

## Robert L. Baker – Curriculum Vitae

### Contact Information

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Department of Botany  
University of Wyoming  
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Outreach: [www.macromicroscopic.com](http://www.macromicroscopic.com)

### Education

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**University of Colorado, PhD in Ecology and Evolutionary Biology** 2012  
*The molecular and morphological microevolution and development of Mimulus guttatus (Phrymaceae) shoot architecture*  
Committee: Pamela Diggle (Advisor), William Friedman, Lena Hileman, William Adams, David Stock

**Reed College, BA in Biology** 2002  
*Senior Thesis advisor:* Keith Karoly

### Appointments

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NSF Postdoctoral Research Fellow, University of Wyoming 2013-present  
*Genome wide associations and genetic architecture of leaf anatomic inputs to water use efficiency; PI: Robert Baker*

Postdoctoral Research Associate, University of Wyoming 2012-2013  
*Quantitative genetics of morphological development across heterogeneous, agroecologically relevant environments*  
PI: Cynthia Weinig

Research Associate, The Arnold Arboretum of Harvard University 2011-2012  
*Quantitative gene expression analyses of genes associated with branch outgrowth; PIs: William Friedman and Pamela Diggle*

Research Assistant, University of Maryland 2003-2004  
*Molecular evolution and development of annelid regeneration and asexual reproduction; PI: Alexa Bely*

Research Assistant, AgResearch, Ltd., New Zealand 2002-2003  
*Developmental significance of the Arabidopsis TERMINAL EAR1-like Gene; PI: Bruce Veit*

- In prep  
(available upon request) **Baker, R. L.**, W. F. Leong, N. An, S. Welch, and C. Weinig. Predicting Developmental phenotypes based on genotypes: a Bayesian Function-Valued Trait approach to canalization and phenotypic plasticity in *Brassica rapa* leaves. For *Genetics*.
- Rubin, M. J, M. T. Brock, **R. L. Baker**, R. J. C. Markelz, J. N. Maloof, and C. Weinig. QTL mapping and expression profiling suggest candidate loci underlying plant architectural complexity in natural settings. For *Molecular Ecology*.
- Pre-print  
(in review revision, or press) **Baker, R. L.**, W. F. Leong, M. T. Brock, M. Rubin, N. An, S. Welch, and C. Weinig. *In revision*. Bayesian inferences and high-throughput remote sensing indices for quantitative genetic analyses of plant growth. *Theoretical and Applied Genetics*.
- 2017 An, N., S. Welch, R. J. C. Markelz, **R. L. Baker**, C. Palmer, J. Ta, J. Maloof, and C. Weinig. Using Photogrammetry and Plant Modeling Techniques to Quantify 2D and 3D Rosette Area for Time-Series High-Throughput Phenotyping. *Computers and Electronics in Agriculture* 135:222-232
- Baker, R. L.**, Y. Yarkhunova, K. Vidal†, B. E. Ewers, and C. Weinig. Polyploidy and the Relationship between Leaf Structure and Function: Implications for correlated evolution of anatomy, morphology, and physiology in *Brassica*. *BMC Plant Biology* 17(3)
- 2016 An, N., C. M. Palmer, **R. L. Baker**, R. J. C. Markelz, J. Ta, J. N. Maloof, S. M. Welch, and C. Weinig. Plant High-Throughput Phenotyping using Photogrammetry and Imaging Techniques to Measure Leaf Length and Rosette Area. *Computers and Electronics in Agriculture* 127:376-394
- Yarkhunova, Y., C. E. Edwards, **R. L. Baker**, B. E. Ewers, and C. Weinig. Selection During Domestication Affects the Circadian Clock and Expression of Ecophysiological Traits. *New Phytologist* 210(1):133-144.
- 2015 **Baker, R. L.**, W. F. Leong, M. T. Brock, R. J. Cody Markelz, M. F. Covington, U. K. Devisetty, C. E. Edwards, J. Maloof, S. Welch, and C. Weinig. Modeling Development and Quantitative Trait Mapping Reveal Independent Genetic Modules for Leaf Size and Shape. *New Phytologist* 210(1):133-144.
- Selected for commentary in *New Phytologist*

- 2014 **Baker, R. L.**, E. Scherbatskoy†, C. Lay, and P. K. Diggle. Developmental Plasticity of Shoot Architecture: Morphological Expression, Ontogenetic Contingency, and Ecologically Relevant Onset in Locally Adapted Populations of *Mimulus guttatus*. *International Journal of Plant Sciences* 175(1): 59-69.
- 2012 **Baker, R. L.**, L. C. Hileman, and P. K. Diggle. Patterns of Shoot Architecture in Locally Adapted Populations are linked to Intraspecific Differences in Gene Regulation. *New Phytologist* 196(1): 271-281.
- Recommended for Faculty of 1000
  - Selected for *New Phytologist* journal cover art
- 2011 **Baker, R. L.** and P. K. Diggle. Node-specific Branching and Heterochronic Changes Determine Population Level Differences in *Mimulus guttatus* (Phrymaceae) Shoot Architecture. *American Journal of Botany* 98(12): 1924-1934.
- 2010 Diggle, P. K., N. J. Abrahamson, **R. Baker**, M. G. Barnes, T. L. Koontaz, C. Lay, J. S. Medeiros, J. Murgel†, M. G. M. Shaner, H. L. Simpson, C. C. Wu and D. L. Marshall. Dynamics of Maternal and Paternal Effects on Embryo and Seed Development in Wild Radishes (*Raphanus sativus*). *Annals of Botany* 106(2):309-313.
- 2007 Noyes, R. D., **R. Baker**, and B. Mai†. Mendelian Segregation for Two-Factor Apomixis in *Erigeron annuus* (Asteraceae). *Heredity* 98:92-98.

#### *Technical Writing (non-peer reviewed)*

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- 2015 **Baker, R. L.**, M. T. Brock, M. Rubin, J. Maloof, S. Welch, and C. Weinig. Mapping function valued traits in *Brassica rapa*. *Wyoming Agricultural Experimental Station* pp. 19-20.
- 2010 **Baker, R. L.** Use of the Scanning Electron Microscope. In P. Diggle, *Plant Eco-Evo-Devo* pp54-56.

#### *Grants, Funding, and Fellowships*

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##### **Total funding: \$257,285 (86.7% external)**

U. Wyo. NIH-INBRE Bioinformatics Travel & Training Grant (\$2000)	2015
U. Wyo. Berry Center Biodiversity Institute's Biodiversity in Art Grant (\$5000)	2014
NSF Postdoctoral Fellowship (\$216,000)	2013
C.U. Graduate Student Travel Grant (\$300)	2011
Botanical Society of America Structural Section Travel Grant (\$200)	2011
C.U. Ecology and Evolutionary Biology Department Research Grant (\$1700)	2011
Beverly Sears Graduate Student Grant (\$1000)	2011

United Government of Graduate Students, C.U. Travel Grant (\$300)	2011
Sigma-Xi Grants-in-Aid of Research (\$995)	2010
California Native Plants Society (\$500)	2010
C.U. Ecology and Evolutionary Biology Department Research Grant (\$2000)	2010
Beverly Sears Graduate Student Grant (\$1000)	2010
C.U. Ecology and Evolutionary Biology Summer Fellowship (\$6000)	2009
Beverly Sears Graduate Student Grant (\$1000)	2008
C.U. Natural History Museum's Walker Van Riper Fund (\$1500)	2008
C.U. Ecology and Evolutionary Biology Departmental Research Grant (\$2500)	2008
Botanical Society of America Graduate Student Research Award (\$500)	2007
C.U. Ecology and Evolutionary Biology Department Research Grant (\$2500)	2007
C.U. Natural History Museum's Walker Van Riper Fund (\$1500)	2007
C.U. Ecology and Evolutionary Biology Department Research Grant (\$2500)	2006
NSF Molecular and Organismic Research in Plant History (MORPH) (\$3000)	2006
C.U. Ecology and Evolutionary Biology Department Training Grant (\$3300)	2005
Cold Spring Harbor Laboratories (\$1990)	2005

### *Honors and Awards*

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Certificate of Meritorious Service: Master Plant Science Team, Planting Science	2011
Certificate of Meritorious Service: Master Plant Science Team, Planting Science	2010
Teaching Excellence Award, C.U. Boulder	2010
Certificate of Meritorious Service: Master Plant Science Team, Planting Science	2009
Certificate of Meritorious Service: Science Mentor, Planting Science	2009
Commendation For Excellence in Teaching, C.U. Boulder	2006
Commendation For Excellence in Teaching, C.U. Boulder	2005
Commendation For Excellence in Scholarship, Reed College	2002

### *Invited Seminars and Conference Contributions*

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- 2017 **Baker, R. L.** University of Vermont, Burlington, VT. "Intraspecific Developmental Variation for Crop Improvement"
- Baker, R. L.** University of Minnesota, St. Paul, MN. "Quantitative Evolutionary Developmental Biology for Crop Improvement"
- Baker, R. L.** Miami University, Oxford, OH. "Understanding Organismal Diversity through Microevolutionary Developmental Biology"
- 2016 **Baker, R. L.** University of Illinois, Urbana-Champaign, IL. "Quantitative Evolutionary Developmental Biology for Crop Improvement"
- Baker, R. L.** State University of New York, Oswego, NY. "Understanding Organismal Diversity through Development and Evolution"

- Baker, R. L.**, W. F. Leong, S. Welch, and C. Weinig. University of Connecticut, Storrs, CT. “Developmental Dynamics: Modeling variation for quantitative genetics”
- 2015 **Baker, R. L.**, Y. Yarkhunova, B. Ewers and C. Weinig. National Science Foundation, Arlington, VA. “Genome wide associations between anatomy, crop-specific resource allocation strategies, and water use efficiency”
- Baker, R. L.**, W. F. Leong, N. An, S. Welch, and C. Weinig. Botanical Society of America, Edmonton, Canada. “Function Valued Trait mapping: Bayesian modeling of leaf development reveals novel genetic controls for leaf size and shape and genotype by environment interactions for plant fitness”
- Yarkhunova, Y., C. E. Edwards, **R. L. Baker**, B. E. Ewers, and C. Weinig. Evolution, São Paulo, Brazil. “Selection during crop diversification involves correlated evolution of the circadian clock and ecophysiological traits in *Brassica rapa*”
- Baker, R. L.**, W. F. Leong, N. An, S. M. Welch, and W. Weinig. microMORPH workshop, Arnold Arboretum of Harvard University, Boston MA. “Bayesian modeling of leaf development reveals novel genetic controls for leaf size and shape”
- 2014 An, N., C. Palmer, **R. Baker**, M. Brock, R. Markelz, K. Price, J. Maloof, S. M. Welch, and C. Weinig. Agronomy Society of America Annual Meeting, Long Beach, CA. “Proximal Sensing: Experiences from *Arabidopsis* and *Brassica rapa*”
- Baker, R. L.**, W. F. Leong, M. Brock, M. Rubin, S. Welch, and C. Weinig. Evolution, Raleigh, NC. “Shade avoidance and *Brassica rapa* leaf development: Bayesian modeling and QTL analysis allows for predicting phenotypes from genotypes”
- 2013 **Baker, R. L.** National Science Foundation, Arlington, VA. “Genome wide associations between anatomy, crop specific allocation, and water use efficiency in *Brassica rapa*”
- 2012 **Baker, R. L.** University of Wyoming, Laramie, WY. “From gene regulation to morphological variation: The microevodevo of shoot architecture in *Mimulus guttatus*”
- Baker, R. L.** and P. K. Diggle. Evolution, Ottawa, Canada. “Patterns of shoot architecture in locally adapted populations are linked to intraspecific differences in gene regulation”
- 2011 **Baker, R. L.** Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO. “Microevolution and Development in *Mimulus*: Monkeying with meristems explains intraspecific changes in shoot architecture and life history”

**Baker, R. L.** Arnold Arboretum of Harvard University, Boston, MA. "Microevolution and development in *Mimulus*: Monkeying with meristem dynamics and heterochrony explains intraspecific changes in shoot architecture and life history"

**Baker, R. L.** Department of Plant Sciences, University of Arizona, Tucson, AZ. "Monkeying with life history: Intraspecific evolution and development of shoot architecture in *Mimulus guttatus*"

**Baker, R. L.** and P. K. Diggle. Botanical Society of America, St. Louis, MO. "Making branches in *Mimulus*: Intraspecific developmental variation in shoot architecture"

**Baker, R. L.** Mimulus Meeting, Duke University, Durham, NC. "Phenotyping"

**Baker, R. L.** Microevolution of development: Processes within populations and species, a microMORPH workshop held at the University of Colorado at Boulder, CO. "Intraspecific evolution and development of shoot architecture"

2008 **Baker, R. L.** Gallery Series talks at the University of Colorado Museum of Natural History, Boulder, CO. "The evolutionary and developmental basis of ecological adaptation"

2007 **Baker, R. L.** Investigating the evolution of plant form: Conceptual integration from the molecular to the ecological, a MORPH minicourse held at the University of Colorado at Boulder, CO. "Microevolution and development of *Mimulus guttatus* shoot architecture"

**Baker, R. L.** Guild of Rocky Mountain Ecologists and Evolutionary Biologists (GREEBs) meeting at Ghost Ranch, UT. "Microevolution of development: Building branches in *Mimulus guttatus*"

**Baker, R. L.** Teaching Evolution Symposium, University of Colorado at Boulder, CO. "Teaching macroevolution: Mutations of large effect"

### Teaching Experience

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Co-Instructor, University of WY, Laramie, WY:	Genetics	2014
Guest Lecturer, University of WY, Laramie, WY:	General Biology	2014
Panel Member, University of WY, Laramie, WY:	Writing Seminar	2014
Teaching Assistant, C.U. Boulder, Boulder, CO:	Plant Eco-Evo-Devo	2010
	Genetics	2009
	Plant Anatomy	2006
	Genetics	2005
	General Biology	2004

## Undergraduate Mentorship

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- 2016 Monique Alexander, Susannah Roberts, SarahJean O'Neill  
2015 Deo Lachman, Reid Olson  
2014 Ariell Ferrin, Katie Vidal, Amelia Sheesley  
2013 Whitney Gifford, Heather Dickson, Landon Eastman, Alexandra Disque, Gage McKeag, Ryan Felde-Vassallo, Ashlyn Fedell, Daniel Latimer  
2012 Emily Gimple, Jonathan Whipps, Keith Anderson, Meredith Pratt, John Beckius, Cody Blumenshine, Sarah Cheeney, Matt Yorgasm, Wyatt Gardner, Christopher Planche, Courtney Gifford  
2011 Emmo Scherbatskoy (Honors thesis student)  
2010 Paige Swanson

## Service

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| Panel Member, "Evaluating Graduate School Offers", McNair Scholars Program, University of Wyoming  | 2016      |
| Biodiversity in Art Grant Selection Committee Member, University of Wyoming Biodiversity Institute | 2016      |
| Moseley Award Committee Member, Botanical Society of America                                       | 2015-2016 |
| Education Committee Member, Botanical Society of America   | 2011-2013 |
| Mentor, C. U. Boulder Undergraduate Research Opportunities Program (UROP)                          | 2009-2011 |
| Mentor, C. U. Boulder Undergraduate Honors Thesis Project  | 2009-2010 |
| Planting Science Master, Plant Science Team  | 2007-2011 |
| Chair, C.U. Boulder Graduate Student Working Group Committee                                       | 2007-2008 |
| Graduate Representative, C.U. Boulder Evo-Devo Job Search Committee                                | 2007      |
| Chair, C.U. Boulder Evo-Devo Job Search Graduate Committee   | 2007      |
| Online Mentor, Planting Science  | 2006-2011 |
| Member, C.U. Boulder Colloquium Committee  | 2005-2006 |
| Department Representative, C.U. Boulder United Government of Graduate Students                     | 2005-2006 |
| Graduate Student Mentor, C.U. Boulder, EBIO Department   | 2005-2006 |

## Workshop and Course Participation

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- 2015 GWAS and Sequencing Data. Summer Institute for Statistical Genetics, Department of Biostatistics, University of Washington School of Public Health. Seattle, WA
- Elements of R for Genetics & Bioinformatics. Summer Institute for Statistical Genetics, Department of Biostatistics, University of Washington School of Public Health. Seattle, WA
- Molecular Genetics and Genomics. Summer Institute for Statistical Genetics,

Department of Biostatistics, University of Washington School of Public Health.  
Seattle, WA

Phenotypic plasticity: Evolution at the intersection of ecology, genetics, and development. Microevolutionary Molecular and Organismal Research in Plant History (microMORPH) NSF Research Coordination Network, Arnold Arboretum of Harvard University. Boston, MA

Communicating Science Workshop. Biodiversity Institute, University of Wyoming.  
Laramie, WY

2013 iPlant Collaborative Tools and Services Workshop. Colorado State University. Fort Collins, CO

Computer Science (1010). Department of Computer Science, University of Wyoming.  
Laramie, WY

Computational Biology (5550). Department of Botany, University of Wyoming.  
Laramie, WY

2011 Microevolution of development: Processes within populations and species. Microevolutionary Molecular and Organismal Research in Plant History (microMORPH) NSF Research Coordination Network, University of Colorado. Boulder, CO

2009 Homology: Conceptual and historical integration from the morphological to the molecular. Molecular and Organismal Research in Plant History (MORPH) NSF Research Coordination Network, University of Colorado. Boulder, CO

2007 Investigating the evolution of plant form: Conceptual integration from the molecular to the ecological. Molecular and Organismal Research in Plant History (MORPH) Research Coordination Network, University of Colorado. Boulder, CO

2005 Frontiers in Plant Science. Cold Spring Harbor Laboratory. Cold Spring Harbor, NY

### *Public Outreach*

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2016 **Baker, R. L.** and L. Vietti. Re-envisioning the Laboratory: Sci-art symposium, University of Wyoming Art Museum, Laramie, WY. "Science Under the Lens: The art of Microscopy." Poster.

2015 **Baker, R. L.** and M. T. Brock. University of Wyoming Biodiversity Institute, Laramie, WY. "The Macro/microscopic Life of Plants: An exploration of art from the scientific perspective". Gallery installation.

**Baker, R. L.** Science . . . Sort of. Episode 225, “Industrious Growth”. Podcast interview.

**Baker, R. L.** Science Café, Altitude Brewery and Chophouse, Laramie WY. “Cabbages and turnips and oilseeds, oh my!” Presentation.

### *Reviewer*

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PLoS One, New Phytologist, Plant Science, Journal of Integrative Plant Biology, Frontiers in Plant Evolution and Development, International Journal of Plant Sciences, American Journal of Botany

### *Professional Society Membership*

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Pan-American Society for Evolutionary Developmental Biology	2015-present
American Association for the Advancement of Science	2013-present
Society for the Study of Evolution	2009-present
American Society of Plant Biologists	2008-present
Botanical Society of America	2007-present