

GREEN AND SUSTAINABLE CHEMISTRY IN NEW ENGLAND

EPA Region 1 Initiatives

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The Concept of risk



- ▣ Risk = Hazard x Exposure

- ▣ All chemicals have some level of intrinsic hazard
 - ▣ Physical
 - ▣ Toxicological
 - ▣ Global
- ▣ Traditional risk reduction has focused on reducing exposure which will always fail
- ▣ Treating disease: Remediation
- ▣ Preventing Disease: Green Chemistry

Green Chemistry and EPA

- Green Chemistry began at EPA
 - Alternative Synthetic Pathways (1990)
 - Benign by design (1994)
 - Green Chemistry Principles (1998)
- USEPA Regional efforts instituted in 2009/2010
- State Efforts
 - California
 - Michigan

Green Chemistry and Sustainability

- ▣ NRC Report
- ▣ Incorporating GC as part of overall sustainability efforts
- ▣ The trajectory we are on now is unsustainable
- ▣ The tools of sustainability begin at the molecular level
- ▣ We make safer chemicals not only because we can, but because we must

Sustainability

Meeting the needs of the present without compromising the ability of future generations to meet their needs."

(The U.N. Brundtland Commission 1987)

Society

- Improved public health
- **People**

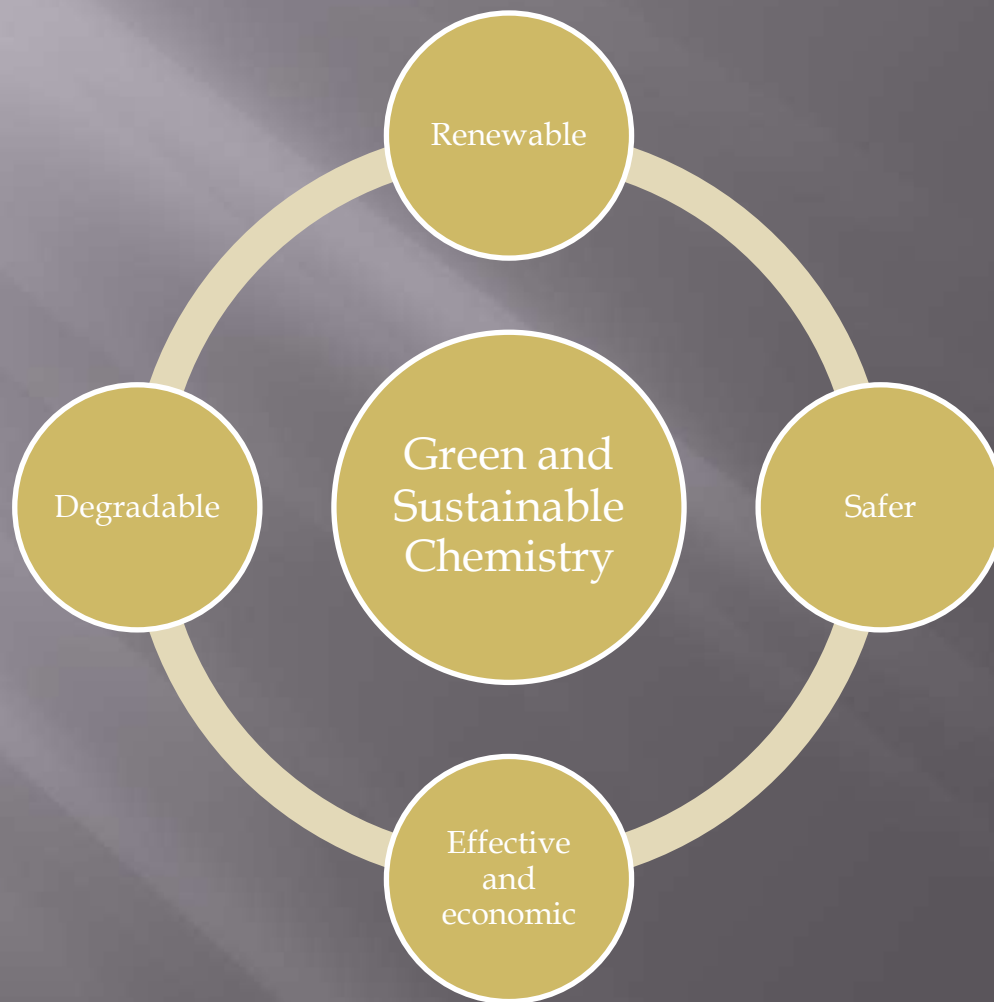
Environment

- Reduced environmental hazard
- **Planet**

Economics

- Economically favorable
- **Profit**

Four Pillars of Green and Sustainable Chemistry



NE Green Chemistry Challenge

- ▣ *Mission: To broaden the understanding and adoption of green chemistry practices and principles in business, education, government, health care and society as a catalyst to grow a sustainable economy in New England*
- ▣ **Goals**
 - Understand the relationship between Green Chemistry and Sustainability
 - Support a transformative dialogue about innovative ways to achieve hazard reduction
 - Promote a New England economy based on local resources, trained labor force, and research capacity

New England Green Chemistry Forum

- ❑ December 2010 at MIT
 - Brought together experts from all sectors associated with green chemistry
- ❑ Second meeting in June 2011
 - Successful; refined the goals focused workplans
- ❑ A series of five short videos are nearing the final stages of production. These videos are geared toward certain sectors to inform and invite participation in green chemistry efforts.
- ❑ Region 1 will co-host the *Green Chemistry Commitment Summit* scheduled for January 10th 2012. The goal of the summit is to bring together academic chemists from colleges and universities in New England and commit to incorporating Green Chemistry into the chemistry curriculum as part of the fundamental training of the new generation of chemists.
- ❑ 21st century chemistry

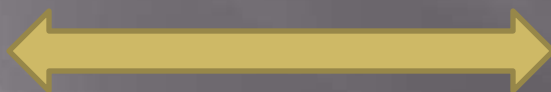
More Region1 GC efforts

- ▣ Greening high school, hospital and university labs
- ▣ Developing an inventory of GC successes
- ▣ Replacing petroleum-based chemicals with bioplastics in 11 hospitals
- ▣ Working with business, NGOs, venture capital and hospitals

Making the business case for Green Chemistry

- ▣ Innovation
- ▣ Increased profits
- ▣ Decreased costs
- ▣ EPA is open to better ways of doing business

EPA



Business

Drivers and Barriers

▣ Drivers

- Ethics
- Improved public and environmental health
- Economic
- Business advantage

▣ Barriers

- Economic
- Institutional
- Regulatory
- Technical
- Organizational
- Measurement/Metric

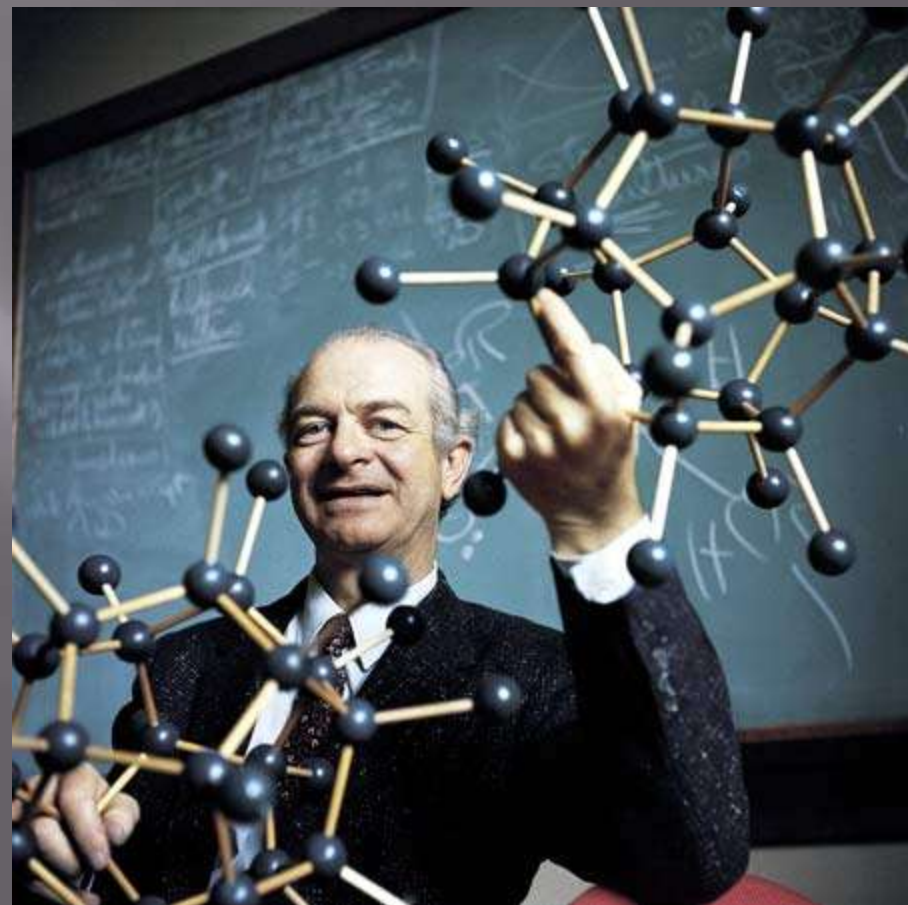
Chemical regulations

- ▣ **This just in:** You've learned that a chemical you use is on a new list of chemicals for potential regulation
 - USEPA
 - REACH

Who ya gonna call?



Regulate? Your Attorney



Innovate? Your Chemist

Needed for Success: Working together

- ▣ Academia
 - Discovers what is possible; the technical promise
- ▣ Business
 - Innovates with the possible in identified markets
 - Sustainability can exist with profit
- ▣ Government
 - Provides insight to problem formulation
 - Promotes collaboration
 - Regulation is important for setting the floor

Anticipated growth of GC industry

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Green Chemical Industry to Soar to \$98.5 Billion by 2020

June 20, 2011

Green chemistry encompasses a broad area of endeavor. It is not covered by a narrow definition and does not offer a "silver bullet" type solution because it is essentially a reaction to a variety of issues. Ranging from dangerous and wasteful production processes and a heavy reliance on increasingly expensive petroleum to the persistence in the environment of toxic substances with far-reaching (and increasingly well-understood) effects on human and animal growth, these problems call for equally diverse solutions. Green chemistry is the expansive discipline that is evolving in response to this wide array of challenges and, according to a new report from [Pike Research](#), represents a market opportunity that will grow from \$2.8 billion in 2011 to \$98.5 billion by 2020.

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Summary

- ▣ The tools of sustainability begin at the molecular level
- ▣ Must look at system based solutions for systems-based problems
- ▣ Must employ transformative innovation
 - 4x-10 improvement; not just incremental
 - Land line to cell phone
 - Decaffeinated coffee
 - Lotus leaf technology

Summary (2)

- ▣ The USEPA has taken a leading role in advancing Green Chemistry
 - Region 1 New England is engaged and committed
- ▣ Green Chemistry is innovative allowing scientists and business to seek out safer chemicals alternatives that are effective and economic
- ▣ There is a continuum of hazard reduction, challenging chemists and toxicologists to approach zero risk

Thank you



- ▣ Mark Rossi *et al.* at Clean Production Action
- ▣ Staples
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