

American Chemical Society AMA: I'm Jane Wissinger, from the University of Minnesota, Ask me anything about green chemistry education and research. AMA.

AmerChemSocietyAMA¹ and r/Science AMAs¹

¹Affiliation not available

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Where do we draw the line as to whether or not something is green? Does it have to do with how long a given compound takes to break down into lesser compounds that the earth can handle? Can certain toxic substances actually break down fast enough to be considered green?

[bowe_flex](#)

This a great but complicated question. You start to address one of many metrics used to assess the greenness/safety of a particular chemical. The risk of a chemical compound to humans or the environment is a function of its inherent hazard and then exposure. Certainly persistence in the environment is a major factor and a goal of green chemistry is to design molecules that break down quickly and to less toxic substances. I would argue that yes, there are substances that are easily degraded or rendered benign which would add to its green characteristics. I will try to come back with a specific example if possible. JW

With plastic bags being outlawed in some places, is there a biodegradable replacement option other than paper, that can be made from organic material in a cost effective way?

[Themosthumble](#)

I will give a quick reply with my personal opinion on the plastic bag controversy. I understand the life cycle analyses that indicate corn-based plastics may have their own toll on the environment. However, the accumulation of non-degradable plastics, such as plastic bags, in our oceans and waterways is of massive concern and a focus on discovering biodegradable polymers is of utmost importance for, I will be dramatic, the planet. Chemists can do it. So we should continue efforts in this area of using biomass for plastics.

Hi Dr. Wissinger,

I took your Ochem 2 and Ochem lab classes a few years ago, and I just wanted to thank you for helping me learn to love Organic chemistry as more than just a bunch of stuff to memorize. I just needed someone to show me how it could be fun and interesting rather than an oppressive body of knowledge that one had to memorize.

It was during your Ochem 2 and Ochem lab classes Organic chemistry went from a class I feared and loathed to a class I loved. Both your enthusiasm and passion for the subject made it much easier to learn and to this day I love O chem and do my best to foster a similar interest in Organic chemistry.

To ask a question: I remember our experiment with PLA (polylactic acid) back when I took your course and I was wondering if there has been much progress with that polymer. I know they tried using it with the sunchip bags a few years ago but the bags were super loud and not very popular as a result. The U however, I believe, has been using PLA plastics for a while with no problems so I'm not sure why the sunchip bags caused such a problem.

Do you know anything about that situation and why PLA can seemingly be used for beverage cups and other plastics with no problems but the sunchip bags were a major failure?

[Wariya](#)

Awesome to hear from a former student! Thanks. I am not on the consumer end but certainly progress has been made at the U of MN Center for Sustainable polymers (and other academic and industrial labs) in combining PLA based polymers - which do have the tendency to be hard and brittle - with other renewable monomers to make thermoplastic elastomers with varying mechanical properties. Recall that in the 2311 lab course we made a triblock copolymer from a renewable flavor lactone as the midblock and added the PLA as the endblock for a flexible thin film. The major impediment to getting these materials to market and the Sunchips bag is cost. But I am confident researchers are making headway through bioengineering on that front.

When I was studying Green Chemistry in undergrad, the theme that frustrated me was hostility toward the adaption of Green philosophies in profit-incentivized environments. Regardless of benefit for environmental or public health, money is an easily measurable incentive that supersedes public interest. Specific examples describing this behavior include the DuPont dumping in West Virginia, integration of Triclosan in J&J personal care products, the Ethyl Corp inclusion of lead in gasoline and paints, the Bayer sales of unapproved medications in South America, etc.

How does Green Chemistry curriculum building and laboratory research change a business culture that only adopts break-even or profitable technology?

[Davikap](#)

Good question and yes the frustration is there. I do see a positive turn though from industry in organizations such as the GC3 (<http://www.greenchemistryandcommerce.org/>) Green Chemistry and Commerce Council who has an impressive list of industrial members working to push green chemistry to the forefront. And the ACS Green chemistry institute Pharmaceutical roundtable (<http://www.acs.org/content/acs/en/greenchemistry/industry-business/pharmaceutical.html>). It does start with the new students entering the workforce which is why I believe teaching green chemistry is of paramount importance for changing the business culture. Their trained mindset of long term impact of chemical products is essential. And, even the non-science majors taking the general chemistry courses and introductory organic will be future consumers and voters that can push company policies for change. Back to the GC3.. they have put out a higher education policy statement encouraging academics to train their future employees in green chemistry and sustainability practices. <http://www.greenchemistryandcommerce.org/assets/media/images/Projects/GC3%20HigherEdPolicy.pdf>
Thank you for this question. Positive change is happening. But it needs to move faster.