Class 26: Wrap Up
Meg, Akos, Mike, Chris, Joe, Alastair, John, and Marty

1) What is the most important message/concept to understand from each of our disciplinary perspectives?

2) What is the most important general message/lesson from Green Chemistry?

Bridging the Gap Between Environmental Health Sciences and Chemical Design

Tools and methods for the practice of green chemistry are still being developed. Many of what are now our best achievements will be seen as inadequate and will be surpassed in the future.

The shift toward new ways of doing chemistry is not just an incremental change in technology. It involves systems change, and at some levels requires changing ways of thinking.

Think solutions!

Mike
Business's Role in Green Chemistry

- Huge! Important!!
  - R&D, manufacturing, marketing
  - Chemical design
  - Product design
  - Process design
  - Designing new inter-firm relationships
    - Supply chain management
    - Roles in waste reduction/product recycling
  - Regulation – lobbying power
    - My book \(\rightarrow\) very important positive role historically - not just negative!

Businesses role in Green Chemistry

- Firms are starting to take initiatives in all these spaces due to
  - Regulatory prodding
  - Customer prodding/requirements (supply chain)
  - And voluntarily – leadership, corp social responsibility
- But not enough!!
- Externalities and information gaps at every step
  - To resolve we need
    - better regulation
    - better consumer education
    - industry to step up to plate on regulation

Law provides a set of incentives and disincentives that shape the economy.

Our current environmental laws generally presume that the economy provides a net benefit to society, even where there is damage to public health and environment, and place the burden of proof on government to prove otherwise in order to prevent harm.

This preference for economic activity and the focus by law and the economy on net benefit of individual activities is ignores, and is not capable of constraining, the overall total human footprint to a sustainable scale. That footprint is growing beyond the capacity of the earth to sustainably accommodate it.

TSCA has three essential flaws: the data gap, the safety gap and the technology gap.

Global chemicals policy reform in the EU (REACH), the US (TSCA Reform) and California (GCI) aim to fill these gaps by requiring publicly available data to be produced about chemicals in commerce and adopting more precautionary legal tests for safety.

These changes are intended to correct current market flaws so that demand for green chemistry can drive production of safer chemicals and the government can more systematically protect human health and the environment.
From my perspective as a chemist:

- Chemistry has a huge societal impact
- Chemists need to consider wider implications of their work
- The general public does not always recognize the good things chemists do, but focuses on the problems
- Metrics to gauge the impact and importance of problem chemicals are needed; different people (groups?) have different tolerances, thresholds
- GC-thinking has the potential to change the way we all think about chemistry

Component of Green Chemical Design

- **Materials**
  - Bio-based
  - Minimize solvent and auxiliaries
  - Safer solvents
- **Reactions**
  - High-yielding
  - Atom and energy efficient
  - Room temperature and pressure
  - Catalytic
- **Products**
  - Design for end of life (degradable or recyclable)
  - Consider toxicity

Safer and more elegant chemistry

Alastair

- Social Norms
- Information
- Fill in the Gaps

New legal norms cannot transform society unless they are supported by social norms.

YOU are critical to the creation of these new social norms.

http://www.dinokengscenarios.co.za/scene_summary.php
Making Green Chemical Design A reality....

Current Considerations
- Performance
- Safety
- Cost

Future Considerations
- Performance
- Safety
- Cost

Data Gathering and Communication

...Requires a broad perspective

Number of People
- Engineers
- NGO's
- Executives
- Undergraduate Students
- Workers
- Academics
- Policy Makers
- Public

Ability to Influence Chemical Design

1) How will you apply Green Chemistry?

2) Comments about the class.

Final Items
1. Monday May 2nd Poster Session 4-6 pm in Bixbie Commons.
2. Posters for printing 48” max small side by end of day tomorrow.
3. All course assignments need to be turned into your course advisor by May 6th (Friday of Next week).
4. Please complete the email survey
5. Please Complete the appropriate University Survey and return to appropriate envelope