Ecological and Evolutionary Genomics of Perennial Grasses

The Juenger lab at the University of Texas at Austin is conducting a cluster hire of postdoctoral researchers for studies of native perennial C4 grasses. The team of researchers will be involved in collaborative DOE and NSF funded projects exploring ecological and evolutionary genetics using switchgrass (*Panicum virgatum*) and panicgrass (*Panicum hallii*) as model systems. The project involves a multidisciplinary team of investigators including ecologists, physiologists, modelers and genomic scientists. A major theme of the research is the study of gene-by-environment interaction, ecological and evolutionary tradeoffs, and the evolution of adaptive trait sets in natural plant populations. A central goal is to identify genes underlying local adaptation and ecotypic differentiation across species ranges using a combination of population genomic inference, quantitative genetic mapping, and eco-physiological studies in experimental common gardens. We are looking for highly motivated candidates with excellent communication skills, initiative, and enthusiasm for large collaborative team efforts. Our diverse research effort offers an ideal scenario for cross-disciplinary training, leveraging existing datasets and resources, leadership opportunities, a creative work environment, and avenues for applied impact in the development of sustainable biofuels.

Austin is the state capital of Texas, an inland city bordering the Hill Country. Home to the University of Texas, Austin is known for its eclectic live-music scene, sizeable tech sector, and SXSW Conference. Its many parks and lakes are popular for nearly year-round hiking, biking, swimming and boating. Austin boasts approximately 300 days of sunshine per year and is America¹s fastest growing city. https://hr.utexas.edu/prospective/austin

We encourage applications from female, minority, and culturally diverse candidates. Please email all applications to bethaney.watson@austin.utexas.edu with the subject "Postdoctoral Application: field". Applications should include a cover letter detailing experience and research interests, a current CV, and contact information for three professional references compiled in a single pdf file. Applicants can find additional information about the Juenger lab at https://sites.cns.utexas.edu/juenger_lab. Applications will be considered until the positions are filled.

Population Genomics

A major aim of the overarching project is to better understand the natural diversity and evolutionary history of C4 perennial grasses. To this end, we have developed a diversity panel of hundreds of natural accessions of switchgrass and panicgrass that have been resequenced and are being utilized in common garden studies. The candidate will likely be involved in studies of

demographic history, population structure, and analyses of climate-genome associations and adaptive molecular evolution. Opportunities also exist for studies of polyploidy and grass genome evolution.

The position requires a PhD in Evolution, Population Genetics, Genomics, Plant Biology, or a related field. The ideal candidate will have experience in handling NGS data along with skills in bioinformatics, population genomic modeling and inference, and statistical analyses of genome-wide polymorphism data.

Statistical Genetics

The Juenger lab has longstanding interests in quantitative genetics, gene-by-environment interaction, and the genetic architecture of ecologically important traits. Over the last decade we have developed a number of resources for studying quantitative genetics in perennial grasses include diversity panels, mapping populations, and common garden plantings. For example, our funded projects leverage existing gardens spanning 10 locations across the latitudinal species range of switchgrass (from Texas to South Dakota). The candidate will likely be involved in statistical genetic projects including genome-wide complex trait analysis (gREML), genetic mapping (outbred QTL and GWAS), and genomic selection in plant breeding.

The position requires a PhD in Evolution, Statistical Genetics, Genomics, Plant Breeding, or Computational Biology. The idea candidate will have strong experience in experimental design and statistical analyses and expertise in genetic mapping, the analysis of high dimensional data, or plant breeding.

Data Scientist

Our collaborative project is generating a number of exciting datasets ranging from high throughput phenomic descriptions of plant material to genome-scale polymorphism data. We are seeking a broadly trained data scientist to manage, process, and facilitate analyses of a variety of datasets in a collaborative environment. The candidate will likely play a role in analyzing next-generation sequencing data from RNA-sequencing studies of expression, whole-genome bisulfite sequencing of the methylome, and in the development of analysis pipelines for a variety of genotyping applications.

We are open to a wide array of applicants, but individuals with solid experience and interest in the development of bioinformatics pipelines are especially encouraged to apply. Preferred qualifications include experience with Unix/Linux systems, proficiency with Python and or Perl scripting languages, proficiency in R, bioinformatics expertise, and familiarity with High Performance Community platforms. The candidate will have opportunities for training and development through interactions with the Texas Advanced Computing Center and the Center for Computational Biology and Bioinformatics at UT.

Physiological and Evolutionary Ecology

Switchgrass is an important member of most tallgrass prairie communities and exhibits extensive phenotypic variability and local adaptation across its range, especially related to latitude and

precipitation gradients (Lowry et al. 2014). Much of this variability is associated with evolved lowland and upland ecotypes. A key goal of our projects are to explore functional trait divergence and genetic architecture between upland and lowland switchgrass.

Opportunities exist for leading physiological studies of abiotic stress tolerance and climate adaptation, studies of physiological priming/acclimation and legacies in stress tolerance, genetic mapping of important eco-physiological and functional traits, and studies linking physiological traits with underlying molecular pathways and natural variation. Candidates with experience or special interests in experimental studies of leaf or root economic spectrums are especially encouraged to apply.

The position requires a PhD in Plant Physiology, Ecology, Evolution, Genetics, Plant Biology or a related field. The ideal candidate will have experience in field measurements of physiological traits, plant-water relations, and measures of plant performance in the field.

Microbial Ecology

This candidate will be involved in collaborative studies exploring the plant-microbiome-soil interface across environmental gradients in switchgrass (*Panicum virgatum*). Our goal is to characterize the relative role of switchgrass host genotype, local environments, and their interaction in the assembly of bacterial and fungal microbiome communities using common gardens of switchgrass. Opportunities exist for studies involving mapping plant genes affecting microbial communities, controlled experiments studying beneficial plant-microbial interactions, characterization of biology at the root/microbiome interface, and studies of microbial impacts on ecosystem processes.

The position requires a PhD in Microbiology, Ecology, Evolution, Plant Biology, or a related field. The ideal candidate will have experience sampling plants and soils for field studies of microbial diversity. Additional skills in next-generation sequencing, experimental design, analysis, and bioinformatics are preferred.

Selected Publications

Taylor, S., Lowry, D.B., Aspinwall, M.J., Bonnette, J., Fay, P.A. and T.E. Juenger. 2016. QTL and Drought Effects on Leaf Physiology in Lowland *Pancium virgatum.* Bioenergy Research. doi:10.1007/s12155-016-9768-5.

Lovell, J.T., Shakirov, E., Schwartz, S., Lowry, D., Aspinwall, A., Taylor, S., Bonnette, J., Palacio-Mejia, J., Hawkes, C.V., Fay, P. and T.E. Juenger. 2016. Promises and challenges of eco-physiological genomics in the field: tests of drought responses in switchgrass. Plant Physiology 172: 734-748.

Milano, E., Lowry, D. and T.E. Juenger. 2016. The genetic basis of upland/lowland ecotype divergence in switchgrass (*Panicum virgatum*). G3 Genes|Genomes|Genetics 6 (11): 3561-3570.

Lovell, J. Schwartz, S., Lowry, D., Shakirov, E., Bonnette, J., Weng, X., Wang, M., Johnson, J., Sreedasyam, A., Plott, C., Jenkins, J., Schmutz, J. and Thomas E. Juenger. 2016. Drought responsive gene expression regulatory divergence between upland and lowland ecotypes of a

perennial C4 grass. Genome Research 26: 510-518.

Berhman, K., Kiniry, J., Juenger, T. and T. Keitt. 2015. Spatial land use tradeoffs for maintenance of biodiversity, biofuel, and agriculture. Landscape Ecology 30: 1-13.

Lowry DB, Hernandez K, Taylor SH, Meyer E, Logan TL, Barry KW, Chapman JA, Rokhsar DS, Schmutz J, Juenger TE. 2015. The genetics of divergence and reproductive isolation between ecotypes of *Panicum hallii*. New Phytologist 205(1):402-14.

Lowry, D.L., Berhman, K., Grabowski, P., Morris, G., Kiniry, J. and T. Juenger. 2014. Adaptations between Ecotypes and along Environmental Gradients in *Pancium virgatum*. The American Naturalist 183: 682-692.