

Is it necessary?

*Green chemistry and
California's Green
Chemistry Initiative*

Presented by Dorothy Wigmore at

*Are women automotive plastic workers at risk? Starting
the conversation -- Windsor, January 27, 2012*



The prevention triangle -- principles for solving health and safety problems



* What happens if it's upside down? It falls over!

For a healthy environment ...

... inside
and out



Why are toxic chemicals used now?

- By “accident”?
- On purpose?



There is a method to the madness

The reactionary principle - don't worry 'til we have to

- ☐ Design new chemicals, materials and technologies without thinking about how they could affect people's health and/or the environment.
- ☐ *Demand 100% proof about the harm from each hazard before doing anything about it. Tackle hazards one at a time.*
- ☐ Expect the public and government to prove something is harmful, after it is on the market, and keep chemical information secret ("confidential business information").
- ☐ *Use the "Delay game" as long as possible.*
- ☐ Discourage a public voice – including workers' and consumers' experiences -- about the need to deal with these hazards.

Delay game - the four dog defence



My dog doesn't bite.



My dog bites, but it didn't bite you.



My dog bit you, but it didn't hurt you.



My dog bit you, and hurt you, but it wasn't my fault!

The Chemical Industry Delay Game, How the Chemical Industry Ducks Regulation of the Most Toxic Substances, Natural Resources Defense Council, 2011.
<http://www.nrdc.org/health/thedelaygame.asp>

You're running the world.
You get to design
products and what goes
into them.

Think of the plastic
cutlery used for lunch.

What "rules" would you
make about "safer"
cutlery?

The precautionary principle -- *better safe than sorry*

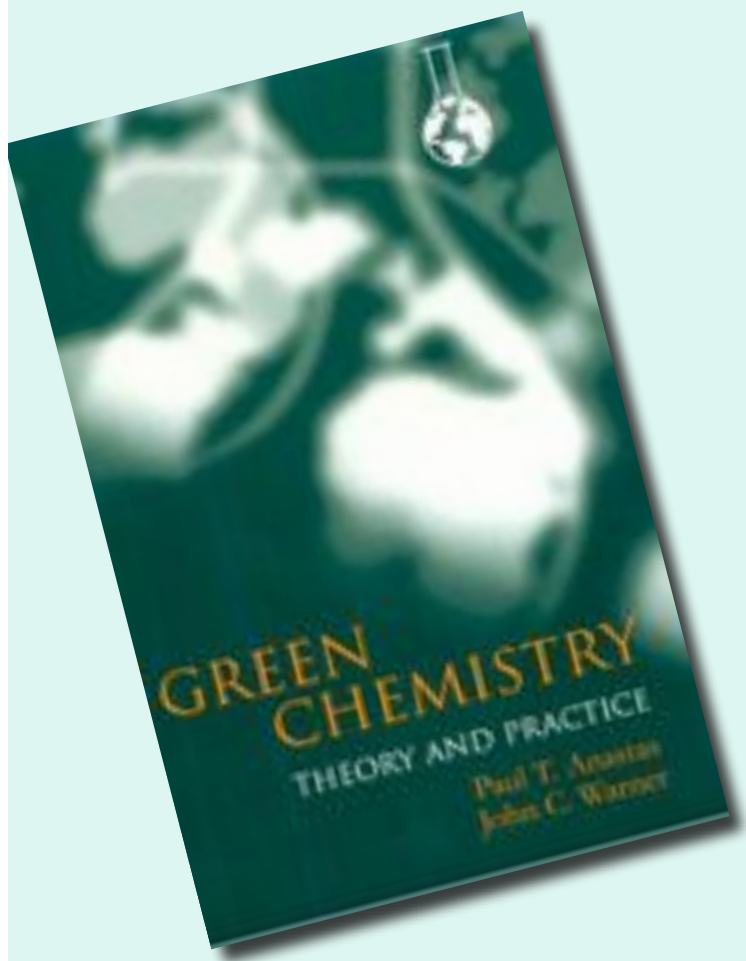
- ✓ Take action to prevent harm, even if we are not sure about (all) the hazards.
- ✓ *Shift the "burden of proof" to companies. Before it is sold, used or put on the market, make them prove that something will not harm people or the environment.*
- ✓ Look at a lot of options or alternatives. Go for the non-toxic or least toxic.
- ✓ *Increase public participation. Be democratic. Make sure that workers, consumers, and environmentalists are in all conversations and decisions about how to deal with chemicals and products.*

It's the hazards, stupid!

Green chemistry is about the chemical's hazard, not the risk it will harm (so why talk of "risk factors"?).

It's not about "safe" exposure levels or "controlling" the hazard.

Green chemistry is ...



- ✓ *asking "Is this chemical/product necessary for this task?"*
- ✓ *about prevention -- using the precautionary approach*
- ✓ *better recipes -- designing safer chemicals, products and processes for healthier people, communities and environments*
- ✓ *not having to say you're sorry (or making it less likely)*

Green chemistry ...

.. is a **framework** for the design of products and processes such that the goals themselves, e.g. degradability or less toxic products, are essential performance criteria.

It will be important that these goals are intrinsic design specifications. In that way, it **will be obvious that when a hazardous and unsustainable product or process is produced, there are only two explanations: (1) there is a design flaw or (2) it was designed to be hazardous.**



Paul Anastas

Paul Anastas and Evan Beach, "Green chemistry: the emergence of a transformative framework", *Green Chemistry Letters and Reviews*, March, 2007.

Green chemistry is important to workplaces and workers



- ✓ addresses the unique effects of toxic chemicals on workers' health
- ✓ *prevents workplaces from contaminating the environment and communities*
- ✓ promotes integrated strategies to protect workers, communities, and the environment
- ✓ *builds on safer/healthier chemical alternatives already out there*

Based on Julia Quint's presentation at a Green Chemistry Initiative workshop, 2010

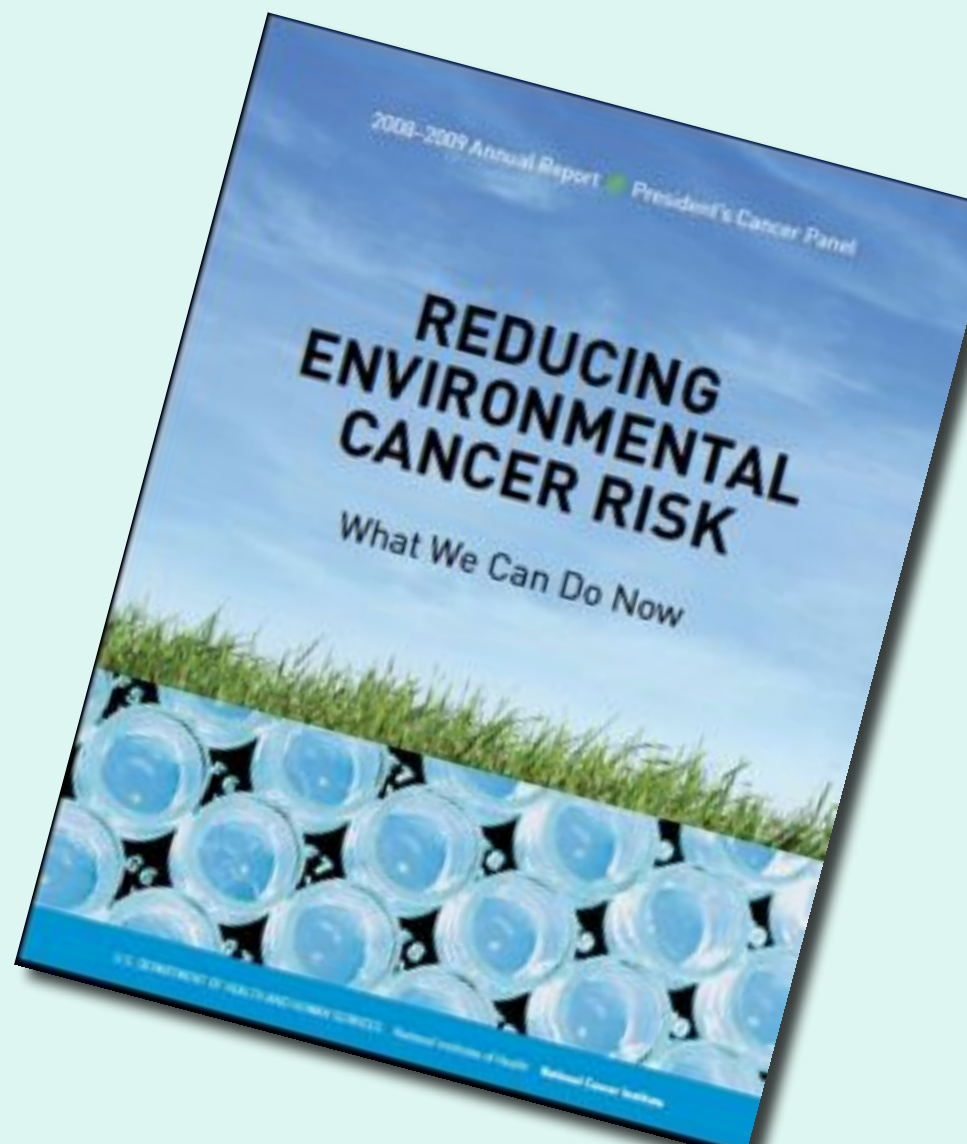
Benefits of green chemistry

- ✓ healthier workplaces and communities
- ✓ links healthy workplaces to a healthy environment
- ✓ economical
- ✓ less waste
- ✓ fewer “accidents”
- ✓ safer/healthier products
- ✓ lowers cost of production and regulation
- ✓ competitive advantage

Thanks to Clean Production Action

Use informed substitution

*"Green chemistry" initiatives and research, including process redesign, should be pursued and supported more aggressively, but **new products must be well-studied prior to and following their introduction** into the environment and stringently regulated to ensure their short- and long-term safety.*





Cradle-to-Cradle is an innovative and sustainable industrial model that focuses on design of products and a production cycle that strives to produce no waste or pollutants at all stages of the lifecycle.

Braungart and McDonough

Cradle-to-Cradle: Remaking the Way We Make Things (2002)

It takes us to different ways of thinking about the design of materials and products and the chemicals that go into them

California has a Green Chemistry Initiative



1. Expand pollution prevention
2. Develop green chemistry capacity
3. Create an on-line product ingredient network
4. Create an on-line toxics clearinghouse (SB 509)
5. Accelerate the quest for safer products (AB 1879)
6. Move toward a cradle-to-cradle economy

*California Green Chemistry Initiative,
Final Report
December, 2008*

The main law was proposed by Assembly Representative Michael Feuer

Assembly Bill No. 1879

CHAPTER 559

An act to add Sections 25252, 25252.5, 25253, 25254, 25255, and 25257 to the Health and Safety Code, relating to hazardous materials.

[Approved by Governor September 29, 2008. Filed with Secretary of State September 29, 2008.]

LEGISLATIVE COUNSEL'S DIGEST

AB 1879, Feuer. Hazardous materials: toxic substances. (1) Existing law establishes the Department of Toxic Substances Control, in the California Environmental Protection Agency, with powers and duties regarding, among other things, hazardous waste disposal, underground storage of hazardous substances and waste, and the handling and release of hazardous materials.

This bill would require the department by January 1, 2011, to adopt regulations to establish a process by which chemicals or chemical ingredients in products may be identified and prioritized for consideration as being chemicals of concern. The bill would specify a procedure for the adoption of those regulations, including requiring that the department, in at

The department would also be required to adopt, by January 1, 2011, regulations to establish a process by which chemicals of concern in products, and their potential alternatives, are evaluated to determine how best to limit exposure or to reduce the level of hazard posed by a chemical of concern.

DTSC
introduced
informal
draft
regulations
in October*

** The formal draft regulations
are expected at the end of
February, 2012.*



Identify
Chemicals
of Concern

California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) lists \pm 3,000 chemicals from different lists as "chemicals of concern"

Identify
Product/Chemical
Combinations

DTSC lists consumer products with these \pm 3,000 chemicals that are "in commerce" in California, combinations of the chemicals

Prioritize
Product/Chemical
Combinations

DTSC prioritises consumer products, based on criteria that include "sensitive populations" (workers?). Companies making these products will have to do alternatives assessment.

Perform
Alternatives
Analysis

DTSC requires manufacturers to determine if there are alternatives for the chemicals of concern, and to provide information about their health effects.

Implement
Regulatory
Response

Bans?
Truly "safer" alternatives?
Less toxic products, chemicals or processes?
Priorities for which chemicals to "pick on"

All Chemicals
(100,000+)

**Chemicals
of
Concern
(COCs)**
(3000+)

**Products
with
COCs**

Priority Products Requiring:

- **Alternatives Assessments**
- **Regulatory Response(s)**
for selected Alternative
and/or Priority Product

Comments on the informal regs:



Many firsts:

- a regulatory agency has set out to build a broad chemicals regulatory structure to require analysis of alternatives to toxic chemicals
- an agency has attempted to regulate chemicals, and their products
- focus first on intrinsic hazard traits of chemicals rather than exclusively relying on risk assessment
- regulations of chemicals will address cumulative exposures, which are a key public health concern and as well
- consumer product manufacturers must formally answer the question, "Is the use of this hazardous chemical necessary in my product?"



BUT:

- don't go far enough (workers not clearly included, "de minimus" levels -- especially for endocrine disruptors)
- no funding for department to do this work
- need "no data, no market" rules to close chemical information data gaps and level playing field for all chemicals
- trade secret claims create lack of transparency
- need other laws to make Green Chemistry Initiative work

And most in industry said:

- regs go too far
- department has no money to do this work
- use "risk assessment" approaches
- ... and other things are not clear or are too onerous

<http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/upload/SCPInformalComments201201Web1.pdf>

So where are there opportunities and openings for green chemistry change, especially with plastics and the auto industry?



- Development of new bioplastics technology- PHA from waste-methane and bioplastics recycling development (Stanford University)

- Sustainable bioplastic market studies (UC Davis and UC Berkeley)



BizNGO.ORG
FOR SAFER CHEMICALS AND SUSTAINABLE MATERIALS

The Business-NGO Working Group promotes the creation and adoption of safer chemicals and sustainable materials in a way that supports market transitions to a healthy economy, healthy environment, and healthy people.

Principles for Sustainable Plastics



Plastics provide benefits to people across the globe. Lightweight, durable, flexible and easy to form, their use continues to grow rapidly. Cellulose, baby car seats, blood bags, backpacks, chairs, cars and clothing are among the many products made with plastics and reflect their benefits. Yet plastic litter, gyres of plastics in the oceans and toxic pollutants in plastic products are raising public awareness, consumer demand, pressure and regulations for a more sustainable material.

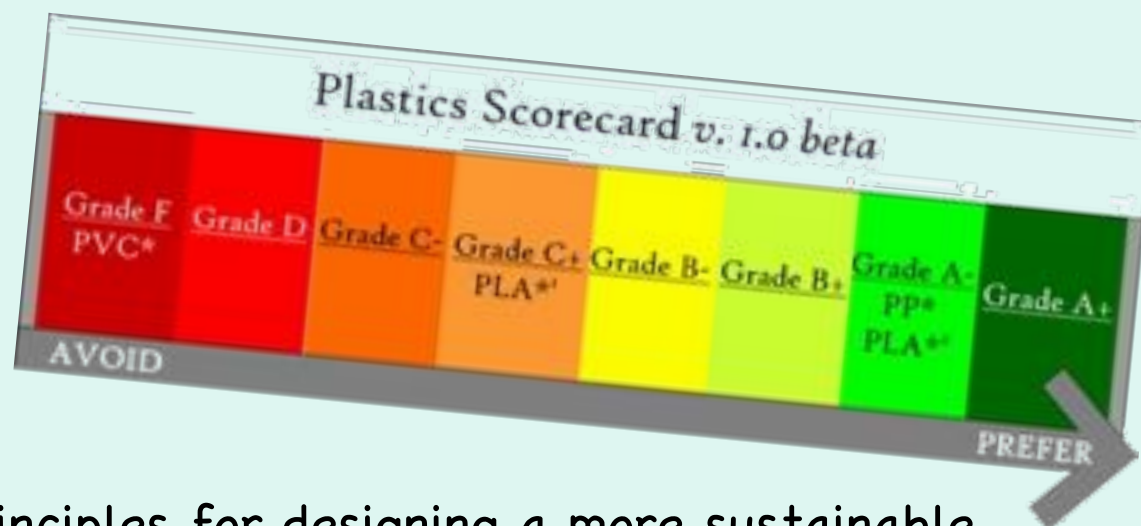
Businesses, hospitals and individuals are increasingly seeking plastics that are more sustainable across their life cycle: from raw material extraction to production to manufacturing to use and end-of-life management.

1. Sustainable resources
2. Closed loop systems (minimise the use of raw materials in the life cycle of a plastic and its associated product)
3. Energy efficient and renewable
4. Safer chemicals (i.e., healthier, non-toxic, chemicals and processes)
5. Healthy workplaces and communities

The BizNGO Principles for Sustainable Plastics have been informed by and incorporate concepts from the:

- 1) 12 Principles of Green Chemistry
- 2) Organization of Economic Cooperation and Development Sustainable Materials Management Principles
- 3) Cradle-to-Cradle Design Principles
- 4) Guidelines for Sustainable Biomaterials
- 5) Lowell Center Framework for Sustainable Products.

<http://www.bizngo.org/sustainable.php>



Our core principles for designing a more sustainable plastic product are:

Sustainable Resources: grow, harvest and/or collect natural resources in a sustainable manner.

Green Chemistry: strive to manufacture plastics based upon the 12 Principles of Green Chemistry.

Closed Loop Systems: for plastics that meet the above two principles, manufacture and use plastics that either a) contain a very high percentage of post-consumer recycled content or b) are biodegradable into safe and usable organic matter.



GC³ Green Chemistry & Commerce Council



Moving Business Toward Safer Alternatives

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Participants Only



GC³ Green Chemistry & Commerce Council

Chemicals, alone or in combination, are the platform upon which key elements of the global economy have been built, and have been incorporated into millions of products used every day. Many chemicals may have inherently harmful characteristics that can impact ecological and human systems as they are used throughout supply chains.

A growing number of companies are discovering that the approaches of green chemistry and Design for Environment (DfE) allow for a transition to safer alternatives. The Green Chemistry and Commerce Council provides open conversation about the challenges to and opportunities for this successful transition.



Automotive bioplastics: back to the future. | Canadian Chemical News | Professional Journal archives from AllBusiness.com

<http://www.allbusiness.com/chemicals/plastics-rubber-industry-plastics/12399182-1.html>
January 21, 2012

[ILLUSTRATION OMITTED]

As far back as the 1930's, Henry Ford used up to 60 pounds of soybeans in paints, enamels and molded plastic parts in his Model T. Plant-based plastics were used to make glove box doors, gear shift knobs, horn buttons, accelerator pedals, distributor heads, interior trim, steering wheels, dashboards and body panels. Ford also used fibres from hemp, wood pulp, cotton, flax and ramie as plastic fillers and reinforcement material.

Over time, bioplastics were eventually replaced by petroleum-based products because they were cheaper and better performing. However, the recent high cost of petroleum-based raw materials used in the production of plastics, and the advancement of new technologies like biotechnology, nanotechnology, green chemistry and material science, are paving the way for the resurgence of bio-based materials.

www.bioautocouncil.com

Dr. Emily Cranston, assistant professor at McMaster University, is working with nanocellulose, which she says could be used to reinforce plastics. Nanocellulose comes from wood, and would replace materials that come from non-renewable sources and are hard to recycle.

Ford's Matthew Zaluzec is a member of the board of this government-funded organisation. Ask him to push for safer plastics and processes.

Board

GreenCentre Canada

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ABOUT US GREEN CHEMISTRY TECHNOLOGIES WORKING WITH US NEWS & EVENTS

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NEWS & EVENTS

- December 5, 2011 - GreenCentre Canada stimulates \$1.2 million in investment in breakthrough Queen's technology
- November 21, 2011 - Agilent Technologies joins GreenCentre Canada's industry sponsors to help drive green chemistry research
- October 15, 2011 - GreenCentre Proof of Principle Funding helps University of Ottawa researchers explore potential of discovery
- October 28, 2011 - GreenCentre-funded copper research leads to 'golden' discovery by Carleton University scientists
- October 14, 2011 - University of Alberta chemical process licensed to GreenCentre Canada
- July 7, 2011 - Discovery Channel's Jig Ingran to address Sustainable Chemistry Summit

PHOTO & VIDEO

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<http://www.greencentrecanada.com/>

There are tools
that could help

Clean Production Action — GreenScreen for Safer Chemicals v1.2

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CLEAN PRODUCTION ACTION

Green Screen for Safer Chemicals v1.2

Welcome to the GreenScreen™ for Safer Chemicals v1.2

We would like to thank the GreenScreen™ Technical Advisory Committee and the GreenScreen™ Steering Committee for all of their helpful feedback and input in helping us realize our goal of continual improvement and development of a robust, scientifically based method that is practical and protective of human health and the environment.

At this site you may download all of the supporting resources and documentation for performing a GreenScreen™ assessment using GreenScreen™ v1.2. We have also provided example assessments.

GreenScreen™ v1.2 Hazard Criteria:

There are 18 hazard endpoints addressed by GreenScreen™ Hazard Criteria:

ENVIRONMENTAL FATE	ENVIRONMENTAL HEALTH	HUMAN HEALTH GROUP I	HUMAN HEALTH GROUP II	PHYSICAL HAZARDS
Persistence (P)	Acute Aquatic Toxicity (AAQ)	Carcinogenicity (C)	Acute Mammalian Toxicity (AMT)	Reactivity (Rx)
Bioaccumulation (B)	Chronic Aquatic Toxicity (CAQ)	Mutagenicity & Genotoxicity (MG)	Systemic Toxicity (Int.) (Immunotoxicity) (STI)	Flammability (F)
		Reproductive Toxicity (RT)	Sensitization (S)	
		Developmental Toxicity (Dev)	Respiratory Sensitization (RS)	
		Endocrine Activity (EA)	Skin Irritation (SI)	
		Other Endpoints (Other)	Eye Irritation (EI)	

Click here to download the GreenScreen™ hazard criteria (.pdf, 115KB)

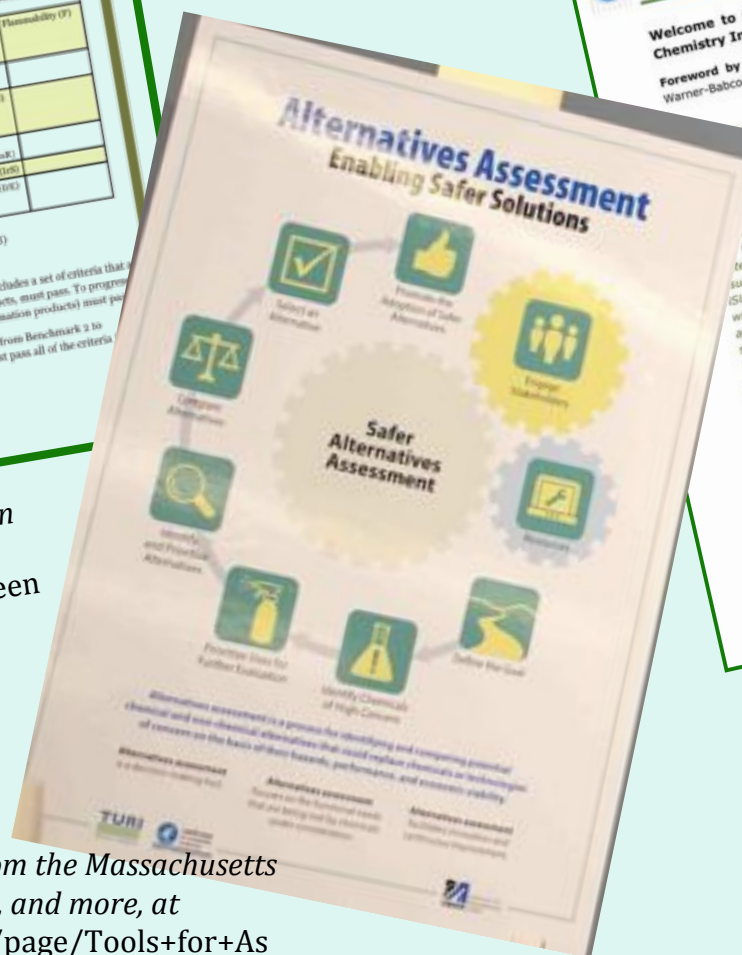
GreenScreen™ v1.2 Benchmarks

GreenScreen™ v1.2 includes four Benchmarks. Each Benchmark includes a set of criteria that a chemical, along with its known and predicted transformation products, must pass. To progress from Benchmark 1 to Benchmark 2, a chemical (including transformation products) must pass all the criteria specified under Benchmark 1. Likewise, to advance from Benchmark 2 to Benchmark 3, the chemical (and its transformation products) must pass all of the criteria under Benchmark 2, etc.

<http://www.cleanproduction.org/GreenScreen-v1-2.php>

The Green Screen from Clean Production Action. See the latest version at <http://www.cleanproduction.org/GreenScreen.v1-2.php>

An alternatives assessment process, from the Massachusetts Toxics User Reduction Institute (TURI), and more, at <http://www.ic2saferalternatives.org/page/Tools+for+Assessing+Alternatives>



ISUSTAIN™ Green Chemistry Index

12-01-26 5:38 PM

Getting Started | Scenarios | Data Input | My Profile | Log Out

Welcome to the ISUSTAIN™ Green Chemistry Index v2.0

Foreword by Dr. John Warner, Director, Warner-Babcock Institute of Green Chemistry

Sign In to ISUSTAIN™

Welcome, Dorothy Wigmore!

Material Data

5518 Materials
Last updated on 5/6/2011

Based on the Book

GREEN CHEMISTRY
THEORY AND PRACTICE
2nd Edition
Paul T. Anastas and John C. Warner

Efforts in institutions and the world have become more intense and ubiquitous. Although attention and resources are spent on such activities, there is not a universal understanding of how sustainability can be truly measured and tracked to determine the actual success of the sustainability endeavor. The ISUSTAIN™ Index provides the user with a CREDIBLE and QUANTIFIABLE assessment of a material process. This tool is useful to retrospectively analyze an existing process or help design a new process with a focus on sustainability.

The ISUSTAIN™ Index provides the user with a respected way to articulate the environmental performance aspects of a process up and down the supply chain. From a customer perspective it can be an invaluable design tool. From a technical perspective it can help communicate the true value of a process to internal and external clients. From any perspective the ISUSTAIN™ Green Chemistry Index provides an objective assessment to effectively

iSustain from beyondbenign, at <https://www.isustain.com/>

Check out green chemistry resources in your region

Michigan Green Chemistry Clearinghouse | An on-line clearinghouse of green chemistry information and resources.

Welcome Guest! [Log Out](#) [Register](#)

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MICHIGAN GREEN CHEMISTRY CLEARINGHOUSE

INTERACT Education Public Toolbox

- Definition of Green Chemistry
- 12 Principles of Green Chemistry
- Chemical Assessment Tools
- Library

Add yourself to our member map and view the location of others!

Welcome!

Welcome to the home of the **Michigan Green Chemistry Clearinghouse**, a project hosted by the Center for Sustainability at Aquinas College through grant funding provided by the State of Michigan.

***** (No Ratings Yet)

The overall goal of the **Michigan Green Chemistry Clearinghouse** is to accelerate green chemistry awareness, innovation and investment in the State of Michigan by creating and enabling a community of green chemistry advocates that are connected and informed. The Clearinghouse aims to be a dynamic and interactive on-line source of information, resources, databases, learning opportunities and interactive tools for citizens, business and industry professionals, educators, policy makers, entrepreneurs and others.

Please consider joining our community. Bookmark this site and stay tuned for further developments. To receive updates by email, please send your name, affiliation and contact information to: migreenchemistry@gmail.com

Read more about the Project Partners, visit the [About Us](#) page.

Upcoming Webinars

February 15, 2012: "Labor and Environmental Health Activists Build Alliances to Promote Green Chemistry" by Tolle Graham (Labor and Environment Coordinator, **Massachusetts Coalition for Occupational Safety and Health**, USW 9358) and Ed Collins (Executive Vice President, Industrial Sector, **Industrial Brotherhood of Electrical Workers**; Exec. Vice President, **Massachusetts AFL-CIO**)

Registration is now open. Please click on the blue button below. Registration is limited to the first 100 respondents.

REGISTER NOW

The Michigan Green Chemistry Clearinghouse (<http://migreenchemistry.org/>) has resources that could be useful. It also is linked to the [Great Lakes Green Chemistry Network](#), which holds regular webinars. The one in February is about how workers and environmentalists in Massachusetts have worked together to promote green chemistry. You can hear it later too.



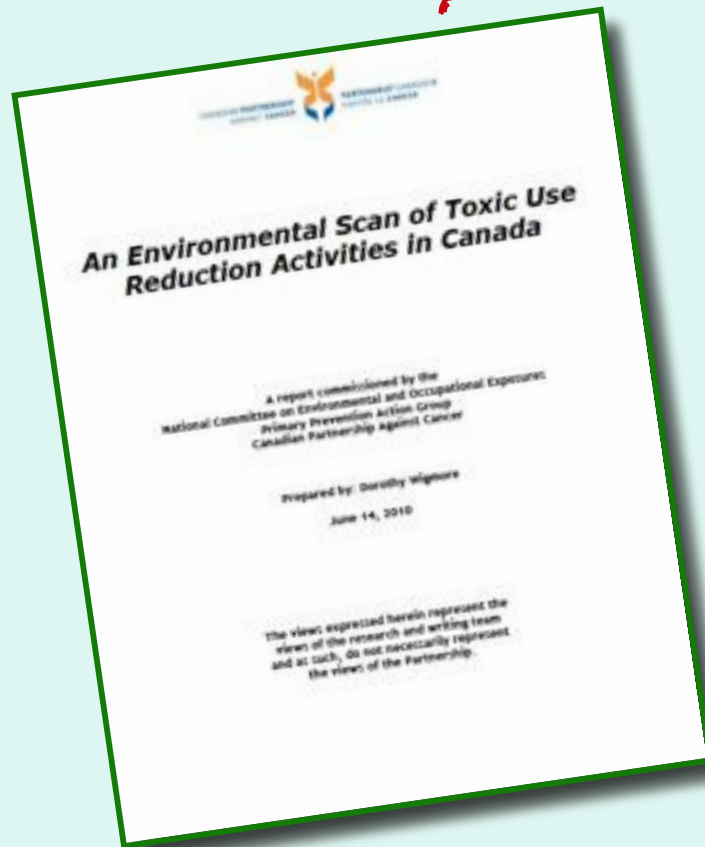
Ask Dr. John Warner, one of the "fathers" of green chemistry, for advice and help.

Some green chemists are interested in workers' needs



Ask Dr. Francesca Kerton, Memorial University about what she could do to help find some solutions

Check out the 250+ organisations that want to reduce the use of toxic substances in Canada, and the government laws that could do make it possible



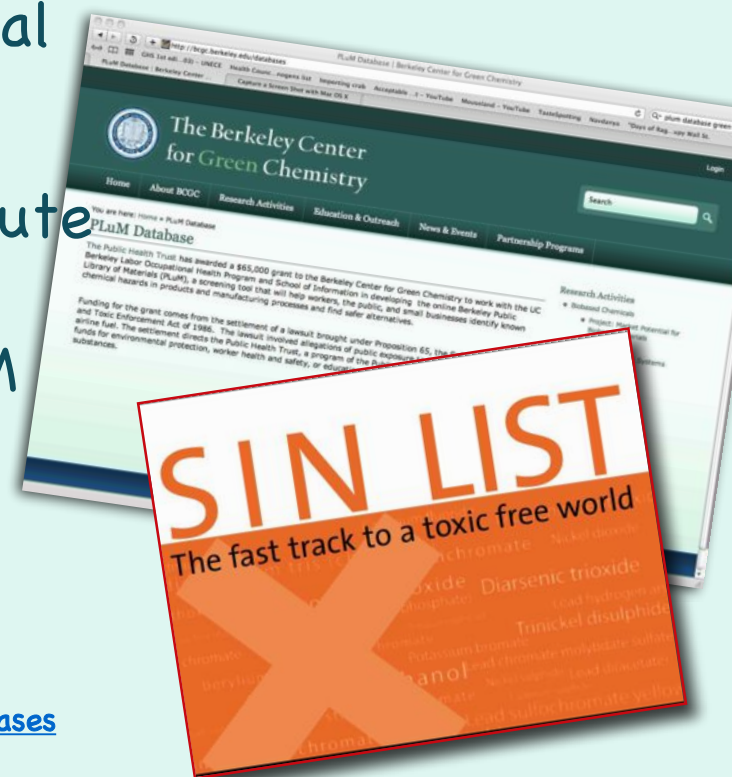
An Environmental Scan of Toxic Use Reduction Activities in Canada

An Environmental Scan of Toxic Use Reduction Activities in Canada - Appendices

<http://www.partnershipagainstcancer.ca/resources-publications/primary-prevention/healthy-public-policy/>

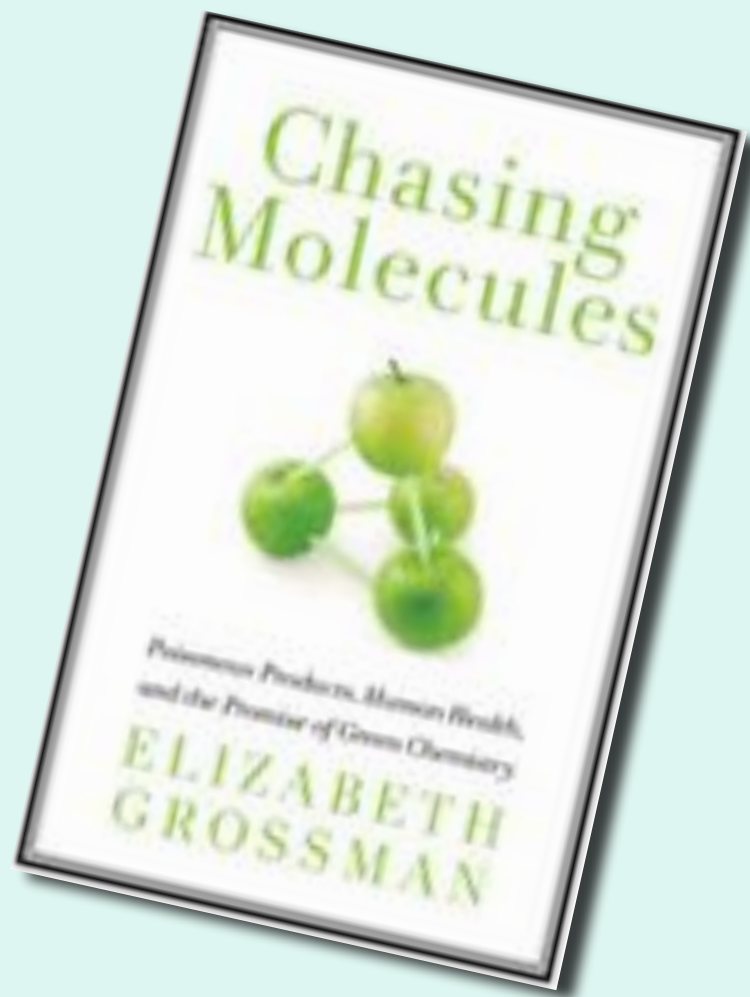
Look for research and reports about:

- “environmentally benign manufacturing” that includes the auto industry (e.g., <http://www.srl.gatech.edu/education/ME4171/EBM-finalreport.pdf>)
- methods to assess the environmental impact of plastic injection molding
- what chemicals we need to substitute now (e.g., the SIN list, the Clean Production Action “Red List”, PLUM database)



<http://www.sinlist.org>; cleanproduction.org/library/CPA-HBN_Red_List_26jan09.doc; <http://bcgc.berkeley.edu/databases>

For general
information about
green chemistry,
check out *Chasing
Molecules*.



Think big.

Think solutions.

Think tools.

Think collective
action.