Gözde S. Demirer

Assistant Professor | Chemical Engineering | California Institute of Technology

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SUMMARY

My research group aims to solve the critical challenge of **sustainable production of more food with fewer resources** by combining approaches across disciplines of nanotechnology, plant gene editing, and synthetic biology. Research talks are available on the lab website. Additionally, I strive to implement best practices in **mentoring**, **professional development**, **and Diversity, Equity, Inclusion & Accessibility** as an educator.

POSITIONS AND AFFILIATIONS

California Institute of Technology, Pasadena, CA — September 2022 - present
Clare B. Luce Assistant Professor, Chemical Engineering

University of California, Davis, Davis, CA — August 2020 - September 2022
Postdoctoral Fellow, Plant Biology and Genome Center

EDUCATION

University of California, Berkeley — August 2015 - May 2020
Ph.D. Chemical and Biomolecular Engineering
Advisor: Markita P. Landry

Koç University, Istanbul, Turkey — September 2010 - June 2015
B.S. Chemical and Biological Engineering

University of Pennsylvania — Spring 2014
Semester Abroad, Chemical and Biomolecular Engineering

Stanford University — Summer 2013
International Honors Summer Program

HONORS AND AWARDS

Clare Boothe Luce Professorship Award	2022-2027
UC Davis PSA Travel Grant Awardee	2022
Justice, Equity, Diversity, and Inclusion (JEDI) Award, Life Science Editors Foundation	2021
Resnick Sustainability Institute Postdoctoral Fellowship	2020-2022
Faculty for the Future Fellowship, Schlumberger Foundation	2016-2020
MIT Chemical Engineering Rising Star	2019
WCC/Merck Research Award	2019
UC Berkeley Graduate Division Travel Grant	2019
AIChE 2019, Bionanotechnology Graduate Student Award Session, 2nd place	2019
Women's Initiative Committee's (WIC) Travel Award	2018
AIChE 2018, Carbon Nanomaterials Graduate Student Award Session, 2nd place	2018
AIChE 2017, Bionanotechnology Graduate Student Award Session, 3rd place	2017
Eltoukhy East-West Gateway Fellowship	2015-2016
B.S. Valedictorian, Top Ranking Student Award	2015

Best Senior Research Project Award: Biodiesel Production from Microalgae using CO_2 2015

Vehbi Koç Scholar for Excellence in Academics 2012-2015

Stanford Summer International Honors Award 2013

PEER-REVIEWED PUBLICATIONS

*Denotes equal contribution ‡Denotes corresponding author

1. Park J., **Demirer G.S.,** Cheung L. Toolboxes for Plant Systems Biology Research. ***Current Opinion in Biotechnology*** (2022).
2. Ali Z., Serag M., **Demirer G.S.,** Torre B., Di Fabrizio E., Landry M., Habuchi S., Mahfouz M. The DNA-carbon nanotube binding mode determines the efficiency of carbon nanotube-mediated DNA delivery to intact plants. ***ACS Applied Nano Materials*** (2022).
3. Zhang H., Goh N.S., Wang J., **Demirer G.S**., Butrus S., Park S.J., Landry M.P. Nanoparticle Cellular Internalization is Not Required for RNA Delivery to Mature Plant Leaves. ***Nature Nanotechnology*** (2021).
   > Highlighted in *Nature Materials* (2021), *C. Horejs*
4. González-Grandío E., **Demirer G.S.,** Jackson C.T., Yang D., Landry M.P. Carbon nanotube biocompatibility in plants is determined by their surface chemistry. ***Journal of Nanobiotechnology*** (2021).
5. González-Grandío E., **Demirer G.S.**, Ma W., Brady S.M., Landry M.P. A ratiometric dual color luciferase reporter for fast characterization of transcriptional regulatory elements in plants. ***ACS Synthetic Biology*** (2021).
6. Zhang H.*, Cao Y.*, Xu D., Goh N.S., **Demirer G.S.**, Landry M.P., Yang P. Gold nanocluster mediated delivery of siRNA to intact plant cells for efficient gene knockdown. ***Nano Letters*** (2021).
7. **Demirer G.S.‡,** Silva T.N., Thomas J.B., Jackson C.T., Mortimer J.C., Rhee S.Y., Landry M.P‡. Nanotechnology to advance CRISPR/Cas genetic engineering of plants. ***Nature Nanotechnology*** (2021).
   > Highlighted in *Nature Bioengineering Community* (2021), News and Opinion
8. **Demirer G.S.**‡ and Landry‡, M.P. Efficient Gene Knock-Down in Tobacco Plants Using Carbon Nanocarriers. *Bio-protocol* (2021).
9. Zhang H., **Demirer G.S.**, Fan C. and Landry M.P. Engineering DNA nanostructures for efficient delivery in plant cells. ***Nature Protocols*** (2020).
10. **Demirer G.S.,** Zhang H., Goh N., Pinals R.L., Chang R., Landry M.P. Carbon nanocarriers deliver siRNA to intact plant cells for efficient gene knockdown. ***Science Advances*** (2020).
11. **Demirer G.S.,** Zhang H., Goh N., Grandio E.G., Landry M.P. Carbon nanotube-mediated DNA delivery without transgene integration in intact plants. ***Nature Protocols*** (2019).
12. Wang J., Grandio G., Newkirk M., **Demirer G.S.** *et al*. Nanoparticle mediated genetic engineering of plants. ***Molecular Plant*** (2019).
13. **Demirer G.S.***, Zhang Hu.*, Zhang Ho., Ye T., Goh N.S., Aditham A.J., Cunningham F.J., Fan. C., Landry M.P. DNA Origami Nanostructure-Mediated Gene Silencing in Mature Plants. ***PNAS*** (2019).
14. **Demirer G.S.,** Zhang H., Matos J., Goh N., et al. High Aspect Ratio Nanomaterials Enable Delivery of Functional Genetic Material Without Transgenic DNA Integration in Mature Plants. ***Nature Nanotechnology*** (2019).
    > Interview and highlighted on *NPR, popular mechanics, and C&E news*
    > Selected for NPR's *Changing the World One Invention at a Time series*
15. **Demirer G.S.***, Goh N.S. *, Cunningham F.J. *, Zhang H. *, Landry M.P. Nano-biolistics: A novel plant genetic transformation approach. ***Methods in Molecular Biology*** (2018).
16. Cunningham F.J. *, Goh N.S. *, **Demirer G.S.**, Matos J., Landry M.P. Nanoparticle-mediated delivery in plants towards advancing plant genetic engineering, ***Trends in Biotechnology*** (2018).

17. **Demirer G.S.** and Landry M.P. Delivering Genes to Plants. *Chemical Engineering Progress* (2017).
18. Del Bonis J. T., Beyene A. G., Chio L., **Demirer G. S.**, Yang D., Landry M.P. Engineering Molecular Recognition with Bio-mimetic Polymers on Single Walled Carbon Nanotubes. *JOVE* (2017).
19. **Demirer G.S.** *, Beyene A.G. *, Landry M.P. Nanoparticle-templated molecular recognition platforms for detection of biological analytes. *Curr. Protoc. Chem. Biol*. 8:197-223 (2016).
20. **Demirer G.S.**, Okur A.C., Kizilel S.S. Synthesis and Design of Biologically Inspired Biocompatible Iron Oxide Nanoparticles for Biomedical Applications. *Journal of Materials Chemistry B* (2015).
21. Nazli C., **Demirer G.S.**, Yar Y., Acar H.Y., Kizilel S.S. Targeted Delivery of Doxorubicin into Tumor Cells via MMP-sensitive PEG Hydrogel Coated Magnetic Iron Oxide Nanoparticles, *Colloids and Surfaces B: Biointerfaces*, (2014).

PATENTS

1. Landry M. P., **Demirer, G.S.** Mature plant transfection using carbon nanotubes. International Patent App. 62/500450, 2017. US Patent App. 16/672459, 2020.
2. Landry M. P., Zhang, H., **Demirer, G.S.** Gene Silencing in Plants with DNA Origami Nanostructures. Invention disclosure BK-2019-044, filed September 2018.

OTHER PUBLICATIONS (Pre-print & Editorial)

1. **Demirer G.S.*,** Bian C.*, Brady S.M. Plant Glutamate Receptor-Like (GLR) proteins mediate a defense - regeneration tradeoff. ***Developmental Cell*** (2022). Editorial Preview.
2. **Demirer G.S.** Disease resistant wheat without growth trade-off. ***GEN Biotechnology*** (2022). Editorial Views & News.
3. **Demirer G.S.** *, Gibson D. *, Yue X., Pan K., Cantó-Pastor A., Kong S., Maloof J., Savaldi-Goldstein S., Brady S.M. The Phosphate Deprivation Response is Mediated by an Interaction between Brassinosteroid Signaling and Zinc in Tomato. ***bioRxiv*** (2022).
4. **Demirer G.S.***, Bian C.*, Oz T.M.*, Patron N., Brady S.M. Conservation and repurposing of a nitrogen regulatory circuit between tomato and Arabidopsis. *In preparation* (2022).
5. **Demirer G.S.***, Gaudinier A.*, Van den Broeck L.*, Sozzani R., Brady S.M. Quantitative modeling of the short-term response to nitrogen availability reveals the role of LBD13 in N-mediated lateral root branching. *In preparation* (2022).

INVITED AND AWARD TALKS

1. *12th International Conference on Biomolecular Engineering:* Improving plant nitrogen use efficiency via CRISPR/Cas9 genetic engineering. Santa Barbara, January 2023 (Invited).
2. *The University of Florida Synthetic Biology Working Group Seminar:* Synthetic biology and functional genomics for improving nutrient use efficiency in tomato. Virtual, October 2022 (Invited).
3. *Stockbridge School of Agriculture Fall Seminar series at the University of Massachusetts:* Nano- and Biotechnologies for Plant Genetic Engineering. Virtual, October 2022 (Invited).
4. *5th International Conference on CRISPR Technologies:* Plant gene Editing Enabled by Nanoparticles. Berkeley, CA, October 2022 (Invited).
5. *Workshop to Identify Convergent Nanotechnology Approaches for Precision Delivery of Active Agents in Plants.* Carnegie Mellon University, Pittsburgh, PA, September 2022 (Invited).
6. *Synthetic Biology Young Speaker Series (SynBYSS):* Engineering the Nitrogen Regulatory Circuit in Tomato. Virtual, July 2022 (Award). https://www.youtube.com/watch?v=NgYrI9POOoo

7. *32nd International Conference on Arabidopsis Research:* Conservation and repurposing of nutrient signaling between Arabidopsis and tomato. Belfast, UK, June 2022 (Invited).
8. *2022 In Vitro Biology Meeting Novel Delivery Technologies – Overcoming Bottlenecks*: Nanomaterials for Plant Genetic Engineering. San Diego, CA, June 2022 (Invited).
9. *ECS 241st Meeting Carbon Nanostructures in Medicine and Biology Symposium*: Carbon Nanotubes for Plant Genetic Engineering. Vancouver, Canada, June 2022 (Invited).
10. *UC Riverside Plant Biology Seminar Series:* Developing Plant Systems and Synthetic Biology Tools for Sustainable Agriculture. Riverside, CA, February 2022 (Invited).
11. *ThinkSTEM February StemConnect x Research Workshop*. Virtual, February 2022 (Invited).
12. *Cold Spring Harbor Laboratory*: Plant Genomes, Systems Biology and Engineering Workshop: Engineering an efficient tomato root system with increased mineral use efficiency. Virtual, December 2021 (Invited).
13. *New Breeding Technologies for Food and Nutritional Security Workshop:* Developing Nano and Biotechnologies for Crop Genome Engineering. Virtual, December 2021 (Invited).
14. *National Postdoctoral week (NPAW) at Clemson University:* Nanomaterials for plant genetic engineering. Virtual, September 2021 (Invited).
15. *Innovative Genomics Institute CRISPR Journal Club*: Nanoparticle-enabled plant genetic transformation. Virtual, October 2020 (Invited).
16. *Plant and Animal Genome PAG XXVIII Conference*: Plant Transgene Genetics Workshop, Carbon Nanomaterials Enable Plant Genome Engineering without Transgene Integration. San Diego, CA, January 2020 (Invited).
17. *AIChE 2019 Annual Meeting, Bionanotechnology Graduate Student Award Session (2nd place)*: Carbon nanomaterials enable plant genome engineering without transgene integration. Orlando, FL, November 2019.
18. *Sustainable Nanotechnology Organization (SNO) Conference*: Plant Genome Engineering with Nanotechnology for Sustainable Agriculture. San Diego, CA, November 2019 (Invited).
19. *ACS*: *I&EC Graduate Student Award Symposium.* Nanomaterials enable biomolecule delivery in mature plants for high-throughput plant transformation applications. San Diego, CA, August 2019.
20. *ACS*: *WCC/MERCK Award Symposium.* Chemical modification of carbon nanotubes for gene delivery into intact plants. San Diego, CA, August 2019.
21. *3rd Precision CRISPR & NBT Agbio Congress:* Discovering Advanced Gene Delivery Methods: Nano-Mediated Delivery. San Diego, CA, June 2019 (Invited as expert speaker).
22. *USDA NIFA Annual Grantee Meeting:* Carbon nanotube enabled plant genetic transformations. Nashville, TN, May 2019 (Invited).
23. *IGI Agricultural Genomics Reviews:* Nanoscale Plant Engineering: Mature Plant Transformation with High Aspect Ratio Nanocarriers. Berkeley, CA, November 2018 (Invited).
24. *AIChE 2018 Annual Meeting, Carbon Nanomaterials Graduate Student Award Session (2nd place)*: 1-Dimensional Carbon Nanoparticles for Functional Biomolecule Delivery to Mature Plants. Pittsburg, PA, October 2018.
25. *AIChE 2017 Annual Meeting, Bionanotechnology Graduate Student Award Session (3rd place)*: Nanoparticle-Guided Biomolecule Delivery for Transgene Expression and Silencing in Mature Plants. Minneapolis, MN, October 2017.

SELECTED PRESENTATIONS

1. **Demirer G.S.** et al. Developing Nano and Biotechnologies for Crop Genome Engineering. *ICAR2022,* Regulation of gene expression, Belfast, UK, June 2022.
2. **Demirer G.S.** et al. Developing systems and synthetic biology tools to understand and engineer tomato transcriptional regulation. *ACS Spring 2022,* Synthetic Biology and Genome Engineering, San Diego, CA, March 2022.
3. **Demirer G.S.** et al. Development and toxicity analysis of carbon nanoparticle platforms for gene delivery into plants. *AIChE 2020 Annual Meeting,* Bionanotechnology for Gene and Drug Delivery, Virtual, November 2020. https://www.youtube.com/watch?v=eGVfUZ07BTY&t=1s
4. **Demirer G.S.** et al. Nanomaterials enable DNA-free siRNA-guided gene silencing in intact plants. *AIChE 2019 Annual Meeting,* Micro- and Nano-Scale Technologies in Life Sciences Session, Orlando, FL, November 2019.
5. **Demirer G.S.** et al. High aspect ratio nanomaterials enable biomolecule delivery and transgene expression or silencing in intact plants. *ACS*: *Division of Agrochemicals.* San Diego, CA, August 2019.
6. **Demirer G.S.** et al. Carbon nanomaterial mediated delivery of genetic cargo into non-model plant species. *Janelia Conference: New Genetic Tools for Non-Model Organisms*. Ashburn, VA, March 2019.
7. **Demirer G.S.** et al. 1-Dimensional Carbon Nanoparticles for Functional Biomolecule Delivery to Mature Plants. *AIChE 2018 Annual Meeting,* Synthetic Biology and Bioengineering Session, Pittsburg, PA, October 2018.
8. **Demirer G.S.** et al. Nanoparticle-Guided Biomolecule Delivery for Transgene Expression and Gene Silencing in Mature Plants. *BPS 2018 Annual Meeting,* Nanotechnology Platform, San Francisco, CA, February 2018.
9. **Demirer G.S.** and Landry M.P. CNT-mediated biomolecule delivery to plants for transient expression and silencing, *Chan-Zuckerberg Biohub Interlab Confab,* San Francisco, CA, November 2017.
10. **Demirer G.S.** and Landry M.P., High Aspect Ratio Nanomaterials as Biomolecule Delivery Tools for Plant Systems, *Innovative Genomics Institute (IGI) Open House,* Berkeley, October 2017.
11. **Demirer G.S.** and Landry M.P. Carbon Nanotubes as Biomolecular Cargo Transporters in Plants. *Synthetic Biology: Engineering, Evolution & Design (SEED),* Genetic Engineering Tools, Vancouver, Canada, June 2017.
12. **Demirer G.S.** and Landry M.P. Nanoparticles as Biomolecular Cargo Transporters in Plants and Plastids. *International Conference on Plant Synthetic Biology and Bioengineering* (*ICPSBB),* Plant Genome Editing, Miami, FL, December 2016.
13. **Demirer G.S.** and Landry M.P., Nanoparticles as Biomolecular Cargo Transporters in Plant Systems. *AIChE 2016 Annual Meeting,* Nanoscale Science and Engineering, San Francisco, CA, November 2016.

RESEARCH EXPERIENCE

University of California Davis, Brady Lab – *Postdoctoral Scholar* 2020-2022

- Improving nutrient use efficiency of tomato plants through studying and modifying gene expression in roots
- Environmental and stimuli-responsive regulation of tomato lateral root formation
- Mapping the interaction between nitrogen and phosphorus in nutrient foraging tomato roots
- Engineering high-throughput and quantitative technologies that advance plant functional genomics

University of California Berkeley, Landry Lab – *Graduate Student Researcher* 2015-2020

- CRISPR/Cas9 gene editing in intact plant leaves *via* nanoparticle-mediated DNA delivery

- Developed a nanomaterial platform for DNA delivery into mature plants for high efficiency transient gene expression; manuscript has been downloaded 20,000 times, and a few hundred research labs have requested nanoparticle samples for use in their own laboratories, and patent is currently under licensing process.
- Established different nanomaterial strategies for siRNA delivery into intact plant cells for high efficiency gene silencing and elucidated the underlying principles of plant nanoparticle internalization process.

TRAINEES

Graduate Students

Current:

- Mark Legendre, Chemical Engineering (January 2022-present)
- Yunqing Wang, Bioengineering (May 2022-present)
- Eugene Li, Chemical Engineering (November 2022-present)

Research Technician

- Aya Nakayama, BS: Bioengineering UC Berkeley (August 2022 – present)

Graduate Rotation Students

Current:

- Raj Mukkamala, Chemical Engineering (September 2022 – December 2022)
- Jesus M. Galeana, Chemistry (November 2022 – January 2022)
- Dominic Covelli, Chemistry (November 2022 – January 2022)

Former:

- Ryen O'Meara, Chemical Engineering (January 2022 - March 2022)
- Kian Faizi, Biology (April 2022- June 2022)

Undergraduate Advising

- Maya de Luis (URM), Bioengineering (September 2022-present)
- Daniela Figueroa (URM), Stanford Chemical Engineering (Summer 2022)

TEACHING AND MENTORING

Higher Education

UC Davis, *Research Mentor* 2020-2022

- Jessica Lin, Biotechnology major undergraduate researcher
- Ruthie Mitchell, Biochemistry undergraduate summer researcher from University of Chicago
- He Yang, Genetics major undergraduate researcher
- Zhicheng Zhou, Biotechnology and Agricultural Sciences major undergraduate researcher
- Lilian Grimbert, Biotechnology major undergraduate researcher
- Thomas Tucker Daly, Biotechnology major undergraduate researcher

UC Berkeley, *Research Mentor* 2016-2019

- Salwan Butrus, Amgen Scholar: Currently PhD student at UC Berkeley Chemical Engineering
- Abhishek Aditham, Chemical Engineering Undergraduate: Currently PhD student at MIT Bioengineering
- Roger Chang, Chemical Engineering Undergraduate: Currently PhD student at UIUC Chemical Engineering
- Arismel Tena, Chemistry Undergraduate: Currently PhD student at UCLA Chemistry

UC Berkeley, *Graduate Student Instructor*

- Nanoscience and Engineering Biotechnology (undergraduate/graduate elective course) 2017
- Chemical Engineering Thermodynamics (undergraduate core course) 2016

Koç University, *Teaching Assistant* 2015
- MATLAB for Chemical Engineers (undergraduate core course)

K-12 Education

ThinkSTEM, *Research Workshop Main Speaker* 2022
- Targeted to underrepresented groups,
- Teaching how to start a research project and what it's like to work in a lab

UC Davis Academia Postdoc Panel, *Panelist* 2021

Summer Youth Intensive Program (SYIP), *Teacher and Research Mentor* 2018-2019
- Taught biology and chemistry topics to two high school students for 9-months
- 4-week mentoring in the laboratory to encourage young students to be involved in STEM and research

UC Berkeley BioEHSC 2018 Competition, *Lycée Français Team Mentor* 2018
- Mentored five high school girls on "CRISPR/Cas9 Genome Editing to Eradicate the Influenza Virus" for 5 months

Bay Area Scientists in Schools, *Team Leader and Teacher* 2016-2018
- Taught hands-on science and engineering classes in numerous Bay Area public elementary schools

Koç University Education Group, *Volunteer Teacher* 2011-2013
- Tutored and mentored underprivileged middle school students to improve their math and science skills

LEADERSHIP AND SERVICE

Conference Organizing Committee Member
- 2023 Synthetic Biology: Engineering, Evolution & Design (SEED2023)
- 2022 32nd International Conference on Arabidopsis Research (ICAR2022)
- *2022 In Vitro* Biology Meeting (SIVB2022)
- 2021 5th International Conference on Plant Synthetic Biology, Bioengineering and Biotechnology

Conference Session Chair/Co-Chair
- 2022 AIChE Annual Meeting, Co-Chair: Cell-free systems and DNA assembly platforms
- 2022 *In Vitro* Biology Meeting (SIVB), Chair: Novel Delivery Technologies - Overcoming Bottleneck
- 2022 ECS Spring Meeting, Chair: Carbon Nanostructures in Medicine and Biology Symposium
- 2021 5th International Conference on Plant Synthetic Biology, Bioengineering and Biotechnology, Session: New Tools and Technologies
- Plant Synthetic Biology 2021 Virtual Meeting, Chair: Plant SynBio Platform Talks #1
- 2021 AIChE Annual Meeting, Chair: i) Carbon Nanomaterials: Dispersion, Surface Structure, and Biointeractions ii) Nanomaterial interactions with cells and biological barriers
- 2020 AIChE Annual Meeting, Chair: i) Nanomaterial interactions with cells and biological barriers ii) Carbon Nanomaterials Graduate Student Award Session
- 2019 AIChE Annual Meeting, Chair: i) Sensor Development Platforms ii) Carbon Nanomaterials Graduate Student Award Session iii) Nanostructured Biomimetic and Biohybrid Materials and Devices

Journal Reviewer

Science, Nature Nanotechnology, Nature Plants, Angewandte Chemie, Scientific Reports, Environmental Science & Technology, The Plant Journal, Critical Reviews in Environmental Science and Technology, Biomacromolecules, Bioconjugate Chemistry, Trends in Plant Science, Frontiers in Bioengineering and Biotechnology

Journal Editorial

Advisory Board Member at *GEN Biotechnology* 2021-present

Topic Editor at *Frontiers in Genome Editing*, Genome Editing in Plants 2021-present

University committees and other service

- Caltech Bioengineering Graduate Admission Committee, *Member* 2022-present
- Caltech Chemical Engineering Graduate Admission Committee, *Member* 2022-present
- Caltech Chemical Engineering Seminar Series Committee, *Chair* 2022-2023
- 2022 Caltech Seminar Day, *Sustainability, Science, Solutions Speaker* May 2022
- International Plant Systems Biology Workshop, *Poster Judge* 2021
- UC Berkeley GOLD Science Fair, *Poster Judge* 2018-2019