

Post Event Summary and Reflections

2023 Change Chemistry Innovators Roundtable



From November 14-16 2023, the Change Chemistry Innovators Roundtable was hosted by Millipore Sigma in St. Louis, MO and virtually. Over 130 participants representing chemical companies, consultancies, NGOs, academia, and government organizations discussed the role education, policy, and finance play in the scaling and commercialization of safe and sustainable chemistry. The need for progress to be measurable and equitable was an important thread considered throughout these conversations.

On the first day of the Roundtable, attendees discussed how industry and academia can collaborate to support innovation and workforce development, including how to inspire students and the need for green chemistry to be incorporated in chemistry curricula. Karen Madden, MilliporeSigma's CTO, gave the Keynote Address before the kickoff of the 2023 Startup Cohort pitches.

The second day began with a Keynote Address from Paul Anastas, Teresa and H. John Heinz III Professor in the Practice of Chemistry for the Environment at the Yale School of the Environment, and John Warner, President and CEO of Technology Greenhouse LLC and Distinguished Professor of Green Chemistry at Monash University. The third day featured a Keynote Address from B Gail McLean, Division Director (Acting) Chemical Science, Geosciences and Biosciences, Department of Energy. During these two days, attendees heard from experts on seven focused panels and engaged in guided breakout sessions based on the panel topics.

Continue reading for detailed summaries of each of the events during the Roundtable.

Tuesday, November 14th

Creating Demand for a Green & Sustainable Chemistry Workforce

Speakers:

- **Jeffrey Whitford**, Vice President, Sustainability & Social Business Innovation, MilliporeSigma, the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany
- **Amy Cannon**, Executive Director and Co-Founder, Beyond Benign
- **David Laviska**, Portfolio Manager for Green Chemistry and Sustainability in Education, ACS Green Chemistry Institute

Summary

- System change in green chemistry education is accelerating, especially in the domains of implementing green chemistry in the education of chemists. Engaged groups must measure this change in strategic ways to support the story of growing momentum.
- Increased action is needed to inspire incoming students and industry to become more involved in the higher education of chemists.

Industry-Academia partnerships to support innovation and workforce development

Speakers:

- **Amy Cannon**, Executive Director and Co-Founder, Beyond Benign
- **Isamir Martinez**, Scientific Alliances & Business Engagement Manager, ACS Green Chemistry Institute
- **David Laviska**, Portfolio Manager for Green Chemistry and Sustainability in Education, ACS Green Chemistry Institute
- **Barclay Satterfield**, External Innovation Technology Manager, Eastman (Virtual)

Summary

- Industry-academia engagements work best when projects have a defined scope, motivations and benefits are mutual (to the extent possible), and there is time and space to develop multi-year relationships.
- When industry is looking to engage with academia, trusted partners of academia, such as Beyond Benign and the ACS, can be valuable starting points.
- Diversity of perspectives, ideas and resources is an invaluable part of industry-academia partnerships.

KEYNOTE: Karen Madden, Millipore Sigma CTO

Karen Madden, Chief Technology Officer, MilliporeSigma, the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany

Summary

- Sustainability is a team sport, and engagement is needed from within the organization, the supply chain, and customers. MilliporeSigma has developed a framework for sustainability such that innovators in the company can engage with sustainability without needing sustainability expertise. The company has also developed a customer sustainability dashboard and the DOZN tool so that customers can evaluate the “greenness” of their products and browse greener alternatives

Startup Network

- **Arrakis Materials** is developing a technology that can fix CO₂ by converting it to a mixture of carbonates/silicates, which will be sold as CO₂-negative plastic/rubber fillers.
- **Axine Water Technologies** has developed a modular water treatment platform that uses electrochemical oxidation to convert organic pollutants (including PFAS) into an oxidized and reduced gas (e.g., H₂O, CO₂, H₂, F₂).
- **Ayas Renewables** offers customers a source of biobased and bio-renewable propylene glycol from glycerin, which is made from a byproduct of biochemical production.
- **Boreal Bioproducts** uses a chemical-free Pressurized Hot Water Extraction (PHWE) process to extract valuable natural products like hemicellulose and lignin from lignocellulosic feedstock.
- **Cascade Biocatalysts** developed an enzyme “body armor” substrate that allows them to fix a wide array of enzymes to comb-like polymer-grafted surfaces, which increases the lifetime of enzymes in chemical production.
- **FiberX** is developing a process (based on corn stover) to produce a filler to go into the production of bio-composite plastics.
- **Hazard Evaluations Ltd (HazEL)** has developed an informatics platform that draws on human and environmental toxicity data to rate, rank and evaluate chemical alternatives.
- **Ruby Bio** has developed a biomanufacturing platform that uses naturally occurring yeast as a “factory” to convert low-cost sugar into surfactants that can be tailored based on different end uses.

Reverse Pitch

- Companies are looking to expand their sustainability and chemical portfolio, targeting three principal areas: 1) fossil free chemicals and solvents, 2) sustainable and safe

alternatives to hazardous chemicals that currently meet strict performance standards, and 3) chemicals that can enable more sustainable activities, such as the reduction in greenhouse gas emissions.

- Companies represented a diverse set of industries, and as a result many different specific innovation needs were mentioned- from corrosion inhibitors to surfactants.

Wednesday, November 15th

KEYNOTE: Paul Anastas and John Warner

Paul Anastas, Teresa and H. John Heinz III Professor in the Practice of Chemistry for the Environment, Yale School of the Environment

John Warner, President and CEO, Technology Greenhouse, LLC and Distinguished Professor of Green Chemistry, Monash University

- The way chemistry is currently approached is not compatible with natural systems.
- The capabilities of the green chemistry field have been demonstrated – what will be implemented is up to each actor in the value chain. Commercializing green chemistry science is a challenge, but we must be faster as we do not have the luxury of time anymore to accelerate the adoption of these solutions.
- Consumers value other things besides price and performance - they can also shift to value sustainability.
- Stories have power, and we should value what our great grandchildren will think of us. It is important to tell a story regarding sustainable chemistry.

SESSION 1: Opportunities to Scale Safe and Sustainable Solvents

Moderator:

- **Jeffrey Whitford**, Vice President, Sustainability & Social Business Innovation, MilliporeSigma, the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany

Speakers:

- **Anna Zhenova**, Founder & CEO, Green Rose Chemistry
- **Jane Murray**, Global Head of Green Chemistry, MilliporeSigma
- **Alessandro Napoli**, Vice President of Product Development, CIRCA
- **Art Fong**, Smarter Chemistry Lead, Apple

Summary

- Designing and piloting the production of sustainable solvents is only the first part of a long journey for companies. Companies producing sustainable solvents need to listen to feedback from their customers to improve on their initial product offering.
- For companies looking to replace hazardous solvents, it is necessary to look at the full picture of the economic, regulatory, and social cost of using the existing hazardous solvent. The upfront cost of safe alternatives may be greater, including the costs of chemical installations, but there could be cost savings in the long term. Subsidies have benefited the oil and gas industry historically and could be used alongside other incentives to aid the transition to sustainable and safe solvents.
- Hansen Solubility Parameter is a popular tool to identify solvent alternatives that could be functionally interchangeable. Mixes of sustainable solvents may also be alternatives to non-sustainable or hazardous solvents.

SESSION 2: Advancing Environmental Justice through Sustainable Chemistry: Establishing Promising Practices

Moderator

- **Sally Edwards**, Director, Retailer Leadership Council, Change Chemistry

Speakers:

- **Karen Chu**, Special Advisor and Environmental Fellow, US Environmental Protection Agency (EPA)
- **Kayla Williams**, Diversity Equity & Inclusion Lead, Clean Production Action
- **Tom Richardson**, Chief Commercial Officer, Solugen

Summary

- Green chemistry will not ensure that environmental justice is addressed – we need to be clear how green and sustainable chemistry can be supportive in addressing EJ issues. Environmental justice audits are a first step.
- Those closest to the problem are often closest to the solution. Companies engaging with communities can lead to surprising solutions. When companies do first engage, they should be in “listening mode” to learn which actions can be the most beneficial to nearby communities. Ongoing engagement should continue and will build trust.
- Decarbonization and detoxification of the chemical industry should go hand in hand.

SESSION 3: Innovating to Solve the Plastics Problem: What is working and how can we build on and scale it?

Moderator:

- **Andy Shafer**, Strategist, business and Brand Builder, Shafers Innovations and Business building Service (SIBBS)

Speakers:

- **Meg Sobkowicz Kline**, Professor of Plastics Engineering, UMass Lowell
- **Michael Delee**, Product Stewardship Director, Plastics and Specialty Plastics, Dow
- **Ryan Smith**, Co-Founder & CTO, Origin Materials
- **Natalie Stirling-Sanders**, Chief Advisor for Americas, Alliance to End Plastic Waste

Summary

- The plastics supply chain is complex, but solutions depend on transparency and communication. Several solutions may need to be scaled at the same time because plastics are such a large problem.
- Innovation is occurring at various stages of the supply chain, and most of these actions are aligned with the vision of sustainable chemistry.
- There is a need for the entire supply chain to speak the same language around plastics. This should be supported by metrics and lead the supply chain in an aligned direction.

SESSION 4: Tracking Progress in Advancing Sustainable Chemistry – Are we getting there?

Moderator:

- **Asli Tamer Vestlund**, European Program Lead, Change Chemistry

Speakers:

- **Amy Cannon**, Executive Director and Co-Founder, Beyond Benign
- **Adelina Voutchkova**, Director of Sustainable Development, American Chemical Society
- **Joel Tickner**, Executive Director, Change Chemistry

Summary

- At the start of green and sustainable chemistry, there was a lack of resources to support training and education and a lack of case studies of green and sustainable chemistry in innovation and business activities.
- The movement is now growing steadily – from the number of green chemistry commitment signers (Beyond Benign) to the growth of sustainable chemistry products in the marketplace. However, there is still more room to grow and expand. This includes

reaching more students and career professionals with diverse learning resources and engaging the investment community.

- The time is now – there is awareness on chemical pollution and global action to decrease greenhouse gas emissions. Sustainable chemistry can contribute and leverage policies, research, and the ecosystem to address these global challenges.

Thursday, November 16th

KEYNOTE ADDRESS: Gail McLean

Gail McLean, Division Director (Acting) Chemical Sciences, Geosciences and Biosciences Division, Department of Energy (DOE)

- The federal government has invested significant resources in growing sustainable chemistry, commonly through initiatives that are labelled as decreasing climate change impacts, addressing past harms of chemical pollution, and increasing domestic production.
- For a company or academic stakeholder, finding the right partner office in the DOE is key to growing research, development, and implementation of sustainable chemistry technologies.

SESSION 5: Policies and Incentives to Drive the Transition to Sustainable Chemistry

Moderator

- **Joel Tickner**, Executive Director, Change Chemistry

Speakers:

- **Kay Williams**, Joint Head of International Chemicals, Pesticides and Hazardous Waste Hub, Department for Environment, Food and Rural Affairs (Defra)
- **Kristin Schreiber**, Director, European Commission, DG Grow, Chemicals, Health, Retail and Agrifood
- **Ben Dunham**, Principal Attorney, Dunham Law & Policy PLLC
- **Saskia van Bergen**, Safer Chemist Lead, Washington State Department of Ecology

Summary

- The links between climate change, biodiversity, and chemical pollution are clear and driving the concepts of sustainable chemistry into international treaties and discussions. Since the impacts of chemicals are global, international discussions are also cognizant of not moving chemicals production to areas with less stringent regulations.

- Sustainable chemistry touches many distinct types of policy, from policies to phase out hazardous substances, to policies that support innovation and climate change, and policies intended to introduce safe chemicals to the market.
- Companies of all sizes benefit from regulation that is consistent across geographies. Small companies especially can benefit from incentives and funding that help to certify their products as sustainable.
- A successful transition requires buy-in from many stakeholders outside of the typical scope of the chemical industry (e.g., retailers and universities). There are government-led efforts to outline the chemical industry's transition in the US and the EU.

SESSION 6: Developing a Holistic Framework for Safe and Sustainable Chemical Design and Selection

Moderator:

- **Jenny MacKellar**, Program Director, Change Chemistry

Speakers:

- **Sally Edwards**, Director, Retailer Leadership Council, Change Chemistry
- **Aude Bechu**, Chemist & Post Doc Research Associate, UMass Lowell
- **Wibke Lölsberg**, Corporate Sustainability Strategy, BASF
- **Sascha Bloemhoff**, Marketing Director Niaga®, Covestro

Summary

- Transparency, traceability, and data are key for sustainability. The first step is finding the right questions to ask because choosing the 'sustainable' option is not straightforward – things are not always what they seem!
- Better data collection can be approved through partnership of brands with suppliers. Brands can provide training and financial support to enhance data collection.
- Companies should decide what their cut-offs are for sustainable products. Innovation activities can be steered towards sustainability efficiently through a stage-gate process that involves different departments in a company.
- The design stage of a product is an opportune time to consider circularity (i.e., end-of-life) and chemicals use.

SESSION 7: Growing Sustainable Chemistry Transition Finance

Moderator

- **Rui Resendes**, Director of Development, Change Chemistry

Speakers:

- **Ann Lee-Jeffs**, Senior Director, Corporate Sustainability, Modern Meadow
- **Caroline Boden**, Director of Shareholder Advocacy, Mercy Investments
- **John May**, Managing Director, Hamilton Clark Sustainable Capital, Inc.
- **Laura Hoch**, Senior Material Innovation Engineer, Patagonia, Inc.

Summary

- Industry needs to invest in developing the right definitions (not biochemicals – instead green, safe, sustainable chemistry) and metrics to measure companies.
- The investment community increasingly understands the material risks to businesses that use hazardous chemistry.
- There is investment and scaling support for small companies that are looking to advance sustainable chemistry, but companies need to know where to look in a complex ecosystem. Certain companies are willing to pilot innovations on a small scale, while others are looking for proven technologies to scale quickly.