聲明

本檔案之內容僅供下載者自我學習或推廣化學教育之非營利目的使用。並請於使用時註明出處。例如「本頁取材自○○○教授演講內容」

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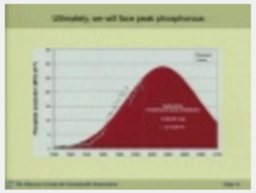
Presentations on Demand

20th Annual GC&E Conference

Track: Green Chemistry and Engineering (GCE)

Session: (THU-AM)
Design of State of the Art Green Chemistry Curricula

Presentation	Title	Presenter(s)
	Green chemistry education roadmap: Overview and update (GCE264) View detail	Jim Hutchison
	Infusing the concepts and tools of toxicology into the chemistry curriculum (GCE265) View detail	Adelina Voutchkova
	Embedding systems thinking in the chemistry curriculum (GCE266) View detail	Eric Beckman
	Toxicology experiments in the general chemistry laboratory curriculum at UC Berkeley (GCE267) View detail	Laura Armstrong, Michelle Douskey

Education Roadmap

Roadmap Timeline

- Visioning Workshop (Fall 2015)
- Community Feedback on the Outcomes of the Visioning Workshop and Core Competencies
- Roadmapping Workshop (June 2016) - *Coming soon!*

Soliciting Broader Stakeholder Input

It is important to gather broader input/feedback from the community about two key elements of the education roadmap: the Roadmap Vision and the set of green chemistry core competencies that every student with a bachelor's degree in chemistry, chemical engineering and allied sciences should attain by graduation. These two elements serve to anchor the roadmap.

How to Get Involved

Contact gci@acs.org

For more information see this recent article in from C&EN.

Click to take Survey

Take this quick survey to provide your input on the education raodmap!

https://www.acs.org/content/acs/en/greenchemistry/students-educators/education-roadmap.html

Roadmap Vision

- The practice of chemistry changes…
  - From: minimal regard for environmental, safety, or health impacts
  - To: minimize adverse environmental, health, and safety impacts
- The “pull” of demand for green chemistry changes…
  - From: a little substantive benefit
  - To: a pivotal role in advancing sustainability and commercial success
- Green chemistry core competencies …
  - From: Chemistry graduates are not conversant in chemistry related to sustainability
  - To: Chemistry graduates leverage green chemistry strategies and tools in chemistry related to sustainability
- Chemistry education and academic enterprise …
  - From: Green chemistry is supplemental to core course work
  - To: Faculty are well-versed in and infuse green chemistry concepts in all level work

Roadmap Vision

“Chemistry education that equips and inspires chemists to help solve the grand challenges of sustainability”

This vision anticipates a **multifaceted future state** encompassing the following:

- *The practice of chemistry changes…*

  From: Chemistry is focused on academic and economic value with minimal regard for environmental, safety, or health impacts. → To: Process and product design to minimize adverse environmental, health, and safety impacts while enhancing desired performance throughout the product life cycle.

- *The “pull” of demand for green chemistry changes…*

  From: Green chemistry is seen as having little substantive benefit, while costing more to implement than its return on investment. → To: Green chemistry is inseparable from routine chemistry practice and is recognized for its pivotal role in advancing sustainability and commercial success.

- *Green chemistry core competencies …*

  From: Chemistry graduates are fully conversant in the terminology, strategy, and tatics of traditional principles, yet largely isolated from outcomes related to sustainability. → To: Chemistry graduates leverage green chemistry strategies and tools to develop and apply novel, sustainable chemicals, chemistries, processes, and products.

- *Chemistry education and academic enterprise …*

  From: Green chemistry concepts are supplemental to core course work and there is a poor understanding of how to reduce chemical hazards and risks. → To: Faculty are well-versed in and infuse green chemistry concepts in the teaching and research training activities at all levels, including academic research.

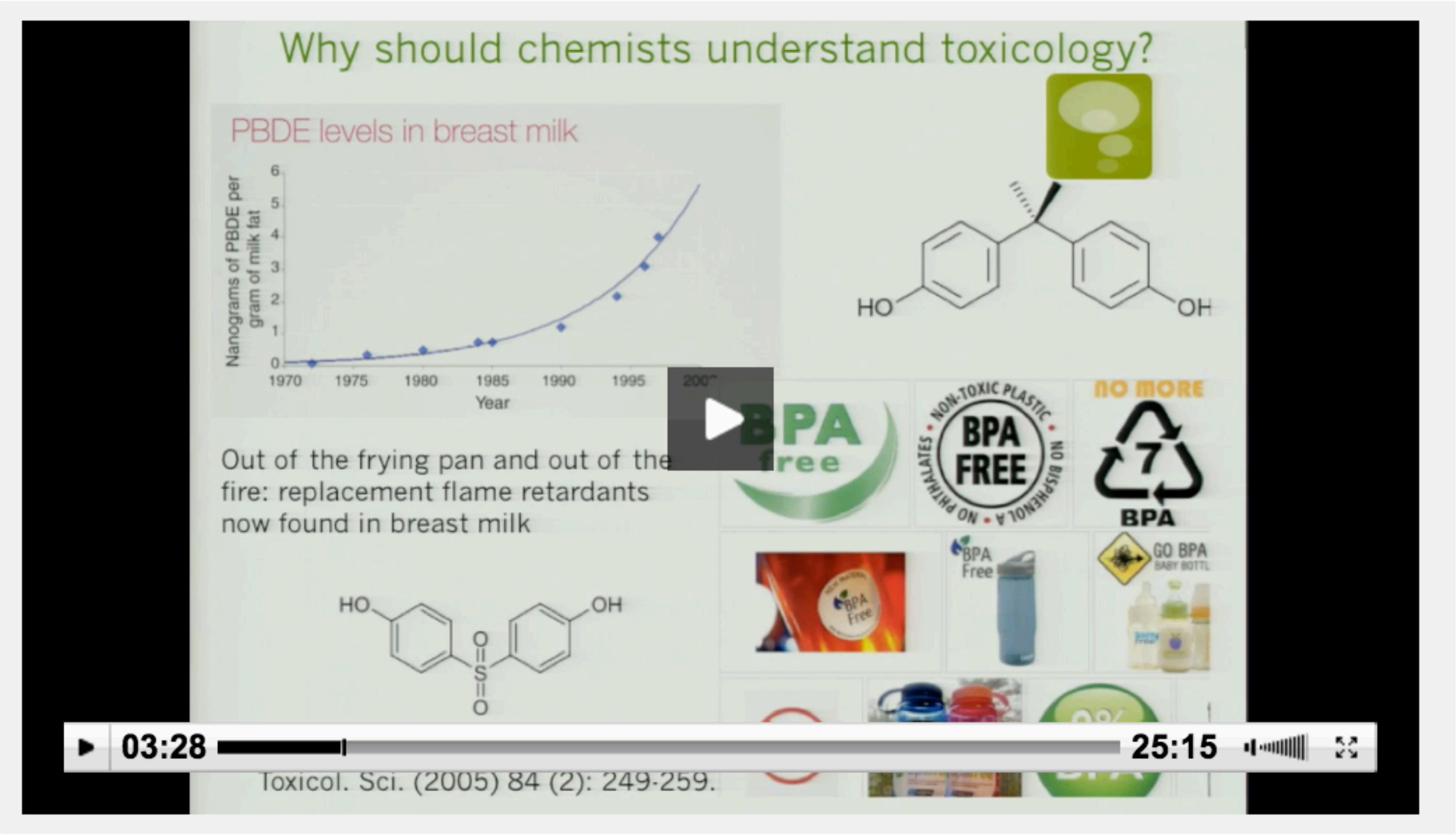
Achieving this vision is important because it will help to move us toward a more sustainable human enterprise that preserves economic vitality and human and environmental well-being. Achieving this vision will help chemistry to be seen as vital to any comprehensive sustainability strategy and a source of pride as it moves to the front lines of the campaign toward a more sustainable world.

This vision will be achieved through the best science, using evidence-based practices and interdisciplinary approaches.

https://www.acs.org/content/dam/acsorg/greenchemistry/education/roadmap-vision.pdf

Infusing the concepts and tools of toxicology into the chemistry curriculum

Adelina Voutchkova



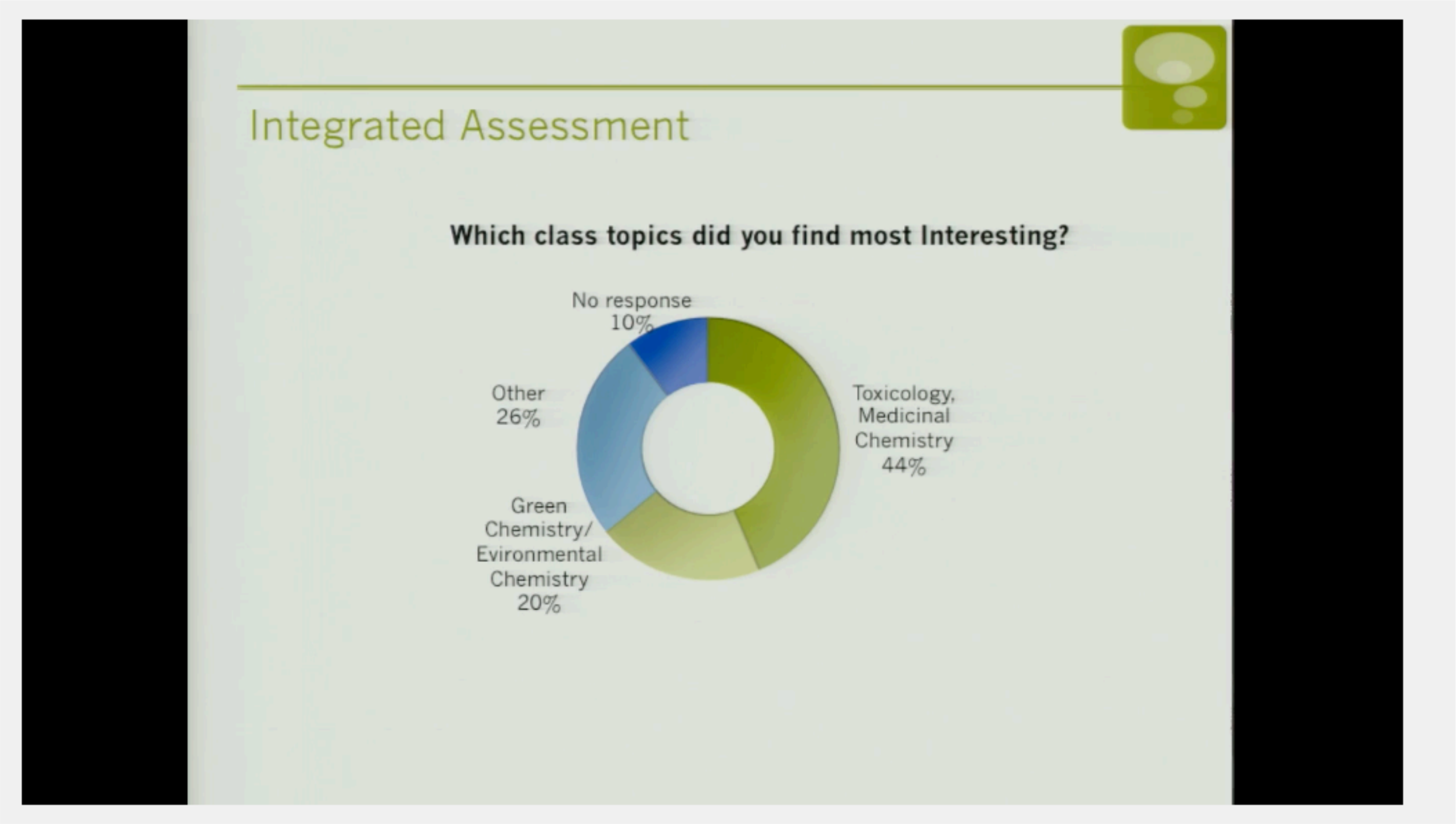
Meeting: 20th Annual Green Chemistry & Engineering Conference (June 14-16, 2016)

Incorporation into traditional organic syllabus

Introduction	Absorption, Toxicokinetics, Toxicodynamics
Ethers, Epoxides and Sulfides	Ethers, anaesthesia and narcosis; Epoxide and olefin mutagenicity
Conjugated Syetsms	Reactivity and HOMO-LUMO gap
Aromatic Compounds	Benzene, polyaromatic hydrocarbons, biphenyl ethers
Reactions of Aromatic Compounds	SnAr leading to protein binding
Infrared Spectroscopy	
Nuclear Magnetic Resonance	Predicting toxicity from spectra
Ketones and Aldehydes	Formalidehyde toxicity
Condensation and Alpha Substitution	Michael additions in covalent modifications
Amines	Amine carcinogenicity
Carboxylic Acids	Toxicity mechanism of carboxylic acids
Carboxylic Acid derivatives	Phase II metablism (conjugation)
Medicinal chemistry/Toxicology	Lipinski rules, Metabolism (main mehcnaims and enzymes)
	Accumulation, Storage, Excretion
	Design guidelines for safer chemicals

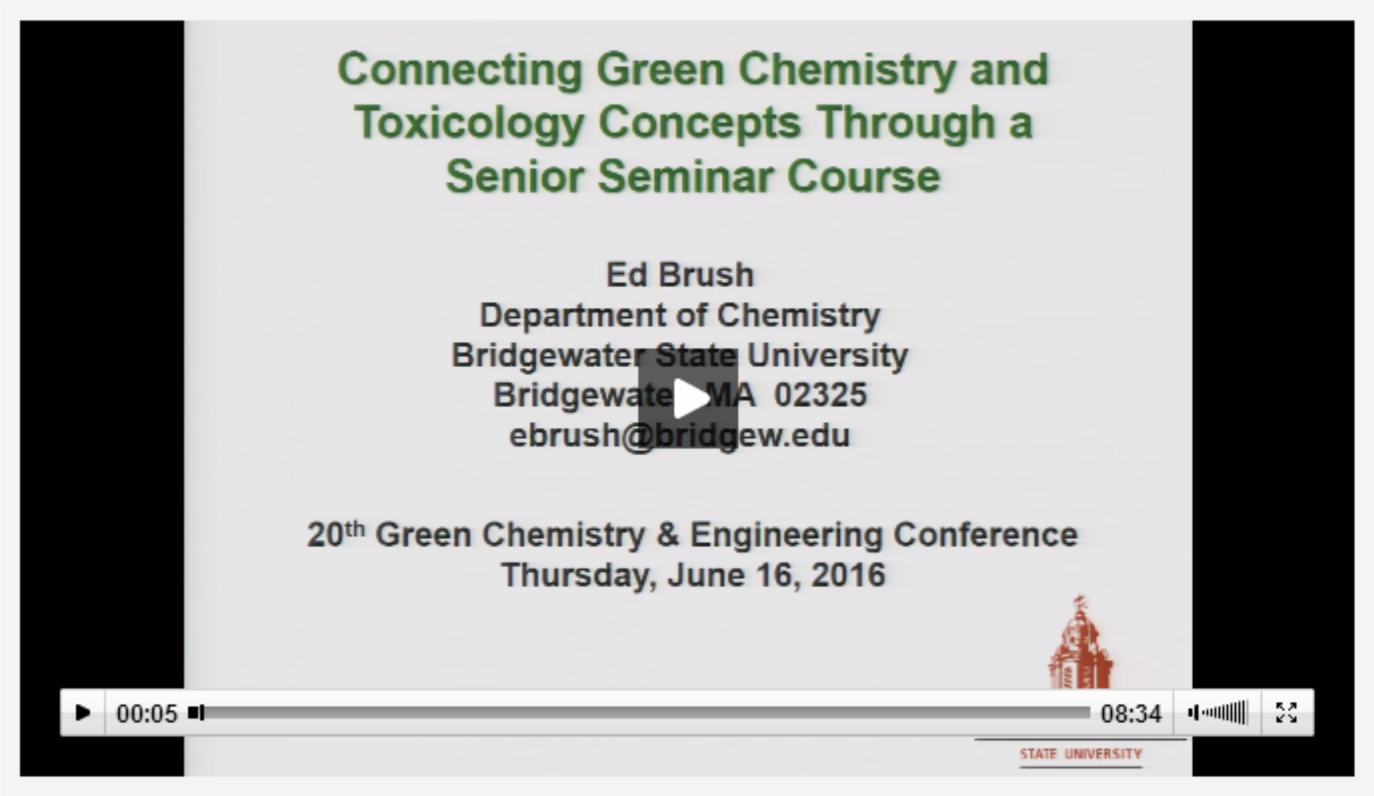
Infusing the concepts and tools of toxicology into the chemistry curriculum

Adelina Voutchkova



Connecting green chemistry and toxicology concepts through a senior seminar course

Edward Brush



Meeting: 20th Annual Green Chemistry & Engineering Conference (June 14-16, 2016)

https://presentations.acs.org/common/media-player.aspx/GCE2016/GC--E/GCE09a/2488593

Context-Based Learning

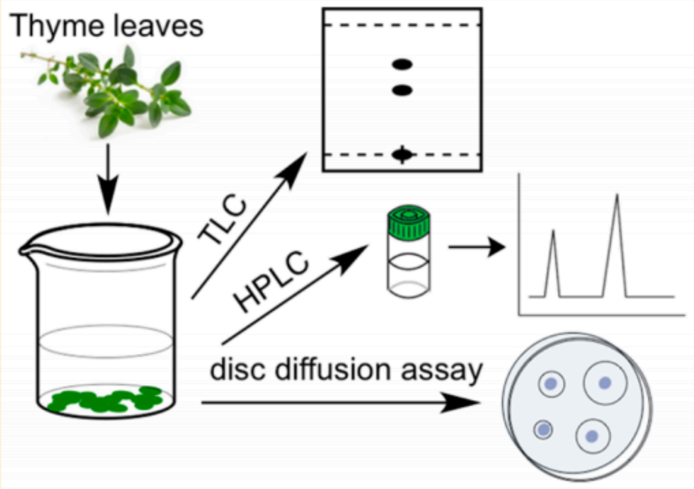
Extraction and Antibacterial Properties of Thyme Leaf Extracts: Authentic Practice of Green Chemistry

Sean C. Purcell, Prithvi Pande, Yingxin Lin, Ernesto J. Rivera, Latisha Paw U, Luisa M. Smallwood, Geri A. Kerstiens, Laura B. Armstrong, MaryAnn T. Robak, Anne M. Baranger, and Michelle C. Douskey*

Department of Chemistry, University of California, Berkeley, Berkeley, California 94720, United States

S *Supporting Information*

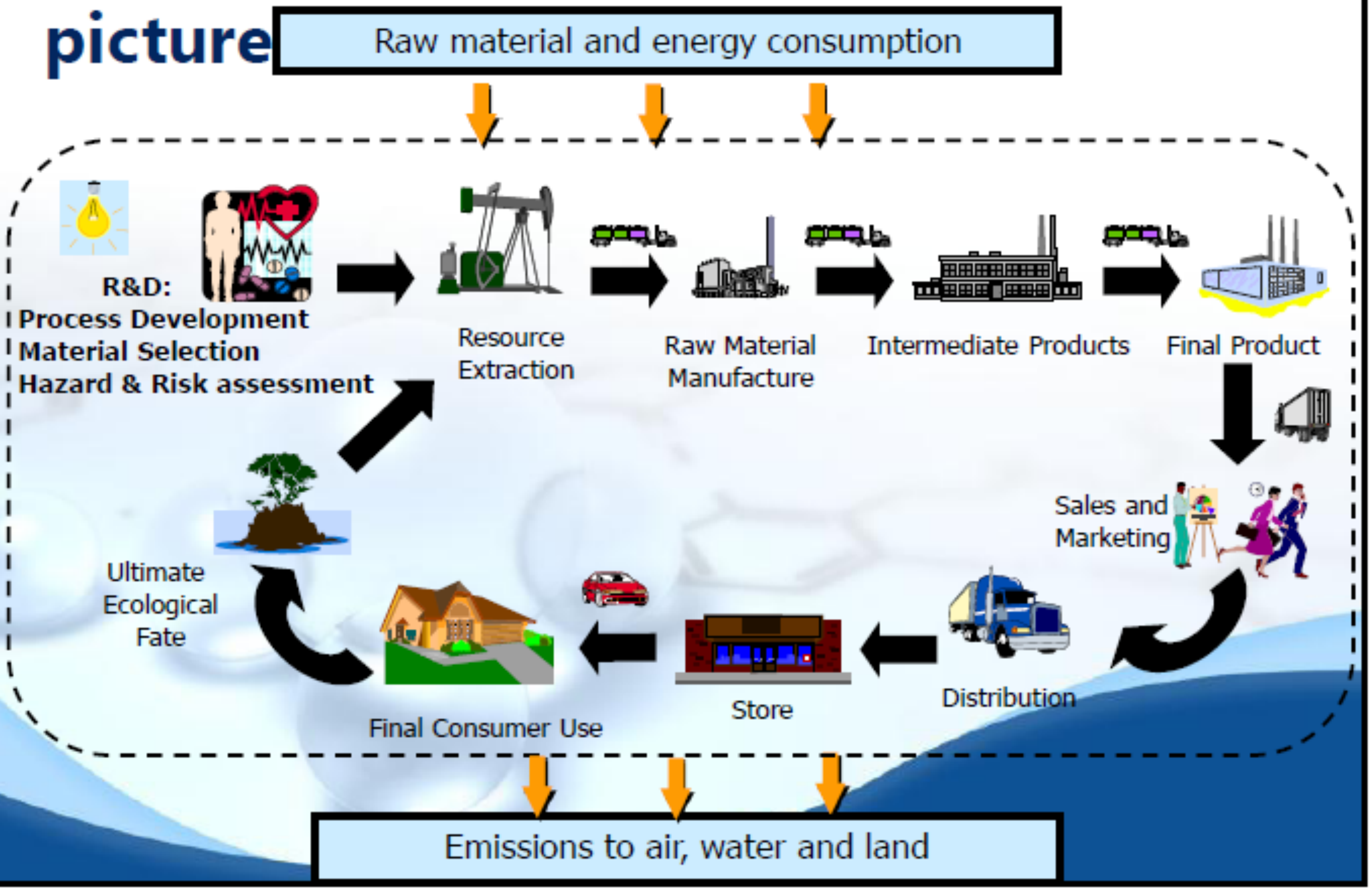
ABSTRACT: In this undergraduate analytical chemistry experiment, students quantitatively assess the antibacterial activity of essential oils found in thyme leaves (*Thymus vulgaris*) in an authentic, research-like environment. This multiweek experiment aims to instill green chemistry principles as intrinsic to chemical problem solving. Students progress through various techniques including extraction, chromatography (TLC and HPLC), culturing bacteria, and disk diffusion via a process of guided exploration that emphasizes green experimental design. Approximately 600 undergraduate students carried out the experiment and self-reported substantial learning gains.



KEYWORDS: *First-Year Undergraduate/General, Green Chemistry, HPLC, Biochemistry, Laboratory Instruction, Inquiry-Based/Discovery Learning, Problem Solving/Decision Making, Natural Products, Quantitative Analysis, Thin Layer Chromatography*

J. Chem. Educ. **2016**, *93*, 1422

Life Cycle Assessment – The very big picture



Slide Courtesy of Dr. David J. C. Constable, ACS Webinar

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Molecular Design Research Network (MoDRN)

MoDRN
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http://modrn.yale.edu/

The Team of Molecular Design Research Network (MoDRN)

Baylor University	**The George Washington University**	**The University of Washington**			**Yale University**		
							
Bryan Brooks (Co-PI)	Adelina Voutchkova-Kostal (Co-PI)	Evan Gallagher (Co-PI)	Terry Kavanagh (Co-PI)	Nancy Simcox (Co-PI)	Paul Anastas (PI)	William Jorgensen (Co-PI)	Julie Zimmerman (Co-PI)
Environmental Science and Biomedical Studies	Chemistry	Environmental and Occupational Health Sciences	Environmental and Occupational Health Sciences	Continuing Education Programs Director	Chemistry for the Environment	Chemistry	Environmental Engineering

http://modrn.yale.edu/team-0

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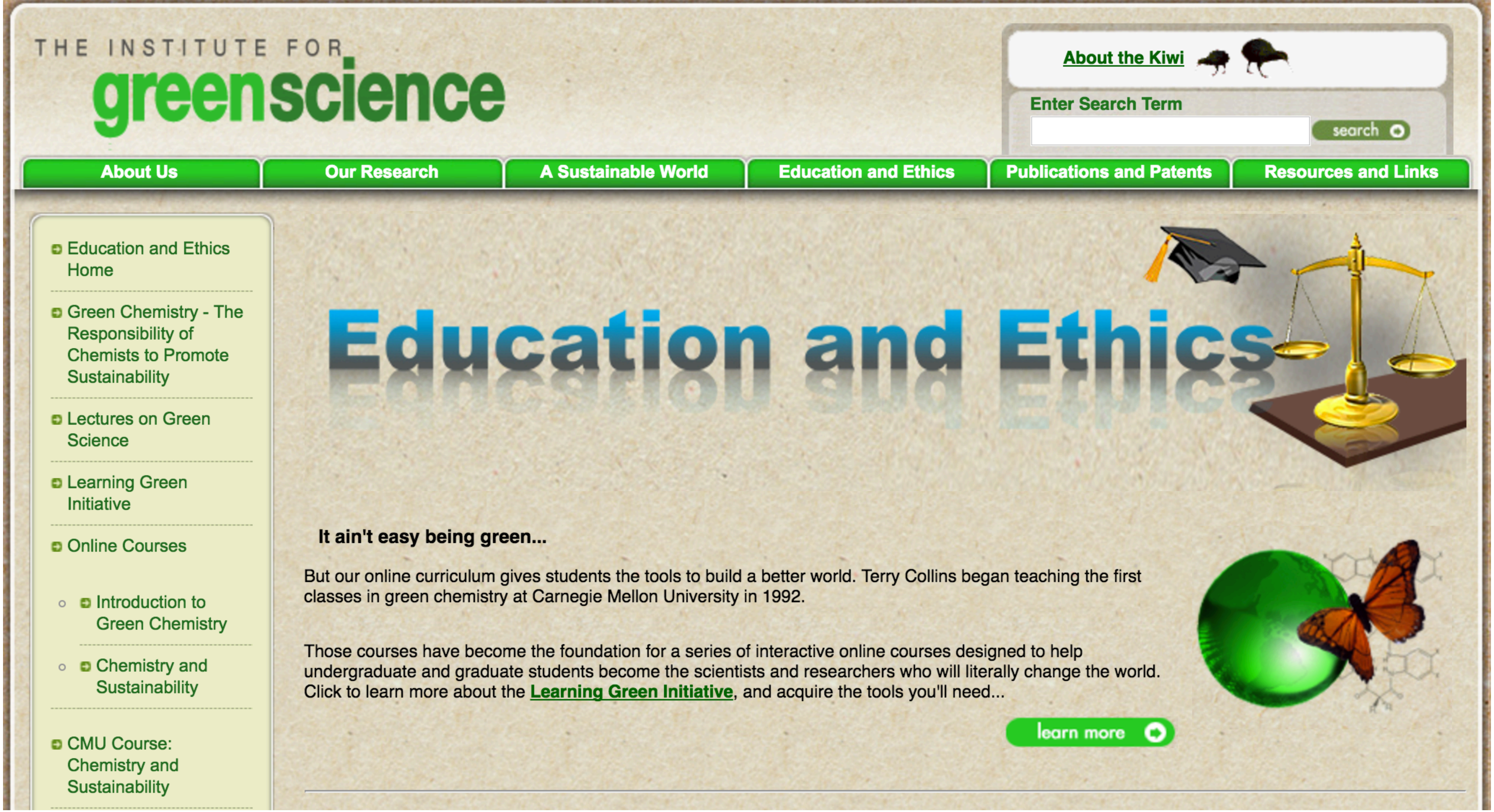
http://www.chem.utoronto.ca/green/about.htm

自學資源

- Institute for the Green Science
- Chem21



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Pharmaceuticals and universities working together on multi million pound project

Europe's largest public-private partnership dedicated to the development of manufacturing sustainable pharmaceuticals has been launched. It's being led by The University of Manchester and the pharmaceutical company GlaxoSmithKline.

The €26.4M (£21.2M) project, CHEM21, brings together six pharmaceutical companies, 13 Universities and four small to medium enterprises from across Europe. The aim is to develop sustainable biological and chemical alternatives to finite materials, such as precious metals, which are currently used as catalysts in the manufacture of medicines.

LATEST NEWS

CHEM21 launches online training platform

04/07/2016

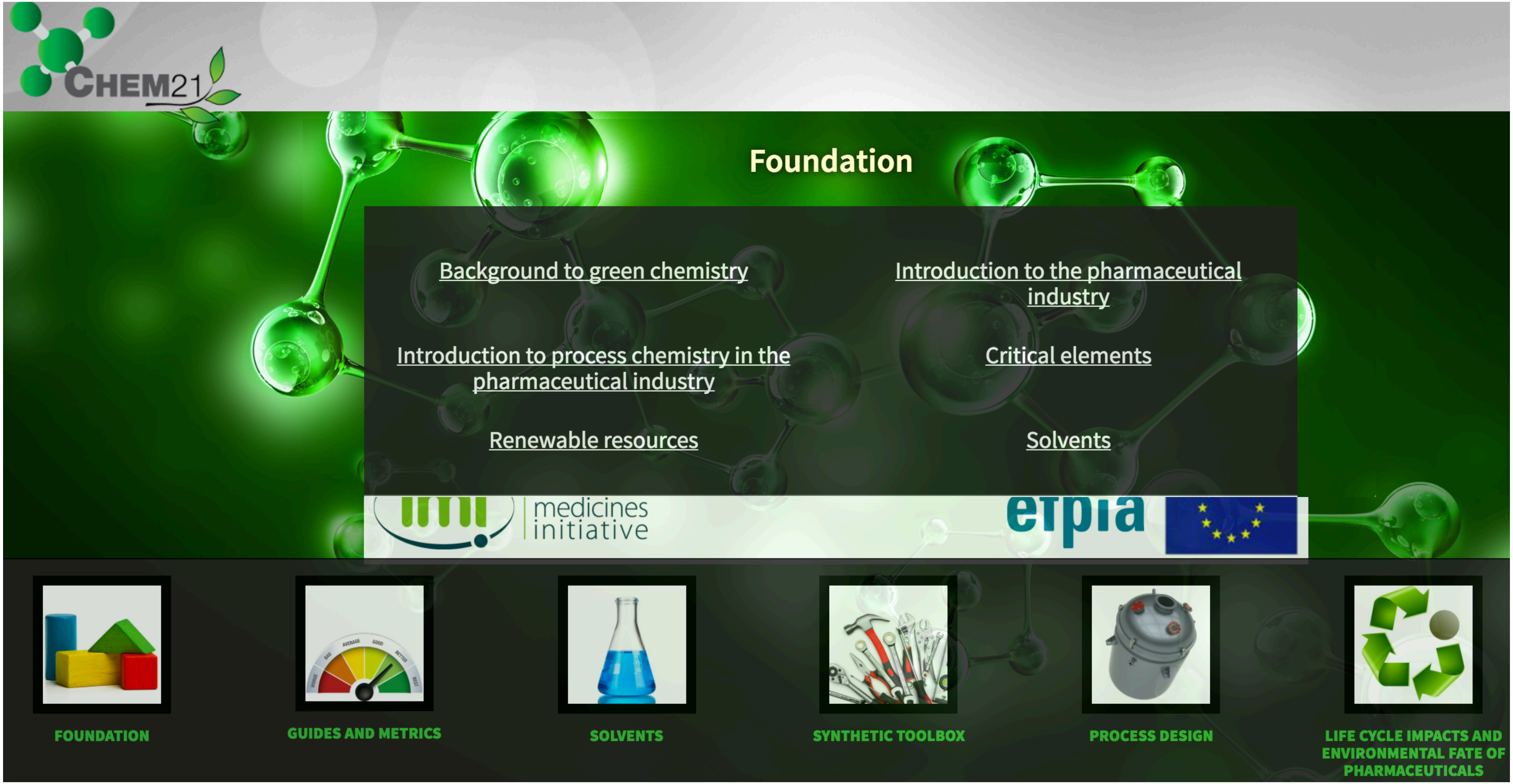
The CHEM21 project launched its new online training platform http://learning.chem21.eu at the Royal Society of Chemistry on 13th June 2016. The platform comprises a range of free, shareable and interactive educational and training materials created to promote the uptake of green and sustainable methodologies, with a particular focus on the synthesis of pharmaceuticals. The launch event formed part of a 2 day workshop and symposium on 'Practical Aspects of Green... **more»**

CHEM21-themed book

16/03/2016

The RSC have published a book 'Green and Sustainable Medicinal Chemistry : Methods, Tools and Strategies for the 21st Century Pharmaceutical Industry' that has been

http://learning.chem21.eu/



http://learning.chem21.eu/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CHEM21 selection guide of classical- and less classical-solvents

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Cite this: *Green Chem.*, 2016, **18**, 288

CHEM21 selection guide of classical- and less classical-solvents†

Denis Prat,*[a] Andy Wells,[b] John Hayler,[c] Helen Sneddon,[c] C. Robert McElroy,[d] Sarah Abou-Shehada[d] and Peter J. Dunn[e]

Table 1 Results from initial survey of publically available solvent guides

Recommended	Water, EtOH, i-PrOH, *n*-BuOH, EtOAc, i-PrOAc, *n*-BuOAc, anisole, sulfolane.
Recommended or problematic?	MeOH, *t*-BuOH, benzyl alcohol, ethylene glycol, acetone, MEK, MIBK, cyclohexanone, MeOAc, AcOH, Ac_2O.
Problematic	Me-THF, heptane, Me-cyclohexane, toluene, xylenes, chlorobenzene, acetonitrile, DMPU, DMSO.
Problematic or hazardous?	MTBE, THF, cyclohexane, DCM, formic acid, pyridine.
Hazardous	Diisopropyl ether, 1,4-dioxane, DME, pentane, hexane, DMF, DMAc, NMP, methoxy-ethanol, TEA.
Highly hazardous	Diethyl ether, benzene, chloroform, CCl_4, DCE, nitromethane, CS_2, HMPA.

Green Chem., 2016, 18, 288
http://pubs.rsc.org/en/content/articlepdf/2016/gc/c5gc01008j

Synthetic toolbox

Route selection

Biocatalysis

C-H activation

C-F bond formation

Amidation

Base metal catalysis

Multicomponent reactions

Carbonylation

Flow chemistry

Synthetic biology

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