出國報告（出國類別：開會）

參加第 27 屆綠色化學與工程年會國際會議報告

（The 27th Annual Green Chemistry & Engineering Conference）

服務機關：行政院環境保護署毒物及化學物質局
姓名職稱：魏宇鴻技士
派赴國家/地區：美國/加利福尼亞州
出國期間：112 年 6 月 11 日至 6 月 19 日
報告日期：112 年 10 月 4 日

摘要

「綠色化學與工程年會 (Green Chemistry & Engineering Conference) 」係由「美國化學學會綠色化學研究機構(American Chemical Society Green Chemistry Institute, ACSGCI)」定期於每年6月主辦，今年於美東時間6月13日至15日在美國加利福尼亞州長灘舉辦「第27屆綠色化學與工程年會(The 27th Annual Green Chemistry & Engineering Conference)」，本次會議主題為「封閉循環：化學促進永續未來 (Closing the Loop: Chemistry for a Sustainable Future)」，會中計有2場主題演講（Keynote Address），會議討論議題涵蓋永續農業、綠色設計、綠色產業、綠色化學之教育推廣及實施策略、循環經濟等等面向，為各國相關領域專家學者之交流平臺。

「第27屆綠色化學與工程年會(The 27th Annual Green Chemistry & Engineering Conference)」開始前，於6月12日有會前活動「第6屆年度綠色化學承諾峰會 (6th Annual Green Chemistry Commitment Summit)」，慶祝GCC成立10週年，該會議是由Beyond Benign辦理， Beyond Benign致力向全球科學教育工作者、工業界和整個社會推廣綠色化學實踐、案例研究、課程、實驗室實驗和活動。透過創新綠色技術應用，向教育工作者介紹永續化學概念。

本局為接軌國際趨勢，邁向永續綠色化學，建構「安全永續的化學環境」，並逐步邁向無毒家園目標，藉由參加本次會議，可以瞭解綠色化學教育推動及產業在國際上發展現況及展望，並學習目前國際推動之理念及作法，有助於我國後續業務推動與施政之參考。

本次會議最大的收穫莫過於能與綠色化學之父 John C. Warner 及 Paul T. Anastas 交流，並說明本局推動綠色化學教育之努力；另同時也向美國環保署(USEPA) 辦理美國總統綠色化學挑戰獎(Presidential Green Chemistry Challenge Award)之承辦人分享臺灣也有辦理綠色化學相關獎項，以鼓勵企業推動綠色化學。

目錄

一、 目的

「綠色化學與工程年會 (Green Chemistry & Engineering Conference) 」係由美國化學學會綠色化學研究機構(American Chemical Society Green Chemistry Institute, ACSGCI)定期在每年 6 月主辦，今年於美東時間 6 月 12 日至 15 日在美國加利福尼亞州長灘舉辦「第 27 屆綠色化學與工程年會(The 27th Annual Green Chemistry & Engineering Conference) 」，本次會議主題為「封閉循環：化學促進永續未來 (Closing the Loop: Chemistry for a Sustainable Future)」，會議討論議題涵蓋永續農業、綠色設計、綠色產業、綠色化學之教育推廣及實施策略、循環經濟等等面向，為各國相關領域專家學者之交流平臺。

本局為接軌國際趨勢，邁向永續綠色化學，建構「安全永續的化學環境」，並逐步邁向無毒家園目標，本次藉由派員參加由美國化學會辦理之「第 27 屆綠色化學與工程年會」，可以瞭解綠色化學教育推動及產業在國際上發展現況及展望，並學習目前國際推動之理念及作法，有助於我國後續業務推動與施政之參考。

二、過程

本次行程規劃如表 1，本(27)屆綠色化學與工程年會(The 27th Annual Green Chemistry & Engineering Conference)於 2023 年 6 月 13 日至 15 日在美國加利福尼亞州長灘希爾頓酒店(Hilton Long Beach Hotel)（圖 1）舉行，年會開始前於 6 月 12 日有會前活動「第 6 屆年度綠色化學承諾 (GCC) 峰會」(6th Annual Green Chemistry Commitment Summit)，慶祝 GCC 成立 10 週年，每日研討會內容非常豐富，會議從上午 8 時 15 分至下午 5 時左右，同時段於 7 至 9 間會議舉行，議程詳如附件。

表 1 每日行程概要

日　期	工 作 內 容 概 要
112.06.11	去程搭機（臺灣－美國洛杉磯）
112.06.12	前往長灘、準備會議資料
112.06.13	參加第 27 屆綠色化學與工程年會會前活動
112.06.14	參加第 27 屆綠色化學與工程年會
112.06.15	參加第 27 屆綠色化學與工程年會
112.06.16	參加第 27 屆綠色化學與工程年會
112.06.17	參訪美國加州大學洛杉磯分校
112.06.18	資料彙整、交通移動前往機場
112.06.19	返程搭機（美國洛杉磯－臺灣）

圖 1 第 27 屆綠色化學與工程年會 LOGO

圖 1 會議地點

圖 2 第 27 屆綠色化學與工程年會

會議重點摘錄

（一） 會前活動-「第 6 屆年度綠色化學承諾 (GCC) 峰會」 (6th Annual Green Chemistry Commitment Summit) ：

1. 「第 6 屆年度綠色化學承諾 (GCC) 峰會 (6th Annual Green Chemistry Commitment Summit) 」主要是由 Beyond Benign 辦理，Beyond Benign 為非營利組織，其由 John C. Warner 和 Amy Cannon 博士在 2007 年共同創立。Beyond Benign 致力向全球科學教育工作者、工業界和整個社會推廣綠色化學實踐、案例研究、課程、實驗室實驗和活動。透過創新綠色技術應用，向教育工作者介紹永續科學和綠色化學概念。
2. 本次會議中除慶祝 GCC 成立 10 週年外，並邀請多位講者分享，分享內容多呼應綠色化學推動需要透過將專業人士、教育工作者和倡導者共同支持、連結、知識分享及成長。其分享重點如下：
   (1) 綠色化學的願景是希望我們每天使用的產品對人類和環境來說是安全和健康的，綠色化學推動必須要從教育著手，教育推動是重要一環；此外，創新也是一關鍵，教育和創新須連結再一起，對於推動綠色化學的未來至關重要。

(2) 教育工作者對學生有著深遠的影響，教育者所產生的影響力是很大的，推動綠色化學教育需要將化學和環境科學或一般基礎學科做聯結，融入於生活當中，使學生可以從生活環境中連結相關內容，而在課程中融入綠色化學是邁向永續未來的一步。

(3) 說服學生接受綠色化學也是一項重大挑戰，我們應該鼓勵學生在課程中進行思考，並重新思考如何教授化學基礎課程吸引學生，並使學生提出問題，從而引發更多的想法。雖然現今人工智慧普及，藉由此技術可以提供答案，但它無法更深入的思考。

(4) 美國加州毒化物管理局局長 Meredith Williams 分享：鼓勵公司採用綠色化學替代並消除產品中的有毒物質來促進更安全的消費品，並積極採取預防措施，重點關注全面的危害評估並使用更安全的化學品。

圖 3 「第 6 屆年度綠色化學承諾峰會」

圖 4 與 John C. Warner 及美國加州毒化物管理局局長 Meredith Williams 合影

（二） 「第 27 屆綠色化學與工程年會(The 27th Annual Green Chemistry & Engineering Conference)」

1. 專題演講：

(1)Helen Sneddon 主講「綠色化學…對學術界和工業界至關重要(Green Chemistry…Essential for Academia and Industry)」：

Helen Sneddon 是英國約克大學永續化學教授兼綠色化學卓越中心主任，其在演講中強調了發展循環經濟不可或缺的四個項目：包括可再生原料、綠色合成、永續技術以及再利用、回收和降解設計。

A. 可再生原料：推動使用可再生資源可實現聯合國永續發展目標(SDG)。「這對於負擔得起的清潔能源至關重要」，因此他也在積極研究開發可再生原料。

B. 綠色合成：除了可再生原料之外，還需要考慮化學反應的性質以及使用的試劑和條件，作為實現封閉循環和發展循環經濟，以避免過程中產生的衍生物以及其他浪費。

C. 永續技術：除了考慮試劑和溶劑之外，還須提高化學反應和化學加工整體永續技術。

D. 再利用、回收和降解設計：為了完成整個生命週期，應在設計產品時考慮到其後續所產生的影響，以避免造成其他後果。

(2) Sean Hunt 主講「脫碳化學品：克服障礙並開創綠色化學的永續解決方案(Decarbonizing Chemicals：Overcoming Hurdles and Pioneering Sustainable Solutions in Green Chemistry)」

Solugen 是在 2016 年創立，Sean Hunt 等化學工程師研發永續製程及產品，以減少產品碳足跡，講者表示利用新技術，將此綠色的合成路徑技術商業化，以進行綠色化學品製造，並投入工廠生產，該技術每年可減少產品碳足跡及二氧化碳排放。

要擴大綠色化學製程並將其規模化其實非常困難，雖過程艱鉅，但講者仍然持續透過提高製程效率和持續創新及挑戰，持續利用綠色化學理念生產產品，從而減少對化石資源的依賴。

2. 教育方面：在綠色化學教育中，須要求學生在實驗室做實驗時更廣泛思考，包括實驗的設計、試劑的使用等應符合綠色化學原則，應對人體/環境無害，學生應接受相關訓練，應將化學與毒理學做連結，使學生瞭解什麼是危害、化學品與生物系統相互作用的方式及其在環境中的宿命、以及如何設計實驗、使用更安全的化學品。

3. 2022 年美國總統綠色化學挑戰獎(Presidential Green Chemistry Challenge Award)獲獎者之分享：

本獎項主要目的為鼓勵減少或排除有害物質的使用，達到源頭即防止或降低污染，獎項分成「綠色合成路徑獎(For Greener Synthetic Pathways)」、「綠色反應條件獎」(For Greener Reaction Conditions)、「小企業獎」(For Small Business)、「學術獎」(For Academic)及「具體環境效益-氣候變遷獎」(For Specific Environmental Benefit—Climate Change)；美國環保署及美國化學會共同辦理此獎項之成效亦可作為我國辦理「綠色化學應用及創新獎」之參考，獲獎之內容亦可作為新知，下列摘述獲獎者分享內容：

(1) 綠色合成路徑獎：因應嚴重特殊傳染性肺炎(COVID-19)情況，促使全世界積極研發 COVID-19 抗病毒藥物，默克公司團隊(Merck & Company, Inc) 開發了 LAGEVRIO™(molnupiravir) ，

LAGEVRIO™(molnupiravir)是一種治療 COVID-19 的小分子抗病毒藥物。最初合成 molnupiravir 其問題為總產率較低，並產生大量溶劑等有機廢棄物；默克公司團隊積極改良，並研發新的合成方式，其可減少廢棄物的產生，並使產量提高；另於研發過程中發現另一種減少合成步驟的方法，以減少 molnupiravir 合成過程中的產生的廢棄物和危害。

(2) 綠色反應條件獎：LUMAKRAS™ (sotorasib)是一種治療某些非小細胞肺癌的新藥，Amgen 公司改進其合成方式後，減少反應步驟，進而減少浪費及縮短製造時間。Amgen 也實施有害物質回收流程，以提高效率並減少廢棄物產生量。除每年將減少反應物之浪費外，同時也提高 sotorasib 產量、成本及整體永續性。

(3) 小型企業獎：秋行軍蟲(Fall armyworm , FAW)是一種破壞性害蟲，以玉米等 80 多種作物為食。為了防治秋行軍蟲，Provivi 開發了 Provivi FAW™，Provivi FAW™ 由兩種費洛蒙組成，透過迷惑雄性秋行軍蟲來降低其繁衍能力，進而減少傳統農藥的使用，並可以改善其他有益昆蟲的數量。此外，Provivi 也持續開發 Provivi FAW™ 新的反應方法，利用植物發酵，並改進其反應步驟，以減少反應過程中原料和有機溶劑的使用及廢棄物的產生。

（三） 意見交流

1. 會中與美國綠色化學之父 John C. Warner 及 Paul T. Anastas 交流，兩位均關心臺灣在推動綠色化學方面之努力。
2. 會中與美國環保署(USEPA)美國綠色化學總統挑戰獎(Presidential Green Chemistry Challenge Award)承辦人 Chen H. Wen 交流，藉以分享臺灣也有辦理相關獎項，以鼓勵企業推動綠色化學。

圖 5 「第 27 屆綠色化學與工程年會」

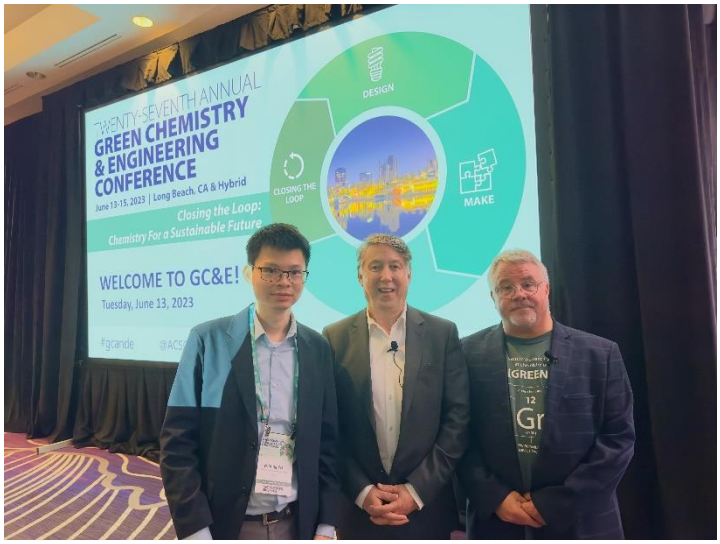

圖 6 與綠色化學之父 John C. Warner 及 Paul T. Anastas 合影

圖 7 與美國綠色化學總統挑戰獎承辦人 Chen H. Wen 合影

三、心得及建議

（一） 本次「第 27 屆綠色化學與工程年會」恢復實體辦理，透過大會安排多元議題，從研討會中聽取不同國家、廠商推動綠色化學之教育方面、研究放面、研發方面之內容，顯示綠色化學對於永續發展之未來之重要性；參加本次會議除能多吸收國際新知外，最大的收穫莫過於能與綠色化學之父 John C. Warner 及 Paul T. Anastas 交流，並說明本局推動綠色化學教育之努力；另同時也與美國環保署(USEPA) 辦理美國綠色化學總統挑戰獎(Presidential Green Chemistry Challenge Award)之承辦人 Chen H. Wen 交流，藉以分享臺

灣也有辦理相關獎項，以鼓勵企業推動綠色化學；此趟行程除獲益良多外，並獲得國際友人一大肯定。

（二） 本局自 2017 年以來積極與教育部合作，推動大專校院和小學綠色化學教育，舉辦大專校院綠色化學創意競賽，對於推動小學綠色化學教育，可將綠色化學融入一般學科中，從中促進學生創新及思考綠色化學；另外可藉由「大專校院綠色化學創意競賽」，引導學生注意實驗室安全，其包括如何設計實驗、使用更安全的化學品等，以符綠色化學原則，促進更永續的未來。

（三） 美國總統綠色化學挑戰獎辦理迄今已 27 年，其所產生之環境效益極大，包含每年逐步減少危害性化學品及溶劑使用、降低碳排放等，其中 2022 年榮獲小型企業獎之 Provivi 公司，其為防治秋行軍蟲，並減少傳統農藥的使用，進而研發 Provivi FAW™ 之替代方案，其與本局今(2023)年「綠色化學應用及創新獎」之獲獎者-農業部花蓮區農業改良場之獲獎事蹟均為了減少傳統農藥的使用，而創新屬於綠色化學替代之動力；後續本局將持續參考「美國總統綠色化學挑戰獎」辦理之方式，以作為我國於產業端、學術研究端推行綠色化學政策之參考，並持續獎勵企業、學校將綠色化學理念融入企業經營及研究發展中。

（四） 透過本次研討會的參與，可以瞭解到從各國積極推動綠色化學，推動綠色化學對於全球環境、健康、安全均有重大助益，而本局亦持續接軌國際，致力於化學物質管理，持續推廣綠色化學，並以綠色化學為重要施政理念，接軌國際，逐步達成安全無毒之家園，建立健康永續環境；未來若有綠色化學相關國際會議，建議可持續派員參與，多方吸收資訊，以做為我國執行業務及政策推動之參考，以邁向安全無毒之家園。

四、附錄：

附錄-年會議程

GREEN CHEMISTRY COMMITMENT SUMMIT

GREEN CHEMISTRY COMMITMENT beyondbenign.org

Green Chemistry Commitment Summit

Celebrating 10 Years and Committing to Action

9:00am – 5:00pm (PT) – Long Beach, CA and Online
Hilton Long Beach Hotel, Rooms Pacific I & II
EVENT AGENDA

8:45am – 9:15am	**Registration and breakfast**
9:15am – 9:30am	**Welcome:** • *Dr. Amy Cannon,* Beyond Benign - Celebrating a 10-year history • *Dr. Natalie O'Neil,* Beyond Benign - Welcome and Logistics
9:30am – 11:15am	**Opening Plenary Session: Building a Sustainable Future through Chemistry: A Call to Action** Moderated by *Dr. Amy Cannon*. Featured speakers: • *Dr. John C. Warner,* Co-Founder Green Chemistry and Beyond Benign • *Dr. Meredith Williams,* Director, California Department of Toxic Substances Control • *Dr. Arthur Fong*, Technology Leader for Smarter Chemistry, Apple • *Areej Nitowski,* Green Chemistry Education Manager, MilliporeSigma
11:15am – 12:00pm	**Celebrating 10 years of the Green Chemistry Commitment:** • GCC 10-year video presentation and awards ceremony • *Dr. Amy Cannon,* Beyond Benign - Committing to Green Chemistry
12:00pm – 1:00pm	**Lunch and Networking Break:** • Use the *photo booth* to share how you will #CommitToGreenChem!
1:00pm – 2:30pm	**Advancing Green Chemistry in Higher Education** Part I: Green Chemistry Commitment: Building and Supporting a Community of Practice. Featured speakers: • *Dr. Natalie O'Neil,* Beyond Benign – Green Chemistry Commitment: Status, Achievements and Successes • *Dr. Nimrat Obhi,* Beyond Benign – Green Chemistry Commitment Minority Serving Institutions (MSIs) Initiative: Building a community for all • *Dr. Jonathon Moir,* Beyond Benign – Green Chemistry Teaching and Learning Community (GCTLC): An On-line platform for the growing green chemistry education community

	Part II: Green Chemistry in Action: Institutional Models and 10+ years of action. Moderated by *Dr. Natalie O'Neil*. Featured speakers: • *Dr. Jane Wissinger,* University of Minnesota • *Dr. Dalila Kovacs,* Grand Valley State University • *Dr. Doug Raynie,* South Dakota State University • Panel Discussion/Q&A session
2:30pm – 3:00pm	**New Opportunities for Advancing Green Chemistry in Higher Education** Moderated by *Nicki Wiggins*. Featured speakers: • *Dr. Adelina Vouchtkova,* ACS GCI – Reimaging Chemistry Education for a Sustainable Future • *Areej Nitowski,* MilliporeSigma – Opportunities for Green Chemistry Commitment Signers
3:00pm – 3:15pm	**Coffee Break – Photo Booth**
3:15pm – 4:30pm	**Calls to Action: Breakout Discussions** • Green Chemistry Teaching & Learning Community (GCTLC) • Greener Labs • Green Chemistry in Research • Green Chemistry Commitment (GCC) • Engaging Minority Serving Institutions (MSIs) and BIPOC students and faculty • Professional Development for Faculty
4:30pm – 5:00pm	**Wrap-Up and Final Reflections (Dr. Amy Cannon and Dr. Natalie O'Neil)**
5:30pm – 7:30pm	**Join us for the Student Workshop and GCC Summit Networking Reception @ Padre Latin Table & Cocktails, 525 E Broadway, Long Beach, CA, 90802, US**

Green Chemistry Commitment Summit

Celebrating 10 Years and Committing to Action

9:00am – 5:00pm (PT) – Long Beach, CA and Online

Hilton Long Beach Hotel, Rooms Pacific I & II

MEET OUR SPEAKERS

Building a Sustainable Future Through Chemistry: A Call to Action

John Warner, Co-Founder, Green Chemistry, Co-Founder and Board Member, Beyond Benign
(www.johnwarner.org)

John Warner is a chemistry inventor who works to design and create commercial technologies inspired by nature consistent with the principles of green chemistry. With over 300 patents, he has invented solutions for dozens of multinational corporations. His inventions have also served as the basis for several new companies.

He is one of the co-founders of the field of green chemistry, co-authoring the defining text **"Green Chemistry: Theory and Practice"** and articulating the **12 principles of green chemistry** with Paul Anastas. John has over 100 publications providing foundational work in the fields of noncovalent derivatization, polymer photochemistry, metal oxide semiconductors and synthetic organic chemistry. John has received prestigious awards as an academic (Presidential Award for Excellence in Science Mentoring – President G. W. Bush & NSF, 2004) and the August Wilhelm von Hofmann Medal from the German Chemical Society, 2022), industrial chemist (Perkin Medal – Society of Chemical Industry, 2014).

John received his BS in Chemistry from UMASS Boston, and his PhD in Chemistry from Princeton University. After working at the Polaroid Corporation for nearly a decade, he then served as tenured full professor at UMASS Boston and Lowell (Chemistry and Plastics Engineering). In 2007 he founded the **Warner Babcock Institute for Green Chemistry**, with Jim Babcock (a research organization developing green chemistry technologies), and **Beyond Benign** with Amy Cannon. John is regularly giving keynote talks and workshops on Green Chemistry, Innovation, The Circular Economy, and Biomimicry. He continues to advise several international organizations.

Meredith Williams, Director, California Department of Toxic Substances Control
(https://dtsc.ca.gov/executive-leadership-team/)

Meredith Williams has served as the Director of the California Department of Toxic Substances Control (DTSC) since December 2019 where she has shaped new policies to improve DTSC's transparency and accountability. She champions equity and inclusive processes for the department's decision making in order to protect California's most vulnerable communities.

Meredith joined DTSC in 2013 to lead the implementation of California's groundbreaking Safer Consumer Products Program to reduce toxic chemicals in consumer products. Before joining DTSC, Meredith worked in the technology sector and for the nonprofit San Francisco Estuary Institute.

She has expertise in research and development, product management, and operations for Fortune 500 companies in the technology, consumer product, and chemical sectors, including 3M and Applied Materials. Following her work in the private sector, Meredith held a number of leadership positions at the nonprofit San Francisco Estuary Institute, a nationally recognized center for science in support of aquatic resource management. She holds a B.A. degree from Yale University and a doctorate in physics from North Carolina State University.

Arthur Fong, Technical Leader for Smarter Chemistry, Apple

(https://www.apple.com)

Art Fong is the Technical Leader for smarter chemistry on the Environmental Technologies team at Apple, driving Apple's efforts to remove harmful substances from its product designs and innovate safer alternatives.

Art is engaged in a number of collaborative projects to advance the science and practice of green, sustainable chemistry to catalyze change across the electronics industry and beyond. He is an advisor for the science-based, nonprofit collaboration Chem*FORWARD*, working to guide hazard assessment harmonization, data quality, process transparency, and scientific integrity to identify chemicals that are inherently benign for their intended use. He is on the Design Team of the Clean Electronics Production Network, which unites diverse stakeholders to understand, address, and eliminate workers' exposure to toxic chemicals in the electronics supply chain.

Art is a product of the University of California educational system, receiving his undergraduate degree from UC Davis and PhD from UC Irvine.

Areej Nitowski, Green Chemistry Education Manager, MilliporeSigma

(https://www.emdmillipore.com)

Areej Nitowski brings together her love of science and education in her role as Green Chemistry Education Manager for the Life Science business of Merck, KGaA, Darmstadt, Germany, which operates as MilliporeSigma in the U.S. and Canada. Areej strives to implement chemistry curriculum change in higher education and prepare future chemists with an education where sustainability is the primary focus.

She is particularly passionate about making science education more accessible for young women and students of color. In her role as Green Chemistry Education Manager, she also serves as the liaison for the company's Signature Partnership with global green chemistry education nonprofit Beyond Benign. Areej spent the first 20 years of her career as an analytical chemist and applications specialist for analytical laboratory equipment and liquid handling automation for high-throughput screening in the

pharmaceutical and biotechnology industries. This industry experience is complemented by an 11-year career teaching 7th grade science. Areej received her B.S. in biochemistry and M.S. in toxicology from SUNY Environmental Science and Forestry.

Adelina Voutchkova, Director of Sustainable Development, American Chemical Society Green Chemistry Institute (ACS GCI) (https://www.acs.org/greenchemistry.html)

Adelina Voutchkova is the Director of Sustainable Development at the American Chemical Society and leads the ACS Green Chemistry Institute®. Adelina joined the ACS from George Washington University where her research program spans the two frontiers of green chemistry: the development of green synthetic methods through supported catalysis, and the development of predictive methods for identifying chemicals of toxicological concern.

She is the recipient of the NSF CAREER award, the 2020 Early Career Researcher Award from GWU, and the 2021 Thieme Chemistry Journals Award, among others. Adelina was previously a Research Associate and a Postdoctoral Fellow at the Yale Center for Green Chemistry and Green Engineering. She completed her Ph.D. in organometallic chemistry at Yale with Bob Crabtree, focusing on atom-economical catalytic transformations facilitated by NHC complexes. She earned her BA from Middlebury College, where she worked with Prof. Sunhee Choi on the chemistry of Pt anticancer complexes.

Jane Wissinger, Distinguished University Teaching Professor and Organic Lab Director, University of Minnesota

Jane Wissinger received her Bachelor of Arts from Susquehanna University (PA), Master's from Georgia Institute of Technology (GA), and doctorate in organic chemistry from Northwestern University (IL). She was employed as a research scientist at Rohm & Haas Co. for five years before beginning her academic career at the University of Minnesota.

Wissinger's teaching and research interests focus on the development of curriculum materials for the college and high school levels that exemplify modern green chemistry methodology, advances in sustainable polymers, and guided inquiry pedagogy. She is a senior principal investigator in the NSF Center for Sustainable Polymers and active in promoting green chemistry education locally and on a national level through funded projects, publications, and conferences.

Her contributions to education were recognized with a University of Minnesota Morse-Alumni Distinguished Teaching Professor award (2014) and an ACS-CEI Award for Incorporation of Sustainability in Chemistry Education (2018). Wissinger was an Institute on the Environment (IonE) Educator in 2018-2019. She has been a member of the American Chemical Society since 1980 and is currently an associate of the National ACS Committee on Environment & Sustainability.

Dalila Kovacs, Professor, Grand Valley State University

Dalila Kovacs holds a B.Sc. in Organic Chemistry by Babes-Bolyai University in Cluj-Napoca, Romania, and a Ph.D. in Physical Organic Chemistry by Michigan State University. She is currently a Professor at Grand Valley State University, where she is exploring heterogeneous catalytic processes as alternatives for green pathways from biomass-based resources toward chemical commodities.

Besides participating in Advisory Board of the Green Chemistry Commitment, Dalila has also been an invited member of the Green Chemistry Roundtable for the Governor of Michigan and has been involved with the Green Chemistry Education Network and the American Association for Environmental Studies & Sciences. Dalila has also been awarded the Michigan Governor's Green Chemistry Award in 2011.

Doug Raynie, Department Head and Professor Emeritus, South Dakota State University

Dr. Doug Raynie is Department Head and Professor Emeritus in the Department of Chemistry and Biochemistry at South Dakota State University. He joined SDSU in 2001 following eleven years in the Corporate Research Division at Procter & Gamble. His research focuses on the use of supercritical fluids, ionic liquids, deep eutectics, and other novel solvent systems for biomass processing and analytical separations.

Under his leadership, South Dakota State University become one of the inaugural signatories to the Green Chemistry Commitment, where he serves on the Advisory Board. In 2016, he received the ACS Committee on Environmental Improvement's Award for Incorporating Sustainability into Chemistry Education.

Full Agenda

All times in Pacific Daylight Time. Subject to change.

Monday, June 12, 2023

8:00 a.m. – 4:30 p.m. Student Workshop

9:00 a.m. – 5:00 p.m. 6th Annual Green Chemistry Commitment Summit

9:00 p.m. – 5:00 p.m. GCI Pharma Roundtable

5:30 p.m.- 7:30 p.m. Student and Summit Networking Reception

Tuesday, June 13, 2023

7:00 a.m. – 8:00 a.m. Networking Breakfast

8:00 a.m. – 8:15 a.m. Welcome Remarks

8:15 a.m. – 9:15 a.m. Keynote Address: Professor Helen Sneddon

9:15 a.m. – 9:30 a.m. Networking Coffee Break

9:30 a.m. – 12:30 p.m. Concurrent Sessions

1) **Advancing Sustainable Processes in Pharma and Allied Industries Utilizing Green Chemistry Innovation** Symposium Organizers: Martinez, Isamir, American Chemical Society; Bailey, Dan; Payne, Philippa, Gilead Alberta ULC.
2) **Harmonizing Sustainable Chemistry: Synthesis and Analysis** Symposium Organizers: Wasylyk, John, Bristol-Myers Squibb Co; Osborne, Matthew, AstraZeneca PLC.
3) **Design of Chemicals, Novel Chemistries, Synthetic Pathways and Processes that Enable a Circular, More Sustainable Future** Symposium Organizers: Ambatipati, Srinivasan, McNeese State University; Ponnusamy, Ettigounder, MilliporeSigma.
4) **Green Chemistry and Sustainability in Undergraduate Laboratories: Asking Students to Think More Broadly About Their Experiments** Symposium Organizers: Wissinger, Jane, University of Minnesota; Morra, Barbora, University of Toronto; Laviska, David, Seton Hall University
5) **Driving Sustainable Chemistry Through Systems- Based Metrics** WORKSHOP
6) **CO_2 Recycling: From Laboratory to Pilot & Regional Scale** Symposium Organizers: Barecka, Magda, Northeastern University College of Engineering
7) **Sustainable Catalysis by Early-Career Chemists and Chemical Engineers** Symposium Organizers: Shifon, Sujana, Bristol Myers Squibb Co; Melendez Matos, Jeishla, Bristol-Myers Squibb Company; Sharma, Sudripet, University of Louisville; Handa, Sachin, University of Louisville.

(10:55 a.m. –11:10 a.m. Networking Coffee Break)

12:30 p.m. – 1:30 p.m. Lunch on own

2:00 p.m. – 6:25 p.m. Concurrent Sessions

1) **Sustainability in Organic Chemistry: Special Student/Postdoc Session** Symposium Organizers: Leahy, David, Bristol-Myers Squibb
2) **Nitrogen Fertilizer Synthesis and Use for Sustainable Agriculture** Symposium Organizers: Sobkowicz, Margaret, the University of Massachusetts Lowell; Baltrusaitis, Jonas, Lehigh University; Williams, Clinton (Abridged Session) 2:00 -3:45 PM
3) **Green Hydrogen Enabled Circular Chemistry** Symposium Organizers: Bala Subramaniam/Joe Bing Hwang (Abridged Session) 4:05 -6:25 PM
4) **Unlocking Sustainability Improvements in Personal Care and Household Product Lifecycles through Green Chemistry and Engineering** Symposium Organizers: Thompson, Eva, Estee Lauder Companies; Scott, Paul (Abridged Session) 2:00 -5:05 PM
5) **Green Innovation for Cosmetic Industry Symposium** Organizers: John Warner (Abridged Session) 5:25 -6:25 PM
6) **Green Chemistry and Sustainability in Undergraduate Laboratories: Asking Students to Think More Broadly About Their Experiments** Symposium Organizers: Wissinger, Jane, University of Minnesota; Morra, Barbora, University of Toronto; Laviska, David, Seton Hall University
7) **Hazard Assessment for Chemists** WORKSHOP
8) **Green Technologies for Sustainable Access to Organic/Medicinal Targets** Symposium Organizers: Zhang, Wei, University of MA Boston; Vaccaro, Luigi, Universita degli Studi di Perugia Dipartimento di Chimica Biologia e Biotecnologie.
9) **Sustainable Production of Bio-Based Polymers** Symposium Organizers: Soh, Lindsay, Lafayette College; Gordon, Melissa, Lafayette College; Stanzione, Joseph, Rowan University

(3:45 p.m. – 4:05 p.m. Networking Coffee Break)

(5:05 p.m. – 5:25 p.m. Networking Break)

6:30 p.m. – 8:00 p.m. Welcome Reception and Dinner

Wednesday, June 14, 2023

6:00 a.m. – 8:00 a.m. GC&E Virtual Poster Session

7:00 a.m. – 8:00 a.m. Networking Breakfast

8:00 a.m. – 8:15 a.m. Welcome Remarks

8:15 a.m. – 9:15 a.m. Keynote Address: Dr. Sean Hunt

9:15 a.m. – 9:30 a.m. Networking Coffee Break

9:30 a.m. – 12:30 p.m. Concurrent Sessions

1. **New Technologies for Sustainable Peptide Synthesis** Symposium Organizers: Mike Kopach

2. **Earth Abundant Metal Catalysis (Contributed, Oral)** Symposium Organizer: Shishi Lin
3. **Sustainable Membrane Separations: From Polymers to Processes** Symposium Organizers: Szekely, Gyorgy, King Abdullah University of Science and Technology Physical Sciences and Engineering Division
4. **Polymers from CO_2: Using Renewable Electricity in Electrochemistry to Make Sustainable Materials** Symposium Organizers: Eric Schuler
5. **Design of Chemicals, Novel Chemistries, Synthetic Pathways and Processes that Enable a Circular, More Sustainable Future** Symposium Organizers: Ambatipati, Srinivasan, McNeese State University; Ponnusamy, Ettigounder, MilliporeSigma.
6. **Looping in Academia to Innovated Solutions: Integrating Real World Applications into Education** Symposium Organizers: O'Neil, Natalie, Beyond Benign Inc; van Bergen, Saskia; Tripp, Jennifer, University of San Francisco; Ponnusamy, Ettigounder, MilliporeSigma
7. **Global Sustainability Connecting Nations Through Green Chemistry and Engineering** Symposium Organizers: Sicars, Stephan; Voutchkova-Kostal, Adelina, George Washington University; Mellor, Karolina, Yale Center for Green Chemistry Engineering; Ratjen, Lars, Yale University
8. **1st Inaugural GC&E Student and Postdoc Award Session** Symposium Organizers: Laviska, David, Seton Hall University

(10:55 a.m. –11:10 a.m. Networking Coffee Break)

12:30 p.m. – 2:00 p.m. Lunch on own

2:00 p.m. – 5:05 p.m. Concurrent Sessions

1. **Using Computers to Deliver Green Chemistry: In Silico Techniques for Designing and Developing Chemical Reactions** Symposium Organizers: Stevens, Jason, Bristol-Myers Squibb; Piper, Jared, Pfizer Global Research and Development
2. **Innovation and Diversity in Electrochemical Synthesis** Symposium Organizers: Martic, Sanela, Trent University
3. **Catalytic Approaches to Green Polymer Synthesis** Symposium Organizers: Kozak, Christopher, Memorial Univ of Newfoundland; Fieser, Megan, University of Southern California.
4. **EPA Green Chemistry Challenge Awards - Past and Present** Symposium Organizers: Wen, Chen, USEPA
5. **Design of Chemicals, Novel Chemistries, Synthetic Pathways and Processes that Enable a Circular, More Sustainable Future** Symposium Organizers: Ambatipati, Srinivasan, McNeese State University; Ponnusamy, Ettigounder, MilliporeSigma
6. **Teaching Workshop: Incorporating the New ACS GCI Green Chemistry and Systems Thinking Modules into your Undergraduate Teaching** WORKSHOP
7. **Material and Chemical Innovations in Apparel and Footwear** Symposium Organizers: Bonanomi, Luca, Patagonia Inc.; Hoch, Laura, Patagonia Inc.
8. **A Greener Future: Steps Toward a Circular Economy** Symposium Organizers: Kerton, Francesca, Memorial University of Newfoundland

(3:25 p.m. – 3:45 p.m. Networking Coffee Break)

5:05 p.m. – 7:05 p.m. GC&E Poster Session

6:45 p.m. – 9:00 p.m. ACS GCI Industry Roundtable Poster Reception (invited)

7:15 p.m. – 9:45 p.m. Science Communication Workshop

Thursday, June 15, 2022

5:45 a.m. – 6:30 a.m. Yoga on the Beach (Meet in Lobby at 5:30 am)

7:00 a.m. – 7:45 a.m. Networking Breakfast

7:45 a.m. – 8:00 a.m. Welcome Remarks & Student Poster Awards

8:00 a.m. – 9:15 a.m. Keynote Address: Lectureship Award Winners

9:15 a.m. – 9:30 a.m. Networking Coffee Break

9:30 a.m. – 12:30 p.m. Concurrent Sessions

1. **Frontiers of Biocatalysis: Green Chemistry in Water** Symposium Organizers: Yang, Yang, Massachusetts Institute of Technology
2. **Advances in Transitioning from Batch to Continuous Flow** Symposium Organizers: Dapremont, Olivier, Ampac Fine Chemicals; Richardson, Paul, Pfizer
3. **Greener Catalytic Oxidation Processes** Symposium Organizers: Biswas, Sourav, SUNY Buffalo State College; Dutta, Biswanath, National Energy Technology Laboratory Morgantown
4. **Mixed Polyolefin Recycling** Symposium Organizers: Beers, Kate; Coughlin, McKenzie, National Institute of Standards and Technology Material Measurement Laboratory
5. **Mechanochemistry: A Tool for Sustainable Chemistry and Chemical Engineering** Symposium Organizers: Martini, Ashlie, UC Merced; Fričić, Tomislav; Moores, Audrey, McGill University
6. **Amplifying Voices of Scholars from Diverse Communities: Green Chemistry Education in Action** Symposium Organizers: Hurst, Glenn, University of York; Laviska, David, Seton Hall University; Moir, Jonathon, Beyond Benign Inc; Obhi, Nimrat, Beyond Benign Inc
7. **Entrepreneurial Vision Behind the Creation of Circular and Sustainable Technologies Using Green Chemistry** Symposium Organizers: Manley, Julie, Guiding Green LLC; Warner, John, Warner Babcock Institute for Green Chemistry

(10:55 a.m. –11:10 a.m. Networking Coffee Break)

12:30 p.m. – 2:00 p.m. Lunch on own (Symposium Organizer Lunch)

2:00 p.m. – 5:05 p.m. Concurrent Sessions

1. **Chemo- and Biocatalytic Transformations in Water for Sustainable Industrial Processes** Symposium Organizers: Bailey, Dan; Derstine, Brenden; Akporji, Nnamdi, Merck & Co Inc
2. **Designing Sustainable Plastics to Reduce Ocean Environmental Impact: An Interdisciplinary Challenge** Symposium Organizers: Wissinger, Jane, University of Minnesota; Giraud, Robert, The Chemours Company

3. **Depolymerization Routes of Condensation Polymers** Symposium Organizers: Yan, Ning; RUBIO ARIAS, JOSE JONATHAN, Katholieke Universiteit Leuven; Thielemans, Wim, Katholieke Universiteit Leuven
4. **Sustainable Products from Cellulose and Wood Processing Streams** Symposium Organizers: Ross, Sederra, University of Massachusetts System
5. **Mechanochemistry: A Tool for Sustainable Chemistry and Chemical Engineering** Symposium Organizers: Martini, Ashlie, UC Merced; Fričić, Tomislav; Moores, Audrey, McGill University
6. **Careers in Green Chemistry and Engineering for a Sustainable Future** Symposium Organizers: Dissanayake, Madushanka, Intel Corporation AmberGlen 1; Vidal, Juliana, McGill University; Garcia, Bria, University of Delaware
7. **Driving Innovation in Sustainable Food Packaging** Symposium Organizers: Giordan, Judy; Voutchkova-Kostal, Adelina, George Washington University

(3:25 p.m. – 3:45 p.m.) Networking Coffee Break

6:15 p.m. – 8:15 p.m. Green Chemistry on Water