CAHNRS Sponsored Undergraduate Internship Proposal - Summer 2018

Part I.

1. Mentors’ Names, Title, Affiliation with CAHNRS and Contact Information
   Dr. Jeff Godoy, Post-Doctoral Research Associate and Dr. Arron H. Carter, Associate Professor and O.A. Vogel Endowed Chair in Winter Wheat Breeding and Genetics, Department of Crop and Soil Sciences, 509-335-6198, ahcarter@wsu.edu

2. Duration of Internship: The internship will be for Summer 2018, will last for 12 weeks and can be full or part-time, with potential to work for the program through the fall semester of 2018. The weekly time requirements will vary depending on the associated field activities. Rate of pay will be $12/hr. The intern will work under the guidance of the mentors.

3. Student Learning Outcomes:
   (1) Critical and Creative Thinking – The intern will develop a research project that would involve the use of high-throughput phenotyping tools currently available in the WSU winter wheat breeding program. After proper training in the operation of these tools, the intern will be required to create suitable strategies to incorporate them in the different stages of wheat breeding.
   (2) Quantitative Reasoning – A lot of field data will be gathered during the course of the program. The intern will be properly guided to handle big datasets and data processing. The intern will be trained to analyze these datasets using different statistical software, create visualizations and correctly interpret the results.
   (3) Scientific Literacy – At the beginning of the program, the intern will be expected to read, and understand selected scientific journals suggested by the mentors. As the program progresses, additional readings will be required and the intern will regularly meet with the mentors for discussions to strengthen their knowledge on the subject matter.
   (4) Information Literacy – Aside from gathering field data, the intern will have the opportunity to be partake in various summer field activities of the winter wheat breeding program. The intern will also participate in at least one of the field days to learn about other research programs in the Department of Crop and Soil Sciences.
   (5) Communication – The intern will be required to have weekly meetings with the mentors to plan out and coordinate field activities. The intern will also interact with other lab personnel in the Carter Lab such as field technicians and graduate students during weekly lab meetings and field group activities. At the end of the program, the intern will be properly guided to create a good presentation and/or design a poster to convey their findings in scientific gatherings.
   (6) Diversity – The intern will have the opportunity to interact with collaborators such as engineers and other breeding programs also working on the high-throughput phenotyping.
Part II.

1. **Internship Title:** What’s going on in there? Using sensors to estimate plant health status under drought in wheat
2. **Location:** Pullman, WA
3. **Desired Start Date:** May 14 to May 21, 2018
4. **Hours and Flexibility:** The position is for 20-40 hrs/wk. A consistent schedule is desired, usually from 7 am to 3 pm daily, but can be flexible depending on the associated field activities.
5. **Majors:** Students studying in Agricultural Biotechnology, Agriculture and Production, Management Systems and Field Crop Management are welcome to apply.
6. **Project Description:**

Wheat is the fifth largest commodity in the state of Washington and brings in about $600 million annually to the economy. Washington wheat varieties, mostly soft white, are very popular in Asian and Middle Eastern markets for having superior flour qualities that are perfect for making cookies, steam breads, sponge cakes and noodles. The WSU winter wheat breeding program has a long and distinguished track record in developing wheat varieties to Washington farmers and stakeholders. Since 2015, a WSU variety ‘Otto’ has been the state’s most popular low rainfall cultivar at 222,000 acres. The success behind WSU varieties relies on extensive research and breeding efforts that are continually involving in response, not only to market demands and environmental constraints, but also to advances in technology. High-throughput phenotyping (HTP), which is the capacity to non-destructively screen or capture different plant traits, is a recent addition to the tools that allow plant breeders to efficiently select superior wheat genotypes in a short amount of time. Some of the most widely used HTP systems include visible spectrum (VIS) and near infrared (NIR) cameras, spectral radiometers and infrared cameras used either separately or in combination and mounted in tractors or drones. Data gathered from these HTP systems can be used to assess water use efficiency, nutrient status, biomass accumulation, canopy temperature, overall plant health and other characteristics which can be very labor extensive and costly with previously used screening methods.

The internship program will allow the student to operate different HTP systems and understand their application in the winter wheat breeding program. The intern will work closely with Dr. Jeff Godoy (postdoctoral research associate in the Carter Lab) and the WSU winter wheat breeder (Dr. Arron Carter) to develop protocols which will enable the breeding program to benefit from information gathered using different HTP systems. This will also include validation of results from previous studies on the prediction accuracy of these systems to select wheat lines with superior agronomic performance in different environments. The intern will be expected to collect data on breeding lines and mapping populations planted in Lind and Pullman, WA and Pendleton, OR. The intern will also be trained to analyze data, interpret results and prepare visualizations to present their findings.

Highly-motivated, enthusiastic and technology-oriented students with interest in plant science and crop production are encouraged to apply. Thank you for your interest!