listed are in μm. (*b*) CAD drawing of a finished coil assembly. (*c*) Optical microscope image of a completed coil.

Microfluidics + NMR

(w/ carl hansen, carl michal)

Publication with students as lead authors

IOP Publishing — Journal of Micromechanics and Microengineering

J. Micromech. Microeng. **19** (2009) 095001 (6pp) — doi:10.1088/0960-1317/19/9/095001

Sub-nanoliter nuclear magnetic resonance coils fabricated with multilayer soft lithography

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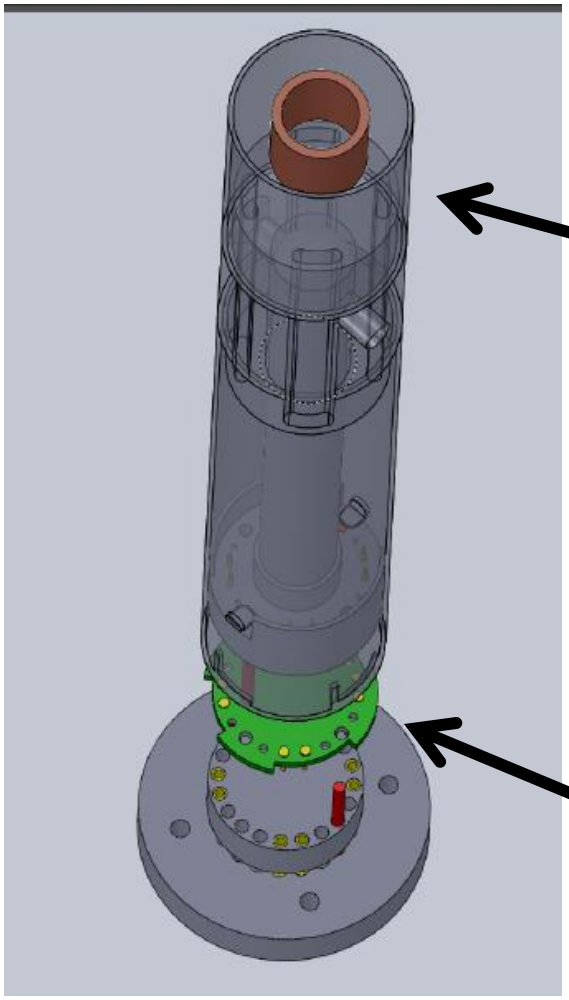
Online at stacks.iop.org/JMM/19/095001

Abstract

We describe the fabrication and characterization of sub-nanoliter volume nuclear magnetic resonance (NMR) transceiver coils that are easily amenable to integration within PDMS-based microfluidics. NMR coils were constructed by the injection of liquid metal into solenoidal cavities created around a microchannel using consecutive replica molding and bonding of PDMS layers. This construction technique permits the integration of NMR coils with solenoidal, toroidal or other three-dimensional geometries within highly integrated microfluidic systems and are one step toward NMR-based chemical screening and analysis on chip. The current proof-of-principle implementation displays limited sensitivity and resolution due to the conductivity and magnetic susceptibilities of the construction materials. However, NMR measurements and finite-element simulations made with the current device geometry indicate that optimization of these materials will allow for the collection of spectra from sub-millimolar concentration samples in less than 1 nL of solution.

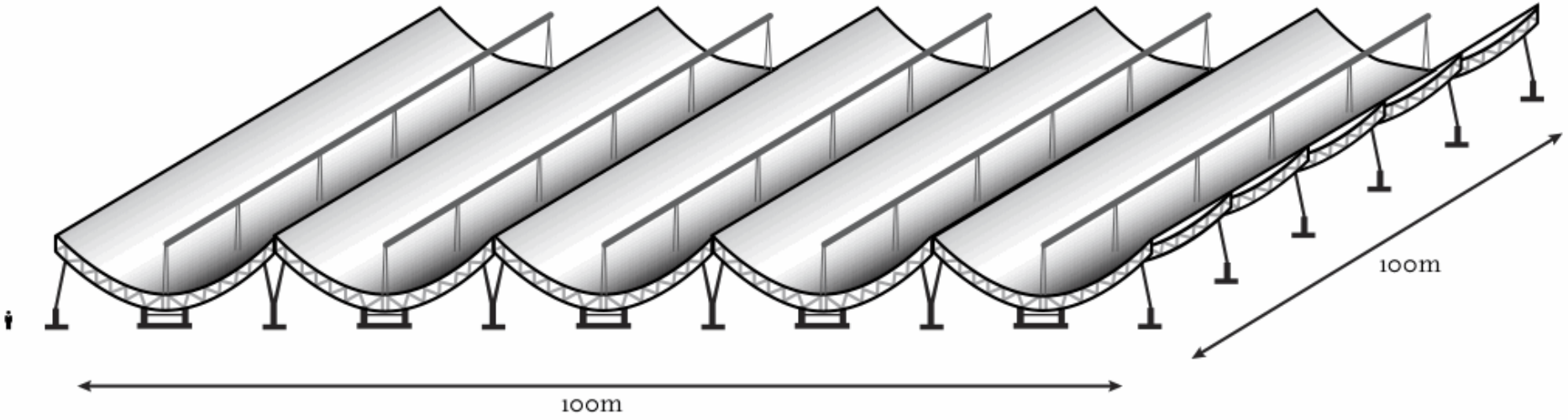
Low-temperature sample transfer mechanism (Josh Folk)



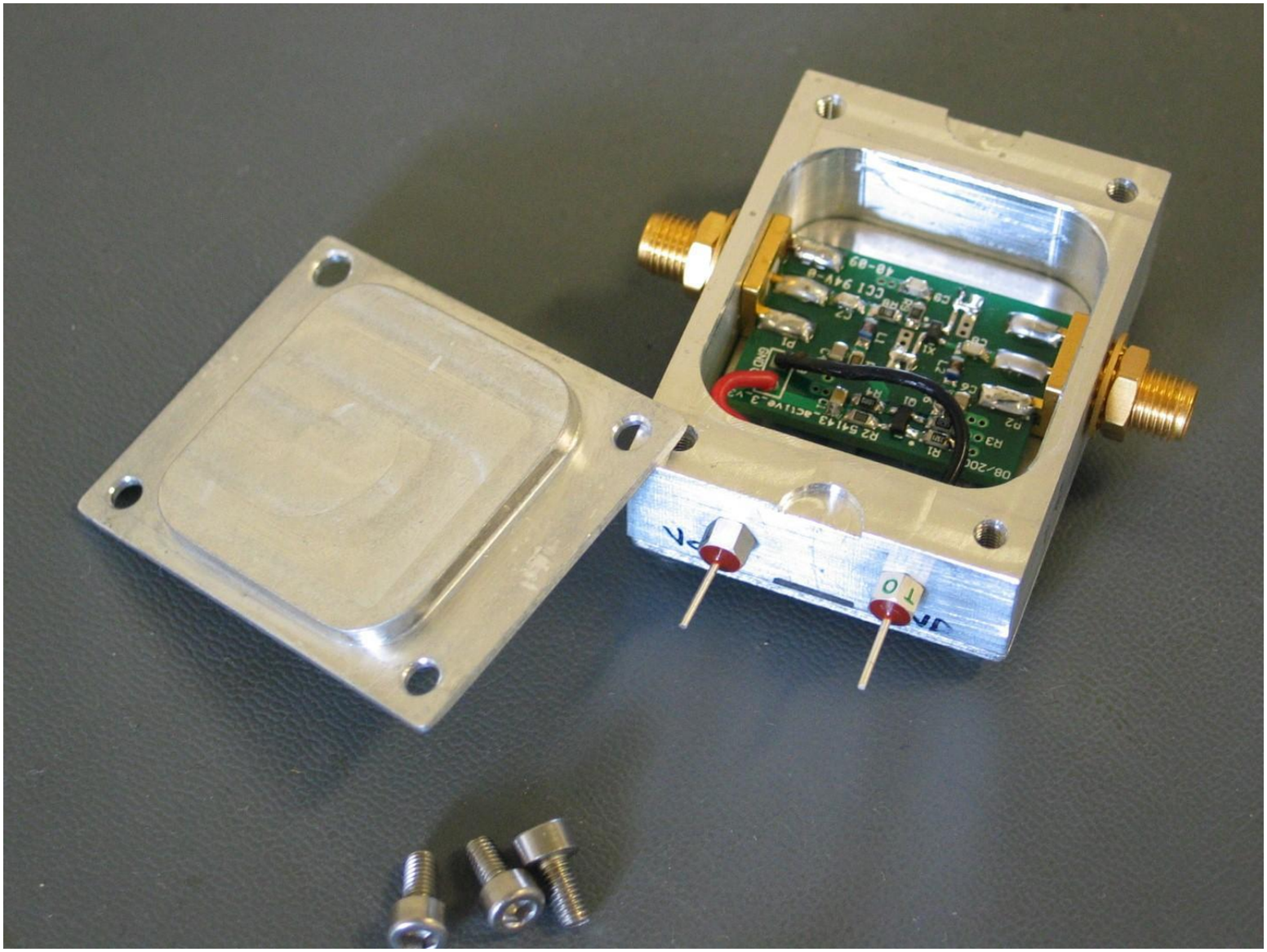
2m long tube reaching into the dilution fridge (0.01K)

Circuit board with sample is ~1cm diameter

UBC CHIME (The Canadian Hydrogen Intensity Mapping Experiment) (Mark Halpern)



$ 11Million. 100m x 100m. Lives in Penticton. Construction started Jan 2013.

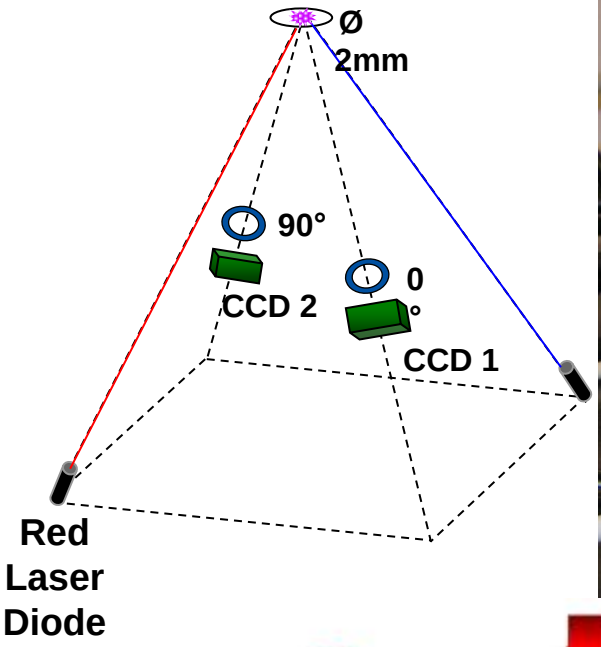


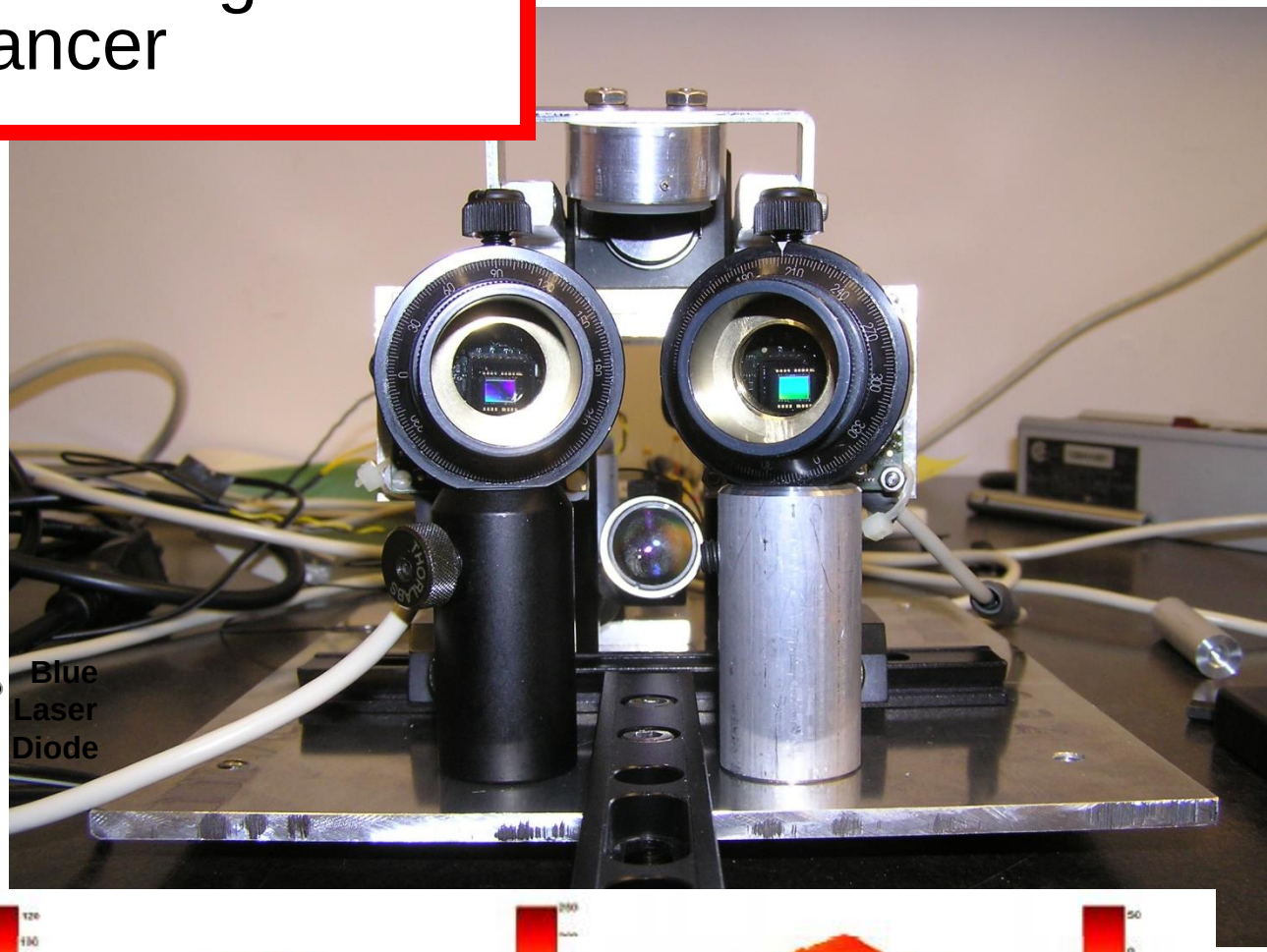
They need 2560 radio amplfier + enclosures. Each box currently costs ~$100. Make it cheaper.

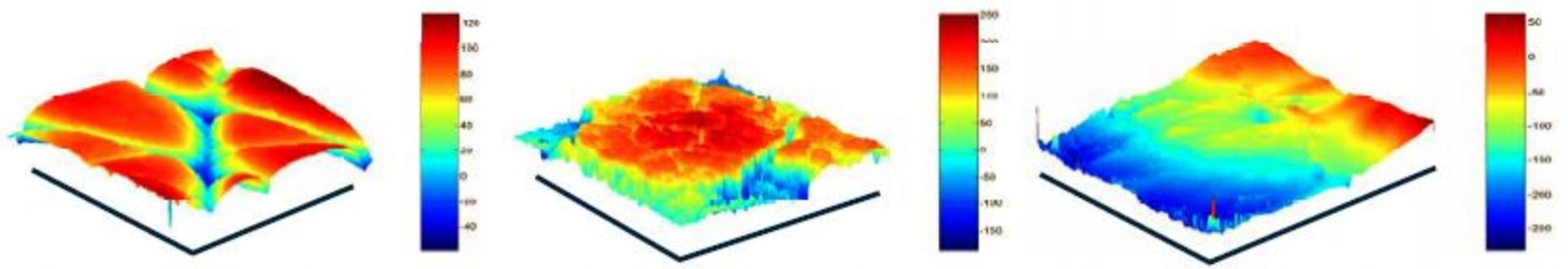
laser speckle imaging for measuring surface roughness and detecting cancer

Tim Lee, Haishan Zeng, Luda Tchvialeva

BC Cancer Agency
CARE & RESEARCH
An agency of the Provincial Health Services Authority



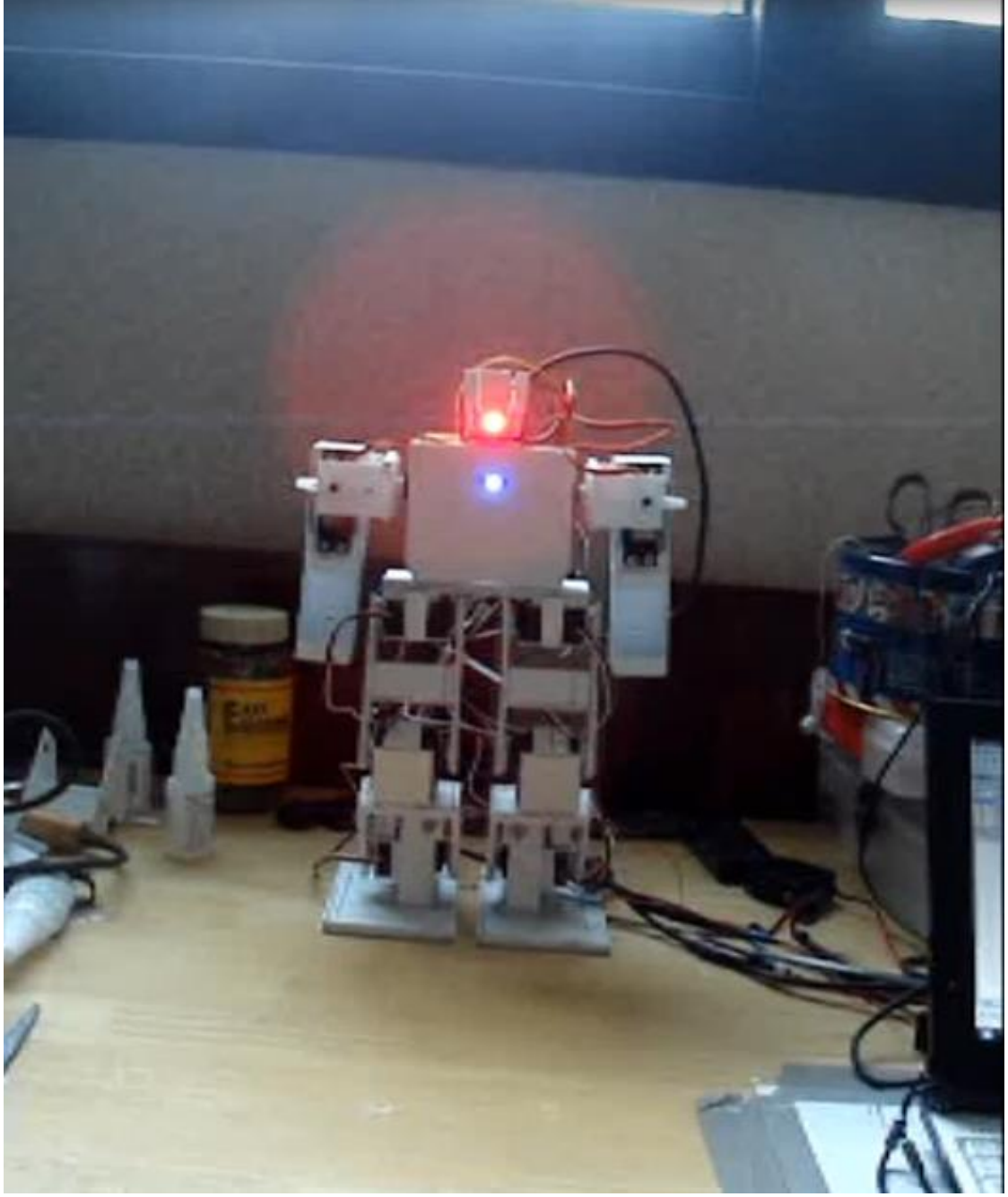




(a) normal skin (b) seborrheic keratosis (c) malignant melanoma.

Recent Self-Sponsored Projects

Walking robot



Automated kite flying for power generation

http://www.youtube.com/watch?v=w5bFlTGGIJs

Surgical flashlight

80 projects posted in Sept 2012

List of Projects

1. Transport Box Redesign (Frogbox)
2. Transport Box Service Station (Frogbox)
3. & Autonomous Sand Painting Robot (EverydayDesign)
4. & Origami Engineering (Olson)
5. Light weight, High strength Egg-carton from 100% recycled fibre (Olson)
6. Quantum Materials Lab - Research Topics (Damascelli)
7. Topics in Acoustics (Waltham)
8. ALS Design Competition (ALSBC)
9. Design and implementation of a temperature compensation system for Silicon-Pl
10. Micro Induction-Heating and Temperature Sensing System (UBC Rapid)
11. & Waste-to-Anything Recycling Machine (UBC Rapid)
12. & Harmonograph (Wanner)
13. Planar Bellows Actuator for Suntracking Array (Lumira)
14. Methods for Monitoring of Human Movement (Leung)
15. Energy conservation and management tools for the home (Leung)
16. An Electronic White Cane for the Visually Impaired (Leung)
17. Error Control Coding for Flash Memory (Leung)
18. Circular Saw Vibration Frequency and Mode Shape Indicator (Schajer)
19. Droplet Sorter (Hansen)
20. Computational Modeling of Hydrodynamic Cell Trapping (Hansen)
21. Human Communication Technologies Lab
22. Assembly and characterization of an ultra-cold atomic jet (Madison)
23. Laser Power Stabilization System (Madison)
24. & Direct digital synthesizer (Madison)
25. Ultra-low noise amplified photodetectors for "atom counting" in laser cooled ato
26. & Hansch-Couillard Stabilized Reference Cavity and Lock (Madison)
27. Miniaturization of a saturated absorption lock for commercial applications of las
28. Ultra-fast intensity stabilization for absorption beam measurements (Madison)
29. & Electronic Photonic Integrated Circuits (EPIC) (Chrostowski)
30. Diffraction Interferometer (Zaber)
31. & Capacitive or Inductive Linear Encoder (Zaber)
32. Light weight direct drive ring stepper motor (Zaber)
33. Black Box Identification of Stepper Motor (Zaber)
34. Design and construction of a position sensor for a scanning tunneling microsco
35. Design and construction of high resolution strain gauges to monitor in real time s transfer arm (Pennec)
36. Submarine Data Logger/Display (UBC SUBC)
37. Submarine Power Meter (UBC SUBC)
38. Submarine Velocimeter (UBC SUBC)
39. Submarine Steering System (UBC SUBC)
40. & Stepper Motor Matrix (TangibleInteraction)
41. System for the Microfluidic Testing of Optical Oxygen Sensors (Cheung)
42. Life Support Systems for AquaVan (VancouverAquarium)
43. & Twitter Parsing Location Information for the Eat St. App (EatStDigital)
44. Microsoft Kinect: (a) computer vision detection of negative obstacles / (b) mounting calibration (Mitchell)
45. Video Recording of Wheelchair Training Sessions on an Android Tablet (Mitchell)
46. Optical Microscope-Based Spectroscopy of Single Nanostructures (YoungRieger)
47. & Numerical modeling of quantum antiferromagnet under a staggered field (Lau)
48. Software development for an numerical scheme for the modeling of quantum antiferromagnet (Lau)
49. Tracking Wandering Residents (HaroPark)
50. 3D Angular Momentum Controlled Satellite (Kotlicki)
51. & Sound-source localization antenna (Hodgson)
52. Building acoustical-environment monitoring system (Hodgson)
53. Replace on-site transformer oil testing, with remote diagnostic device (Grubner)
54. & Modified Bicycle Front Suspension Fork with Electric Motor (Zender)
55. & ROV Construction, Field Test and Trouble-Shooting (Vancouver Aquarium)
56. & Underwater light Project (Dennison/HarveyClark)
57. Pan & Tilt Drop Camera (Dennison/HarveyClark)
58. Bidirectional Single Cable Power and Signal to ROV (Dennison/HarveyClark)
59. & ROV (Dennison/HarveyClark)
60. Digital Caliper Measurement Improvement (SOCRobotics)
61. 3D Printing - now in foam (Kotlicki)
62. RoboCup@Home (ThunderbirdRobotics)
63. Development of a Novel Nerve Refraction modality to facilitate Electrosurgical endoluminal Bladder/Prostate Surgery (N
64. Development of a Magnetic Stone Attractant Catheter for Endourological Ureteroscopy and Laser Lithotripsy (Nguan)
65. Conceptual development of an improved urethral catheterization system (Nguan)
66. Development of a novel imaging method using transcorporeal transmitted light (Nguan)
67. Transblood Imaging of Surgical Areas (Nguan)
68. Development of a System for Assisting Visualization and Tracking of Urinary Stones for Targetting during Extracorpore (Nguan)
69. Web-based Citation Comparison of Scientific Computing Research Articles (Mitchell)
70. Design of a compact high-resolution atomic force microscope for future integration with optics and liquid environment (
71. & Rodent Deterrent (UBCFarm)
72. Novel Tensor-based Features for DTI Registration (Abugharbieh)
73. Virtual Bronchoscopy (Abugharbieh)
74. High Altitude GPS Glider, revisited (Halpern/Waltham)
75. Robotic Parts-Cart for Human-Robot Collaborative Manufacturing (CARISLab)
76. Design and build a high efficiency keel foil for use in robotic sailing competition (UBCSailbot)
77. Develop programing logic and code for a wind direction controlled steering system for use in Robotic Sailing competitio
78. Slipstream Hovercraft Fan Design (Slipstream)
79. Lateral Tilt Axle and Bearing (SunnyHill)
80. Lever Drive Caster for Manual Wheelchairs (SunnyHill)
81. Floor Raiser (Scissor Lift) System (TetraSociety)
82. Suspension Design for UBC Solar
83. Development of a fast load/unload procedure for ultra-low temperature electronics measurements (Folk)

Many recent 459/479 final reports now posted online at UBC cIRcle repository

What is cIRcle?

cIRcle is the University of British Columbia's digital repository for research and teaching materials created by the UBC community and its partners. Materials in cIRcle are openly accessible to anyone on the web, and will be preserved for future generations.

Who's contributing to cIRcle?

- Award Programs and Funding Agencies
- Faculties and Schools
- Graduate Theses and Dissertations
- Institutes, Centres, Programs, Labs
- Journals@UBC
- Library
- Office of the President
- Offices of the Vice-Presidents
- Students
- UBC Affiliates and Community Partners
- UBC Okanagan
- UBC Press

Resources for Self-Sponsored Projects

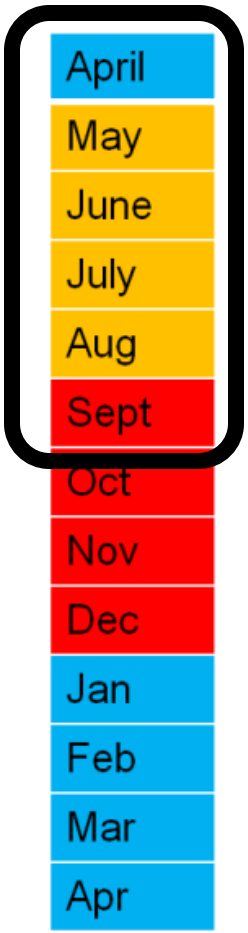
Bycast Prize

- $10k/year for Engphys-based Entrepreneurial teams
- All money awarded to 1 group in 2012/13.
- submissions in Sept/Oct

Mentorship:

- Lean Launchpad (Iain Verigin)
- entrepreneurship@UBC (networking, patent searches, office space)
- Alumni network (get on LinkedIn ENPH group)

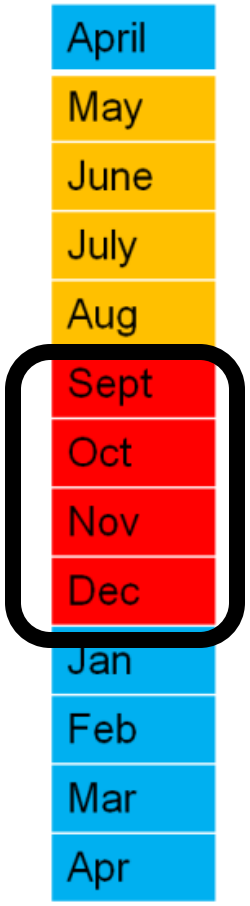
What to do for the next 8 months (before Jan 2014)



Pick your project and group (2-3 people) by September

- Project Lab postings go up in late August.
- Find something fun and genuinely interesting to you.
- See what fits with your future plans (grad school, jobs, references/contacts) – or choose something completely different.
- All Intellectual Property stays with the Project Sponsors – including self-sponsored projects.
- Longer projects might need more credits (ENPH 480/481)

Research + Proposal Preparation until December



3 or 4 iterations from Sept-Dec (Stay in touch with team and sponsors throughout the term)

Proposals submitted for review every 3-4 weeks starting early Oct.

Plan to work 4-6 hours per week.

95% of groups don't do enough research and info gathering and scramble in 2nd term..

Advice from previous 459 students

View it online:

Advice from Previous 459 students

No one has ever said:

"I wish I did less research on my project in first term, I learned too much and was way too well prepared in Jan!"

End with the most important slide

ENPH 459 is a 2-term course. Treat it like a 1year experience

(don't believe SSC when it lists it as only a Term2 course)

April
May
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Summer

ID potential team members (2-3 members per group)
Discuss self-guided projects, possible topics

Term 1 (4-6 hrs/week)

Confirm team members / Project by mid-September
Research and Proposals (3-4 drafts submitted)
Most students on co-op this term

Term 2 (8-12hrs/week)

Project work officially begins
Final Reports submitted