

## Ruth Geyer Shaw

January, 2014

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### **Education:**

1976 B.A. Oberlin College, Oberlin, Ohio. Biology.  
1983 Ph.D. Duke University, Durham, N.C. Botany, Genetics.

### **Positions Held:**

1977-1978 Research assistant, Microbial Ecology Laboratory, Division of Engineering and Applied Sciences, Harvard University.  
1978-1979 Teaching Assistant, Duke University.  
1983 Post-doctoral Research Assistant, Duke University.  
1984-1986 Post-doctoral Research Fellow, University of Washington.  
1987-1992 Assistant Professor, University of California, Riverside.  
1993-1994 Assistant Professor, University of Minnesota  
1994-2000 Associate Professor, University of Minnesota  
1995-1996 Sabbatical leave, University of Edinburgh  
2000- Professor, University of Minnesota  
2002-2003 Visiting Professor, Université de Montpellier II  
2009- Resident Fellow, Minnesota Center for Philosophy of Science  
2010-2011 Sabbatical leave, University of York (UK) and Université de Montpellier II

### **Awards and Fellowships:**

1975 Florence Frew prize in Classics, Oberlin College.  
1975 Phi Beta Kappa  
1979-1982 National Science Foundation Graduate Fellowship  
1982-1983 National Institutes of Health Traineeship administered by the University Program in Genetics, Duke University  
1984-1986 National Institutes of Health Individual Post-doctoral Fellowship  
1995-1996 Bush Sabbatical Fellowship, University of Minnesota  
2002-2003 Fellowship, John Simon Guggenheim Memorial Foundation  
2002-2003 College of Biological Sciences (UM) Sabbatical Supplement  
2009 President's Award, American Society of Naturalists  
2010-2011 College of Biological Sciences (UM) Sabbatical Supplement

- 2010 William Skinner Cooper Award from the Ecological Society of America  
(with M.B. Davis and J.R. Etterson)
- 2011 Outstanding Advisor award from the EEB graduate students
- 2012 Council of Graduate Students Outstanding Faculty Award

## Research Activities

### Publications:

#### Book Chapters:

Platenkamp, G. A. J., and R. G. Shaw. 1995. Limits to adaptive population differentiation of quantitative traits in plants. In *Ecogeographic Races: Papers presented at the 73rd annual meeting of the pacific division of AAAS in honor of the 100th anniversary of the birth of Gote Turesson*. A. Kruckeberg, R.B. Walker, and A. E. Leviton, Eds.

Shaw, R. G. and D. L. Byers. 1998. Genetics of maternal and paternal effects. In *Maternal effects as adaptations*, T. A. Mousseau and C. W. Fox, eds. Oxford Univ. Press.

#### Refereed Articles:

Clay, K. and R. G. Shaw. 1981. An experimental demonstration of density-dependent reproduction in a natural population of *Diamorpha smallii*, a rare annual. *Oecologia* 51: 1-6.

Shaw, R. G. 1986. Response to density in a wild population of the perennial herb *Salvia lyrata*: variation among families. *Evolution* 40: 492-505.

Shaw, R. G. and J. Antonovics. 1986. Density-dependence in *Salvia lyrata*: the effects of experimental alteration of seed densities. *Journal of Ecology* 74: 797-813.

Shaw, R. G. 1987. Density-dependence in *Salvia lyrata*: experimental alteration of densities of established plants. *Journal of Ecology* 75: 1049-1063.

Shaw, R. G. and J. Antonovics. 1987. The dynamics of an experimental population of *Salvia lyrata*: the population cage approach applied to plants. *New Phytologist* 107: 415-426.

Mitchell-Olds, T. and R. G. Shaw. 1987. Regression analysis of natural selection: statistical inference and biological interpretation. *Evolution* 41: 1149-1161.

- Shaw, R. G. 1987. Maximum-likelihood approaches applied to quantitative genetics of natural populations. *Evolution* 41: 812-826.
- Tsuji, J. S., R. G. Huey, F. H. Van Berkum, T. Garland, Jr, and R. G. Shaw. 1989. Locomotor performance of hatchling fence lizards (*Sceloporus occidentalis*): quantitative genetics and morphometric correlates. *Evol. Ecol.* B3: 240-252.
- Thompson E. A. and R. G. Shaw. 1990. Pedigree analysis for quantitative traits: variance components without matrix inversion. *Biometrics* 46: 399-413.
- Shaw, R. G. 1991. The comparison of quantitative genetic parameters between populations. *Evolution* 45: 143-151.
- Shaw, R. G. and H. L. Billington. 1991. Comparison of variance components between two populations of *Holcus lanatus*: a reanalysis. *Evolution* 45: 1287-1289.
- Platenkamp, G. A. J., and R. G. Shaw. 1992. Environmental and genetic constraints on adaptive population differentiation in *Anthoxanthum odoratum*. *Evolution* 46: 341-352.
- Thompson, E. A. and R. G. Shaw. 1992. Estimating polygenic models for multivariate data on large pedigrees. *Genetics* 131:971-978.
- Shaw, R. G. 1992. Comparison of quantitative genetic parameters: reply to Cowley and Atchley. *Evolution* 46: 1967-1969.
- Hill, J. P., E. M. Lord, and R. G. Shaw. 1992. Morphological and growth rate differences among outcrossing and self-pollinating races of *Arenaria uniflora* (Caryophyllaceae). *Journal of Evolutionary Biology* 5: 559-573.
- Platenkamp, G.A.J. and R. G. Shaw. 1993. Environmental and genetic maternal effects on seed characters in *Nemophila menziesii*. *Evolution* 47: 540-555.
- Shaw, R. G. and G. A. J. Platenkamp. 1993. Quantitative genetics of response to competitors in *Nemophila menziesii*. *Evolution* 47: 801-812.
- Mitchell, R. J. and R. G. Shaw. 1993. Heritability of floral traits for the perennial wild flower *Penstemon centranthifolius* (Scrophulariaceae): clones and crosses. *Heredity* 71: 185-192.
- Shaw, R. G. and T. Mitchell-Olds. 1993. ANOVA for unbalanced data: an overview. *Ecology* 74: 1638-1645.
- Shaw, R. G. and N. M. Waser. 1994. Quantitative genetic interpretations of postpollination reproductive traits in plants. *American Naturalist* 143: 617-635.

- Andersson, S. and R. G. Shaw. 1994. Phenotypic plasticity in *Crepis tectorum* (Asteraceae): genetic correlations across light regimes. *Heredity* 72: 113-125.
- Montalvo, A.M. and R.G. Shaw. 1994. Quantitative genetics of sequential life-history and juvenile traits in the partially selfing perennial, *Aquilegia caerulea*. *Evolution* 48: 828-841.
- Shaw, R. G., G. A. J. Platenkamp, F. H. Shaw, R. H. Podolsky. 1995. Quantitative genetics of response to competitors in *Nemophila menziesii*: a field experiment. *Genetics* 139: 397-406.
- Waser, N. M., R. G. Shaw, and M. V. Price. 1995. Seed set and seed mass in *Ipomopsis aggregata*: variance partitioning and inferences about postpollination selection. *Evolution* 49: 80-88.
- Shaw, F. H., R. G. Shaw, G. S. Wilkinson, and M. Turelli. 1995. Changes in the genetic variance-covariance: **G** whiz!. *Evolution* 49: 1260-1267.
- Wilén, C.A., Holt, J.S., Ellstrand, N.C., Shaw, R.G. 1995. Genotypic diversity of Kikuyugrass (*Pennisetum clandestinum*) populations in California. *Weed Science* 43: 209-214.
- Reznick, D. N., F. H. Shaw, F. H. Rodd, R. G. Shaw. 1997. Evaluation of the rate of evolution in natural populations of guppies (*Poecilia reticulata*). *Science* 275: 1934-1937.
- Byers, D. L., G. A. J. Platenkamp, and R. G. Shaw. 1997. Variation in seed characters in *Nemophila menziesii*: evidence of a genetic basis for maternal effect. *Evolution* 51: 1445-1456.
- Podolsky, R. P., R. G. Shaw, and F. H. Shaw. 1997. Population structure of morphological traits in *Clarkia dudleyana*. II. Constancy of within-population genetic variance. *Evolution* 51: 1785-1796.
- Mitchell, R. J., R. G. Shaw, and N. M. Waser. 1998. Pollinator selection, quantitative genetics, and predicted evolutionary responses of floral traits in *Penstemon centranthifolius* (Scrophulariaceae). *International Journal of Plant Sciences* 159: 331-337.
- Shaw, R. G., D. L. Byers, and F. H. Shaw. 1998. Genetic components of variation in *Nemophila menziesii* undergoing inbreeding: morphology and flowering time. *Genetics* 150: 1649-1661.
- Hauser, T. P., R. G. Shaw, and H. Ostergard. 1998. Hybridisation between weedy populations of *Brassica campestris* and varieties of oilseed rape (*B.napus*): I. Fitness of F<sub>1</sub> progeny. *Heredity* 81:429-435.

- Waser, N.M., M.V. Price, and R. G. Shaw. 2000. Outbreeding depression varies among cohorts of *Ipomopsis aggregata* planted in nature. *Evolution* 54: 485-491.
- Shaw, R. G., D. L. Byers, and E. Darms. 2000. Spontaneous mutational effects on reproductive traits of *Arabidopsis thaliana*. *Genetics* 155: 369-378.
- Jannink, J.-L., J. H. Orf, N. R. Jordan, and R. G. Shaw. 2000. Index selection for weed suppressive ability in soybean. *Crop Sci* 40: 1087-1094.
- Keightley, P. D., E. K. Davies, A. D. Peters, R. G. Shaw. 2000. Properties of ethylmethane sulfonate-induced mutations affecting life-history traits in *Caenorhabditis elegans* and inferences about bivariate distributions of mutation effects. *Genetics* 156: 143-154.
- Davis, M.B. and R. G. Shaw. 2001. Range shifts and adaptive responses to quaternary climate change. *Science* 292: 673-679.
- Etterson, J. R. and R. G. Shaw. 2001. Constraint to adaptive evolution in response to global warming. *Science* 294: 151-154.
- Shaw, F. H., C. J. Geyer and R. G. Shaw. 2002. A comprehensive model of mutation affecting fitness and inferences for *Arabidopsis thaliana*. *Evolution* 56:453-463.
- Mercer, K., J. Jordan, D. Wyse, and R. G. Shaw. 2002. Multivariate differentiation of quackgrass (*Elytrigia repens*) from three farming systems. *Weed Science* 50: 677-685.
- Neuhauser, C., D. A. Andow, G. Heimpel, G. May, R. G. Shaw, and S. Wagenius. 2003. Community genetics: expanding the synthesis of ecology and genetics. *Ecology* 84: 545-558.
- Shaw, R. G., F. H. Shaw, and C. J. Geyer. 2003. What fraction of mutations reduces fitness: a reply to Keightley and Lynch. *Evolution* 57: 686-689.
- Chang, S.-M. and R.G. Shaw. 2003. The contribution of spontaneous mutation to variation in environmental response in *Arabidopsis thaliana*: responses to nutrients. *Evolution* 57: 984-994.
- Kavanaugh, C.M. and R.G. Shaw. 2005. The contribution of spontaneous mutation to variation in environmental response in *Arabidopsis thaliana*: responses to light. *Evolution* 59: 266-275.
- Davis, M.B., R.G. Shaw, and J.R. Etterson. 2005. Evolutionary responses to changing climate. *Ecology* 86: 1704-1714.

- Heiser, D.A. and R.G. Shaw. 2006. The fitness effects of outcrossing in *Calylophus serrulatus*, a permanent translocation heterozygote. *Evolution* 60:64-76.
- Mercer, K.L., R.G. Shaw, and D.L. Wyse. 2006. Increased germination of diverse crop-wild hybrid sunflower seeds. *Ecol. Appl.* 16:845-854.
- Gomez, N. and R.G. Shaw. 2006. Inbreeding effect on male and female fertility and inheritance of male sterility in *Nemophila menziesii* (Hydrophyllaceae). *American Journal of Botany* 93: 739-746.
- Shaw, R.G. and Chang, S.-M. 2006. Gene action of new mutations in *Arabidopsis thaliana*. *Genetics* 172: 1855-1865.
- Mercer, K. M., D. L. Wyse, and R. G. Shaw. 2006. Effects of competition on the fitness of wild and crop-wild hybrid sunflower from a diversity of wild populations and crop lines. *Evolution* 60: 2044-2055.
- Geyer, C. J., S. Wagenius, and R. G. Shaw. 2007. Aster models for life history analysis. *Biometrika* 94: 415-426.
- Mercer, K. M., R. G. Shaw, D. A. Andow, and D. L. Wyse. 2007. Stress and domestication traits increase the relative fitness of crop-wild hybrids in sunflower. *Ecology Letters* 10: 383-393.
- Lau J.A., Shaw R.G., Reich P.B., P. Tiffin. 2007. Strong ecological but weak evolutionary effects of elevated CO<sub>2</sub> on a recombinant inbred population of *Arabidopsis thaliana*. *New Phytologist* 175: 351-362.
- Lopez, S., F. Rousset, F.H. Shaw, R.G. Shaw and O. Ronce. 2008. Migration load in plants: role of pollen and seed dispersal in heterogeneous landscapes. *J. Evol. Biol.* 21: 294-309.
- Shaw, R.G., C.J. Geyer, S. Wagenius, H.H. Hangelbroek, J.R. Etterson. 2008. Unifying life history analyses for inference of fitness and population growth. *American Naturalist* 172: E35-E47.
- Crozier, L. G., A. P. Hendry, P. W. Lawson, T. P. Quinn, N. Mantua, J. Battin, R. G. Shaw, R. B. Huey. 2008. Potential responses to climate change for organisms with complex life histories: evolution and plasticity in Pacific salmon. *Evolutionary Applications* 1:252-270.
- Franks, S. J., Avise, J. C., Bradshaw, W. E., Conner, J. K., Etterson, J. R., Mazer, S. J., Shaw, R. G., Weis, A. E. 2008. The Resurrection Initiative: Storing ancestral genotypes to capture evolution in action. *Bioscience* 58: 870-873.
- Ronce, O., F. H. Shaw, F. Rousset, R. G. Shaw. 2009. Is inbreeding depression lower in

- maladapted populations? A quantitative genetic model. *Evolution* 63: 1807-1819.
- Marriage T. N., S. Hudman, M. E. Mort, M. E. Orive, R. G. Shaw, J. K. Kelly. 2009. Direct estimation of the mutation rate at dinucleotide microsatellite loci in *Arabidopsis thaliana* (Brassicaceae). *Heredity* 103:310-317.
- Lopez, S., F. Rousset, F. H. Shaw, R. G. Shaw, O. Ronce. 2009 Joint effects of inbreeding and local adaptation on the evolution of genetic load after fragmentation. *Conservation Biology* 23: 1618–1627.
- Ossowski, S., K. Schneeberger, J. I. Lucas-Lledo, N. Warthmann, R. M. Clark, R. G. Shaw, D. Weigel, M. Lynch. 2010. The rate and molecular spectrum of spontaneous mutations in *Arabidopsis thaliana*. *Science* 327: 92-94.
- Wagenius, S., H. H. Hangelbroek, C. E. Ridley, R. G. Shaw. 2010. Biparental inbreeding and inter-remnant mating in a perennial prairie plant: fitness consequences for progeny in their first eight years. *Evolution* 64:761-771.
- Lau, J. A., R. G. Shaw, P. B. Reich, and P. Tiffin. 2010. Species interactions in a changing environment: elevated CO<sub>2</sub> alters the ecological and potential evolutionary consequences of competition. *Evolutionary Ecology Research* 12: 435-455.
- Shaw, R. G. and C. J. Geyer. 2010. Inferring fitness landscapes. *Evolution* 64: 2510-2520.
- Ridley, C. E., H. H. Hangelbroek, S. Wagenius, J. Stanton-Geddes and R. G. Shaw. 2011. The effect of plant inbreeding and stoichiometry on interactions with herbivores in nature: *Echinacea angustifolia* and its specialist aphid. *PLoS One* 6(9): e24762. DOI: 10.1371/journal.pone.0024762
- Wagenius, S., A. Dykstra, C. E. Ridley, and R. G. Shaw. 2012. Seedling recruitment in the long-lived perennial, *Echinacea angustifolia*: a ten year experiment. *Restoration Ecology* 20:352-359. DOI: 10.1111/j.1526-100X.2011.00775.x
- Stanton-Geddes, J. R. G. Shaw, and P. Tiffin. 2012. Interactions between soil habitat and geographic range location affect plant fitness. *PLoS One* 7(5): e36015 DOI: 10.1371/journal.pone.0036015
- Rutter, M. T., Roles, A., Conner, J. K., Shaw, R. G., Shaw, F. H., Schneeberger, K., Ossowski, S., Weigel, D. and Fenster, C. B. 2012. Fitness of *Arabidopsis thaliana* mutation accumulation lines whose spontaneous mutations are known. *Evolution* 66: 2335–2339. DOI:10.1111/j.1558-5646.2012.01583.x
- Stanton-Geddes, J., P. Tiffin, and R. G. Shaw. 2012. Role of climate and competitors in limiting fitness across range edges of an annual plant. *Ecology* 93:1604–1613.

<http://dx.doi.org.ezp1.lib.umn.edu/10.1890/11-1701.1>

Shaw, R. G. and J. R. Etterson. 2012. Tansley Review: Rapid climate change and the rate of adaptation: insight from experimental quantitative genetics. *New Phytologist* 195:752–765.

Aguilée, R., F. H. Shaw, F. Rousset, R. G. Shaw and O. Ronce. 2013. How does pollen vs. seed dispersal affect niche evolution? *Evolution* 67: 792-805.  
DOI: 10.1111/j.1558-5646.2012.01816.x

Gomulkiewicz, R. and R. G. Shaw. 2013. Evolutionary rescue beyond the models. *Phil. Trans. R. Soc. B* 368:20120093 .

Stanton-Geddes, J., R. G. Shaw, and P. Tiffin. 2013. Insights from population genetics for range limits of a widely distributed native plant. *Am. J. Bot.* 100: 744-753.

Geyer, C. J., Ridley, C. E., Latta, R. G., J. R. Etterson, and R. G. Shaw. 2013. Local adaptation and genetic effects on fitness: Calculations for exponential family models with random effects. *Annals of Applied Statistics* 7: 1778-1795.

Shaw, R. G. and F. H. Shaw. 2014. Quantitative genetic study of the adaptive process. *Heredity* 112: 13-20.

Lau, J. A., R. G. Shaw, P. Reich and P. Tiffin. 2014. Indirect effects drive evolutionary responses to global change. *New Phytologist* 201: 335-343.

Other articles (not refereed):

Travisano, M. and R. G. Shaw. 2013. Lost in the Map. *Evolution* 67: 305-314. (Commentary, unreviewed) doi:10.1111/j.1558-5646.2012.01802.x

Software:

Shaw, R. G. and F. H. Shaw. 1992, 1994. Quercus: programs for quantitative genetic analysis using maximum likelihood. Published electronically on the Internet, <http://biosci.cbs.umn.edu/eeb/quercus.html>.

Invited Research Presentations:

1987 Michigan State University, Ecology and Evolutionary Biology Program  
1987 Kellogg Biological Station  
1987 Second International Conference on Quantitative Genetics, Raleigh, NC  
1987 University of California, San Diego, Population Biology Group



1987 University of California, Irvine, Department of Ecology and Evolutionary Biology  
1987 Pennsylvania State University, Department of Biology  
1988 University of California, Santa Barbara, Department of Biological Sciences  
1988 University of California, Davis, Ecology Group  
1989 University of California, Riverside, Statistics Department  
1989 University of Illinois, Urbana-Champaign, Department of Ecology, Ethology, and Evolution  
1989 Cornell University, Section of Ecology and Systematics  
1989 Genetics Society of America, Annual Meeting, Workshop on Genetics of Conservation  
1990 California State University, Long Beach, Department of Biology  
1990 San Diego State University, Department of Biology  
1992 University of Minnesota, Department of Ecology, Evolution, and Behavior  
1992 University of North Carolina, Department of Biology  
1993 Gordon Research Conference, Quantitative Genetics and Biotechnology  
1993 University of Minnesota, Department of Agronomy and Plant Genetics  
1993 McGill University, Montreal, Department of Biology  
1993 West Virginia University, Department of Biology  
1993 University of Chicago, Department of Ecology and Evolution  
1993 Midwest Population Biology Conference, University of Kansas  
1994 Kellogg Biological Station, Michigan State University, Ecology and Evolutionary Biology Program  
1995 University of Edinburgh, Institute for Cell, Animal and Population Biology, Genetics  
1996 University of Edinburgh, Institute for Cell, Animal and Population Biology, Evolution  
1997 10th meeting on Plant Population Biology of the Gesellschaft fur Okologie, Zurich  
1998 University of Wisconsin, 3rd Annual Sewell Wright Symposium  
1999 University of Minnesota, Plant Biological Sciences Colloquium  
1999 Symposium on Spontaneous mutation, European Society of Evolutionary Biology, Barcelona  
1999 University of South Dakota, Department of Biology  
2000 University of California, Davis, Evolution and Ecology Seminar  
2000 NCR21 meeting (Plant and animal breeders from midwest land-grant universities), St. Paul.  
2001 University of Minnesota, Department of Physiology  
2001 Minnesota Agricultural Extension Agents and Specialists  
2001 Washington State University, Department of Biology, invited by graduate students  
2001 University of Southern California, Department of Molecular Biology  
2002 University of Minnesota, Ecology, Evolution and Behavior  
2002 Université de Montpellier II, Institut des Sciences de l'Evolution  
2003 University of Edinburgh, ICAPB, Genetics  
2003 University of Fribourg, Ecology and Evolution  
2004 Kellogg Biological Station, Michigan State University  
2004 Initiative in Organismal Interactions Retreat, Washington State University and University of Idaho

2004 Plant Biological Sciences Colloquium, University of Minnesota  
2005 Department of Biology, University of Minnesota-Duluth, March 4  
2005 Center for Population Biology, University of California, Davis. (Distinguished speaker, 5 talks, April 11-15; Invited by graduate students in CPB)  
2005 Department of Biology, Carleton College, October 24  
2006 Dept. of Ecology, Evolution and Organismal Biology, Iowa State University.  
2006 Symposium: Evolutionary consequences of anthropogenic changes to Pacific salmon  
2007 Elroy L. Rice Lecture in Ecology, University of Oklahoma  
2007 Yodzis Colloquium, University of Guelph, Ontario Canada  
2008 Department of Biological Sciences, University of Notre Dame  
2008 Department of Biology, University of Virginia  
2009 Instituto de Ecologia, Universidad Autonoma de México  
2009 Department of Biology, Hamline University  
2010 Department of Horticultural Sciences, University of Minnesota  
2010 Atwood Lecture (Invited by graduate students), Dept of Ecology and Evolutionary Biology, University of Toronto  
2010 Meeting: Evolutionary potential in natural populations, Aarhus Denmark  
2010 Institute of Evolutionary Biology, University of Edinburgh  
2011 CEFE, CNRS Montpellier (2/4/2011)  
2011 Institut des Sciences de l'Evolution Montpellier, Université de Montpellier II (2/14/2011)  
2011 Evolutionary Biology Centre, University of Uppsala (3/15/2011)  
2011 Department of Biology, University of Manchester UK (5/9/2011)  
2011 Department of Biology, University of York UK (5/12/2011)  
2011 School of Biology, University of St. Andrews UK (5/13/2011)  
2011 Department of Biology, University of Iowa (10/28/2011)  
2012 Biology Department, Winona State U. (3/22/2012)  
2012 webinar, genetic sources for prairie restorations (11/29/2012)  
2012 Plenary speaker, Crop Wild Relative Genomics: a Key to Unlocking Diversity (2/12/2012)  
2013 2nd Annual Cornell University Plant Breeding Symposium: Crop improvement in a changing environment. (3/8/2013)

Contributed talks at the joint meeting of the Society for the Study of Evolution and the American Society of Naturalists in 1981, 1983, 1985, 1992, 1995, 1997 (2), 1998 (2), 2004 (1 talk, co-author on 3 posters), 2005 (1 talk, co-author on 1 poster), 2008 (1 talk, co-author on 3 others), 2009 (1 talk), 2010 (1 talk), 2012 (poster).  
Contributed talk at the meeting of the British Population Genetics Group: Dec 1985, Jan 2011

### **Grants and Contracts - Funded**

Genetic Basis of Plant Interactions, 1989 - 1992. NSF. \$145,000. PI Shaw.

Maximum likelihood analysis of Quantitative Genetic Data, 1991 - 1993. NSF

\$58,330. PI Shaw.

Mating Success in Montane Wildflowers: Postpollination Mechanisms and Relative Fitness Contribution of Differential Outcrossing Distance, (P.I. N.M. Waser, coPIs, M.V. Price and R.G. Shaw), 1989 - 1993. NSF. \$214,000.

Patterns of Genetic Variation in Natural Populations: Chromosomal, Single Gene and Polygenic, 1992-1994. NSF. \$5,330. (Doctoral Dissertation Improvement Award for Robert Podolsky, PI, Shaw).

Estimation of Quantitative Genetic Parameters in Inbred Populations", 1993 – 1995. Pioneer Hi-Bred International, Inc. \$60,000. PI, Shaw)

STAR Graduate Fellowship for Julie Otterson, 1995-1998, EPA \$23,262.

Underwood Fund Grant, 1995 - 1996. BBSRC(UK) \$8000. PI, Shaw

Mutational effects on quantitative traits of *Arabidopsis thaliana*, 1996 – 2000. NSF. \$264,000. PI, Shaw.

Spontaneous mutation affecting quantitative traits in *Arabidopsis thaliana*, 2000-2005. NSF. \$404,000. PI, Shaw.

Biocomplexity: Evolution and ecology of perturbed interactions: modeling disequilibria in time and space, 2000 - 2005, NSF PI C. Neuhauser, PI, DN Alstad, G. May, P. Graham, RG Shaw co-PIs. \$2,965,346.

DISSERTATION RESEARCH: The effect of inbreeding on nitrogen use efficiency, 2002 -2003. NSF. \$8,000, co-PI with D. Alstad, for E. Lonsdorf.

Genetic basis of biomass accumulation in the model plant *Arabidopsis thaliana* grown in ambient and elevated CO<sub>2</sub> environments. \$25,000. 2004-2005. University of Minnesota Initiative for Renewable Energy and the Environment PI P. Tiffin (PI), co-PIs, R. Shaw and P. Reich.

Natural selection and evolutionary constraints in an elevated CO<sub>2</sub> environment. \$237,452 2004 - 2006. NSF. co-PI with P. Tiffin (PI), P. Reich

LTREB: The interplay of genetic and numerical dynamics in severely fragmented prairie populations of *Echinacea*, \$225,000 2006-2011. NSF. PI Shaw, collaborative with S. Wagenius.

IGERT: Risk Analysis for Invasive Species and Genotypes, \$3,000,000; 2007-2012. NSF. PI R. Newman, co-PIs, D. Andow, S. Galatowitsch, A. Kapuscinski, RG Shaw.

LTREB: The interplay of genetic and numerical dynamics in severely fragmented prairie populations of *Echinacea*, \$225,000; 2011-2016. NSF. PI Shaw, collaborative with S. Wagenius.

Project Baseline, a living plant genome reserve for the study of evolution, \$1,199,984; 2011-2015. NSF. PI Etterson (UM-Duluth), co-PIS Franks (Fordham), Mazer (UCSB), Shaw.

Potential for adaptation, and its realization, in natural plant populations, \$700,000; 2013-2017. NSF. PI R.G. Shaw.

Pending grant:

Healthy prairies: Seed storage, beneficial microbes, and adaptation. Approved by LCCMR, pending legislative approval. \$600,000. R. G. Shaw, Project Manager, G. May and D. Wyse, co-PIs. **LCCMR**: Proposal submitted, June 7, 2013.

**Teaching and Advising Activities**

Courses taught:

Biol 3008: Ecology and Evolution (60-80 students) W97, W98, W99

Biol 3409: Evolution (70-120 students, cotaught with S. Lanyon, A. Dean or G. May), F99, F00, F01, S06, S07, S08

EEB 5042: Quantitative Genetics (15-25 students) S97, S98, S99, F06, F07, F08, F09, F11, F12, F13

EEB 5033: Population and Quantitative Genetics (20-30 students, cotaught with J. Curtsinger in F93, F94, F99, F00, F01, F03; taught solo, F04, F05

EEB 8390: Graduate seminars: Topics include Plant Evolutionary Biology, Practicum in Quantitative Genetics, Community Genetics (with Community Genetics faculty) Professional Issues (with Hobbie and Lanyon [2000], with Cotner and Lanyon [2004]), Advanced Topics in Quantitative Genetics.

EEB 8980: Proposal writing seminar for second year EEB grad students (6-12 students F11, F12, F13

ISG 8001: Seminar on Introduced Species and Genotypes S08, F09, F11, F12

ISG 5010: Risk Analysis for Introduced Species and Genotypes (one of 12 co-instructors) F08, F09

## Graduate advising:

Member of graduate faculties: Ecology, Evolution, and Behavior; Plant Biological Sciences; Conservation Biology; Applied Plant Sciences; Invasive Species and Genotypes (graduate minor)

Students advised:

Robert Podolsky, Plant Genetics (UC-Riverside), Ph.D. 1994. "Population genetic structure of *Clarkia dudleyana*". Biostatistician, University of Georgia Medical School.

Elizabeth Svenson, Ecology (co-advised with P. Morrow), M.S. 1995. "Response of prairie species and old-field vegetation in an experimental restoration from seed".

Julie Etterson, Ecology, Evolution and Behavior, Ph.D. 2000. "Evolutionary potential of the annual legume, *Chamaecrista fasciculata*, in relation to global warming." Associate Professor, U. Minnesota-Duluth.

David Heiser, Ecology, Evolution and Behavior, M.S. 2000. "Fitness effects of outcrossing and the occurrence of insect-mediated cross-pollination in *Calylophus serrulatus*, a prairie perennial". Head of Education and Outreach, Peabody Museum, Yale University.

Christine Kavanaugh, Plant Biological Sciences, M.S. 2000. "The effects of spontaneous mutation on fitness and response to shading in *Arabidopsis thaliana*." Monsanto.

Nadilia Gomez, Plant Biological Sciences, M.S. 2001 (G. May, co-advisor). "Effect of inbreeding on male and female fertility of *Nemophila menziesii*." Ph.D. completed in Applied Plant Sciences, U.M. Pioneer Hi-Bred International (Dupont).

Stacey Halpern, Ecology, Evolution and Behavior Ph.D. 2003 (co-advised with P. Morrow). "Evaluating the potential for adaptation to climate change in *Lupinus perennis*." Associate Professor, Pacific University.

Eric Lonsdorf, Ecology, Evolution and Behavior Ph. D. 2003 (co-advised with D. Alstad). "Consequences of inbreeding in fragmented habitat for plant populations and communities." Postdoc at N. AZ. U. and Lincoln Park Zoo.

Jason Hill, Plant Biological Sciences, Ph. D.2004. "Effects of spontaneous mutation on fitness of *Arabidopsis thaliana*". Assistant Professor, Bioproducts and Biosystems Engineering, U. Minnesota-TC.

Kristin Mercer, Applied Plant Sciences Ph.D. 2005 (co-advised with D. Wyse). "Seed germination, growth and fitness in crop-wild sunflower hybrids from multiple genetic backgrounds: genetic and environmental effects on evolution of wild populations."

Assistant Professor, Ohio State Univ.

Laurie Stone, Plant Biological Sciences, M.S. 2007 (co-advised with P. Tiffin). "CO<sub>2</sub>, N, and Biodiversity Effects on Phenotypic Selection and Demography of Native Grassland Perennials."

Rachel Mills (Plant Biological Sciences), M.S. 2008. Evolutionary divergence of the invasive prairie species *Melilotus officinalis*.

John Stanton-Geddes (EEB, coadvisor Tiffin), Ph.D. 2011. Limits to range expansion in the native annual legume, *Chamaecrista fasciculata*. Currently postdoc, University of Vermont

Amy Dykstra (PBS), Ph.D. 2013. Seedling recruitment in fragmented populations of *Echinacea angustifolia*. Currently visiting assistant professor, Bethel University.

Gina Quiram (EEB, coadvisor Cavender-Bares), Ph.D. 2013. The ecology and evolution of an invasive perennial plant (*Lythrum salicaria*) in the context of biological control by specialist herbivores (*Galerucella spp.*). Currently visiting assistant professor, Gustavus Adolphus College.

Current students: Marcus Warwell (EEB), Shelby Flint (Conservation Biology, coadvisor Jordan), Amber Eule-Nashoba (PBS), Nicholas Goldsmith (EEB).

#### **Postdoctoral Associates:**

Gerrit A. J. Platenkamp, postdoctoral funded by my NSF grant 1988-1991, currently environmental consultant.

Stefan Andersson, postdoctoral funded by Swedish NSF 1992-1993, currently lecturer at University of Lund.

Diane Byers, postdoctoral funded by my setup funds and NSF grant 1993-1998, Currently Associate Professor at Illinois State University.

Shumei Chang, postdoctoral funded by NSF grant 1999-2001. Currently, Associate Professor at Univ. of Georgia.

Stuart Wagenius, postdoctoral funded by NSF biocomplexity grant, 9/2000 - 5/2001. Currently, Conservation scientist, Chicago Botanic Garden.

Helen Hangelbroek, postdoctoral funded by NSF biocomplexity grant, 2003 - 2005.

Jen Lau, postdoctoral funded by NSF grant (Peter Tiffin, PI, P. Reich and R. Shaw, co-PIs), (2005-2007). Currently Assistant Professor, Michigan State University.

Caroline Ridley, postdoctoral funded by NSF LTREB grant (2008-2009). Currently at US Environmental Protection Agency.

### **Undergraduate advising:**

Since 1993, 28 undergraduates have gained experience in research by assisting in my research program. In addition, the following undergraduate students have conducted independent research under my supervision:

Julie Etterson (summa cum laude, 1994)

Jon Poppele (magna cum laude, 1997)

Jennifer Larson

Christy Olson

Emily Wennerlind (cum laude, 1998)

Kelly Wilson

Abe Gol (spring, 2004)

Jeremy Kobany (2004-5)

Karl Tinsley (2006)

Allegra Halverson (2009), REU

Hillary Lyons (2010), REU

Lee Rodman (2011), REU

Shona Sanford-Long (2012), REU

Tao Li (2012-2013), UROP

Xiang Li (2012-2014)

Sarah Baker (2013), REU

Dana Olofson (2013-2014), Honors

Mindi Depaola (2013-2014)

### **Visiting Professional Associates:**

Thure Hauser, Postdoc in Riso, Denmark. visitor for several weeks in 1996,

Philip Service, Associate Professor, Northern Arizona Univ. sabbatical visitor fall, 1997.

Alejandra Ramos, Depto de Ecologia Evolutiva, Inst de Ecologia UNAM, May 2010

Cynthia Norton, Professor, Biology, St. Catherine's University, summer, fall 2013

Pamela Kittelson, Professor in Biology, Gustavus Adolphus College, sabbatical 2013-4  
(partially funded by supplement to NSF LTREB award).

### **Service at University of Minnesota**

1993-1994

Seminar Committee, EEB, chair

Crop-weed ecologist search for Agronomy and Plant Genetics (outside member)

1994-1995

Advisory Committee, EEB

Greenhouse use committee, EEB

1995-1996

Sabbatical: University of Edinburgh

1996-1997

Curriculum Committee, EEB, chair [conversion to semesters]

Salary Committee, EEB

Long-range planning committee, EEB

Greenhouse planning committee, campus

1997-1998

Co-leader (with N. Jordan) of University of Minnesota Center for Community Genetics

Salary Committee, EEB, chair

Curriculum Committee, EEB, chair

Committee to convert to salary ladder, EEB

Centralized Greenhouse Oversight Committee (campus)

Committee to design new greenhouses for the St. Paul Campus

Ichthyology search for Bell Museum and Fisheries and Wildlife (outside member)

Awards Committee, Ecology graduate program

Curriculum Committee, Plant Biological Sciences graduate program

Task force for establishment of Department of Plant and Fungal Biology

1998-1999

Advisory Committee, EEB

Search for Department Head, EEB

Seminar Committee, EEB

Post-Tenure Review Committee, EEB

Committee to convert to salary ladder, EEB

Centralized Greenhouse Oversight Committee, campus

Committee to design new greenhouses for the St. Paul Campus

1999-2000

Advisory Committee, EEB

Long-range planning Committees, EEB

Awards Committee, Ecology graduate program

Centralized Greenhouse Oversight Committee, campus

Committee to design new greenhouses for the St. Paul Campus

2000-2001

Chair, Search Committee for Endowed Chair in Evolutionary Biology, EEB

Centralized Greenhouse Oversight Committee, campus

Committee to design new greenhouses for the St. Paul Campus

Faculty Consultative Committee, CBS

Colloquium Committee, Plant Biological Sciences



2001-2002

Search Committee for two spousal hires, EEB

Seminar Committee, EEB

Ombudsperson for 2nd floor, EEB

Search Committee for five faculty positions in Genomics and Development, Plant Biology

Imaging Center Oversight Committee, CBS

Executive Committee, NIH Cardiovascular Disease Training Grant, AHC

2002-3

Sabbatical: Université de Montpellier II, France

2003-4

Advisory Committee, EEB

Ombudsperson for 5th floor, EEB

Pre-tenure review Committee, EEB

Awards Committee, EEB Graduate Program

Recruitment Committee, Plant Biological Sciences Graduate Program

Committee to design new greenhouses for the St. Paul Campus

TA award committee, CBS

Organizer of ad hoc meetings (monthly, Spring semester) of evolution faculty to discuss recruitment and curriculum

Participant in Brown bag lunches to discuss plans for microbial evolution

2004-5

Search committee for faculty hire in evolution, EEB

Advisory Committee, EEB

Ombudsperson for 5th floor, EEB

Post-tenure review Committee, EEB

Interim Associate Director of Graduate Studies, PBS (Jan-Aug)

2005-6

Search committee for faculty hire in evolution, EEB

Post-tenure review Committee, EEB

Admissions Committee, EEB Graduate Program

2006-7

Admissions Committee, EEB Graduate Program

Mentoring Committee, EEB (Chair)

2007-2008

Promotion and Tenure Committee, EEB

Mentoring Committee, EEB

Awards Committee, PBS

Executive Committee, ISG-IGERT

2008-2009

Promotion and Tenure Committee, EEB  
Advisory Committee, EEB  
Steering Committee, PBS  
Promotion and Tenure Committee, CBS  
Executive Committee, ISG-IGERT

2009-2010

Promotion and Tenure Committee, EEB  
Advisory Committee, EEB  
Promotion and Tenure Committee, College of Biological Sciences (chair)  
Steering Committee, PBS  
Executive Committee, ISG-IGERT  
Executive Committee, Center for Foundations of Evolutionary Biology

2010-2011

Sabbatical: University of York, UK and Université de Montpellier II, France

2011-2012

Promotion and Tenure Committee, EEB  
Post-tenure Review Committee, EEB  
Cluster hire process: drafted proposal for evolution hires, helped edit proposal for theory hires  
Executive Committee, ISG-IGERT  
Executive Committee, Center for Foundations of Evolutionary Biology  
Mentor for David Moeller (Plant Biology)

2012-2013

Elected member of the University Senate (to 2015)  
Co-chair, Search Committee for two faculty in quantitative and theoretical biology  
Interim DGS, EEB  
Post-tenure Review Committee, EEB, Chair  
Executive Committee, Center for Foundations of Evolutionary Biology  
Mentor for David Moeller (Plant Biology)

2013-2014

Elected member of Advisory Committee, EEB  
Elected member of the University Senate (to 2015)  
Executive Committee, Center for Foundations of Evolutionary Biology  
Mentor for David Moeller (Plant Biology) and Emilie Snell-Rood (EEB)

### **Professional Affiliations and Service**

American Genetic Association: Editorial Board, Journal of Heredity, 1992-1995; elected member of Council, 1999-2001

American Society of Naturalists: Editorial Board, *The American Naturalist*, 1993-1997; Committee to name recipient of Sewall Wright Award, 1995, 2001; Committee to name recipients of Young Investigator Prizes, 1995, 1998 [Chair]; Committee to name new Editor-In-Chief for *The American Naturalist*, 2007; Editor, *The American Naturalist*, 2008-2011

Genetics Society of America: Editorial Board, *Genetics*, 1994-2001

Society for the Study of Evolution: Member; Editorial Board, 1995-1997; Member of the Council, 1997-1999; Member of Finance Committee, 1999-2001; Vice President, 2005; member, planning committee for 2008 meeting held in Minneapolis; Editor-In-Chief, *Evolution*, June 2013 -

Editor, *New Phytologist*, 2004-2009

NSF - Population Biology Panel, Spring 1993, Fall 1997, Spring 2004; RTG site visit, Spring 1992; Committee of Visitors, Spring 1995; STC site visit, Jan 1999; IRC-EB panel, Spring 1999, Spring 2000; Evolutionary Synthesis Center workshop, Spring 2002; Population and Evolutionary Processes Panel, Spring 2006, Spring 2008; Evolutionary Genetics Panel, Fall 2011.

Reviewer of grant proposals for NSF, USDA, NSERC (Canada), RCENR (Finland; chaired grant panel on Ecology, Sept 2002)

NIH (Program Project Review Panel, Fall 1994; Genetic Variation and Evolution Panel, Spring 2006, Fall 2007, reviews of single proposals, spring and summer 2009)

Reviewer of manuscripts for *The American Naturalist*, AoB PLANTS, *Canadian Journal of Botany*, *Ecological Monographs*, *Ecology*, *Evolution*, *Genetical Research*, *Genetics*, *International Journal of Plant Science*, *Journal of Evolutionary Biology*, *Livestock Production Science*, *Nature*, *New Phytologist*, *Oikos*, *Proceedings of the National Academy of Sciences*, *Proceedings of the Royal Society of London*, *Science*, *Trends in Ecology and Evolution*.

Detailed comment on book chapters for Sinauer, W.H. Freeman, and Roberts and Co.

member, Evolutionary Biology Advisory Committee of the Department of Ecology, Evolution and Environmental Biology at Columbia University, 2003-2004

member, Board of Advisors, Initiative in Organismal Interaction, Washington State University and University of Idaho, 2004-2005

member, Committee on Native grasses and forbs: Minnesota Crop Improvement Association, 2009-2010, 2012-2014.