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Sponsoring Scientist Statement for Andrew Read (NSF postdoctoral applicant)

Dear review Panel,

I am providing this letter to document my commitment to act as a primary mentor for Andrew Read's postdoctoral project. Dr. Read is joined my research group on September 1st following the recent completion of his PhD at Cornell University. Dr. Read's graduate work was focused on applying genomics and genome editing approaches to deepen our understanding of plant disease resistance. Dr. Read approached me to describe his interest in studying the intersection of disease resistance with transposons and epigenetic regulation. This is a very interesting area of research. My lab has been working on studies of transposons and epigenetic regulation in maize. However, we have not been working on considering how these may interact with disease resistance. There have been several intriguing studies in Arabidopsis or other model organisms that suggest the potential for biotic stress to create epigenetic variation and for changes in epigenetic state to influence disease resistance. My group has recently collaborated with Feng Zhang at the University of Minnesota to create CRISPR-based knock-outs of each of the DNA methylation pathways in *Setaria viridis*. We have recovered mutants and are just beginning to characterize these mutants to generate a model system for studying the role of DNA methylation in a monocot species. Dr. Read's interests sparked the opportunity to use this resource to better understand the role of DNA methylation and epigenetic regulation in disease resistance in monocots. Although my group does not have expertise in plant-pathogen interactions there are several very strong research programs at the University of Minnesota focused on small grains disease resistance and Andrew has initiated a collaboration with Brian Steffenson to support his proposed work. I will address each of the requested items below in regards to Dr. Read's proposed research.

- A brief description of the research projects in the host research group(s), including a statement of current and pending research support;
The Springer laboratory is involved in several research themes including studies of maize transposon biology, epigenetic regulation, mechanisms that drive gene expression variation and application of phenomics to understand heritable variation. A broad theme of the Springer group research is to understand the mechanisms that create variation for gene expression. In particular, we are interested in understanding how transposons or chromatin variation can create novel patterns or levels of gene expression. In addition, we are working to develop tools to better understand phenotypic variation in order to monitor genotype x environment interactions and attempt to link these to molecular variation.

Overall, the proposed research directions of Dr. Read do not have any overlap with funded projects or proposed research in the Springer group. Dr. Read's interest in understanding the potential role of transposons and DNA methylation in disease resistance is complementary to the Springer lab's interest but represents a novel research direction. Several the of projects that are funded in the Springer group will be generating resources (genomic or biological) that will be useful to Dr. Read's proposed research but the aims of Dr. Reads proposal represent research

areas that are not proposed or on-going in the Springer lab. Below I will summarize the current and pending research and any potential overlap with Dr. Read's proposed research.

The Springer lab currently is participating in several NSF PGRP projects. These include three projects that will be completed in the coming year: NSF-1546899 (PI – Steve Briggs) that is focused on studying potential mechanisms of heterosis using transcriptomics and proteomics; NSF IOS01733633 (PI – Erich Grotewold) that is studying maize gene regulatory networks with a focus on the regulation of phenolic biosynthetic pathways; and NSF IOS-1802848 (PI – Springer) that is focused on develop tools for perturbing DNA methylation in maize. The last of these projects (IOS-1802848) is an EAGER project has developed some tools that could be quite useful for Dr. Reads proposed research but does not have any overlap with his proposed work. In addition, Springer is the PI of another project (IOS-1934384) that is funded through August of 2021. This project is focused on developing a better understanding of the role that transposons play in creating variation in maize. Dr. Read would use some of the transposon annotations or transposon polymorphism data generated by this project in his aim but there is no overlap in the specific research goals. The Springer lab also has funding to be part of a recent Biology Integration Institute (PI – Jeannine Cavender-Bares) and has a pending FFAR proposal that both are focused on using hyperspectral variation to understand maize responses to abiotic stress. These projects do not have any overlap with Dr. Read's proposed research.

- A description of how the research and training plan for the applicant would fit into and complement ongoing research of the sponsor(s) as well as an indication of the personnel with whom the Fellow would work;

The Springer lab has ongoing research focused on studying transposon variation and DNA methylation variation among maize genotypes. We are generally interested in understanding how transposons and chromatin play a role in creating expression variation. We have never monitored how transposons and chromatin may play roles in response to pathogens. Dr. Read has a strong background in plant pathology and genomic approaches to monitoring plant responses to disease. Dr. Read would use the strengths of my research group to address his long-term interests in the intersection of disease response, chromatin and transposons. On-going work in my lab is generating tools for studying chromatin variation and transposon variation and Dr. Read could easily apply these to an in-depth analysis of NBS-LRR genes in maize. In addition, my group has been working to develop edited maize and Setaria lines that will have reduced DNA methylation. Dr. Read will be able to use these materials to perform experiments with plant pathogens to monitor any changes in pathogen response in materials with reduced DNA methylation.

I strive to generate a collaborative environment within my research group. While Dr. Read would have independence in working on his research themes I would strongly encourage him to collaborate with other lab members. Currently, I have three other postdocs that provide expertise in bioinformatics (Peng Zhou), molecular genetics (Zachary Myers) and phenomics (Zhikai Liang). Dr. Read would be encouraged to collaborate with these postdocs and with current gradate students in my group. I would also encourage Dr. Read to collaborate with experts on plant genome editing (Feng Zhang) and cereal disease resistance (Brian Steffenson) that my group works with here at the University of Minnesota.

- An explanation of how the sponsor(s) will determine what mentoring the applicant needs in research, teaching, and career development skills and how these would be translated into a specific plan that fosters the development of the applicant's future independent research career;

I believe that each individual that I work with is unique and seek to help each person maximize their skills to achieve their goals. I attempt to better understand each person I work with through having conversations and encouraging individuals to take assessments such the StrengthFinders or similar tools. Based on my current interactions with Dr. Read he has a fairly clear set of goals for his career and we have already been discussing how to develop the skills and resources to enable his goals. I would prioritize working with Dr. Read to develop his research skills through his research activities and by providing him with opportunities to collaborate on research projects and grant proposals. I think it is important to create opportunities to work in collaborative groups and to develop research proposals. In addition, I would work to help Dr. Read further develop teaching and other career skills. I would encourage him to participate in the Preparing Future Faculty program at the University of Minnesota and would have regular meetings with Dr. Read to discuss career development. I could also provide opportunities to present a lecture in the upper-level genetics course I teach if Dr. Read wishes to gain teaching experience.

- A description of the role the sponsor(s) will play in the proposed research and training and the other resources that will be available to the Fellow to complete their training plan during the fellowship;
My role is to enable Dr. Read's research and to provide an environment for him to develop. I am excited about his proposed research and look forward to discussing his work to help him be successful in performing experiments and communicating the results. I will also be present to mentor Dr. Read in any areas that need development or encouragement. Since my group is developing some of the tools and resources that Dr. Read will use I can commit resources to help him perform necessary experiments on these materials. I also will play a role in helping Dr. Read developing collaborations.

- A description of any limitations that may be placed on the Fellow for continuing the research project in an independent capacity following the fellowship;
The research being proposed by Dr. Read would be fully available for him to take as a focus in an independent position. There is a possibility that some of the tools being used by Dr. Read would also be used for research in the Springer lab but he would also be free to utilize these resources. I am fully committed to enabling Dr. Read (or any other postdoc in my group) to a strong start in an independent position. He would be free to take the projects he develops to start his own group and I would anticipate supporting him in this endeavor.

Summary:
I think Dr. Read would be a fantastic part of the NSF PGRP post-doc fellows program. Dr. Read is a deep thinker with wonderful curiosity. He has been a part of my group for the past 2.5 months and I have really enjoyed talking to him about projects and watching his interactions with other members of my group. It is clear that Dr. Read has the set of skills that will enable him to be a very strong scientist and an excellent member of the scientific community. This is an interesting project that Dr. Read has developed that represents a blend of achievable projects and generation of tools that would enable his long-term research. I would be thrilled to have Dr. Read's proposal funded as this would provide a very nice synergy between the themes of my on-going research and a new application of the work that is beyond my abilities.

Nathan Springer; Professor; Department of Plant and Microbial Biology, University of Minnesota