

# Bo Li, Ph.D.

## PERSONAL

Genome Sciences Building 3256  
Department of Chemistry  
The University of North Carolina, Chapel Hill, NC 27599-3290  
Phone: 919-843-4436  
Email: [boli@email.unc.edu](mailto:boli@email.unc.edu)  
Website: <http://www.chem.unc.edu/people/faculty/li/group/index.html>

## EDUCATION

**Ph.D. Biochemistry, University of Illinois at Urbana-Champaign** 2004 – 2009  
Advisor: Wilfred A. van der Donk  
Urbana, IL  
Thesis title: Mechanistic studies of lantibiotic biosynthetic enzymes and discovery of novel lanthionine-containing peptides

**B.S. Biological Sciences, Beijing University** 2000 – 2004  
Advisors: Yuxian Zhu and Hong Cai  
Beijing, China  
Thesis title: Novel DNA vaccines against *Mycobacterium tuberculosis*

## PROFESSIONAL EXPERIENCE

**Assistant Professor, The University of North Carolina at Chapel Hill** 2013 – present  
Department of Chemistry, Carolina Center for Genome Sciences  
Chapel Hill, NC

**Postdoctoral Fellow, Harvard Medical School** 2009 – 2013  
Department of Biological Chemistry and Molecular Pharmacology  
Boston, MA  
Advisor: Christopher T. Walsh

**Visiting Scholar, University of California, San Francisco** Oct, 2012  
Department of Microbiology and Immunology  
San Francisco, CA  
Collaborator: Carol A. Gross

**Visiting Scholar, John Innes Centre, UK** Summer, 2011  
Department of Molecular Microbiology  
Norwich, UK  
Collaborator: Mervyn Bibb

## HONORS

**National Institutes of Health Director's New Innovator Award** 2017  
**National Science Foundation CAREER Award** 2017  
**Packard Fellowship for Science and Engineering** 2016  
**Rita Allen Foundation Scholars** 2016  
**NIH Pathway to Independence Award (K99/R00)** 2012  
**Postdoctoral Travel Award (Harvard Medical School)** 2012  
**David Philips Fellowship** 2012  
(Biotechnology and Biological Sciences Research Council, UK, declined)

<b>Jane Coffin Childs Postdoctoral Fellowship</b> (Howard Hughes Medical Institute)	2011
<b>Biochemistry Trust of Urbana Ph.D. Thesis Award</b> (UIUC)	2010
<b>Guanghua Scholarship for Academic Excellence</b> (Beijing University)	2002

## **BIBLIOGRAPHY**

*\*denotes corresponding author*

### **Manuscripts Submitted from Independent Research at UNC-Chapel Hill**

- \*21. Chan, A.N., Wever, W.J., Massolo, E., Allen, S.E., **Li, B.\*** “Reducing the holomycin thiosulfonate to its disulfide with thiol nucleophiles,” *submitted*.

### **Refereed Publications from Independent Research at UNC-Chapel Hill (11 total)**

- \*20. O'Neill, E.M., Mucyn, T.S., Patteson, J.B., Finkel, O.M., Chung, E-H., Baccile, J.A., Massolo, E., Schroeder, F.C., Dangl, J.L., **Li, B.\*** “A new bacterial small molecule suppresses plant immune response,” *Proc. Nat. Acad. Sci. U.S.A.*, *in press*.
- \*19. Kretsch, A.M., Morgan, G.L., Tyrrell, J., Mevers, E., Vallet-Gély, E. **Li, B.\*** “Discovery of (dihydro)pyrazine *N*-oxides via genome-mining in *Pseudomonas*,” *Org. Lett.*, 10.1021/acs.orglett.8b01944.
18. Pellock, S., Creekmore, B., Walton, W., Mehta, N., Biernat, K., Cesmat, A., Ariyaratna, Y., Dunn, Z.D., **Li, B.**, Jin, J., James, L., Redinbo, M. “Piperazine-containing inhibitors intercept the catalytic cycle of gut microbial  $\beta$ -glucuronidases,” *ACS Cent. Sci.*, 4, 868–879 (2018).
- \*17. Patteson, J.B., Dunn, Z.D., **Li, B.\*** “*In vitro* biosynthesis of the nonproteinogenic amino acid methoxyvinylglycine,” *Angew. Chem. Int. Ed.*, 57, 6780–6785 (2018).
16. Biernat, K.A., **Li, B.**, Redinbo, M.R.\* “Microbial unmasking of plant glycosides,” *mBio*, 9, e02433–17 (2018). (*Invited commentary*)
- \*15. Patteson, J.B., Cai, W., Johnson, R.A., Santa Maria, K.C., **Li, B.\*** “Identification of the biosynthetic pathway for the antibiotic bicyclomycin,” *Biochemistry*, 57, 61–65 (2018).

Published in the “**Future of Biochemistry**” Special Issue

**Highlighted** in *Viewpoint* article: Chekan J.R., Moore B.S. “Biosynthesis of the antibiotic bicyclomycin in soil and pathogenic bacteria,” *Biochemistry*, 57, 897–898 (2018).

- \*14. Chan, A.N., Shiver, A.L., Weaver, W.J., Razi, S.Z.A., Traxler, M.F., **Li, B.\*** “Role for dithiolopyrrolones in disrupting bacterial metal homeostasis,” *Proc. Nat. Acad. Sci. U.S.A.*, 10, 2717–2722 (2017).
- Highlighted** in *Chemical & Engineering News* “Mode of action for unusual antibiotic found,” 95, 10 (2017).
13. Shiver, A.L., Osadnik, H., Kritikos, G., **Li, B.**, Krogan, N., Typas, A., Gross, C.A. “A chemical-genomic screen of neglected antibiotics reveals illicit transport of kasugamycin and blasticidin S,” *PLoS Genet.*, 12, e1006124 (2016).
- \*12. Chan, A.N., Santa Maria, K.C., **Li, B.\*** “Direct capture technologies for genomics-guided discovery of new natural products,” *Curr. Top. Med. Chem.*, 16, 1695–1704 (2016). (*Invited Review*)
- \*11. Dunn, Z.D., Weaver, W.J., Economou, N.J., Bowers, A.A., **Li, B.\*** “Enzymatic basis of ‘hybridity’ in thiomarinol biosynthesis,” *Angew. Chem. Int. Ed.*, 54, 5137–5141(2015).

- \*10. Li, B.\*, Weaver, W.J., Walsh, C.T., Bowers, A.A. "Dithiopyrrolones: biosynthesis, synthesis, and activity of a unique class of disulfide-containing antibiotics," *Nat. Prod. Rep.*, 31, 905–923 (2014). (Invited Review)

### **Refereed Publications Prior to UNC-Chapel Hill**

9. Ortega, M.A., Cogan, D.P., Mukherjee, S., Garg, N., Li, B., Maffioli, S., Donadio, S., Sosio, M., Escano, J., Smith, J.L., Nair, S.K., and van der Donk, W.A. "Two flavoenzymes install 5-chlorotryptophan and 2-amionvinyl cysteine during the biosynthesis of the lantibiotic NAI-107," *ACS Chem. Bio.* 12, 548–557 (2017).
8. Li, B., Forseth, R.R., Bowers, A.A., Schroeder, F.C., Walsh, C.T. "A backup plan for self-protection: S-methylation of holomycin biosynthetic intermediates in *Streptomyces clavuligerus*," *ChemBioChem*, 13, 2521–2526 (2012).

**Highlighted in *Chem. Eur. J.*, 18, 15904 (2012).**

7. Li, B., Walsh, C.T. "*Streptomyces clavuligerus* Hlml is an intramolecular disulfide-forming dithiol oxidase in holomycin biosynthesis," *Biochemistry*, 50, 4615–4622 (2011).
6. Li, B., Walsh, C.T. "Identification of the gene cluster for the dithiopyrrolone antibiotic holomycin in *Streptomyces clavuligerus*," *Proc. Natl. Acad. Sci. U.S.A.*, 107, 19731–19735 (2010).
5. Li, B., Sher, D., Kelly, L., Shi, Y., Huang, K., Knerr, P.J., Joewono, I., Rusch, D. Chisholm, S.W., van der Donk, W.A. "Catalytic promiscuity in the biosynthesis of cyclic peptide secondary metabolites in planktonic marine cyanobacteria," *Proc. Natl. Acad. Sci. U.S.A.*, 107, 10430–10435 (2010).

**Highlighted in "A Most Versatile Enzyme," *Chemical and Engineering News*, 88, 56 (2010). Also listed as the 5<sup>th</sup> most-read paper online at *Proc. Natl. Acad. Sci. U.S.A.* in June, 2010**

4. Goto, Y., Li, B., Claesen, J., Shi, Y., Bibb, M.J., van der Donk, W.A. "Discovery of unique lanthionine synthetases reveals new mechanistic and evolutionary insights," *PLoS Biol.*, 8, e1000339 (2010).
3. Li, B., Cooper, L.E., van der Donk, W.A. "Chapter 21. *In vitro* studies of lantibiotic biosynthesis," *Methods Enzymol.*, 458, 533–558 (2009). (Review)
2. Li, B., van der Donk, W.A. "Identification of essential catalytic residues of the cyclase NisC involved in the biosynthesis of nisin," *J. Biol. Chem.*, 282, 21169–21175 (2007).
1. Li, B., Yu, J.P., Brunzelle, J.S., Moll, G.N., van der Donk, W.A., Nair, S.K. "Structure and mechanism of the lantibiotic cyclase involved in nisin biosynthesis," *Science*, 311, 1464–1467 (2006).

**Highlighted in perspective "Five golden rings," *Science*, 311, 1382–3 (2006); "Antimicrobials: A ringing success," *Nature Reviews Microbiol.*, 4, 322–3 (2006); "Resisting the resistance," *ACS Chem. Biol.*, 1, 119 (2006); "Nisin engineered in test tube," *Chemical and Engineering News*, 84, 9 (2006).**

### **Book Chapter**

1. Cooper, L.E., Li, B., van der Donk, W.A. "Biosynthesis and mode of action of lantibiotics," In *Comprehensive Natural Products Chemistry II*, Eds. Mander, L., Liu, H-w., (May 2010).

## ***Invited Meeting and Conference Oral Presentations***

### **Invited**

14. Metals in Biology Gordon Research Conference, Ventura, CA (Jan 27–Feb 1, 2019)
13. The 70<sup>th</sup> Southeastern Regional Meeting of American Chemical Society, Augusta, GA (Oct 31–Nov 3, 2018)

### **Completed**

12. “A new bacterial small molecule suppresses plant immune response,” Society for Industrial Microbiology and Biotechnology Annual Meeting, Chicago, IL (Aug 12–16, 2018)
11. “Metal-chelating antibiotics and natural products,” Metals in Medicine Gordon Research Conference, Andover, NH (June 24–29, 2018)
10. “Biosynthesis of nonproteinogenic amino acids,” American Society for Biochemistry and Molecular Biology Annual Meeting, San Diego, CA (Apr 21–25, 2018)
9. “Mighty chemistry of bacterial small molecules,” American Chemical Society National Meeting, New Orleans, LA (Mar 18–22, 2018) *ACS Chemical Biology* Lectureship Symposium
8. “Biosynthesis of nonproteinogenic amino acids,” The Southeastern Regional Meeting of the American Chemical Society, Charlotte, NC (Nov 8–10, 2017)
7. “Biosynthesis of nonproteinogenic amino acids,” Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville, NH (July 16–21, 2017)
6. “Dithiopyrrolones as antibiotics and organocatalysts for protein oxidation,” Bioorganic Chemistry Gordon Research Conference, Andover, NH (June 11–16, 2017)
5. “Chemistry and Social Life of Bacteria,” 9<sup>th</sup> US-Japan Seminar on the Biosynthesis of Natural Products, Lake Arrowhead Conference Center, University of California at Los Angeles, Los Angeles, CA (May 30–June 4, 2017)
4. “Deciphering the logic of natural product biosynthesis,” American Society for Biochemistry and Molecular Biology Annual Meeting, Chicago, IL (Apr 22–26, 2017)
3. “Mining genomes for antibiotics and signaling molecules,” Directing Biosynthesis V, Warwick, UK (Mar 22–24, 2017)
2. “From amide forming enzymes to discovery and engineering of bioactive molecules,” The International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI (Dec 15–20, 2015)
1. “Discovering and deciphering natural product biosynthetic pathways in the era of synthetic biology,” Society for Industrial Microbiology and Biotechnology Annual Meeting, St. Louis, MO (July 20–24, 2014)

## ***Invited University and Institution Lectures***

### **Invited**

22. Northwestern University, Department of Chemistry, Evanston (May 31, 2019)
21. College of Charleston, Charleston, SC (Oct 18, 2018)
20. Memorial Sloan Kettering Cancer Center, Chemical Biology Program, New York, NY (Oct, 9, 2018)
19. University of Minnesota, Department of Medicinal Chemistry, Chemical Biology Initiative, Minneapolis, MN (Oct 1, 2018)

18. The University of North Carolina at Chapel Hill, Department of Microbiology and Immunology, Chapel Hill, NC (Sep 18, 2018)

### **Completed**

17. University of California, San Francisco, Department of Pharmaceutical Chemistry, San Francisco, CA (May 17, 2018)
16. Stanford University, Department of Chemical Engineering, Palo Alto, CA (May 16, 2018)
15. Harvard University, Chemistry and Chemical Biology, Cambridge, MA (May 11, 2018)
14. University of California, San Diego, Scripps Institute of Oceanography, San Diego, CA (Apr 26, 2018)
13. Cornell University, Department of Chemistry, Ithaca, NY (Mar 12, 2018)
12. Texas Agricultural and Mechanical University, Department of Chemistry, College Station, TX (Feb 23, 2018)
11. Yale University, Department of Chemistry, New Haven, CT (Feb 15, 2018)
10. University of Texas at Austin, Department of Chemistry, Austin, TX (Feb 9, 2018)
9. University of Chicago, Department of Chemistry, Chicago, IL (Oct 17, 2017)
8. The University of Illinois at Urbana-Champaign, Department of Chemistry, Urbana, IL (Oct 16, 2017)
7. University of Manchester, Manchester Institute of Biotechnology, Manchester, UK (Mar 27, 2017)
6. John Innes Centre, Molecular Microbiology, Norwich, UK (Mar 20, 2017)
5. Oxford University, Department of Chemistry, Oxford, UK (Mar 17, 2017)
4. University of Wisconsin-Madison, Distinguished Lecture in Microbiology, Madison, WI (Oct 20, 2016)
3. Marshall University, Department of Chemistry, Huntington, WV (Nov 3, 2015)
2. The University of North Carolina at Chapel Hill, Department of Cell Biology and Physiology, Chapel Hill, NC (Nov 17, 2014)
1. Wake Forest University, Departments of Chemistry and Biochemistry, Wake Forest, NC (Oct 23, 2013)

### **Conference abstracts (poster presentations)**

8. "Identification of the biosynthetic pathway for the antibiotic bicyclomycin," Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville, NH (July 22–27, 2018)
7. "A new bacterial small molecule suppresses plant immune response," Bioorganic Gordon Research Conference, Andover, NH (June 10–15, 2018)
6. "A new bacterial small molecule suppresses plant immune response," American Society for Biochemistry and Molecular Biology Annual Meeting, San Diego, CA (Apr 21–25, 2018)
5. "Reactivity and antimicrobial mechanism of dithiopyrrolones," Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville, NH (July 24–29, 2016)
4. "Reactivity and antimicrobial mechanism of dithiopyrrolones," Bioorganic Chemistry Gordon Research Conference, Andover, NH (June 5–10, 2016)
3. "Microbial small molecules in plant infection and biocontrol," Microbial and Plant Systems Modulated by Secondary Metabolites Meeting, Walnut Creek, CA (May 2–4, 2016)

2. "From amide forming enzymes to discovery and engineering of bioactive molecules," Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville, NH (July 12–17, 2015)
1. "Mapping the biosynthesis and reactivity of dithiolopyrrolone antibiotics," Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville, NH (July 13–17, 2014)

## **TEACHING ACTIVITIES**

### ***Courses Taught in the Last 3 Years***

2018 Spring	Metabolic Chemistry and Cellular Regulatory Networks (CHEM 432) Enrollment: 58 undergraduate students
2017 Spring	Metabolic Chemistry and Cellular Regulatory Networks (CHEM 432) Enrollment: 71 undergraduate students
2016 Spring	Metabolic Chemistry and Cellular Regulatory Networks (CHEM 432) Enrollment: 65 undergraduate students
2016 Spring	BBSP First Year Group (BBSP 902) Enrollment: 15 Ph.D. students
2015 Fall	BBSP First Year Group (BBSP 902) Enrollment: 15 Ph.D. students

### ***Graduate students supervised***

10. Adam Lescallete            2018 – present  
B.S. Juniata College, Huntingdon, PA
9. Katie Acken                2018 – present  
B.S. North Carolina State University
8. Rachel Johnson            2016 – present  
M.S. East Carolina University
7. Gina Morgan                2015 – present  
B.S. Regis University, Denver, CO
6. Jonathan Patteson        2015 – present  
B.S. University of Richmond
5. Andrew Chan                2014 – present  
B.S. The University of North Carolina Chapel Hill
4. Ashley Kretsch            2014 – present  
B.S. Harvie Mudd College
3. Erinn O'Neill               2014 – present  
B.S. Drew University
2. Kevin Santa Maria        2014 – present  
B.S. University of Connecticut
1. Zachary Dunn              2014 – 2018 (Ph.D. May, 2018)  
*Thesis:* Characterization of biosynthetic enzymes of thiomarinol and oxyvinylglycines  
B.S. Wheaton College

### **Postdoctoral fellows supervised**

3. Elissabetta Massolo      1/2017 – 12/2017  
Ph.D. University of Milano (Advisor: Maurizio Benaglia)  
*Current position:* University of Milano
2. Wenlong Cai              10/2015 – 10/2016  
Ph.D. University of Kentucky (Advisor: Steven van Lanen)  
*Current position:* Postdoc at the University of California, Berkeley
1. Jillian Tyrrell            07/2013 – 04/2015  
Ph.D. The University of North Carolina Chapel Hill (Advisor: Gary Pielak)  
*Current position:* Truvian Sciences, San Diego, CA

### **Undergraduate students supervised**

8. Martina Knechel          6/2016 – 5/2018  
*Honors Thesis:* Characterizing a novel signaling pathway in *Pseudomonas entomophila*: elucidation of the signal cascade initiated by *Pseudomonas virulence factor* through transposon mutagenesis
7. Savannah Weeks        6/2015 – 5/2018
6. Evan Xu                  1/2016 – 9/2016
5. Kiera Brigh Turner      1/2015 – 12/2015
4. Emily Batchelor        8/2015 – 11/2015
3. Holly Ozgun             1/2015 – 5/2015
2. Courtney Whitaker     5/2013 – 5/2014
1. Peter Fan                5/2013 – 8/2013

### **GRANTS**

#### **Current Support as PI**

##### **National Institutes of Health Director's New Innovator Award (DP2)**

*Title:* Mining Genomes for Synergistic Antibiotics

*Role:* Principal Investigator

*Dates:* 9/30/2017–6/30/2022

##### **National Science Foundation CAREER Award**

*Title:* CAREER: Combining Chemistry with Bioinformatics to Discover Novel Transformations of Nonproteinogenic Amino Acids

*Role:* Principal Investigator

*Dates:* 7/15/2017–6/30/2022

##### **Packard Fellowship in Science and Engineering**

*Title:* Natural Antibiotic Cocktails for Combination Therapy

*Role:* Principal Investigator

*Dates:* 11/15/2016–11/14/2021

##### **Rita Allen Foundation Scholars Award**

*Title:* Discovering Neuroactive Metabolites at the Gut-Brain Axis

*Role:* Principal Investigator

*Dates:* 9/1/2016–8/31/2021

### ***Completed Support as PI***

#### **National Institutes of Health Pathway to Independence Award**

*Title:* Dithiopyrrolone Antibiotics: Biosynthesis, Mode of Action and Cellular Function

*Role:* Principal Investigator

*Dates:* 8/12/2013–6/30/2017

### ***Support as Co-PI***

#### **National Science Foundation Major Research Instrumentation Program**

*Title:* Upgrade of a 600 MHz Spectrometer for high-sensitivity Nuclear Magnetic Resonance

*Role:* Co-investigator

## **PROFESSIONAL ACTIVITIES**

### **Memberships**

Society for Industrial Microbiology and Biotechnology	2013 – current
American Chemical Society	2010 – current

### **Reviewers for journals**

*ACS Catalysis, Biochemistry, Cell Chemical Biology, Chemical Science, Journal of American Chemical Society, Journal of Biological Chemistry, Nature, Nature Biotechnology, Nature Chemical Biology, Natural Product Report, Organic Letters, PLoS One, PLoS Pathogens, Science*

### **Reviewers for grant proposals**

National Science Foundation (2015)

### **Conference discussion leader**

Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville, NH (July 22–27, 2018)