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Department of Biology
University of North Dakota
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EDUCATION

National Academies Education Fellow in the Life Sciences, University of Minnesota, July 2013.
Gene Regulatory Networks in Development Course, Woods Hole Marine Biological Laboratory,
Woods Hole, MA, October 2010.

University of Texas-Austin, Ph.D. in Zoology, May 2000.

University of North Dakota, M.S. in Biology, December 1993.

University of Minnesota Biological Station-Lake Itasca, Summer 1991.

University of North Dakota, B.S. in Biology, minor in Chemistry, May 1991.

PROFESSIONAL EXPERIENCE

Full Professor, Department of Biology (UND), August 2016 to present.

Associate Professor, Department of Biology (UND), August 2009 to July 2016.

Assistant Professor, Department of Biology (UND), August 2003 to July 2009.

Postdoctoral Fellow, Advisor: John A. Cidlowski (NIH), July 2000 to July 2003.

Doctoral Student, Advisor: David Crews (UT-Austin), August 1994 to May 2000.

Masters Student, Advisor: Jeffrey W. Lang (UND), January 1992 to December 1993.

PROFESSIONAL SOCIETIES

Endocrine Society

Society for Integrative and Comparative Biology

Society for the Study of Evolution

Society for Experimental Biology

HONORS, FELLOWSHIPS AND SCHOLARSHIPS

Summer Graduate Research Professorship, (UND), 2013 (\$7,000 + stipend for 2 grad students).

Summer Graduate Research Professorship, (UND), 2009 (\$7,000 + stipend for grad student).

Faculty Research Proposal Writing Fellowship, (UND), Spring 2007 (\$1,000).

National Research Service Award-Predoctoral Fellowship (National Institute of Mental Health),
1996-1999 (\$41,273).

Travel Fellowship (Department of Zoology, UT-Austin), 1998 (\$250).

Carl Gottfried Hartman Fellowship (Department of Zoology, UT-Austin), 1998 (\$3,000).

David Bruton, Jr. Fellowship (UT-Austin), 1998-1999 (\$1,000).

Sigma Xi, elected full member 1997.

Zoology Scholarship Endowment for Excellence (UT-Austin), 1997 (\$1,000).

Houston Endowment President's Excellence Fellowship (UT-Austin), 1996-1997 (\$12,500).

Summer Tuition Fellowship (UT-Austin), 1996 (\$400).

State Board of Higher Education Scholarship (UND), 1993 (\$700).

GRANTS AND AWARDS

Current:

“Collaborative Research: Effects of Embryonic Hypoxia on Juvenile Cardiac Function”, PI Dane Crossley, CoPIs Michael Hedrick, Todd Gillis, Turk Rhen), National Science Foundation, Division of Integrative Organismal Systems 2019-2022 (total budget ~\$1M, \$163,639 to T. Rhen at UND).

Completed:

- “Epigenomic Analysis of Temperature-dependent Sex Determination”, PI Turk Rhen, National Science Foundation, Division of Integrative Organismal Systems 2016-2020 (\$819,835).
- “Integrative Systems Biology: Developing a Multi-Scale Modeling Framework for Linking Internal and External Systems.” PI Turk Rhen (CoPIs Diane Darland, Archana Dhasarathy, Joel Iiams, Manu), ND-EPSCoR and UND Pilot Postdoctoral Program, December 2016 to February 2019 (\$120,000).
- “Genome-wide Profiling of DNA Methylation in Gonads during Sex Determination”, PI Turk Rhen (CoPI Sunil Singh), NIH CoBRE: Epigenomics of Development and Disease (UND), September 2017 to September 2018 (\$29,432).
- “De Novo Genome Sequencing to Enable CHIP-Seq and Genome-wide Association Studies of Temperature-dependent Sex Determination”, PI Turk Rhen (CoPI Manu), Faculty Research Seed Grant, Research, Development and Compliance, Division of Research (UND), March 2015 to February 2017 (\$13,320).
- “High-throughput Transfection System to Stimulate Systems Biology Research at UND”, PI Turk Rhen (CoPIs Brian Darby, Diane Darland, Tristan Darland, Manu), ND-EPSCoR Development Award, January 2015 to December 2015 (\$125,000).
- “Atrazine Effects on Hypothalamus and Pituitary Development in the Snapping Turtle, *Chelydra serpentina*”, PI Turk Rhen, ND-EPSCoR Infrastructure Improvement Program – Doctoral Dissertation Assistantship (for advisee Kathryn Gruchalla), 2014-2016 (\$45,420).
- “Environmental Epigenomics and Genomics”, PI Turk Rhen (CoPIs Diane Darland, Robert Newman, Rebecca Simmons), ND-EPSCoR, May 2012 to June 2013 (\$58,265).
- Travel Award, Organizers of the Sixth International Symposium on Vertebrate Sex Determination, 2012 (\$1,900).
- “Wolffian Duct Stabilization in the Common Snapping Turtle”, PI Turk Rhen, ND-EPSCoR Infrastructure Improvement Program – Doctoral Dissertation Assistantship (for advisee Tony Schroeder), 2010-2012 (\$39,400).
- “Acquisition of a Liquid Handling Robot and a High-Throughput Real-time PCR Thermocycler for Genetics and Genomics Research at UND”, PI Turk Rhen (CoPIs Dane Crossley, Jeremiah Neubet, Steven Ralph), National Science Foundation, Major Research Instrumentation Grant, 2010-2012 (\$397,727).
- Faculty Travel Award, Research, Development and Compliance, Division of Research (UND), 2010 (\$600).
- “Genomic and Genetic Analysis of Temperature-dependent Sex Determination”, PI Turk Rhen, National Science Foundation, Division of Integrative Organismal Systems 2009-2013 (\$467,847).
- Research Committee Grant, Biology Department (UND), 2009-2010 (\$2,631).
- Senate Scholarly Activities Committee Grant, Research, Development and Compliance, Division of Research (UND), 2008-2009 (\$2,500).
- “Role for Androgens in Ovary Development”, PI Turk Rhen, Faculty Research Seed Money Grant, Research, Development and Compliance, Division of Research (UND), 2008-2009 (\$15,000).

Faculty Travel Award, Research, Development and Compliance, Division of Research (UND), 2007 (\$600).

“Loan Repayment Program for Contraception and Infertility Researchers”, PI Turk Rhen, National Institute of Child Health and Human Development, 2006-2008 (\$41,354).

“Comparative Genomics of Sex Determination in Amniotes”, PI Turk Rhen, R21 Exploratory Research Grant, National Institute of Child Health and Human Development, 2005-2008 (\$311,743).

Faculty Travel Award, Senate Scholarly Activities Committee (UND), 2005 (\$1,245).

Fellows Award for Research Excellence (National Institute of Environmental Health Sciences), 2002 (\$1,000).

“Origin of Behavioral Organization: Constraint or Adaptation?”, PI Turk Rhen, National Science Foundation Dissertation Improvement Grant, 1996-1999 (\$4,019).

Student Activities Committee Travel Stipend (UND), 1993 (\$250).

Biology Graduate Student Association Travel Stipend (UND), 1993 (\$50).

Academic Programs and Student Awards Committee Research Stipend (UND), 1992 (\$250).

Floyd Hunter Memorial Award (UND), 1991 (\$100).

PUBLICATIONS (Google Scholar, h-index = 29, total citations = 5697)

Published:

55. Doering, J.A., M. Brinkmann, M. Lucio, S. Stoeck, A. Vien, S. Petersen, **T. Rhen**, P.D. Jones, M. Hecker, and A. Schroeder. 2021. Sensitivity of a model reptile, the common snapping turtle (*Chelydra serpentina*), to *in ovo* exposure to TCDD and other dioxin-like chemicals. *Environmental Toxicology and Chemistry*, in press.
54. Ruhr, I., J. Bierstedt, **T. Rhen**, D. Das, S.K. Singh, S. Miller, D.A. Crossley II, and G.L.J. Galli. 2021. Developmental programming of DNA methylation and gene expression patterns is associated with extreme cardiovascular tolerance to anoxia in the common snapping turtle. *Epigenetics & Chromatin* 14:42 (DOI: 10.1186/s13072-021-00414-7).
53. **Rhen, T.**, Z. Even, A. Brenner, A. Miller, D. Das, S.K. Singh, R. Simmons. 2021. Evolutionary turnover in Wnt gene expression, but conservation of Wnt signaling during ovary determination in a TSD reptile. *Sexual Development* 15:47-68 (DOI: 10.1159/000516973).
52. Eme, J., K.B. Tate, **T. Rhen**, and D.A. Crossley II. 2021. Cardiovascular responses to putative chemoreceptor stimulation of embryonic common snapping turtles (*Chelydra serpentina*) chronically incubated in hypoxia (10% O₂). *Comparative Biochemistry and Physiology-Part A: Molecular and Integrative Physiology* 259:110977.
51. Das, D., S.K. Singh, J. Bierstedt, A. Erickson, G.L.J. Galli, D.A. Crossley II, and **T. Rhen**. 2020. Draft genome of the common snapping turtle, *Chelydra serpentina*, a model for phenotypic plasticity in reptiles. *G3: Genes, Genomes, Genetics* 10:4299-4314. **Featured article in issue and selected for 2020 Spotlight collection of research and scholarship excellence published in the Genetics Society of America journals.**
50. Miller, S., A. Derenne, S. Ellis-Felege, and **T. Rhen**. 2020. Incubation temperature and satiety influence general locomotor and exploratory behaviors in the common snapping turtle (*Chelydra serpentina*). *Physiology and Behavior* 220:112875.
49. Singh, S.K., D. Das, and **T. Rhen**. 2020. Embryonic temperature programs phenotype in reptiles. *Frontiers in Physiology* 11:35.
48. Schroeder, A., and **T. Rhen**. 2019. Role for androgens in determination of ovarian fate in the common snapping turtle, *Chelydra serpentina*. *General and Comparative Endocrinology* 281:7-16.

47. Roush, D., and **T. Rhen**. 2018. Developmental plasticity in reptiles: critical evaluation of the evidence for genetic and maternal effects on temperature-dependent sex determination. *Journal of Experimental Zoology Part A: Ecological and Integrative Physiology* 329:287-297.
46. Gustafson, K.D., R.A. Newman, **T. Rhen**, and V.V. Tkach. 2018. Spatial distribution and population genetic patterns of amphibian lung nematodes across a prairie landscape. *Population Ecology* 60:261-273.
45. Guo, L., and **T. Rhen**. 2017. Characterization of the FoxL2 proximal promoter and coding sequence from the common snapping turtle (*Chelydra serpentina*). *Comparative Biochemistry and Physiology-Part A: Molecular and Integrative Physiology* 212:45-55.
44. **Rhen, T.**, and A.L. Schroeder. 2017. The genetics of thermosensitive sex determination. *Temperature* 4:109-111.
43. Connahs, H., **T. Rhen**, and R.B. Simmons. 2016. Physiological perturbation reveals modularity of eyespot development in the painted lady butterfly, *Vanessa cardui*. *PLOS One* 11:e0161745.
42. Russart, K.L.G., and **T. Rhen**. 2016. Effects of atrazine on expression of reproductive and stress genes in the developing hypothalamus of the snapping turtle, *Chelydra serpentina*. *Toxicology* 366:1-9.
41. Tate, K.B., **T. Rhen**, J. Eme, Z.F. Kohl, J. Crossley, R. Elsey, and D.A. Crossley II. 2016. Periods of cardiovascular developmental susceptibility to hypoxia in embryonic American alligator (*Alligator mississippiensis*). *American Journal of Physiology – Regulatory, Integrative and Comparative Physiology* 310:R1267-R1278.
40. Schroeder, A.L., K.J., Metzger, A. Miller, and **T. Rhen**. 2016. Novel genetic association between cold-inducible RNA-binding protein and temperature-dependent sex determination. *Genetics* 203:557-571. **F1000Prime Recommendation by Deborah Charlesworth**
F1000Prime.com/726190637#eval793517921
39. Connahs, H., **T. Rhen**, and R.B. Simmons. 2016. Transcriptome analysis of the gene regulatory network underlying wing development and pigmentation in the painted lady butterfly, *Vanessa cardui*. *BMC Genomics* 17:270.
38. Wearing, O.H., J. Eme, **T. Rhen**, and D.A. Crossley II. 2016. Phenotypic plasticity in the common snapping turtle (*Chelydra serpentina*): long-term physiological effects of chronic hypoxia during embryonic development. *American Journal of Physiology – Regulatory, Integrative and Comparative Physiology* 310:R176-R184.
37. Claycombe, K., E. Vomhof-DeKrey, J. Roemmich, **T. Rhen**, and O. Ghribi. 2015. Maternal low protein diet causes body weight loss in male, neonate Sprague-Dawley rats involving UCP-1 mediated thermogenesis. *Journal of Nutritional Biochemistry* 26:729-735
36. **Rhen, T.**, R. Fagerlie, A. Schroeder, D.A. Crossley II, and J.W. Lang. 2015. Molecular and morphological differentiation of testes and ovaries in relation to the thermosensitive period of gonad development in the snapping turtle, *Chelydra serpentina*. *Differentiation* 89:31-41.
35. Tate, K., Z.F. Kohl, J. Eme, **T. Rhen**, and D.A. Crossley II. 2015. Critical windows of cardiovascular susceptibility to developmental hypoxia in common snapping turtle embryos. *Physiological and Biochemical Zoology* 88:103-115.
34. Eme, J., **T. Rhen**, and D.A. Crossley II. 2014. Adjustments in cholinergic, adrenergic and purinergic control of cardiovascular function in snapping turtle embryos (*Chelydra serpentina*) incubated in chronic hypoxia. *Journal of Comparative Physiology B* 184:891-902.
33. Eme, J., **T. Rhen**, K.B. Tate, K. Gruchalla, Z.F. Kohl, C.E. Slay, and D.A. Crossley II. 2013. Plasticity of cardiovascular function in snapping turtle embryos (*Chelydra serpentina*): Chronic hypoxia alters autonomic regulation and gene expression. *American Journal of Physiology – Regulatory, Integrative and Comparative Physiology* 304:R966-R979.

32. Alvine, T., **T. Rhen**, and D.A. Crossley II. 2013. Temperature-dependent sex determination modulates cardiovascular maturation in embryonic snapping turtles, *Chelydra serpentina*. *Journal of Experimental Biology* 216:751-758.
31. Marwarha, G., **T. Rhen**, T. Schommer, and O. Ghribi. 2011. The oxysterol 27-hydroxycholesterol regulates a-synuclein and tyrosine hydroxylase expression levels in human neuroblastoma cells through modulation of liver X receptors and estrogen receptors-relevance to Parkinson's disease. *Journal of Neurochemistry* 119:1119-1136.
30. **Rhen, T.**, A. Schroeder, J.T. Sakata, V. Huang, and D. Crews. 2011. Segregating variation for temperature-dependent sex determination in a lizard. *Heredity* 106:649-660.
29. **Rhen, T.** and A. Schroeder. 2010. Molecular mechanisms of sex determination in reptiles. *Sexual Development* 4:16-28.
28. **Rhen, T.**, A. Jangula, A. Schroeder, and R. Woodward-Bosh. 2009. The platelet-derived growth factor signaling system in snapping turtle embryos, *Chelydra serpentina*: potential role in temperature-dependent sex determination and testis development. *General and Comparative Endocrinology* 161: 335-343.
27. Huang, V., J.T. Sakata, **T. Rhen**, P. Coomber, S. Simmonds, and D. Crews. 2008. Incubation temperature effects dominate potential maternal contributions for sex determination in the leopard gecko (*Eublepharis macularius*). *Naturwissenschaften* 95: 1137-1142.
26. **Rhen, T.**, K. Metzger, A. Schroeder, and R. Woodward. 2007. Expression of putative sex-determining genes during the thermosensitive period of gonad development in the snapping turtle, *Chelydra serpentina*. *Sexual Development* 1: 255-270.
25. **Rhen, T.**, D. Crews, A.J. Fivizzani, and P.K. Elf. 2006. Reproductive tradeoffs and yolk steroids in female leopard geckos, *Eublepharis macularius*. *Journal of Evolutionary Biology* 19: 1819-1829.
24. **Rhen, T.**, and J.A. Cidlowski. 2006. Estrogens and glucocorticoids have opposing effects on the amount and latent activity of complement proteins in the rat uterus. *Biology of Reproduction* 74: 265-274.
23. **Rhen, T.**, and J.A. Cidlowski. 2005. Anti-inflammatory action of glucocorticoids: new mechanisms for old drugs. *New England Journal of Medicine* 353: 1711-1723.
22. **Rhen, T.**, J.T. Sakata, and D. Crews. 2005. Effects of gonadal sex and incubation temperature on the ontogeny of gonadal steroid concentrations and secondary sex structures in leopard geckos, *Eublepharis macularius*. *General and Comparative Endocrinology* 142: 289-296.
21. **Rhen, T.**, S. Grissom, C. Afshari, and J.A. Cidlowski. 2003. Dexamethasone blocks the biological effects of 17 β -estradiol in the rat uterus without antagonizing its global genomic actions. *FASEB Journal* 17: 1849-1870.
20. **Rhen, T.**, J.T. Sakata, R. Porter, S. Wooley, and D. Crews. 2003. Changes in androgen receptor mRNA expression in the forebrain and oviduct during the reproductive cycle of female leopard geckos, *Eublepharis macularius*. *General and Comparative Endocrinology* 132: 133-141.
19. **Rhen, T.**, and D. Crews. 2002. Variation in reproductive behavior within a sex: neural systems and endocrine activation. *Journal of Neuroendocrinology* 14: 517-532.
18. **Rhen, T.**, and D. Crews. 2001. Distribution of androgen and estrogen receptor mRNA in the brain and reproductive tissues of the leopard gecko, *Eublepharis macularius*. *Journal of Comparative Neurology* 437: 385-397.
17. **Rhen, T.**, J.T. Sakata, M. Zeller, and D. Crews. 2000. Sex steroid levels across the reproductive cycle of female leopard geckos, *Eublepharis macularius*, from different incubation temperatures. *General and Comparative Endocrinology* 118: 322-331.

16. **Rhen, T.**, and D. Crews. 2000. Organization and activation of sexual and agonistic behavior in the leopard gecko, *Eublepharis macularius*. *Neuroendocrinology* 71: 252-261.
15. Willingham, E., **T. Rhen**, J.T. Sakata, and D. Crews. 2000. Embryonic treatment with xenobiotics disrupts steroid hormone profiles in hatchling red-eared slider turtles (*Trachemys scripta elegans*). *Environmental Health Perspectives* 108: 329-332.
14. **Rhen, T.** 2000. Sex-limited mutations and the evolution of sexual dimorphism. *Evolution* 54: 37-43.
13. **Rhen, T.**, E. Willingham, J.T. Sakata, and D. Crews. 1999. Incubation temperature influences sex steroid levels in juvenile red-eared slider turtles, *Trachemys scripta*, a species with temperature-dependent sex determination. *Biology of Reproduction* 61: 1275-1280.
12. **Rhen, T.**, J. Ross, and D. Crews. 1999. Effects of testosterone on sexual behavior and morphology in adult female leopard geckos, *Eublepharis macularius*. *Hormones and Behavior* 36: 119-128.
11. **Rhen, T.**, and D. Crews. 1999. Embryonic temperature and gonadal sex organize male-typical sexual and aggressive behavior in a lizard with temperature-dependent sex determination. *Endocrinology* 140: 4501-4508.
10. **Rhen, T.**, and J.W. Lang. 1999. Incubation temperature and sex affect mass and energy reserves of hatchling snapping turtles (*Chelydra serpentina*). *Oikos* 86: 311-319.
9. Bergeron, J.M., E. Willingham, C.T. Osborn III, **T. Rhen**, and D. Crews. 1999. Developmental synergism of steroidal estrogens in sex determination. *Environmental Health Perspectives* 107: 93-97.
8. **Rhen, T.**, and J.W. Lang. 1999. Embryonic and juvenile temperature independently influence growth in hatchling snapping turtles, *Chelydra serpentina*. *Journal of Thermal Biology* 24: 33-41.
7. Crews, D., J. Sakata, and **T. Rhen**. 1998. Developmental effects on intersexual and intrasexual variation in growth and reproduction in a lizard with temperature-dependent sex determination. *Journal of Comparative Biochemistry and Physiology C* 119: 229-241.
6. **Rhen, T.**, and J.W. Lang. 1998. Among-family variation for environmental sex determination in reptiles. *Evolution* 52: 1514-1520.
5. Crews, D., A.R. Cantu, **T. Rhen**, and R. Vohra. 1996. The relative effectiveness of estrone, estradiol 17- β , and estriol in sex reversal in the red-eared slider (*Trachemys scripta*), a turtle with temperature-dependent sex determination. *General and Comparative Endocrinology* 102: 317-326.
4. **Rhen, T.**, P.K. Elf, A.J. Fivizzani, and J.W. Lang. 1996. Sex-reversed and normal turtles display similar sex steroid profiles. *Journal of Experimental Zoology* 274: 221-226.
3. **Rhen, T.**, and J.W. Lang. 1995. Phenotypic plasticity in the common snapping turtle: effects of incubation temperature, clutch, and their interaction. *The American Naturalist* 146: 726-747.
2. Crews, D., A. Cantu, J. Bergeron, and **T. Rhen**. 1995. The relative effectiveness of androstenedione, testosterone and estrone, precursors to estradiol, in sex reversal in the red-eared slider (*Trachemys scripta*), a turtle with temperature-dependent sex determination. *General and Comparative Endocrinology* 100: 119-127.
1. **Rhen, T.**, and J.W. Lang. 1994. Temperature-dependent sex determination in the snapping turtle: manipulation of the embryonic sex steroid environment. *General and Comparative Endocrinology* 96: 243-254.

BOOK CHAPTERS

- Busillo, J.M., **Rhen, T.**, and J.A. Cidlowski. 2013. Steroid hormone action. *In* J.F. Strauss and R. Barbieri, eds., *Yen and Jaffe's Reproductive Endocrinology, 7th Edition*. W.B. Elsevier Saunders, Orlando.
- Rhen, T.**, and J.A. Cidlowski. 2009. Steroid hormone action. Pp. 105-120 *In* J.F. Strauss and R. Barbieri, eds., *Yen and Jaffe's Reproductive Endocrinology, 6th Edition*. W.B. Elsevier Saunders, Orlando.
- Rhen, T.** 2007. Sex differences: genetic, physiological, and ecological mechanisms. Pp. 167-175 *In* D.J. Fairbairn, W.U. Blanckenhorn, and T. Szekely, eds., *Sex, Size, and Gender Roles: Evolutionary Studies of Sexual Size Dimorphism*. Oxford University Press, Oxford.
- Rhen, T.**, and D. Crews. 2007. Why are there two sexes? Pp. 3-14 *In* Becker, J.B., K. Berkley, N. Geary, E. Hampson, J. Herman, and E. Young, eds., *Sex Differences in the Brain: From Genes to Behavior*. Oxford University Press, Oxford.
- Rhen, T.**, and J.W. Lang. 2004. Phenotypic effects of incubation temperature. Pp. 90-98 *In* N. Valenzuela and V. Lance, eds., *Temperature-Dependent Sex Determination*. Smithsonian Institution Press, Washington D.C.
- Rhen, T.**, and J.A. Cidlowski. 2004. Nuclear factor-kappa B and glucocorticoid receptors. Pp. 391-398 *In* L. Martini, ed., *Encyclopedia Endocrine Diseases*. Elsevier Science Inc., New York.
- Rhen, T.**, and J.A. Cidlowski. 2004. Steroid hormone action. Pp. 155-174 *In* J.F. Strauss and R. Barbieri, eds., *Yen and Jaffe's Reproductive Endocrinology, 5th Edition*. W.B. Saunders, Orlando.
- Rhen, T.**, and D. Crews. 2001. Sex and gender. Pp.154-164 *In* C.W. Fox, D.A. Roff, and D.J. Fairbairn eds., *Evolutionary Ecology: Concepts and Case Studies*. Oxford University Press, Oxford.

INVITED SEMINARS

- Rhen, T.** 1996. Possible Adaptive Significance of Temperature-Dependent Sex Determination. International Herpetological Society Symposium, San Antonio, Texas.
- Rhen, T.** 2004. Estrogen and glucocorticoid regulation of uterine gene expression, inflammation, and innate immunity. Department of Biochemistry and Molecular Biology, University of North Dakota School of Medicine and Health Sciences.
- Rhen, T.** 2004. The genetics, evolution, and ecology of sex differences. Anthropology Club, University of North Dakota.
- Rhen, T.** 2005. Evolution of sex differences: genetic, physiological, and ecological mechanisms. Conference on the Evolution of Sexual Size Dimorphism. Centro Stefano Franscini, Monte Verita, Switzerland.
- Rhen, T.** 2005. Comparative genomics of sex determination in vertebrates. Department of Biological Sciences, North Dakota State University.
- Rhen, T.** 2005. Comparative genomics of sex determination in amniotes. Department of Animal Sciences, Rutgers University.
- Rhen, T.** 2007. Comparative genomics of sex determination in amniotes. Genomics, Proteomics and Bioinformatics Steering Committee, University of North Dakota.
- Rhen, T.** 2008. Temperature-dependent sex determination in the snapping turtle: Molecular genetic analysis of thermal sensitivity. Department of Biological Sciences, Idaho State University.
- Rhen, T.** 2011. Systems genetics of temperature-dependent sex determination. Department of Biological Sciences, University of North Texas.
- Rhen, T.** 2012. Genetic and genomic analysis of temperature-dependent sex determination. Sixth International Symposium on Vertebrate Sex Determination, Kona, Hawaii.

- Rhen, T.** 2013. Genetics, genomics and the evolution of temperature-dependent sex determination in reptiles. Symposium on Phenotypic Plasticity and the Evolution of Gender Roles. Society for Integrative and Comparative Biology Annual Meeting, San Francisco, California.
- Rhen, T.** 2013. Temperature-dependent Sex Determination and Epigenetics. Epigenetics Annual Symposium, University of North Dakota School of Medicine and Health Sciences.
- Rhen, T.** 2017. Mechanistic Basis and Adaptive Significance of Temperature-Dependent Sex Determination, North Dakota State University.
- Rhen, T.** 2018. Temperature-dependent sex determination in reptiles and the potential impact of climate change, United Tribal Technical College, Bismarck, North Dakota.
- Singh, S., D. Das, and **T. Rhen.** 2019. Does DNA methylation play a role in temperature-dependent sex determination in the snapping turtle? North American Society for Comparative Endocrinology Biennial Meeting, Gainesville, Florida.
- Rhen, T.** 2019. Do DNA and histone modifications play a role in mediating temperature effects on sexual phenotype in snapping turtles? Society for Experimental Biology Annual Meeting, Seville, Spain.
- Rhen, T.** 2021. Genetic and epigenetic mechanisms underlying temperature-dependent sex determination (TSD). Journal of Experimental Zoology Part A: Virtual Symposium in Recognition of Dr. David Crews Career and Editorship.

CONFERENCE ABSTRACTS (44 total)

- Rhen, T.,** and D. Crews. 1996. Phenotypic plasticity in adult sex traits of lizards with temperature-dependent sex determination. American Zoologist 36: Abstract 492, 128A.
- Lang, J.W., and **T. Rhen.** 1998. Sex ratio evolution in reptiles with temperature-dependent sex determination. Special Issue: Proceedings from the First International Symposium on the Biology of Vertebrate Sex Determination, April 7-11, 1997, Honolulu, Hawaii. Guest Editors: V.A. Lance and M.H. Bogart. Journal of Experimental Zoology 281: 509-510.
- Sakata, J.T., **T. Rhen,** and D. Crews. 1998. Ontogeny of secondary sex structures and gonadal steroids in the leopard gecko. American Zoologist 38: Abstract 297, 86A.
- Rhen, T.,** J.T. Sakata, and D. Crews. 1998. The reproductive cycle of female leopard geckos. American Zoologist 38: Abstract 302, 88A.
- Rhen, T.** 1999. Sex-limited mutations and the evolution of sexual dimorphism. Annual Meeting, Society for the Study of Evolution, Madison, Wisconsin.
- Rhen, T.,** and D. Crews. 2000. Androgen receptor mRNA expression in the ventromedial hypothalamus and androgen-dependent sexual receptivity. Society for Neuroscience Abstracts.
- Rhen, T.,** and J.A. Cidlowski. 2001. Glucocorticoids block estrogen-induced uterine growth. The Endocrine Society Annual Meeting, Denver, Colorado.
- Crews, D., **T. Rhen,** R.S. Porter, S.C. Wooley, and J.T. Sakata. 2001. Changes in sex steroid hormone receptor gene expression over the reproductive cycle in female leopard geckos. Society for Neuroscience Abstracts.
- Rhen, T.,** and J.A. Cidlowski. 2002. The classical pathway of complement plays a role in mediating the pro-inflammatory effects of E2 in the rat uterus. The Endocrine Society Annual Meeting, San Francisco, California.
- Rhen, T.,** and J.A. Cidlowski. 2003. Dexamethasone antagonizes estrogen action in immature rat uterus without blocking estrogen induced gene expression. The Endocrine Society Annual Meeting, Philadelphia, Pennsylvania.
- Elf, P., **T. Rhen,** A. Fivizzani, and D. Crews. 2004. Relationships between female circulating plasma hormones and hormones deposited in eggs of the leopard gecko, *Eublepharis*

- macularius*. Society for Integrative and Comparative Biology Annual Meeting.
- Elf, P., **T. Rhen**, A. Fivizzani, and D. Crews. 2005. Inter- and intra-seasonal differences in yolk hormone levels in eggs from the leopard gecko, *Eublepharis macularius*. Society for Integrative and Comparative Biology Annual Meeting.
- Rhen, T.**, A. Schroeder, R. Woodward-Bosh. 2007. Temperature-dependent sex determination in the snapping turtle: molecular genetic analysis of thermal sensitivity. Fifth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Schroeder, A., **T. Rhen**, and R. Woodward-Bosh. 2009. Identification of a candidate gene involved in sexual development in the snapping turtle, *Chelydra serpentina*. Sixth Annual Northern Plains Biological Symposium, University of North Dakota
- Woodward-Bosh, R., **T. Rhen**, and A. Schroeder. 2009. The effects of androgens on the developing ovary in the common snapping turtle (*Chelydra serpentina*). Sixth Annual Northern Plains Biological Symposium, University of North Dakota.
- Rhen, T.**, A. Schroeder, J.T. Sakata, V. Huang, and D. Crews. 2009. Segregating variation for temperature-dependent sex determination in a lizard. Seventh Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Schroeder, A.L., and **T. Rhen**. 2009. Identification and characterization of a candidate gene involved in ovary development in the common snapping turtle, *Chelydra serpentina*, a reptile with temperature-dependent sex determination. Seventh Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Fagerlie, R, J. Levin, A. Schroeder, and **T. Rhen**. 2010. Identification and characterization of WT1, a candidate gene for gonad development in the common snapping turtle, *Chelydra serpentina*. Eighth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Galvin, W.G., J. Levin, A.L. Schroeder, and **T. Rhen**. 2010. Incubation temperature influences expression of Cyp26a1, a key enzyme involved in retinoic acid catabolism, during sex determination in the common snapping turtle, *Chelydra Serpentina*. Eighth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Legge, H., J. Levin, A. Schroeder, and **T. Rhen**. 2010. Temperature-dependent expression of Oct4, a marker of pre-meiotic germ cells, during sex determination in the common snapping turtle, *Chelydra Serpentina*. Eighth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Levin, L., and **T. Rhen**. 2010. Identification of a gene involved in initial gonad development in the common snapping turtle, *Chelydra serpentina*. Eighth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Rhen, T.**, and A.L. Schroeder. 2010. Characterization of the transcriptome during the temperature-sensitive period for sex determination in the common snapping turtle. Eighth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.
- Schroeder, A.L., and **T. Rhen**. 2010. Development of an *in vitro* organ culture system for snapping turtle gonads. Graduate School Scholarly Forum, University of North Dakota.
- Wessman, L.L., J. Levin, A. Schroeder, and **T. Rhen**. 2010. Analysis of follicle stimulating hormone receptor expression during the temperature sensitive period for sex determination in the common snapping turtle, *Chelydra Serpentina*. Eighth Annual Ecological Genomics Symposium, Sponsored by the Ecological Genomics Institute at Kansas State University.

- Rhen, T.**, and A.L. Schroeder. 2011. Temperature-dependent sex determination: merging classical genetics and next generation sequencing technologies to identify temperature sensitive genes. Society for Integrative and Comparative Biology Annual Meeting.
- Gruchalla, K.L. and **T. Rhen**. 2012. Development of the hypothalamus and pituitary gland in the snapping turtle, *Chelydra serpentina*. Society for Integrative and Comparative Biology Annual Meeting.
- Gruchalla, K.L. and **T. Rhen**. 2012. Development of the hypothalamus and pituitary gland in the snapping turtle, *Chelydra serpentina*. Ninth Annual Northern Plains Biological Symposium, North Dakota State University.
- Guo, L. and **T. Rhen**. 2012. Androgen regulation of FoxL2 expression and ovary development in the snapping turtle. Ninth Annual Northern Plains Biological Symposium, North Dakota State University.
- Schroeder, A.L., and **T. Rhen**. 2012. Wolffian duct stabilization in the common snapping turtle, a reptile with temperature-dependent sex determination. Sixth International Symposium on Vertebrate Sex Determination, Kona, Hawaii.
- Connahs, H., **T. Rhen**, and Simmons, R. 2013. Molecular Evolution of an Epigenetic Silencer (Polycomb Repressive Complex 2). Epigenetics Annual Symposium, University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota.
- Chelemedos, K., H. Connahs, **T. Rhen**, D. Darland, and R. Simmons. 2013. Investigating the effects of epigenetic modifiers and temperature shock on the painted lady butterfly, *Vanessa cardui*. Epigenetics Annual Symposium, University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota.
- Connahs, H., **T. Rhen**, K. Chelemedos, D. Darland, and R. Simmons. 2013. Do epigenetic mechanisms regulate wing color patterns in the painted lady butterfly, *Vanessa cardui*? Entomological Society of America, Austin, Texas. November 2013.
- Rhen, T.**, A. Schroeder, K. Gruchalla, L. Guo, L. Wessman, H. Legge, R. Fagerlie, J. Heimler, M. Bonapace-Potvin, and K Zhang. 2013. Genetic and genomic analysis of temperature-dependent sex determination. NSF Bioinformatics Workshop to Foster Collaborative Research, Little Rock, Arkansas.
- Hoyt, T., J.A. Thompson, C.R. Lessard, **T. Rhen**, and C. Bates Congdon. 2013. A computational investigation of candidate regulatory elements in the human noncoding regions of genes co-expressed in gonad development in *C. serpentina* sexual dimorphism. North East Regional IDEA Conference, Newark, Delaware.
- Connahs, H., **T. Rhen**, and R. Simmons. 2014. Transcriptome analysis underlying wing color pattern development in the painted lady butterfly, *Vanessa cardui*. ND EPSCoR Conference, Grand Forks, North Dakota.
- Connahs, H., **T. Rhen**, and R. Simmons. 2014. Transcriptome analysis underlying wing color pattern development in the painted lady butterfly, *Vanessa cardui*. Graduate Women in Science Conference, Minneapolis, Minnesota.
- Gruchalla, K.L. and **T. Rhen**. 2014. Effects of atrazine on gene expression within the hypothalamus and pituitary gland. International Congress of Endocrinology/Endocrine Society Annual Meeting, Chicago, Illinois.
- Connahs, H., **T. Rhen**, and R. Simmons. 2015. Effects of heat shock on epigenetic regulators and eyespot plasticity in the painted lady butterfly, *Vanessa cardui*. ND EPSCoR Conference, Fargo, North Dakota.
- Gruchalla, K., and **T. Rhen**. 2015. Effects of atrazine on gene expression within the hypothalamus and pituitary gland. ND EPSCoR Conference, Fargo, North Dakota.

- Guo, L., and **T. Rhen**. 2015. Androgen regulation of FoxL2 expression and ovary development in the snapping turtle, *Chelydra serpentina*. ND EPSCoR Conference, Fargo, North Dakota.
- Miller, A., and **T. Rhen**. 2015. Linkage disequilibrium in snapping turtles (*Chelydra serpentina*) from Minnesota. ND EPSCoR Conference, Fargo, North Dakota.
- Guo, L., and **T. Rhen**. 2016. Reconstruction of gene regulatory networks in the developing gonad of the common snapping turtle using ARACNe opens new perspectives for the study of temperature-dependent sex determination. The Allied Genetics Conference, Orlando, Florida.
- Hilliard, K., **T. Rhen**, and S. Singh. 2018. Sex-ratio heritability in the common snapping turtle: a reptile with temperature-dependent sex determination. Population, Evolutionary, and Quantitative Genetics Conference, Madison, Wisconsin.
- Hilliard, K., S. Singh, and **T. Rhen**. 2019. Sex-ratio heritability in the common snapping turtle. Evolution Meetings, Providence, Rhode Island.

EDITORIAL SERVICE

Editorial Board of Sexual Development, Karger, AG, Basel (2006-present).

Associate Editor for Frontiers in Physiology – Developmental Physiology, Lausanne (2021-present)

AD HOC REVIEWER (51 journals)

American Naturalist; The Anatomical Record; Aquaculture Research; Behaviour; Biological Journal of the Linnean Society; Biology of Reproduction; Biology Letters; Brain Research; Canadian Journal of Zoology; Comparative Biochemistry and Physiology Part A Molecular and Integrative Physiology; Copeia; Cytogenetic and Genome Research; Developmental Biology; Ecography; Ecology; Endocrinology; Environmental Science and Technology; Evolution; Evolution & Development; Evolutionary Biology; Frontiers in Physiology; General and Comparative Endocrinology; Hormones and Behavior; Integrative and Comparative Biology; Integrative Organismal Biology; Journal of Clinical Endocrinology and Metabolism; Journal of Comparative Physiology B Biochemical, Systemic, and Environmental Physiology; Journal of Endocrinology; Journal of Experimental Biology; Journal of Experimental Zoology Part A: Ecological Genetics and Physiology; Journal of Experimental Zoology Part B: Molecular and Developmental Evolution; Journal of Herpetology; Journal of Steroid Biochemistry and Molecular Biology; Journal of the World Aquaculture Society; Mechanisms of Development; Molecular Ecology; Nature Communications; Naturwissenschaften; Oikos; Oncogene; Philosophical Transactions of the Royal Society B; Physiological and Biochemical Zoology; PLoS Genetics; PLoS Medicine; PLoS One; Proceedings of the National Academy of Sciences of the United States of America; Proceedings of the Royal Society Series B; Reproductive Biology and Endocrinology; Sexual Development; Trends in Ecology and Evolution; Zoological Research

GRANT REVIEWER

National Science Foundation: Ad hoc reviews for Program in Ecological and Evolutionary Physiology, Integrative Organismal Systems Program, Neuroendocrinology Program, Evolution of Developmental Mechanisms Program, and Dissertation Improvement Grants

National Science Foundation: Organism-Environment Interactions Panel, Spring 2010

Israeli Science Foundation, Spring 2014

National Geographic Society, Spring 2014

National Science Foundation: Evolution of Developmental Mechanisms Panel, Spring 2015

United States Geological Survey, Water Resources Center at the University of Minnesota, Fall 2016

French National Research Agency, Summer 2019

Czech Science Foundation, Fall 2021

UNIVERSITY SERVICE

Executive Committee, Biology Department (2021-present)
Academic Program and Student Awards Committee, Biology Department (2020-present)
College of Arts and Sciences Tenure and Promotion Committee, UND (2020-present)
University-wide Tenure and Promotion Committee, UND (2018-present)
Computational Biology Search Committee, Biology Department (Chair 2018-2019)
Research Committee, Biology Department (2013-2018)
Executive Committee, Biology Department (2014-2017)
Systems Biology Search Committee, Biology Department (Chair 2012-2013 and 2013-2014)
Animal Physiologist Search Committee, Biology Department (2011-2012)
Integrative Biology Search Committee Chair, Biology Department (2010-2011)
Research Committee, Biology Department (2007-2010)
Academic Program and Student Awards Committee, Biology Department (2004-2007)
Radiation Safety Committee, University-wide (2004-present)
Animal Physiologist Search Committee, Biology Department (2005-2006)
Genomics Search Committee, Biology Department (2006-2007)
Molecular Biology Core Facilities Committee, Biology Department (2007-present)
Graduate Faculty, UND (Associate Member 2003-2006; Full Member 2006-present)
Academic advisor for biology majors (2003-present)

COURSES TAUGHT

I have taught, co-taught, or coordinated ten courses while at UND. Genetics was a primary teaching responsibility during my first decade as a faculty member. Animal Behavior is another major teaching responsibility. I enjoy this class because I am able to interact with students more than I could in the large enrollment Genetics course. I have had students write an Animal Behavior term paper since I first started teaching this class in 2006. The quality of term papers varies tremendously and it is clear that most students need to improve their written communication skills. Since 2012, I have had students write several drafts, with peer and instructor feedback along the way. This exercise has significantly improved the quality of term papers. Molecular Biology Techniques is a regular offering. Since 2009, I have incorporated aspects of my own research into class projects. By doing real research instead of routine labs, students gain valuable experience and develop marketable skills. An important aspect of this class is that students learn to trouble shoot and solve problems when things don't work exactly as expected. Endocrinology is now a regular part of my teaching portfolio. Students consistently report that they enjoy and learn a lot from these classes, giving me particularly strong evaluations in Animal Behavior, Genetics, Molecular Biology Techniques, and Endocrinology.

Animal Behavior (Spring Semester 2006, 2008, 2010, 2012, 2014, 2016, 2018, 2020, 2022)
Endocrinology (Fall Semester 2010, 2015, 2017, 2018, 2019, 2020, 2021)
Concepts of Biology (Spring Semester 2005)
Genetics (Fall Semester 2003-2011; Fall Semester 2013; Summer 2008, 2011, 2020)
Genetics Recitation (Fall Semester 2004-2011; Fall Semester 2013; Summer 2008)
Graduate Seminar: Ecological and Evolutionary Genomics (Fall Semester 2006, 2007, 2009, 2012)
Graduate Seminar: Evolution and Mechanisms of Sex (Spring Semester 2005)
Graduate Seminar: Population Genomics (Spring Semester 2021, 2022)
Graduate Seminar: Topics in Cell and Molecular Biology (Spring Semester 2007-2019)
Molecular Biology Techniques (Fall Semester 2006, 2007, 2009, 2011; Spring Semester 2014, 2015, 2017, 2019, 2021)
Scientific Writing (Fall Semester 2014)

TRAINEES

Graduate research training

I have served on 26 graduate committees (10 as chair) while at UND. My advisees have been quite successful. Two trainees are now tenure-track faculty members and three trainees are in postdoctoral positions in prominent labs. I am currently major advisor for three M.S. students and one Ph.D. student. I strive to provide my students rigorous interdisciplinary training so they become broad, integrative thinkers.

Committee Chair for:

Mandy Guinn (Ph.D. student, 2021-present)

Melissa Thompson (M.S. student, 2020-present)

Danielle Roush (M.S. in 2018; Ph.D. 2018-present)

Jacob Bierstedt (M.S. student, 2018-2021)

Kyle Hilliard (M.S. student, 2017-2019)

Jasmine Kasanke (M.S. student, 2017-2019)

Lei Guo (Ph.D. in 2017, Postdoctoral Fellowship in Dr. Bin Zhang's lab at Icahn School of Medicine, Mount Sinai)

Kathryn Russart (née Gruchalla) (Ph.D. in 2016, currently Assistant Professor, Minnesota State University-Moorhead)

Heidi Connahs (Ph.D. in 2015, currently Postdoctoral Fellow in Dr. Antonia Monteiro's lab at the National University of Singapore)

Anthony Schroeder (Ph.D. in 2012, currently Assistant Professor, University of Minnesota-Crookston)

Rikki Woodward-Bosch (M.S., 2005-2008, did not finish thesis for personal reasons)

Kelsey Metzger (M.S. in 2005, currently Associate Professor, University of Minnesota-Rochester)

Service on Dissertation Committee or Dissertation Evaluation at other Institutions:

Kayla Bieser (Ph.D. from the University of Alabama at Birmingham in 2013, currently Associate Professor, Nevada State College)

Martín Andrés Estermann (Ph.D. from Monash University in Australia, expected graduation in December of 2021)

Undergraduate research training

A total of 45 undergraduate students have conducted research in my lab at UND. Roughly half of these students earned credit for Research or Directed Studies. The other half of these students were supported by federally funded grants or undergraduate research programs, as outlined below. As part of my NSF grants since 2009, I have implemented a different approach to REU training by recruiting a small cohort of students for long-term training over two or three years. Students are recruited at the start of their sophomore or junior years and employed until graduation (~10 hrs/week during the school year and full-time during summers). These students become integral members of the lab and have been very successful after leaving my lab (7 out of 7 students are in graduate school, professional school, or are employed as research technicians). Though sample size is small, this approach appears to produce much better results than the typical summer REU programs.

NSF Research Grants

Aerica Nagornyuk (2021-present) undergraduate at UND

Autumn Anderson (2021-present) undergraduate at UND

Serenity Hanson (2021-present) undergraduate at UND
Carter Stevens (2021-present) undergraduate at UND
Alyssa Erickson (2018-2021) in Ph.D. program at Washington University in St. Louis
Zachary Even (2018-2020) undergraduate at UND
Soleille Miller (2017-2020) in Ph.D. program at University of New South Wales, Australia
Jacob Bierstedt (2017) in M.S. program at UND
Paige Hanson (2016-2018) in M.S. program at University of Chicago
Rosemary McDonald (2015-2018) in Ph.D. program at University of Colorado
Heath Legge (2009-2013) M.A. in Counseling Psychology
Laurel Wessman (2009-2013) M.D.
Ruby Bower (née Fagerlie) (2009-2012) P.A.
June Levin (2010-2011) M.S.

NIH Research Grant

Adam Jangula (2007-2008) M.D.
Robert Marshall (2007) M.D.
Tiffany Youngquist (2006-2007) in Ph.D. program at University of Washington
Stephanie Lee (2005-2007) M.D.
Rachel Miest (née Nemgar) (2005-2006) M.D.

EPSCoR Advanced Undergraduate Research Award

Alexandra Miller (2012-2015) Research Technician
Jon Heimler (2011-2012) M.D.

NSF Research Experience for Undergraduates

Tatyana Bazile (summer of 2021) undergraduate at Rensselaer Polytechnic Institute
Aerica Nagomyuk (summer of 2021) undergraduate at UND
Melanie Borysewicz (summer of 2021) undergraduate at Concordia College
Alaina Brenner (summer of 2020) Undergraduate at Michigan State University
Sydney Winterton (summer of 2019) Undergraduate at Southern Virginia University
Soleille Miller (summer of 2019) Undergraduate at UND
Alexandria Wenz (summer of 2018) Undergraduate at Clarke University
Caitlin Brabble (summer of 2017) Undergraduate at North Carolina Wesleyan College
Paige Goodman (summer of 2016) Undergraduate at College of St. Benedict and St. John's University
Erika Scheibe (summer of 2016) Undergraduate at the College of Idaho
Kevin Molinar (summer of 2015) Undergraduate at New Mexico Highlands University
Elizabeth Oestreich (summer of 2015) Undergraduate at University of Washington
Gavin Nadeau (summer of 2012) Undergraduate at UND
Hannah Schubloom (summer of 2011) finished M.S. in Neuroscience from McGill University

OTHER PROFESSIONAL WORK

Reviewed and rated high school biology textbooks for the Texas Education Agency.
Wrote chapter review questions and answers for fifth edition of *Endocrinology* by M.E. Hadley.
Prentice-Hall, Upper Saddle River, New Jersey.
Served as a judge for Fellows Award for Research Excellence (National Institutes of Health, 2003).