

**External Release 10-16-2020**

**Bayer Crop Science/University of Minnesota Multifunctional Agriculture and Food System Initiative Graduate Student Fellowships 2021**

**Call for research proposals and graduate student nominations:**

The Bayer Crop Science/University of Minnesota Multifunctional Agriculture Initiative is seeking applications for graduate student fellowships sponsored by Bayer Crop Science. The program will provide funding for four premier-level Graduate Research Assistantships, each for a period of three years, in any of the research priority areas listed below. In addition to tuition, fees, research funding, and stipend, this program provides a unique opportunity for the Fellows to discuss their research ideas and progress, and learn about career opportunities in industry with Bayer employees from different parts of the company. The fellows will interact with Bayer at in-person events in St. Louis and on the University of Minnesota Campus, as well as through personal mentoring by Bayer scientists. In addition, the Fellows will collaborate on a cohort project that provides the opportunity to participate in dialogue on important issues facing today's food and agriculture system and the opportunity to encourage development of the "soft skills" needed to be an effective member of a research and development team.

We are seeking fellowship applicants for placement at the University of Minnesota in the Departments of:

Agronomy and Plant Genetics (<https://agronomy.cfans.umn.edu/>)

Applied Economics (<https://www.apec.umn.edu>)

Bioproducts and Biosystems Engineering (<https://bbe.umn.edu>)

Computer Science and Engineering (<https://www.cs.umn.edu>)

Entomology (<https://www.entomology.umn.edu/>)

Food Science and Nutrition (<https://fscn.cfans.umn.edu>)

Horticultural Sciences (<https://horticulture.umn.edu/>)

Plant and Microbial Biology (<https://cbs.umn.edu/academics/departments/pmb>)

Plant Pathology (<https://plpa.cfans.umn.edu/>)

Soil, Water and Climate (<https://www.swac.umn.edu/>)

Individuals interested in being considered for a Bayer Graduate Student Fellowship should apply to the graduate programs in the departments listed above with faculty and research programs with the capacity to advise students in the selected priority research areas. The nomination packages selected and

provided by each graduate program to the Bayer Graduate Student management Team will include:

1. Student transcripts (undergraduate and graduate if applicable)
2. Two letters of recommendation
3. Student statement that describes the student's interest in a potential area of research, future career interests, and a list of potential graduate faculty advisors (and projects, if available) for the student

Nominations from each graduate program should be sent to Lynne Medgaarden [medga001@umn.edu](mailto:medga001@umn.edu), by Wednesday, January 4, 2021, at 6:00 pm.

The Bayer Graduate Student Management Team will review the applications and select applicants for virtual interviews. Following the interviews the Bayer Graduate Student Management Team will select 4 applicants (fellowship awardees will be notified between January 15 and February 15, 2021) and work to match the student's areas of interest with a faculty member with an interest in conducting research in one of the priority research areas. The identified faculty member, in partnership with the fellowship recipient, will develop and submit a final research proposal to Lynne Medgaarden [medga001@umn.edu](mailto:medga001@umn.edu), as soon as possible, with a deadline of July 1, 2021 for final review by the Bayer Graduate Student Fellowship Management Team.

### **Research Priorities for the Bayer Crop Science/University of Minnesota Fellows Entering Fall Semester 2021:**

- **Big data management/informatics:** The scale of data that is being generated in agriculture is unprecedented. This data revolution includes measurements of plant genomes, phenomes, the environment in which plants are growing, grower management practices, as well as socioeconomic factors, all at high spatial and temporal resolution. The diversity of domains and data types has generated a number of challenges for agriculture. These range from data interoperability to the development of new, cross-domain machine learning and artificial intelligence approaches to generate actionable information. Improved data management and informatics resources that are interoperable to the many types of data will be critical to maximize the utility of the big data revolution in agriculture and contribute to the sustainability of future.

- **Remote sensing and imaging:** Advances in remote sensing and robotics provide opportunities for high-throughput collection of data on plant traits and prediction of varietal performance in new locations. Widespread collection of plant phenotype data can be used to perform basic and applied research to develop optimal plant varieties and will also be important in precision agriculture systems that improve agricultural practices by selecting the right hybrid or variety and management practices for an environment that increases sustainable productivity.
- **Insect management:** Insect pests can adversely affect crop yield and quality requiring actions be taken to protect crops. Integrated pest management for insect pests is a comprehensive approach to managing insect-induced crop stress that is economically and ecologically sustainable. Continued research is needed on decision tools for deployment of tactics (e.g., sampling, remote sensing, thresholds, predictive models), continued evaluation and integration of preventative (e.g., resistant varieties, transgenics), therapeutic tactics (e.g., insecticides), and response to new pest challenges (e.g., invasive species and insecticide-/trait-resistant pests).
- **Chemistry and biochemistry:** Chemistry and biochemistry have been, and likely will remain for the foreseeable future, vitally important for crop protection – from the chemicals used for control of fungal pathogens, insect pests and weeds to understanding *in planta* the consequences and targets of genetic changes. Biochemistry, and its partner science, metabolomics, provide the closest fundamental insights possible into understanding plant phenotypes. Enhanced knowledge of biochemical processes is key to promoting sustainable crop production, improving plant photosynthesis, productivity and quality, improving postharvest performance, understanding how plants cope with abiotic stress, capturing the diversity of plant specialized metabolism, and understanding fundamental mechanisms of growth and development.
- **Plant pathology:** Plant health is critical to food security, agricultural productivity, and agricultural sustainability. Areas of research include the management of crop diseases (biotic stresses) caused by plant pathogens (especially fungi, bacteria and nematodes) through genetics, cultural practices, and chemical controls; enhancing crop resistance to environmental stresses caused by temperature and moisture extremes; and

leveraging non-pathogenic microbes associated with crop plants to promote overall health through increased nutrient and water availability, reduction of impacts of environmental stresses, and enhancement of innate resistance to pathogens.

- **Novel plant-based proteins:** A growing interest in sustainable and environment friendly sources is among the reasons that have led to heightened interest in novel plant proteins. Another important contributing factor is securing additional protein sources for the growing population. An interdisciplinary approach as well as partnering with the industry will lead to the delivery of new, nutritious, and functional plant protein ingredients and products, working all the way from breeding and genetics to processing, formulation, and marketing. Demonstration of novel proteins as equivalent or superior sources, in terms of nutrition and functional properties, compared to existing protein alternatives is essential to their market success. A multifaceted approach involving a concerted effort from breeders as well as food and nutrition scientists will lead to the production of protein crops that are viable sources of plant protein for various food applications.
- **Crop hybridization approaches:** The phenomenon in which a hybrid outperforms its inbred parents is heterosis. The generation of hybrid varieties in species such as maize has had profound impacts on yield, stress tolerance, and other important agronomic traits. It has long been a goal in a number of self-pollinating species, such as wheat, to develop hybrid varieties that take advantage of benefits of hybridization. Hybridization between species has been utilized in plant breeding to bring in new traits of interest such as winter hardiness, quality traits, and perennialism. Continued efforts in interspecies and intraspecies hybridization as well as a fundamental understanding of heterosis in crop plants are all important to the future of sustainable food and agricultural systems
- **Biologicals/Natural products:** Biologicals, and especially microbial products have shown tremendous promise in their capacities to suppress plant diseases, enhance plant tolerance of drought and other abiotic stresses, increase plant productivity, and boost soil carbon sequestration. While consistency of performance remains a challenge, rapid advances in genomics, transcriptomics, and metabolomics are shedding light on the

critical ecological factors that mediate the success of biologicals, and offer a path forward for the development of practical and effective biologicals for crop production systems.

The program also encourages the submission of proposals that deal with other important seed physiology, disease, insect, and weed problems, as well as other issues important to the enhancement of sustainable agriculture practices and the yield potential of corn and soybean-based cropping systems. Particular attention will be given to proposals with cross-cutting research agendas relying on advanced computing to drive innovative outcomes in agriculture.

**Questions about the Bayer Graduate Student Fellowship program should be sent to:**

Lynne Medgaarden, [medga001@umn.edu](mailto:medga001@umn.edu)

Donald Wyse, [wyses001@umn.edu](mailto:wyses001@umn.edu)