Research in Canadian universities has always been among the finest in the world and there is no exception to this in the area of green chemistry. The field of green chemistry has tremendous potential to have a positive impact on our environment and our lives — if we can get the ideas out of the lab and used in commercial applications. Making that transition involves building a business case and an emphasis on the D in R&D — not traditionally areas of expertise for university researchers.

GreenCentre Canada is a non-profit Centre of Excellence for Commercialization and Research that can fill the gaps between great research and a great business opportunity. GreenCentre has a unique mix of development labs, people with industrial experience, and strong links to both universities and industry with a mandate and funding to bridge the commercialization gap.

GreenCentre works in partnership with university tech transfer offices to help realize the potential in the research. With more companies shifting their emphasis to short-term research, the need for more D to create a successful licensing relationship is growing.

This workshop will look at examples of the challenges of commercialization and discuss how to turn more great research into real impact on people’s lives.
Taking Green Chemistry to Market

Lynn Leger
Commercial Development Director
GreenCentre Canada
May 25, 2010
What is Green Chemistry?

• “Green chemistry” is a chemical philosophy encouraging the design of products and processes that reduce waste, eliminate costly end-of-the-pipe treatments; provide safer products; and reduce use of energy and resources.
## Canadian Green Chemistry

### Impact Across the Chemical Industry

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<th>Oil and Gas</th>
<th>Consumer Goods</th>
<th>Synthetic Polymers</th>
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<th>Energy Storage and Generation</th>
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[GreenCentre Canada](https://www.greencentre.ca)

changing chemistry, changing the world
Is it green chemistry if it does not get commercialized or is it just chemistry?
What makes some types of research better candidates for commercialization than others?

- Excellent Research may be just that and not make a good commercialization candidate
- Research Phase sought to create new knowledge or technology, Commercialization Phase seeks to create a new business opportunity with competitive advantage

**Diagram**

- MARKET ACCESS
- TECHNOLOGY
- INFRASTRUCTURE
- COMPETITIVE ADVANTAGE
Commercializing Chemistry and Materials is Hard!

- The chemical industry is a low margin industry
- Capital costs to implement a new process are enormous
- Need for GREEN will force chemical companies to innovate – but industry has difficulty with undeveloped university technologies
Why Excellent Research is Not Enough

- Government and the public have increased expectations of research impact on the economy; we ignore these concerns at our peril.
- Scale-up work will not typically lead to high-impact publications, so academics are rarely motivated to do this sort of work.
- Industrial considerations are a completely different set of design criteria.
- Different equipment is needed to test for industrial applicability.
The Commercialization Gap

What Academics can deliver:
- Discoveries
- Bench-test proof of utility
- Grams of sample

What Industry wants:
- Discoveries
- Demonstrated scale-up
- Optimization
- Field-test proof of utility
- Kilograms of sample
The “P”s of Commercialization Activities

**Research Phase:**
- Papers
- Prototype
- Patent

**Development Phase:**
- Project Management
- Pricing & Costing
- Positioning
- Process Manufacturing
- Promotion Strategy
- Place – Channel Strategy
- Project Budgeting
- Product Support Infrastructure
- Patents & IP Protection
- People Issues & Management of Change
- Product Stewardship & Regulatory
- Product Development & Field Testing
- Proforma Financials & Investment
- etc
The Challenges of Commercialization – Peptide Example - Chimica Oggi June 2003 paper Marder & Albericio

• “Peptides play a key role in the post-genomic and proteomic era. From an industrial basis, the formation of the amide bond is crucial for obtaining an efficient and economic process...Nowadays, peptides represent 1% of total API with a market of US $300-500 M per year and a growth rate of 15-25% annually”
The Challenges of Commercialization – Peptide Example - Chimica Oggi June 2003 paper Marder & Albericio

• “There are more than 80 reagents known today, However only a few have found their way to the industry…..”

• What is a good coupler from the industrial point of view?
  • Effective Coupling Reagent
  • Cost-Effective Reagent
  • Safe for Producer, User, and Environment
  • Can be Produced in Large Quantities”
• “Despite the presence of novel, highly effective coupling reagents, the classical activators have remained in the market for years. We could point out a few reasons to define this fact:
  • Influence of the human factor, which includes inertness or unavailability of human resources…
  • Marketing problem…
  • Supply chain when the information about new products does not always find its addressee
  • Role of existing regulation requirements”
Keys to Success in Commercializing Green Chemistry

- Make connections
  - Build a team with a wide range of skills that understand the role that they play
Keys to Success in Commercializing Green Chemistry

- Expect the unexpected
Keys to Success in Commercializing Green Chemistry

- Follow the money
  - Early and often – know the impact of changing costs and assumptions as they happen
  - Sustainable

Source: SDTC Sustainable Development Technology Canada
Keys to Success in Commercializing Green Chemistry

• Know your story
  – Clear well-communicated common vision among the team – know where you cannot compromise
Keys to Success in Commercializing Green Chemistry

• Keep asking:

GreenCentre Canada
A New Model for the Commercialization of Green Chemistry Technologies
greencentrecanada.com
GreenCentre Canada

Overview

• GreenCentre Canada (GCC) is a CECR funded with $23 million from two levels of government.

• Working closely with industry and universities, GCC helps to bridge the industry-academic gap by developing, de-risking and transferring Green Chemistry discoveries.

• We are academia’s gateway to the global chemical & materials industry and industry’s portal to Canada’s premier Green technologies.
GreenCentre Canada
Overcoming the Gap

GCC represents a comprehensive and collaborative approach to commercializing Green Chemistry technologies.
GCC Facilities for Development and Scale-Up

- GCC Lunch Room
- Office
- GCC Lunch Room
- Directors & Commercialization Managers
- Reception
- Scale Up
- Lab Space
- Researcher Offices

GreenCentre Canada
changing chemistry, changing the world
What Does GreenCentre Do?

1 - Analysis

- GCC conducts a quick review of the technology to see if it fits our mandate (filter out about 10-20%)
- GCC takes a 90-day license option and conducts a thorough assessment of market opportunity, technology maturity, competition, price and required next steps
- GCC’s industry partners comment on the analysis
- Analysis is shared with the institution even if GCC decides it cannot commercialize
What Does GreenCentre Do?

2 - Development

- If GCC wishes to commercialize (10-20%) it signs an exclusive license with the institution, and will return 75% of all profits to the institution/inventors
- GCC invests its own scale-up resources to close the market gap
- GCC partner companies may co-invest in the research
- In some cases where additional exploratory research is required, GCC will fund work in the university ($500k per year budget)
What Does GreenCentre Do?
3 - Commercialization

- GCC will pay patent costs
- GCC will support additional scale-up to pilot level through its partners if required
- GCC may market new compounds through a “web store”
- When invention is market-ready GCC will advise its industry partners for “last call” and market the technology
- GCC will license the technology or create new start-ups and start sending $ back to the creators
Close Partnership with Industry

- Industry partners review every project disclosure and receive option to license

- NOVA Chemicals
- NexCycle
- Stepan
- Fielding
- Varian
- Bayer
- Pressure Chemical
- Albonia IT
- Polycorp
- Veolia
- Ford

- Resource Extraction
- Petrochem.
- Bulk Chem. & Materials
- Fine Chem. & Pharma
- Consumer Goods Manufacturing
- Retail
GreenCentre Canada

A New Model for the Commercialization of Green Chemistry Technologies

greencentrecanada.com