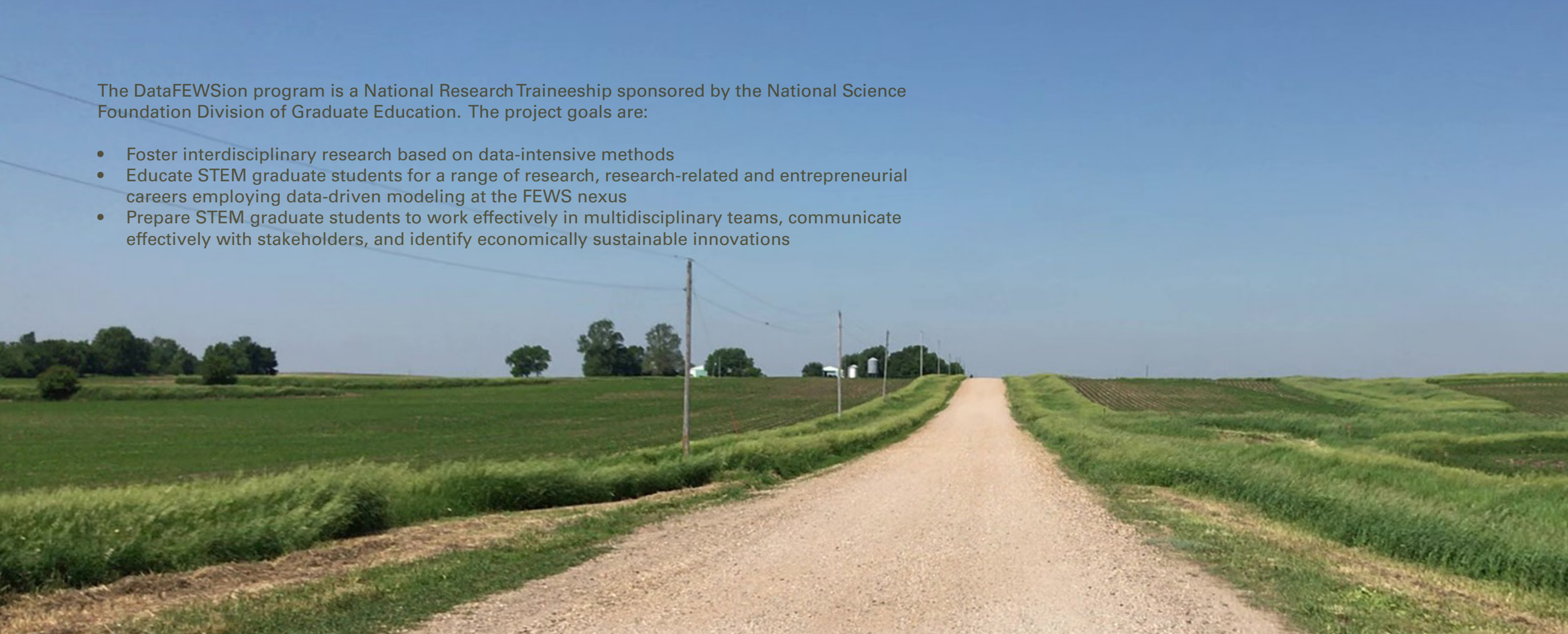
The image is a close-up of a car's side-view mirror. The mirror's frame is black and curved. Inside the mirror, a rural landscape is reflected. A light-colored gravel or dirt road stretches from the bottom center towards the horizon. To the left of the road is a green field, and to the right is a grassy area with some utility poles. The sky is blue with scattered white clouds. The text is overlaid on the right side of the mirror's reflection.

**DataFEWSion Traineeship for  
Innovations at the Nexus of Food  
Production, Renewable Energy,  
and Water Quality**

2020 Annual Report



The DataFEWSion program is a National Research Traineeship sponsored by the National Science Foundation Division of Graduate Education. The project goals are:

- Foster interdisciplinary research based on data-intensive methods
- Educate STEM graduate students for a range of research, research-related and entrepreneurial careers employing data-driven modeling at the FEWS nexus
- Prepare STEM graduate students to work effectively in multidisciplinary teams, communicate effectively with stakeholders, and identify economically sustainable innovations

### **Notes from the Program Director**

As we complete our first year of traineeship activities, I am grateful to the leadership team, faculty advisors, project manager Cynthia Lidtke and, most importantly, our first cohort of trainees for their hard work and creativity. The Covid19 pandemic has underscored the importance of connection and the privilege of collaboration to solve important problems. Human health requires nutrition, hydration, and many forms of energy. These future engineers and scientists inspire me by their commitment to finding ways to sustainably provide for all of these needs.

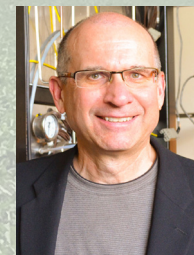
# Leadership Team



Sarah Ryan, PI

Industrial & Mfg. Sys.  
Engineering

Operations  
research; data-driven  
decision models



Robert Brown, Co-PI

Bioeconomy  
Institute

Biomass energy



Amy Kaleita, Co-PI

Ag & Biosystems  
Engineering

Ag land and water  
resources conservation  
engineering



Sergio Lence, Co-PI

Economics

Ag economics,  
welfare and market  
analysis



Michelle Soupir, Co-PI

Ag & Biosystems  
Engineering

Water quality  
and watershed  
management



## What is a Traineeship?

The DataFEWSion traineeship is composed of three core components. The foundation is the student's dissertation or thesis research. Layered on top of that is a new graduate certificate with a focus on data analytics and decision making. And finally, the heart of the traineeship is the learning community, which we've adapted from the very successful undergraduate learning communities at ISU.

Up to six PhD trainees per year receive assistantships that cover tuition, living expenses, and health insurance for a year. We also have unfunded trainees who are mostly international students not eligible for this funding.

The most important part of a traineeship is the trainees. Here is our first cohort, who are completing their first year of the two-year program.

## Cohort 1



**Garrison Gunter**

Chemical Engineering

**Research Interest:**  
*Developing pyrolysis plants, capable of effectively converting waste biomass into biofuel and value added chemicals*

**Advisor:**  
Dr. Robert Brown



**Matthew Nowatzke**

Crop Prod. & Physiology

**Research Interest:**  
*The intersection of data science, agriculture, and human-centered design to identify models and systems that couple human decision-making with sound agricultural and environmental practices*

**Co-Advisors:**  
Dr. Emily Heaton &  
Dr. Andy VanLooke



**Virginia “Gina” Nichols**

Crop Prod. and Physiology

**Research Interest:**  
*Quantifying the benefits of diverse crop rotations on environmental, social, and economic scales.*

**Co-Advisors:**  
Dr. Matt Liebman  
Dr. Satirios Archontoulis



**Chin-Yuan “Jeff” Chu**

Industrial Engineering

**Research Interest:**  
*Data analytic tools that manage supply chain risk in the FEWS nexus to help farmers, companies, and policymakers develop innovative and sustainable solutions*

**Advisor:**  
Dr. Gül Kremer



**Lindsey Murry**

Ag & Biosystems Eng.

**Research Interest:**  
*Agricultural practices to improve water quality through agricultural engineering methods.*

**Advisor:**  
Dr. Michelle Soupир



**Timothy Neher**

Ag & Biosystems Eng.

**Research Interest:**  
*Antibiotic resistance indicators as they relate to quantities used by livestock owners; evaluation of in-field or edge-of-field practices that may reduce resistance indicators; and economic benefits to farmers*

**Advisor:**  
Dr. Michelle Soupир



**Görkem Emirhüseyinoğlu**

Industrial Engineering

**Research Interest:**  
*Investigating land use and management decisions to reduce nutrient runoff while maximizing agricultural profit under market and precipitation uncertainty*

**Advisor:**  
Dr. Sarah Ryan



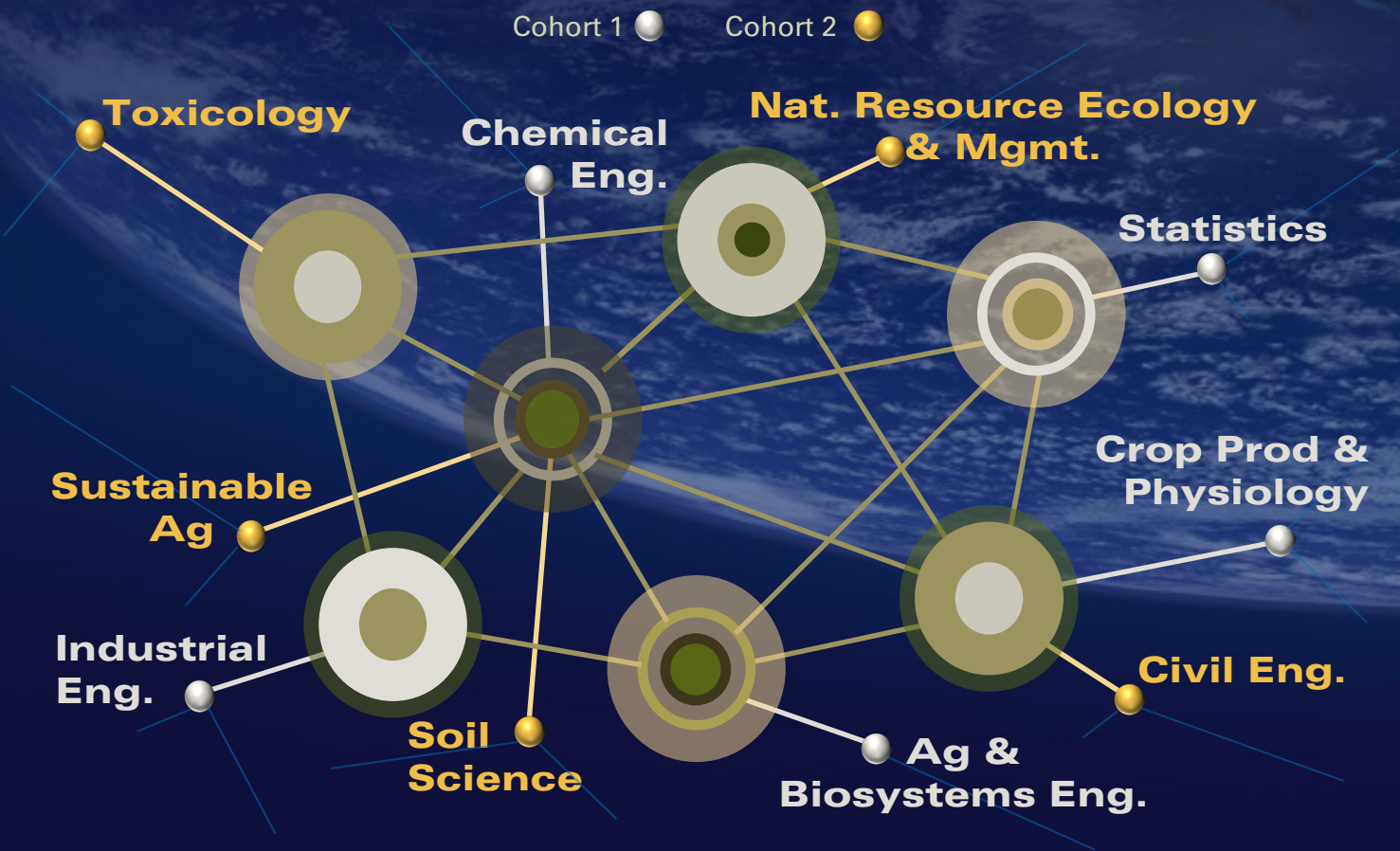
**Charlie Labuzzetta**

Statistics

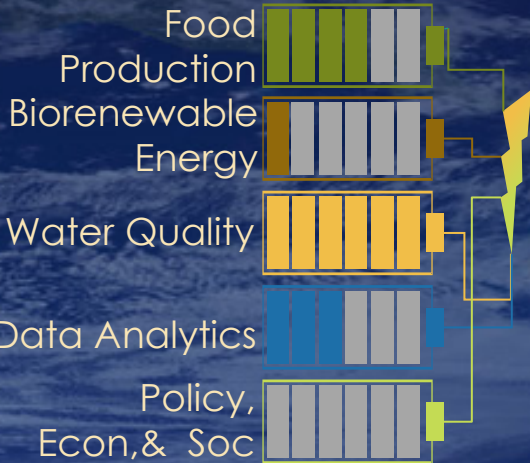
**Research Interest:**  
*Statistical analysis of satellite imagery for monitoring natural resources and best management practices*

**Advisor:**  
Dr. Zhenguan Zhu

# Diverse Disciplines, Domains, Demographics, and Directions



## FEWS Collaboration Potentials



## Anticipated Career Paths



### Demographics

- ☒ Under-represented populations
- ☒ International work experience
- ☒ First generation college students
- ☒ International students



During our planning year we established a Graduate Certificate, hired a project manager and recruited eight trainees.

## Year 1 2018-19

### Graduate Certificate in Data-Driven Food, Energy, and Water Decision-Making

#### Core Courses (required)

ABE 615: Biosystems for Sustainable Development  
GR ST 566: Communications in Science  
AGRON/BCB/EE/ENGR/ME 693: Entrepreneurship for Graduate Students in Science and Engineering

#### Data acquisition, visualization & analytics (select 1)

ABE 504: Instrumentation for Ag. & Biosystems Engineering  
E E 525X: Data Analytics in Elect. & Comp. Engineering  
I E 583: Data Mining  
I E 592X: Analytics Projects for Improved Decision Making in the Service Sector  
ME 592X: Data Analytics & Machine Learning for Cyber-Physical Syst App.  
STAT 575: Methods of Multivariate Analysis  
STAT 585: Methods of Multivariate Analysis  
STAT 587: Stat. Methods for Research Workers

#### Complex systems modeling for decision support (select 1)

ABE 580: Engineering Analysis of Biological Systems  
I E/E AER E 565: Systems Engineering & Analysis  
I E 564: Decision Analysis in System Design  
I E/AER E 568: Large-Scale Complex Engineered Systems  
M E 525: Optimization Methods for Complex Design  
AGRON 525: Crop & Soil Modeling

#### Economics, Policy & Sociology of FEWS (select 1)

BRT/POLS 516: Biorenewables Law & Policy  
ECON 580: Intermediate Environmental & Resource Economics  
ME 510: Econ. & Policy of Engineering Energy Systems  
SOC 544: Sociology of Food & Ag Systems  
SOC 549: Sociology of the Environment  
JL MC 574: Communication Tech & Social Change  
NREM 570: Advanced Decision-Making in Natural Resource Allocation

## Workshop Series I

### Fall: Your Role in the FEWS Nexus

- Career Paths and Planning
- Establishing Your Brand
- Interdisciplinary Communication

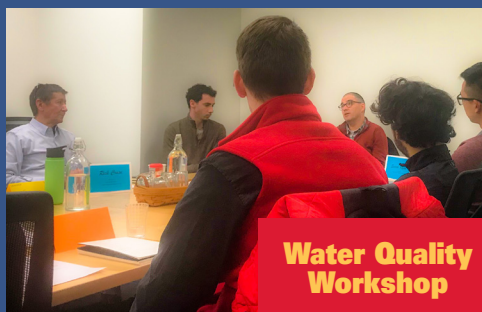
### Spring: Stakeholder Listening Sessions

- Agriculture & Water Quality
- Agribusiness & Bioenergy
- ~~Policy Impacts~~ (canceled by COVID19)

## Year 2 2019-20

A two-year alternating series of monthly workshops compose part of the learning community. This past year, we focused on professional development and communication in the fall. In the spring, we brought in panels of experts on water quality and bioenergy.

Weekly small group sessions form the second component of the learning community. Students conduct peer review on writing projects, discuss their research, and take turns chairing the meetings.



**Water Quality Workshop**

## **Year 2 Highlights**



**Stakeholder Meetings**



**Branding Workshop**



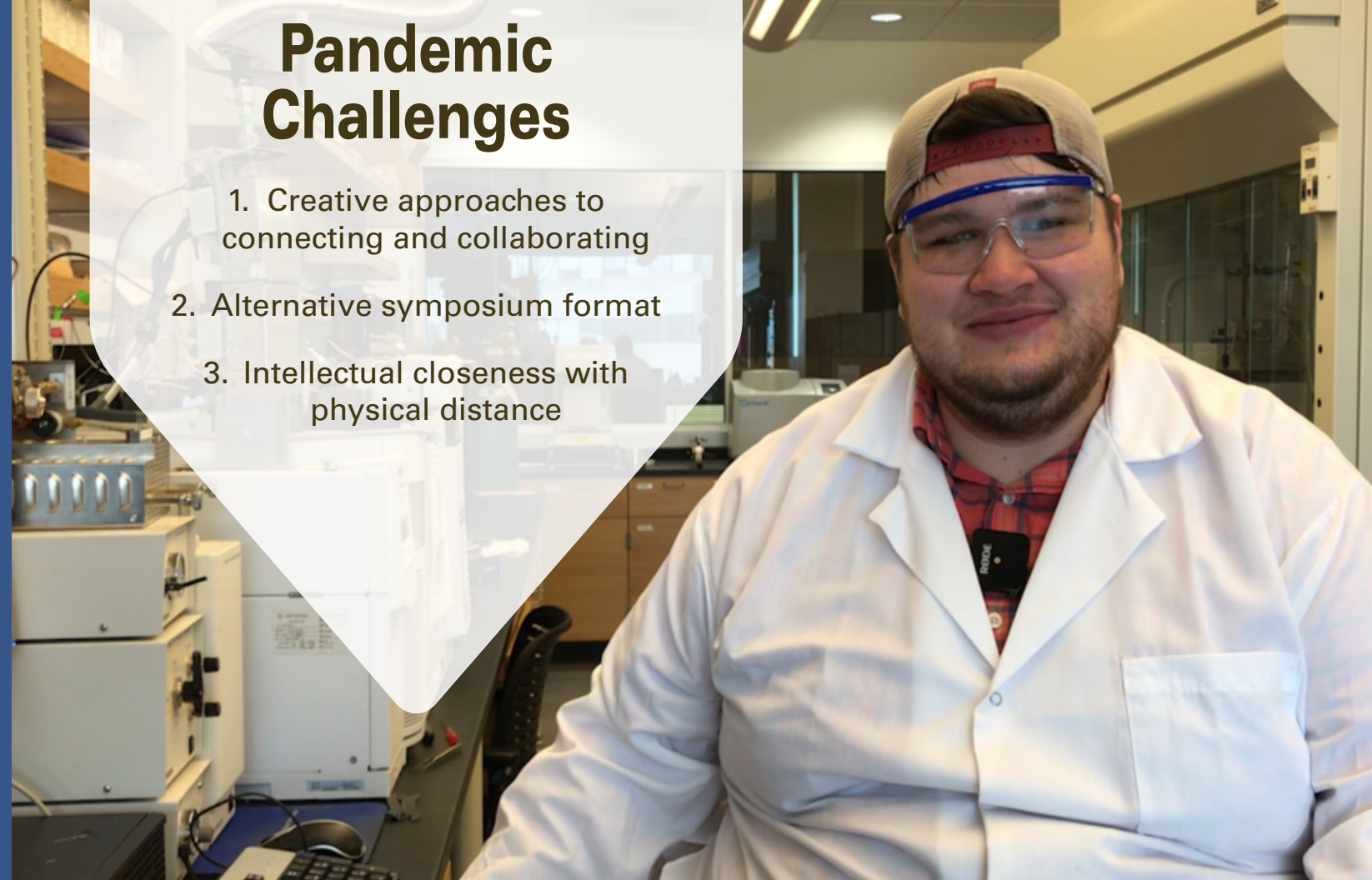
**Orientation Team Building**



**BioEnergy Workshop**

## **Pandemic Challenges**

1. Creative approaches to connecting and collaborating
2. Alternative symposium format
3. Intellectual closeness with physical distance



[illegible]

We will welcome six new trainees, offer the graduate communication class for the first time and present the second workshop series to focus on Effecting Change in the FEWS Nexus

The students will continue to meet in small groups, leading discussions, and providing training to each other in their fields of expertise.

**Year 3  
2020-21**

lowa  
quality  
FEWS  
insects

The students will continue to meet in small groups, leading discussions, and providing training to each other in their fields of expertise.

The students will continue to meet in small groups, leading discussions, and providing training to each other in their fields of expertise.

**Year 3**  
**2020-21**



# Faculty Advisors

(Cohort 1)

					
Robert Brown BEI	Michelle Soupir ABE	Emily Heaton Agronomy	Gül Kremer IMSE	Matt Liebman Agronomy	Sarah Ryan IMSE
					
Andy VanLoocke Agronomy	Sotirios Archontoulis Agronomy	Zhengyuan Zhu Statistics			

[illegible]

Robert Brown  
BEI



Robert Brown	Michelle Soupir
BEI	ABE



Robert Brown	Michelle Soupir	Emily Heaton
BEI	ABE	Agronomy



Robert Brown	Michelle Soupir	Emily Heaton	Gül Kremer
BEI	ABE	Agronomy	IMSE



	Robert Brown	Michelle Soupir	Emily Heaton	Gül Kremer	Matt Liebman
	BEI	ABE	Agronomy	IMSE	Agronomy



	Robert Brown	Michelle Soupir	Emily Heaton	Gül Kremer	Matt Liebman	Sarah Ryan
	BEI	ABE	Agronomy	IMSE	Agronomy	IMSE



Andy VanLoocke  
Agronomy



Andy VanLoocke      Sotirios Archontidis  
Agronomy      Agronomy



Andy VanLoocke	Sotirios Archontoulis	Zhengyuan Zhang
Agronomy	Agronomy	Statistics



# Industry Advisory Board



Akash Vidyadharan  
Founder and  
Chief Technology Officer



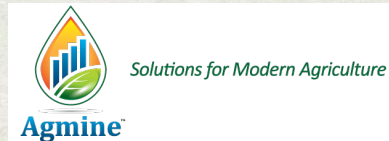
Greg Doonan  
Head of Novel Algorithm  
Advancement



Hassan Loutfi  
R&D Manager



Frank Dohleman  
Open Innovation Lead



Tom D'Alfonso  
President



Kara Hobart  
Senior R&D  
Engineer

# Diversity Advisory Board

Karen Crosby, Southern U and A&M  
Zahed Siddique, U of Oklahoma  
Tonya Smith-Jackson, N. Carolina A&T  
Heidi Taboada, U of Texas at El Paso

## With gratitude:

Vice President for Research  
College of Engineering  
College of Agriculture and Life Sciences  
Graduate College Career Services and Center for  
Communication Excellence  
Bioeconomy Institute  
Department of Industrial and Manufacturing Systems  
Engineering  
Iowa Nutrient Research Center  
Iowa Water Center  
Learning Communities  
Predictive Plant Phenomics (P3) Traineeship  
Reiman Gardens  
Workspace

# IOWA STATE UNIVERSITY



*The NSF National Research Traineeship (NRT) program encourages the development of bold, new, & transformative models for STEM graduate education training.*

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Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.



For more information  
Email: [datafewsion@iastate.edu](mailto:datafewsion@iastate.edu)  
Website: [datafewsion.iastate.edu](http://datafewsion.iastate.edu)



Photo by Jack and June Schmidt