Lucas Busta

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Appointments

University of Minnesota Duluth

2020-present Assistant Professor ..... Department of Chemistry and Biochemistry

University of Nebraska Lincoln

2018-2020 NSF Plant Genome Postdoctoral Research Fellow ..... Advisor: Edgar B. Cahoon
2016-2018 Postdoctoral Research Associate ..... Advisor: Edgar B. Cahoon

Education

University of British Columbia

2011-2016 Ph.D. Chemistry ..... Advisor: Reinhard Jetter

University of Minnesota Duluth

2007-2011 B.S. Chemistry, Biochemistry & Molecular Biology ..... Advisor: John F. Evans

Selected Honors and Awards

2020 Early Career Award ..... The Plant Journal-Phytochemical Society of North America
2019 SciFinder Future Leader Award ..... American Chemical Society CAS
2018 Postdoctoral Research Fellowship in Biology ..... National Science Foundation

Funding

As Principal Investigator

2020-present [2] Assistant Professor Start-Up Funds. UNIVERSITY OF MINNESOTA DULUTH, SWENSON COLLEGE OF SCIENCE AND ENGINEERING $250000

2018-2020 [1] Genes Controlling Wax Biosynthesis In Sorghum Bicolor: Potential For Improving Crop Performance And Value. NSF PLANT GENOME RESEARCH PROGRAM $216000

As Co-Principal Investigator

2020-present [1] Designing An Online / At Home Quantitative Analysis Laboratory Course SWENSON COLLEGE OF SCIENCE AND ENGINEERING $8725

Publications

Bold indicates a Busta lab member or mentee.

Journal Articles

2021 [20] **Lucas Busta**, **Elizabeth Schmitz**, Dylan K Kosma, James C Schnable, Edgar B Cahoon. "A Co-opted Steroid Synthesis Gene, Maintained In Sorghum But Not Maize, Is Associated With A Divergence In Leaf Wax Chemistry". PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, 118 (12) pp. 1–12, DOI: https://doi.org/10.1073/pnas.2022982118

2021 [19] Xuefeng Zhang, Yu Ni, Daixiang Xu, **Lucas Busta**, Yu Xiao, Reinhard Jetter, Yanjun Guo. "Integrative Analysis Of The Cuticular Lipidome And Transcriptome Of Sorghum Bicolor Reveals Cultivar Differences In Drought Tolerance". PLANT PHYSIOLOGY AND BIOCHEMISTRY, 163 (6) pp. 285–295, DOI: https://doi.org/10.1016/j.plaphy.2021.04.007

2021 [18] Craig Schenck, **Lucas Busta**. "Using Interdisciplinary, Phylogeny-guided Approaches To Understand The Evolution Of Plant Metabolism". PLANT MOLECULAR BIOLOGY, TBD (TBD) pp. 1–13, DOI: https://doi.org/10.1007/s11103-021-01220-1

2020 [17] **Lucas Busta**, Sabrina E Russo. "Enhancing Interdisciplinary And Systems Thinking With An Integrative Plant Chemistry Module Applied In Diverse Undergraduate Course Settings". JOURNAL OF CHEMICAL EDUCATION, 97 (12) pp. 4406–4413, DOI: https://doi.org/10.1021/acs.jchemed.0c00395

2020 [16] Henry V Jakubowski, Nicholas Bock, **Lucas Busta**, Matthew Pearce, Rebecca L Roston, Zachery D Shomo, Cassidy R Terrell. "Introducing Climate Change Into The Biochemistry And Molecular Biology Curriculum". BIOCHEMISTRY AND MOLECULAR BIOLOGY EDUCATION, 49 (2) pp. 167–188, DOI: https://doi.org/10.1002/bmb.21422

2020 [15] **Lucas Busta**, Olga Serra, Ok Tae Kim, Marisa Molinas, Irene Pere-Fossoul, Merce Figueras, Reinhard Jetter. "Oxidosqualene Cyclases Involved In The Biosynthesis Of Triterpenoids In Quercus Suber Cork". SCIENTIFIC REPORTS, 10 (1) pp. 1–12, DOI: https://doi.org/10.1038/s41598-020-64913-5

2019 [14] Tao Feng, Ya Yang, **Lucas Busta**, Edgar B Cahoon, Hengchang Wang. "FAD2 Gene Radiation And Positive Selection Contributed To Polyacetylene Metabolism Evolution In Campanulids". PLANT PHYSIOLOGY, 181 (2) pp. 714–728, DOI: https://doi.org/10.1104/pp.19.00800

2019 [13] Gianfranco Diretto, Sarah Frusciante, Claudia Fabbri, Nicolas Schauer, **Lucas Busta**, Zhonghua Wang, Antonio J Matas, Alessia Fiore, Jocelyn KC Rose, Alisdair R Fernie. "Manipulation Of β-Carotene Levels In Tomato Fruits Results In Increased ABA Content And Extended Shelf Life". PLANT BIOTECHNOLOGY JOURNAL, 18 (5) pp. 1185 - 1199, DOI: https://doi.org/10.1111/pbi.13283

2018 [12] Ok Tae Kim, Yurry Um, Mei Lan Jin, Jang Uk Kim, Daniela Hegebarth, **Lucas Busta**, Radu C Racovita, Reinhard Jetter. "A Novel Multifunctional C-23 Oxidase, CYP714E19, Is Involved In Asiaticoside Biosynthesis". PLANT AND CELL PHYSIOLOGY, 59 (6) pp. 1200–1213, DOI: https://doi.org/10.1093/pcp/pcy055

2018 [11] Yanjun Guo, Jia Jun Li, **Lucas Busta**, Reinhard Jetter. "Coverage And Composition Of Cuticular Waxes On The Fronds Of The Temperate Ferns Pteridium aquilinum, Cryptogramma crispa, Polypodium glycyrrhiza, Polystichum munitum And Gymnocarpium dryopteris". ANNALS OF BOTANY, 122 (4) pp. 555–568, DOI: https://doi.org/10.1093/aob/mcy078

2018 [10] Xiangjun Li, Alicen M Teitgen, Asghar Shirani, Juan Ling, **Lucas Busta**, Rebecca E Cahoon, Wei Zhang, Zaiyun Li, Kent D Chapman, Diana Berman. "Discontinuous Fatty Acid Elongation Yields Hydroxylated Seed Oil With Improved Function". NATURE PLANTS, 4 (9) pp. 711–720, DOI: https://doi.org/10.1038/s41477-018-0225-7

2018 [9] **Lucas Busta**, Won Cheol Yim, Evan William LaBrant, Peng Wang, Lindsey Grimes, Kiah Malyszka, John C Cushman, Patricia Santos, Dylan K Kosma, Edgar B Cahoon. "Identification Of Genes Encoding Enzymes Catalyzing The Early Steps Of Carrot Polyacetylene Biosynthesis". PLANT PHYSIOLOGY, 178 (4) pp. 1507–1521, DOI: https://doi.org/10.1104/pp.18.01195

2018 [8] **Lucas Busta**, Reinhard Jetter. "Moving Beyond The Ubiquitous: The Diversity And Biosynthesis Of Specialty Compounds In Plant Cuticular Waxes". PHYTOCHEMISTRY REVIEWS, 17 (6) pp. 1275–1304, DOI: https://doi.org/10.1007/s11101-017-9542-0

2018 [7] Tongjun Sun, **Lucas Busta**, Qian Zhang, Pingtao Ding, Reinhard Jetter, Yuelin Zhang. "TGACG-BINDING FACTOR 1 (TGA 1) And TGA 4 Regulate Salicylic Acid And Pipecolic Acid Biosynthesis By Modulating The Expression Of SYSTEMIC ACQUIRED RESISTANCE DEFICIENT 1 (sard 1) And CALMODULIN-BINDING PROTEIN 60g (CBP 60g)". NEW PHYTOLOGIST, 217 (1) pp. 344–354, DOI: https://doi.org/10.1111/nph.14780

2017 [6] **Lucas Busta**, Daniela Hegebarth, Edward Kroc, Reinhard Jetter. "Changes In Cuticular Wax Coverage And Composition On Developing Arabidopsis Leaves Are Influenced By Wax Biosynthesis Gene Expression Levels And Trichome Density". PLANTA, 245 (2) pp. 297–311, DOI: https://doi.org/10.1007/s00425-016-2603-6

2017 [5] Yanjun Guo, **Lucas Busta**, Reinhard Jetter. "Cuticular Wax Coverage And Composition Differ Among Organs Of Taraxacum officinale". PLANT PHYSIOLOGY AND BIOCHEMISTRY, 115 (1) pp. 372–379, DOI: https://doi.org/10.1016/j.plaphy.2017.04.004

2017 [4] **Lucas Busta**, Reinhard Jetter. "Structure And Biosynthesis Of Branched Wax Compounds On Wild Type And Wax Biosynthesis Mutants Of Arabidopsis Thaliana". PLANT AND CELL PHYSIOLOGY, 58 (6) pp. 1059–1074, DOI: https://doi.org/10.1093/pcp/pcx051

2016 [3] Pingtao Ding, Dmitrij Rekhter, Yuli Ding, Kirstin Feussner, **Lucas Busta**, Sven Haroth, Shaohua Xu, Xin Li, Reinhard Jetter, Ivo Feussner. "Characterization Of A Pipecolic Acid

Biosynthesis Pathway Required For Systemic Acquired Resistance". THE PLANT CELL, 28 (10) pp. 2603–2615, DOI: https://doi.org/10.1105/tpc.16.00486

2016 [2] **Lucas Busta**, Jessica M Budke, Reinhard Jetter. "Identification Of β-Hydroxy Fatty Acid Esters And Primary, Secondary-Alkanediol Esters In Cuticular Waxes Of The Moss Funaria hygrometrica". PHYTOCHEMISTRY, 121 (1) pp. 38–49, DOI: https://doi.org/10.1016/j.phytochem.2015.10.007

2016 [1] **Lucas Busta**, Jessica M Budke, Reinhard Jetter. "The Moss Funaria hygrometrica Has Cuticular Wax Similar To Vascular Plants, With Distinct Composition On Leafy Gametophyte, Calyptra And Sporophyte Capsule Surfaces". ANNALS OF BOTANY, 118 (3) pp. 511–522, DOI: https://doi.org/10.1093/aob/mcw131

Teaching

Courses Taught

CHEM5725 [3] Advanced Analytical Chem I ..... Average Enrollment: 24
CHEM8720 [2] Modern Mass Spectrometry ..... Average Enrollment: 7
CHEM2223 [1] Quantitative Analysis Laboratory ..... Average Enrollment: 152

Guest Lectures

Fall 2019 [7] "Analysis of Plant Chemicals", Univ. of Nebraska Lincoln. ..... 10 hours
Fall 2019 [6] "Membrane Hemifusions", Univ. of Nebraska Lincoln. ..... 2 hours
Fall 2018 [5] "Analysis of Plant Chemicals", Univ. of Nebraska Lincoln. ..... 10 hours
Fall 2018 [4] "Plant Metabolism: Why Is It Special?", Univ. of Wisconsin Whitewater. . 1.5 hours
Fall 2018 [3] "Practical Skills for Graduate Research", Univ. of Nevada Reno. ..... 1 hours
Fall 2017 [2] "Evolution of Plant Specialized Metabolism", Univ. of Nebraska Lincoln. .. 2 hours
Fall 2016 [1] "Practical Skills for Graduate Research", Univ. of British Columbia. ..... 0.5 hours

Mentorship and Advising

Research Advisor

2021-present [13] Amber McRae (Major: Biochemistry) ..... Undergraduate Student
2021-present [12] Clint McCue (Major: Biochemistry) ..... Undergraduate Student
2021-present [11] Emma Fitzgibbons (Major: Biochemistry) ..... Undergraduate Student
2021-present [10] Mady Larson (Major: Biochemistry) ..... Undergraduate Student
2021-present [9] Taylor Abrahamson (Major: Biology, Minor: Chemistry) Undergraduate Student
2020-present [8] Jacob Lastovich (Major: Biology) ..... Undergraduate Student
2020-present [7] Dien Nguyen ..... Masters Student
2020-present [6] Nicole Babineau (Major: Biochemical Engineering) ..... Undergraduate Student
2020-present [5] Nicole Groth (Major: Biology) ..... Undergraduate Student
2020-present [4] Samuel Scott ..... Masters Student
2020-2020 [3] Alexis Salmon (Major: Biology) ..... Undergraduate Student
2019-2020 [2] Elizabeth Schmitz (Major: Biochemistry and Biology) ..... Undergraduate Student
2018-2019 [1] Evan Updike (Major: Biochemistry) ..... Undergraduate Student

Thesis Committee Member

2021-present [6] Uttam Gomes ..... Master's Thesis/Research Committee
2021-present [5] Bryan Reutzel ..... Master's Thesis/Research Committee
2021-present [4] Guenter Schwoerer ..... Master's Thesis/Research Committee
2020-present [3] Uttam Gomes ..... Master's Thesis/Research Committee
2020-present [2] Malachy Brink ..... Master's Thesis/Research Committee
2020-present [1] Bennett Hanson ..... Master's Thesis/Research Committee

Graduate Program Faculty Member

2020-present University of Minnesota Duluth Chemistry Graduate Program (MS)
2020-present University of Minnesota Integrated Biosciences Program (MS, PhD)

Presentations

Invited Presentations

2021 [14] "A Co-opted Steroid Synthesis Gene, Maintained In Sorghum But Not Maize, Is Associated With A Divergence In Leaf Wax Chemistry", Department of Biochemistry, North Carolina State University. Virtual Conference. Host: Josh Strable ..... 50 minutes

2021 [13] "Using Citizen Science To Communicate And Catalyze Plant Chemical And Genomic Research", Department of Biological Sciences, East Tennessee State University. Virtual Seminar. Host: Prof. Dhirendra Kumar ..... 50 minutes

2021 [12] "A Co-opted Steroid Synthesis Gene, Maintained In Sorghum But Not Maize, Is Associated With A Divergence In Leaf Wax Chemistry", Meeting of the Botanical Society of America. Virtual Conference. ..... 15 minutes

2021 [11] "A Co-opted Steroid Synthesis Gene, Maintained In Sorghum But Not Maize, Is Associated With A Divergence In Leaf Wax Chemistry", Plant Apoplastic Diffusion Barriers (mini session). Virtual Conference. Host: Sarah McKim ..... 50 minutes

2021 [10] "A Co-opted Steroid Synthesis Gene, Maintained In Sorghum But Not Maize, Is Associated With A Divergence In Leaf Wax Chemistry", UMN Plant Breeding Seminar Series. Virtual Seminar. Host: Prof. Eric Watkins ..... 50 minutes

2020 [9] "Integrated Bioanalytical Chemistry: Quantitative And Structural Analyses Of Biomolecules Large And Small To Understand Metabolism", Department of Chemistry and Biochemistry, University of MN Duluth. Duluth, Minnesota. Host: Prof. Erin Sheets 50 minutes

2020 [8] "Integrated Bioanalytical Chemistry: Quantitative And Structural Analyses Of Biomolecules Large And Small To Understand Metabolism", Department of Chemistry, Northern Michigan University. Marquette, Michigan. Host: Prof. Mark Paulsen ..... 50 minutes

2020 [7] "Using Citizen Science To Communicate And Catalyze Plant Chemical And Genomic Research", Plant and Animal Genome Conference XXVIII. San Diego, California. Host: Diane Okamuro (NSF Program Officer) ..... 25 minutes

2020 [6] "Using Citizen Science To Communicate And Catalyze Plant Chemical And Genomic Research", University of Minnesota Duluth Departmental Seminar. Duluth. Host: Venkatram Mereddy ..... 50 minutes

2019 [5] "Fatty Acids: A Metabolic Starting Point For Plant Chemicals With Diverse Functions Both Above And Below Ground", Department of Biochemistry, The University of Nebraska Lincoln. Lincoln, Nebraska. Host: Prof. Edgar Cahoon ..... 50 minutes

2019 [4] "Analytical Chemistry In The Age Of Genomics: Quantitative And Structural Analyses To Understand Metabolism And Fuel A Bio-Based Economy", Departments of Biology and Chemistry Joint Seminar, The University Of Minnesota Duluth. Duluth, Minnesota. Hosts: Prof. Steve Berry and Prof. Jennifer Liang ..... 50 minutes

2018 [3] "Phytochemical Structures And Occurrence Across Plant Diversity As A Tool For Biosynthetic Pathway Discovery", Department of Biochemistry, The University of Nevada Reno. Reno, Nevada. Host: Prof. Dylan Kosma ..... 50 minutes

2016 [2] "The Diversity And Biosynthesis Of Cuticular Waxes", The Boyce Thompson Institute. Ithaca, New York. Host: Prof. James Giovannoni ..... 50 minutes

2016 [1] "The Diversity And Biosynthesis Of Waxes", The Center For Plant Science Innovation. Lincoln, Nebraska. Host: Prof. Edgar Cahoon ..... 50 minutes

Service

Ad Hoc Reviewer

2021-2021 Nature Communications ..... Total number of articles: 1
2021-2021 New Phytologist ..... Total number of articles: 1
2021-2021 The Bryologist ..... Total number of articles: 1
2021-2021 The Plant Cell ..... Total number of articles: 1
2020-2021 Frontiers in Plant Science ..... Total number of articles: 4
2020-2021 Plant Direct ..... Total number of articles: 2
2020-2020 BMC Plant Biology ..... Total number of articles: 1
2020-2020 Metabolites ..... Total number of articles: 1
2020-2020 Planta ..... Total number of articles: 1
2019-2019 ACS Applied Materials and Interfaces ..... Total number of articles: 1
2019-2019 ACS Journal of Agricultural and Food Chemistry ..... Total number of articles: 1
2019-2019 Journal of Integrative Agriculture ..... Total number of articles: 1
2019-2019 Scientific Reports ..... Total number of articles: 1
2019-2019 The Plant Genome ..... Total number of articles: 1
2018-2021 Horticulture Research ..... Total number of articles: 2
2018-2021 Plant Physiology ..... Total number of articles: 4
2018-2019 Plant Physiology and Biochemistry ..... Total number of articles: 2
2018-2018 Functional Plant Biology ..... Total number of articles: 1
2018-2018 Lipids ..... Total number of articles: 1
2017-2017 Plant Cell Reports ..... Total number of articles: 1

Grant Reviewer

2021 Binational Agricultural R&D Fund (BARD) ..... Total number of proposals: 1
2021 National Science Foundation ..... Total number of proposals: 1

Scientific Society Memberships

2019-present American Chemical Society
2018-present American Society of Plant Biologists
2018-2020 Botanical Society of America
2013-present Phytochemical Society of North America

Society and Committee Service

2021-present Organizer, Primary Organizer, #PhytochemTalks Virtual Seminar Series
2021-present Member, Outreach Committee
2021-present Advisor, Chemistry Club
2021-2021 Tour Guide, Video Creation, Admitted Students Days
2021-2021 2021 Graduation Party Helper, Department of Chemistry and Biochemistry
2021-2021 Transitions Newsletter Contributor, Department of Chemistry and Biochemistry
2021-2021 Judge, SURP Poster Session, Illenda Competition
2020-present Instrument Liaison, HCAMS 109 GCMS
2020-2021 Member, Graduate Studies Committee
2020-2021 Member, Physical Resources Committee
2020-2021 Minute Recorder, Department Meetings
2020-2020 Member, Physical Resources Committee
2018-2019 Secretary, University of Nebraska Lincoln Plant Science Student and Postdoc Society

Interviews and Science Communication

2020 Twitch Stream "Drink and Think"
2020 Podcast "Evolution Eats"
2019 News Website Chemical and Engineering News
2018 Podcast In Defense of Plants

Volunteering

2020 #ChemicalBlooms Virtual Meet A Scientist. Met with two Missouri elementary school classrooms on Zoom that had participated in the #ChemicalBlooms citizen science project. Explained to them how their efforts were helping our research, gave them a tour of the lab and the greenhouse

2020 Girl Scout Science Explorer Badge Event. Gave a brief explanation of plant chemistry to a local Junior Girl Scout troop and then helped them collect plant chemical samples in the park for later analysis

2018 Sunday With A Scientist. Designed and ran a Saturday morning science activity booth for children where they used plant extracts as indicators to explore the pH of common solutions

2019, 2017 Fascination of Plants Day. Helped high school students perform thin layer chromatography separations and learn about polarity

2019, 2017 NSF Outreach Day. Assist local high school students to separate natural dyes using column chromatography and TLC to learn about polarity

2017 Sunday With A Scientist. Designed and ran an activity booth for children to explore plant chemistry using starch dyes, thin layer chromatography separations, and microscopy

2019, 2017 Women In Science Weekend. Assist young women from rural high schools perform thin layer chromatography separations and learn about polarity

2016-2020 Blog (plantsarechemists.blogspot.com). Compile posts in a blog about plant chemicals in plants' and humans' daily lives. Written for the lay reader (>15,000 reads).

2016-2020 GC-MS Maintenance Video Channel on YouTube. Prepare and upload detailed, step-by-step videos on how to maintain and repair a GC-MS system (>24,000 views).

2016-2020 Phytochemistry Twitter Posts (@PlantsRChemists, #PhytochemicalFriday). Feature a phytochemical in a Twitter post every Friday, highlighting features interesting to lay readers (>2,200 followers).