

Haoran Zhang

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Engineering C106
Piscataway, NJ 08854
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Professional experience

- Associate Professor (2021-present)
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey
- Assistant Professor (2015-2021)
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey
- Postdoctoral Associate (2011-2015)
Department of Chemical Engineering
Massachusetts Institute of Technology

Education

- Ph. D. in Chemical Engineering (2005-2011)
Department of Chemical and Biological Engineering, Tufts University
Thesis: "Metabolic Engineering for the Heterologous Biosynthesis of Erythromycin A and Associated Polyketide Products in *Escherichia coli*"
- M. Eng. in Chemical Engineering (2002-2005)
Department of Chemical and Biochemical Engineering, Xiamen University
Thesis: "Biosorption and Bioreduction of Silver by Bacterium SH09 and their Characterization"
- B. Eng. in Chemical Engineering (1998-2002)
Department of Chemical and Biochemical Engineering, Xiamen University

Research Interests

Metabolic Engineering, Synthetic Biology, Biosensing, Applied Microbiology, Natural Product Biosynthesis

Publications

‡ supervised undergraduate students, † supervised graduate students,

§ supervised postdoctoral fellow, * corresponding author

Citation information: Google Scholar

<https://scholar.google.com/citations?user=w6iaWu8AAAAJ&hl=en>

Total citations: >3000 H index: 26 ORCID ID: [0000-0002-7059-572X](https://orcid.org/0000-0002-7059-572X)

1. Liu Y†, Wang X†, Zhuang L†, Stapleton M‡, **Zhang H***. Increasing biosensor-based cell selection pressure improves microbial biosynthesis of 4-hydroxybenzoate. *Biochemical Engineering Journal*.
2. Zhuang L†, Liu Y†, **Zhang H***. Microbial Biosynthesis of Straight-Chain Aliphatic Carboxylic Acids. Book chapter for *Microbial Production of High-Value Products, 2022*: 23-45.
3. Akdemir H, Liu Y†, Zhuang L†, **Zhang H***, Koffas MAG. Utilization of microbial cocultures for converting mixed substrates to valuable bioproducts. *Current Opinion in Microbiology* 2022. 68: 102157.
4. Gargatte S†, Li Z†, Zhou Y†, Wang X†, Zhuang L†, **Zhang H***. Utilizing a tyrosine exporter to facilitate 4-hydroxystyrene biosynthesis in an E. coli-E. coli co-culture. *Biochemical Engineering Journal*. 2021. 176: 108178.
5. Chen T†, Wang X†, Zhuang L†, Shao A‡, Lu Y, **Zhang H***. Development and optimization of a microbial co-culture system for heterologous indigo biosynthesis. *Microbial Cell Factories*. 2021. 20: 154.
6. Chopda V§, Gyorgypal A, Yang O, Singh R, Ramachandran R, **Zhang H**, Tsilomelekis G, Chundawat S, Ierapetritou M. Recent Advances in Integrated Process Analytical Techniques, Modeling, and Control Strategies to Enable Continuous Biomanufacturing of Monoclonal Antibodies. *Journal of Chemical Technology and Biotechnology*. 2022. 9: 2317-2335.
7. Zhuang L†, **Zhang H***. Discovery of novel natural products by utilizing cross-species cocultures. *Current Opinion in Biotechnology*. 2021. 69: 252-262.
8. Liu Y†, Caruso J‡, **Zhang H***. Developing an effective approach for microbial biosynthesis of hydroxyhydroquinone. *Biochemical Engineering Journal*. 2021. 168: 107929.
9. Hua K, Liu X, Zhao Y, Gao Y, Pan L, **Zhang H**, Deng Z, Jiang M. Offloading role of a discrete thioesterase in type II polyketide biosynthesis. *mBio*. 2020. 11 (5): e01334-2
10. Li Z†, Zuber A, Wang X†, Marlowe J, Vekaria A‡, Lu Y‡, **Zhang H***, Tsilomelekis G*. Towards the coupling of microbial biosynthesis and catalysis for the production of alkylated phenolic compounds. *AIChE Journal*. 2020. e16547.
11. Li Z†, Lu Y‡, Wang X†, Vekaria A‡, Jiang M, **Zhang H***. Enhancing anthranilic acid biosynthesis using biosensor-assisted cell selection and in situ product removal. *Biochemical Engineering Journal*. 2020. 162: 107722.

12. Wang X†, Shao A‡, Li Z†, Policarpio L‡, **Zhang H***. Constructing *E. coli* co-cultures for de novo biosynthesis of natural product acetin. *Biotechnology Journal*. 2020. 15: 2000131.
13. Wang X†, Li Z†, Policarpio L‡, Koffas M, **Zhang H***. De novo biosynthesis of complex natural product sakuranetin using modular co-culture engineering. *Applied Microbiology and Biotechnology*. 2020. 104: 4849-4861.
14. Liu X, Hua K, Liu D, Wu ZL, Wang Y, **Zhang H**, Deng Z, Pfeifer B, Jiang M. Heterologous Biosynthesis of Type II Polyketide Products Using *E. coli*. *ACS Chemical Biology*. 2020. 15: 1177-1183.
15. Guo X†, Wang X†, Chen T†, Lu Y, **Zhang H***. Comparing *E. coli* mono-cultures and co-cultures for biosynthesis of protocatechuic acid and hydroquinone. *Biochemical Engineering Journal*. 2020. 756: 107518.
16. Wang X†, Policarpio L‡, Prajapati D‡, Li Z†, **Zhang H***. Developing *E. coli*-*E. coli* co-cultures to overcome barriers of heterologous tryptamine biosynthesis. *Metabolic Engineering Communications*. 2020. 10: e00110.
17. Guo X†, Li Z†, Wang X†, Wang J‡, Chala J‡, Lu Y, **Zhang H***. De novo phenol bioproduction from glucose using biosensor-assisted microbial co-culture engineering. *Biotechnology and Bioengineering*. 2019. 116: 3349-3359.
18. Zhou Y†, Li Z†, Wang X†, **Zhang H***. Establishing microbial co-cultures for 3-hydroxybenzoic acid biosynthesis on glycerol. *Engineering in Life Sciences*. 2019. 19(5): 389-395.
19. Li Z†, Wang X†, **Zhang H***. Balancing the non-linear rosmarinic acid biosynthetic pathway by modular co-culture engineering. *Metabolic Engineering*. 2019. 54: 1-11.
20. Wang X†, Cabales A‡, Li Z†, **Zhang H***. Biosensor-assisted high performing cell selection using an *E. coli* toxin/antitoxin system. *Biochemical Engineering Journal*. 2019. 144: 110-118.
21. Chen T†, Zhou Y†, **Zhang H***. Advances in heterologous biosynthesis of plant and fungal natural products by modular co-culture engineering. *Biotechnology Letters*. 2019. 41(1): 27-34. (Invited review paper)
22. Ganesan V†, Li Z†, Wang X†, **Zhang H***. Heterologous biosynthesis of natural product naringenin by co-culture engineering. *Synthetic and Systems Biotechnology*. 2017. 2(3): 236-242.
23. **Zhang H***, Wang X†. Modular co-culture engineering, a new approach for metabolic engineering. *Metabolic Engineering*. 2016. 37: 114–121.
24. **Zhang H***, Stephanopoulos G*. Co-culture engineering for microbial biosynthesis of 3-amino-benzoic acid in *E. coli*. *Biotechnology Journal*. 2016. 11(7): 981-987.
25. Jiang M*, **Zhang H***. Engineering the shikimate pathway for biosynthesis of molecules with pharmaceutical activities in *E. coli*. *Current Opinion in Biotechnology*. 2016. 42: 1-6. (invited review paper)

26. Li Z, Qiao K, Shi W, Pereira B, **Zhang H**, Olsen B, Stephanopoulos G. Biosynthesis of poly(glycolate-co-lactate-co-3-hydroxybutyrate) from glucose by metabolically engineered *Escherichia coli*. *Metabolic Engineering*. 2016. 35: 1-8.
27. Pereira B, Li Z, De Mey M, Lim CG, **Zhang H**, Hoeltgen C, Stephanopoulos G. Efficient utilization of pentoses for the bioproduction of renewable two-carbon compounds, ethylene glycol and glycolate. *Metabolic Engineering*. 2016. 34: 80-87.
28. Pereira B, **Zhang H**, De Mey M, Lim CG, Li Z, Stephanopoulos G. Engineering a novel biosynthetic pathway in *Escherichia coli* for production of renewable ethylene glycol. *Biotechnology and Bioengineering*. 2016. 113: 376-383.
29. **Zhang H**, Lei F, Osburne M, Pfeifer B. The continuing development of *E. coli* as a heterologous host for complex natural product. *Nonribosomal Peptide and Polyketide Biosynthesis: Methods and Protocols*. Methods in Molecular Biology. 2016. 1401: 121-134.
30. **Zhang H**, Li Z, Pereira B, Stephanopoulos G. Engineering *E. coli*-*E. coli* cocultures for production of muconic acid from glycerol. *Microbial Cell Factories*. 2015. 14: 134.
31. **Zhang H**, Pereira B, Li Z, Stephanopoulos G. Engineering *Escherichia coli* coculture systems for the production of biochemical products. *Proceedings of the National Academy of Sciences of the United States of America*. 2015. 112: 8266-8271.
32. Qiao K, Abidi S, Liu H, **Zhang H**, Chakraborty S, Watson N, Ajikumar PK, Stephanopoulos G. Engineering lipid overproduction in the oleaginous yeast *Yarrowia lipolytica*. *Metabolic Engineering*. 2015. 29: 56-65.
33. **Zhang H**, Stephanopoulos G. Engineering *E. coli* for caffeic acid biosynthesis from renewable sugars. *Applied Microbiology and Biotechnology*. 2013. 97(8): 3333-3341.
34. Jiang M, **Zhang H**, Park S, Li Y, Pfeifer B. Deoxysugar pathway interchange for erythromycin analogues heterologously produced through *E. coli*. *Metabolic Engineering*. 2013. 20: 92-100.
35. Jiang M, **Zhang H**, Pfeifer B. The logic, experimental steps, and potential of heterologous natural product biosynthesis featuring the complex antibiotic erythromycin A produced through *E. coli*. *The Journal of Visualized Experiments*. 2013. (71): e4346.
36. **Zhang H**, Skalina K, Jiang M, Pfeifer B. Improved *E. coli* erythromycin A production through the application of metabolic and bioprocess engineering. *Biotechnology Progress*. 2012. 28(1): 292-296.
37. **Zhang H**, Boghigian B, Armando J, Pfeifer B. Methods and options for the heterologous production of complex natural products. *Natural Product Reports*. 2011. 28(1): 125-151.
38. Boghigian B, **Zhang H**, Pfeifer B. Multi-factorial engineering of heterologous polyketide production in *Escherichia coli* reveals complex pathway interactions. *Biotechnology and Bioengineering*. 2011. 108(6): 1360-1371.
39. **Zhang H**, Wang Y, Wu J, Pfeifer B. Complete biosynthesis of erythromycin A and designed analogs using *E. coli* as a heterologous host. *Chemistry and Biology*. 2010. 17: 1232-1240.

40. **Zhang H**, Boghigian B, Pfeifer B. Investigating the role of native propionyl-CoA and methylmalonyl-CoA metabolism on heterologous polyketide production in *Escherichia coli*. *Biotechnology and Bioengineering*. 2010. 105(3): 567-573.
41. Wu J, Boghigian B, Myint M, **Zhang H**, Pfeifer B. Construction and performance of heterologous polyketide producing K-12 and B-derived *Escherichia coli*. *Letters in Applied Microbiology*. 2010. 51: 196-204.
42. **Zhang H**, Wang Y, Boghigian B, Pfeifer B. Probing the heterologous metabolism supporting 6-deoxyerythronolide B biosynthesis in *Escherichia coli*. *Microbial Biotechnology*. 2009. 2(3): 390-394.
43. **Zhang H**, Wang Y, Pfeifer B. Bacterial hosts for natural product production. *Molecular Pharmaceutics*. 2008. 5(2): 212-225.
44. **Zhang H**, Li Q, Wang H, Sun D, Lu Y, He N. Accumulation of silver(I) ion and diamine silver complex by *Aeromonas* SH10 biomass. *Applied Biochemistry and Biotechnology*. 2007. 143: 54-62.
45. **Zhang H**, Li Q, Lu Y, Lin X, Deng X, He N, Zheng S. Biosorption and bioreduction of diamine silver complex by *Corynebacterium*. *Journal of Chemical Technology & Biotechnology*. 2005. 80(3): 285-290.
46. **Zhang H**, Li Q, Sun D, Lin X, Deng X, Lu Y, He N. The preparation of silver nanoparticles (in Chinese). *Precious Metals*. 2005. 26(2): 51-56.

Patents

1. Stephanopoulos G, Zhou K, Qiao K, Edgar S, **Zhang H**. Co-culture based modular engineering for the biosynthesis of isoprenoids, aromatics and aromatic-derived compounds. World Intellectual Property Organization patent. Publication number : WO 2015069847 A2. US patent publication number: US 20150203880
2. Pfeifer BA, **Zhang H**, Park S. Genetically modified *E. coli* strains for producing erythromycin analogs. World Intellectual Property Organization patent. Publication number: WO 2012/166408
3. Li Q, Fu M, Sun D, **Zhang H**, Wang H, Wang L, He N, Wang Y, Chen C. A new method for preparation of water-soluble silver nanoparticles containing biomass. Chinese patent. Publication number: CN100500335

Honors and Awards

- (1) Excellence in Teaching and advising award, Chemical and Biochemical Engineering Department, Rutgers University, 2023
- (2) Scialog Fellow, Research Corporation for Science Advancement (RCSA) and the Gordon and Betty Moore Foundation, 2020, 2021
- (4) Research Grant-in-Aid Award for Graduate Student, Tufts University, 2010

- (5) Best Senior Student Award of Xiamen University, 2005
- (6) Bendong Prize (one of the highest honors at Xiamen University), 2005

Funding support

1. Engineering microbial co-cultures for complex natural product biosynthesis
Sole PI
Source of Support: National Science Foundation (CBET-1706058)
Total Award Amount: \$299,080 (2017-2021)
2. NSF Non-Academic Research Internships for Graduate Students (INTERN) program
Source of Support: National Science Foundation
Sole PI
Total Amount: \$51,766 (2020-2021)
3. Advanced continuous upstream manufacturing of biotherapeutics
Co-PI, (PI: Shishir Chundawat)
Source of Support: U.S. Food and Drug Administration (1R01FD006588)
Total Award Amount: \$1,799,999 (2018-2021)
4. Developing a new paradigm for antibiotic discovery using advanced synthetic biology tools
PI, (Co-PI: Benjamin Schuster)
Source of Support: Busch Biomedical Grant of Rutgers University
Total Award Amount: \$40,000 (2019-2021), funds assigned to the PI: \$22,600
5. Self-assembling Antimicrobial Peptide Particles for Treatment of Antibiotic-resistant Infections
Co-PI, (PI: Benjamin Schuster)
Source of Support: New Jersey Health Foundation
Total Award Amount: \$35,000 (2021-2023)
6. Procuring funding support for upgrading and maintenance of a HPLC-MS/MS at the Department of Chemical and Biochemical Engineering
PI, (co-PI: George Tsilomelekis, Shishir Chundawat, Fuat Celic, Laura Fabris)
Source of Support: Rutgers University School of Engineering
Total Award Amount: \$48,000 (2016)
7. Construction of a microbial consortium for biosynthesis of nutraceutical acacetin
Sole PI
Source of Support: Research Council Grant of Rutgers University
Total Award Amount: \$3,000 (2018-2019)
8. Petroleum-free production of commodity chemical styrene using an advanced microbial biosynthesis platform
Sole PI

Source of Support: Research Council Grant of Rutgers University

Total Amount: \$3,460 (2020-2022)

9. Putting bacteria to sleep: Establishing an artificial circadian clock

PI, (multi-PI: W. Seth Childers, Elizabeth Read)

Source of Support: Research Corporation for Science Advancement

Total Amount: \$55,000 (2022-2024)

10. REU Site: Advanced Materials at Rutgers Engineering

Senior personnel, (PI: Meenakshi Dutt, Deirdre O'Carroll)

Source of Support: National Science Foundation

Total Amount: \$382,260 (2022-2025)

11. Closed-loop control of microbial communities by integrating optogenetics and metabolite biosensing

PI, (multi-PI: Jose Avalos)

Source of Support: National Science Foundation

Total Award Amount: \$ 949,877 (2023-2027)

Teaching

Rutgers University, Chemical and Biochemical Engineering Department, Instructor

14:155:411 Biochemical Engineering (undergraduate course)

Rutgers University, Chemical and Biochemical Engineering Department, Instructor

16:155:533 Bioseparations (graduate course)

Rutgers University, Chemical and Biochemical Engineering Department, Instructor

16:155:535 Biochemical Engineering Laboratory (graduate course)

Rutgers University, Biomedical Engineering Department, Invited guest lecturer

16:125:584 Integrative Molecular and Cellular Bioengineering (graduate course)

Rutgers University, Chemical and Biochemical Engineering Department, Invited guest lecturer

16:155:531 Biochemical Engineering (graduate course)

Advisees

Postdoctoral fellow

1. Viki Chopda, 2019 - 2020

co-advise with Prof. Shishir Chundawat

PhD students

1. Zhenghong Li, Sep. 2015 - Apr. 2020
2. Xiaonan Wang, Sep. 2015 - Dec. 2020
3. Xiaoyun Guo, visiting student, Nov. 2016 - Nov. 2018
4. Tingting Chen, visiting student, Oct. 2017- Oct. 2019
5. Yuxin Liu, Sep. 2019 - Sep. 2022
6. Lei Zhuang, Sep. 2019 - present
7. Michael Bai, Sep. 2022 – present

Master's students

1. Vijay Ganesan, thesis student, Sep. 2015 - Aug. 2017
2. Xuechan Zhao, non-thesis student, Sep. 2015 - May. 2017
3. Yiyao Zhou, thesis student, Sep. 2016 - Mar. 2019
4. Anais Brafine, visiting student, Jun. 2019 - Aug. 2019
Co-supervised with Dr. Benjamin Schuster
5. Christopher Laliwala, thesis student, Sep. 2021 - May 2022
6. Sweta Gargatte, thesis student, Oct. 2018 - Mar. 2021
7. Uwaiz Mansuri, non-thesis student, Sep. 2022 - May 2023
8. Shivangi Patel, non-thesis student, Sep. 2022 - Dec. 2022

Undergraduate students

- 2016-2017 Jordan Goris, Chemical and Biochemical Engineering, Rutgers University
- 2016-2018 Avaniek Cabales, Chemical and Biochemical Engineering, Rutgers University
- 2016-2018 Jing Wang, Chemical and Biochemical Engineering, Rutgers University
Rutgers McNair Program research
- 2017 Mahija Cheekati, Biology, Rutgers University
Aresty undergraduate research
- 2017-2018 Juan Chala, Biology, Rutgers University
Aresty undergraduate research
- 2018 Sean Monteverde, Chemical and Biochemical Engineering, Rutgers University
- 2018-2020 Lizelle Policarpio, Chemical and Biochemical Engineering, Rutgers University
- 2018-2020 Dhara Prajapati, Chemical and Biochemical Engineering, Rutgers University

- 2018-2020 Yingxi Lu, Chemical and Biochemical Engineering, Rutgers University
Douglass Project SUPER (Science for Undergraduates: A Program for Excellence in Research)
- 2018-2022 Ashil Vekaria, Chemical and Biochemical Engineering, Rutgers University
School of Engineering Honors Academy
- 2019 Yuecen Jin, Biomedical Engineering, Rutgers University
- 2019 Ahsan Shawl, Chemical and Biochemical Engineering, Rutgers University
- 2019 Elizabeth Niemiec, School of Engineering, Rutgers University
Introduction to Scientific Research class independent study
- 2019-2020 Yulun Wu, Chemical and Biochemical Engineering, Rutgers University
- 2019-2020 Alan Shao, Cell Biology and Neuroscience, Rutgers University
Rutgers University Honors College, Rutgers Presidential Scholarship and Award
- 2019-2021 James Caruso, Chemical and Biochemical Engineering, Rutgers University
- 2019-2021 Mia Stapleton, Chemical and Biochemical Engineering, Rutgers University
School of Engineering Honors Academy
- 2020 Stephanie Jeune, Douglass Residential College, Rutgers University
Douglass Project SUPER (Science for Undergraduates: A Program for Excellence in Research)
- 2020 Ikmatu Ibrahim, Douglass Residential College, Rutgers University
Douglass Project SUPER (Science for Undergraduates: A Program for Excellence in Research)
- 2020-2021 Bhavini Lakshmanan, Biomedical Engineering, Rutgers University
Aresty undergraduate research
- 2022 Jacob Lakomy, Chemical and Biochemical Engineering, Rutgers University
- 2022-2023 Julia Caldaro, Chemical and Biochemical Engineering, Rutgers University
- 2022 Julie Bondy, Trinity college
NSF REU program
- 2023 Taylor Sullivan, The University of Texas at Austin
NSF REU program
- 2023-present Lakshmi Mahalingam, Biotechnology program, Rutgers University
Douglass Project SUPER (Science for Undergraduates: A Program for Excellence in Research)
- 2023-present Avi Bhuyan, Biomedical Engineering, Rutgers University
Aresty undergraduate research

2022-2023 Ibrahim Basar, Chemical and Biochemical Engineering, Rutgers University

2022-2023 Dylan Wilde, Chemical and Biochemical Engineering, Rutgers University

Service for academic journals and publications

Editorial board member

- Current Opinion in Biotechnology (Elsevier)
- Metabolic Engineering Communications (Elsevier)
- Bioresources and Bioprocessing (Springer)

Reviewer for academic journals (58 in total)

- Nature Chemical Biology • Nature Communications • Nature Catalysis
- Science Advances • Metabolic Engineering • Bioresource Technology
- AIChE Journal • Biotechnology Advances • Process Biochemistry
- Biotechnology and Bioengineering • Biotechnology Progress
- ACS Synthetic Biology • ACS Omega
- Applied and Environmental Microbiology • Biochemical Engineering Journal
- Metabolic Engineering Communications • Bioresources and Bioprocessing
- Journal of the Royal Society Interface • Applied Microbiology and Biotechnology
- Journal of Chemical Technology and Biotechnology • PLoS ONE
- Microbiology and Molecular Biology Reviews • Chemosensors
- Journal of Membrane Biology • Journal of Agricultural and Food Chemistry
- Microbial Cell Factories • Letters in Applied Microbiology
- Enzyme and Microbial Technology • Biotechnology for Biofuels
- FEMS Microbiology Letters • Biomedical Research International
- AIMS Bioengineering • Advanced Biosystems
- Bioprocess and Biosystems Engineering • Biotechnology Journal
- BMC Biotechnology • Journal of Biological Engineering
- Microbiological Research • Journal of Biotechnology
- Frontiers in Microbiology • Frontiers in Marine Science
- Journal of Industrial Microbiology & Biotechnology • Engineering in life sciences
- Biotechnology Reports • Journal of Applied Microbiology
- Trends in Biotechnology • Critical Reviews in Biotechnology

- Scientific Reports • Bioactive Materials • mSystems
- Trends in Food Science & Technology • Current Research in Microbial Sciences
- Catalysts • Synthetic and Systems Biotechnology
- Electronic Journal of Biotechnology • Journal of Cleaner Production
- ChemSusChem • Heliyon

Reviewer for book chapters

John Wiley & Sons, Inc. New Jersey, USA

Service for academic communities

- Panelist for US National Science Foundation (Division of Chemical, Bioengineering, Environmental, and Transport Systems)
- Proposal Reviewer for USDA & National Institute of Food and Agriculture
- Co-chair of the “Modeling and Engineering Cellular Communities” session at 2016 annual meeting of American Institute of Chemical Engineers
- Proposal Reviewer for Rutgers University Busch Biomedical Grant
- Advisor for The New Jersey Governor's School of Engineering & Technology
- Advisor for NSF REU site “Advanced Materials at Rutgers Engineering”
- Advisor for International Research Experience Partnership (IREP) Between FIGURE Network and the Big Ten Academic Alliance
- Advisor for Rutgers University Ronald E. McNair Postbaccalaureate Achievement Program
- Advisor for Rutgers Aresty Undergraduate Research Assistant program
- Mentor of Douglass Project for Rutgers Women in Math, Science, and Engineering (Project SUPER)
- Member of graduate admission committee of the Chemical and Biochemical Engineering Department at Rutgers University
- Chair of PhD qualifying exam committee, Chemical and Biochemical Engineering Department
- Chair of the working group for “Graduate Certificate in Biochemical Engineering”, Chemical and Biochemical Engineering Department at Rutgers University
- Judge of the Graduate Symposium, Chemical and Biochemical Engineering Department at Rutgers University

- Reviewer for Aresty Rutgers Undergraduate Research Journal, Rutgers University