Zhi-Yan (Rock) Du
College of Tropical Agriculture and Human Resources
Department of Molecular Biosciences & BioEngineering
FTE Distribution: 40% I; 60% R; 0% E

Education

Degree	**University**	**Major**
Bachelors	Beijing Forestry University	Biological Sciences
Masters	Institute of Botany, Chinese Academy of Sciences	Evolutionary Developmental Biology
PhD	The University of Hong Kong	Biochemistry & Molecular Biology

Professional Appointments

Title	**Employer**	**Dates Employed**
Assistant Professor (tenure-track)	Department of Molecular Biosciences & BioEngineering, UHM	2020.8 - present
Assistant Professor (fixed-term)	Department of Biochemistry & Molecular Biology, Michigan State University	2018-2020
Research Associate	US Department of Energy-MSU Plant Research Laboratory, Michigan State University	2013 - 2018
Research Assistant	Plant Molecular Biology and Biochemistry, School of Biological Sciences, The University of Hong Kong	2011 - 2013

Courses Taught

Course ID and name (credits)

MBBE/BIOL 401 Molecular Biotechnology (3 cr, Spring)
MBBE/BIOL 401L Molecular Biotechnology Lab - Gene Editing by CRISPR (2 cr, Spring)
MBBE 610 Advanced Special Topics in MBBE (1 cr, Fall)
MBBE 601 Molecular Cell Biology (3 cr, Fall)

Publications (reverse chronological order)

Books

1. **Du, Z.** CRISPR Handbook: Applications, Tools, and Resources. ELSEVIER. First Edition. 2024.
2. **Du, Z.**, Bhat, W., Kai, G., Yu, X., Zienkiewicz, A., Zienkiewicz, K. Metabolic engineering of valuable compounds in photosynthetic organisms. Frontiers Media SA. 2023.
3. **Du, Z.**, Hoffmann-Benning, S., Zienkiewicz, A., Zienkiewicz, K., Wang, S., Yin, L. Lipid Metabolism in Development and Environmental Stress Tolerance for Engineering Agronomic Traits. Frontiers Media SA. 2021.

Book Chapters

1. Zhu, S., Bonito, G., Chen, Y., and **Du, Z.*** 2020. Oleaginous Fungi in Biorefineries. In "Reference Module in Life Sciences" (ISBN 9780128096338), DOI: 10.1016/B978-0-12-819990-9.00004-4.
2. **Du, Z.**, and Benning, C. 2016. Triacylglycerol accumulation in photosynthetic cells in plants and algae. In "Lipids in plant and algae development" (ISBN 9783319259796), edited by Nakamura, Y. and Li-Beisson Y. Springer. 179-205.

Book Reviews

Du, Z. Handbook of Algal Science, Technology and Medicine. Edited by Ozcan Konur. Academic Press. Amsterdam (The Netherlands) and New York: Elsevier. ISBN: 978-0-12-818305-2. 2020.

Selected Journal Publications

1. Bouwman, T., Higa, L., Lee, C., Young, S., Ragasa, A., Bonito, G., Nguyen, N., **Du, Z*.** 2025. Biochemical and molecular characterization of fungal isolates from California annual grassland soil. Biotechnology for Biofuels and Bioproducts, DOI : 10.1186/s13068-025-02651-4.
2. Cecchini, P., Nitta, T., Sena, E., **Du, Z.*** Saving coral reefs: significance and biotechnological approaches for coral conservation. Advanced Biotechnology, 2:42. https://doi.org/10.1007/s44307-024-00049-1
3. Do, S. and **Du, Z*.** 2024. Exploring the Impact of Environmental Conditions and Bioreactors on Microalgae Growth and Applications. Energies, 17: 5218. https://doi.org/10.3390/en17205218
4. Worland, A., Han, Z., Maruwan, J., Wang, Y., **Du, Z.**, Tang, Y., Su, W., Roell, G. 2024 Elucidation of triacylglycerol catabolism in Yarrowia lipolytica: How cells balance acetyl-CoA and excess reducing equivalents. Metabolic Engineering, 85:1-13. https://doi.org/10.1016/j.ymben.2024.06.010
5. Zhang, B., Liu, X., Xie, X., Huan, L., Shao, Z., **Du, Z.***, Wang, G.* 2024. Genetic evidence for functions of Chloroplast CA in Pyropia yezoensis: decreased CCM but increased starch accumulation. Advanced Biotechnology, 2:16. https://doi.org/10.1007/s44307-024-00019-7
6. Liu, Y., Do, S., Huynh, H., Li, J., Liu, Y., **Du, Z.***, Chen, M.* 2024. Importance of pre-mRNA splicing and its study tools in plants Advanced Biotechnology, 2:4. https://doi.org/10.1007/s44307-024- 00009-9
7. Yang, J., Zeng, M., Wu, H., Han, Z., **Du, Z.**, Yu, X., Luo, W. 2024. Light irradiation changes the regulation pattern of BtCrgA on carotenogenesis in Blakeslea trispora. FEMS Microbiology Letters, 10:fnae002. DOI: 10.1093/femsle/fnae002
8. **Du, Z.***, Bhat, W., Poliner, E., Johnson, S., Bertucci, C., Farre, E., Hamberger., B.* 2023. Engineering Nannochloropsis oceanica for the scalable production of diterpenoid compounds. mLife, 2:428- 437. https://doi.org/10.1002/mlf2.12097
9. Xie, J., Zhou, X., Jia, Z., Su, C., Zhang, Y., Fernie, A., Zhang, J.*, **Du, Z.***, Chen, M.* 2023. Alternative Splicing, An Overlooked Defense Frontier of Plants with Respect to Bacterial Infection. Journal of Agricultural and Food Chemistry, DOI: 10.1021/acs.jafc.3c04163.
10. Shitanaka, T., Fujioka, H., Khan, M., Kaur, M., **Du, Z.***, Khanal, S.* 2023. Recent advances in microalgal production, harvesting, prediction, optimization, and control strategies. Bioresource Technology, 129924. https://doi.org/10.1016/j.biortech.2023.129924
11. Li, Y., Yang, Y., Li, P., Sheng, M., Li, L., Ma, X., **Du, Z.**, Tang, K., Hao, X., Kai., G. 2023. AaABI5 transcription factor mediates light and abscisic acid signaling to promote anti-malarial drug artemisinin biosynthesis in Artemisia annua. International Journal of Biological Macromolecules, 253: 127345. https://doi.org/10.1016/j.ijbiomac.2023.127345
12. **Du, Z.***, Bhat, W., Kai, G., Yu, X., Zienkiewicz, A., Zienkiewicz, K. 2023. Metabolic engineering of valuable compounds in photosynthetic organisms. Frontiers in Plant Science, 14: 1260454. https://doi.org/10.3389/fpls.2023.1260454

13. Shitanaka, T., Higa, L., Bryson, A., Bertucci, C., Vande Pol, N., Lucker, B., Khanal, S. Bonito, G., **Du, Z.*** 2023. Flocculation of oleaginous green algae with Mortierella alpina fungi. Bioresource Technology, 129391. https://doi.org/10.1016/j.biortech.2023.129391
14. **Du, Z.***, Qu, Y., Liu, Z., Gaid, M. 2023. Advances in metabolism and chemodiversity-focus-plant enzymes. Frontiers in Plant Science, 14: 1227424. https://doi.org/10.3389/fpls.2023.1227424
15. Rennick, B., Benucci, G., **Du, Z.**, Healy, R., Bonito, G. 2023. Tuber rugosum, a new species from northeastern North America: Slug mycophagy aides in electron microscopy of ascospores. Mycologia, https://doi.org/10.1080/00275514.2023.2184983.
16. Zhu, S., Higa, L., Barela, A., Lee, C., Chen, Y., **Du, Z.*** 2023. Microalgal Consortia for Waste Treatment and Valuable Bioproducts. Energies 16: 884. https://doi.org/10.3390/en16020884
17. **Du, Z.***, Hoffmann-Benning, S., Zienkiewicz, A., Zienkiewicz, K., Wang, S., Yin, L. 2021. Editorial: Lipid Metabolism in Development and Environmental Stress Tolerance for Engineering Agronomic Traits. Frontiers in Plant Science, DOI: 10.3389/fpls.2021.739786.
18. Shi, M., **Du, Z.**, Hua, Q., and Kai, G. 2021. CRISPR/Cas9-mediated targeted mutagenesis of bZIP2 in Salvia miltiorrhiza leads to promoted phenolic acid biosynthesis. Industrial Crops and Products164: 113560. https://doi.org/10.1016/j.indcrop.2021.113560
19. Zhou, W., Li, S., Maoz, I., Wang, Q., Xu, M., Feng, Y., Hao, X., **Du, Z.***, and Kai G. 2021. SmJRB1 positively regulates the accumulation of phenolic acid in Salvia miltiorrhiza. Industrial Crops and Products 164: 113417. https://doi.org/10.1016/j.indcrop.2021.113417
20. Guo, Z., Pogancev, G., Meng, W., **Du, Z.**, Liao, P., Zhang, R., Chye, M. 2020. The overexpression of rice ACYL-COA-BINDING PROTEIN4 improves salinity tolerance in transgenic rice. Environmental and Experimental Botany, 104349. https://doi.org/10.1016/j.envexpbot.2020.104349
21. Meng, W., Xu, L., **Du, Z.**, Wang, F., Zhang, R., Song, X., Lam, S., Shui, G., Li, Y., and Chye, M. 2020. RICE ACYL-COA-BINDING PROTEIN6 affects acyl-CoA homeostasis and growth in rice. Rice, 13: 75. doi: 10.1186/s12284-020-00435-y
22. Aznar-Moreno, J., Venegas-Calerón, M., **Du, Z.**, Garcés, R., Tanner, J., and Chye, M.,Martínez-Force,
1. E., Salas, J. 2020. Characterization and function of a sunflower (Helianthus annuus L.) Class II acyl-CoA-binding protein. Plant Science, 300: 110630.
23. Liber, J., Bryson, A., Bonito, G., and **Du, Z.*** 2020. Harvesting Microalgae for Food and Energy Products. Small Methods, 2000349.
24. Zienkiewicz, A., Zienkiewicz, K., Poliner, E., Pulman, J., **Du, Z.**, et al. 2020. The microalga Nannochloropsis during transition from quiescence to autotrophy in response to nitrogen availability. Plant Physiology, 182:819-839.
25. **Du, Z.**, Zienkiewicz, K., Vande Pol, N., Ostrom, N., Benning, C., and Bonito, C. Algal-fungal symbiosis leads to a photosynthetic mycelium. eLife, 2019;8:e47815.
26. O'Donnell, D., **Du, Z.**, Litchman, E. 2019. Experimental evolution of phytoplankton fatty acid thermal reaction norms. Evolutionary Applications, https://doi.org/10.1111/eva.12798.
27. **Du, Z.**, Alvaro, J., Hyden, B., Zienkiewicz, K., Benning, N., Zienkiewicz, A., Bonito, C., and Benning, C. 2018. Enhancing oil production and harvest by combining the marine alga Nannochloropsis oceanica and the oleaginous fungus Mortierella elongata. Biotechnology for Biofuels, 11: 174.
28. Poliner, E., Takeuchi, T., **Du, Z.**, Benning, C., Farré, E. 2018. Non-transgenic marker-free gene disruption by an episomal CRISPR system in the oleaginous microalga, Nannochloropsis oceanica CCMP1779. ACS Synthetic Biology, 7: 962-968.
29. **Du, Z.**, Lucker, B., Zienkiewicz, K., Millera, T., Zienkiewicz, A., Sears, B., Kramer, D., and Benning, C. 2018. Galactoglycerolipid Lipase PGD1 Is Involved in Thylakoid Membrane Remodeling in Response to Adverse Environmental Conditions in Chlamydomonas. The Plant Cell, 30: 447-465.

30. Zienkiewicz, K., Zienkiewicz, A., Poliner, E., **Du, Z.**, Vollheyde, K., Herrfurth, C., Marmon, S., Farré, E., Feussner, I., and Benning, C. 2017. Nannochloropsis, a rich source of diacylglycerol acyltransferases for engineering of triacylglycerol content in different hosts. Biotechnology for Biofuels, 10:8.
31. Uehling, J., Gryganskyi, A., Hameed, K., Tschaplinski, T., Misztal, P., Wu, S., Desirò, A., Vande Pol, N., **Du, Z.** et al. 2017. Comparative genomics of Mortierella elongata and its bacterial endosymbiont Mycoavidus cysteinexigens. Environmental Microbiology, 19: 2964-2983.
32. Zienkiewicz, K., **Du, Z.**, Ma W., and Benning, C. 2016. Neutral lipid biosynthesis in microalgae - molecular, cellular and physiological insight. Biochimica et Biophysica Acta, 1816:1269-1281.
33. **Du, Z.**, Arias, T., Meng, W., and Chye, M. 2016. Plant acyl-CoA-binding proteins: An emergingfamily involved in plant development and stress responses. Progress in Lipid Research, 63:165-181.
34. **Du, Z.**, Chen, M., Chen, Q., Gu, J., and Chye, M. 2015. Expression of Arabidopsis acyl-CoA-binding proteins AtACBP1 and AtACBP4 confers Pb(II) accumulation in Brassica juncea roots. Plant, Cell & Environment, 38: 101-117.
35. **Du, Z.**, Chen, M., Chen, Q., Xiao, S., and Chye, M. 2013a. Arabidopsis Acyl-CoA-Binding Protein ACBP1 participates in the regulation of seed germination and seedling development. The Plant Journal, 74: 294- 309.
36. **Du, Z.**, Chen, M., Chen, Q., Xiao, S., and Chye, M. 2013b. Overexpression of Arabidopsis Acyl-CoA-Binding Protein ACBP2 enhances drought tolerance. Plant, Cell & Environment, 36: 300-314.
37. **Du, Z.**, and Chye, M. 2013c. Interactions between Arabidopsis acyl-CoA-binding proteins and protein partners. Planta, 238: 239-245.
38. **Du, Z.**, Xiao, S., Chen, Q., and Chye, M. 2010a. Arabidopsis acyl-CoA-binding proteins ACBP1 and ACBP2 show different roles in freezing stress. Plant Signaling & Behaviour, 5: 607-609.
39. **Du, Z.**, Xiao, S., Chen, Q., and Chye, M. 2010b. Depletion of the membrane-associated acyl-CoA-binding protein ACBP1 confers freezing tolerance in Arabidopsis. Plant Physiology, 152: 1585-1597.
40. **Du, Z.**, and Wang, Y. 2008. Significance of RT-PCR expression patterns of CYC-like genes in Oreocharis benthamii (Gesneriaceae). J. Syst. Evol. 46: 23-31.

Patents

1. **Du, Z.**, Fadzlan, M., Kamarudzaman, B., Purvin, W., Rinke, S., Saito, T., Winner, C. US20210169005A1. Biofiltration System for Harvesting Microalgae and Related Methods.
2. Bonito, G., **Du, Z.**, Benning, C. US Patent 10858687. Lipid biosynthesis and abiotic stress resilience in photosynthetic organisms.
3. Chye, M., **Du, Z.**, Chen, Q. WO/2013/064119. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.
4. Chye, M., **Du, Z.**, Chen, Q. EP Patent EP2773765A4. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.
5. Chye, M., **Du, Z.**, Chen, Q. CA Patent CA2854069C. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.
6. Chye, M., **Du, Z.**, Chen, Q. CN Patent CN104080915B. Methods using acyl-coenzyme a-binding proteins to enhance drought tolerance in genetically modified plants.

Creative Works (i.e., Extension Videos, Websites, Blogs, Creative Designs and Exhibitions, etc.)

www.dulab.bio

https://www.youtube.com/watch?v=AoFZZtYIRYc

Leadership Roles (Committees, Boards, Advisory, etc.)

Associate editor: Advanced Biotechnology, Frontiers in Plant Science, and Frontiers in Bioengineering and Biotechnology

Advisory board member: AntiAlias Ventures (https://theantialias.com/)

Panelist for USDA, DOE, and NSF

Faculty/committee: MBBE Graduate Program, Microbiology Graduate Program, C-MAIKI (Center for MICROBIOME Analysis through Island Knowledge & Investigation), Water Resources Research Center, CliRAIM (Climate Resilient Aquaculture Innovation Megahub), and CTAHR Faculty Senate

Graduate Students

Category	Current Number of Students	Number Graduated (Career)
Chair of Master Committees	5	2
Chair of PhD Committees	2	0
Member of Master Committees	6	4
Member of PhD Committees	15	7

Grant Support

Title of Grant: RII Track-2 FEC: Genome Engineering to Sustain Crop Improvement (GETSCI) Source of Grant: NSF
Total Dollar Value (Your share of the grant value):
$3,993,756 ($549,086)
Dates of Grant: 10/01/2021-09/30/2025
Role: Co-PI

Title of Grant: USDA-HEC: Education of Novel CRISPR Technologies for Hawaii Undergraduate and Graduate Students
Source of Grant: USDA
Total Dollar Value (Your share of the grant value): $149,000
Dates of Grant: 1/1/23-12/31/25
Role: PI

Title of Grant: Developing a biofiltration system with fungal filters for sustainable and economical harvesting of microalgae
Source of Grant: USDA-CTSA
Total Dollar Value (Your share of the grant value): $47,969
Dates of Grant: 08/1/2022-07/31/2023
Role: PI

Title of Grant: Developing affordable and efficient photobioreactor and biofiltration systems with fungal filters to grow and harvest microalgae
Source of Grant: USDA-CTSA
Total Dollar Value (Your share of the grant value):
$99,790.75

Dates of Grant: 8/1/23-7/31/25
Role: PI

Title of Grant: Synthetic Bioengineering of Tropical Microalgae for the Production of High-Value Bioproducts
Source of Grant: USDA (Startup)
Total Dollar Value (Your share of the grant value): $60,000
Dates of Grant: 06/24/2023-06/23/2025
Role: PI

Title of Grant: Random mutagenesis breeding of zooxanthellae for better stress resilience
Source of Grant: Zymo Research Corporation-Molecular Wildlife and Ecology Grant
Total Dollar Value (Your share of the grant value): $1,000
Dates of Grant: 06/24/2023-06/23/2025
Role: PI

Title of Grant: Random mutagenesis breeding of zooxanthellae for better stress resilience
Source of Grant: Zymo Research Corporation-Molecular Wildlife and Ecology Grant
Total Dollar Value (Your share of the grant value): $1,000
Dates of Grant: 06/24/2023-06/23/2025
Role: PI

Title of Grant: Biomanufacturing and Developing Oral Vaccine and Therapeutic Proteins in Microalgae
Source of Grant: GENEWIZ Award
Total Dollar Value (Your share of the grant value): $1,000
Dates of Grant: 11/24/2024-11/23/2025
Role: PI

Title of Grant: Building Capacity To Teach Novel CRISPR/Cas Technology To Undergraduate And Graduate Students To Develop Skilled Workforce
Source of Grant: USDA
Total Dollar Value (Your share of the grant value): $75,615
Dates of Grant: 01/1/2025-12/31/2027
Role: co-PI

Presentations at Conferences

Title: Algae-fungi symbiosis and applications
Name of Conference: SynBio Young Speaker Series 2024
Location: Online
Date of Presentation: August 16, 2024

Title: Algae-fungi symbiosis and applications
Name of Conference: Symposium on Plant Molecular Biology Research
Location: Chinese University of Hong Kong, Hong Kong
Date of Presentation: March 9, 2024

Title: Flocculation of oleaginous green algae with Mortierella fungi
Name of Conference: Annual Conference of the Phytochemical Society of North America 2023
Location: Kellogg Hotel & Conference Center, Michigan State University
Date of Presentation: July 17, 2023

Title: Engineering Nannochloropsis oceanica for the scalable production of diterpenoid compounds
Name of Conference: International Conference on Algal Biomass, Biofuels and Bioproducts
Location: Waikoloa Beach Marriott Resort, Hawaii
Date of Presentation: June 12, 2023

Title: Co-production of high-value biomaterials using algae-fungi symbiotic systems
Name of Conference: International Conference on Plant productivity and food safety:
Soil science, Microbiology, Agricultural Genetics and Food quality, Poland, Sep 15-16, 2022
Location: Online
Date of Presentation: Sep 16, 2022

Title: Co-production of valuable compounds with algae-fungi symbiotic systems
Name of Conference: The 61st annual meeting of the Phytochemical Society of North America (PSNA), Blacksburg, VA, Jul 24-28, 2022
Location: Viginia Tech, Blacksburg, VA
Date of Presentation: Jul 26, 2022

Title: New oil production system powered by a community of algae and fungi
Name of Conference: Annual Meeting of The Multistate Research Project, S1075 USDA, Houston, TX, Jul 15-16, 2022
Location: Houston, TX
Date of Presentation: Jul 15, 2022

Title: Algal-fungal symbiosis leads to photosynthetic mycelium

Name of Conference: Algal BBB 2021 - The International Conference on Algal Biomass, Biofuels and Bioproducts, Jun 12-14, 2021
Location: Online, Live & On-Demand Date of Presentation: Jun 14, 2021

Title: Function and biosynthesis of lipids in microalgae
Name of Conference: 2021 Symposium of natural product biotechnology, Hong Zhou, China, Jan 18, 2021
Location: Online
Date of Presentation: Jan 18, 2021

UHM presentations (exclude MBBE talks)
Title: Algae-fungi symbiosis and applications
Name of Conference: HNFAS seminar 2024
Location: UHM
Date of Presentation: September 4, 2024

Title: Algae-fungi symbiosis
Name of Conference: C-MĀIKI Symposium 2023
Location: BioMed, UHM
Date of Presentation: November 22, 2023

Title: Co-production of valuable compounds with algae-fungi symbiotic systems
Name of Conference: Microbiology Seminar Series, UH Manoa, Sep 12, 2022
Location: WEB 113, UH Manoa
Date of Presentation: Sep 12, 2022

Graduate students' presentations

Title: Flocculation of Oleaginous Green Algae Using Hawaiian Fungal Isolates
Name of Conference: 2024 CTAHR Symposium
Student presenter: Yu Wang, PhD candidate
Location: UHM
Date of Presentation: April 11, 2024

Title: The Impact of and Mechanism Behind Light Intensity Response on Microalgae Growth and Productivity
Name of Conference: 2024 CTAHR Symposium
Student presenter: Sally Do, MS candidate; best oral presentation award
Location: UHM
Date of Presentation: April 11, 2024

Title: Flocculation of oleaginous green microalgae with Mortierella alpina fungi

Name of Conference: International Conference on Algal Biomass, Biofuels and Bioproducts
Student presenter: Ty Shitanaka, PhD candidate
Location: Waikoloa Beach Marriott Resort, Hawaii
Date of Presentation: June 13, 2023

Title: Developing Cost-Efficient and Environmental Bioreactors for Algal Research
Name of Conference: Hawaii Branch American Society for Microbiology (HI-ASM) Symposium
Student presenter: Sally Do, MS candidate
Location: JABSOM, UHM
Date of Presentation: April 22, 2023

Title: Unlocking the Power of Algae: Exploring its Nutritional Potential as a Sustainable Food Source
Name of Conference: Hawaii Branch American Society for Microbiology (HI-ASM) Symposium
Student presenter: Yu Wang, PhD candidate
Location: JABSOM, UHM
Date of Presentation: April 22, 2023

Title: Developing an Efficient Gene-Editing Method for Tropical Maize
Protoplasts Using CRISPR-Cas9
Name of Conference: 2023 CTAHR Symposium
Student presenter: Lauren Higa, MS candidate
Location: UHM
Date of Presentation: March 27, 2023

Title: Unlocking the Power of Algae: Exploring its Nutritional Potential as a Sustainable Food Source
Name of Conference: 2023 CTAHR Symposium
Student presenter: Yu Wang, PhD candidate
Location: UHM
Date of Presentation: March 27, 2023