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Studying natural products, the chemical language of nature, helps us better understand how living organisms communicate with each other and interact with the environment. My research group investigates their chemical- and bio-synthesis, and also develop new assays to identify natural products with unconventional bioactivities.

Positions

2025.08 –	Associate Research Fellow, Center for Emerging Material and Advanced Devices, National Taiwan University (joint appointment)
2025.08 –	Associate Professor, Department of Chemistry, National Taiwan University
2024.05 –	Assistant Research Fellow, Center for Emerging Material and Advanced Devices, National Taiwan University (joint appointment)
2021.08 –	Faculty Member, Taiwan International Graduate Program, Academia Sinica (joint appointment)
2019 – 2025	Assistant Professor, Department of Chemistry, National Taiwan University

Education

2010	Ph.D., Chemistry; The Scripps Research Institute
2004	B.S., Chemistry; National Taiwan University

Research Experience

2014 – 2019	**Postdoctoral Associate** | The Rockefeller University	Professor Sean F. Brady
2011 – 2014	**Dreyfus Foundation Postdoctoral Fellow** | Yale University	Professor Alanna Schepartz
2005 – 2010	**Ph.D. Student** | Scripps Research Institute	Professor M. Reza Ghadiri
2003 – 2004	**Undergraduate Intern** | National Taiwan University	Professor Tien-Yau Luh
2002 – 2003	**Undergraduate Intern** | Undergraduate Research Assistant	Professor Andrew H. J. Wang

Honors and Awards

2025	English as a Medium of Instruction (EMI) Teaching Award
2024	NSTC 2030 Excellent Young Scholar Project
2024	Taiwan International Graduate Program Outstanding Faculty Award
2023	English as a Medium of Instruction (EMI) Teaching Award
2019	NTU Chemistry Junior Faculty Research Excellence Award
2018	Rockefeller University Postdoctoral Association Career Development Award
2013	Yale University Postdoctoral Scholar Travel Fund
2011	Camille and Henry Dreyfus Environmental Chemistry Postdoctoral Fellowship
2004	Dr. An-Tai Chen Distinguished Research Scholarship

Teaching

Advanced Chemical Biology I, Graduate Level
Biochemistry
Bioorganic Chemistry
Lab to Market
Natural Product Chemistry
Quantitative Analyses in Chemical Biology

Seminar & Literature Review

Professional Services

2025.11 – Director, Chemistry Division, NSTC Science Promotion and Engagement Center
2025.07 – Early Career Board Member, *Journal of Medicinal Chemistry*
2022.01 – Grant Review
Dutch Research Council (Netherlands)
National Science and Technology Council (Taiwan)
Office of Research and Development (National Taiwan University)
Postdoctoral Scholar Program (Academia Sinica)
2019.07 – Paper Peer Review
Annals of the New York Academy of Sciences, Chemistry – A European Journal, Current Opinion in Microbiology, Engineering Microbiology, European Journal of Medicinal Chemistry, Journal of the American Chemical Society, Journal of Medicinal Chemistry, Journal of Natural Products, Journal of the Chinese Chemical Society, mSystems, Organic and Biomolecular Chemistry, Public Library of Science ONE, RSC Chemical Biology
2022.07 Wiley Chemistry Panelist

Invited Talks

2025.09 NTU-SNU-UTokyo Trilateral Chemistry Symposium, Seoul National University, Seoul, Korea
2025.08 International Chemistry Workshop, Chulalongkorn University, Bangkok, Thailand
2025.07 Department of Chemistry, The Scripps Research Institute, La Jolla, USA
2025.03 Biostudies Student Symposium (keynote speaker), Kyoto University, Kyoto, Japan
2025.03 Taiwan-Czech (NTU-ICOB) Bilateral Symposium; National Taiwan University, Taipei, Taiwan
2024.11 Taiwan-Japan Bilateral Symposium on Natural Products; University of Tokyo, Tokyo, Japan
2024.06 Kyoto Next-Generation Organic Chemistry Symposium, Kyoto University, Kyoto, Japan
2024.03 Annual Meeting, Chinese Chemical Society, Tamkang University, New Taipei City, Taiwan
2024.01 Bowei Research Conference; Sun Moon Lake, Nantou County, Taiwan
2023.12 Taiwan-Japan Bilateral Symposium on Natural Products; Academia Sinica, Taipei, Taiwan
2023.12 Department of Chemistry, Kaohsiung Medical University; Kaohsiung, Taiwan
2023.08 Asian Chemical Biology Conference; Jeju Island, Korea
2023.06 Institute of Biological Chemistry, Academia Sinica, Taipei, Taiwan
2023.04 Department of Fragrance & Cosmetic Science, Kaohsiung Medical University; Kaohsiung, Taiwan
2023.04 Department of Chemistry, Fu Jen Catholic University, Taipei, Taiwan
2023.02 Annual Symposium, Division of Organic Chemistry, NSTC, Taiwan
2022.10 Department of Chemistry, National Changhua University of Education, Changhua, Taiwan
2021.12 School of Medicine, National Taiwan University, Taipei, Taiwan
2021.08 NTU-MIT Frontiers in Biotechnology Symposium (Virtual meeting)
2021.04 Department of Bioscience and Technology, National Chiao Tung University, Hsinchu, Taiwan
2021.03 Department of Life Sciences, National Taiwan University, Taipei, Taiwan
2020.09 Annual Meeting, Pharmaceutical Society of Taiwan, Miaoli, Taiwan
2020.03 Department of Chemistry, Tamkang University, New Taipei City, Taiwan
2019.12 Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan
2019.12 Chinese Chemical Society and Asian Chemical Congress Joint Meeting, Taipei, Taiwan
2019.11 Institute of Biological Chemistry, Academia Sinica, Taipei, Taiwan
2018.03 New Antibacterial Discovery & Development, Gordon Research Conference, Ventura, Calif., USA

Grants and Funding

2024.08 *Calcium-Dependent Antibiotics as a Molecular Scaffold: Engineering, Application, and Searching for New Members*
National Science and Technology Council (NSTC 113-2628-M-002-014-MY4)

2024.01 *Cancer Targeting Peptides: Real-Time Diagnosis and Drug Delivery*
Office of Research and Development, National Taiwan University (113L895203)

2023.11 *Generation of New-To-Nature Lasso Peptides Using Chemical and Synthetic Biology*
National Science and Technology Council (112-2923-M-002-005-MY3)

2022.08 *Bioinformatics and Chemical Synthesis Join Forces for Natural Product Discovery*
National Science and Technology Council (111-2113-M-002-019-MY2)

2021.08 *Biosynthetic, Mechanistic, and Structural Mimetic Studies of MccJ25 Using Chemical Approaches*
Ministry of Science and Technology (110-2113-M-002-022)

2021.01 *A Discovery Platform for Overlooked Bioactive Natural Products*
Office of Research and Development, National Taiwan University (109-B-CD-5203-25314)

2020.01 *Bioinformatics Guided Design of Combinatorial Nonribosomal Peptide Libraries for Antibiotic Discovery*
Ministry of Science and Technology (109-2113-M-002-005-MY3)

Publications (equal contribution (§), corresponding author (*))

24. Chiou, S-L; Lin, J; Miao, J; Tsai, Y-H; Chiu, C-W; Lin, Y-S; ***Chu, J**. Mechanism of action of the boron-dependent antibiotic entails synergistic binding of substrate and cofactor. *Submitted.*
23. Lai, Y-T; Peng, C-Y; Liao, H-T; Hsiao, P-Y; Hsieh, C-K; Luo, Y-R; Huang, S-C; Wang, Y-L ; Ma, T; Chen, Y-R; Kuo, Y-M; Lin, Y-C; **Chu, J**; Chang, Chin-Yuan. Biosynthesis of antituberculosis antibiotic capreomycin involves a *trans*-iterative adenylation domain within the NRPS machinery. *Org. Lett.* **2025**, *27*, 9553-9558.
22. Ashley, MA; Borsari, C; Cazzamalli, S; **Chu, J**; Lee, Y; Perlíková, P; Sarott, RC; Simmons, BJ; Xu, X; Patil, NA; Kounde, C; Wang, S. Announcing the Early Career Board of *Journal of Medicinal Chemistry*. *J. Med. Chem.* **2025**, *68*, 13131 (DOI: 10.1021/acs.jmedchem.5c01588)
21. Chiou, S-L; Chang, C-Y; ***Chu, J**. "Cofactors" for natural products. *ChemMedChem* **2025**, e202400498 (DOI: 10.1002/cmdc.202400498).
20. Ma, T; ***Chu, J**. Chemical structure metagenomics of microbial natural products: Surveying nonribosomal peptides and beyond. *Beilstein J. Org. Chem.* **2024**, *20*, 3050 (DOI: 10.3762/bjoc.20.253).
19. Tan, H-N; Liu, W-Q; Ho, J; Chen, Y-J; Shieh, F-J; Liao, H-T; Wang, S-P; Hegemann, JD; Chang, C-Y; ***Chu, J**. Structure prediction and protein engineering yield new insights into microcin J25 precursor recognition. *ACS Chem. Biol.* **2024**, *19*, 1982 (DOI: 10.1021/acschembio.4c00251).
18. Chiou, S-L; Chen, Y-J; Lee, C-T; Ho, MN; Miao, J; Kuo, P-C; Hsu, C-C; Lin, Y-S; ***Chu, J**. A boron-dependent antibiotic derived from a calcium-dependent antibiotic. *Angew. Chem. Int. Ed.* **2024**, *63*, e202317522 (DOI: 10.1002/anie.202317522).
17. Jian, B-S; Chiou, S-L; Hsu, C-C; Ho, J; Wu, Y-W; ***Chu, J**. Bioinformatic analysis reveals both oversampled and underexplored biosynthetic diversity in nonribosomal peptides. *ACS Chem. Biol.* **2023**, *18*, 476 (DOI: 10.1021/acschembio.2c00761).
16. Chen, I-H; Cheng, T; Wang, Y-L; Huang, S-J; Hsiao, Y-H; Lai, Y-T; Toh, S-I; **Chu, J**; Rudolf, JD; Chang, C-Y. Characterization and structural determination of CmnG-A, the adenylation domain that activates the nonproteinogenic amino acid capreomycidine in capreomycin biosynthesis. *ChemBioChem* **2022**, e202200563 (DOI: 10.1002/cbic.202200563).
15. Chen, P-H; Sung, L-K; Hegemann, JD; ***Chu, J**. Disrupting transcription and folate biosynthesis leads to synergistic suppression of *Escherichia coli* growth. *ChemMedChem* **2022**, e202200075 (DOI: 10.1002/cmdc.202200075).
14. Wu, C.-H.; ***Chu, J**. Total synthesis and biological evaluation of pagoamide A. *Front. Chem.* **2021**, 9:741290 (DOI: 10.3389/fchem.2021.741290).

13. Chung, H-H; Kao, C-Y; Wang, A T-S; **Chu, J;** Pei, J; Hsu, C-C. Reaction tracking and high-throughput screening of active compounds in combinatorial chemistry by tandem mass spectrometry molecular networking. *Anal. Chem.* **2021**, *93*, 2456-2463 (DOI: 10.1021/acs.analchem.0c04481).
12. **Chu, J**; Koirala, B; Forelli, N; Vila-Farres, X; Ternei, MA; Ali, T; Colosimo, DA; Brady, SF. Synthetic-bioinformatic natural product antibiotics with diverse modes of action. *J. Am. Chem. Soc.* **2020**, *142*, 14158-14168 (DOI: 10.1021/jacs.0c04376).
11. **Chu, J**; Vila-Farres, X; Brady, SF. Bioactive synthetic-bioinformatic natural product cyclic peptides inspired by nonribosomal peptide synthetase gene clusters from the human microbiome. *J. Am. Chem. Soc.* **2019**, *141*, 15737-15741 (DOI: 10.1021/jacs.9b07317).
10. §Vila-Farres, X; §**Chu, J**; Ternei, MA; Lemetre, C; Park, S; Perlin, DS; Brady, SF. An optimized synthetic-bioinformatic natural product antibiotic sterilizes multidrug-resistant *Acinetobacter baumannii*-infected wounds. *mSphere* **2018**, *3*, e00528-17 (DOI: 10.1128/mSphere.00528-17).
9. §**Chu, J**; §Vila-Farres, X; Inoyama, D; Gallardo-Macias, R; Jaskowski, M; Satish, S; Freudlich, JS; Brady, SF. Human microbiome inspired antibiotics with improved β-lactam synergy against MDR *Staphylococcus aureus*. *ACS Infect. Dis.* **2018**, *4*, 33-38 (DOI: 10.1021/acsinfecdis.7b00056).
8. Cohen, LJ; Esterhazy, D; Kim, SH; Lemetre, C; Aguilar, RR; Gordon, EA; Pickard, AJ; Cross, JR; Emiliano, AB; Han, SM; **Chu, J**; Vila-Farres, X; Kaplitt, J; Rogoz, A; Calle, P; Hunter, C; Bitok, JK; Brady, SF. Commensal bacteria make GPCR ligands that mimic human signaling molecules. *Nature* **2017**, *549*, 48-53 (DOI: 10.1038/nature23874).
7. §Vila-Farres, X; §**Chu, J**; Inoyama, D; Ternei, MA; Lemetre, C; Cohen, LJ; Cho, W; Reddy, BVB; Zebroski, HA; Freudlich, JS; Perlin, DS; Brady, SF. Antimicrobials inspired by nonribosomal peptide synthetase gene clusters. *J. Am. Chem. Soc.* **2017**, *139*, 1404-1407 (DOI: 10.1021/jacs.6b11861).
6. §**Chu, J**; §Vila-Farres, X; Inoyama, D; Ternei, MA; Cohen, LJ; Gordon, EA; Reddy, BVB; Charlop-Powers, Z; Zebroski, HA; Gallardo-Macias, R; Jaskowski, M; Satish, S; Park S; Perlin, DS; Freudlich, JS; Brady, SF. Discovery of MRSA active antibiotics using primary sequence from the human microbiome. *Nat. Chem. Biol.* **2016**, *12*, 1004-1006 (DOI: 10.1038/nchembio.2207).
5. Cohen, LJ; Kang, HS, **Chu, J**; Huang, YH; Gordon, EA; Reddy, BV; Ternei, MA; Craig, JW; Brady, SF. Functional metagenomic discovery of bacterial effectors in the human microbiome and isolation of commendamide, a GPCR G2A/132. *Proc. Natl. Acad. Sci.* **2015**, *112*, E48245 (DOI: 10.1073/pnas.1508737112).
4. Melicher, MS; **Chu, J**; Walker, AS; Miller, SJ; Baxter, RHG; Schepartz, A. A β-boronopeptide bundle of known structure for differential polyol recognition. *Org. Lett.* **2013**, *15*, 5048-5051 (DOI: 10.1021/ol402381n).
3. **Chu, J**; González-López, M; Cockroft, SL; Amorin, M; Ghadiri, MR. Real-time monitoring of DNA polymerase function and stepwise single-nucleotide DNA strand translocation through a protein nanopore. *Angew. Chem. Int. Ed.* **2010**, *49*, 10106-10106 (DOI: 10.1002/anie.201005460).
2. Cockroft, SL; **Chu, J**; Amorin, M; Ghadiri, MR. A single-molecule nanopore device detects DNA polymerase activity with single-nucleotide resolution. *J. Am. Chem. Soc.* **2008**, *130*, 818-820 (DOI: 10.1021/ja077082c).
1. Huang, KF; Ko, TP; Hung, CC; **Chu, J**; Wang, AHJ; Chiou, SH. Crystal structure of a platelet-agglutinating factor isolated from the venom of Taiwan habu (*Trimeresurus mucrosquamatus*). *Biochem. J.* **2004**, *378*, 399-407 (DOI: 10.1042/bj20031507).

Patents

1. Brady, S.; Chu, J. Antibacterial synthetic-bioinformatic natural products and uses thereof. US 18008006; 31 August 2023.
2. Chu, C-H; Chiou, S-L. An antibiotic, method of preparation and method of treatment thereof. US 2025-0177537; 5 June 2025.