

Noah J. Langenfeld

Logan, Utah 84341

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Education

Ph.D. Plant Science <i>Utah State University</i>	May 2025 Intended
B.S. Biochemistry <i>University of Wisconsin – Stevens Point</i>	May 2020
B.S. Biology <i>University of Wisconsin – Stevens Point</i>	May 2020
Aquaponics certificate <i>University of Wisconsin – Stevens Point</i>	May 2020

Employment

Graduate Research Assistant **July 2020 – Present**
Crop Physiology Laboratory, Utah State University, Logan, UT

- Worked closely with other graduate students to develop, design, and execute nutrient recycling projects to optimize recovery of nitrogen in closed life support systems for future missions to, on, and from Mars. Managed recirculating hydroponic systems and developed bioreactors for NASA-funded food and plant science projects.

Fresh Market Crew Manager **June 2011 – July 2020**
Flyte Family Farms, LLC, Coloma, WI

- Managed harvest crews to maintain positive morale and GAP adherence while overseeing customer service and production operations for consumer-direct sales. Helped manage four commercial hydroponic greenhouses for tomato and cucumber production. Maintained efficient field records to ensure quality control for commercial strawberry and organic blueberry production.

Master Writing Lab Consultant **September 2017 – May 2020**
Writing Lab, University of Wisconsin, Stevens Point, WI

- Advised students on academic and creative literary endeavors for classes and professional aspirations. Maintained confidential student records while promoting ethical adherence to tutoring policies.

Personal Statements Honors Intern **September 2019 – May 2020**
Writing Lab, University of Wisconsin, Stevens Point, WI

- Worked with graduating students to develop strategic plans and personal application materials for admittance into graduate school programs.

Tutoring Mentor **January 2017 – May 2020**

Tutoring-Learning Center, University of Wisconsin, Stevens Point, WI

- Mentored colleagues on pedagogical instruction and content delivery methods. Designed reference and learning materials for students and led group study sessions for undergraduate organic chemistry and plant biology courses.

Faculty Assistant **January 2019 – May 2020**

Department of Chemistry, University of Wisconsin, Stevens Point, WI

- Worked closely with faculty members to accurately and timely assess and address student performance. Ensured confidentiality and fairness among student content submissions of learning materials.

Research Experience

Infinite recirculation of hydroponic nutrient solutions **December 2021 - Present**

Crop Physiology Laboratory, Utah State University, Logan, UT

Advisor Dr. Bruce Bugbee

- Designed and optimized nutrient solutions for infinite recycling in hydroponic systems to eliminate water and fertilizer waste between cropping cycles.

Nitrogen Recycling for Closed Life Support Systems **July 2020 - Present**

Crop Physiology Laboratory, Utah State University, Logan, UT

Advisor Dr. Bruce Bugbee

- Studied nitrification efficiency in soilless media systems under different nitrogen inputs to determine optimal conditions for nitrogen recycling in closed systems.

Reduced Chlorophyll to Improve Canopy Photosynthesis **March 2021 – January 2023**

Crop Physiology Laboratory, Utah State University, Logan, UT

Advisors Dr. Bruce Bugbee (Utah State University), Dr. Devin Colman-Derr (UC Berkeley)

- Grew truncated light antenna (TLA) CRISPR-modified rice with reduced chlorophyll content and analyzed physiological responses using the LI-COR 6800 portable photosynthesis system and spectrophotometric chlorophyll extraction methods.

Genetics of Nitrifying Bacteria **Fall 2019 – Spring 2020**

Department of Biology, University of Wisconsin, Stevens Point, WI

Advisor Dr. Ann Impullitti

- Quantified bacterial population densities using qPCR to determine nitrification presence and abundance in diverse aquaponic systems.

Mechanisms of HIV Protease **Fall 2019 – Spring 2020**

Department of Chemistry, University of Wisconsin, Stevens Point, WI

Advisor Dr. Amanda Jonsson

- Studied crystallized structures of HIV Protease to elicit possible drug resistance. Used digital computational models to develop future inhibitors to block viral life cycles.

Nanobubble Technologies in Aquaponic Systems

Spring 2019

Department of Biology, University of Wisconsin, Stevens Point, WI

Advisor Dr. Christopher Hartleb

- Monitored continuous fish and plant growth and development in aquaponic systems to determine effects of nanobubble generation in water columns.

Antibiotic Resistance Mechanisms in Bacteria

Fall 2018 – Spring 2019

Department of Chemistry, University of Wisconsin, Stevens Point, WI

Advisor Dr. Amanda Jonsson

- Explored structural identities of bacterial immune response proteins in relation to aminoglycoside resistant mechanisms for antibiotics.

Hybrid Walleye Stocking Density in Aquaponics

Fall 2017 – Fall 2018

Department of Biology, University of Wisconsin, Stevens Point, WI

Advisor Dr. Christopher Hartleb

- Analyzed optimal walleye stocking density in aquaponic systems through water chemistry and organismal growth analysis to promote development of new sustainable options for aquaponic fish.

O-GluNAcylation Protein Catalysis

Fall 2017 – Spring 2018

Department of Chemistry, University of Wisconsin, Stevens Point, WI

Advisor Dr. Amanda Jonsson

- Developed computational models for protein glycosylation to study effects of sequence identity on structural function.

Publications

144 career citations, h-index = 5

Langenfeld, N. and Bugbee, B. (2024). Sustainable hydroponics using zero-discharge nutrient management and automated pH control. *HortScience*. 59(8), 1202-1206.

<https://doi.org/10.21273/HORTSCI17975-24>

Langenfeld, N., Skabelund, H., Heins, R., and Bugbee, B. (2024). Advantages of a novel *in situ* pH measurement for soilless media. *Frontiers in Plant Science*. 15:1334328.

<https://doi.org/10.3389/fpls.2024.1334328>

Langenfeld, N. and Bugbee, B. (2023). An improved digestion and analysis procedure for silicon in plant tissue. *PLOS One*. 18(9): e0289151.

<https://doi.org/10.1371/journal.pone.0289151>

Wallentine, T., Merkley, D., **Langenfeld, N.,** Seefeldt, L., and Bugbee, B. (2023). Approaches to nitrogen fixation and recycling in closed life-support systems. *Frontiers in Astronomy and Space Sciences*. 10:1176576. <https://doi.org/10.3389/fspas.2023.1176576>

- Dey, M., **Langenfeld, N.**, and Bugbee, B. (2023). The effect of elevated copper on plant growth in peat-based media and hydroponics. *HortScience*. 58(4), 459-464.
<https://doi.org/10.21273/HORTSCI17048-22>
- Langenfeld, N.** and Bugbee B. (2023). Evaluation of micro dwarf tomato cultivars for use in controlled environments. *USU Digital Commons*.
https://digitalcommons.usu.edu/cpl_dwarfcrops/16/
- Caddell, D., **Langenfeld, N.**, Zhen, S., Klaras, R., Mishra, L., Bugbee, B., and Coleman-Derr, D. (2023). Photosynthesis in rice is increased by CRISPR/Cas9 mediated transformation of two truncated light harvesting antenna genes. *Frontiers in Plant Science*. 14:1050483.
<https://doi.org/10.3389/fpls.2023.1050483>
- Langenfeld, N.** and Bugbee, B. (2022). Germination and seedling establishment for deep-flow hydroponics: The benefit of slant boards. *PLOS One*. 17(10): e027571
<https://doi.org/10.1371/journal.pone.0275710>
- Langenfeld, N.**, Pinto, D., Faust, J., Heins, R., and Bugbee, B. (2022). Principles of nutrient and water management for indoor agriculture. *Sustainability*. 14(16): 10204.
<https://doi.org/10.3390/su141610204>
- Langenfeld, N.** and Bugbee, B. (2022). Continuous pH monitoring and control: Selecting and interfacing the electrode, controller, and datalogger. *USU Digital Commons*.
https://digitalcommons.usu.edu/cpl_techniquesinstruments/21/
- Langenfeld, N.**, Payne, L., and Bugbee, B. (2021). Colorimetric determination of urea in strong acids. *PLOS One*. 16(11): e0259760. <https://doi.org/10.1371/journal.pone.0259760>
- Langenfeld, N.**, Kusuma, K., Wallentine, T., Criddle, C., Seefeldt, L., and Bugbee, B. (2021). Optimizing nitrogen fixation and recycling for food production in regenerative life support systems. *Frontiers in Astronomy and Space Sciences*. 8:699688.
<https://doi.org/10.3389/fspas.2021.699688>
- Langenfeld, N.** and Bugbee, B. (2021). Evaluation of three dissolved oxygen meters. *HortTechnology*. 31(4), 428-431. <https://doi.org/10.21273/HORTTECH04819-21>
- Bugbee, B. and **Langenfeld, N.** (2021). Utah Monocot/Dicot Solution. *USU Digital Commons*.
https://digitalcommons.usu.edu/cpl_nutrients/2
- Langenfeld, N.** and Bugbee, B. (2021). Dissipation rates of oxygen nanobubbles in recirculating systems. *USU Digital Commons*.
https://digitalcommons.usu.edu/cpl_techniquesinstruments/19
- Langenfeld, N.**, Rhodes, S., and Bugbee, B. (2021). Deep-flow hydroponic culture: Copper toxicity at 8 μ M (0.13 ppm) in tomato. *USU Digital Commons*.
https://digitalcommons.usu.edu/cpl_hydroponics/8

Presentations

Title	Type	Meeting*	Location	Date
Nitrification for food production in bioregenerative life-support systems	Oral	UT-NASA SGC	Salt Lake City, UT	May 2024
Nitrogen recycling for bioregenerative life support	Oral	CUBES	Berkeley, CA	Apr. 2024
Serendipitous sunflowers: Decreased hydroponic aeration improves iron uptake	Poster	NCERA-101	Des Moines, IA	Mar. 2024
Serendipitous sunflowers	Oral	NCERA-101	Des Moines, IA	Mar. 2024
Nitrogen transformations in closed root-zones for sustainable life support	Oral	CSSA	St. Louis, MO	Nov. 2023
Eliminating leaching using mass-balance principles	Oral	ASHS	Orlando, FL	Aug. 2023
Infinite closed-system nutrition using mass balance	Flash	ASHS	Orlando, FL	Aug. 2023
Optimizing recycling of nitrogen in closed life support systems	Oral	CUBES	Berkeley, CA	May 2023
Optimizing nitrogen use for continuous recycling in closed life support systems	Oral	UT-NASA SGC	Ogden, UT	May 2023
Nutrient solutions designed using mass-balance enable infinite nutrient recirculation for closed-system agriculture	Poster	NCERA-101	Davis, CA	Apr. 2023
Infinite closed-system nutrition using mass balance	Flash	NCERA-101	Davis, CA	Apr. 2023
A larger root-zone volume facilitates nitrogen transformations in controlled environment agriculture	Poster	CSSA	Baltimore, MD	Nov. 2022
Crop Physiology Laboratory overview	Oral	Hansen	Logan, UT	Oct. 2022
Mass balance optimizes nutrient and water management for indoor agriculture	Poster	NCERA-101	Tucson, AZ	Sep. 2022
Mass balance principles for sustainable fertilization	Flash	ASHS	Chicago, IL	Aug. 2022
Day and night gas exchange is necessary to predict water-use efficiencies of whole crops	Poster	ASHS	Chicago, IL	Aug. 2022
Nitrogen recycling in closed life support systems	Oral	ASPB	Portland, OR	Jul. 2022
Microbes for meals: N-fixing microbial biomass as a plant fertilizer	Oral	CUBES	Berkeley, CA	May 2022
Modelling whole plant water-use efficiency from single leaf measurements	Oral	USU SRS	Logan, UT	April 2022
Copper tolerance in hydroponic lettuce for disease prevention	Flash	Rapid Fire	Logan, UT	Mar. 2022
Hydroponic copper tolerance for disease prevention	Flash	NCERA-101	Virtual	Nov. 2021
Nutrient solutions for recirculating hydroponics	Oral	CSSA	Salt Lake, UT	Nov. 2021

Optimizing nitrogen fixation and recycling for Martian life support	Poster	Hansen	Logan, UT	Oct. 2021
Biomanufacturing of nitrogen fertilizer from Martian atmospheric N ₂ gas, Virtual oral presentation	Oral	NASA ISRU	Virtual	Sep. 2021
Maintenance of nutrient solutions for recirculating hydroponics	Oral	ASHS	Denver, CO	Aug. 2021
CREST: Bacteria Fighting Back	Oral	Seminar	Stevens Point, WI	Oct. 2019
Nanobubble oxygenation effects on fish growth and water nutrients in an aquaponics system	Poster	COLS URS	Stevens Point, WI	May 2019
Eliciting the mechanism of aminoglycoside resistant NpmA as a rRNA methyltransferase	Poster	COLS URS	Stevens Point, WI	May 2019
Eliciting the Mechanism of Aminoglycoside Resistant NpmA as a rRNA Methyltransferase	Poster	ASBMB	Orlando, FL	Apr. 2019
Influence of walleye (<i>Sander vitreus</i>) stocking density on plant growth in an aquaponics system	Poster	COLS URS	Stevens Point, WI	May 2018
OGT protein recognition and catalysis	Poster	COLS URS	Stevens Point, WI	May 2018
OGT protein recognition and catalysis	Poster	ASBMB	San Diego, CA	Apr. 2018

*Acronyms

- ASBMB = American Society for Biochemistry and Molecular Biology
- ASHS = American Society for Horticultural Science
- ASPB = American Society for Plant Biology
- COLS URS = College of Letters and Sciences Undergraduate Research Symposium
- CUBES = Center for the Utilization of Biological Engineering in Space
- CSSA = Crop Science Society of America
- Hansen = Lars Hansen Life Sciences Retreat
- NASA ISR = NASA *In situ* Resource Utilization
- NCERA-101 = North Central Extension Research Activity – Committee on Controlled Environments
- Rapid Fire = Rapid Fire Research
- UT-NASA SGC = Utah NASA Space Grant Consortium

Invited discussions

- Land Grant/R1: Community over Commercialization, Panelist, Utah State University Libraries, 11 April 2024
- Vertical farming and controlled environmental agriculture, Panelist, Soil Health and Fertility Class, Utah State University, 2 April 2024

Media coverage

- USU Ag Graduate Student: Growing Futures and Feeding Communities June 18, 2024
<https://www.usu.edu/advancement/stories/ag/growing-futures-and-feeding-communities>
- NASA looking to researchers at Utah State University to problem-solve farming on Mars April 25, 2024
<https://ksltv.com/639930/nasa-looking-to-researchers-at-utah-state-university-to-problem-solve-farming-on-mars/>
- USU Scientists Among Multi-Institution Team Receiving NASA Achievement Award April 24, 2024
<https://www.usu.edu/today/story/usu-scientists-among-multi-institution-team-receiving-nasa-achievement-award>

Teaching

- **Courses**
 - Hydroponics
 - 2 credits, PSC 2900/4900, Utah State University, Spring 2022, 2023, 2024
 - Instructor of record. I designed the course from scratch and delivered all lectures and labs (4) independently. Principles and practices of design, maintenance, and applications of hydroponic systems for sustainable food production. Basic solution chemistry and plant physiology principles and their impact on hydroponic optimization.
- **Teaching assistant**
 - Environmental plant physiology – Spring 2022, 2023, 2024
 - Plant nutrition – Fall 2022, 2024
 - Environmental instrumentation – Fall 2021
- **Guest lectures**
 - “Hydroponic methods of vegetable production”, Vegetable Crops 10 Oct 2024
 - “Visual identification of nutrient stress”, Plant Nutrition 24 Sept 2024
 - “Nutrient management by mass balance”, Plant Nutrition 20 Sept 2024
 - “Long wave radiation”, Environmental Plant Physiology 26 Jan 2024
 - “Short wave radiation”, Environmental Plant Physiology 23 Jan 2024
 - “Deficiencies, toxicities, and heavy metal stress”, Plant Stress Physiology 22 Feb 2023
 - “Opportunities in plant science research”, Plants, Soils, and Climate Orientation 13 Oct 2022

Unique Coursework

Title	Course	Professor	Date
Plant nutrition	PSC 6430	Dr. Bruce Bugbee	Spring 2022
Environmental instrumentation	PSC 6000	Dr. Bruce Bugbee	Fall 2021
Biochemical engineering	BENG 6810	Dr. Ron Sims	Fall 2021
Principles of bioenergetics	CHEM 6760	Dr. Lance Seefeldt	Spring 2021
Environmental soil physics	PSC 6670	Dr. Scott Jones	Fall 2020
TEM workshop: Viruses and bacteria	BIOL 498	Dr. Sol Sepsonwol	Spring 2019
Ecology of Southern Florida	BIOL 309	Dr. Brian Barringer	Winter 2019
Techniques in aquaponics	BIOL 384	Dr. Chris Hartleb	Spring 2019
Environment and culture of the Mississippi Delta	GEOG 387	Lisa Theo	Spring 2018
Post-Secondary learning theory and practicum	EDUC 301	Emily Wisinski	Fall 2017

Scholarships and fellowships awarded

Post-secondary total	\$132,683	2016-2024
Graduate	\$85,283	2020-2024
Utah NASA Space Grant Consortium Graduate Fellowship	16000	2024
John Seymour Memorial Scholarship	5438	2024
Apogee Instruments - Campbell Scientific Graduate Fellowship	2000	2024
Utah NASA Space Grant Consortium Graduate Fellowship	16000	2023
American Society for Horticultural Science PhD Graduate Student Scholarship	1500	2023
Noelle and John Cockett Graduate Fellowship	3798	2023
Apogee Instruments Graduate Fellowship	2000	2023
Utah NASA Space Grant Consortium Graduate Fellowship	15000	2022

Apogee Instruments Graduate Fellowship	2000	2022
Bertrand D. Tanner / Campbell Scientific Graduate Fellowship	5000	2022
George & Viola Larsen Scholarship	2547	2021
Bertrand D. Tanner / Campbell Scientific Graduate Fellowship	5500	2021
Phi Kappa Phi Graduate Student Scholarship	8500	2020
Undergraduate	\$47,400	2016-2020
Tommy Thompson Leadership Scholarship	2300	2020
Wisconsin Potato and Vegetable Growers Association Scholarship	750	2019
UW-Stevens Point Student Government US Bank Scholarship	750	2019
Culver-Rogers Award	500	2019
UW-Stevens Point Writing Lab Scholarship	1000	2019
Edgar Pierson Biology Award	750	2019
Milwaukee Art Museum Garden Club Scholarship	2000	2019
UW-Stevens Point Kazmerak Scholarship	900	2018
Waushara County Health and Community Education Scholarship	500	2018
Wisconsin Garden Club Scholarship	1000	2018
Waushara County Master Gardeners Scholarship	2500	2018
UW-Stevens Point Student Government US Bank Scholarship	1000	2017
Waushara County 4H Leader's Association Scholarship	100	2017
Thomas Schullen Memorial Scholarship	600	2016
Foundation for Blended and Online Learning Scholarship	20000	2016
Melvin Laird Memorial Scholarship	4000	2016
Academic Excellence Scholarship	9000	2016

Travel Grants

Post-secondary total	\$5,600	2018-2024
Grant	Amount (\$)	Date
Utah State University Graduate Student Travel Award	300	2024
Marc van Iersel Student Travel Award	1000	2024
Utah State University Graduate Student Travel Award	300	2023
NCERA-101 Student Travel Award	500	2023
UW-Stevens Point Travel Grant	2000	2019
UW-Stevens Point Travel Grant	1500	2018

Awards

Award	Sponsor	Date
Student flash talk, 2 nd place	NCERA-101	Mar. 2024
Graduate Student Teacher of the Year: Plant, Soils, and Climate Department	USU PSC	Dec. 2023
Student flash talk, 3 rd place	NCERA-101	Apr. 2023
Student flash talk, 3 rd place	NCERA-101	Nov. 2021
Crop physiology and metabolism, 1 st place oral and poster presentation	CSSA	Nov. 2021
Albertson Medal	UW-Stevens Point	May 2020
University Leadership Award	UW-Stevens Point	May 2020
University Leadership Award	UW-Stevens Point	May 2019
University Leadership Award	UW-Stevens Point	May 2018

Professional Societies

American Society of Plant Biology	2022-Present
Crop Science Society of America	2021-Present
Soil Science Society of America	2021-Present
American Society of Agronomy	2021-Present
American Society for Horticultural Science	2021-Present
American Society for Molecular Biology	2017-2020
American Chemical Society	2017-Present

Honor Organizations

Organization	Inducted
Beta Beta Beta Biological Honors Society	2019
Phi Kappa Phi Collegiate Honors Society	2019
National Society for Leadership and Success	2018
Phi Eta Sigma Freshman Honors Society	2017
National Honors Society	2016

Extracurricular Involvement

Organization	Role	Date
Plant Science Club – Utah State University	Member	2021-Present
Biochemistry Club – UW-Stevens Point	President	2019-2020
Chemistry Club – UW-Stevens Point	Social Media Coordinator	2019-2020
Botany Club – UW-Stevens Point	Vice-President	2018-2019

Volunteer Work

Organization	Location	Date
Cache Trails Alliance	Logan, UT	2024-Present
Utah State University Student Nutrition Access Center	Logan, UT	2021-Present
Coloma Dynamites 4H Club	Coloma, WI	2012-2020
Waushara County 4H Executive Leaders Board	Wautoma, WI	2016-2018
Humane Society of Portage County	Plover, WI	2016-2018
Eyes of Hope Animal Shelter	Oxford, WI	2008-2016
Ice Age Trail Alliance	Coloma, WI	2010-2012

References

Name	Location	Phone	Email
Dr. Bruce Bugbee	Utah State University	435-512-5213	bruce.bugbee@usu.edu
Dr. Lance Seefeldt	Utah State University	435-797-3964	lance.seefeldt@usu.edu
Dr. Jeanette Norton	Utah State University	435-797-2166	jeanette.norton@usu.edu
Dr. Paul Johnson	Utah State University	435-797-7039	paul.johnson@usu.edu
Dr. Brian Barringer	UW-Stevens Point	715-346-2452	brian.barringer@uwsp.edu
Dr. Christopher Hartleb	UW-Stevens Point	715-346-3228	chartleb@uwsp.edu
Dr. Amanda Jonsson	UW-Stevens Point	715-346-2600	amanda.jonsson@uwsp.edu