

Green Chemistry Training
September 29, 2010, 12:00 – 4:30pm
Warner Babcock Institute for Green Chemistry
Wilmington, MA

Green Chemistry is the *design* of chemical products and processes that reduce or eliminate the *use and/or generation* of hazardous substances.

The **Warner Babcock Institute for Green Chemistry** (www.warnerbabcock.com) is dedicated to the practical application of Green Chemistry: we assist our industry partners in the development of sustainable technologies, products, and processes at the molecular level. In addition, the Institute provides professional training in green chemistry, sustainable design, and toxicology for scientists, engineers, and executives. **Our emphasis is on the practical application of green chemistry concepts to drive cost savings and minimize time to market.** The Warner Babcock Institute for Green Chemistry was founded in 2007 by Dr. John C. Warner, co-author of the seminal book *Green Chemistry: Theory and Practice*, which first defined the Twelve Principles of Green Chemistry.

As an introduction to Green Chemistry and its implementation in the context of discovery science, the Warner Babcock Institute for Green Chemistry will provide a four-hour training for participants of the 3rd International Symposium on Green Processing in the Pharmaceutical & Fine Chemical Industries. The purpose of the training is to provide participants with a foundation of green chemistry knowledge and tools. Those who receive the training will gain an appreciation of how Green Chemistry principles can be practically implemented in their laboratories.

Green Chemistry Training: Overview

Introduction to Green Chemistry: Historical Perspective and The Twelve Principles

Green Chemistry seeks to reduce or eliminate the use of hazardous materials at the design stage of a materials process. It has been demonstrated that materials and products CAN be designed with negligible impact on human health and the environment while still being economically competitive and successful in the marketplace. This presentation will describe the history and background of Green Chemistry and discuss the opportunities for the next generation of chemical and materials designers to create a safer future. The lecture will also discuss each of the Twelve Principles of Green Chemistry, concentrating specifically on the methods and applications of the Principles that are of particular relevance to the Pharmaceutical and Fine Chemicals Industry.

Green Chemistry in the Pharmaceutical and Fine Chemicals Industry: Case Studies

On average in the American pharmaceutical industry, the ratio of kg by-product:kg product produced is 200:1 for APIs with MW<1000, and 5000:1 for APIs with MW> 1000 kg. By designing

a synthesis guided by green chemistry principles thereby improving atom economy, large resource savings and thus cost savings can be obtained in the manufacturing process. As a result, many advances in green chemistry have come from the pharmaceutical industry. Since its founding, the Presidential Green Chemistry Challenge award has been given to several major pharmaceutical companies, including Pfizer and Merck. This seminar will focus on specific examples of green chemistry that have been implemented in the pharmaceutical industry. Key cost and resource savings metrics will be discussed.

iSUSTAIN™ Green Chemistry Index Application: A tool for assessing your chemical processes according to the 12 Principles of Green Chemistry

The iSUSTAIN™ Green Chemistry Index is a new application for assessing your chemical processes according to the Twelve Principles of Green Chemistry. This first of its kind tool provides a methodology to generate a sustainability-based score for chemical products and processes. It contains a set of sustainability metrics based on the Twelve Principles of Green Chemistry and takes into account such factors as waste generation, energy usage, health and environmental impact of raw materials and products, safety of processing steps, and others. This training will include an overview of the iSUSTAIN™ Green Chemistry Index, including working examples of how the application works for different industrial sectors.

Logistics

Audience

The anticipated audience is senior scientists and management level professionals; no prior experience or training in green chemistry is assumed. Dr. John Warner and Dr. Amy Cannon will lead the seminars. Course materials will be provided.

Cost, Location, and Timing

The \$200 registration fee includes 4 hours of training at the Warner Babcock Institute for Green Chemistry headquarters, located in Wilmington, MA. The training will be held from 12:00pm through 4:30pm. Lunch will be provided. Transportation to the training will be provided at an additional cost.

Instructor Bios



John C. Warner, Ph.D.

President and Chief Technology Officer

Warner Babcock Institute for Green Chemistry

John C. Warner is President and Chief Technology Officer of the Warner Babcock Institute for Green Chemistry, which he co-founded with Jim Babcock in 2007. The Institute is staffed with a diverse team of scientists and engineers focused on developing non-toxic, environmentally benign and sustainable technological solutions for society. These solutions must be as cost effective and perform as well or better than the existing technology they replace. Recent innovations at the Institute have drawn from the research areas of crystal engineering, molecular recognition, and self-assembly.

John Warner received his B.S. in Chemistry from the University of Massachusetts-Boston, his M.S. and Ph.D. from Princeton in Organic Chemistry. He worked at the Polaroid Corporation from 1988-1997 in exploratory research and media research. In 1997 he accepted a position in the Chemistry Department at the University of Massachusetts-Boston, where he started the world's first Green Chemistry Ph.D. program. Following this, he founded the Center for Green Chemistry as a professor at University of Massachusetts-Lowell. John received the American Institute of Chemistry's Northeast Division's Distinguished Chemist of the Year for 2002, and the 2004 Presidential Award for Excellence in Science Mentoring.

In 2009, the Council of Scientific Society Presidents honored John Warner with their Leadership in Science award for founding the field of Green Chemistry. The honor was shared with Green Chemistry co-founder, Paul Anastas. John is co-author of the book *Green Chemistry: Theory and Practice* [with Paul Anastas], which first described the 'Twelve Principles of Green Chemistry.' John was also a key stakeholder in the founding of the Presidential Green Chemistry Challenge Award, annually given by the US Environmental Protection Agency to companies and academic institutions in recognition of innovations in cleaner, cheaper, smarter chemistry. John currently serves on the Board of Directors of the Green Chemistry Institute in Washington, DC. In 2008, John chaired the Science Advisory Committee of the California Environmental Protection Agency's Green Chemistry Initiative, which recently released landmark policy recommendations seeking to eliminate or reduce the use of toxic substances in products and manufacturing processes. Most recently he was named as one of the ICIS Top 40 'Power Players,' a list that highlights the most influential people impacting the global chemical industry. John is editor of *Green Chemistry Letters and Reviews*, and associate editor of the journal *Organic Preparations and Procedures International*. John has been awarded a number of patents in the fields of semiconductor design, biodegradable plastics, personal care products, and polymeric photoresists.



Amy Cannon, Ph.D.

Executive Director

Beyond Benign, a Warner Babcock Foundation

Amy Cannon is the Executive Director of Beyond Benign, a nonprofit organization focused on creating a workforce and public that is well educated in green chemistry in order to create safer materials for a thriving society. The non-profit was created to generate, gather, and disseminate green chemistry information to a wide audience. Beyond Benign focuses on infusing green chemistry knowledge throughout society using curriculum development and training, community outreach, and workforce development.

Amy holds the world's first Ph.D. in Green Chemistry from the University of Massachusetts where her research involved the environmentally benign synthesis of photoactive materials. She received her M.S. in chemistry from the University of Massachusetts-Boston and her undergraduate degree in Chemistry from Saint Anselm College in Manchester, NH. Amy worked as an Assistant Professor of Green Chemistry and Director of Outreach and Community Education at the Center for Green Chemistry at the University of Massachusetts-Lowell until September of 2007 when she left to co-found Beyond Benign. Amy has industrial experience working as an analytical chemist for the Gillette Company and as a scientist for Rohm and Haas Electronic Materials. She was awarded the Kenneth G. Hancock Memorial Award in Green Chemistry in 2004 for her work on titanium dioxide semiconductors and their application in dye-sensitized solar cells. Her interests are in green chemistry education and research around safer green chemistry alternative technologies. Amy serves on the Editorial board of the new journal *Green Chemistry: Letters and Reviews*.