John Chaston

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Education

Ph.D.	Microbiology Doctoral Training Program. University of Wisconsin-Madison (UW-Madison). Madison, WI. Aug 2005-Aug 2011
B.S.	Microbiology. Brigham Young University (BYU). Provo, UT (cum laude). Sep 2003-Aug 2005
No Degree	Microbiology Major. University of New Hampshire (UNH). Durham, NH. Sep 1999-May 2000, Sep 2002-May 2003

Research Experience

Post-doctoral

- **Post-doctoral Associate.** Laboratory of Dr. Angela Douglas; Cornell University — *Sep '11 - present*

Genomics and transcriptomics of fruit flies and their beneficial intestinal bacteria.

Graduate

- **Research Assistant**. Laboratory of Dr. Heidi Goodrich-Blair; UW-Madison — *Jan '06-Aug '11*

Genetics of host-microbe interactions from a microbial perspective. Specifically, understanding the role of three bacterial genes that are required and sufficient for host colonization by a mutualistic microbial partner. The most useful tools in probing these functions have been site-directed mutagenesis, gene expression assays, and epifluorescent microscopy.

Undergraduate

- **Research Assistant** Laboratory of Dr. Byron Adams; BYU — *Jan'03 – Aug '05*
- **Research Assistant** McMurdo Dry Valleys Long-Term Ecological Research Station: National Science Foundation United States Antarctic Program; Colorado State University, Lead Co-PI: Dr. Diana H. Wall — *Dec '04 – Jan '05*
- **Laboratory Technician III** Teaching Laboratory; UNH — *Summer '00, Sep '02 – Aug '03*
- **Research Assistant** Laboratory of Dr. Robert Zsigray; UNH — *Summer '99, Academic '00, Jan-Aug'03*

Publications

John M. Chaston, Kristen Murfin, and Heidi Goodrich-Blair. Xenorhabdus nematophila *nil* colonization factors are necessary and sufficient for early colonization of specific tissues of the nematode Steinernema carpocapsae. In preparation for submission to *Cellular Microbiology*

Characterizes and describes the events that lead to colonization of a model animal host by its symbiotic bacteria. I described and imaged these events, and I verified most of the findings (K. Murfin verified the remaining findings).

John M. Chaston and Angela Douglas. Making the Most of Omics for Symbiosis Research. Invited review, Biological Bulletin. *Submitted.*

Discusses applications of omics approaches to studying symbiosis and suggests two "next-generation" next-generation analysis tools.

Bhasin, Archna*, **John M. Chaston***, and Heidi Goodrich-Blair. Mutational analyses reveal overall topology and functional regions of NilB, a bacterial outer membrane protein required for host-association in a model animal-bacterial mutualism. *Accepted*. J. Bacteriology. *20 Jan 2012*

Characterizes an outer membrane protein that is a member of one of only two families of reported animal mutualist species-specificity factors. I performed more than half of the experiments and was the primary drafter of the manuscript.

Adler R. Dillman, **John M. Chaston**, Byron J. Adams, Todd A. Ciche, Heidi Goodrich-Blair, S. Patricia Stock, and Paul W. Sternberg. An Entomopathogen By Any Other Name. *Accepted*. PLoS Pathogens*, 27 Dec 2011***.**

Addresses the debate regarding if newly described associations between insect pathogenic bacteria and nematodes should be classified as entomopathogenic nematodes. I assisted in developing and formalizing late stages of the manuscript and extensively in revising based on reviewer comments.

Darby R. Sugar, Kristen E. Murfin, **John M. Chaston**, Aaron W. Andersen, Gregory R. Richards, James A. Baum, Steven Forst, Barry S. Goldman, William P. Clinton, Karina C. Krasomil-Osterfeld, Steven Slater, S. Patricia Stock, and Heidi Goodrich-Blair. Phenotypic variation and host interactions of *Xenorhabdus bovienii* SS-2004, the entomopathogenic symbiont of *Steinernema jollieti* nematodes. *Accepted*. Environmental Microbiology, 3 Nov 2011.

The Xenorhabdus nematophila / Steinernema carpocapsae pair are the established model for studying host-microbe interactions in these genera of entomopathogenic nematode. This study characterizes another entomopathogenic nematode pair for future studies that compare mechanisms of mutualism within these genera. I assisted with confocal microscopy.

Chaston, John M.*, Garret Suen* *et al*. The Entomopathogenic Bacterial Endosymbionts Xenorhabdus and Photorhabdus: Convergent Lifestyles from Divergent Genomes. PLoS ONE 6(11): e27909. doi:10.1371/journal.pone.0027909

Shows significant differences between two bacterial species with similar lifestyles and provides extensive comparison to closely related bacteria with similar lifestyles, P. luminescens and P. asymbiotica. Drafted various analyses into a cohesive story and contributed to genome annotation.

Chaston, John M.*, Adler R. Dillman*, David I. Shapiro-Illan, Anwar Bilgrami, Randy Gaugler, Keith Hopper, and Byron J. Adams. 2011. Outcrossing and crossbreeding recovers deteriorated traits in laboratory cultured *Steinernema carpocapsae* nematodes. *The International Journal for Parasitology*. 41: 801–809

Suggests solutions for nematode trait deterioration during mass production for commercial distribution. Assisted in proof of concept for experimental design (Dillman and Shapiro-Ilan performed most of the experiments) and was the primary drafter of the manuscript.

Goodrich-Blair, Heidi et al. **2010**. Symbiosis research, technology, and education: Proceedings of the 6th International Symbiosis Society Congress held in Madison Wisconsin, USA, August 2009.*Symbiosis*. 51:1–12

Conference proceedings article prefacing select material from the 6th International Symbiosis Society Congress. I chaired the student committee that organized a Post-Doc/Professional Development Forum. International faculty from diverse institutional backgrounds discussed material at our request and responded to audience questions. We summarized the proceedings.

Chaston, John and Heidi Goodrich-Blair. **2010**. Common trends in mutualism revealed by model associations between invertebrates and bacteria. *FEMS Microbiology Reviews*. 34: 41-58

An invited review article. One of the first review articles to draw upon emerging trends from genetic analysis of multiple horizontally transmitted symbionts (previous articles focused on vertically transmitted symbioses or trends emerging from the study of a single symbiont). Related articles include Nat. Rev. Microbiol. ***2008****. 6, 752-762; Nat. Rev. Microbiol.* ***2010*** *8, 218-230; and Trends Microbiol.* ***2010****. 18(10):504-511. I was the primary drafter of the manuscript.*

Adhikari, Bishwo N., Chin-Yo Lin, Xiaodong Bai, Todd A. Ciche, Parwinder S. Grewal, Adler R. Dillman, **John M. Chaston**, David I. Shapiro-Ilan, Anwar L. Bilgrami, Randy Gaugler, Paul W. Sternberg, Byron J. Adams. **2009**. Transcriptional profiling of trait deterioration in the insect pathogenic nematode *Heterorhabditis bacteriophora*. *BMC Genomics*. 10:609

Has implications for understanding nematode trait deterioration during commercial growth and the evolution of mutualism and parasitism. I performed stress tolerance and fecundity assays.

Adams, Byron J., Diana H. Wall, Ugur Gozel, Adler R. Dilllman, **John M. Chaston**, and Ian D.Hogg. **2007**. The southernmost worm, *Scottnema lindsayae* (Nematoda): diversity, dispersal and ecological stability. *Polar Biology*. 30: 809-815.

Suggests that ecosystem disruption is correlated with negative impacts on stability on the otherwise stable southernmost population of the Nematoda.

*Authors contributed equally to this work

Invited Presentations

Oct 2011. Characterization of host-association events in a model animal-bacterial mutualism. Symbiosis and Cooperation Group. Cornell University.

March 2011. Characterization of host-association events and a bacterial host-association factor in a model animal-bacterial mutualism. Center for Ecology and Evolutionary Biology Seminar Series. University of Oregon.

Feb 2011. Characterization of host-association factors and events in a model animal-bacterial mutualism. Cornell University.

Feb 2010. Hulcr, J., **J. Chaston**, and M. Venkateshwaran. Convergence in the Evolution of Symbiosis. **Speaker and Panelist**. Evolution Seminar Series, UW-Madison (talk and panel discussion).

Presentations

Chaston, J.M. and H. Goodrich-Blair. Aug 2011. Characterization of host-association events and factors in a model animal-bacteria mutualism. UW-Madison, dissertation defense (talk).

Chaston, J.M. and H. Goodrich-Blair. Mutualism and Pathogenesis: Two Destinations on the Same Path. Dec 2010, Microbes in Health and Disease Training Grant Seminar Series. UW-Madison (talk).

Chaston, J.M., A. Bhasin, R. C. Whitemarsh, H. Goodrich-Blair. Characterization of a colonization factor shared by bacterial mutualists and pathogens of animals. 3rd American Society for Microbiology Conference on Beneficial Microbes. 2010. Miami, FL (poster).

Chaston J., A. Bhasin, A. Lopez, and H. Goodrich-Blair. Mutational analysis yields insight into the function of *nilB*, a specificity determinant in an animal-bacteria symbiosis. With

- Human Microbiome Research Conference. 2010. St. Louis, MO (poster)**.**
- 24th Annual Raper Sympsium. 2010. Madison, WI (poster).
- 23rd Annual Raper Sympsium. 2009. Madison, WI (poster, Honorable Mention).
- 42nd Annual Meeting of the Society for Invertebrate Pathology. 2009. Park City, UT (talk).
- 6th International Symbiosis Society Congress. 2009. Madison, WI (**selected abstract speaker**).
- The 2009 Molecular Genetics of Bacteria and Phages Meeting. 2009. Madison, WI (poster).
- 33rd Steenbock Symposium: Synthetic Genes to Synthetic Life. 2009. Madison, WI (poster).
- Microbiology Doctoral Training Program Student Seminar. Feb 2009. UW-Madison, WI (poster).

Chaston, J. and H. Goodrich-Blair. Characterizing the process of host colonization in a model animal-bacterial mutualism. Microbes in Health and Disease Training Grant Seminar Series. Feb 2009. UW-Madison, WI (talk).

Chaston, J., R.C.M. Whitemarsh, H. Goodrich-Blair. Interactions Among Membrane-Localized Colonization Factors in *Xenorhabdus nematophila*, the Bacterial Symbiont of *Steinernema carpocapsae* nematodes.

- Microbiology Doctoral Training Program Student Seminar. Apr 2008. UW-Madison, WI (talk)
- 2nd ASM Conference on Beneficial Microbes: Beneficial Host-Microbial Interactions. 2008. San Diego, CA (poster).
- 22nd Annual Raper Symposium. 2008. Madison, WI (poster).

Chaston, J., R.C.M. Whitemarsh, H. Goodrich-Blair. Functional Complementation of *nilB*, a Host-Association Factor in *Xenorhabdus nematophila*, with Homologs in Diverse Gram-Negative Bacteria. 15th Annual Midwest Microbial Pathogenesis Conference. 2008. Madison, WI (poster).

Chaston, J, A Dillman, R Gaugler, A Bilgrami, DI Shapiro-Ilan, and BJ Adams. Effects of Inbreeding on the Fecundity and Heat Tolerance of *Heterorhabiditis bacteriophora* and *Steinernema carpocapsae*. Evolution Meeting. Jun 2005. Fairbanks, AK (poster, talk).

Chaston, J and BJ Adams. A Possible Mechanism for Phase Variation in *Photorhabdus luminescens* TTO1. Annual National Meeting of the Society of Nematologists. Aug 2004. Estes Park, CO (talk).

Teaching Experience

Mentored undergraduate student research – *Spring '04-Spring '11*

- Nathan Feirer (Fall '10-Spring '11)
- Kesekokikenew Grignon (Fall '10, UW-Madison)
  - Changes in *Steinernema* nematode colonization in response to changes in nematode culture time, nematode culture inoculation size, and symbiont culture type.
    - Undergraduate Research and Mentoring (URM) Program. Fall 2010 Semester. NSF Funded UW-Madison program. Madison, WI. talk
- Regina Whitemarsh (Fall '08 – Spring '10)
  - Functional complementation of a bacterial host-association factor (NilB) with homologs in diverse species and their use as a tool for probin NilC function.
    - Evolution Meeting. 2010. Boise, ID – *Harvard Diversity Group Travel Award / Program* (poster).
    - 12th Annual Undergraduate Symposium. 2010. Madison, WI (talk).
    - 23rd Annual Raper Sympsium. 2009. Madison, WI (poster).
    - 6th International Symbiosis Society Congress. 2009. Madison, WI (poster).
    - 1st NemaSym (NSF-RCN) Meeting. 2009. Madison, WI (talk).
    - 2009 Molecular Genetics of Bacteria and Phages. Madison, WI (poster).
  - Functional complementation of a bacterial host-association factor (NilB) with homologs in diverse species.
    - 11th Annual Undergraduate Symposium. 2009. Madison, WI (talk).
    - 22nd Annual Raper Symposium. 2008. Madison WI (poster).
- Shane Spiers (Fall '08 – Summer '09)
- Jessica Baden (Fall '08 - Spring '09)
- TJ Bliss (Spring 2004-Summer 2005)
  - $1500 University Research Grant, Office of Creative Research and Activitiies, BYU. 2005. Characterization of Phase-switching Genes in *Photorhabdus luminescens*
  - Development and description of a novel symbiotic, non-pathogenic mutant of the entomopathogenic bacterium *Photorhabdus luminescens*.
    - Annual Meeting of the Society of Nematologists. 2006. Kauai, Hawaii (poster – Best Poster Award).
    - Utah Conference on Undergraduate Research. 2007. Salt Lake City, UT (poster).
- Laura Chorak (Fall 2005)
  - $1500 University Research Grant, Office of Creative Research and Activities; declined

- Adler Dillman (Spring 2004-Summer 2005)
  - Inbreeding and trait deterioration in entomopathogenic nematodes.
    - 44th Annual Meeting of the Society of Nematologists. 2006. Kauai, HA (talk).
- Kyle Winkler (Spring-Summer 2004)
  - $1500 University Research Grant, Office of Creative Research and Activitiies, BYU. 2005; *Antarctic Soil Microbial Food Webs: Molecular Analysis of Nematode Gut Contents*
  - Identification of trophic relationships for free-living microbivorous nematodes via DNA extraction, amplification, and sequencing of nematode gut contents.
    - 43rd Annual Meeting of the Society of Nematologists. 2004. Estes Park, CO (talk).

Invited Lecturer, Parasitology 351, General Parasitology Laboratory (1 lecture per year). UW-Madison. *Spring '07 – '11*

Research Experience for Undergraduates (REU) mentor - each REU student gave an oral presentation at the end of the program; additional work is below *Summer '08-'10*

- Kesekokikenew Grignon ('10, UW-Madison) *Summer '04-'05*
  - Changes in *Steinernema* nematode colonization in response to changes in nematode culture time, nematode culture inoculation size, and symbiont culture type.
- Aliberkys Lopez ('09, UW-Madison)
  - Characterization of site directed mutants of *nilB*, a gene that encodes a species-specificity factor in a model animal bacterial mutualism.
- Regina Whitemarsh (*'08*, UW-Madison)
  - Functional complementation of a bacterial host-association factor (NilB) with homologs in diverse species.
- Dana Blackburn (*'05*, BYU)
  - Bioluminescence genes in *Photorhabdus luminescens*
    - 45th Annual Meeting of the Society of Nematologists. 2007. San Diego, CA (talk).
    - 2006 Meeting of the Rocky Mountain Virology Club and Rocky Mountain Branch, American Society for Microbiology. Pingree Park, CO (poster).
    - 44th Annual Meeting of the Society of Nematologists. 2006. Kauai, HA (talk).
    - 2006 Intermountain-Branch Meeting of the American Society for Microbiology. Provo, UT (talk).
- Carmel Higuera, Laureen Julien, Veronica Sa ('04, BYU)

Teaching Assistant, Microbiology 875 Special Topics. I helped develop and run a curriculum for reviewing papers, preparing fellowship applications, and presenting primary literature to a group. UW-Madison. *Fall '09*

Discussion Leader, Bacteriology 303 Biology of Microorganisms Course. UW-Madison. *Fall '07*

Teaching Assistant, Bacteriology 551 Physiological Diversity of Prokaryotes Laboratory. UW-Madison. *Spring '07*

Teaching Assistant, Bacteriology 304 Prokaryotic Microbiology Laboratory. UW-Madison. *Fall '06*

Fellowships and Awards

- **Graduate Student Travel Award**, Department of Bacteriology, UW-Madison. $500 Travel Award Issued by the Department of Bacteriology. *'08, '10*
- **National Institutes of Health Microbes in Health and Disease Trainee**. Competitive, 2-year full-coverage training grant funded by the NIH; available to students who research topics relating to microbes' role in health and disease ** *'08, '10*
- **National Science Foundation Graduate Research Fellow**. Competitive, 3-year increased-stipend training grant funded by the NSF; available to students who research topics relating to microbes' role in health and disease. ** *'06, '07, '09*

- **2nd Place Society for Invertebrate Pathology Nematode Division Travel Award**. Competitive travel award for $500 from the Nematode Division of the Society for Invertebrate Pathology. '09
- **Dr. Phillip and Vera Gerhardt Student Travel Award**, Department of Bacteriology, UW-Madison. Competitive travel award issued by the Department of Bacteriology for $750. May only be received once. '09
- **University Distinguished Fellowship, Michigan State University (MSU), Declined.** Competitive (50 awards per year) University Fellowship for 5 years of graduate study with increased stipend and benefits. *'05-'10*
- **College of Natural Science Recruiting Fellowship, Michigan State University (MSU), Declined.** Competitive college fellowship for 4 years of graduate study with increased stipend and benefits. *'05-'09*;
- **Undergraduate Evolution Meeting Travel Award**, Microbiology and Molecular Biology Department, BYU. Competitive travel award issued by departments in the College of Biology and Agriculture for travel to the Evolution 2005 meeting. *'05*
- **Office of Creative Research and Activities Grant**, BYU. Competitive research grant for $1500 to perform mentored research in a BYU campus laboratory** *'05*
- **Office of Creative Research and Activities Grant. C. Laird Snelgrove Signature Mentorship**, BYU. Competitive research grant for $1500 to perform mentored research in a BYU campus laboratory. ** *'04*
- **Agricultural Alumni Endowed Scholarship**, College of Life Sciences and Agriculture, UNH **Declined.** $500 Competitive College of Agricultural and Life Sciences scholarship. *'03*
- **Albert H. Brown Scholarship**, College of Life Sciences and Agriculture, UNH **Declined.** $500 Competitive College of Agricultural and Life Sciences scholarship. *'03*
- **Daniel Heath Memorial Scholarship**, Microbiology Department, UNH. **Declined.** $400 Competitive Microbiology Department scholarship. *'03*
- **Summer Undergraduate Research Fellow**, UNH. Competitive $3000 university summer fellowship to perform mentored research in a UNH campus laboratory; performed in laboratory of Dr. Robert Zsigray. ** *2003*
- **Presidential Scholarship**. Competitive 4 year half-tuition scholarship to UNH; **2 years declined.** *'99, '02*
- **Research and Engineering Apprenticeship Program**. Competitive summer research program in the laboratory of Dr. Robert Zsigray, UNH ** *'99*

***Indicates a research scholarship or fellowship*

Departmental Service / Outreach

- **insectapalooza**
- **Student Member.** Microbiology Doctoral Training Program (MDTP) Admissions Committee. Participated fully as a committee member in reviewing applications for admission to the MDTP. *Fall '10*
- **Student Chair**, Student Symbiosis Organizing Committee. Organized journal clubs, colloquia, and similar activities for the core labs in the Symbiosis Cluster (all events were also open for campus-wide participation) *Fall '07- Summer '10*
- **Student Instructor,** People Program. Introduced groups of high school students to *Steinernema carpocapsae* nematodes, a model system in studying symbiosis. *Jul '10*
- **Presenter,** Teaching Symbiosis Session Hands-On Lab Practicum, 6th International Symbiosis Society Congress. *Presented* Galleria mellonella *infected with* Steinernema carpocapsae *nematodes as a model for education outreach.* *Aug '09*
- **Chair,** Professional Development / Post-Doctoral Forum Planning Committee. Chaired the committee that organized the Forum for the 6th International Symbiosis Society Congress. *Jan-Aug '09*

- **Member**, Student Organizing Committee, Biennial Life Sciences Career Day 2007, 2009. *Helped plan the activity* — *Spring '07, '09*
- **Organizer**, Symbiosis Symposium 2006. UW-Madison. — *'06*
- **Member**, Student Symbiosis Organizing Committee. UW-Madison. (*7*) — *Spring '06 –Summer '07*
- **Educational outreach** Taught 1st, 3rd, and 4th grade classrooms in Alpine-, Nebo-, and Provo-, Utah School Districts about symbiosis, and sampling for entomopathogenic nematodes on school grounds. BYU. — *Fall '05*

References

Dr. Angela Douglas
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Additional Information for Undergraduate Mentors Byron J. Adams (Brigham Young University) and Robert Zsigray (University of New Hampshire, Emeritus), and Undergraduate Employer Robert Mooney (Department Laboratory Technician, University of New Hampshire) available upon request.