# Importance of transformation research for science, application, and biosafety

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*Oregon State University*

**NIFA listens presentation – Nov 2, 2022**

A few key points from an invited presentation at Society for *in Vitro* Biology Annual Meeting / June 2022

# Of media and miracles: Successes and frustrations in the search for efficient regeneration and transformation methods for trees and crops

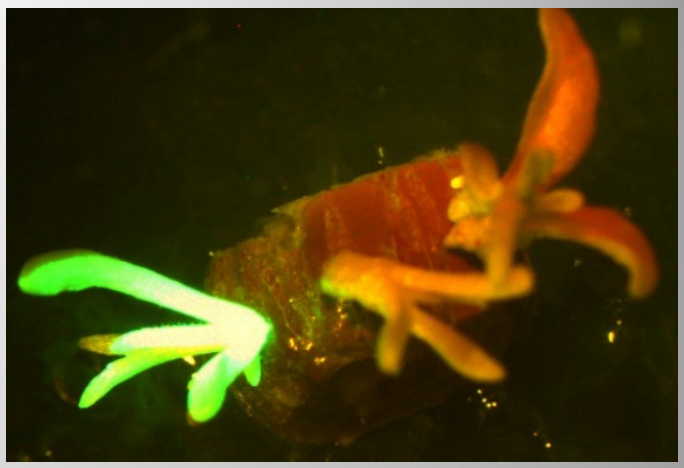
## You can view it here

**My laboratory has worked on transformation and gene editing for woody crops for nearly three decades**

# Regeneration & transformation (RT) continue to be major limiting factors for gene editing & engineering in plants

- Species and genotypic differences often dramatic
- Minor and woody crop species perhaps most problematic
  - Tough biology, research investment limited
- Slow, costly, complex customization efforts usually needed
- Miracle “DEV” genes like WUS and BBM often do not work, and actually impede RT or are highly genotype specific in effect
- On top of often large social/regulatory constraints, often a “deal breaker”

# We need fresh approaches and new investments



- Transient editing systems – viruses and beyond
- *In planta* systems – *in vitro* methods a great cost and source of variability
- Better understanding of plant defense responses and how they affect RT, and can be controlled
- Much more exploration of Agrobacterium biology and diversity as key tools
- Better tools for control of expression and epigenetic responses to treatments
- Identification and use of a much wider variety of "DEV" genes
- **In sum, a combination of basic and applied, but RT-targeted, research**

# NSF gets it, why doesn't USDA-NIFA get it?

National Science Foundation

You are subscribed to Biological Sciences (BIO) funding and updates from the U.S. National Science Foundation (NSF). NSF provides these email updates to the research community for new or recently updated funding opportunities, including those in cross-cutting, multidisciplinary programs.

## Dear Colleague Letter: Advancing Plant Transformation

See this in PDF format

Document Number: nsf23019

Emailed October 27, 2022

# NSF Dear Colleague screen shot

**PROPOSAL PREPARATION AND SUBMISSION**

Proposal titles should be prefaced with "PlantTransform:" after any solicitation-specific title requirements and submitted to the NSF/BIO or NIFA program most closely related to the proposed research.

Proposals with relevance to NSF-supported research may be submitted to one of the following NSF programs or clusters that are most aligned with the proposed research:

- The Plant Genome Research Program (PGRP) in the Division of Integrative Organismal Systems (IOS);
- The Plant Biotic Interactions (PBI) Program in IOS;
- The Genetic Mechanisms (GM) Cluster in the Division of Molecular and Cellular Biosciences (MCB); or
- The Cellular Dynamics and Function (CDF) Cluster in MCB.

Proposals with relevance to U.S. agriculture may be submitted to the following NIFA Program Area Priorities that are most aligned with the proposed research:

- Foundational Knowledge of Plant Products (AFRI A1103);
- Physiology of Agricultural Plants (AFRI A1152);
- Plant Breeding for Agricultural Production (AFRI A1141); or
- Emergency Citrus Disease Research and Extension Program (ECDRE).

The AFRI program's descriptions, deadlines, and points of contact are published in the current AFRI Foundational and Applied Science Program Request for Applications.

This DCL is not intended to announce a special competition or a new program, but simply to highlight NSF/BIO's and NIFA's interest in an area of research funded through existing programs.

**POINTS OF CONTACT**

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

Kan Wang and Gerald Schoenknecht, BIO/IOS/PGRP, dbipgr@nsf.gov
Michael Mishkind, BIO/IOS/PBI, mmishkin@nsf.gov
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# NSF PGRP language related to RT

- ***Track 2: Tools, Resources and Technology Advances (TRTech-PGR)***
- "New methods, tools, or techniques to overcome bottlenecks to plant transformation, especially those that improve plant regeneration, increase genotype independence or circumvent tissue culture, and facilitate ease of transformation in the public sector,
- Technologies for advancing genome/epigenome editing technologies,"

# Why doesn’t USDA-NIFA BRAG get it?

- Example: Many of the tools they wish to see developed and employed for management of gene dispersal and ecological impacts depend on being able to do modifications toward that goal efficiently and at scale
- But research to specifically advance RT as a major goal, even where there are specific biosafety goals directly connected, are not included in the RFP
- Program Leaders do understand and agree based on personal communications, but I have seen no movement for support of RT research per se at NIFA for many years
- **Lets change this at USDA NIFA as soon as possible!**

# THANK YOU