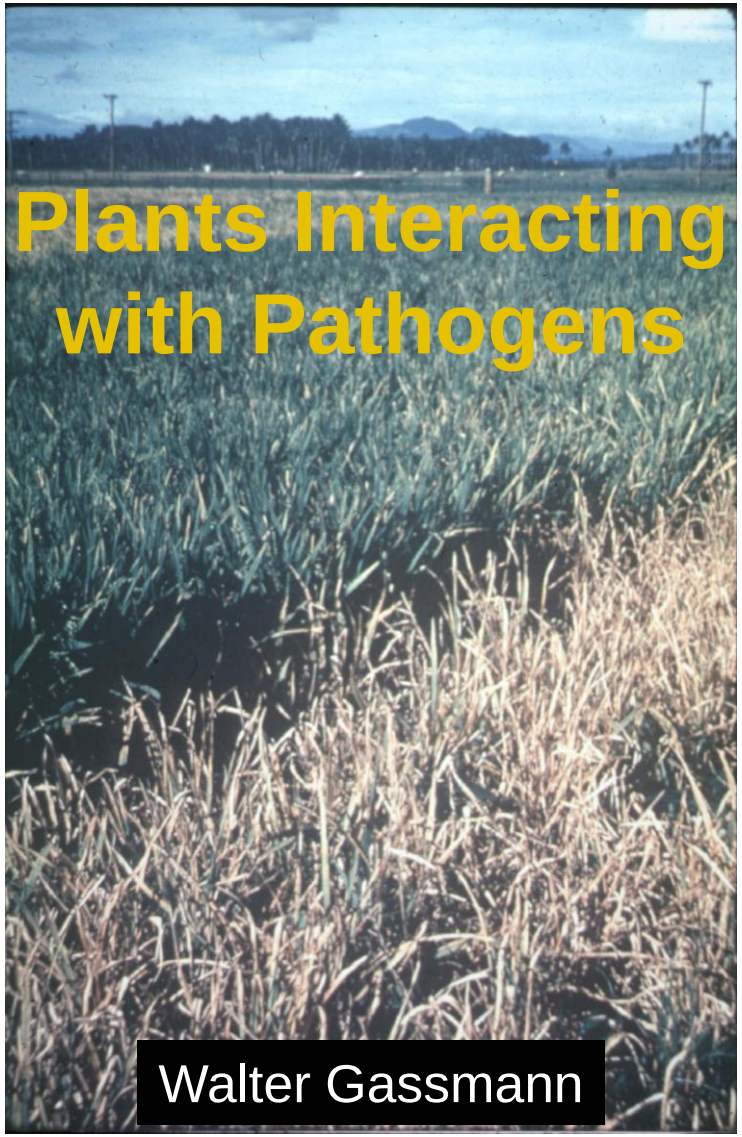


Plants Interacting with Pathogens

Walter Gassmann

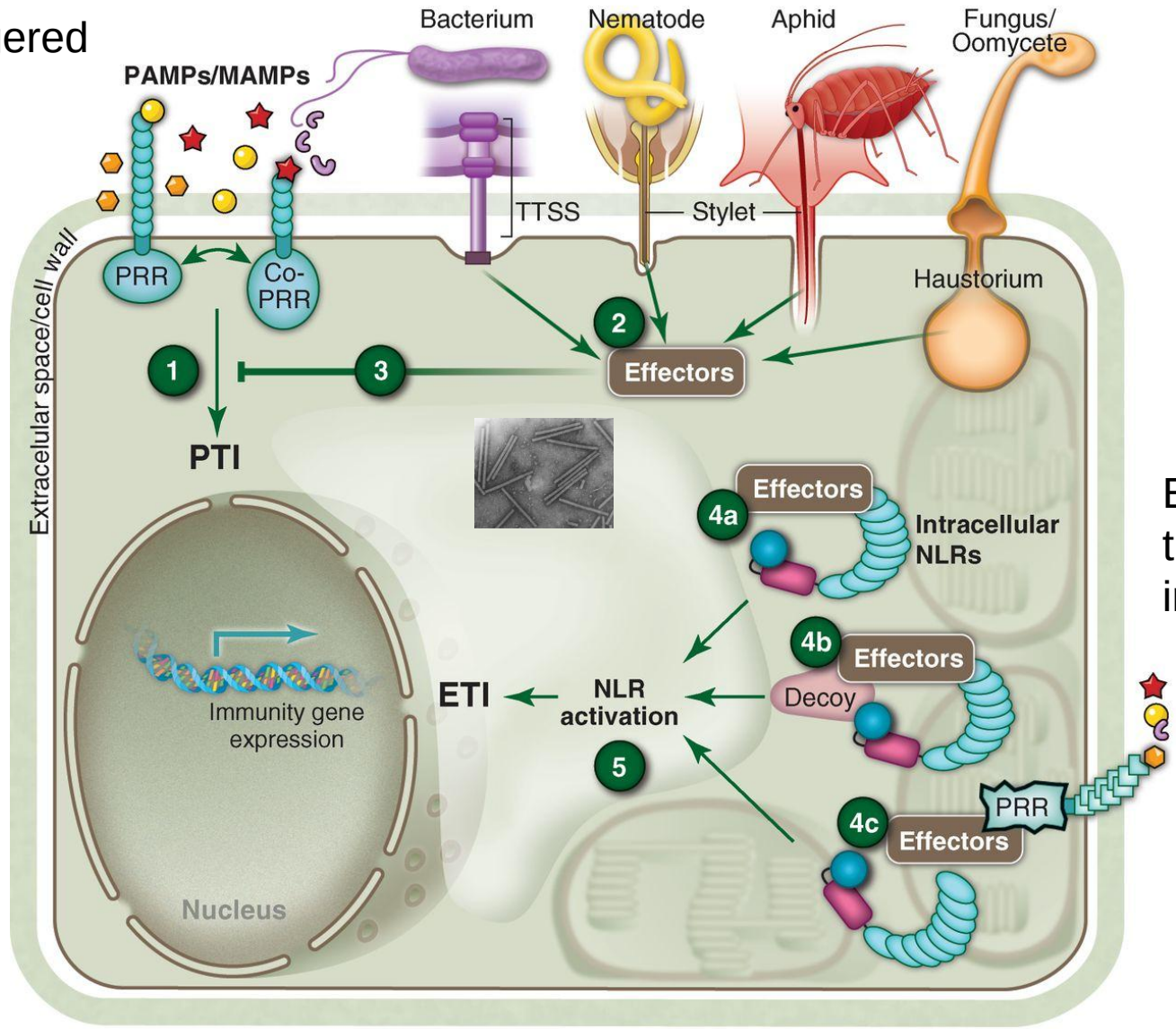
Christopher S. Bond Life Sciences Center

Plant Sciences

Interdisciplinary Plant Group
University of Missouri

The cellular basis of plant immunity

PAMP-triggered immunity

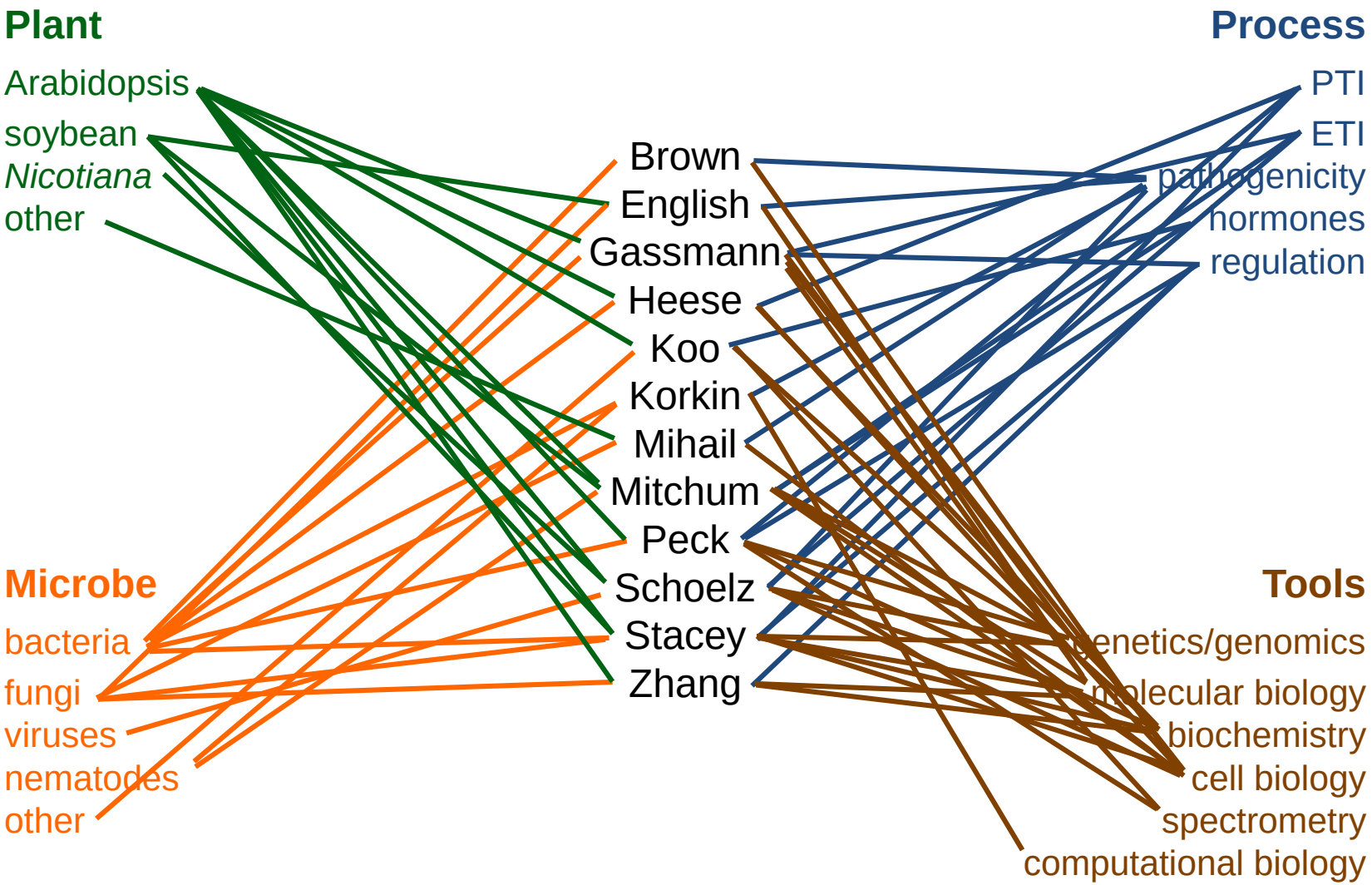


Effector-triggered immunity

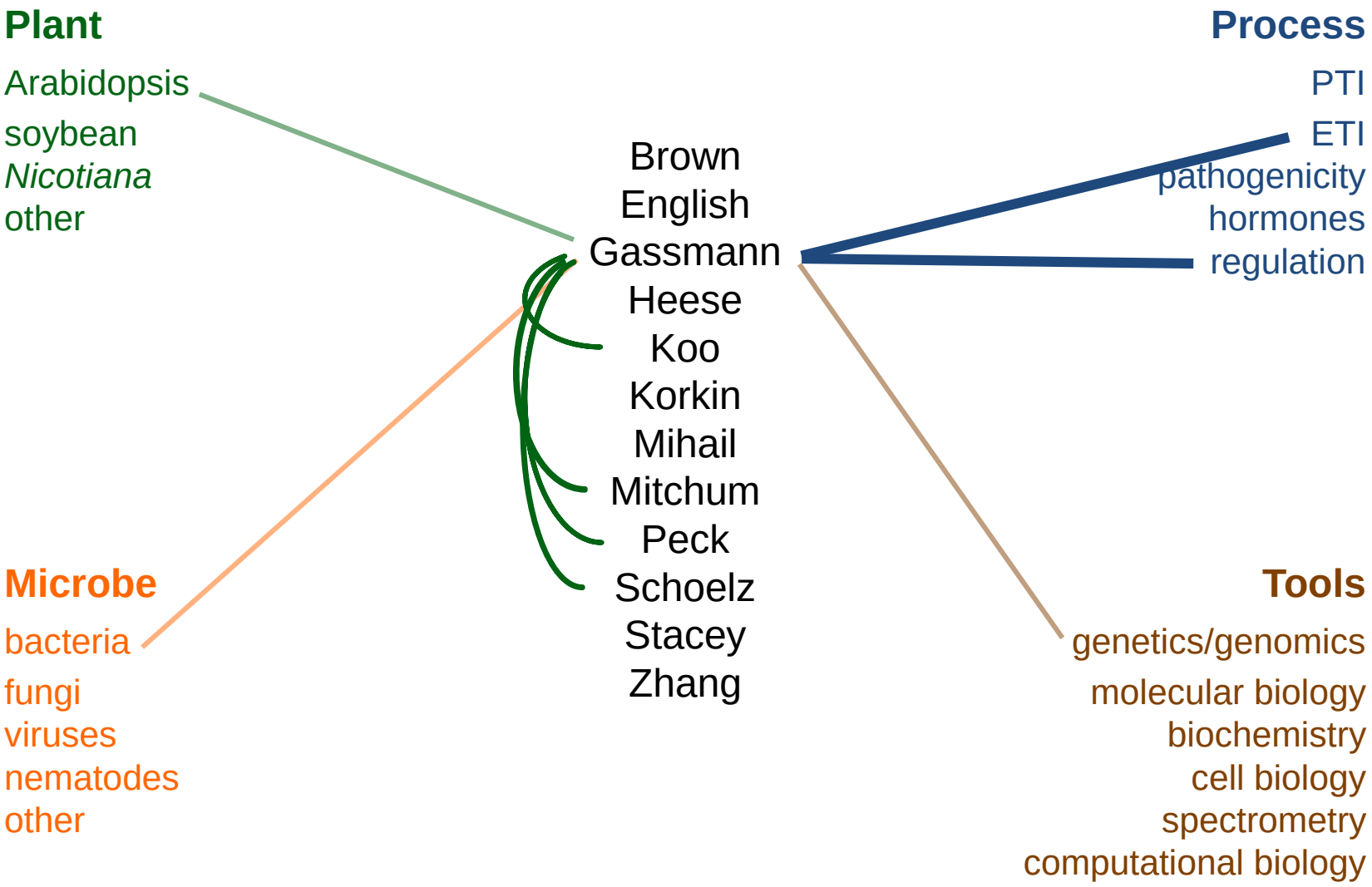
Published by AAAS

J L Dangl et al. Science 2013;341:746-751

The IPG plant-microbe interactome (simplified)



The IPG plant-microbe interactome (simplified)

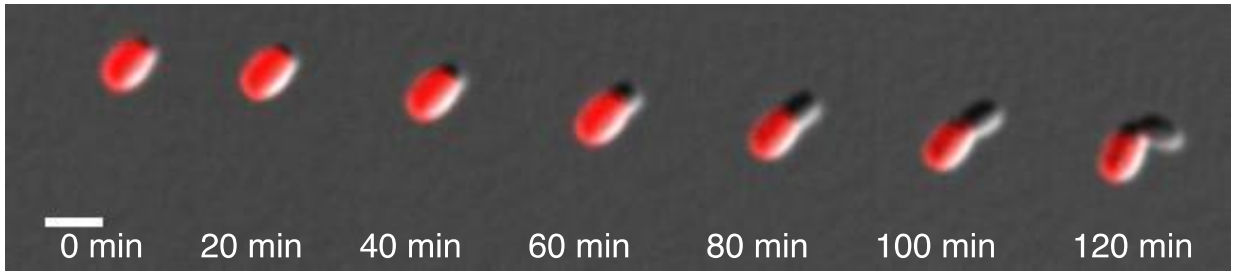


Pam Brown

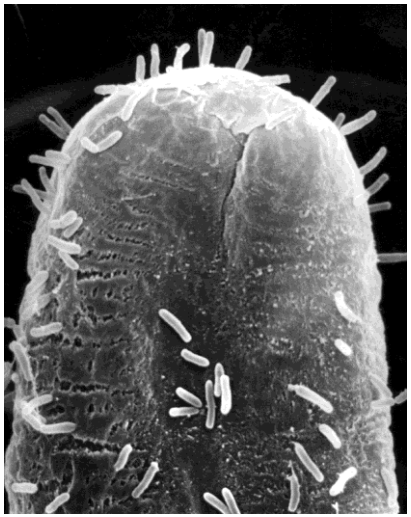
What is the mechanism underlying polar growth of *Agrobacterium tumefaciens?*

Crown gall tumor caused by *Agrobacterium tumefaciens*

The Brown lab (brown.biology.missouri.edu) is interested in understanding the mechanism of polar elongation in *Agrobacterium tumefaciens*



New growth (unlabeled) of the *Agrobacterium tumefaciens* cell occurs at the cell pole

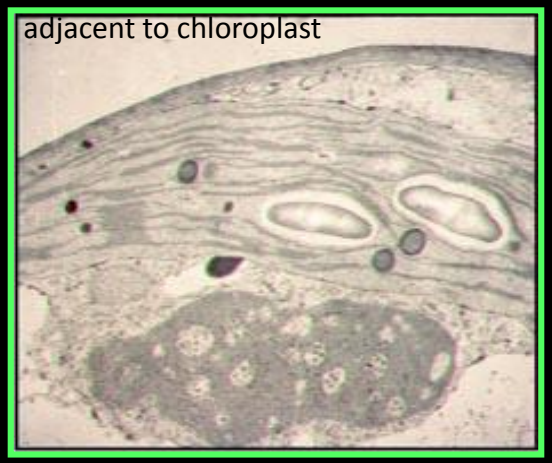


Polar attachment of *Agrobacterium tumefaciens* cells to a root hair

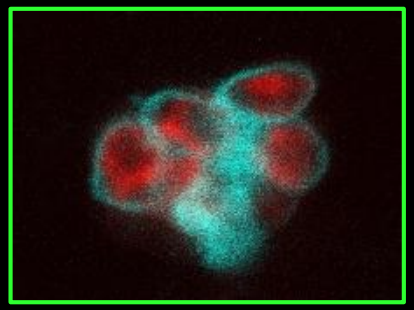
We expect to apply insights gained from this basic research to address:

- the need for biocontrol of this plant pathogen
- for improved genetic engineering of plants

CaMV P6 is a multifunctional protein, with distinct roles in translation of viral proteins, silencing suppression, defense gene suppression, and trafficking of CaMV virions to plasmodesmata.



1. P6 forms inclusion bodies that are considered "virion factories". Almost all CaMV virions are retained with the P6 inclusion bodies.

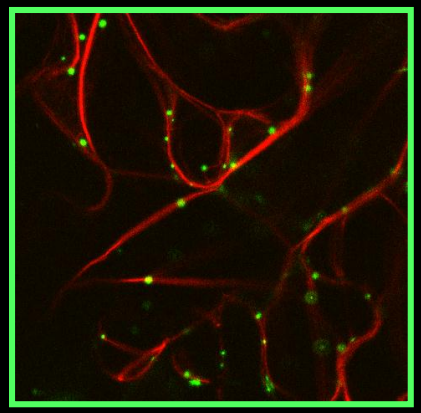


CHUP1, tagged with CFP, is localized to the outer membrane of chloroplasts, which autofluoresce red

3. P6 protein physically interacts with CHUP1, a protein that moves chloroplasts on microfilaments. Angel et al. 2013, Virology.

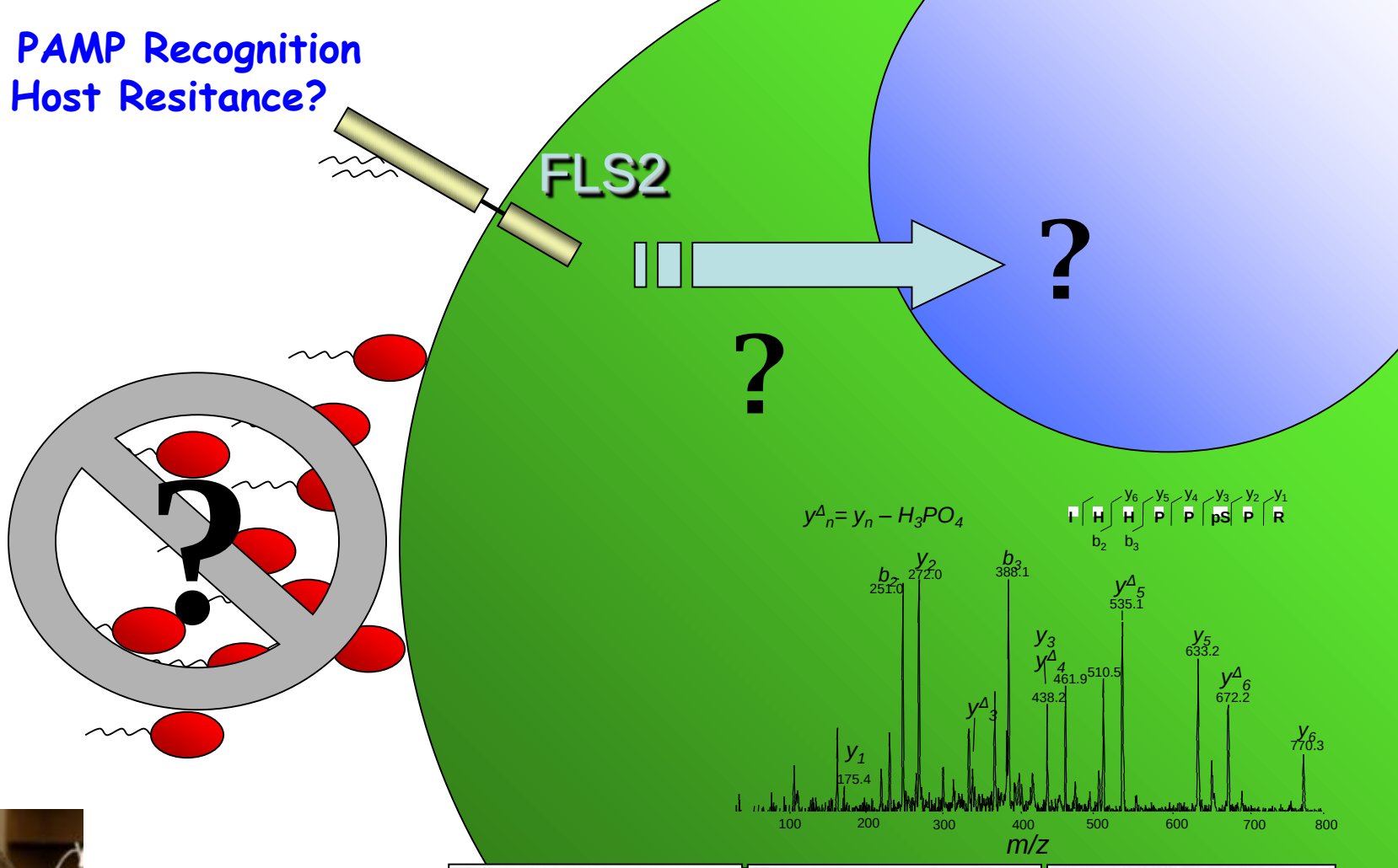
Jim Schoelz

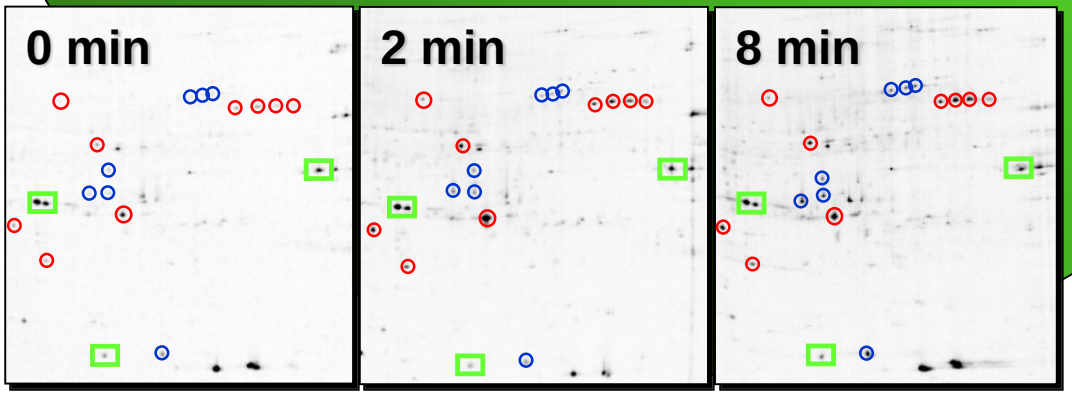
P6 protein tagged with GFP.
Actin tagged with dsRed



2. P6 inclusion bodies interact with and move on actin microfilaments. Harries et al. 2009, Plant Phys.

How Does PAMP Recognition Lead to Host Resitance?



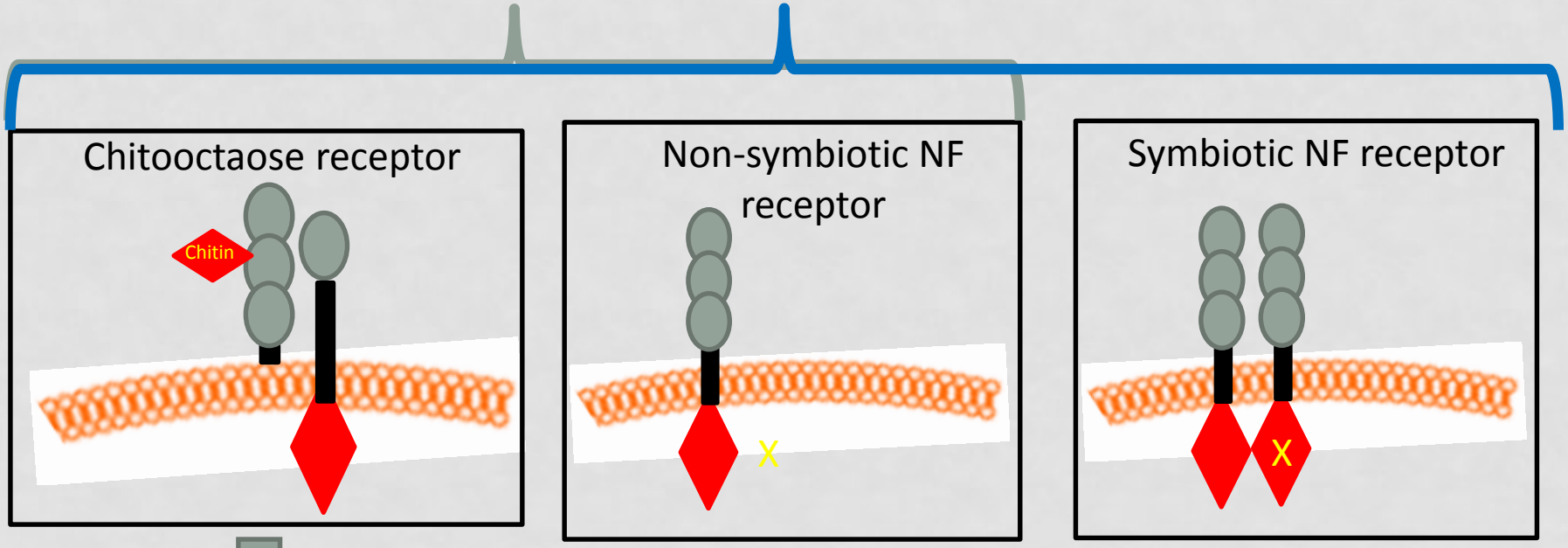


Scott Peck

Gary Stacey

High Affinity (~1 nM) Chitin and Lipo-Chitin Signaling Pathways in Plants

ALL PLANTS **SYMBIOTIC PLANTS**

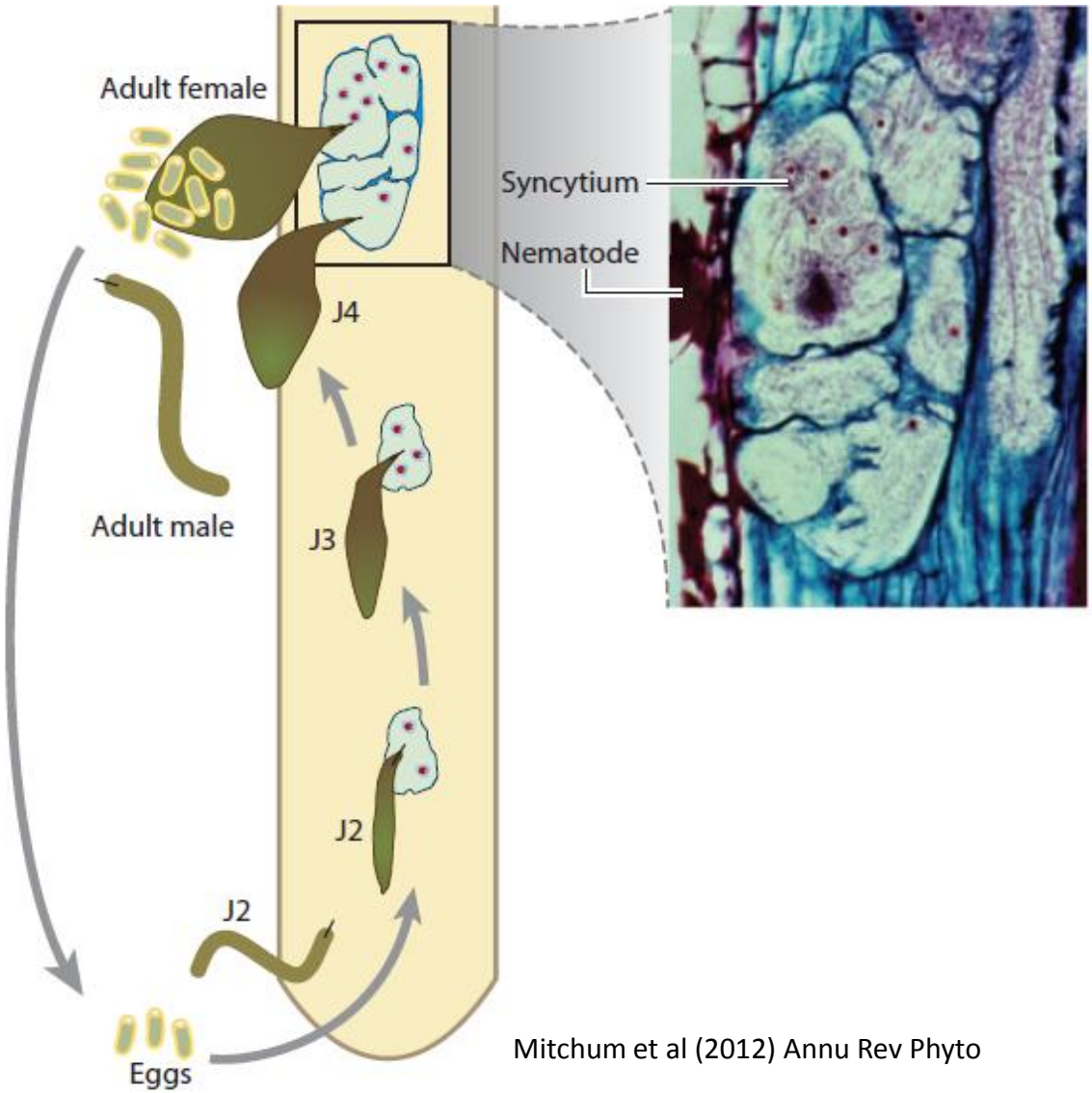


Induction of plant defense pathways

Suppression of plant innate immunity

Induction of symbiotic development

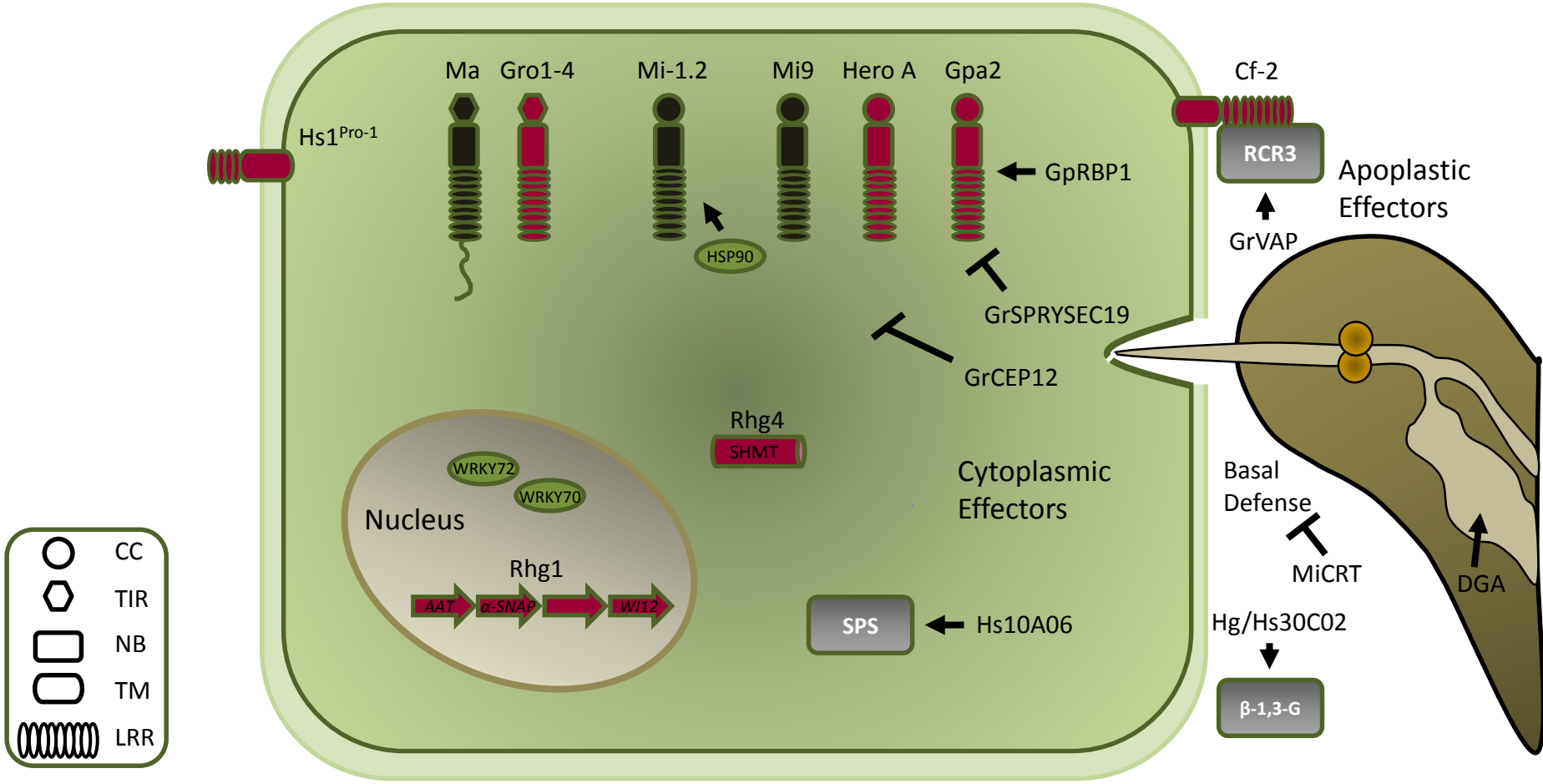
How Do Cyst Nematodes Reprogram Host Cells?



Mitchum et al (2012) Annu Rev Phyto

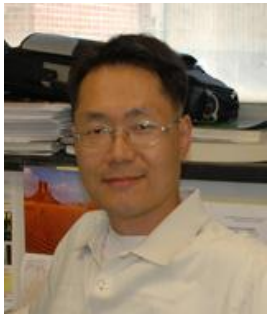
Melissa Mitchum

Mechanisms of Plant Resistance to Nematodes

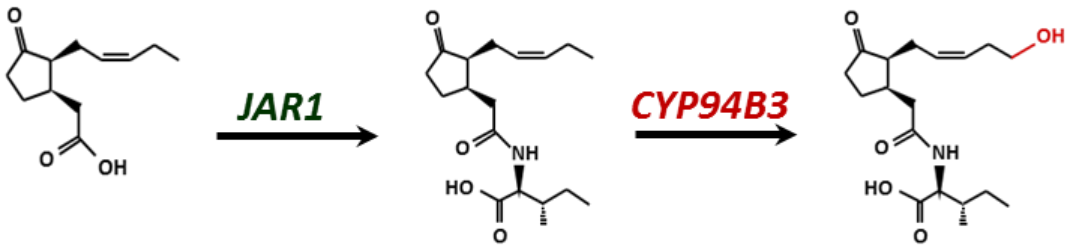


Liu, Kandoth et al., *Nature* (2012) 492: 256-260
Kandoth & Mitchum, *COPB* (2013) 16: 457-463

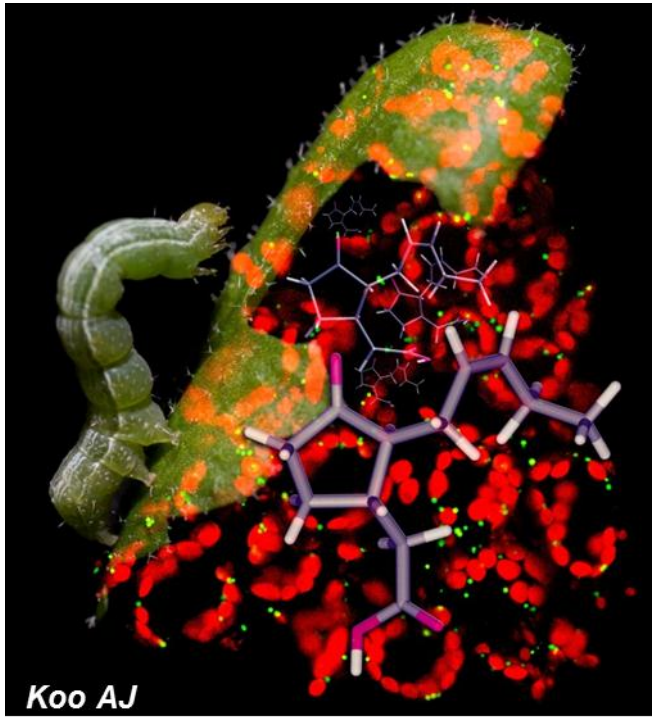
Jasmonate Metabolism and Signaling

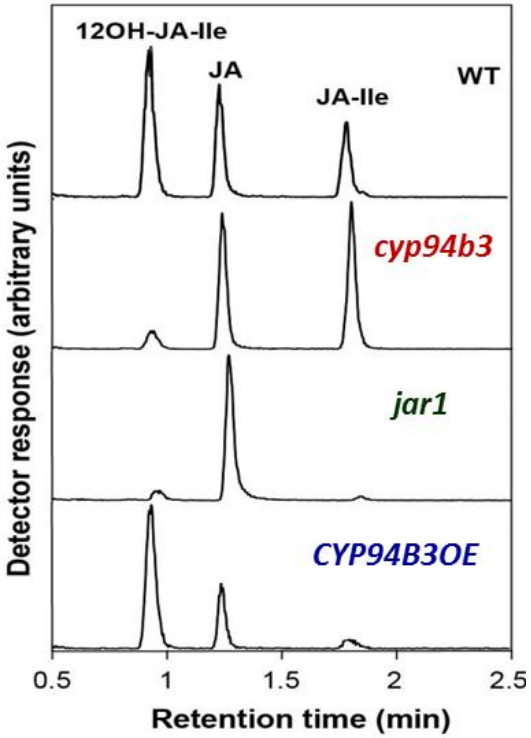


Abraham Koo



UPLC-MS/MS



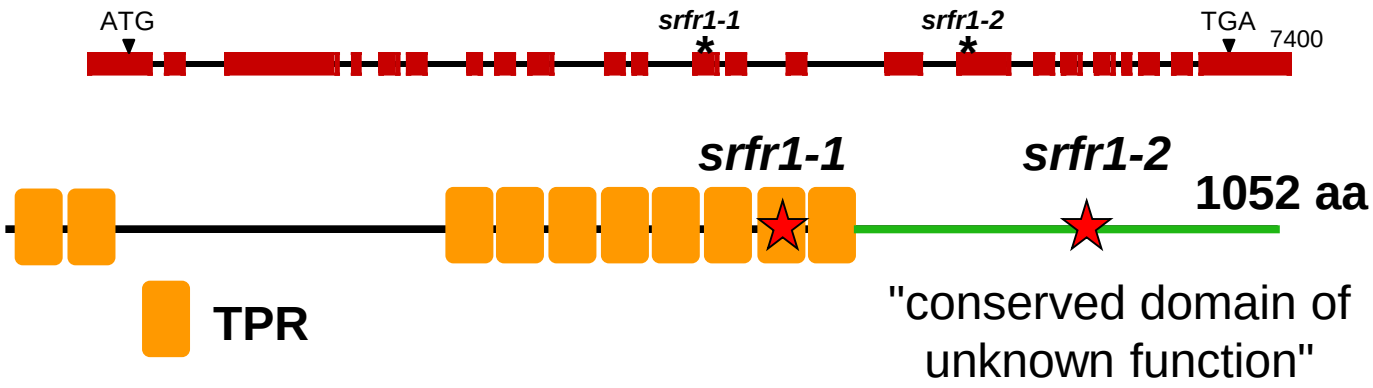


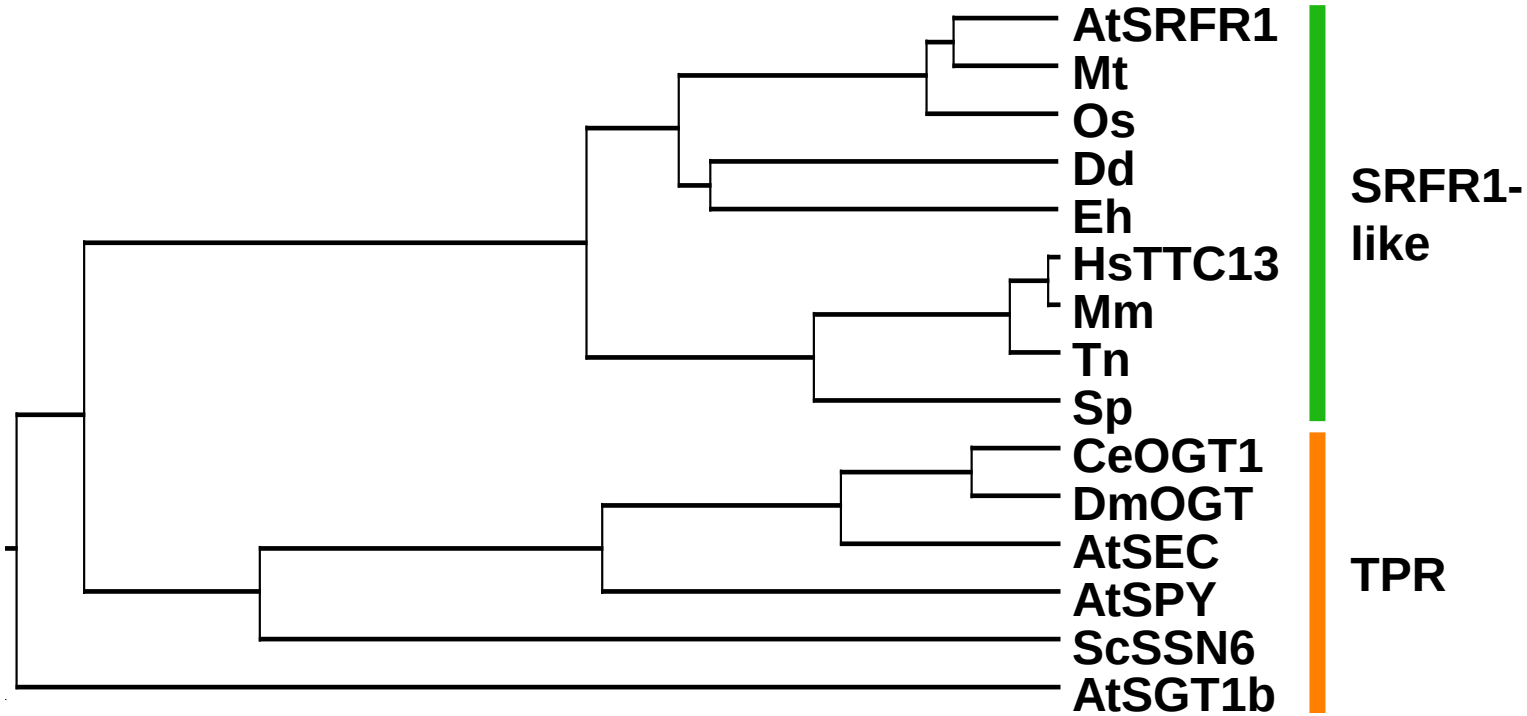
Plant resistance to various biotic stresses are controlled by lipid-derived hormone jasmonate. Metabolic processes involved in maintenance of optimal hormone level as well as its control over global gene expression are studied using multidisciplinary approaches including mass spectrometry.

Constitutively activated immunity is deleterious to the plant

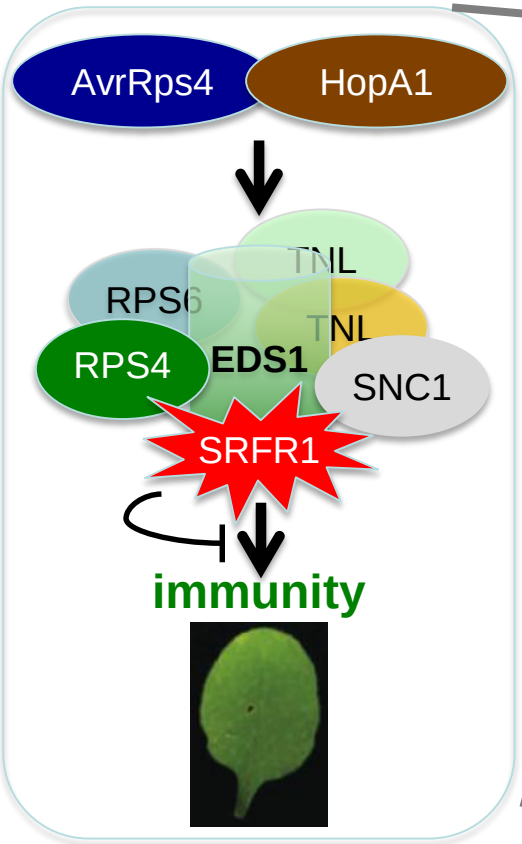
Columbia-0 ***srfr1-4***

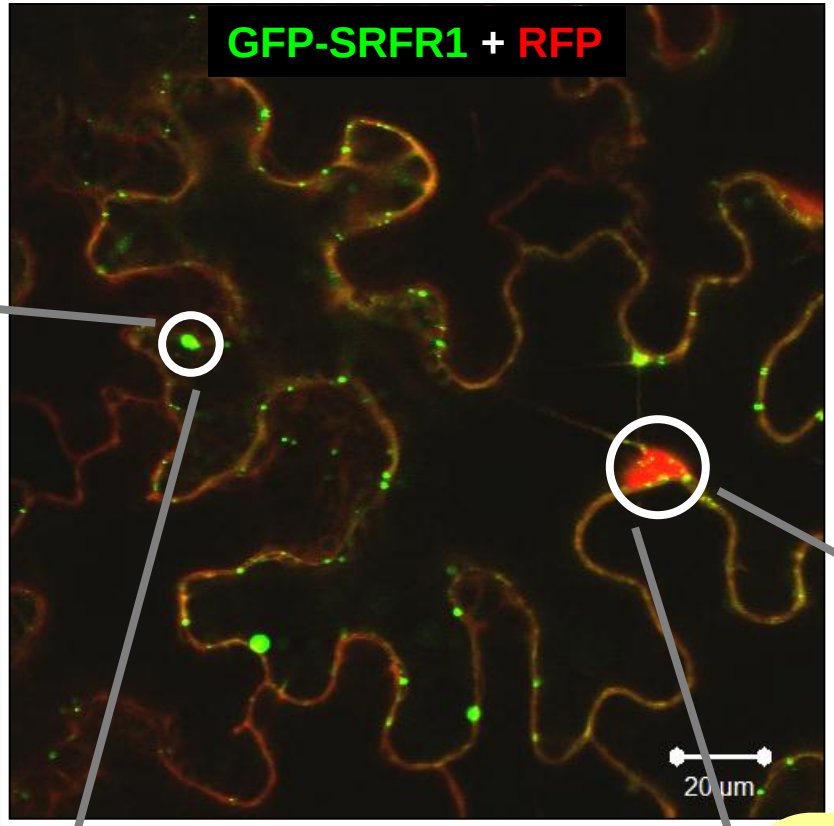
SRFR1 encodes a novel TPR protein that may function as an adaptor protein

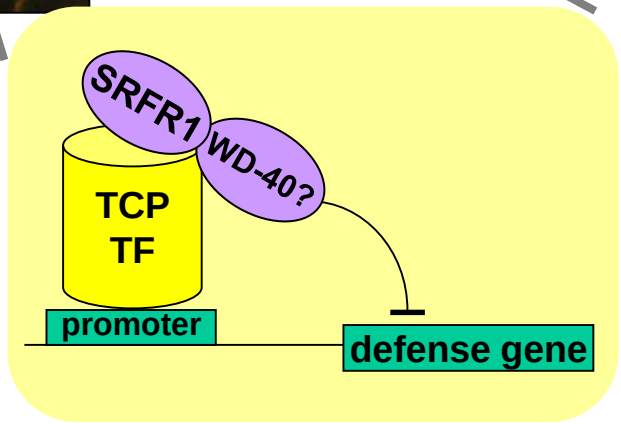




SRFR1 is a nucleocytoplasmic adaptor protein that negatively regulates the plant immune system



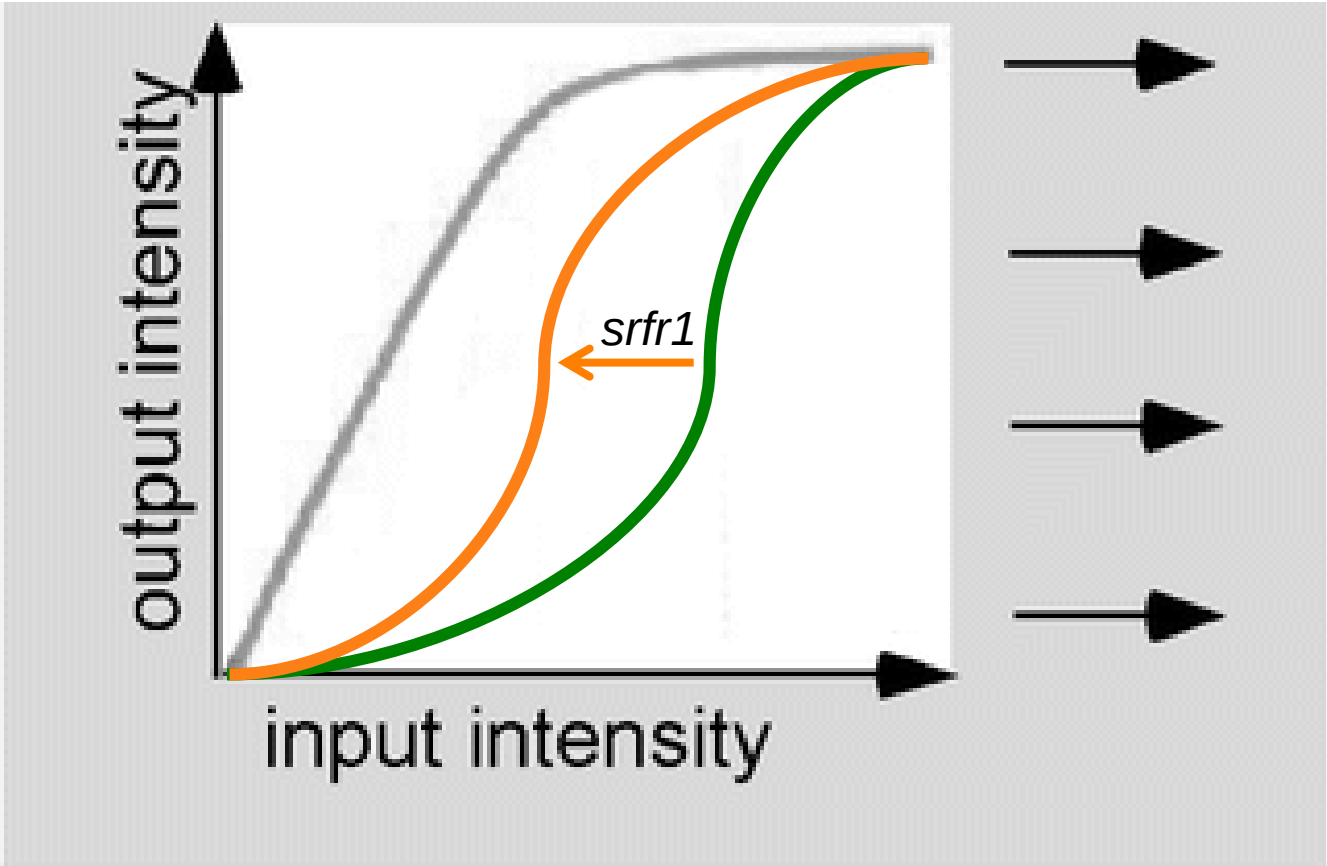




Bhattacharjee et al. (2011) Science

Kim et al., unpublished

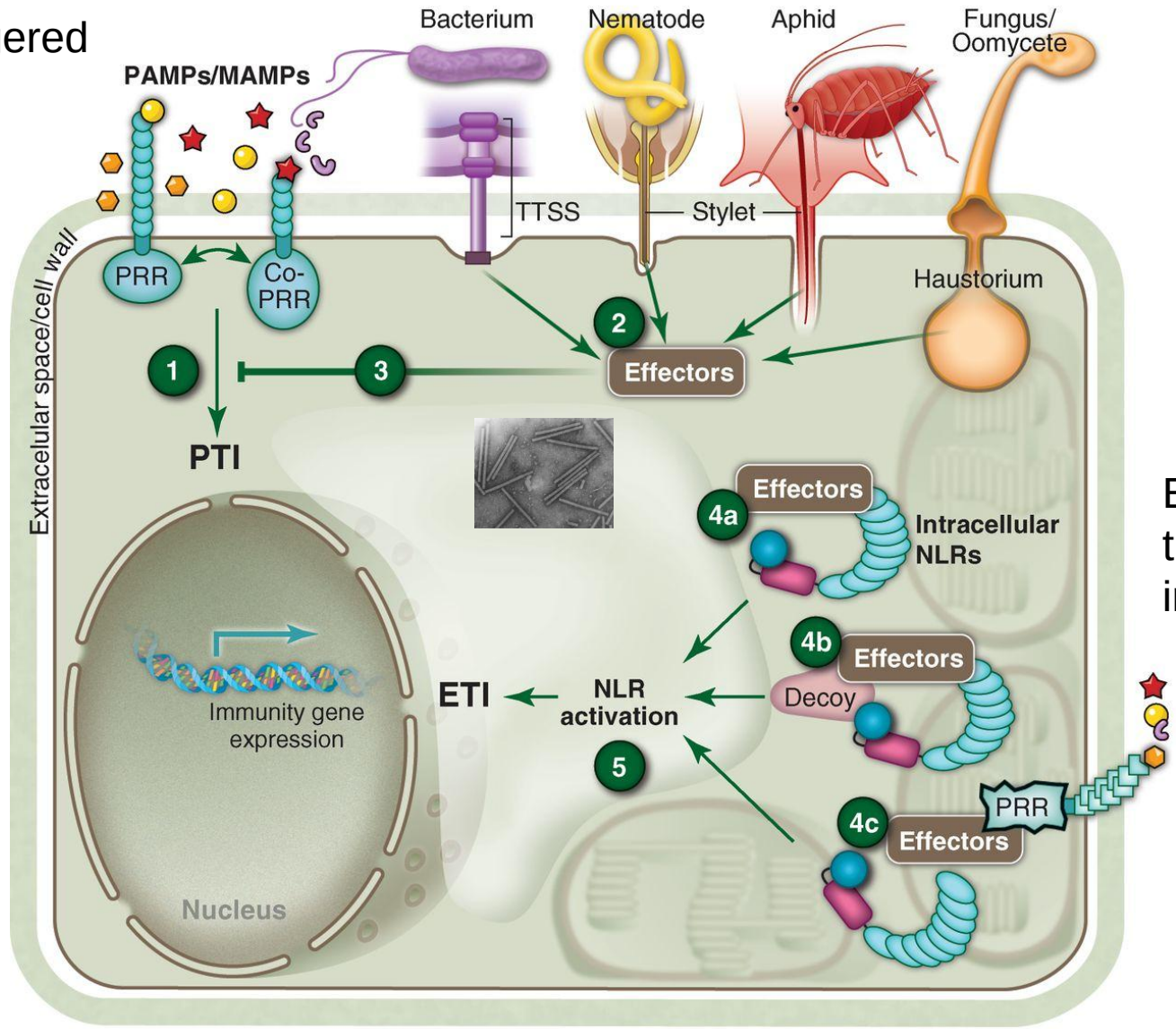
SRFR1 may determine the sensitivity of the plant effector-triggered immune response



Nimchuck et al. (2003) Annu. Rev. Gen. 37: 579
adapted from Tao et al. (2003) Plant Cell 15: 317

The cellular basis of plant immunity

PAMP-triggered immunity



Effector-triggered immunity

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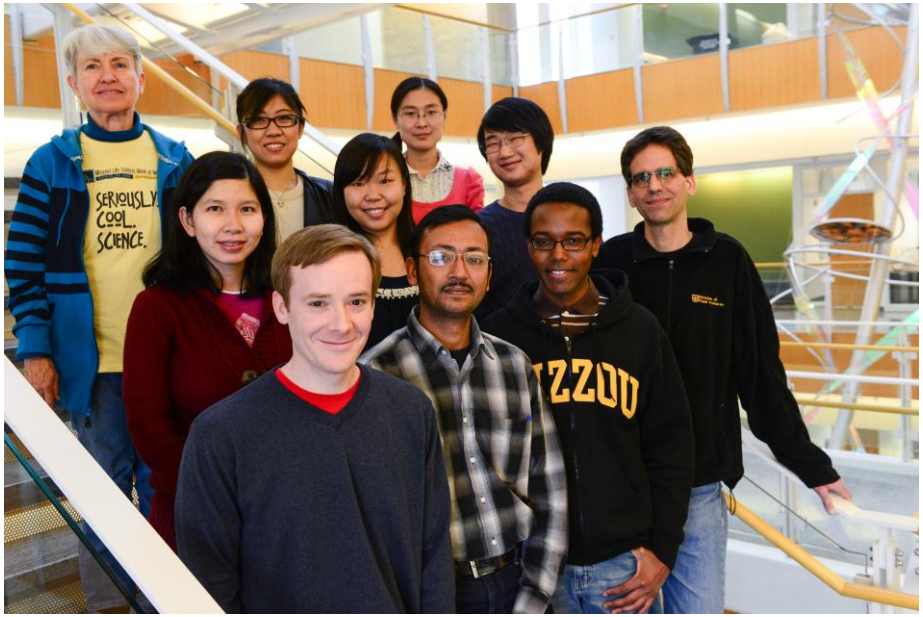

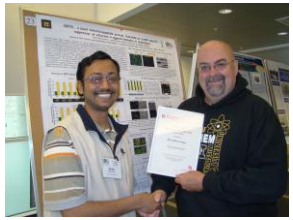

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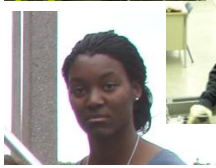

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