NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 20-045

Dear Colleague Letter: Plant Synthetic Biology

February 18, 2020

Dear Colleagues:

NSF has long supported interdisciplinary research and merging of ideas and technologies from diverse fields of science and engineering. The availability of whole genomes and comprehensive "omic" data sets (at the transcript, protein and metabolite, and epigenomic levels) coupled with new modeling methods have given us unprecedented insight into genetic pathways underlying plant development and response to biotic and abiotic stresses. The data reveal that many of the most challenging questions involve multiple genes, epigenomic interactions and metabolic networks. Improvements in the methods for generating and testing hypotheses based on this information are greatly needed.

Parallel achievements in gene synthesis and bioengineering have empowered new advances in the field of synthetic biology. Synthetic biology involves the simultaneous manipulation of multiple genes using modular components and engineering principles. It allows for hypothesis testing based on genetic pathways and metabolic networks and has the potential of creating entirely new processes and outcomes. Much of this work is now being performed in yeast and at the microbial level, with increasing potential to apply synthetic approaches to plants and other multicellular eukaryotes.

Synthetic biology has the potential to enable new ways of studying basic plant processes involving multiple genes. The same methods and tools could accelerate the translation of knowledge into real world application, for instance in engineering metabolic pathways, advancing agriculture and contributing to solutions that solve environmental problems. To realize these potential outcomes, there is a need to develop new vectors, platforms, and methods for plant genetic modification that are easy to use and widely available.

This Dear Colleague Letter (DCL) highlights existing programs in the Directorate for Biological Sciences (BIO) and the Directorate for Engineering (ENG) offering support for proposals that advance the growing field of plant synthetic biology, including support for basic research, tool development, and applications; and proposals that emphasize the potential

outcomes with benefits to society. Proposal titles should be prefaced with "PlantSynBio:" and submitted to the program most closely related to the proposed research.

- The Plant Genome Research Program (NSF 18-579) in the Division of Integrative Organismal Systems.
- The Systems and Synthetic Biology Cluster in the Division of Molecular and Cellular Biosciences (NSF18-585).
- The Cellular and Biochemical Engineering Program in the Division of Chemical, Bioengineering, Environmental and Transport Systems (NSF PD 20-1491).

This DCL is not intended to announce a special competition nor a new program, but simply highlight NSFs interest in an area of research that is funded through existing programs. The three relevant programs all accept proposals without deadline.

Points of Contact: Investigators interested in submitting a proposal are strongly encouraged to contact one of the Program Directors listed below for further information:

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Sincerely,

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