# Gözde S. Demirer, Ph.D.

# Assistant Professor of Chemical Engineering at the California Institute of Technology

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**EDUCATION**

**University of California, Berkeley**  2020

**Ph.D.** Chemical and Biomolecular Engineering

Ph.D. Advisor: Markita P. Landry

**Koç University**, Istanbul, Turkey 2015

**B.S.** Chemical and Biological Engineering

**University of Pennsylvania** 2014

Semester Abroad, Chemical and Biomolecular Engineering

**Stanford University**  2013

International Honors Summer Program

## HONORS AND AWARDS

Resnick Sustainability Institute Postdoctoral Fellowship 2020-2022

Justice, Equity, Diversity, and Inclusion (JEDI) Award, Life Science Editors Foundation 2021

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 CO2 2015

Vehbi Koc Scholar for Excellence in Academics 2012-2015

Stanford Summer International Honors Award 2013

## PUBLICATIONS

24. **Demirer G.S.\*,** Bian C.\*, Brady S.M. Plant Glutamate Receptor-Like (GLR) proteins mediate a defense - regeneration tradeoff. ***Developmental Cell*** (2022).

23. Park J., **Demirer G.S.,** Cheung L. Toolboxes for Plant Systems Biology Research. ***Current Opinion in Biotechnology*** (2022).

22. 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)*.*

21. 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).

20. 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).

19. 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. ***ChemRxiv***(2021).

18. 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).

17. **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). \*co-corresponding authors.

16. **Demirer G.S.\*** and Landry\*, M.P. Efficient Gene Knock-Down in Tobacco Plants Using Carbon Nanocarriers. *bio- protocol* (2021). \*co-corresponding authors.

15. Zhang H., **Demirer G.S.**, Fan C. and Landry M.P. Engineering DNA nanostructures for efficient delivery in plant cells. ***Nature Protocols*** (2020).

14. **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).

13. **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).

11. **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).

10. **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).

9. **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).

8. Cunningham F.J., Goh N.S., **Demirer G.S.**, Matos J., Landry M.P. Nanoparticle-mediated delivery in plants towards advancingplantgenetic engineering, ***Trends in Biotechnology***(2018).

7. **Demirer G.S.**, Landry M.P. Delivering Genes to Plants. *Chemical Engineering Progress*(2017).

6. 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).

5. **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).

4. **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).

3. 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](http://www.sciencedirect.com/science/article/pii/S0927776514004226), *Colloids and Surfaces B: Biointerfaces*, (2014).

## PATENTS

2. Landry M. P., **Demirer, G.S.** Mature plant transfection using carbon nanotubes. International Patent App. 62/500450, 2017. US Patent App. 16/672459, 2020.

1. Landry M. P., Zhang, H., **Demirer, G.S.** Gene Silencing in Plants with DNA Origami Nanostructures. Invention disclosure BK-2019-044, filed September 2018.

## INVITED AND AWARD TALKS

18. *2022 In Vitro Biology Meeting Novel Delivery Technologies – Overcoming Bottlenecks*: Nanomaterials for Plant Genetic Engineering. San Diego, CA, June 2022 (Invited).

17. *ECS 241st Meeting Carbon Nanostructures in Medicine and Biology Symposium*: Carbon Nanotubes for Plant Genetic Engineering. Vancouver, Canada, June 2022 (Invited).

16. *UC Riverside Plant Biology Seminar Series:* Developing Plant Systems and Synthetic Biology Tools for Sustainable Agriculture. Riverside, CA, February 2022 (Invited).

15. *ThinkSTEM February StemConnect x Research**Workshop*. Virtual, February 2022 (Invited).

14. *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).

12.  *National Postdoctoral week (NPAW) at Clemson University:* Nanomaterials for plant genetic engineering. Virtual, September 2021 (Invited).

11. *Innovative Genomics Institute CRISPR Journal Club*: Nanoparticle-enabled plant genetic transformation. Virtual, October 2020 (Invited).

10. *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).

9. *AIChE 2019 Annual Meeting,* *Bionanotechnology Graduate Student Award Session (2nd place)*: Carbon nanomaterials enable plant genome engineering without transgene integration. Orlando, FL, November 2019.

8.  *Sustainable Nanotechnology Organization (SNO) Conference*: Plant Genome Engineering with Nanotechnology for Sustainable Agriculture. San Diego, CA, November 2019 (Invited).

7. *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.

6.*ACS*: *WCC/MERCK Award Symposium.* Chemical modification of carbon nanotubes for gene delivery into intact plants. San Diego, CA, August 2019.

5. *3rd Precision CRISPR & NBT Agbio Congress:*Discovering Advanced Gene Delivery Methods: Nano-Mediated Delivery. San Diego, CA, June 2019 (Invited as expert speaker).

4. *USDA NIFA Annual Grantee Meeting:*Carbon nanotube enabled plant genetic transformations. Nashville, TN, May 2019 (Invited).

3. *IGI Agricultural Genomics Reviews:* Nanoscale Plant Engineering: Mature Plant Transformation with High Aspect Ratio Nanocarriers. Berkeley, CA, November 2018 (Invited).

2. *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.

1. *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

13. **Demirer G.S.** et al. Developing Nano and Biotechnologies for Crop Genome Engineering. *ICAR2022,* Regulation of gene expression, Belfast, UK, June 2022.

12. **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.

11. **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.

10. **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.

9. **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.

8. **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.

1. **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.
2. **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.

4. **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.

1. **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.

2. **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.

1. **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 the delivery of DNA 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 the delivery of siRNA into intact plant cells for high efficiency gene silencing and elucidated the underlying principles of plant nanoparticle internalization process.

**Koç University,** **Kizilel Lab *–*** *Undergraduate Student Researcher* 2011-2015

## TEACHING AND MENTORING

**Higher Education**

**UC Davis,** *Research Mentor*  2020-2022

* 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

## PROFESSIONAL SERVICE

**Conference Organizing Committee Member**

2021 5th International Conference on Plant Synthetic Biology, Bioengineering and Biotechnology

2022 32*nd* International Conference on Arabidopsis Research (ICAR2022)

**Conference Session Chair/Co-Chair**

* 2022 ECS Spring Meeting, Chair: Carbon Nanostructures in Medicine and Biology Symposium
* 2021 5th International Conference on Plant Synthetic Biology, Bioengineering and Biotechnology, Session 1: 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

## 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,** Board Memberat *GEN Biotechnology* 2021-present

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

**International Plant Systems Biology Workshop,** *Poster Judge* 2021

**UC Berkeley GOLD Science Fair,** *Poster**Judge*2018-2019