

EVERETT EUSTANCE
Curriculum Vitae
2018

Address:

Biodesign Swette Center for Environmental Biotechnology
1001 S. McAllister Ave
Tempe, AZ, 85287

Phone:

(406) 899-2738 (Cell)

Email:

everett.eustance@asu.edu

EDUCATION

Postdoctoral Research Associate at the Biodesign Institute

Arizona State University, Tempe, AZ
Advisor: Dr. Bruce Rittmann
Employment: July 2016 - Current
Project: Atmospheric Carbon Enrichment and Delivery

Postdoctoral Research Associate at the Arizona Center for Algae Technology and Innovation

Arizona State University, Tempe, AZ
Advisor: Dr. Milton Sommerfeld (deceased)
Employment: July 2015- June 2016
Projects: Developing Best Management Practices Plan for Prevention and Treatment of Zooplankton Contamination in Algal Crop Production
Managing Water Quality at Power Plants to Meet Stringent Discharge Limits

Ph.D. in Civil, Environmental and Sustainable Engineering with focus in Environmental Microbiology

Arizona State University, Tempe, AZ
Graduated: 2015
GPA: 4.00
Advisor: Dr. Milton Sommerfeld
Dissertation: Assessing Outdoor Algal Cultivation in Panel and Raceway Photobioreactors for Biomass and Lipid Productivity

M.S. Chemical Engineering

Montana State University, Bozeman, MT,
Graduated: 2011
GPA: 3.86
Advisors: Brent Peyton and Robin Gerlach
Thesis: Biofuel potential, nitrogen utilization, and growth rates of two green algae isolated from a wastewater treatment facility

B.S. Chemical Engineering with focus in Biological Engineering

Montana State University, Bozeman, MT,

Graduated: 2009

GPA: 3.91

EMPLOYMENT

2016 – Current	Postdoctoral researcher at Biodesign Institute, Tempe, AZ
2016 – Current	Faculty Associate in ERM, Mesa, AZ
2015 – 2016	Postdoctoral researcher at AzCATI, Mesa, AZ
2011 –2015	Doctoral research associate at ASU, Mesa, AZ
2009 –2011	Master’s research assistant at MSU, Bozeman, MT
2008 – 2009	Lead researcher at CTW Energy, Bozeman, MT

PUBLICATIONS

Journal Articles

2018

Lai YS, Zhou Y, **Eustance E**, Straka L, Wang Z, Rittmann BE (2018) Cell disruption by cationic surfactants affects bioproduct recovery from *Synechocystis* sp. PCC 6803. *Algal Research* (34) 250-255

Zhou Y, **Eustance E**, Straka L, Lai YS, Xia S, Rittmann BE (2018) Quantification of heterotrophic bacteria during the growth of *Synechocystis* sp. PCC 6803 using fluorescence activated cell sorting and microscopy. *Algal Research* (30) 94-100

2017

Xia S, Zhou Y, **Eustance E**, Zhang Z (2017) Enhancement mechanisms of short-time aerobic digestion for waste activated sludge in the presence of cocoamidopropyl betaine. *Scientific Reports* 7(1)

Zhou Y, Lai YS, **Eustance E**, Straka L, Zhou C, Xia S, Rittmann BE (2017) How myristyltrimethylammonium bromide enhances biomass harvesting and pigments extraction from *Synechocystis* sp. PCC 6803. *Water Research* (126) 189-196

Wang Y, **Eustance E**, Castillo-Keller M, Sommerfeld MR (2017) Evaluation of chemical treatments for control of ciliate grazers in algae cultures: A site study. *Journal of Applied Phycology* 1-10

Wang Y, Castillo-Keller M, **Eustance E**, Sommerfeld MR (2017) Early detection and quantification of zooplankton grazers in algal cultures by FlowCAM. *Algal Research* 21 (0): 98-102

2016

Badvipour S, **Eustance E**, Sommerfeld MR (2016) Process evaluation of energy requirements for feed production using dairy wastewater for algal cultivation: Theoretical approach. *Algal Research* 19 (0): 207-214

Eustance E, Wray JT, Badvipour S, Sommerfeld MR (2016) Volatile Nutrients - Improving Utilization of Ammonia and Carbon Dioxide in Microalgal Cultivation: A Review. *Current Biotechnology* 5(2): 130-141

Eustance E, Badvipour S, Wray JT, Sommerfeld M (2016) Biomass productivity of two *Scenedesmus* strains cultivated semi-continuously in outdoor raceway ponds and flat-panel photobioreactors. *Journal of Applied Phycology* 28 (3): 1471-1483

Eustance E, Wray JT, Badvipour S, Sommerfeld MR (2016) The effects of cultivation depth, areal density and nutrient level on lipid accumulation of *Scenedesmus acutus* in outdoor raceway ponds. *Journal of Applied Phycology* 28 (3): 1459-1469

2015

Eustance E, Wray JT, Badvipour S, Sommerfeld MR (2015) The effects of limiting nighttime aeration on productivity and lipid accumulation in *Scenedesmus dimorphous*. *Algal Research* 10 (0): 33-40

2014

Moll KM, Gardner RD, **Eustance EO**, Gerlach R, Peyton BM (2014) Combining multiple nutrient stresses and bicarbonate addition to promote lipid accumulation in the diatom RGD-1. *Algal Research* 5 (0): 7-15

2013

Eustance E, Gardner RD, Moll KM, Menicucci J, Gerlach R, Peyton BM (2013) Growth, nitrogen utilization and biodiesel potential for two chlorophytes grown on ammonium, nitrate or urea. *Journal of Applied Phycology* 25 (6): 1663-1677

2012

Gardner R, Cooksey K, Mus F, Macur R, Moll K, **Eustance E**, Carlson R, Gerlach R, Fields M, Peyton B (2012) Use of sodium bicarbonate to stimulate triacylglycerol accumulation in the Chlorophyte *Scenedesmus sp.* and the Diatom *Phaeodactylum tricornutum*. *Journal of Applied Phycology*:1-10

Manuscripts in Submission

Publication Awards

Editor's Choice from Bentham Science for the article "Volatile Nutrients - Improving Utilization of Ammonia and Carbon Dioxide in Microalgal Cultivation: A Review" in *Current Biotechnology*. Selected by Editor-in-Chief Pabulo Henrique Rampelotto. Press Release in EurekaAlert

http://www.eurekaalert.org/pub_releases/2016-05/bsp-iuo050216.php

Bio Fuel Daily

http://www.biofueldaily.com/reports/Improving_utilization_of_ammonia_and_carbon_dioxide_in_microalgal_cultivation_999.html

PRESENTATIONS

2018

Eustance E. Presentation for Environmental Engineering Seminar Series: ASU SSEBE, Tempe, AZ. Membrane Carbonation for Improved Carbon Capture Efficiency in Algal Cultivation. 02-27-18.

2017

Eustance E, Lai YS, Shesh T, Rittmann, BE. Presentation at Algae Biomass Summit 2017, Salt Lake City, UT. Utilization of Membrane Carbonation in Algal Cultivation to Improve Carbon Capture Efficiency. 10-31-17.

2016

Wang Y, Eustance E, **Sommerfeld MR.** Presentation for PSA 2016. Chemical treatment to control zooplankton contaminants for sustainable algal cultivation. 7-28-16

Eustance E. Presentation for Science and Mathematics Colloquium Series: ASU CLS, Mesa, AZ. Recycling Nutrients: Using dairy wastewater to produce algae biomass for feed and fuel. 3-23-2016

2015

Eustance E. Dissertation defense, Tempe, AZ. Assessing Outdoor Algal Cultivation in Panel and Raceway Photobioreactors for Biomass and Lipid Productivity. 7-01-2015

Eustance E. Presentation to Arizona Department of Agriculture. Future roles of algae in agriculture. 6-29-2015

Eustance E, Puruhito E, Sommerfeld MR. Poster for Arizona Board of Regents Meeting Student Research Showcase. Assessment of Wastewaters for Algae Biomass Production and Bioremediation. 6-04-2015

2014

Eustance E, Wray JT, **Sommerfeld MR.** Poster for 2014 Algal Biomass Summit. Assessment of Wastewaters for Algae Biomass Production and Bioremediation

Eustance E, Wray JT, Sommerfeld MR. Poster for Polytechnic Innovation Showcase. Improving Culturing Techniques to Prevent Ammonia Toxicity and Volatilization

Eustance E. Presentation for Polytechnic Innovation Showcase. The Good and the Bad of Growing Algae on Ammonium-based Wastewaters

Eustance E. Presentation for quarterly ABOR TRIF Meeting. Solving Challenges of Growing Algae on Ammonium-based Wastewaters

Eustance E, Wray JT, Sommerfeld MR. Poster for AZ Water Conference. Assessment of Different Types of Wastewater for Algae Bioremediation and Biofuel Production

Grant Proposals

As Senior Personnel

2018

DOE-BETO Efficient Carbon Utilization in Algal Systems. Membrane Carbonation for 100% Efficient Delivery of CO₂ from Industrial Gases. PI: Rittmann BE.

Status: Submitted

DOE-ARPA-E. Membrane-Enabled Microalgal Productivity System (MEMPS). PI: Rittmann BE.

Status: Discouraged from writing full proposal

2017

DOE-USDA-BRDI. Maximizing Algal Fuel Total Productivity. PI Rittmann BE. Status: Submitted

DOE-PEAK. A Quantitative Tool for Maximizing Algae Fuel Productivity. PI: Rittmann BE. Status: Rejected

2016

Polytechnic School – SRP Research Grant Program. Bioinspired Management of Power Plant Water Discharges to Meet Water Quality Regulations. PI: Sommerfeld MR. Status: Approved

2015

NSF/CBET-BSF: Algae wall system for bioenergy production, improved building energy performance and indoor/outdoor air quality enhancement. PI: Sommerfeld MR. Status: Rejected

RESEARCH EXPERIENCE

Outdoor cultivation

Photobioreactors (Flat Panel and Horizontal Tubular)
Raceways
ARID (algae raceway integrated design)

Experimental design and setup

Startup, shutdown and instrumentation procedures for outdoor experiments
Design improvements for photobioreactors, raceways, and ARID
Maintenance of infrastructure for photobioreactors and raceways
Methods to increase growth rate by increasing CO₂ availability and increase lipid production through pH and nitrogen stress
Culture isolation

Algal physiology

Carbon metabolism
Nitrogen metabolism
Carbon-nitrogen metabolism
Lipid metabolism and requirements to achieve lipid accumulation

Analytical methods

Ion chromatography/Lachat to monitor nitrate/ammonium/phosphorus consumption
FAME analysis (GC-FID)
Lipid analysis (ASE)
Carbohydrate analysis
Culture density using hemacytometer, ash free dry weight, optical density
Lipid extraction techniques including Blight and Dyer, hexane, ultrasonication, microfluidizer, liquid nitrogen, French press and Microwave

Data analysis and interpretation

Excel
OriginPro
Extensive literature library dealing with multiple aspects of algae including nitrogen utilization and metabolism, carbon metabolism, photobioreactors, and general physiology

RESEARCH INTERESTS

Algal biofuels production
Improving net energy ratio
Minimizing water consumption
Wastewater utilization
Carbon capture efficiency
High-value products

Algae for animal feed
Algal strain selection
Media recycle
Photobioreactor design
Algal bioremediation
Lipid extraction
Harvesting

TEACHING EXPERIENCE AND COURSE DEVELOPMENT

2018

ERM 494/598: Algae in Water/Energy/Food Nexus. Online only course
Course development: Shahrzad Badvipour and **Everett Eustance**.

2017

ERM 494/598: Algae in Water/Energy/Food Nexus. Online only course
Course development: Shahrzad Badvipour, **Everett Eustance**, Sarah Crago.
Course description: This course was redesigned from 2016 and designed specifically for online teaching. The course limited individual presentations to 15 minutes with specific content.

ERM 494/598: Utilizing Algae Technology for Diverse Products. In-person/Online hybrid course

Course development: **Everett Eustance** and Shahrzad Badvipour.

Course description: This course explores critical elements and knowledge for those wanting to work in the algae industry and utilizing algae as a sustainable environmental resource.

Students will learn about the challenges of scaling cultures, maintaining outdoor cultures, improving sustainability, different methods for cultivating, harvesting, and downstream processing algae, along with the diverse products that can be produced by algae.

2016

ERM 494/598: Algae in Water/Energy/Food Nexus. In-person/Online hybrid course

Course development: Shahrzad Badvipour and **Everett Eustance**.

Presented lecture dates: 8-31-16, 9-7-16, 9-12-16, 10-12-16, 11-14-16, 11-28-16.

Course description: This course provides an overview of Algae as versatile biomass resource that can be used for energy, food, and animal feed, along with providing bioremediation services for both water and air. These capabilities can significantly reduce concerns about resources that are associated with the water-energy-food nexus. The course will focus on addressing short-comings in technology and knowledge of biology that are limiting algae from moving forward in the market through existing policy and regulatory frameworks. The effects of current policy and regulations on the development of algae-based technologies for sustainable production of energy (biofuels) and food/feed are not currently well defined but are essential for developing a sustainable technology. An overview of existing commercial

facilities will be provided. This course will also discuss and provide a process outline to engage students on how policy and market must change for algae to become a viable and sustainable production platform

SERVICE TO PROFESSION

Conferences

Poster Track/Young Innovators Lounge Co-Chair. Algal Biomass Summit 2018, The Woodlands, TX. 10-14-18 to 10-17-18

Poster Track/Young Innovators Lounge Co-Chair. Algal Biomass Summit 2017, Salt Lake City, UT. 10-29-17 to 11-1-17

Workshops

Algae Cultivation for Carbon Capture and Utilization Workshop. U.S. DOE. Orlando, FL. May 23-24, 2017

Algae Biofuels Strategy Workshop. U.S. DOW. Mesa, AZ. November 19-20, 2013

Review Efforts

2018

Biology abstract review for 2018 Algae Biomass Summit. The Woodlands, TX. 10-14-18 to 10-17-18

ALGAL_2018_35. Algal Research. Assessment of Physiological Responses and Growth Phases of Different Microalgae under Environmental Changes by Raman Spectroscopy with Chemometrics.

ALGAL_2018_62. Algal Research. Analysis of mass transfer capacity in raceway reactors.

JAPH-D-17-00449. Journal of Applied Phycology. Homologous Expression of Lipid Droplet Protein Enhanced Neutral Lipid Accumulation in the Marine Diatom *Phaeodactylum tricorutum*. Corresponding Author: Masaki Yoshida

2017

Biology abstract review for 2017 Algae Biomass Summit. Salt Lake City, UT. 10-29-17 to 11-1-17

ALGAL_2017_922. Algal Research. An integrated biorefinery process: stepwise extraction of fucoxanthin, eicosapentaenoic acid and chrysolaminarin from the same *Phaeodactylum tricornutum* biomass. Corresponding Author:

BSP-RICE-2017-119. Recent Innovations in Chemical Engineering. Effects of Environmental Factors on *Chlorella* sp. microalgae for biodiesel production purpose: Enhanced lipid and biomass productivity. Corresponding Author: A. Hallajisani

CJCE-17-0278. The Canadian Journal of Chemical Engineering. Increasing Microalgal Carbohydrate Content for Hydrothermal Gasification Purposes. Corresponding Author: Samiee-Zafarghandi, Roudabeh

ALGAL_2017_470. Algal Research. Autotrophic biofloc technology system (ABFT) using *Chlorella vulgaris* and *Scenedesmus obliquus* positively affects performance of Nile tilapia (*Oreochromis niloticus*). Corresponding Author:

ALGAL_2017_568. Algal Research. Optimization and energy estimation of microalgal lipid extraction using ozone-rich microbubbles for biodiesel production. Corresponding Author:

2016

ALGAL-D-16-00620. Algal Research. High selective electrolytic methyl esterification towards biodiesel production from FFAs rich microalgae oil. Corresponding Author: Reena Pandit

ALGAL-D-16-00548. Algal Research. Lignocellulose based mixotrophy: Towards sustainable microalgal production. Corresponding Author: Qingfa Wang

ALGAL-D-16-00484. Algal Research. Fatty acid productivity of *Scenedesmus obliquus* under nitrogen starvation in mixotrophic cultivation exceeds the combination of autotrophic and heterotrophic cultivations. Corresponding Author: Raymond Jianxiong Zeng

ALGAL-D-16-00350. Algal Research. Valorisation of aquaculture effluents with microalgae: The Integrated Multi-Trophic Aquaculture Concept. Special Issue: Wastewater and Algae. Corresponding Author: Ana Otero

ALGAL-D-16-00297. Algal Research. Nutrients utilization or contaminants removal? A review of two approaches for microalgae and cyanobacteria cultivation. Special Issue: Wastewater and Algae. Corresponding Author: Roberto Parra

ALGAL-D-16-00157. Algal Research. An algae optical density sensor for pond monitoring and production process control. Corresponding Author: John Alexander Thomasson

PRE-2015-076. Phycological Research. Lipid compositions in microalgae, *Conticribra weissflogii* under static and aerated culture conditions. Corresponding Author: Jilin Xu

ALGAL-D-16-00150. Algal Research. Growth inhibitory and antifeedant effects of sublethal concentrations of toosendanin on the rotifer *Brachionus plicatilis*. Corresponding Author: Jianguo Liu

JAPH-D-16-00133. Journal of Applied Phycology. *Chlorella* biomass production in annular photobioreactor using palm oil mill effluent (POME): effect of hydrodynamics and mass transfer, irradiance, aeration rate and POME concentration. Corresponding Author: Nik Meriam Nik Sulaiman

ALGAL-D-16-00128. Algal Research. Differential effects of nitrogen-fed, heterotrophic, batch cultivation on *Chlamydomonas reinhardtii* growth and lipid accumulation. Corresponds Author: Kenneth Reardon

ALGAL-D-15-00480. Algal Research. Use of Spirulina biomass produced from treatment of aquaculture wastewater as agricultural fertilizers. Corresponding Author: Shy Chyi Wuang

ALGAL-D-15-00420. Algal Research. Biomass of Spirulina maxima enriched by biosorption process as a new feed supplement for laying hens. Corresponding Author: Agnieszka Saeid

ALGAL-D-15-00347. Algal Research. Microalgal carotenoids: Potential nutraceutical compounds with chemotaxonomic importance. Corresponding Author: Sandhya Mishra

2015

ALGAL-D-15-00698. Algal Research. Nutrient uptake and lipid yield in diverse microalgal communities grown in wastewater. Corresponding Author: Maria Stockenreiter

ALGAL-D-15-00246. Algal Research. Stabilizing continuous mixed cultures of microalgae. Corresponding Author: William J. Henley

ALGAL-D-15-00561. Algal Research. Chemically enhanced lipid production from microalgae under low sub-optimal temperature. Corresponding Author: Yi-feng Chen

ALGAL-D-15-00341. Algal Research. Operational strategies for maximizing CO₂ utilization efficiency by the novel microalga *Scenedesmus obliquus* SA1 cultivated in lab scale photobioreactor. Corresponding Author: Kaustubha Mohanty

ALGAL-D-15-00193. Algal Research. Effect of UV radiation and titanium dioxide on polyphenol and lipid contents of *Arthrospira* (*Spirulina*) *platensis*. Corresponding Author: Alessandro Alberto Casazza

ALGAL-D-15-00304. Algal Research. Minimization of Biomethane Oxygen Concentration during Biogas Upgrading in Algal-Bacterial Photobioreactors. Corresponding Author: Raul Munoz

ALGAL-D-15-00504. Algal Research. The implications of nitrogen limitation and sufficiency on the Acetyl Co-A carboxylase (ACCase) activity and biodiesel production from marine microalgae *Chlorella vulgaris* (JF894250). Corresponding Author: Magesh D Peter

ALGAL-D-15-00300. Algal Research. Non-invasive rapid harvest time determination of oil-producing microalgae cultivations for biodiesel production by using Chlorophyll fluorescence. Corresponding Author: Qiang Wang

ALGAL-D-15-00167. Algal Research. Algal products beyond lipids: Comprehensive characterization of different products in direct saponification of green alga *Chlorella* sp.. Corresponding Author: Dmitry Yu. Murzin

Mentorship

Gururaj Daptardar. 2018-present. Masters student focusing on ammonia/ammonium utilization in algal cultures

Tarun Shesh. 2016-2018. Masters student focusing on the abiotic CO₂ delivery through membrane carbonation.

Shahrzad Badvipour. 2016. Doctorate working on finishing publications involving water and energy efficiency of outdoor cultivation systems.

Shahrzad Badvipour. 2013-2015. Doctoral Student in Environmental Design and the Arts.

SERVICE TO COMMUNITY

Mentorship

Samihan Dani 2017-2018. Hamilton High School. Science Fair project focusing on nutrient use in alkaline conditions. Volunteering in the lab starting in January of 2018.

McKenna Loop. 2015-2016. Arizona College Prep-Erie High School. Science Fair project focusing on the extraction of lipids from algal biomass. 1st place in ASU Walton Sustainability Solutions at Arizona State Science and Engineering Fair. 2ND place in ASU Walton Sustainability Solutions at the International Science and Engineering Fair.

Brooke D'Agostini. 2016. ASU Preparatory Academy High School. Apprenticeship at AzCATI for 2.5 hours/week.

Destiny Woods. 2016. ASU Preparatory Academy High School. Apprenticeship at AzCATI for 2.5 hours/week.

Sarah Zinke. 2016. ASU Preparatory Academy High School. Apprenticeship at AzCATI for 2.5 hours/week.

Brooke D'Agostini, Sarah Zinke, Destiny Woods. 2016. ASU Preparatory Academy High School. Senior capstone project: Utilizing algal biomass as a slow release fertilizer.

Risha Jadhav. Knox Gifted Academy. 2016. 6th grade science fair project. Provided algae and completed optical density and dry weight measurements for experimentation on effects of CO₂ on growth. 1st place in Plant Sciences at Arizona State Science and Engineering Fair.

Community outreach

Open Door. February 24, 2018. Team Lead for “The possibilities of algae”. Event for the local community to come learn about the research happening at ASU.

East Valley Regional Bioscience Collaboration. First Meeting 09-06-17. New collaboration between industries, high schools, community colleges, and universities to improve the bioscience offerings in high school and to improve the curriculum to decrease the skills gap.

Night of the Open Door. February 19, 2016. Event for the local community to come learn about the research happening at ASU Polytechnic.

REFERENCES

Bruce E Rittmann, Ph.D.

Biodesign Swette Center for Environmental Biotechnology
Arizona State University
1001 S McAllister Ave,
BDA210
Tempe, AZ 85287
(480) 727-0434 (O)
Rittmann@asu.edu

Robin Gerlach, Ph.D.

Chemical and Biological Engineering Department
Montana State University
306 Cobleigh Hall
PO Box 173920 Bozeman, MT 59717
(406) 994-1840 (O)
(406) 994-2221 (Dept.)
robin_g@biofilm.montana.edu

Robert Gardner, Ph.D.

College of Food, Agriculture and Natural Resource Sciences
West Central Research and Outreach Center
University of Minnesota
46352 State Hwy 329
Morris, MN 56267
(320) 589-1711 (O)
rdgardne@umn.edu