

PAUL R. CABE
BIOLOGY DEPARTMENT
WASHINGTON AND LEE UNIVERSITY
LEXINGTON, VA 24450
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EDUCATION

Ph.D. Department of Ecology, Evolution and Behavior, University of Minnesota. March 1994.
Dissertation: The Population genetics of introduced species: The European Starling (*Sturnus vulgaris*) in North America
B. S. Biology. College of William and Mary, Williamsburg, Virginia. May 1984. Highest Honors.

RESEARCH INTERESTS

My current interests focus on using the methods of molecular genetics to answer questions in the areas of population genetics and evolutionary biology. Recent and current projects include the cloning and sequencing of microsatellite repeats, the use of microsatellites to address questions of paternity, gene flow, and population structure, and molecular methods to measure microbial communities (t-RFLP, DNA sequencing, qPCR). I maintain active interests in ornithology, ecology, and conservation biology.

EMPLOYMENT

Associate Professor of Biology, Washington and Lee University, Lexington, VA August 2000 to present.

Courses: Fundamentals of Biology (Biol 111)
Biology of Mainland Ecuador and the Galapagos (Biol 216)
Genetics (Biol 220)
Genetics Laboratory (Biol 221)
Ornithology (Biol 241)
Topics in Biology (Biol 295)
Modern Genetic Analysis (Biol 320)
Advanced Genetics Laboratory (Biol 321)
Conservation Genetics (Biol 322)

Assistant Professor of Biology, St. Olaf College, Northfield, MN. September 1994 to May 2000.
Instructor, University of Minnesota, St. Paul MN. Summer term, 1994.
Instructor, Augsburg College, Minneapolis, MN. January Term 1994.
Instructor, University of Minnesota. 1992, 1993, 1995. Compleat Scholar/Extension program.

HONORS, AWARDS, AND FELLOWSHIPS

Windler Award, Best Systematic Botany Paper published in *Castanea* during the preceding year.
Received April, 1996.

Outstanding Performance as a Teaching Assistant, College of Biological Sciences, University of Minnesota, 1992. (nominated again in 1993)
Cooper Ornithological Society Student Membership Award. 1991
Fulbright Fellowship to study in England, January-October 1990. DNA fingerprinting of wild bird populations in Dr. D. T. Parkin's laboratory at the University of Nottingham.
National Science Foundation Fellowship for Graduate Study. 1985-1989.
Graduate School Fellowship (Bush Foundation). 1985. University of Minnesota.
Phi Beta Kappa. Elected November 1983.

GRANTS RECEIVED

Taxonomy, ecological modeling, and conservation status determination of *Orconectes* (cf.) *punctimanus* in Virginia. Zachary Loughman (West Liberty University, WV), with contract to Paul R. Cabe. Virginia Department of Game and Inland Fisheries. August 2015. \$25,000.

Allelic diversity within and genetic divergence between Virginia and Missouri populations of the federal threatened species, *Helenium virginicum*. Virginia Department of Agriculture and Consumer Services / US Fish and Wildlife Services. John Knox, Paul Cabe, Maryanne Simurda. August 2010. \$10,000.

Community Research and Education - Birds and Bird Habitats on private land in Rockbridge County, VA. Corporation for National Service (CNS) Learn and Serve America. June 2008.

Developing cpDNA and nuclear genetic markers for population analysis in Virginia Sneezeweed, *Helenium virginicum*. W&L Glenn Grant 2008. (internal grant)

Developing genetic markers for population analysis in Virginia Sneezeweed, *Helenium virginicum*. W&L Glenn Grant 2007. (internal grant)

Developing genetic markers for paternity testing in the Gray Catbird (*Dumetalla carolinensis*). W&L Glenn Grant 2006. (internal grant)

Can genetic markers from Northern Mockingbirds be used to detect extra-pair paternity in the Gray Catbird? W&L Glenn Grant 2005. (internal grant)

Genomics Education Matching Grant Program, LI-COR Biosciences. Instrument grant for purchase of an automated DNA sequencer. August 2004. \$41,250.

Fragmentation of terrestrial salamander populations by forest roads: ecological and genetic effects. D. Marsh and P. Cabe. National Science Foundation, Research at Undergraduate Institutions. Submitted to Division of Environmental Biology (Population Biology) July 2002. (\$375,000)

Are Roads Barriers to Gene Flow for Red-backed Salamanders? W&L Glenn Grant 2002. (internal grant)

Gene Flow and Population Structure in Virginia's Flowering Dogwoods. Jeffress Memorial Trust. December 2001 (\$28,939).

Demography and Breeding System of the Acadian Flycatcher in Virginia. R. E. Lee Grant to support Hillary Lockemer ('02); Glenn Grant for project support. June - August 2001. (internal grant)

Protocols for DNA fingerprints from the University of Minnesota apple cultivar "Honeycrisp®." Patents and Technology Marketing Office, University of Minnesota. 1999 (\$4000).

Testing a Streamlined Method for the Development of Microsatellite Loci in Dark-Eyed Juncos. Faculty Development Grant. St. Olaf College, Northfield, Minnesota. 1999.
The geographic population structure of duckweed (*Lemna minor*). Faculty Development Grant. St. Olaf College, Northfield, Minnesota. 1996.

RESEARCH PUBLICATIONS (* denotes undergraduate researchers)

- Liebgold E. B., Kramer C. F., Roomian, T. C. Sorce, G.M. and Cabe, P. R. 2018. Heterozygosity-behavior and heterozygosity-fitness correlations in a salamander with limited dispersal. *Population Ecology* 60(3): 251-260.
- Irwin*, A, L Greer, R Humston, M Devlin-Durante, P Cabe, H Lescinsky, K Wirth, HA Curran, IB Baums. 2017. Age and intraspecific diversity of resilient *Acropora* communities in Belize. *Coral Reefs* 36(4): 1111-1120.
- Cabe, P. R. 2016. A complete mitogenome from *Orconectes (Procericambarus) ozarkae* (Williams). *Freshwater Crayfish* 22: 95-98.
- Knox, J. S., K. Bezold, P. R. Cabe, S. Williams and M. C. Simurda. 2016. Genetic Diversity and Population Structure of the Endemic Disjunct Species, *Helenium virginicum* (Asteraceae). *American Midland Naturalist* 175(2): 242-260.
- Cabe PR, Navalsky* BE, Bloomer* AK, Doherty* R, Edgren* J, Putney* JE and Bezold KA. 2015. A test of DNA barcoding in crayfish of the upper James River basin, Virginia. *Freshwater Crayfish* 21(1): 179-183.
- Bayer*, Claire S. O., Andrew H. Sackman, Kelly Hemminger, Paul R. Cabe, and David M. Marsh. 2012. Conservation genetics of a mountaintop salamander with an extremely limited range. *Conservation Genetics* 13(2): 443-454.
- Humston, Robert, Kelly A. Hemminger, Nathaniel D. Adkins*, Ryan J. Elsey*, Jessica Huss*, Brent A. Meekins*, Paul R. Cabe, and Timothy L. King. 2012. Put-and-grow stocking of brook trout in Virginia reservoirs: dispersal, naturalization, and interactions with wild populations in tributaries. *North American Journal of Fisheries Management* 32: 100-108.
- Liebgold, E. B., E. D. Brodie III, and P. R. Cabe. 2011. Female philopatry and male-biased dispersal in a direct-developing salamander *Plethodon cinereus*. *Molecular Ecology* 20: 249-257.
- Liebgold, E. B. and P. R. Cabe. 2008. Familiarity with adults, but not relatedness, affects the fitness of juveniles of *Plethodon cinereus*, a territorial salamander. *Behavioral Ecology and Sociobiology* 63:277-284.
- Marsh D. M., R. B. Page, T. J. Hanlon, R. Corritone*, E. C. Little*, D. E. Seifert*, and P. R. Cabe. 2008. Effects of roads on patterns of genetic differentiation in red-backed salamanders, *Plethodon cinereus*. *Conservation Genetics* 9(3): 603-613.
- Marsh, D. M., R.B. Page, T.J. Hanlon, H. Bareke*, R. Corritone*, N. Jetter, N.G. Beckman*, K.J. Gardner, D.E. Seifert and P.R. Cabe. 2007. Ecological and genetic evidence that low-order streams are partial barriers to the dispersal of red-backed salamanders (*Plethodon cinereus*). *Canadian Journal of Zoology* 85: 319-327.
- Aldrich*, L. Connors, and D. M. Marsh. 2007. Fine-scale population differentiation and gene flow in a terrestrial salamander (*Plethodon cinereus*) living in

- continuous habitat. *Heredity* 98: 53-60.
- Liebgold, E. B., P. R. Cabe, R. G. Jaeger, and P. L. Leberg 2006. Multiple paternity in a salamander with socially monogamous behavior. *Molecular Ecology* 15: 4153-4160.
- Fauth, P. and P. R. Cabe 2005. Reproductive success of Acadian Flycatchers in the Blue Ridge Mountains of Virginia. *Journal of Field Ornithology* 76(2): 150-157.
- Cabe, P. R., A. Baumgarten*, K. Onan*, J. J. Luby, D. S. Bedford. 2005. Using Microsatellite Analysis to verify breeding records: A study of 'Honeycrisp' and other cold hardy apple cultivars. *HortScience* 40(1): 15-17.
- Connors, L. M. and P. R. Cabe. 2003. Isolation of dinucleotide microsatellite loci from red-backed salamanders (*Plethodon cinereus*). *Molecular Ecology Notes* 3(1): 131-133.
- Cabe, P. R., and J. S. Liles*. 2002. Dinucleotide Microsatellite Loci Isolated from flowering dogwood (*Cornus florida* L.). *Molecular Ecology Notes* 2: 150-152.
- Cabe, P. R., and K. E. Marshall*. 2001. Isolation of microsatellite sequences from House Wrens (*Troglodytes aedon*). *Molecular Ecology Notes* 1(3): 155-157.
- Cabe, P. R. 1999. Dispersal and population structure in the European Starling (*Sturnus vulgaris*). *The Condor* 101:451-454.
- Cabe, P. R. 1998. The effects of founding bottlenecks on genetic variation in the European Starling (*Sturnus vulgaris*) in North America. *Heredity* 80: 519-525.
- Cabe, P. R. 1995. The *Trillium pusillum* Michaux complex in Virginia. I. Morphological investigations. *Castanea* 60: 1-14.
- Cabe, P. R. and C. Werth. 1995. The *Trillium pusillum* Michaux complex in Virginia. II. Isozyme evidence. *Castanea* 60: 15-29.
- Cabe, P. R. and D. Alstad. 1994. Interpreting population differentiation in terms of drift and selection. *Evolutionary Ecology* 8: 489-492.
- Cabe, P. R. 1993. European Starling (*Sturnus vulgaris*). In *The Birds of North America*, No. 48 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists Union.

PUBLICATIONS

- Cabe, P. R. 2006. The History of Ornithology in Virginia. *The Raven* 77(2): 48. [book review]
- Cabe, P. R. 2004. DNA Fingerprinting. In *Encyclopedia of Genetics*, Revised Edition, ed. B. D. Ness. Salem Press, Inc. Pasadena, California.
- Cabe, P. R. 2002. Northern Red-bellied Snake (*Storeria occipitomaculata occipitomaculata*) in Rockbridge County. *Catesbeiana* 22(1): 14-15.
- Cabe, P. R. 2001. Spotted Salamander (*Ambystoma maculatum*) in Rockbridge County. *Catesbeiana* 21(1) 34.
- Cabe, P. R. 2001. Population Genetics. In *Biology for Students* (MacMillan Science Library for Students), ed. R. Robinson. MacMillan Publishing Company, Inc.
- Cabe, P. R. 1999. Starlings and Mynahs. *The Auk* 116: 1166. [book review]
- Cabe, P. R. 1999. Inbreeding and assortative mating. In *Encyclopedia of Genetics*, ed. J. A. Knight. Salem Press, Inc. Pasadena, California.
- Cabe, P. R. 1999. Alfred H. Sturtevant. In *American National Biography*, ed. J. A. Garraty and Mark C. Carnes. Oxford University Press, New York.

PRESENTATIONS (* denotes undergraduate researchers)

- Crustacyanin Genes of *Cambarus* Crayfish. PAUL R. CABE, Morgan Trimas*, Jeronimo Reyes-Olmedo* and Christian Kim*. International Association of Astacology, 22nd Conference, July 2018, Pittsburgh, PA. (Oral presentation)
- Gene expression in the crayfish endocuticle. Jeronimo Reyes-Olmedo*, Christian Kim*, Trevor Dacus*, and Paul R. Cabe. International Association of Astacology, 22nd Conference, July 2018, Pittsburgh, PA. (Poster presentation)
- On the Provenance of an *Orconectes* population in Virginia. Morgan Trimas* ('18) and Paul Cabe. Society for Freshwater Science, June 2017, Raleigh NC. (Oral presentation by MT)
- A Complete Mitogenome from *Orconectes*. Paul R. Cabe. American Fisheries Society, Southern Division, Feb. 20, 2016. (Oral presentation)
- Liebgold, Eric, Christian Kramer, Tamar Roomian, Gina Sorce, and Paul R. Cabe. The effects of heterozygosity and growth on territory size in a salamander with limited dispersal. [poster] Conservation Biology meeting, July 2013.
- Marsh, David, Clarice Bayer*, Andrew Sackman*, and Paul R. Cabe, Morphological and mitochondrial analyses of a contact zone between a narrow endemic and a common salamander. Society for the Study of Evolution Annual Meeting, June 2010.
- miliarity with adults, but not relatedness, affects the fitness of juveniles of *Plethodon cinereus*, a territorial salamander. 93rd Ecological Society of American Annual Meeting. August 2008.
- Cabe, Paul R. Natural History of the European Starling. USDA - Animal and Plant Inspection Service Conference: Managing Blackbirds, Starlings and Crows, Nashville, TN, January 29, 2008. Invited oral presentation.
- Victoria Childress* and Paul R. Cabe. 2008. Designing Microsatellite Primers for *Helenium virgicum*. Li-Cor Undergraduate Research Poster Contest. Second Place Winner. [Http://biosupport.licor.com/index.jsp?m=Proteomics&menu=Research_Area&spec=Undergraduate,Presentations_and_Posters](http://biosupport.licor.com/index.jsp?m=Proteomics&menu=Research_Area&spec=Undergraduate,Presentations_and_Posters)
- E. William Hamilton III, C. Eric Hellquist, Paul R Cabe, Andrew Friski*, Kelly Hemminger, Michelle A Thorne and Douglas A Frank. 2007. The effects of simulated grazing on soil microbial community abundance and composition in a Yellowstone National Park grassland. 92nd Ecological Society of American Annual Meeting. 2007.
- Cabe, Paul R. Population Structure and dispersal in the Red-backed Salamander. University of Virginia, Department of Biology. September 2005.
- Robert Page, David Marsh, Teresa Hanlon, Mary Aldrich*, Lisa Connors, Paul Cabe. Genetic Structure in the Red-backed Salamander (*Plethodon cinereus*), Across a 2 KM Transect: Evidence for Isolation by Distance. Southeastern Ecology, Population Genetics, and Evolution Annual Meeting, September 2004.
- Cabe, Paul R. Vanishing Gem of the Southern Appalachians: Population Structure and Gene Glow in Flowering Dogwood. Mary Humphreys memorial lecture, Mary Baldwin College, February 2004.
- Aldrich*, Mary S.; Hanlon, Teresa; Marsh, David M.; Cabe, Paul R. Effects of a highway on genetic differentiation of red-backed salamander populations. American Society of Ichthyologists and Herpetologists Annual Meeting, Manaus, Brazil. June 2003. (Poster presented by Mary Aldrich '04).
- Cabe, Paul R. Breeding Biology of Acadian Flycatchers in Virginia. November 2002. Invited Seminar at the College of William and Mary, Williamsburg, VA.

- Fauth, Peter, T. (Hartwick College) and Paul R. Cabe (Washington and Lee University).
Demography of Acadian Flycatchers in the Blue Ridge Mountains of Virginia..
September 2002. Third North American Ornithological Conference.
- Cavanaugh*, Amy, Melanie Lenahan (Biology Department, Drew University, Madison, NJ)
Peter Fauth (Biology Department, Hartwick College, Oneonta, NY) and Paul Cabe
(Washington and Lee University, Lexington, VA). Effects of Stream Discontinuity on
Genetic Diversity of Blacknose Dace, *Rhinichthys atratulus*. April 2002. New Jersey
Academy of Science Meetings.
- Cabe, Paul R. , Lisa Montanus* (St. Olaf College, Northfield, MN) and Peter Fauth (Drew
University, Madison NJ). May 2001. Breeding Success of the Acadian Flycatcher
(*Empidonax vireescens*) in the George Washington National Forest, Rockbridge County,
Virginia. Virginia Society of Ornithology Annual Meeting.
- Liles*, J. Spencer and Paul R. Cabe. May 2001. Characterization of microsatellite loci from
flowering dogwood (*Cornus florida*). 79th Annual Meeting of the Virginia Academy of
Science, Harrisonburg, Virginia.
- Marshall*, Kriste and Paul R. Cabe. October 1999. Cloning microsatellite markers and
development of primers in House Wrens (*Troglodytes aedon*). Pew Midstates Science
and Math Consortium Undergraduate Research Symposium in Biological Sciences and
Psychology, St. Louis, MO.
- Onan*, Kyle and Paul R. Cabe. October 1999. An investigation of lineage in *Malus x domestica*
using microsatellites. Pew Midstates Science and Math Consortium Undergraduate
Research Symposium in Biological Sciences and Psychology, St. Louis, MO.
- Cabe, Paul R. and Kathy Shea. October 1999. Teaching Oral Communication Skills to Enhance
Learning. Project Kaleidoscope National Convention.
- Cabe, Paul R. June 1999. Geographic range expansion and population differentiation:
Simulations of European Starlings. Society for the Study of Evolution Annual Meeting,
Madison, WI.
- Crofts*, John and Paul Cabe. May 1998. Using Universal Primers to amplify cpDNA from
domestic apples (*Malus*). Minnesota Academy of Science Annual Meeting.
- Engen*, Kristina and Paul Cabe. May 1998. Using Universal Primers to amplify cpDNA from
duckweed (*Lemna minor*). Minnesota Academy of Science Annual Meeting, Wenona.
- Straub*, Justin and Paul Cabe. April 1997. Genetic variation within and among populations of
Lemna minor L. (duckweed). Minnesota Academy of Science Annual Meeting, St. Paul.
- Cabe, Paul, Charles Umbanhowar, and Anne Walter. February 1996. Facilitating Discussion in
Large Lectures. Pew Midstates Science and Math Consortium Faculty Development
Workshop: The Special Problems and Possibilities of Teaching Introductory Biology.

UNDERGRADUATE RESEARCH STUDENTS

- Jeronimo Reyes-Olmeda ('21) Summer 2018. DNA barcoding of crayfish, geographic genetic
variation in *Cambarus acuminatus* crayfish.
- Christian Kim ('20) Summer 2018. DNA barcoding of crayfish, geographic genetic variation in
Cambarus acuminatus crayfish.
- W. Trevor Dacus ('19) Summer 2017, 2018. DNA barcoding of crayfish, geographic genetic
variation in *Cambarus acuminatus* crayfish.
- Morgan Trimas ('18) Summer 2016, 2017. Crayfish genetics, introduced populations.
- Sarah Clifford ('19) Summer 2016. Crayfish DNA barcoding.
- Ainsley Bloomer (2015) Summer 2014. DNA Barcoding of Crayfish.

Bradleigh Navalsky (2015). Summer 2014. DNA Barcoding of Crayfish.

Joy Putney (2016) Summer 2013. DNA Barcoding of Crayfish.

Jordan Edgren (2015) Summer 2013. DNA Barcoding of Crayfish.

Melissa Champion (2014) Winter 2013. Sequencing the mitochondrial genome of a crayfish.

Ryan Dohery (2014) Summer 2011, 2012, 2013. Analysis of population structure in Mexican bats. DNA Barcoding of Crayfish.

Aubri Charnigo (2013) Development of microsatellite markers for Mexican fruit bats. Analysis of population structure in Mexican bats.

Robert Warneford-Thomson (2012) Summer 2010, 2011. Development of microsatellite markers for Mexican fruit bats.

Katherine Gould (2011) Fall 2010, Winter 2011. Chloroplast haplotype diversity in *Helenium virginicum* revealed by DNA sequencing.

Huss, Jessica (2010) - Developing nuclear and cpDNA markers for population analysis of the endangered Virginia plant, *Helenium virginicum*. Spring 2008, Summer 2008.

J. Woodrow Friend (2008). An *rpoB* based qPCR assay for counting soil bacteria. Fall 2007, Winter 2008, Spring 2008.

Nicole Conkling (2008). Testing taxa-specific 16S gene primers for qPCR analysis of soil microbe communities. Fall 2007, Winter 2008.

Victoria Childress (2008). Development of microsatellite primers for *Helenium virginicum*. Summer 2007.

Karen Klein (2008). Summer 2006, Development of microsatellite primers for paternity analysis in the Gray Catbird. (Honors Thesis)

Molly Potekhen (2007). Kinship analysis of red-backed salamanders using microsatellites.

Oakley, Clinton (2006). Fall 2005, Winter 2006. Sequencing 16S rRNA gene fragments isolated from soil to identify soil bacteria.

Lide, Ellen (2006). Summer 2005. Testing microsatellite primers isolated from Northern Mockingbird on its relative, the Gray Catbird.

Corritone, Rachel (2005). Winter 2005, Summer 2004. Microsatellite analysis of population structure and gene flow in the Red-backed Salamander.

Little, Elizabeth. (2006) Winter 2005, Summer 2005. Microsatellite analysis of population structure and gene flow in the Red-backed Salamander

Aldrich, Mary. (2005). Winter 2003, Winter 2004, Summer 2003, Summer 2004 Microsatellite analysis of population structure and gene flow in the Red-backed Salamander

Wall, Katie (2005). Summer 2002. Population structure of flowering dogwood (*Cornus florida*).

Lockemer, Hillary. Summer 2001. Demography of breeding Acadian Flycatchers in Rockbridge County.

Liles, Spencer (2001). Development of microsatellite loci for the flowering dogwood (*Cornus florida*).

GRADUATE STUDENTS

Eric B. Liebgold, MS candidate, Department of Biology, The University of Louisiana at Lafayette, Lafayette, LA (I was an external Graduate Committee member).

Eric B. Liebgold, PhD candidate, Department of Biology, University of Virginia, Charlottesville, VA. (I am an external Graduate Committee member).

PROFESSIONAL DEVELOPMENT

Society for the Study of Evolution Annual Meeting, Workshop: Teaching Evolution to Undergraduates. Madison, Wisconsin, June 1999.
Project Kaleidoscope's Faculty 21 Annual Meeting: Building Connections. Chicago, Illinois, September 1998.
Workshop on including oral communication practice and instruction in courses. St. Olaf College, June 1998.
Lilly Fellows Faculty Mentoring Program. St. Olaf College, Spring 1998
Project Kaleidoscope's Faculty 21 Annual Meeting: Thinking Outside the Box. Houston, Texas, November 1997.
Pew Midstates Science and Math Consortium Faculty Development Workshop: The Special Problems and Possibilities of Teaching Introductory Biology. February 1996.

PROFESSIONAL SERVICE

Editor, *The Raven*, journal of the Virginia Society of Ornithology; July 2002 to 2009.
Board of Directors, Virginia Society of Ornithology, July 2002 to 2009.
NSF Graduate Research Fellowship Review Panelist (2000, 2001, 2002, 2008, 2009, 2010, 2012, 2013).
Board of Directors, Nature Camp; beginning 2007.
Manuscript Reviewer for Molecular Ecology, HortScience.

COLLEGE SERVICE

COMMITTEE SERVICE

W&L Advanced Placement Committee, August 2001 - 2006.
W&L Public Functions Committee, April 2003 - June 2008.
W&L University Scholars Advisory Committee, September 2002 - 2006
W&L Faculty Committee on Inclusiveness, August 2004- June 2008.
W&L Community Grants Committee, Spring 2008 - present.
W&L Writing Program Advisory Committee, August 2008 - 2011
W&L Student Faculty Hearing Board, September 2014 - present

OTHER SERVICE

Howard Hughes Medical Institute Grant Committee; culminated in a grant award of \$1.3 million to support science education and research. Ongoing service on committee overseeing grant.
W&L George Washington Honor / Johnson Scholarship Interviewer, 2001, 2002, 2003, 2005, 2006, 2007, 2008, 2009, 2010, 2013.

Manuscript Reviewer for Molecular Ecology, HortScience.

MEMBERSHIPS AND AFFILIATIONS

American Association for the Advancement of Science
Society for the Study of Evolution

American Ornithologist's Union
Virginia Society of Ornithology
Virginia Academy of Science
PKAL F21: Project Kaleidoscope Faculty for the 21st Century Network