

## **CHU-YOUNG KIM, PH.D.**

Professor of Biochemistry

600 South Mathews Avenue  
417 Roger Adams Laboratory, MC-712  
Urbana, IL 61801, USA

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### **EDUCATION**

- 2001            Ph.D. in Chemistry  
                  University of Pennsylvania, Philadelphia, PA  
                  Advisor: David W. Christianson
- 1998            M.S.E. in Bioengineering  
                  University of Pennsylvania, Philadelphia, PA
- 1996            B.A. in Chemistry  
                  Cornell University, Ithaca, NY  
                  Advisors: Roald Hoffmann, John E. McMurry

### **PROFESSIONAL APPOINTMENTS**

- 2023–present    University of Illinois Urbana-Champaign  
                  Professor
- 2016–2023      The University of Texas at El Paso  
                  Associate Professor (2016–2021), Professor (2021–2023)
- 2006–2016      National University of Singapore  
                  Assistant Professor (2006–2015), Associate Professor (2015–2016)
- 2001–2005      Stanford University  
                  Postdoctoral Associate  
                  Advisor: Chaitan Khosla

### **OTHER APPOINTMENTS**

- 2025–present    Carl R. Woese Institute for Genomic Biology  
                  Affiliate
- 2021–2022      Stanford-SLAC Cryo-EM Center  
                  Visiting Scientist

### **HONORS**

- 2022            The University of Texas at El Paso  
                  Ralph and Kathleen Ponce de Leon Endowed Professorship
- 2016            The University of Texas System  
                  Rising STARS Award

2006–2014 National University of Singapore  
Top Research Award (2013, 2014), Inspiring Research Mentor Award (2011, 2012), Young Scientist Award (2006, 2012)

## PUBLICATIONS

1. Qian Wang, Yaming Deng, Dayan Viera, Xiaopeng Liu, Ning Liu, Yulu Hu, Xiangdong Hu, Hao Wei, Quan Zhou, Ting Lan, Wei He, Xi Chen, **Chu-Young Kim**. Structural basis of sequential enantioselective epoxidation by a flavin-dependent monooxygenase in lasalocid A biosynthesis. *Angewandte Chemie International Edition* e202504982 (2025).
2. Qian Wang, Ning Liu, Yaming Deng, Yuze Guan, Hongli Xiao, Tara A. Nitka, Hui Yang, Anju Yadav, Lela Vukovic, Irimpan I. Mathews, Xi Chen, **Chu-Young Kim**. Triepoxide formation by a flavin-dependent monooxygenase in monensin biosynthesis. *Nature Communications* 14, 6273 (2023).
3. Priyanka Gade, Amanda Erlandson, Anwar Ullah, Xi Chen, Irimpan I. Mathews, Paola E. Mera, **Chu-Young Kim**. Structural and functional analyses of the echinomycin resistance conferring protein Ecm16 from *Streptomyces lasalocidi*. *Scientific Reports* 13, 7980 (2023).
4. Amanda Erlandson, Priyanka Gade, Inoka P. Menikpurage, **Chu-Young Kim**, Paola E. Mera. The UvrA-like protein Ecm16 requires ATPase activity to render resistance against echinomycin. *Molecular Microbiology* 117, 1434 (2022).
5. Saket R. Bagde, Irimpan I. Mathews, J. Christopher Fromme, **Chu-Young Kim**. Modular polyketide synthase contains two reaction chambers that operate asynchronously. *Science* 374, 723 (2021).
6. Ying Gao, Yulu Hu, Qimeng Liu, Xiaokang Li, Xinming Li, **Chu-Young Kim**, Tony D. James, Jian Li, Xi Chen, Yuan Guo. Two-dimensional design strategy to construct smart fluorescent probes for the precise tracking of senescence. *Angewandte Chemie International Edition* 60, 10756 (2021).
7. Xiaokang Li, Wenjing Qiu, Jinwen Li, Xi Chen, Yulu Hu, Ying Gao, Donglei Shi, Xinming Li, Huiling Lin, Huiling Lin, Zelan Hu, Guoqiang Dong, Chunquan Sheng, Bei Jiang, Conglong Xia, **Chu-Young Kim**, Yuan Guo, Jian Li. First-generation species-selective chemical probes for fluorescence imaging of human senescence-associated  $\beta$ -galactosidase. *Chemical Science* 11, 7292 (2020).
8. Zilong Wang, Saket R. Bagde, Gerardo Zavala, Tsutomu Matsui, Xi Chen, **Chu-Young Kim**. De novo design and implementation of a tandem acyl carrier protein domain in a type I modular polyketide synthase. *ACS Chemical Biology* 13, 3072 (2018).
9. Thanh-Binh Nguyen, Priya Jayaraman, Elin Bergseng, M. S. Madhusudhan, **Chu-Young Kim**, Ludvig Sollid. Unraveling the structural basis for the unusually rich association of human leukocyte antigen DQ2.5 with class-II-associated invariant chain peptides. *Journal of Biological Chemistry* 292, 9218 (2017).
10. Fong T. Wong, Kinya Hotta, Xi Chen, Minyi Fang, Kenji Watanabe, **Chu-Young Kim**. Epoxide hydrolase–lasalocid A structure provides mechanistic insight into polyether natural product biosynthesis. *Journal of the American Chemical Society* 137, 86 (2015).

11. Kinya Hotta, Ronan M. Keegan, Soumya Ranganathan, Minyi Fang, Jaelyn Bibby, Martyn D. Winn, Michio Sato, Mingzhu Lian, Kenji Watanabe, Daniel J. Rigden, **Chu-Young Kim**. Conversion of a disulfide bond to a thioacetal group during echinomycin biosynthesis. *Angewandte Chemie International Edition* 53, 824 (2014).
12. Sathya Dev Unudurthi, Kinya Hotta, **Chu-Young Kim**. Engineering the Polyproline II Propensity of a class II major histocompatibility complex ligand peptide. *ACS Chemical Biology* 8, 2382 (2013).
13. Kinya Hotta, Xi Chen, Robert S. Paton, Atsushi Minami, Hao Li, Kunchithapadam Swaminathan, Irimpan I. Mathews, Kenji Watanabe, Hideaki Oikawa, Kendall N. Houk, **Chu-Young Kim**. Enzymatic catalysis of anti-Baldwin ring-closure in polyether biosynthesis. *Nature* 483, 355 (2012).
14. Stig Tollefsen, Kinya Hotta, Xi Chen, Bjørg Simonsen, Kunchithapadam Swaminathan, Irimpan I. Mathews, Ludvig M. Sollid, **Chu-Young Kim**. Structural and functional studies of the *trans*-encoded HLA-DQ2.3 (DQA1\*03:01/DQB1\*02:01) protein molecule. *Journal of Biological Chemistry* 2012, 287, 13611.
15. Michael Bodd, **Chu-Young Kim**, Knut E. Lundin, Ludvig M. Sollid. T-cell response to gluten in patients with HLA-DQ2.2 reveals requirement of peptide-MHC stability in celiac disease. *Gastroenterology* 142, 552 (2012).
16. Kinya Hotta, **Chu-Young Kim**, David T. Fox, Andrew T. Koppisch. Siderophore-mediated iron acquisition in *Bacillus anthracis* and related strains. *Microbiology* 156, 1918 (2010).
17. Lars-Egil Fallang, Elin Bergseng, Kinya Hotta, Axel Berg-Larsen, **Chu-Young Kim**, Ludvig M. Sollid. Differences in the risk of celiac disease associated with HLA-DQ2.5 or HLA-DQ2.2 are related to sustained gluten antigen presentation. *Nature Immunology* 10, 1096 (2009).
18. David T. Fox, Kinya Hotta, **Chu-Young Kim**, Andrew T. Koppisch. The missing link in Petrobactin biosynthesis: AsbF encodes a (-)-3-dehydroshikimate dehydratase. *Biochemistry* 47, 12251 (2008).
19. Andrew T. Koppisch, Kinya Hotta, David T. Fox, Christy E. Ruggiero, **Chu-Young Kim**, Timothy Sanchez, Srinivas Iyer, Cindy C. Browder, Pat J. Unkefer, Clifford J. Unkefer. Biosynthesis of the 3,4-dihydroxybenzoate moieties of petrobactin by *Bacillus anthracis*. *Journal of Organic Chemistry* 73, 5759 (2008).
20. Jiang Xia, Elin Bergseng, Burkhard Fleckenstein, Matthew Siegel, **Chu-Young Kim**, Chaitan Khosla, Ludvig M. Sollid. Cyclic and dimeric gluten peptide analogues inhibiting DQ2-mediated antigen presentation in celiac disease. *Bioorganic & Medicinal Chemistry* 15, 6565 (2007).
21. Yinyan Tang, Alice Y. Chen, **Chu-Young Kim**, David E. Cane, Chaitan Khosla. Structural and mechanistic analysis of protein interactions in module 3 of the 6-deoxyerythronolide B synthase. *Chemistry & Biology* 14, 931 (2007).
22. Yinyan Tang, Ho Young Lee, Yi Tang, **Chu-Young Kim**, Irimpan Mathews, Chaitan Khosla. Structural and functional studies on SCO1815: A  $\beta$ -Ketoacyl-acyl carrier protein reductase from *Streptomyces coelicolor* A3(2). *Biochemistry* 45, 14085 (2006).

23. Yinyan Tang, **Chu-Young Kim**, Irimpan I. Mathews, David E. Cane, Chaitan Khosla. The 2.7-Å crystal structure of a 194-kDa homodimeric fragment of the 6-deoxyerythronolide B synthase. *Proceedings of the National Academy of Sciences of the U.S.A.* 103, 11124 (2006).
24. Alice Y. Chen, Nathan A. Schnarr, **Chu-Young Kim**, David E. Cane, Chaitan Khosla. Extender unit and acyl carrier protein specificity of ketosynthase domains of the 6-deoxyerythronolide B synthase. *Journal of the American Chemical Society* 128, 3067 (2006).
25. Elin Bergseng, Jiang Xia, **Chu-Young Kim**, Chaitan Khosla, Ludvig M. Sollid. Main chain hydrogen bond interactions in the binding of proline-rich gluten peptides to the celiac disease associated HLA-DQ2 molecule. *Journal of Biological Chemistry* 23, 21791 (2005).
26. **Chu-Young Kim**, Viktor Y. Alekseyev, Alice Y. Chen, Yinyan Tang, David E. Cane, Chaitan Khosla. Reconstituting modular activity from separated domains of 6-deoxyerythronolide B synthase. *Biochemistry* 43, 13892 (2004).
27. **Chu-Young Kim**, Hanne Quarsten, Elin Bergseng, Chaitan Khosla, Ludvig M. Sollid. Structural basis for HLA-DQ2 mediated presentation of gluten epitopes in celiac disease. *Proceedings of the National Academy of Sciences of the U.S.A.* 101, 4175 (2004).
28. Vijay M. Krishnamurthy, Brooks R. Bohall, **Chu-Young Kim**, Demetri T. Moustakas, David W. Christianson, George M. Whitesides. Thermodynamic parameters for the association of fluorinated benzenesulfonamides with bovine carbonic anhydrase II. *Chemistry - An Asian Journal* 2, 94 (2007).
29. **Chu-Young Kim**, Douglas A. Whittington, Jeanne S. Chang, John Liao, Jesse A. May, David W. Christianson. Structural aspects of isozyme selectivity in the binding of inhibitors to carbonic anhydrases II and IV. *Journal of Medicinal Chemistry* 45, 888 (2002).
30. Bartosz A. Grzybowski, Alexey V. Ishchenko, **Chu-Young Kim**, George Topalov, Robert Chapman, David W. Christianson, George M. Whitesides, Eugene I. Shakhnovich. Combinatorial computational method gives new picomolar ligands for a known enzyme. *Proceedings of the National Academy of Sciences of the U.S.A.* 99, 1270 (2002).
31. Ryan D. Madder, **Chu-Young Kim**, Pooja P. Chandra, Jeffrey B. Doyon, Teaster A. Baird Jr., Carol A. Fierke, David W. Christianson, Judith G. Voet, Ahamindra Jain. Twisted amides inferred from QSAR analysis of hydrophobicity and electronic effects on the affinity of fluoroaromatic inhibitors of carbonic anhydrase. *Journal of Organic Chemistry* 67, 582 (2002).
32. **Chu-Young Kim**, Pooja P. Chandra. Ahamindra Jain, David W. Christianson. Fluoroaromatic-fluoroaromatic interactions between inhibitors bound in the crystal lattice of human carbonic anhydrase II. *Journal of the American Chemical Society* 123, 9620 (2001).
33. **Chu-Young Kim**, Jeanne S. Chang, Jeffrey B. Doyon, Teaster T. Baird Jr., Carol A. Fierke, Ahamindra Jain, David W. Christianson. Contribution of fluorine to protein-ligand affinity in the binding of fluoroaromatic inhibitors to carbonic anhydrase II. *Journal of the American Chemical Society* 122, 12125 (2000).
34. Jeffrey B. Doyon, Elizabeth A. M. Hansen, **Chu-Young Kim**, Jeanne S. Chang, David W. Christianson, Ryan D. Madder, Judith G. Voet, Teaster A. Baird Jr., Carol A. Fierke,

Ahamindra Jain. Linear free energy relationships implicate three modes of binding for fluoroaromatic inhibitors to a mutant of carbonic anhydrase II. *Organic Letters* 2, 1189 (2000).

## BOOK CHAPTER & REVIEW ARTICLES

1. Saket R. Bagde and **Chu-Young Kim**. Architecture of full-length type I modular polyketide synthases revealed by X-ray crystallography, cryo-electron microscopy, and AlphaFold2. *Natural Product Reports* 41, 1219 (2024).
2. **Chu-Young Kim**. Three-dimensional structure of megasynthases - mammalian fatty acid synthase, type I modular polyketide synthase, and nonribosomal peptide synthetase. In: Hung-Wen (Ben) Liu and Tadhg P. Begley (eds.) *Comprehensive Natural Products III: Chemistry and Biology*, 6, 318. UK: Elsevier (2020).
3. Suttinee Poolsup, **Chu-Young Kim**. Therapeutic applications of synthetic nucleic acid aptamers. *Current Opinion in Biotechnology* 48, 180 (2017).

## RESEARCH FUNDING

### Current research support

1. R01GM138990 (National Institute of General Medical Sciences, NIH), PI. Structural biology of polyether antibiotic biosynthesis (09/15/2020–08/31/2026).

### Completed research support

1. R21EY030981 (National Eye Institute, NIH), PI. Developing isozyme-selective inhibitors against carbonic anhydrase isozymes expressed in the eye (04/01/2020–08/31/2023).
2. R-154-000-644-112 (Singapore Ministry of Education), PI. Detoxification of gluten using DNA (2014–2017).
3. R-154-000-548-112 (Singapore Ministry of Education), PI. Biosynthesis of natural product antibiotic drugs in soil bacteria (2012–2015)
4. R-182-000-204-133 (National University of Singapore), co-PI. Peptide-assisted delivery of DNA minimal vectors for RNAi-based knockdown of target genes (2011–2013).
5. R-154-000-495-133 (Japan Society for the Promotion of Science), PI. Structural and enzymological investigations of enzymes involved in natural product modifications and precursor biosynthesis (2011–2013).
6. R-154-000-277-112 (Singapore Ministry of Education), PI. Coordinated DNA double-strand break repair by gp46 and gp47 proteins (2010–2012).
7. R-154-000-363-305 (Singapore Agency for Science, Technology and Research), PI. Exploring the structure and function of trans-encoded MHC's (2008–2011).
8. R-154-000-386-275 (Singapore Ministry of Health), PI. Toward the development of polyproline type II peptide-based, entropy-driven MHC blocker as novel and general therapeutics and prophylactics for treating autoimmune diseases (2008–2010).

9. R-154-000-277-101 (National University of Singapore), PI. Multivalent MHC blockers for treatment of autoimmune diseases (2006–2009).

### **CLASSROOM TEACHING**

University of Illinois Urbana-Champaign

MCB354–Biochemical and Physical Basis of Life

Korea University International Summer Campus

ISC103–Introductory Life Science

ISC105–General Biology I

The University of Texas at El Paso

CHEM1107–Laboratory for General Chemistry

CHEM3330–Biochemistry I

CHEM3332–Biochemistry II

CHEM5331–Advanced Biochemistry

National University of Singapore

LSM2106–Fundamentals of Biochemistry

LSM2191–Laboratory Techniques in Life Sciences

LSM3247–Synthetic Biology

### **RESEARCH MENTORING**

University of Illinois Urbana-Champaign (U of I), The University of Texas at El Paso (UTEP), National University of Singapore (NUS)

Ph.D. students graduated

Priyanka Gade (UTEP)

Qian Wang (UTEP)

Zilong Wang (NUS)

Minyi Fang (NUS)

Priya Jayaraman (NUS)

Thanh-Binh Nguyen (NUS)

Roopsha Brahma (NUS)

Sathya Dev Unudurthi (NUS)

Xi Chen (NUS)

Master's students graduated

Gileydis Guillama (UTEP)

Dayan Viera (UTEP)

Afroz Karim (UTEP)

Saket Bagde (UTEP)  
Soumya Ranganathan (NUS)

Postbaccalaureate students supervised

Anna Gilstrap (U of I)  
Gerardo Vargas (U of I)

Undergraduate students supervised

Mia Garcia (U of I)  
Kyren Whiting (U of I)  
Amartya Jayakumar (U of I)  
Eileen Park (U of I)  
Aryaman Murdeshwar (U of I)  
Lham Tsering (UTEP)  
Alheli Romero (UTEP)  
Xay Pham (UTEP)  
Jerrica Keaton (UTEP)  
Gerardo Zavala (UTEP)  
Jennifer Villa (UTEP)  
Katherine McCormick (UTEP)  
Jonathan Vaquera (UTEP)  
Keira Howard (UTEP)  
Tanja Weil (NUS)  
Kevin Lim Jie Han (NUS)  
Lynn Yap Lin (NUS)  
Ju Ih Shin (NUS)  
Ju Hong Lee (NUS)  
Kuk Chun Yin (NUS)  
Sakshi Sikka (NUS)  
Tang An Ting Nicole (NUS)  
Tan Mingli Yvonne (NUS)  
Tan Yaw Sing (NUS)  
Eu Kum Wah Dominic (NUS)  
Lee Lin Elijah (NUS)

**CONFERENCE PRESENTATION**

1. The Fourth U.S.-Korea Synthetic Biology Conference (USA, Sep 16-17, 2025)
2. Formulatrix Protein Crystallization User Meeting 2023 (online, Nov 15, 2023)

3. SLAC National Accelerator Laboratory 2022 SSRL/LCLS Users' Group Meeting (USA, Sep 26-30, 2022)
4. American Chemical Society Southwest & Rocky Mountain Regional Meeting (USA, Nov 13-16, 2019)
5. 14<sup>th</sup> Federation of Asian and Oceanian Biochemists and Molecular Biologists Conference (India, Nov 27-30, 2015)
6. 9<sup>th</sup> Asian Biophysics Association Symposium (China, May 9-12, 2015)
7. 8<sup>th</sup> Singapore International Chemistry Conference (Singapore, Dec 14-17, 2014)
8. National University Health System Synthetic Biology Symposium (Singapore, Oct 20, 2014)
9. ESF-EMBO Symposium on Synthetic Biology of Antibiotic Production II (Spain, Aug 30-Sep 4, 2014)
10. 1<sup>st</sup> Chulalongkorn University & National University of Singapore Joint Seminar in Biochemistry (Thailand, Jun 24, 2014)
11. UK-Singapore Workshop on Synthetic Biology (Singapore, Feb 18-19, 2014)
12. 3<sup>rd</sup> Asia-Korea Conference on Science and Technology (Singapore, Nov 21-23, 2013)
13. 264<sup>th</sup> American Chemical Society National Meeting (USA, Sep 8-12, 2013)
14. Keystone Symposia, Structural Analysis of Supramolecular Assemblies by Hybrid Methods (USA, Mar 3-7, 2013)
15. International Conference on Biomolecular Forms and Functions & Celebration of 50 Years of the Ramachandran Map (India, Jan 08-11, 2013)
16. 10<sup>th</sup> Global COE International Symposium on Biochemistry and Cell Biology (Singapore, Dec 22-23, 2011)
17. A Special Symposium Celebrating the 40<sup>th</sup> Anniversary of the Protein Data Bank (USA, Oct 28-30, 2011)
18. XXII Congress and General Assembly of the International Union of Crystallography (Spain, Aug 22-30, 2011)
19. 1<sup>st</sup> Asian Chemical Biology Conference (Korea, Jun 25-27, 2010)
20. Gordon Research Conferences, Immunochemistry & Immunobiology (Switzerland, May 16-21, 2010)
21. Joint A-Star Bioinformatics Institute & Department of Biological Sciences Workshop (Singapore, Sep 3-4, 2009)
22. 13<sup>th</sup> International Coeliac Disease Symposium (Netherlands, April 6-8, 2009)
23. Nanyang Technological University Bioinformatics Research Centre Workshop on Protein Structure and Function (Singapore, Oct 25, 2008)
24. Gordon Research Conferences, Chemistry and Biology of Peptides (USA, Feb 17-22, 2008)

25. Keystone Symposia, Frontiers of Structural Biology (USA, Jan 6-11, 2008)
26. 13<sup>th</sup> International Congress of Immunology (Brazil, Aug 21-25, 2007)
27. Joint 3<sup>rd</sup> Asia Oceania Human Proteome Organization & 4th Structural Biology and Functional Genomics Conference (Singapore, Dec 4-7, 2006)
28. 7<sup>th</sup> Frontier Science Symposium (Taiwan, Nov 23-26, 2006)

### **INVITED SEMINARS**

1. Alpha Chi Sigma Professional Chemistry Fraternity, University of Illinois Urbana-Champaign (Oct 20, 2025, Urbana, IL)
2. American Society for Biochemistry and Molecular Biology Student Chapter, University of Illinois Urbana-Champaign (October 3, 2024, Urbana, IL)
3. California Polytechnic State University, San Luis Obispo, Chemistry & Biochemistry Department (Oct 14, 2022, San Luis Obispo, CA)
4. University of Illinois at Urbana-Champaign, Department of Biochemistry (Apr 29, 2022, Urbana, IL)
5. Stanford-SLAC Cryo-Electron Microscopy Center (Oct 13, 2021, Menlo Park, CA)
6. University of Connecticut, School of Pharmacy (Sep 22, 2021, Storrs, CT)
7. University of Texas at El Paso, School of Pharmacy (Feb 2, 2021, El Paso, TX)
8. New Mexico State University, Department of Chemistry and Biochemistry (Oct 4, 2019, Las Cruces, NM)
9. Northern Arizona University, Department of Chemistry and Biochemistry (Sep 27, 2019, Flagstaff, AZ)
10. Northwest University, Department of Chemistry and Materials Science (Jun 19, 2019, Xi'an, The People's Republic of China)
11. Indian Institute of Science Education and Research, Bhopal, Department of Chemistry (Jun 13, 2019, Bhopal, India)
12. Indian Institute of Science Education and Research, Pune, Department of Biology (Jun 10, 2019, Pune, India)
13. Indian Institute of Science Education and Research, Pune, Department of Biology (Dec 3, 2015, Pune, India)
14. Korea Advanced Institute of Science and Technology, Department of Biological Science (Aug 8, 2014, Daejeon, South Korea)
15. Chinese University of Hong Kong, Department of Chemistry (Apr 29, 2014, Hong Kong SAR, The People's Republic of China)
16. Chinese Academy of Medical Sciences, Institute of Materia Medica (Apr 15, 2014, Beijing, The People's Republic of China)

17. Tsinghua University, School of Life Sciences (Apr 14, 2014, Beijing, The People's Republic of China)
18. Dartmouth College, Department of Chemistry (Feb 25, 2014, Hanover, NH)
19. University of Minnesota, Department of Biochemistry, Molecular Biology, and Biophysics (Jan 6, 2014, Minneapolis, MN)
20. National University of Singapore, Department of Chemistry (Mar 5, 2012, Singapore)

#### **UNIVERSITY SERVICE**

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|--------------|--|
| 2024–present | Graduate Admissions Committee, School of Molecular and Cellular Biology  |
| 2024–present | Promotion and Tenure Committee, School of Molecular and Cellular Biology |
| 2024–present | Senate Committee on Admissions, University of Illinois Urbana-Champaign  |

#### **PROFESSIONAL SERVICE**

- |              |  |
|--------------|--|
| 2023–present | Editorial board member, <i>Scientific Reports</i>  |
| 2021–2024    | Panel member, Ford Foundation Fellowship Programs<br>The National Academies of Sciences, Engineering, and Medicine |
| 2017–2023    | Faculty member, Faculty of 1000 (now H1 Connect)   |

#### **COMMUNITY SERVICE**

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|--------------|---|
| 2025–present | Annual one-week “Introduction to Astrobiology” outreach course delivered each February at a local public high school. |
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