CENTER FOR GREEN CHEMISTRY & GREEN ENGINEERING AT YALE
The Center’s Work

Advancing the Science
- Basic research
- Technical workshops
- Research tools
- Promote research investment
- Advance the research agenda

Catalyzing Implementation
- Industrial partnerships
- Policy advancement
- Benchmarking
- Roundtables
- Assessment protocols

Preparing the Next Generation
- Education materials
- Yale courses
- Training trainers
- Graduate workshops
- Faculty training

Raising Awareness
- Conferences/symposia
- Books
- Multi-media
- Web presence
- Public engagement
Core researchers

Chemistry

Chemical / Environmental Engineering

Forestry / Environmental Studies
Collaborators

Northeastern – George Washington
Duke – Baylor – Harvard

African Power Initiative
Monash – Waseda – Hunan
Chinese Academy of Science – RWTH (Aachen) – IUCT
Research Areas

• Materials
• Energy
• Water
• Systems
Designing Safer Chemicals

Deriving empirical rules that can be used by chemists and engineers to guide the design of chemicals with reduced toxicological, environmental, physical, and global hazards.
Designing Safer Chemicals


Safer nanomaterial design

Understanding relationships between surface functionalization and toxic effects of single-walled & multi-walled carbon nanotubes
Lifecycle assessment of algae-to-fuel and algae-to-chemical technologies

Calculating energy flows and comparing alternative technologies for cultivation, harvesting, and processing of microalgae.
Lifecycle assessment of algae-to-fuel and algae-to-chemical technologies


Improving extraction methods for algal lipids in biofuel production

Using supercritical CO₂ to optimize efficiency, selectivity, and reduce hazard.
Biopolymer Sorbents for Arsenic Removal

Developing a point-of-use water treatment technology for areas lacking modern infrastructure; treating wastewater effluents containing oxyanions
Biopolymer Sorbents for Arsenic Removal


Catalytic transformation of lignocellulose

Developing new catalysts and methods for controlled transformation of lignin and lignocellulosic materials.
Catalytic transformation of lignocellulose


NSF-MUSES (Materials Use: Science, Engineering, and Society)

Modeling and analyzing the use, efficiency, value and governance of water as a material in the Great Lakes region through an integrated approach.

Educational programs

Teaching green chemistry and green engineering to New Haven Public Schools students.
Green chemistry and policy

Promoting the integration of GC&GE with US and international chemical policy.

A Proactive Approach to Toxic Chemicals: Moving Green Chemistry Beyond Alternatives in the “Safe Chemicals Act of 2010”

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During the lifecycle of chemical production and use, there are several drivers for action on chemicals management legislation including (1) recent concerns on the part of nongovernmental organizations and the public about particular chemical hazards (BPA, phthalates, etc...), (2) strict state level chemical regulations, and (3) the enactment of a comprehensive chemical regulation program by the European Community known as Registration, Evaluation, Authorization and Restriction of Chemicals substances (REACH). Further, in 2009, EPA Administrator Lisa Jackson laid out the Obama Administration’s key priorities for TSCA reform (1). This was accompanied by similar proposals from industry and the NGO communities indicating a desire to update TSCA.

Many of the provisions included in the recently proposed legislation, such as shifting the burden of data provision from the EPA to industry, are widely supported. Other elements, such as what data should be provided, how chemicals will be prioritized, the scope of EPA’s authority to take action, and whether it is feasible to “prove” the safety of a chemical have emerged as topics for vigorous debate.

Among the many elements in the current bills, there is one provision, “Green Chemistry,” that has the potential, in the long term, to drastically change the paradigm of the chemical enterprise. Green chemistry, simply defined, is “the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances” (2). Based on 12 Principles (2), Green Chemistry is a systems-based approach for reduced hazard across the entire lifecycle of chemicals, from design, manufacture, and use to
Alumni

- Carbon Recycling International
- George Washington U. (Faculty, Chemistry)
- London School of Economics (Faculty)
- MWH Global (Water Resources Engineer)
- National Science Foundation (AAAS Fellow)
- Northeastern U. (Faculty)
- Novozymes (Production Chemist)
- Royal Haskoning (Consultant)
- University College, London (Faculty)
- VeruTEK (Senior Research Scientist)
- Wageningen Research U. (Postdoc)