

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2. Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Linder, Carol Cutler		POSITION TITLE Professor of Biology	
eRA COMMONS USER NAME (credential, e.g., agency login) clinder			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of New Mexico	B.S.	1978-1982	Exercise Technology
The University of Texas at Austin	M.A. (thesis)	1983-1985	Exercise Physiology
The University of Texas at Austin	Ph.D.	1986-1990	Cell/Develop. Biology
Washington State University	Postdoc	1990-1994	Biochemistry

A. Personal Statement

My research focuses on processes that regulate normal cellular differentiation using chemically-induced genetic mouse models of infertility to explore the genetic causes of human male infertility, with an ultimate goal of discovering ways to modulate reproduction. Most recently I became a faculty participant in the Cold Spring Harbor Laboratory Infrastructure and Training to Bring Next-generation Sequence (NGS) Analysis Into Undergraduate Education grant attending a weeklong workshop at Bowie State University in June 2015. Following my postdoctoral training I spent more than ten years at The Jackson Laboratory in a variety of roles but culminating as the Associate Director of Genetic Resources. I was in charge of consolidating all NIH grant-funded mutant mouse resources under a single repository umbrella. I also served as a new models scientist and the research administrator for the Alzheimer Mouse Model Repository at Jackson Laboratory. Since 2004, I have since established and maintained an active research program with federal and institutional funding that trains undergraduate and master’s level students with the help of a part-time research associate. I added several new skills and knowledge to conduct my research during my sabbatical in the laboratory of Drs. Carolyn Machamer and Phillip Jordan at Johns Hopkins University in the Fall of 2013 and summer 2014 and have incorporated them into my research program at Highlands University, a small comprehensive Hispanic-serving institution in rural northeastern New Mexico. Since 2004, I have mentored 39 undergraduate students, 3 high school students, 13 graduate students, and one postdoctoral fellow; 83% of the undergraduates and 92% of the graduate students are from underrepresented populations in STEM fields. I have a very strong record of having my undergraduate and graduate students present their research at national conferences. Five of my former students have recently completed their PhDs and are currently doing post-doctoral research or employed in industry.

B. Positions and Employment

1983 – 1986	Research/Teaching Assistant, Exercise Physiology, University of Texas, Austin TX
1986 – 1990	Assistant Instructor/Research Assistant, Cell Biology, Developmental Biology, and Vertebrate Physiology, University of Texas, Austin TX
1993 – 1994	Visiting Assistant Professor, Department of Animal Sciences, Oregon State University
1994 – 1996	Technical Services Advisor, Genetic Resources, The Jackson Laboratory, Bar Harbor ME
1996 – 1998	Manager, Technical Services, The Jackson Laboratory, Bar Harbor ME
1997 – 1998	Assistant Professor, Adjunct, New Mexico Highlands University, Las Vegas NM
1998 – 2000	Senior Technical Information Scientist, The Jackson Laboratory, Bar Harbor ME
2000 – 2002	Senior New Models Development Scientist, The Jackson Laboratory, Bar Harbor ME
2002 – 2004	Associate Director of Genetic Resources, The Jackson Laboratory, Bar Harbor ME
2004 – 2005	Associate Research Scientist, The Jackson Laboratory, Bar Harbor ME
2004 – 2009	Assistant Professor, Dept. of Biology, New Mexico Highlands University, Las Vegas NM
2009 – 2014	Associate Professor, Dept. of Biology, New Mexico Highlands University, Las Vegas NM
2014 – present	Professor, Dept. of Biology, New Mexico Highlands University, Las Vegas NM

Other Experience and Professional Memberships

Research Experience in the following model organisms: mouse, rat, human, sea urchin, *Drosophila*

Management Training: Frank Lee Associates Leadership Style & management Effectiveness Course, AMA Fundamentals of Finance and Accounting for Non-financial Managers, Strategic Account Management Association training, Hurricane Island outward Bound Leadership & Teambuilding training, AMA Management Course

Committee Work and Service:

Professional: Faculty member of the CSHL Infrastructure and Training to Bring Next-generation Sequence (NGS) Analysis Into Undergraduate Education; Diversity committees for the Society for the Study of Reproduction (SSR) and American Society of Andrology; Phi Kappa Phi, Sigma Xi Scientific Research Society (vice-president and co-chair student research funding with Mary Shaw), Reviewer for a variety of scientific journals (Lab Animal, Andrology, Asian J Andrology, Reproduction, Cell and Tissue Research).

University: IACUC, Chair, Faculty Athletic Committee, member of College of Arts and Sciences Dean and Athletic Director search committees; Faculty Association President (2011-2013), Planning committee for Freshman Learning Communities, Freshman Orientation mock classroom teacher and advisor; Faculty Advisor for International Humanitarian Delegation, recruitment trip to Ft. Lewis and San Juan Community College, Certificate of Appreciation in recognition for support and partnership with Career Services Center.

Department: mentor to Jesus Rivas and Sarah Corey Rivas, participated in curriculum development, and developed 4 year road map degree plans for biology major. Mentor 3-5 undergraduate and 1-2 graduate students. Worked with Dr. Edward Martinez on Natural Sciences Graduate Handbook.

Community: Host visits and workshop for by elementary school kids (at least once a year), AAUW Girls' Can (5th grade girls, yearly in April or May) and Tech Trek (July, 2015), Northeastern regional science fair lead judge (yearly, March), Church Elder /Clerk of Session (ongoing)

Jackson Laboratory 1994-2005: Institutional Budget Committee, Repository Management Team, Genetic Quality Control, Scientific Outreach, Alzheimer's Disease Mouse Models Resource Administrator, Genetic Resources strategic planning, Animal Care and Use

Honors

Pre-doctoral Fellowship, NIH Development Biology Training Grant, University of Texas, Austin (1989-1990)
Teaching Excellence Award, Natural Sciences Foundation Advisory Council, University of Texas, Austin (1990)
National Research Service Award, NIH, Postdoctoral Fellowship (August 1991-May 1994)
National Institute of Child Health and Development, Young Investigator Travel Award (April, 1993)
Community Award, Alzheimer Research Forum (November, 2005)
Outstanding Service Award, New Mexico Highlands University (April, 2008)
Cowgirl Way Award New Mexico Highlands University (September, 2011)
U.S. Professor of the Year/CASE Nomination (April, 2014)
Excellence in Teaching Award, National Society of Leadership and Success (April, 2015)

C. Publications – (in chronological order, student authors are underlined).

Original Research

1. Ivy JL, Sherman WM, Cutler CL, Katz AL. 1986. Exercise and diet reduce muscle insulin resistance in obese Zucker rats. *Am J Physiol* 251:E299-E305.
2. Lillioja S, Young AA, Cutler CL, Ivy JL, Abbott WGH, Zawadski YJ, Christin L, Secomb TW, Bogardus C. 1987. Skeletal muscle capillary density and fiber type are possible determinants of in vivo insulin resistance in man. *J Clin Invest* 80:415-424.

3. Ivy JL, Katz AL, Cutler CL, Sherman WM, Coyle EF. 1988. Muscle glycogen synthesis after exercise: effect of time of carbohydrate ingestion. *J Appl Physiol* 64(4):1480-1485.
4. Sherman WM, Katz AL, Cutler CL, Withers RT, Ivy JL. 1988. Glucose transport: locus of muscle insulin resistance in obese Zucker rats. *Am J Physiol* 255:E374-E382.
5. Linder CC, Heckert LL, Roberts KP, Kim KH, Griswold MD. 1991. Expression of receptors during the cycle of the seminiferous epithelium. In: The Male Germ Cell: Spermatogonium to fertilization. *Ann of NY Acad Sci* 637:313-321. PMID: 1664678.
6. Sitteri JE, Karl AF, Linder CC, Griswold MD. 1992. Testicular synchrony: evaluation and analysis of different protocols. *Biol Reprod* 46:284-289. PMID: 1536904
7. Trezise AEO, Linder CC, Grieger D, Thompson EW, Meunier H, Griswold MD, Buchwald M. 1993. CFTR expression is regulated during both the cycle of the seminiferous epithelium and the oestrous cycle of rodents. *Nat Genet* 3:157-164. PMID: 7684647
8. Linder CC, Heckert LL, Goetz TL, Griswold MD. 1994. Follicle-stimulating hormone receptor gene promoter activity. *Endocrine J* 2:957-966.
9. McGuinness MP, Linder CC, Morales CR, Heckert LL, Pikus J, Griswold MD. 1994. Relationship of a mouse Sertoli cell line (MSC-1) to normal mouse Sertoli cells. *Biol Reprod* 51:116-124. PMID: 7918865.
10. Griswold MD, Heckert L, Linder CC. 1995. The molecular biology of the FSH receptor. *J Steroid Biochem Mol Biol* 53:215-218. PMID: 7626457
11. Law GL, McGuinness M, Linder CC, Griswold MD. 1997. Expression of apolipoprotein E mRNA in the epithelium and interstitium of the testis and the epididymis. *J Androl* 18(1):32-42. PMID: 9089066
12. Simpson EM, Linder CC, Sargent EE, Davisson MT, Mobraaten LE, Sharp JJ. 1997. Genetic variation among 129 substrains is problematic for targeted mutagenesis in mice. *Nat Genet* 16:19-27. PMID: 9140391
13. Bentson LF, Agbor, VA, Lopez, AC, Nfonam, L, Agbor, NL, Bornstein, SA, Handel MA, Linder CC,. New point mutation in *Golga3* causes multiple defects in spermatogenesis. *Andrology*, 1, 440-450: PMC Journal-In process. PMID: 23495255
14. Yimbesalu, JP, Hart, E., Chisholm D, Hart E, Devitt N, Ngam, P, Lindquist, I, Schilkey, F, Linder, CC. Strain Background Affects Severity of Spermatogenic Defects and Gene Expression in *Golga3^{repro27}* Mice. In final stages of preparation for Andrology.
15. Linder, CC and Machamer, CE. GOLGA3 not required for Golgi ribbon structure. In preparation for J Cell Science.

Abstracts/Poster Presentations (2010 – present)

1. Torres, J, Bentson, L, and Linder CC. Evaluation of *Zcchc8* as a candidate gene for male infertility in *repro29* mice. WAESO Student Conference, Tempe AZ. Jan 2010; NMHU Research Day, April 2010.
2. Esparza, R, Bentson, L, and Linder CC. Male Infertility: Sequencing *repro29* candidate genes. WAESO Student Conference, Tempe AZ. Jan 2010; NMHU Research Day, April 2010.
3. Sigdel R, Bentson, L, and Linder CC. Evaluating changes in gene expression patterns of *Kif5b* and *Psm6*: Are they regulated by GOLGA3? NM Bioinformatics Symposium (Santa Fe, NM), March 2010; NM INBRE Annual Meeting, March 2010.
4. Yee, OL, Bentson, LF, Linder, CC *Clip1* as a candidate gene for *repro29* male infertility mice. WAESO student conference (Tempe, AZ, Feb 2011): Emerging Researchers National Conference (Wash DC, Feb 2011); NMHU Research Day (April 2011).
5. Trujillo, A, Yee, O., Bentson, LF, Linder, CC. *Clip1* as a candidate gene for *repro29* male infertility: complementation testing with *Clip1^{tm1Gal}*. WAESO student conference (Tempe, AZ, Feb 2011).
6. Yimbesalu, JP, Linder, CC. More Severe Spermatogenetic Defects in Coisogenic C57BL/6J-*Golga3^{repro27}* strain: Deciphering GOLGA3 function in spermatogenesis. NMBIS (Santa Fe, NM, Mar 2011). *Oral Presentation*
7. Baidya R, Bentson LF, Sigdel R, Linder CC. *Golph3* and *Vamp4* Gene Expression in *Golga3^{repro27}* Mice. Poster presentation, Society for Study of Reproduction, Portland OR, August 2011.

8. Yimbesalu, JP, Linder, CC. More Severe Spermatogenetic Defects in Coisogenic C57BL/6J-*Golga3*^{repro27} strain: Deciphering GOLGA3 function in spermatogenesis. Poster presentation, Society for Study of Reproduction, Portland OR, August 2011.
9. Sigdel, R, Mobarak, C, Linder CC. Proteomic analysis of gene expression in *Golga3*^{repro27} male infertility mice. American Society of Andrology, Tucson AZ, Apr 2012.
10. Garcia, M, Trujillo, A, Bentson, LF, Linder, C. Identifying Proteins required for spermatogenesis using *repro29* mice. Society for the Study of Reproduction. State College, PA, August 2012.
11. Vigil, A, Santillanes, M, Sigdel, R, Mobarak, C, Linder, C. Identifying proteins important for spermatogenesis using *Golga3*^{repro27} mice. Society for the Study of Reproduction, State College, PA, August 2012.
12. Trujillo, A, Bentson, LF and Linder, C. *Clip1* as a Candidate Gene for *repro29* Male Infertility: A Test Using Sperm Morphology. Emerging Researchers National Conference in STEM, Washington D.C., February, 2013 and NMHU Research Day, April 2013.
13. Chisholm, D, Devitt, N, Ngam P, Lindquist, I, Schilkey F, Linder, C. Lost in Transcription Using Transcriptomics to Identify Differential Gene Transcription in the Testis of Infertile *Golga3*^{repro27} Mice.. NMBIST Genome Dynamics Symposium, Santa Fe, NM, March 2013.
14. Garcia, M, Trujillo, A, Bentson, L.F. Linder, C. identifying proteins required for spermatogenesis using *repro29* mice. WAESO student conference, Phoenix AZ, March, 2103.
15. Little, C. and Linder, C. Differential enolase 1 protein expression in *Golga3*^{repro27} mice. NMHU Research Day, April 2013.
16. Dikuba, R, and Linder, C. Infertility: Validating Differentially Expressed Proteins in *Golga3*^{repro27} Mutant mice. NMHU Research Day, April 2013.
17. Chisholm, D, Devitt, N, Ngam P, Lindquist, I, Schilkey F, Linder, C. Transcriptomic analysis of *Golga3*^{repro27}: a mouse model of male infertility. Society for the Study of Reproduction, Montreal, CANADA, July 2013.
18. Hart, E, Yimbesaul, JP, and Linder, C. Germ cell quantification reveals strain specific defects in *Golga3*^{repro27} mice. NM Bioinformatics, Science and Technology (NMBIST) Symposium: Transcriptional Control, Santa Fe, NM, March 2015. NMHU Research Day, April 2015.
19. Rivera, C, and Linder, C. Where's the mut? NMHU Research Day, April 2015.
20. Gomez, S, Estrada, E. and Linder, C, *Zcchc8*: A candidate gene for repro29 male infertility. NM Bioinformatics, Science and Technology (NMBIST) Symposium: Transcriptional Control, Santa Fe, NM, March 2015. NMHU Research Day, April 2015.
21. Dicko, A. and Linder, C. Sequencing The Zinc finger CCHC domain-containing protein 8 (*Zcchc8*) gene in *repro29* mice to locate an induced mutation. NM Bioinformatics, Science and Technology (NMBIST) Symposium: Transcriptional Control, Santa Fe, NM, March 2015. NMHU Research Day, April 2015.
22. Jiron, K. Pescador, F. and Linder, CC. *Acchc8*: a candidate for male infertility in repro29 mice. . NM Bioinformatics, Science and Technology (NMBIST) Symposium: Transcriptional Control, Santa Fe, NM, March 2015. NMHU Research Day, April 2015.
23. Umarova, A., Garcia, A., and Linder C. Finding the gene for *repro29* infertile mice: *Zcchc8* candidate gene sequencing. . NM Bioinformatics, Science and Technology (NMBIST) Symposium: Transcriptional Control, Santa Fe, NM, March 2015. NMHU Research Day, April 2015.

Book Chapters and Reviews

1. Linder CC, Griswold MD. 1993. Stage synchronization in rat seminiferous tubules using vitamin A depletion. In: *Meth Repro Toxic Acad Press* (Ed. Robert E. Chapin and Jerrold J. Heindel) 95-105.
2. Griswold MD, Heckert LL, Goetz TL, Linder CC. 1994. Structural and functional characterization of the FSH receptor gene. In: *Cell and Molecular Biology of the Testes* Ed M, Dufau A, Isidori A, (eds). Front Endoc Ser Aris Sero Publications Rome 5:61-68.
3. Smith RS, Sundberg JP, Linder CC. 1997. Mouse mutations as models for studying cataracts. *Pathobiology* 65:146-154.
4. Lake JP, Haines D, Linder CC, Davisson MT. 1999. Dollars and sense: time and cost factors critical to establishing genetically engineered mouse colonies. *Transgenic Rodents* 8-14.
5. Linder CC. 2001. The influence of genetic background on spontaneous and genetically engineered mouse models of complex diseases. *Lab Anim* 30(5):34-9.

6. Sharp JS, Linder CC, Mobraaten L. 2001. Genetically Engineered Mice: Husbandry and Resources. In: *Methods in Molecular Biology*. Timms M, Kola I (eds), Humana Press, 158:381-396.
7. Linder CC. 2002. Mouse nomenclature and maintenance of genetically engineered mice. *Comp Med* 53:119-125.
8. Linder CC. 2002. Genetic Resources for Studying the Mouse Eye. In: *Systematic Evaluation of the Mouse Eye: Anatomy, Pathology and Biomethods*, Smith RD (ed), CRC Press, pp. 345-352.
9. Davisson MT, Linder CC. 2004. Historical Foundations. In: *Laboratory Mouse, Handbook of Experimental Animals Series*, Hedrich HJ, Bullock G, Petrusz P (eds.), Elsevier Science, London, UK, . pp 15-21.
10. Linder CC, Davisson MT. 2004. Strains, Stocks, and Mutant Mice. In: *Laboratory Mouse, Handbook of Experimental Animals Series*, Hedrich HJ, Bullock G, Petrusz P (eds.), Elsevier Science, London, UK, pp 25-44.
11. Linder CC. 2006. Genetic variables that affect phenotype. *ILAR Journal*, 47:132-140.
12. Berry ML, Linder CC. 2006. Breeding Systems: Considerations, Genetic Fundamentals, Genetic Background, and Strain Types. In: *Mouse in Biomedical Research, 2nd ed Vol 1*. Fox J, Barthold S, Davisson MT, Newcomer C, Quimby F, Smith A (eds.), Academic Press. pp 53-78.
13. Linder CC, Witham BA. 2009. Appendix X: commonly-used inbred strains and substrains of JAX[®] mice—genes and research applications. In: *Handbook on Genetically Standardized JAX[®] Mice, 6th edition*. Curren JM and Flurkey K (eds), Jackson Laboratory Press, Bar Harbor ME.
14. Curren JM, Linder CC, Witham BA, Corrigan J, Davisson MT, Merriam J, Flurkey K. 2009. Chapter 3: Categories of laboratory mice: genetic architecture, uses, nomenclature. In: *Handbook on Genetically Standardized JAX[®] Mice, 6th edition*. Curren JM and Flurkey K (eds), Jackson Laboratory Press, Bar Harbor ME.
15. Curren JM, Witham BA, Linder CC, Flurkey K. 2009. Chapter 5: selecting a mouse model for research. In: *Handbook on Genetically Standardized JAX[®] Mice, 6th edition*. Curren JM and Flurkey K (eds), Jackson Laboratory Press, Bar Harbor ME.
16. Linder CC and Davisson, MT. 2012. Historical Foundations. In: *The Laboratory Mouse, 2nd Edition* , edited by Hans J. Hedrich. Elsevier Science, London, UK . pp 19-36.
17. Lutz C, Linder CC, Davisson, MT. 2012. Strains, Stocks, and Mutant Mice. In: *The Laboratory Mouse, 2nd Edition* , edited by Hans J. Hedrich. Elsevier Science, London, UK , pp 37-50.
18. Linder, CC. 2012. Applying Mouse Genetics expertise to Research. *Lab Animal* 41(5):135.

D. Research Support.

Active

NSF NM-AMP Summer Community College Opportunity for Research Experience (SCCORE) Summer 2015. Role: Faculty Mentor (JaMarcus Trujillo, Brittney Mares, Luna Community College)

NSF NM-AMP Faculty Mentored Undergraduate Research Assistantship, Summer 2015. Role: Faculty Mentor (Phylisia Dimas, Chantel Rivera) NM State University.

ACS Project SEED (Linder, CC). Understanding Male Infertility through Next Generation Sequencing. Summer 2015. Role: Faculty Mentor: Ulisses Villalobos, Robertson High School, Las Vegas, NM.

Cold Spring Harbor Laboratories Infrastructure and Training to Bring Next-generation Sequence (NGS) Analysis Into Undergraduate Education. Role: Faculty participant. 2015-2017.

Completed

NM Highlands ARMAS Internships (Chantel Rivera, Spr 2015; Alyssa Ramirez and Marissa Valencia, Fall 2014; Adrian Vigil, Spr 2012; Carlos Garcia, Sum 2012; Daniel Gutierrez, Summer and Fall 2012). Role: Faculty Mentor.

8P20GM103451 (formerly P20RR016480, NCRR), Jeffrey Arterburn (PI) NM State, 5/1/09 – 2/28/14
NIH/NIGMS NM-Idea Networks of Biomedical Research Excellence (no cost extension to 6/14/14)

Program Director/Principal Investigator (Last, First, Middle): Linder, Carol Cutler

GOLGA3, a protein essential for spermatogenesis. Role: Subproject PI. Students: Raji Baidya, Devon Chisholm, Rodrigue Dikuba, Mario Sanchez, Alfonso Trujillo, Adrian Vigil, Anthony Vigil, Rahul Sigdel, Joannes Paulus Yimbessalu, Iman Brown, Chrys Djatche Kaminque.

NSF L-SAMP Faculty Mentored Undergraduate Research Assistantship (Constance Little, Fall 2012, Ismael Flores, Spr 2013), NM State University.

NMHU Institutional Research Funds (Linder, CC). Spr 2012. Transcriptomic Analysis of of *Golga3^{repro27}* mice. Bioinformatics Analysis. Role: PI, Collaborators: Faye D. Schilkey, Director, NM-INBRE Sequencing and Informatics Core Ingrid Linquist (Informatician, NCGR), Joanne Mudge (Research Scientist/Analytics Lead, NCGR), Students: Rahul Sigdel, Surendra Thapa, Devon Chisholm

ACS Project SEED (Linder, CC). GOLGA3 Protein Biochemistry. Sum 2011 and 2012. Role: Faculty Mentor: Sean Lujan, Robertson High School, Las Vegas, NM.

Linder, CC. Transcriptomic Analysis of *Golga3^{repro27}* mice. 8/24/2011 – 8/24/2012
NCGR Pilot Sequencing Award Role: PI, Collaborators; Faye D. Schilkey, Director, NM-INBRE Sequencing and Informatics Core Ingrid Linquist (Informatician, NCGR), Joanne Mudge (Research Scientist/Analytics Lead, NCGR), Students: Rahul Sigdel, Kabir Shresthra, Devon Chisholm

NSF 09-508 Mary Shaw and Stella Helvie (co-PIs). 1/1/2009 – 12/31/2011
NSF-RDE Research in Disabilities Education Stem STARS. Role: Collaborator; students: Olivia Yee, Raji Baidya,

F2011ur0024/F11UR016 Antonio Garcia (PD), Arizona State University. 2009 - 2011
NSF Western Alliance to Expand Student Opportunities Role: Faculty Mentor, Students: Ruben Esparza, Marcus Garcia, Matt Santillanes, Joseph Torres, Alfonso Trujillo, Adrian Vigil, Olivia Yee,

P 520 MD001104, Rodolfo Martinez (PD) 12/28/07 (9/30/07) -8/31/09
NIH/ NCMHD-Research Infrastructure in Minority Institutions
repro27, a mouse model of male infertility. Role: Subproject PI

P20 RR 016480, Jeff Arterburn (PI), NM State 9/1/2004 - 4/30/2009
NIH/NCRR NM-Idea Networks of Biomedical Research Excellence
Gene expression patterns during spermatogenesis. Role: Subproject PI. Students: Larry Agbor, Valentine Agbor, Anita Lopez, Landry Nfonsam, Estevan Martinez, Adrian Carter, Leonela Mora, Mingma Sherpa, Jennifer Woods.

NMHU Institutional Research Funds (Carol Linder/Merritt Helvenston). 3/1/07-5/1/08
Synthesis and mouse screening of potential cancer drugs. Role: Co-investigator. Students: Amalia Martinez, Leonela Mora, Geniel Parson, Jennifer Woods,

Collaborators: *Carolyn Machamer, PhD (Johns Hopkins School of Medicine, new), Philip Jordan, PhD (Johns Hopkins Bloomberg School of Public Health, new); Faye Shilkey and NCGR scientists (Transcriptomic project funded by NCGR and FRC, continuing).*

E. Teaching

Non-majors biology university core, freshman form; cell and molecular biology (lower and upper division biology majors core); genetics; advanced cell biology (graduate students) research ethics (graduate students), upper division/graduate electives (developmental biology, selected advanced topics in cell and molecular biology).