

Elizabeth (Betsy) I. Parkinson

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EDUCATION

Ph.D. in Chemistry with a focus on Chemical Biology, September 2015

University of Illinois at Urbana-Champaign, Urbana, IL
Cumulative GPA: 3.93/4.00

Certificate in Foundations of Teaching, April 2015

Center for Innovation in Teaching and Learning
University of Illinois at Urbana-Champaign, Urbana, IL

B.S. with Honors in Chemistry, May 2010

Rhodes College, Memphis, TN
Graduated *summa cum laude*
American Chemical Society certification
Cumulative GPA: 4.00/4.00

ACADEMIC EXPERIENCE

Fall 2018

Assistant Professor

Department of Chemistry and Department of Medicinal Chemistry and Molecular Pharmacology, Purdue University, West Lafayette, IN

- Discover novel bioactive natural products (antibiotic and anticancer) from cryptic biosynthetic gene clusters found in soil dwelling bacteria
- Utilize chemical biology to study mechanisms of bioactive natural products
- Use organic synthesis to make bioactive natural products and analogues with improved properties

2015-Present

NIH Postdoctoral Fellow in Genetics, Microbiology, and Natural Product Biosynthesis

With Professor William W. Metcalf

Department of Microbiology, University of Illinois at Urbana-Champaign, Urbana, IL

- Studied the biosynthetic pathways of phosphonic acid antibiotics in *Streptomyces* species
- Discovered new natural products and their biosynthetic pathways via metabologenomics (a method that correlates biosynthetic gene clusters with specific masses in bacterial extracts)

2010-2015

NSF and ACS Graduate Research Fellow in Chemical Biology and Medicinal Chemistry

With Professor Paul J. Hergenrother

Department of Chemistry, University of Illinois at Urbana-Champaign, Urbana, IL

- Evaluated deoxynyboquinone (DNQ) as an anticancer agent using in vitro, tissue culture, & murine xenograft models
- Designed, synthesized, and performed biological evaluation of DNQ derivatives
- Identified anti-cancer compounds through cell-based high-throughput screening and subsequent target identification
- Evaluated deoxynybomycin (DNM) as an antibacterial agent
- Designed, synthesized, and performed biological evaluation of DNM derivatives

2007-2010

St. Jude Summer Plus Undergraduate Research Fellow in Molecular Pharmacology

With Doctor Philip M. Potter

Chemical Biology and Therapeutics, St. Jude Children's Research Hospital, Memphis, TN

- Synthesized selective carboxylesterase (CE) inhibitors as potential agents to ameliorate the dose-limiting toxicity of the chemotherapeutic irinotecan
- Evaluated CE inhibitors in vitro and in tissue culture

PUBLICATIONS

12. Parkinson, E.I.; Ju, K.; Eliot, A.C.; Metcalf, W.W. "Biosynthesis and bioactivity of dehydrofosmidomycin." In preparation. **2018**

11. Montgomery, W.; Knezevic, C. E.; Parkinson, E.I.; Lee, H.Y.; Granger, B. A.; Hua, B.; Sahn, J.J.; Martin, S. F.; Hergenrother, P.J. "An endoplasmic reticulum stress-inducing compound that kills cancer cells with uniformly high Hill slope and E_{max} values." In preparation. **2018**.

PUBLICATIONS (continued)

10. Parkinson, E.I.; Goering, A.W.; Tryon, J.H.; Ju, K.; McClure, R.A.; Kemball, J.D.; Zhukovsky, S.; Thomson, R.J.; Kelleher, N.L.; Metcalf, W.W. *ACS. Chem. Biol.* **2018**, "Discovery of the Tyrobetaine Natural Product Family and Their Biosynthesis Using Metabologenomics." *13*,1029. DOI: 10.1021/acscchembio.7b01089

9. Lee, H.Y.; Parkinson, E.I.; Granchi, C.; Panigrahy, D.; Seth, P.; Minutolo, F.; Hergenrother, P.J. *ACS Chem. Biol.* **2017**, "Reactive Oxygen Species Synergize to Potently and Selectively Induce Cancer Cell Death". *12*, 1416. DOI: 10.1021/acscchembio.7b00015

8. Lundberg, A.P.; Francis, J.M.; Pojaka, M.; Parkinson, E.I.; Wycisloc, K.; Rosold, T.J.; Browne, M.E.; Londond, C.A.; Dirikoluf, L.; Hergenrother, P.J.; Fan, T.M. *Invest. New Drugs.* **2017**, "Pharmacokinetics and derivation of an anticancer dosing regimen for the novel anti-cancer agent isobutyl-deoxyxyboquinone (IB-DNQ) in the domestic felid species." *35*, 134. DOI:10.1007/s10637-016-0414-z.

7. Parkinson, E.I.; Hergenrother, P.J. *Acc. Chem. Res.* **2015**, "Deoxyxyboquinones as Personalized Cancer Therapeutics." *48*, 2715. DOI: 10.1021/acs.accounts.5b00365

6. Parkinson, E.I.; Bair, J.S.; Nakamura, B.A.; Lee, H.Y.; Kuttub, H.K.; Southgate, E.S.; Lau, G.W.; Hergenrother, P.J. *Nat. Commun.* **2015**, "Deoxyxybomycins Inhibit Mutant DNA Gyrase and Rescue Mice Infected with Fluoroquinolone-Resistant Bacteria." *6*, 6947. DOI: 10.1038/ncomms7947

5. Granger, B. A.; Jewett, I. T.; Butler, J. D.; Hua, B.; Knezevic, C. E.; Parkinson, E.I.; Hergenrother, P. J.; Martin, S. *F. J. Am. Chem. Soc.* **2013**, "Synthesis of (±)-Actinophyllic Acid and Analogs: Applications of Cascade Reactions and Diverted Total Synthesis." *135*,12984-12986. DOI: 10.1021/ja4070206

4. Parkinson, E.I.; Bair, J.S.; Cismesia, M. Hergenrother, P.J. *ACS Chem. Biol.* **2013**, "Efficient NQO1 Substrates are Potent and Selective Anticancer Agents." *8*, 2173-2183, DOI: 10.1021/cb4005832

3. Huang, X.; Dong, Y.; Bey, E.A.; Kilgore, J.A.; Bair, J.S.; Li, L.; Patel, M.; Parkinson, E.I.; Wang, Y.; Williams, N.S.; Gao, J.; Hergenrother, P.J.; Boothman, D.A. *Cancer Res.* **2012**, "An NQO1 Substrate with Potent Antitumor Activity that Selectively Kills by PARP1-Induced Programmed Necrosis." *72*, 3038-3047, DOI: 10.1158/0008-5472.CAN-11-3135.

2. Parkinson, E.I.; Hergenrother, P.J. *ChemMedChem.* **2011**, "Runaway ROS as a Selective Anticancer Strategy." *6*, 1957-1959, DOI: 10.1002/cmcd.201100381.

1. Parkinson, E.I.; Hatfield, J.M.; Tsurkan, L.; Hyatt, J.L.; Edwards, C.C.; Hicks, L.D.; Yan, B.; Potter, P.M. *Bioorg. Med. Chem.* **2011**, "Requirements for mammalian carboxylesterase inhibition by substituted ethane-1,2-diones." *29*, 4635-4643, DOI: 10.1016/j.bmc.2011.06.012.

PATENTS

4. Hergenrother, P.J.; Parkinson, E.I.; Bair, J.S. 2015. Compounds for treatment of fluoroquinolone-resistant bacteria. WO 2015142952 filed Mar. 17, 2015 and issued Sep. 24, 2015.

3. Hergenrother, P. J.; Knezevic, C. E.; Parkinson, E. I.; Martin, S. F.; Granger, B. A. 2015. Anticancer Agents. WO 2015006615 filed July 10, 2014 and issued Jan. 15, 2015.

2. Hergenrother, P.J.; Boothman, D.A.; Bair, J.S.; Cao, L.; Gao, J.; Huang, X.; Luo, X.; Ma, X.; Moore, Z.R.; Parkinson, E.I. 2014. Tumor Selective Combination Therapy. WO 2014168991 filed April 8, 2014, issued Oct. 16, 2014.

1. Hergenrother, P.J.; Boothman, D.A.; Bair, J.S.; Palchaudhuri, R.; Parkinson, E.I. 2013. Preparation of antitumor NAD(P)H quinone oxidoreductase substrates. WO2013056073 filed Oct. 12, 2012 and issued April 18, 2013; CA 2887648 filed Oct. 12, 2012 and issued April 18, 2013; EP 2768308 filed Oct. 12, 2012 and issued Aug. 27, 2014; US 20150011509 filed April 14, 2014 and issued Jan. 8, 2015.

TEACHING EXPERIENCE

- Summer 2016 to Present **Research Mentor**
Lab PI: Professor William Metcalf, University of Illinois, Urbana, IL
- Mentored a chemistry graduate student completing a one-month rotation and a microbiology undergraduate student completing a summer and two semesters of research
 - Instructed them on proper laboratory techniques including natural product isolation, natural product purification, and bacterial and mammalian cell culture
 - Developed projects based on student interest (e.g. fractionation of extracts from *Streptomyces* and testing for activity against pathogenic bacteria and cancer cell lines for the undergraduate interested in discovering novel medications)
 - Assisted in the preparation of oral presentations about their research
- Fall 2014 **Teaching Assistant, Fundamental Organic Chemistry I (Chem 236)**
Course Instructor: Prof. Steven Zimmerman, University of Illinois, Urbana, IL
- Led discussion sections (3 sections with 25-30 students per section)
 - Made weekly worksheets for students to practice new material
 - Encouraged them to work in groups to improve their understanding and ability to communicate scientific ideas
 - Wrote and gave quizzes to assess student understanding of concepts including reaction mechanisms and small molecule synthesis
 - Assisted in writing and grading of examinations
 - Guest lectured class (~260 students) on conformational analysis, Newman projections, basic kinetics and thermodynamics of isomerism, and nomenclature of alkanes
 - 2014 UIUC List of Teachers Ranked Excellent by their Students; Rating of outstanding (Top 10% in Overall Teaching Effectiveness)
 - 2014-2015 School of Chemical Sciences Graduate Student Teaching Award
- April 2014 **Guest Lecturer, Chemical Biology Laboratory Class (Chem 590)**
Course Instructor: Professor Paul Hergenrother, University of Illinois, Urbana, IL
- Applied expertise in mammalian cell culture during instruction of 13 graduate students in mammalian cell culture and led a demonstration of sterile technique
- 2010-2015 **Research Mentor**
Lab PI: Professor Paul Hergenrother, University of Illinois, Urbana, IL
- Instructed 11 students (1 high school, 2 chemistry undergraduate, 3 biochemistry undergraduate, 2 veterinary medicine, and 3 chemistry graduate) on laboratory techniques including organic chemistry, enzymatic assays, bacterial and mammalian cell culture
 - Developed projects appropriate for each student based on their interest, prior experience, and expected duration of research experience
 - Assisted in the preparation of undergraduate senior theses and posters for presentations
- Summer 2009 **Laboratory Assistant**
Rhodes College, Memphis, TN
- Developed and wrote protocols for laboratory experiments for high school classes
 - Assisted in designing and running a conference to improve laboratory instruction skills of ~15 high school chemistry teachers
 - Constructed laboratory kits for high school classrooms lacking adequate equipment
- Fall 2008 to Spring 2010 **Teaching Assistant, Chemistry and Archaeology/Art Laboratory (Chem 107 and 108)**
Course Instructor: Professor David Jeter, Rhodes College, Memphis, TN
- Led laboratory sections (4 classes, ~25 students per class) focused on the interface of chemistry and archaeology or art
 - Increased student understanding of chemistry through assistance in laboratory and graded written assignments
- Winter 2007 to Spring 2009 **General Chemistry/Organic Chemistry Tutor**
Rhodes College, Memphis, TN
- Improved student performance in general and organic chemistry through private instruction

TRAINING IN TEACHING

- Spring 2017 **Educational Organization & Leadership 585: College Teaching (audited)**
 Profs. Michel Bellini, Cheelan Bo-Linn, Faye Lesht, *University of Illinois, Urbana, IL*
- Spring 2016 **Chemistry 590F: Preparing Future Faculty (audited)**
 Prof. Steven Zimmerman, *University of Illinois, Urbana, IL*
- Summer 2014 **Center for Innovation in Teaching and Learning Workshop:
 What You Need to Know: Essentials of Effective Teaching**
 Profs. Lucas Anderson and Sandy Finley, *University of Illinois, Urbana, IL*

LEADERSHIP ROLES AND SERVICE

- June 2015-
 June 2017 **High Throughput Chemistry and Chemical Biology Gordon Seminar
 Chair for 2017 meeting; Co-chair for 2015 meeting**
Colby Sawyer College, New London, NH and Proctor Academy, Andover, NH
 - Submitted a NIGMS R13 proposal and solicited donations from industry to fund the meeting
 - Developed the program for the meeting including choosing speakers and poster presenters
 - Advertised the seminar
 - Led discussion sections for the seminar (Finding Vulnerabilities of Cancer and Malaria, 2015) and the conference (Chemical Probes for Profiling and Perturbation / Selectivity and Dynamics, 2015 and Small Molecule Probes and Drug Candidates, 2017)
- June 2016-
 June 2017 **Institute for Genomic Biology Postdoctoral Association
 Co-chair**
Carl R. Woese Institute for Genomic Biology, University of Illinois at Urbana-Champaign, Urbana, IL
 - Planned and advertised meetings, professional development workshops, and outside speakers
 - Aided in the implementation of a postdoctoral mentoring plan
- May 2017 **The World of Genomics
 Volunteer**
The Field Museum of Natural History, Chicago, IL
 - Explained drug discovery and the problem of antimicrobial resistance to museum visitors
- November 2015&
 November 2016 **Carl R. Woese Institute for Genomic Biology Genome Day
 Volunteer**
University of Illinois at Urbana-Champaign, Urbana, IL
 - Led an experiment table to educate grade-school aged children about the structure of DNA
 - Led an experiment table to educate children about phylogenetic classification of organisms
- March 2016 **Girls Do Science Club for K-5th Grade Chemistry
 Volunteer**
Orpheum Children's Science Museum, Champaign, IL
 - Planned and performed chemistry demonstrations and experiments with 32 K-5th grade girls
- March 2016 **Mining Microbial Genomes Symposium
 Co-Chair**
Carl R. Woese Institute for Genomic Biology, University of Illinois at Urbana-Champaign, Urbana, IL
 - Recruited presenters for the symposium
 - Led the afternoon session for the symposium
- January 2012-
 September 2015 **Hergenrother Laboratory Safety Officer**
University of Illinois at Urbana-Champaign, Urbana, IL
 - Ensured compliance with proper safety procedures in the Hergenrother laboratory
 - Presented annual safety lectures and helped the laboratory prepare for safety inspections
 - Served on a departmental safety committee to determine a mechanism for regular laboratory inspections and institute a follow-up mechanism to remedy deficiencies

LEADERSHIP ROLES AND SERVICE (continued)

- March 2014 **Chemical Biology Graduate Student Recruiting Weekend**
Co-coordinator
University of Illinois at Urbana-Champaign, Urbana, IL
- Organized a visit weekend for 12 students accepted to the UIUC Chemical Biology program
 - Matched host students to prospective students
 - Ensured proper travel arrangements for prospective students
- 2010-
Present **Encouraging Tomorrow's Chemists**
Co-coordinator, 2012-2013; volunteer, 2010-present
University of Illinois at Urbana-Champaign, Urbana, IL
- Planned and volunteered at chemistry demonstrations for local middle and elementary schools
- 2011-
2015 **Women Chemists Committee Girls Day Camp**
Coordinator, 2012; Station Leader, 2013; volunteer, 2011, 2014-2015
University of Illinois at Urbana-Champaign, Urbana, IL
- Organized a day camp for 90 middle school girls with scientific experiment stations
 - Assisted graduate students in planning experiments for stations
 - Demonstrated the concepts of solubility and chromatography through a t-shirt tie dying station
 - Volunteered at multiple stations including food chemistry and chemistry of art
- 2006-
2010 **Rhodes College Associates of the American Chemical Society**
Vice President, 2009-2010; President, 2008-2009; Outreach Chair, 2006-2008
Rhodes College, Memphis, TN
- Organized the annual Natural Science Picnic for ~200 people
 - Organized outreach activities at underprivileged elementary and middle schools in Memphis
 - Assisted in organizing the Pumpkin Drop, an event to encourage interest in college students' interest in science
 - Honorable Mention Chapter Award for 2008-2009 activities at 239th ACS National Meeting

HONORS AND AWARDS

NIH Ruth L. Kirschstein National Research Service Award, F32, 2017-2019
School of Chemical Sciences Graduate Student Teaching Award, 2014-2015
UIUC List of Teachers Ranked as Excellent by Their Students, 2014
R.C. Fuson Fellowship, 2013-2014
ACS Medicinal Chemistry Pre-Doctoral Fellowship, 2013-2014
Seemon Pines Travel Award, 2013
Best Poster Award at the Medicinal Chemistry Gordon Research Conference, 2013
Fuson Memorial Travel Award, 2013
Best Student Poster Award at the University of Illinois Cancer Center Research Forum, 2012
National Science Foundation Graduate Research Fellow, 2010-2013
Phi Beta Kappa, 2009
Omicron Delta Kappa, 2009
Mortar Board, 2009
Beta Beta Beta National Biological Honors Society, 2009
William Spandow Scholarship in Chemistry, 2009
Barry M. Goldwater Scholarship, 2008
Iota Sigma Pi: National Honor Society of Women in Chemistry, 2008
Rhodes College Organic Chemistry Award, 2008
Rhodes College First-year Biology Award, 2008
CRC First-year Chemistry Award, 2007
Rhodes College Honor Roll, 2006-2010

MEETING PRESENTATIONS

17. Natural Product Discovery and Development in the Genomic Era, Society for Industrial Microbiology, Clearwater Beach, FL, January 2018 (poster)
Discovery of the Tyrobetaine Natural Product Family and Their Biosynthesis Using Metabologenomics

MEETING PRESENTATIONS (continued)

16. High Throughput Chemistry and Chemical Biology Gordon Conference and Seminar, Andover, NH, June 2017 (poster)*Discovery of the Tyrobetaine Natural Product Family and Their Biosynthesis Using Metabologenomics***15. Better Cancer Therapy from Redox Biology, Cold Springs Harbor, NY, April 2017 (invited speaker)***Deoxyxyboquinones as NQO1-targeted anticancer compounds***14. Mining Microbial Genomes Annual Symposium, Urbana, IL, January 2017 (oral presentation)***Discovery of the Tyrobetaine Natural Product Family and Their Biosynthesis Using Metabologenomics***13. Mining Microbial Genomes Annual Symposium, Urbana, IL, March 2016 (Poster)***Characterization of Phosphonate Production by the Reported Fosmidomycin Producer *Streptomyces lavendulae* strain Fujisawa 8006***12. High Throughput Chemistry and Chemical Biology Gordon Conference and Seminar, New London, NH, June 2015 (poster)***Deoxyxybomycins Inhibit Mutant DNA Gyrase & Rescue Mice Infected with Fluoroquinolone-Resistant Bacteria***11. 2015 Cal Meyers Memorial Organic Chemistry Symposium, Carbondale, IL, April 2015 (oral presentation)***Deoxyxybomycins Inhibit Mutant DNA Gyrase & Rescue Mice Infected with Fluoroquinolone-Resistant Bacteria***10. 248th American Chemical Society National Meeting, San Francisco, CA, August 2014 (oral presentation)***Synthesis and Biological Evaluation of Compounds with Activity against Antibacterial Resistant Bacteria***9. 27th Annual Beak-Pines Organic Area Allerton Conference, Monticello, IL, November 2013 (poster)***Synthesis and Biological Evaluation of Compounds with Activity against Antibacterial Resistant Bacteria***8. Medicinal Chemistry Gordon Conference and Seminar, New London, NH, August 2013 (poster)***Efficient NQO1 Substrates are Potent and Selective Anticancer Agents
(best poster award)***7. High Throughput Chemistry and Chemical Biology Gordon Conference and Seminar, New London, NH, June 2013 (poster for the conference and oral presentation for the seminar)***Efficient NQO1 Substrates are Potent and Selective Anticancer Agents***6. 24th EORTC-NCI-AACR Symposium on Molecular Targets and Cancer Therapeutics, Dublin, Ireland, November 2012 (poster)***Targeting NQO1 as a Potential Anticancer Strategy Using the Small Molecule Deoxyxyboquinone***5. Cancer Community at Illinois Symposium, Urbana, IL, April 2012 (poster)***Targeting NQO1 as a Potential Anticancer Strategy Using the Small Molecule Deoxyxyboquinone***4. University of Illinois Cancer Center Research Forum, Chicago, IL, March 2012 (poster)***Targeting NQO1 as a Potential Anticancer Strategy Using the Small Molecule Deoxyxyboquinone
(best student poster award)***3. 239th American Chemical Society National Meeting, San Francisco, CA, March 2010 (poster)***Synthesis and Biological Evaluation of Benzil Based Carboxylesterase Inhibitors***2. AACR/ACS Chemistry in Cancer Research: A Vital Partnership in Cancer Drug Discovery and Development, New Orleans, LA, February 2009 (poster)***Benzil-based Inhibitors of Carboxylesterases***1. Rhodes College Undergraduate Research and Creative Activity Symposium, Memphis, TN, April 2008 (oral presentation)***Benzil-based Inhibitors for Carboxylesterases*