

TREVOR M. NOLAN

Iowa State University ◇ 1031 Roy J. Carver Co-Lab ◇ 1111 WOI Road ◇ Ames, IA 50011-1085
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EDUCATION

- Iowa State University** *2013 - 2018*
Ph.D. in Genetics and Genomics
Plant Sciences Institute and Brown Graduate Fellow
Zaffarano Prize and Karas Award Recipient
- Iowa State University** *2009 - 2013*
B.S. in Genetics
summa cum laude
Honors Program

RESEARCH EXPERIENCE

- Postdoctoral Researcher** July 2019 (Expected)
Laboratory of Philip Benfey, Duke University
- Postdoctoral Researcher** December 2018 - July 2019
Laboratory of Yanhai Yin, Iowa State University
- Led NSF funded project *Network Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis* which aims to expand and characterize Brassinosteroid transcriptional networks through the integration of mRNA, protein and phosphorylation profiling experiments.
- Graduate Research Assistant** March 2014 - 2018
Laboratory of Yanhai Yin, Iowa State University
- Uncovered several mechanisms by which plants mediate the trade-off between growth and stress responses by investigating the degradation of BES1 transcription factor in Brassinosteroid signaling. Used genetic, genomic, biochemical and cell biology techniques to characterize BES1 interacting proteins and their role in degrading BES1, which is necessary for optimal plant fitness under drought or nutrient limiting conditions.
 - Led a team of graduate and undergraduate students in a large scale phenomics project to study Brassinosteroid-mediated growth and stress responses. Integrated network analysis with high throughput phenotyping to identify critical transcription factors mediating Brassinosteroid responses and characterized their roles in controlling Brassinosteroid and drought responses.
 - Developed Robotic Assay for Drought (RoAD) system for automatic weighing, watering and 3D imaging of plants during drought stress conditions. Collaborated extensively with a multidisciplinary team of biologists, engineers and computational scientists to design, plan and build the RoAD system.
- Graduate Research Assistant** June 2013 - March 2014
Laboratory of Steven Rodermel, Iowa State University
- Studied interactions between the plastoglobule and thylakoid subcompartments of chloroplasts using a second-site suppressor of *immutans* in *Arabidopsis* deficient in a plastoglobule redox component. Devised genetic, biochemical and molecular experiments to determine the mechanism of suppression and redefine the model of interaction between these suborganellar structures.
- Undergraduate Research Assistant** 2011-2013
Laboratory of Steven Rodermel, Iowa State University

- Performed hypothesis driven, independent research in genetics and molecular biology using the Arabidopsis mutant *immutans* as a model system to study chloroplast biogenesis and function.
- University Honors Program Capstone Project: Alternate Pathways of Electron Transport in the Plastid: Modulation of VTE1 in *immutans*.

PUBLICATIONS

20. **Nolan, T.**, S. Chockalingam, L. Xiang, Z. Jubery, M. Lewsey, N. Huser, S. McLaughlin, A. Hurd, Z. Xie, H. Guo, H. Jiang, Y. Bao, T. Tuel, H. Lin, D. Kelley, P. Wang, A. Akintayo, S. Shivakumar, H. Jeon, M. Aluru, M. Zander, D. Nettleton, B. Ganapathysubramanian, S. Sarkar, D. Bassham, P. Schnable, J. Walley, S. Aluru J. Ecker, L. Tang and Y. Yin. Network-Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis. *In Preparation*.
19. Xiang, L*, **T. Nolan***, Y. Bao, T. Tuel, D. Shah, S. McLaughlin, A. Hurd, N. Huser, Y. Yin and L. Tang. Robotic Assay for Drought (RoAD) - A fully automated phenotyping system for Brassinosteroid and Drought response. *In Preparation*. * co-first authors.
18. **Nolan, T.**, N. Vukasinovic, D. Liu, J. Russinova and Y. Yin. Brassinosteroids: Multidimensional Regulators of Plant Growth, Development and Stress Responses. *Invited review at Plant Cell - Under Revision*.
17. Pu, Y.*, **T. Nolan***, G. Song, J. Walley, Y. Yin and D.C. Bassham. Brassinosteroids control growth and autophagy through BIN2 modulation of TOR signaling. *Under Revision*. * co-first authors.
16. Jiang, H., B. Tang, Z. Xie, **T. Nolan**, H. Ye, G. Song, J. Walley and Y. Yin. GSK3-Like Kinase BIN2 Phosphorylates RD26 to Potentiate Drought Signaling in Arabidopsis. *Under Revision at The Plant Journal*.
15. Xie, Z., **T. Nolan**, H. Jiang, B. Tang, M. Zhang, Z. Li and Y. Yin. 2019. The AP2/ERF Transcription Factor TINY Modulates Brassinosteroid-Regulated Plant Growth and Drought Response in Arabidopsis. *Plant Cell (Accepted)*.
14. Wang, P., **T. Nolan**, Y. Yin and D. Bassham. 2019. Identification of a transcription factor-centered regulatory network of autophagy genes in Arabidopsis. *Autophagy*.
13. Xie, Z., **T. Nolan**, H. Jiang and Y. Yin. 2019. AP2/ERF Transcription Factor Regulatory Networks in Hormone and Abiotic Stress Responses in Arabidopsis. *Frontiers in Plant Science*. 10, 228.
12. Guo, H., **T. Nolan**, Z. Xie, G. Song, J. Walley and Y. Yin. 2018. FERONIA Receptor Kinase Contributes to Plant Immunity by Suppressing Jasmonic Acid Signaling in Arabidopsis thaliana. *Current Biology*. 28 (20), 3316-3324.
11. **Nolan, T.**, J. Chen, and Y. Yin. 2017. Cross-talk of Brassinosteroid signaling in controlling growth and stress responses. *Biochemical Journal*. 474 (16), 2641-2661.
10. Chen, J., **T. Nolan**, H. Ye, M. Zhang, H. Tong, P. Xin, J. Chu, C. Chu, Z. Li, and Y. Yin. 2017. Arabidopsis WRKY46, WRKY54 and WRKY70 Transcription Factors Are Involved in Brassinosteroid-Regulated Plant Growth and Drought Response. *Plant Cell*. 29 (6), 1425- 1439.
9. **Nolan, T.**, B. Brennan, M. Zhang, M. Yang, J. Chen, M. Zhang, Z. Li, X. Wang, D. Bassham, J. Walley, and Yin, Y. 2017. Selective Autophagy of BES1 Mediated by DSK2 Balances Plant Growth and Survival. *Developmental Cell*. 41 (1), 33-46.
 - Featured in *Science Signaling*: Mushegian, A., 2017. Stress signaling in plants. 10.
 - Featured in *BioTechniques*: Shivni, R., 2017. To Survive Hard Times, a Plant Degrades Part of Itself.

- Featured in *SciencDaily*: Plant scientists untangle the molecular mechanisms connecting plant stress and growth.
 - Featured in *Iowa Farmer Today*: Tiedje, B., 2017. Researchers reveal plant hormone interactions.
8. Yang, M., C. Li, Z. Cia, Y. Hu, **T. Nolan**, F. Yu, Y. Yin, Q. Xie, G. Tang and X. Wang. 2017. SINAT E3 ligases control the light-mediated stability of the brassinosteroid-activated transcription factor BES1 in Arabidopsis. *Developmental Cell*. 41 (1), 47-58.
 7. Ye, H., S. Liu, B. Tang, J. Chen, Z. Xie, **T. Nolan**, H. Jiang, H. Guo, H. Lin, L. Li, Y. Wang, H. Tong, M. Zhang, C. Chu, Z. Li, M. Aluru, S. Aluru, P. Schnable and Y. Yin. 2017. RD26 mediates crosstalk between drought and Brassinosteroid signaling pathways. *Nature Communications*. 8, 14573.
 6. Jiang, H., X. Want, **T. Nolan**, Y. Yin, M. Aluru and L. Dong. 2017. Automated microfluidic plant chips-based plant phenotyping system. *IEEE 12th International Conference on Nano/Micro Engineered and Molecular Systems (NEMS)*. 756-760.
 5. **Nolan, T.**, H. Guo, S. Liu, L. Li, P. Schnable, and Y. Yin. 2016. Identification of Brassinosteroid Target Genes by Chromatin Immunoprecipitation Followed by High-throughput Sequencing (ChIP-seq) and RNA-seq. *Brassinosteroid Analysis Book*.
 4. Pogorelko, G., S. Kambakam, **T. Nolan**, A. Foudree, O. Zabolina and S. Rodermel. 2016. Impaired Chloroplast Biogenesis in *immutans*, an Arabidopsis Variegation Mutant, Modifies Developmental Programming, Cell Wall Composition and Resistance to *Pseudomonas syringae*. *Plos one*. 11, 4.
 3. Wang, X., J. Chen, Z. Xie, S. Liu, **T. Nolan**, H. Ye, M. Zhang, H. Guo, P. Schnable, Z. Li, and Y. Yin. 2014. Histone Lysine Methyltransferase SDG8 Is Involved in Brassinosteroid-Regulated Gene Expression in Arabidopsis thaliana. *Molecular Plant* 7, 1303- 1315.
 2. Putarjunan, A., X. Liu, **T. Nolan**, F. Yu, and S. Rodermel. 2013. Understanding chloroplast biogenesis using second-site suppressors of *immutans* and *var2*. *Photosynthesis Research* 116, 437-453.
 1. Foudree, A., A. Putarjunan, S. Kambakam, **T. Nolan**, J. Fussell, G. Pogorelko, and S. Rodermel. 2012. The Mechanism of Variegation in *immutans* Provides Insight into Chloroplast Biogenesis. *Frontiers in Plant Science* 3, 260

ORAL PRESENTATIONS

14. **Nolan, T.**, S. Chockalingam, Z. Xie, N. Huser, S. McLaughlin, A. Hurd, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, D. Nettleton, M. Aluru, B. Ganapathysubramanian, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. Network-based discovery of brassinosteroid regulation of plant growth and stress responses in Arabidopsis. Plant Sciences Institute Board Meeting. April 5, 2019. Ames, IA.
13. **Nolan, T.**, S. Chockalingam, Z. Xie, N. Huser, S. McLaughlin, A. Hurd, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, D. Nettleton, M. Aluru, B. Ganapathysubramanian, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. Network-based discovery of brassinosteroid regulation of plant growth and stress responses in Arabidopsis. 3rd International Conference on Brassinosteroid Research. August 1-4, 2018. San Diego, CA.
12. **Nolan, T.**, S. Chockalingam, J. Chen, M. Yang, Z. Xie, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, X. Wang, D. Nettleton, M. Aluru, B. Ganapathysubramanian, Z. Li, P. Schnable, D.

- Bassham, J. Walley, S. Aluru and Y. Yin. To Grow or Survive: Plants Modulate Brassinosteroid-Regulated Transcription Factor BES1 During Drought to Mediate Growth-Stress Tradeoffs. Salk Institute for Biological Studies. July 31st, 2018. San Diego, CA.
11. **Nolan, T.**, S. Chockalingam, J. Chen, M. Yang, Z. Xie, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, X. Wang, D. Nettleton, M. Aluru, B. Ganapathysubramanian, Z. Li, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. To Grow or Survive: Plants Modulate Brassinosteroid-Regulated Transcription Factor BES1 During Drought to Mediate Growth-Stress Tradeoffs. Duke University. July 26th, 2018. Durham, NC.
 10. **Nolan, T.**, S. Chockalingam, J. Chen, M. Yang, Z. Xie, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, X. Wang, D. Nettleton, M. Aluru, B. Ganapathysubramanian, Z. Li, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. To Grow or Survive: Plants Modulate Brassinosteroid-Regulated Transcription Factor BES1 During Drought to Mediate Growth-Stress Tradeoffs. Plant Biology 2018. July 14-18, 2018. Montreal, Quebec, Canada.
 9. **Nolan, T.**, S. Chockalingam, J. Chen, M. Yang, Z. Xie, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, X. Wang, D. Nettleton, M. Aluru, B. Ganapathysubramanian, Z. Li, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. To Grow or Survive: Plants Modulate Brassinosteroid-Regulated Transcription Factor BES1 During Drought to Mediate Growth-Stress Tradeoffs. University of California San Diego. March 13th, 2018. San Diego, CA.
 8. **Nolan, T.**, S. Chockalingam, C. McNinch, A. Akintayo, S. Sarkar, M. Aluru, P. Schnable, S. Aluru and Y. Yin. Network-Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis. Workshop on Plant Development and Drought Stress. November 5-8, 2017. Pacific Grove, CA.
 7. **Nolan, T.**, B. Brennan, M. Yang, J. Chen, M. Zhang, Z. Li, X. Wang, J. Walley, D.C. Bassham and Y. Yin. Selective Autophagy of BES1 Mediated by DSK2 Balances Plant Growth and Survival. Plant Biology 2017. June 23-28, 2017. Honolulu, HI.
 6. **Nolan, T.**, S. Chockalingam, C. McNinch, A. Akintayo, S. Sarkar, M. Aluru, P. Schnable, S. Aluru and Y. Yin. Network-Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis. International Conference on Arabidopsis Research. June 19-23, 2017. St. Louis, MO.
 5. **Nolan, T.**, B. Brennan, M. Zhang, Z. Li, J. Walley, D.C. Bassham and Y. Yin. Degradation of BES1 mediated by autophagy receptor BIP5 controls the balance between Brassinosteroid regulated plant growth and stress responses in Arabidopsis. Post-transcriptional Gene Regulation in Plants Meeting. July 14-15, 2016. Austin, TX.
 4. **Nolan, T.**, S. Chockalingam, M. Aluru, S. Aluru, and Y. Yin. A Network Approach to Study Brassinosteroid-Regulated Plant Growth and Stress Responses in Arabidopsis. Plant Biology 2016. July 9-13, 2016. Austin, TX
 3. **Nolan, T.**, B. Brennan, M. Zhang, D. Bassham, Z. Li, and Y. Yin. Degradation of BES1 mediated by adaptor protein BIP5 controls the balance between plant growth and stress responses in Arabidopsis. GDCB Brown Bag Seminar Series. November 11th, 2015. Ames, IA
 2. **Nolan, T.**, B. Brennan, M. Zhang, D. Bassham, Z. Li, and Y. Yin. Degradation of BES1 mediated by adaptor protein BIP5 controls the balance between plant growth and stress responses in Arabidopsis. International Conference on Arabidopsis Research. July 5-9, 2015. Paris, France.
 1. **Nolan, T.**, and Y. Yin. 2015. Understanding BES1 Degradation in Brassinosteroid Signaling using CRISPR/Cas9 Genome Editing. Crop Bioengineering Consortium Summer 2015 Meeting. June 17-18, 2015. Ames, IA

POSTER PRESENTATIONS

7. **Nolan, T.**, S. Chockalingam, Z. Xie, N. Huser, S. McLaughlin, A. Hurd, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, D. Nettleton, M. Aluru, B. Ganapathysubramanian, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. Network-based discovery of brassinosteroid regulation of plant growth and stress responses in Arabidopsis. Novel candidate gene discovery by computing on phenotypes. April 3rd, 2019. Ames, IA.
6. **Nolan, T.**, S. Chockalingam, Z. Xie, N. Huser, S. McLaughlin, A. Hurd, P. Wang, A. Akintayo, D. Kelley, S. Sarkar, D. Nettleton, M. Aluru, B. Ganapathysubramanian, P. Schnable, D. Bassham, J. Walley, S. Aluru and Y. Yin. Network-based discovery of brassinosteroid regulation of plant growth and stress responses in Arabidopsis. 1st International Plant Systems Biology Meeting. September 10-14, 2018. Roscoff, France.
5. **Nolan, T.**, S. Chockalingam, C. McNinch, A. Akintayo, S. Sarkar, M. Aluru, P. Schnable, S. Aluru and Y. Yin. Network-Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis. Loomis and Crop Bioengineering Consortium 2018 Meeting. May 8-10, 2018. Ames, IA.
4. **Nolan, T.**, S. Chockalingam, C. McNinch, A. Akintayo, S. Sarkar, M. Aluru, P. Schnable, S. Aluru and Y. Yin. Network-Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis. Predictive Crop Design: Genome-to-phenome. April 6-7, 2017. Lincoln, NE.
3. **Nolan, T.**, and S. Rodermel. Alternate Pathways of Electron Transport in the Chloroplast: Modulation of VTE1 in immutans. American Society of Plant Biologists Midwest Section Meeting, March 23-24th, 2013. Chicago State University, Chicago, IL.
2. Fu, A., H. Liu, S. Luan, A. Putarjuna, A. Foudree, S. Kamakam, **T. Nolan**, J. Zobrist, and S. Rodermel. 2012. Mitochondrial Alternative Oxidase (AOX2) Functionally Substitutes for Plastid Terminal Oxidase (PTOX) in Thylakoid Membranes of Arabidopsis. Plant Biology 2012, July 20-24, 2012. Austin, TX.
1. Fu, A., H. Liu, S. Luan, A. Putarjuna, A. Foudree, S. Kamakam, **T. Nolan**, J. Zobrist, and S. Rodermel. 2012. Mitochondrial Alternative Oxidase (AOX2) Functionally Substitutes for Plastid Terminal Oxidase (PTOX) in Thylakoid Membranes of Arabidopsis. American Society of Plant Biologists Midwest Section Meeting, March 24-25, 2012. University of Nebraska, Lincoln, NE

TEACHING

Teaching Assistant

Genetics Laboratory (Genetics 313L)

Spring 2018

Iowa State University

Guest Lecturer

Molecular Genetics (Genetics 409)

Fall 2016

Iowa State University

Lectured on Trp attenuation mechanism and designed in class activity to promote student interaction and discussion.

Guest Lecturer

Transmission Genetics (Genetics 510)

Spring 2016

Iowa State University

Led paper discussion covering the genetics of the Wnt signaling pathway.

Tutor

Principles of Genetics (Genetics 313)

Fall 2012

Iowa State University

Undergraduate Teaching Assistant

Principles of Genetics (Genetics 313)

Fall 2011

Iowa State University

Undergraduate Teaching Assistant
Genetics Laboratory (Genetics 313L)

Fall 2011
Iowa State University

MENTORING

Mentor in Research Experience for Teachers Program

Nick Smith, Eagle Grove High School	2017-2018
Brent Chambers, Bellevue High School	2014

Mentor for First Year Graduate Students

Tanner Cook	2018
Ashley Paulsen	2017
Basanta Bista	2017
Max McReynolds	2016
Jie Tang	2016

Mentor for Undergraduate Lab Assistants

Ashley Hurd	2018-Present
Nicole Huser	2016-Present
Sean McLaughlin	2016-Present
Jessica Parrott	2016
Paige Rassel	2016
Kyle Small	2016
Ben Brennan	2014-2015

AWARDS AND FELLOWSHIPS

Zaffarano Prize for Graduate Student Research <i>Iowa State University</i>	2019
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Karas Award for an Outstanding Dissertation <i>Iowa State University</i>	2019
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Genetics, Development and Cell Biology Award <i>Iowa State University</i>	2019
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Genetics and Genomics Research Excellence Award <i>Iowa State University</i>	2018
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Biochemical Journal Poster Award - 1st Place <i>3rd International Conference on Brassinosteroid Research, San Diego, CA</i>	2018
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Best Poster Presentation by a Graduate Student <i>Loomis and Crop Bioengineering Consortium Meeting, Ames, IA</i>	2018
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Brown Graduate Fellow <i>Iowa State University</i>	2016-2017
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Plant Sciences Institute Fellow <i>Iowa State University</i>	2013-2017
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Travel Awards

Crop Bioengineering Center Travel Grant	2019
Iowa State University W.E. Loomis award for travel to Plant Biology Workshop on Plant Development and Drought Resistance	2018
Iowa State University W.E. Loomis award for travel to Plant Biology	2017
Iowa State University W.E. Loomis award for travel to Plant Biology	2017
Iowa State University W.E. Loomis award for travel to Plant Biology	2016
Iowa State University GDCB travel award to the ICAR	2015

Best Oral Presentation by a Graduate Student 2016
Post-transcriptional Gene Regulation in Plants Meeting, Austin, TX

Best Poster Presentation by an Undergraduate Student 2013
ASPB Midwest Meeting, Chicago, IL

Research in Genetics Summer Undergraduate Internship 2012
Sui Tong Chan Fung Fund for the Promotion of Study, Iowa State University

GRANTS

Network-Based Discovery of Brassinosteroid Regulation of Plant Growth and Stress Responses in Arabidopsis 2018-2021
PI: Yanhai Yin Co-PI: Justin Walley

Role: Led the development and writing of this funded proposal from the NSF Division of Molecular and Cellular Biosciences Cellular Dynamics and Function cluster.

Crosstalk between Brassinosteroid and autophagy pathways in the regulation of plant growth and stress responses 2017-2020
PI: Yanhai Yin Co-PIs: Diane Bassham and Justin Walley

Role: Generated preliminary data, participated in writing and designed experimental approach for this funded NIH R01 proposal.

PROFESSIONAL ACTIVITIES

Graduate Student Representative 2017
Genetics, Development and Cell Biology Faculty Search Committee

Crop Bioengineering Center Member 2014-Present
Iowa State University

American Society of Plant Biologists Member 2012-Present

Ad Hoc Reviewer

Independent manuscript reviews
Plant Cell 2018

Mentored reviews under Dr. Yanhai Yin
New Phytologist and *PNAS* 2018

Developmental Cell 2017

Plant Biotechnology Journal 2016

REFERENCES

Dr. Yanhai Yin, Professor

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Dr. Diane Bassham, Professor

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bassham@iastate.edu

Dr. Stephen Howell, Professor

Iowa State University

shh@iastate.edu

Dr. Justin Walley, Assistant Professor

Iowa State University

jwalley@iastate.edu