

Canadian Light Source: LESSONS LEARNED: How to GET Industry to Play in the Sandbox



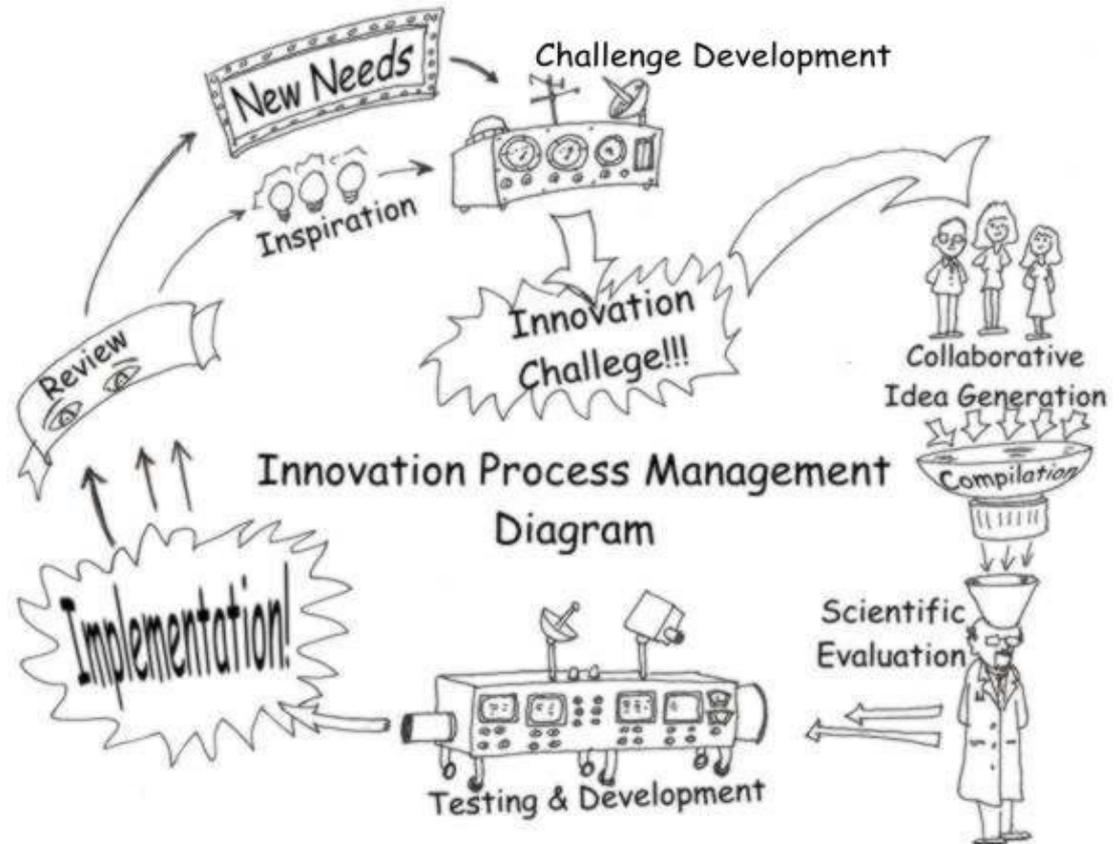
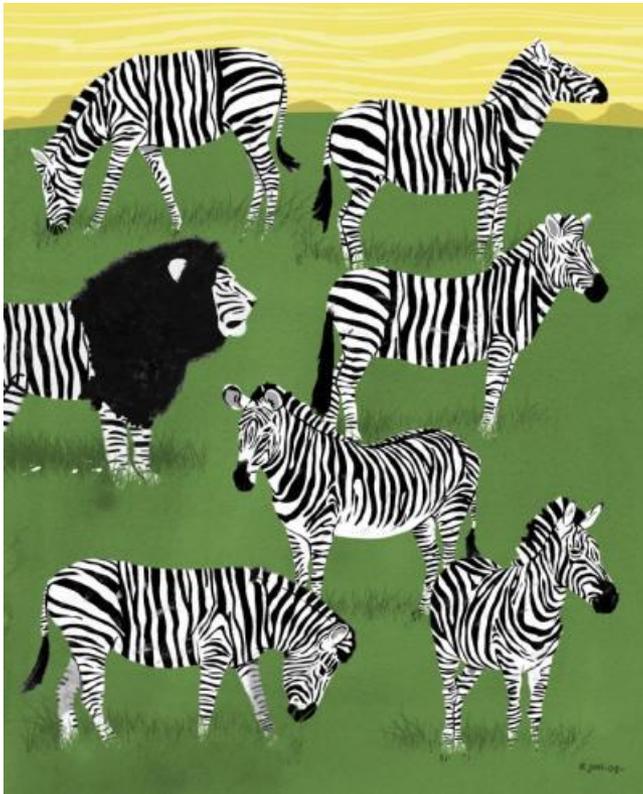
Making a dollar is not a bad word



so let us start with Innovation

Industry needs to innovate

- 1 : the introduction of something new
- 2 : a new idea, method, or device : novelty

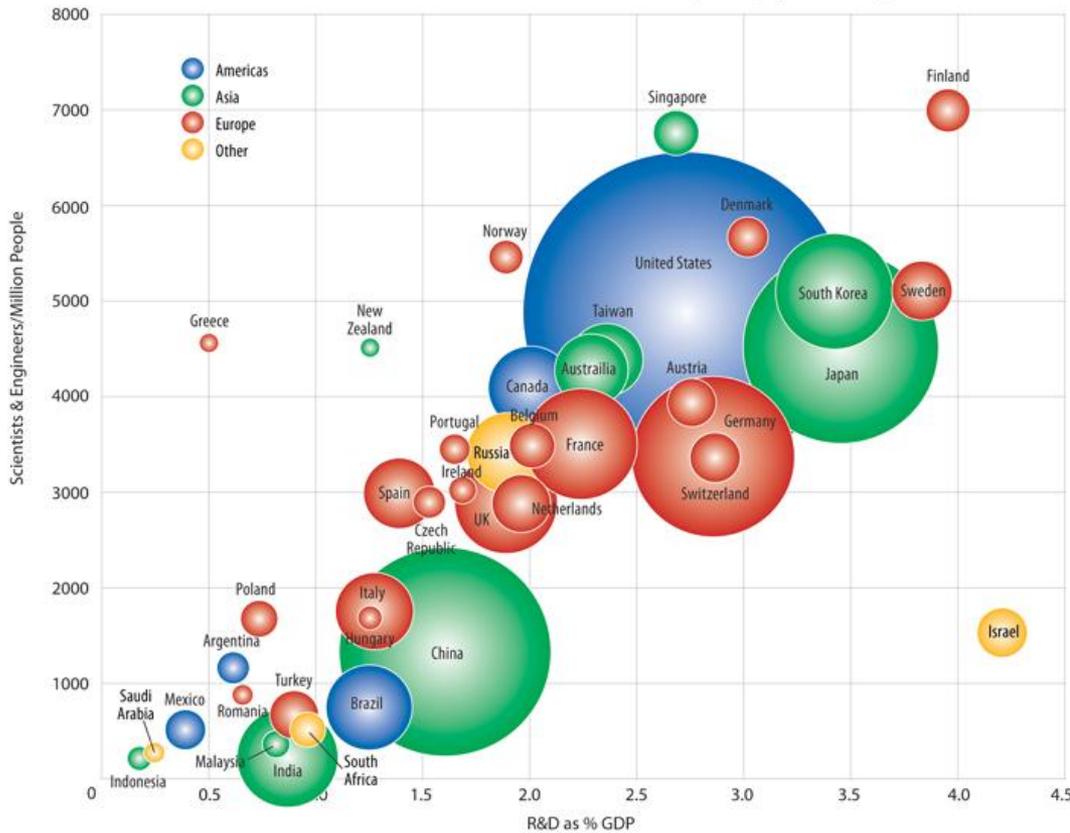


Opportunity for a WIN-WIN

The Opportunity

World of R&D 2011

Size of circle reflects the relative amount of annual R&D spending by the country noted.



Source: Battelle, R&D Magazine, International Monetary Fund, World Bank, CIA World Factbook, OECD

Country	Expenditures on R&D (billions) USD	% of GDP
United States	405.3	2.7%
China	296.3	1.97%
Japan	160.3	3.67%
Germany	69.5	2.3%
South Korea	55.8	3.74%
France	42.2	1.9%
United Kingdom	38.4	1.7%
India	36.1	0.9%
Canada	24.3	1.8%
Russia	23.8	1.0%
Brazil	19.4	0.9%
Italy	19.0	1.1%

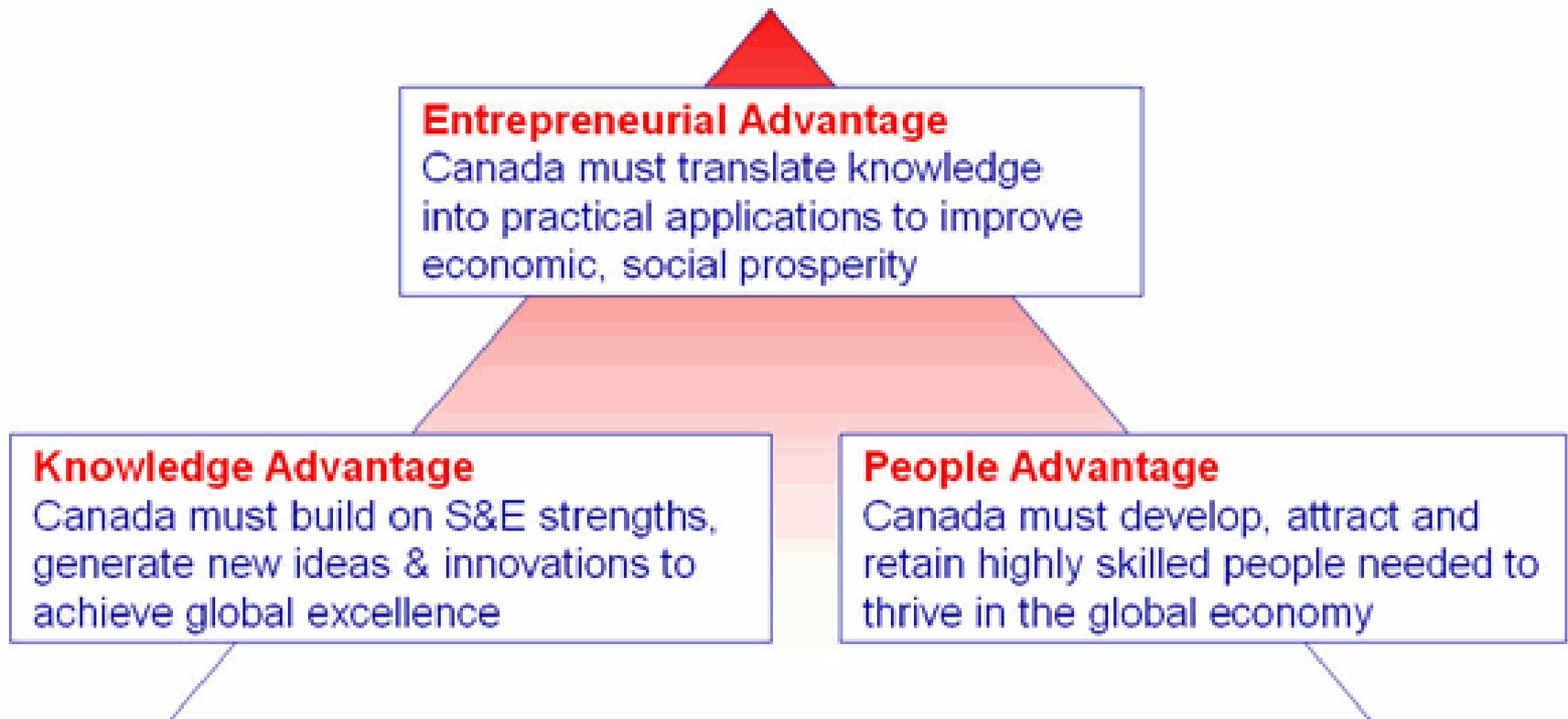
Global total on R&D is ~\$1.4 trillion

Strategic Planning

LESSON 1

What have you done for industry today?

"Canada can no longer be all things to all people; it is time to develop a national strategy to focus on specific paths to Canadian innovation and excellence." - Brenda Lafleur of The Conference Board of Canada



Building on Success

The Canadian Light Source
Strategic Plan
April 1, 2013 to March 31, 2017

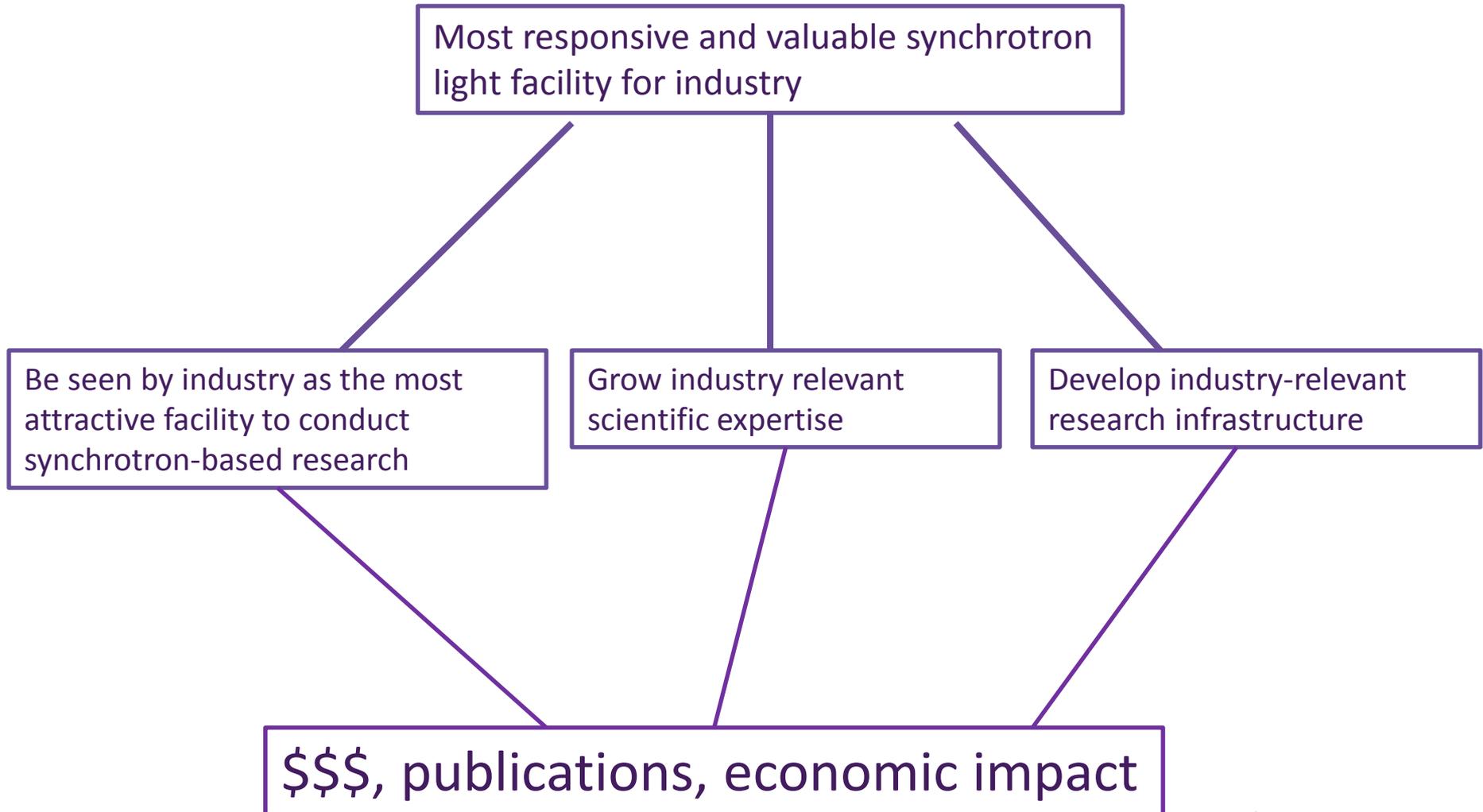
Goal:
: Be a Global Centre of Excellence
in Synchrotron-Enabled Research

Be a Scientific Leader in Canadian
Research and Innovation
Addressing Canada's
Grand Challenges



Canadian Light Source
Centre canadien de rayonnement synchrotron

Objectives for Goal 2



Modes of Access



Up to 25% of the experimental time on all of the experimental facilities to be set aside for first-come first-serve users in which intellectual property ownership is clearly identified and rapid access is an important consideration in scheduling access

Culture

LESSON 2

Culture

The Cycle of Culture and Success



tablexi
Source: www.tablexi.com

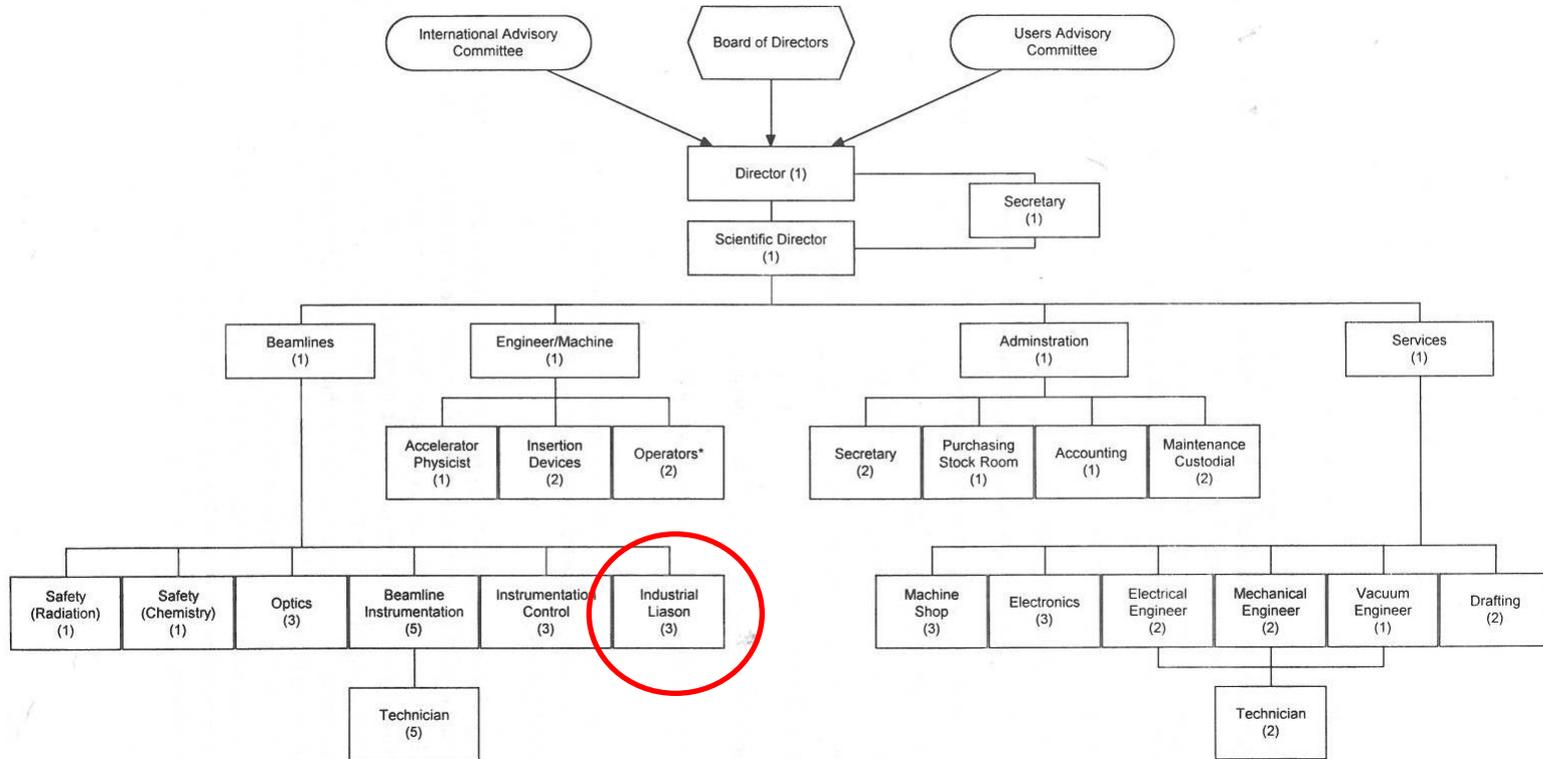


The Early Days

FIGURE 4.1.1

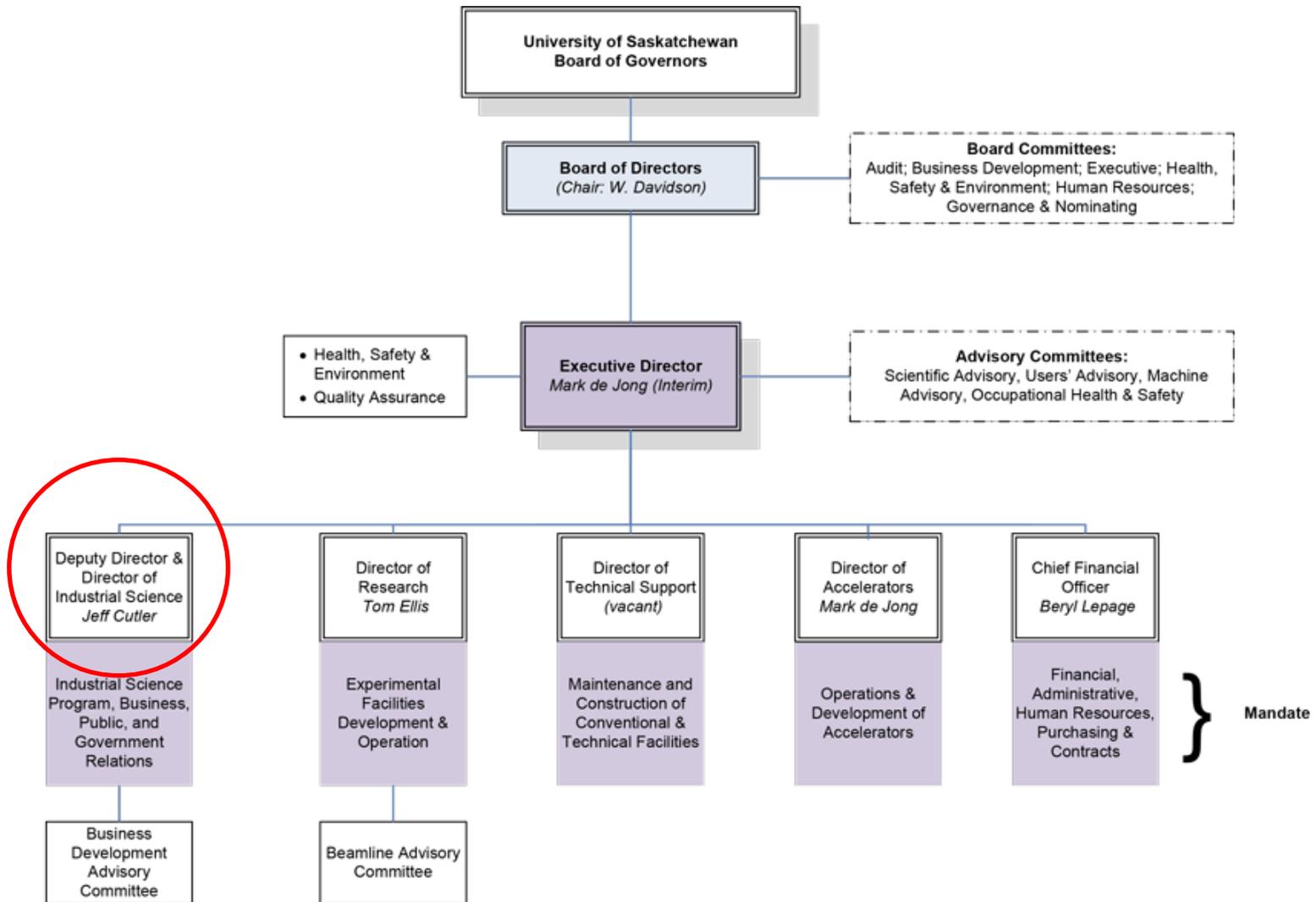
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CANADIAN LIGHT SOURCE ORGANIZATIONAL CHART



Original CLS Proposal - 1995

Today



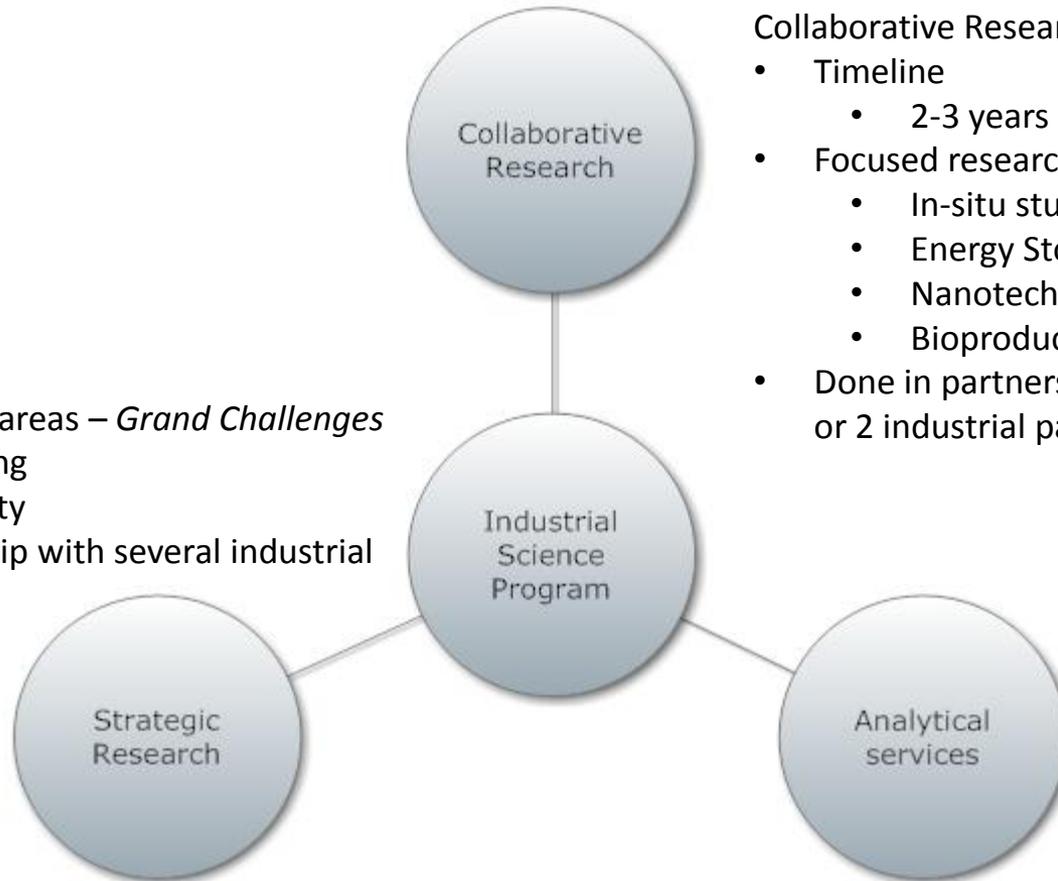
Partnerships

LESSON 3

Modes of Industrial Engagement

Strategic research

- Timeline
 - 3-5 years
- Focused research areas – *Grand Challenges*
 - Green mining
 - Food security
- Done in partnership with several industrial partners



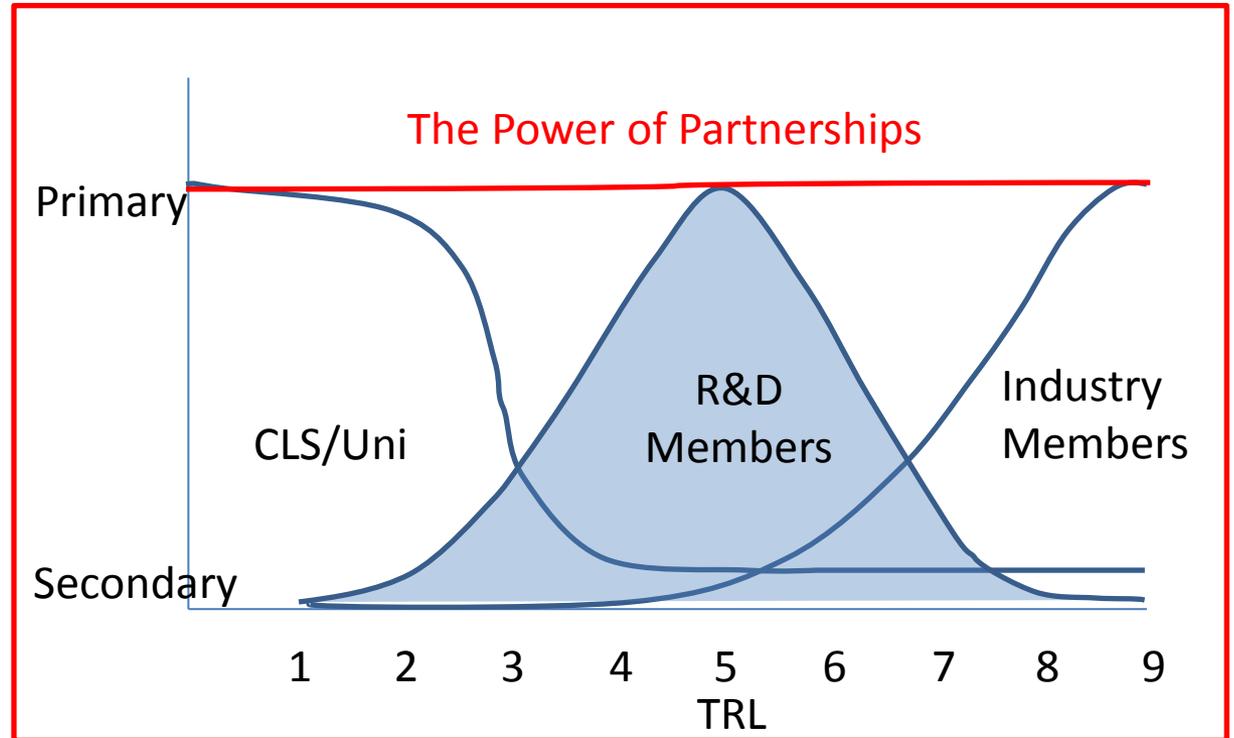
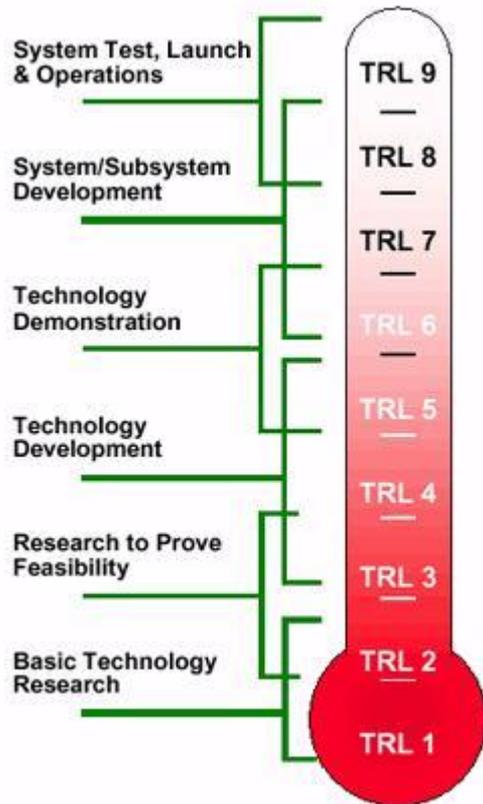
Collaborative Research

- Timeline
 - 2-3 years
- Focused research areas
 - In-situ studies
 - Energy Storage
 - Nanotech
 - Bioproducts
- Done in partnership with 1 or 2 industrial partners

Analytical Services

- Short turn around
- Timeline
 - < 6 months
- Purchased access
 - Mx
 - Academia
- Fee-for-service
 - Chemical speciation

Importance of Partnerships



Engagement

LESSON 4

Targeted Sectors

- **Earth and Environmental Sciences**

- Mining-Metals
 - Exploration
 - Mineral processing
 - Environmental issues
- Oil and Gas
 - Oil reservoir characterization
 - Oil sands
 - Corrosion

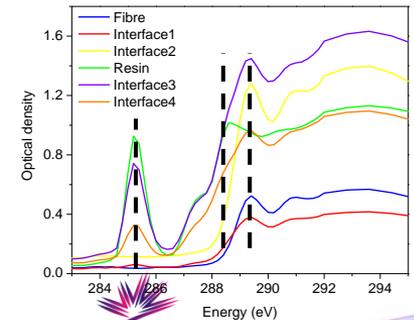
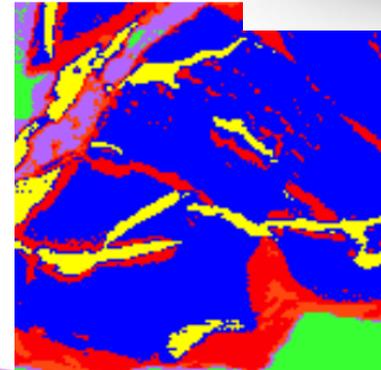
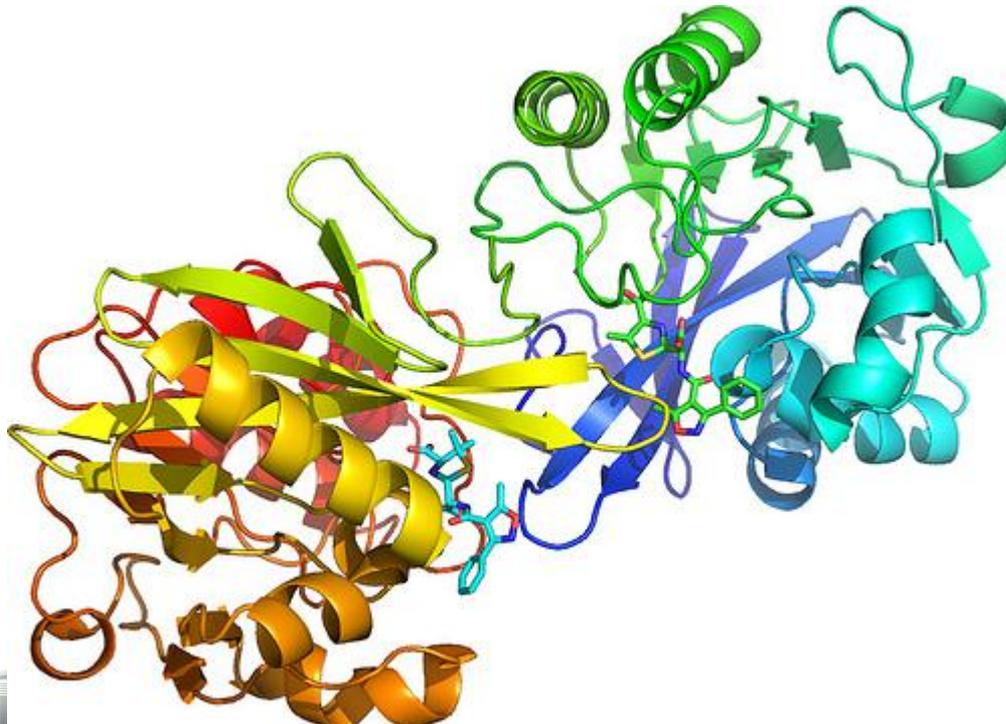
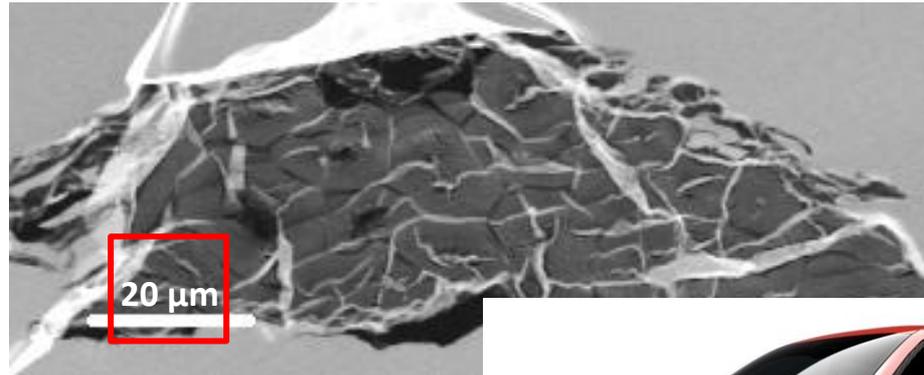
- **Material and Chemical Sciences**

- Aerospace
 - Composite materials
 - Paints and coatings
- Automotive
 - Tribology
 - Novel alloys
- Petrochemical
 - Catalysis
- Energy Storage
 - Batteries
 - Fuel Cells



Targeted Sectors

- Life
 - Agriculture
 - Biomaterials
 - Biofuels
 - Pharma



Analysis

LESSON 5

Analysis of Key Industry Sectors

Aerospace

Collaborative research to focus on the Aerospace sector in which we are building partnership with the Quebec aerospace community and in particular the Consortium for Research and Innovation in Aerospace in Québec (CRIAQ) along with other research organizations including the Composite Innovation Centre (Winnipeg) and Composite Research Network (Vancouver).



Future Major Platforms

Key Technology Matrix

Environment	Advanced Materials	More Intelligent Systems	More Electric Systems	Product Development	Manufacturing	Avionics	Human Performance Augmentation
Noxious emissions reduction	Low cost manufacturing	Sensors	Electric power gen & distr	Future configuration development	Lean	In flight entertainment	Synthetic training environments
Noise emissions reduction	High temperature composites	Network centric	Actuation	Multi-disciplinary design optimization	Agile	In flight business	Advanced diagnostics
Fuel burn	Thermosets	Morphing systems	Power management	Integrated design and manufacturing	Special processes	System integration	Human machine interface
Materials of concern	Liquid composite moulding	Adaptive systems	Environmental control systems	Quality systems and processes	Automated fibre placement	Open platforms	Remote operators
Alternative fuels	High temperature alloys	Autonomous systems	Engine technologies	Lean engineering	Machining	Landing aids	Integrated Electronic Tech Manuals
	Metallics	Air transport system optimization		Virtual prototyping, testing and integration	Joining	Augmented / synthetic vision systems	Environmental database
	Advanced metallic alloys			Advanced product development strategy	Advanced assembly processes	Display systems	
	Hybrids			Logistic system integration	Robotic	Adaptive over life cycle	
	Ceramic Matrix composites			Life analysis	Inspection and repair	Fly by wire/light	
	Metal matrix composites			Prognostics and health management	Near net shape manufacturing	Diagnostics	
	Thermoplastics				Intelligent manufacturing		
	Multi-functional				RFID		
	Nanomaterials						
	Coatings						

Analysis of Key Industry Sectors

- *CLS role in aerospace research*
 - Research and innovation in advanced materials
 - Development of collaborative projects
- *Current Status*
 - CLS is engaging with a number of aerospace research consortia including:
 - CRIAQ
 - Composite Research Network
- *Who the CLS Industrial Science team will work with:*
 - Various OEMs and the supply chain for the aerospace sector
 - Various research centres/institutes which are working on the development of next generation materials, such as the Composite Innovation Centre in Winnipeg, MB and the Composite Research Network in Vancouver, BC
 - University researchers associated with aerospace research projects
 - Various aerospace and space industry associations including AIAC and CRIAQ

Analysis of Key Industry Sectors

- *Capabilities to be developed at CLS*
 - In-situ stress and strain in order to understand failure mechanism
 - Methodologies to characterize the interface chemistry/bonding between different materials systems
- *Potential Areas of Research with Industry*
 - Aerospace Manufacturing Technology
 - Additive manufacturing
 - Development of various composite materials
 - Structural and material performance
 - Non-destructive testing
- *Other industry sectors that would benefit from this research*
 - Automotive
 - Nuclear including power generation, mining and waste disposal
 - Defence
 - Space
- *Industry Tradeshows and Conferences*
 - Aerospace
 - Society for the Advancement of Material and Process Engineering (SAMPE)
 - International Conference on Composite Materials
 - Canadian Association of Defence and Security Industries (CADSI) Annual Meeting
 - Canadian Aerospace Summit
 - CANSEC

Project: Characterization of interfaces in biocomposite materials

Company: Composite Innovation Centre

Point of Contact: Simon Potter

Problem

- In order to develop next generation of biocomposite materials, it is important to improve bonding between fibre and resin
- Collaborative project with CIC, UBC and NDSU
- Part of FibreCity project

Deliverables

- Better understanding of the interface between a fibre and resin
- Quarterly reports will be supplied to CIC
- 1-2 publications

Materials

- Biocomposite samples supplied by NDSU
- Purchasable plant-based standards (lignin, cellulose, etc...)
- Raw fibre and resin

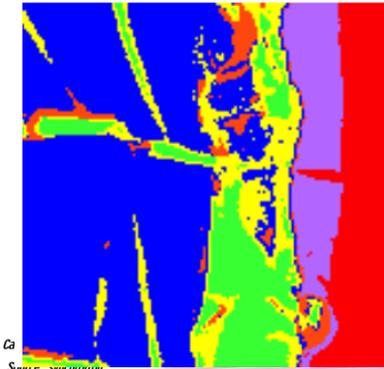
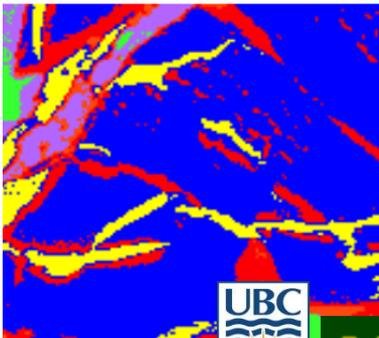
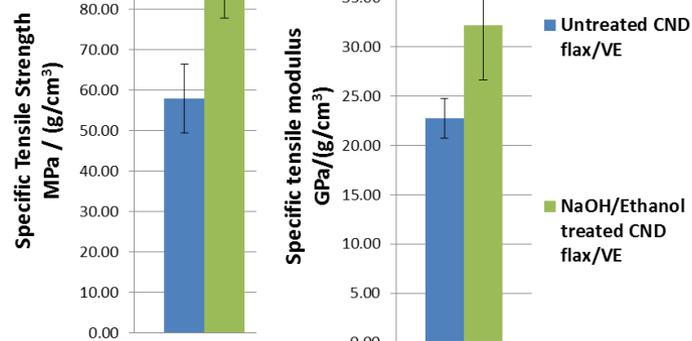
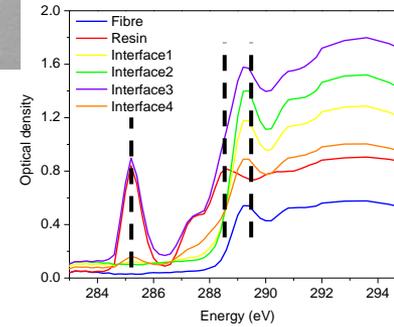
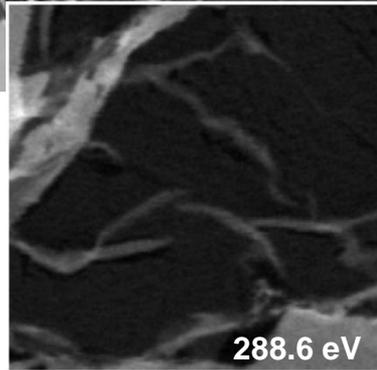
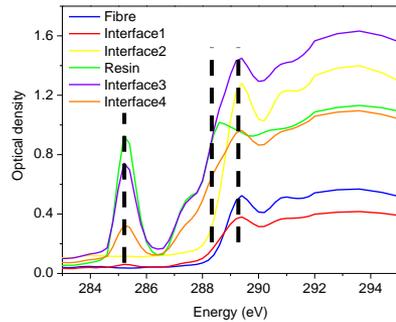
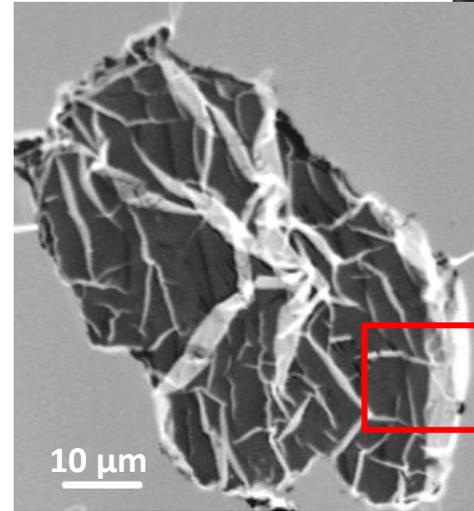
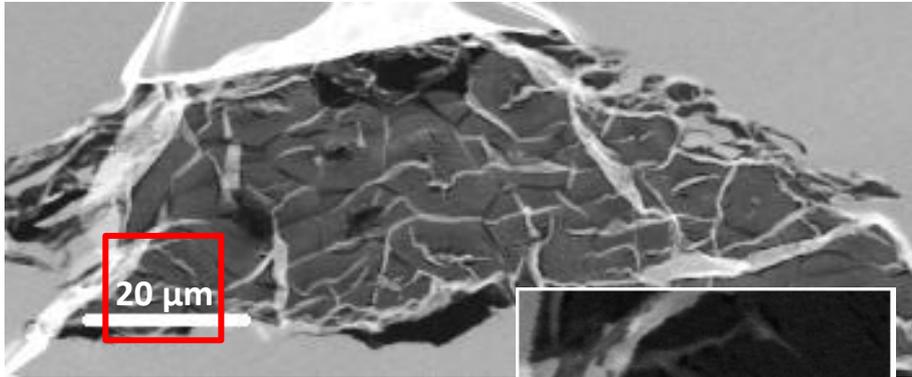
Resources

- **Equipment**
 - STXM
 - Mid-IR
 - Microtome
- **Personnel**
 - 2 staff scientists for data collection and project oversight
 - Post-doc
- **Time – 2 years**
 - 100 shifts beamtime
 - 600 hrs staff time over 2 years
 - 1 FTE post doc for 2 years

Mapping of Fibre Bundles

Untreated Canadian flax with vinyl ester resin

NaOH/Ethanol treated Canadian flax with vinyl ester resin



Can a light source make a dollar?



Yes – but it requires time, effort and patience

Funding Partners



Discussion

