***CURRICULUM VITAE***

Wayne K. Potts

February 2024

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**EDUCATION**

Brigham Young University - B.S. 1974 – Zoology, Cum Laude

University of Montana - 1975

Utah State University - M.S. 1978, Biology, Major advisor: Dr. Kieth Dixon

University of Washington - Ph.D. 1986, Zoology, Major advisor: Dr. Sievert Rohwer

NIH Fellow - 1986-1989, Pathology, Univ. of Florida, Sponsor: Dr. Edward Wakeland

**FACULTY APPOINTMENTS**

Assistant Research Scientist, Dept. of Pathology, Univ. of Florida, 1990 – 92

Assistant Professor, Dept. of Pathology, Univ. of Florida, 1992 – 1996

Assistant Professor, Dept. of Zoology, Univ. of Florida, 1993 – 1996

Associate Professor, Dept. of Pathology, Univ. of Florida, 1996

Associate Professor, Dept. of Biology, University of Utah, 1996 – 2003

Professor, Dept. of Biology, University of Utah, 2003 – present

Adjunct Professor of Pathology, University of Utah, 2005 – present

**OTHER TRAINING**

United States Army Officer Training and Rotary Wing Flight Schools, 1969 – 71

**PROFESSIONAL SOCIETIES**

American Association for the Advancement of Science

American Society of Naturalists

Association for the Study of Animal Behavior

Society for the Study of Molecular Biology and Evolution

Society for the Study of Evolution

**SERVICE AS REVIEWER**

*American Journal of Human Genetics*

*American Naturalist*

*Animal Behavior*

*Auk*

*Behavior Ecology and Sociobiology*

*Behavioural Brain Research*

*Behavioural Processes*

*BMC Evolutionary Biology*

*BMC Genetics*

*BMC Medical Genetics*

*Current Biology*

### *Ecology Letters*

*Ethology*

*Ethology Ecology and Evolution*

*Evolution*

*Evolution and Human Behavior*

*Frontiers in Zoology*

*Functional Ecology*

*Genes, Brain and Behavior*

*Genetics*

*Immunogenetics*

*Immunology Today*

*International Journal of Primatology*

*Journal of Evolutionary Biology*

*Journal of Chemical Ecology*

*Journal of Immunology*

*Molecular Biology and Evolution*

*Molecular Ecology*

*Nature*

*Nature Genetics*

*Nature Reviews Genetics*

*Nature Reviews Immunology*

*Neuroscience and Biobehavioral Reviews*

*Physiology and Behavior*

*Psychoneuroendocrinology*

*PLOS Biology*

*PLOS Genetics*

*PLOS ONE*

*Proceedings of the National Academy of Sciences*

*Proceedings of Royal Society of London*

*Science*

*Trends in Ecology and Evolution*

*Trends in Immunology*

**SERVICE, NATIONAL / INTERNATIONAL**

Max Plank Scientific Advisory Board (1999-2005)

NIH NAID Panel “Population genetics analysis program: immunity to vaccines/infections”, 2004

NSF Advisory Panel - Postdoctoral Research Fellowships in Molecular Evolution

NSF Ad Hoc Reviewer for Population Biology and Systematics Advisory Panel

NSF Ad Hoc Reviewer for Animal Behavior Advisory Panel

Opponent for Petteri Ilmonen’s dissertation disputation, University of Turku, Finland

**SERVICE, LOCAL** (last five years)

2016-2017: Biology: Animal Care/Facilities Committee and Graduate Program Committee; COS: Conflict of interest committee (campus wide)

2017-2018: Biology: Animal Care/Facilities Committee; COS: Conflict of interest committee (campus wide)

2018-2019: (no committees) (sabbatical Fall 2018 and Spring 2019)

2019-2020: Biology: Computer Advisory Committee and Honors Committee; COS: Conflict of interest committee (campus wide)

2020-2021: Biology: Graduate Admissions Committee; COS: Conflict of interest committee (campus wide)

2021-2022: Biology: Animal Care/Facilities Committee; COS: Conflict of interest committee (campus wide)

2022-2023 Biology: Teaching peer review committee; Senator for academic senate (Biology representative); co-director for Scientific Speaking. COS: Conflict of interest committee (campus wide); Senator for academic senate (campus wide)

**SCHOLARSHIPS, FELLOWSHIPS, HONORS, AND AWARDS**

Distinguished Scholarly and Creative Research Award – University of Utah – 2015

Judge for Allee Awards at the 1994 Animal Behavior Society Meeting –

Seattle, Washington

NSF Travel Award for the XXI International Ethological Conference –

Utrecht, Netherlands – 1993

NIH Post-Doctoral Fellowship, Tumor Biology Training Grant, 1986 – 1987

Achievement Reward for College Scientists (ARCS) –1985

Jessup-McHenry Fellowship - Philadelphia Academy of Sciences – 1982

Research Grant – Sigma Xi – 1977

Graduate Fellowship – Utah State University – 1975-76

Cum Laude graduate – Brigham Young University – 1974

Music Scholarship – Brigham Young University – 1967-68 and 1971-74

**PATENTS**

Assays for performance of organisms in phenotrons

WK Potts – US Patent 8,304,208; 11/06/2012

**GRANTS**

National Institutes of Health Individual NRSA Grant, *Selective mechanisms that maintain MHC polymorphisms*, Jan. 1988 through Jan. 1990

National Institutes of Health Grant RO1 GM-39578, *Analysis of selective mechanisms maintaining MHC polymorphisms*, Co-investigator with Edward K. Wakeland, PI, Jan. 1989 through Dec. 1993

National Science Foundation Grant BSR-9021902, *Demography and fragmentation in the Florida scrub jay: a genetic analysis*, Co-investigator with John Fitzpatrick, Glen Wolfenden, and David McDonald, Feb. 1991 through Feb. 1993

National Science Foundation Grant OCE-9006392, *Reproductive behavior of Limulus polyphemus*, H. Jane Brockman, PI, Subcontract to W.K. Potts for genetic analysis of paternity, March 1991 through March 1994

National Science Foundation Grant - *Endocrine and immune system effects on sexual selection and reproductive behavior in red jungle fowl*, Marlene Zuk, PI, Subcontract to W.K. Potts for genetic analysis of MHC genes, Jan. 1992 through Jan. 1994

National Science Foundation Grant IBN-9222177 - *MHC-associated patterns of mating, kin recognition, and genetic diversity in six vertebrate species*, June 1993 through June 1996 ($259,000)

National Institutes of Health Grant RO1 39578 - *Selective mechanisms maintaining H-2 polymorphisms*, July 1994 through July 1998 ($804,000)

National Institutes of Health Grant RO1 39578 (interim) - *Selective mechanisms maintaining H-2 polymorphisms*, July 1998 through July 1999 ($60,000)

National Science Foundation Grant (interim) - *Recognition of kin and mates through MHC genes: chemosensory and imprinting mechanisms*, Sept. 1998 through Sept. 1999 ($56,000)

National Science Foundation Grant IBN-9817008 (co-PI with Nigella Hillgarth PI) – *Mechanisms of androgen-mediated immunocompetence in mice*, April 1999 through March 2001 ($260,000)

National Institutes of Health Grant 2 RO1 GM39578-10A1- *Selective mechanisms maintaining H-2 polymorphisms*, July 1999 through July 2002 ($1,056,380)

National Science Foundation Grant IBN-9904609– *Histocompatibility genes and sexual selection: chemosensory mechanisms and parasite resistance*, Sept. 1999 through Sept. 2002 ($360,000)

National Science Foundation Research Experience for Undergraduates – Supplement to Grant IBN-9904609– *Histocompatibility genes and sexual selection: chemosensory mechanisms and parasite resistance*, July 2001 through July 2002 ($10,000)

National Institutes of Health – Supplement to Grant 2 RO1 GM39578-10A1- *Selective mechanisms maintaining H-2 polymorphisms*, July 2001 through July 2002 ($40,422)

National Science Foundation Research Experience for Undergraduates – Supplement to Grant IBN-9817008 – *Mechanisms of androgen-mediated immunocompetence in mice*, Jan. 2002 through Jan. 2003 ($12,500)

Western Alliance to Expand Student Opportunities (WAESO) – Grant to support under-represented minority students in science - *Phenotyping Hox mutants using ecological functional genomics,* Fall semester 2003 thru winter 2004 ($3,506)

National Science Foundation - Western Alliance to Expand Student Opportunities (WAESO) – Grant to support under-represented minority students in science - *Phenotyping Hox mutants using ecological functional genomics,* Winter semester 2005 ($1,700)

National Science Foundation – *Ecological functional genomics of cryptic-phenotype Hox gene knockouts* – IBN-0344907, March 2004 through March 2006 ($280,000)

Canine Health Foundation – *Histocompatibility alleles conferring susceptibility to canine diabetes, immune-mediated thyroiditis and immune-mediated hemolytic anemia* – #305 - July 2004 through July 2006 ($120,960)

National Institutes of Health – *Ecological functional genomics: phenotyping Hox mutants* – RO1-GM039578, June 2004 through June 2009 (incl. 1yr no-cost extension) ($1,160,122)

National Science Foundation – *Pathogen adaptation to specific host genotypes: implications for host-pathogen coevolution* DEB 0918969, July 2009 through June 2014 ($985,070)

National Science Foundation – DISSERTATION RESEARCH: *Characterizing the genetic basis of virus adaptation to genotypes of its' mammalian host* - DEB 0910052, April 2009 through April 2011

National Science Foundation – DISSERTATION RESEARCH: The (epi)genetic basis of increased MUP expression during rapid adaptation to sociality in MUS - IOS 0909801, June 2009 through May 2011

National Science Foundation – HRD-1101728 - Western Alliance to Expand Student Opportunities (WAESO) – Grant to support under-represented minority students in science -Organismal performance assays for broad, sensitive toxicity assessment*.* Fall semester 2010 ($1,756)

National Science Foundation – HRD-1101728 - Western Alliance to Expand Student Opportunities (WAESO) – Grant to support under-represented minority students in science -Organismal performance assays for broad, sensitive toxicity assessment*.* Spring semester 2011 ($1,756)

National Science Foundation – HRD-1101728 - Western Alliance to Expand Student Opportunities (WAESO) – Grant to support under-represented minority students in science - *Organismal performance assays for broad, sensitive toxicity assessment.* Fall semester 2011 ($3,256)

National Science Foundation – HRD-1101728 - Western Alliance to Expand Student Opportunities (WAESO) – Grant to support under-represented minority students in science -*Transmission, host diversity and the evolution of virulence.* 2015 ($5,134)

National Institutes of Health – 1R01GM109500 - *Manipulation of transmission and host genetic diversity to understand the evolution and spread of virulent infectious disease*. Sept. 2013 thru Sept. 2018. ($1,023,956, directs)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *Host Genetic Diversity*. Fall 2016. ($2,378)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *What mechanisms link paternal social status to offspring body mass.* Spring 2017. ($2,378)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of Pathogen Diversity on Virulence Evolution.* Summer 2017. ($2,378)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *Pathogen Diversity.* Fall 2017. ($2,378)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of Pathogen Diversity on Virulence Evolution.* Spring 2018. ($2,378)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of Pathogen Diversity on Virulence Evolution.* Summer 2018. ($2,378)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of Pathogen Diversity on Virulence Evolution: Phase V*. Fall 2018. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of Pathogen Diversity on Virulence Evolution: Phase VI.* Spring 2019. (2,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of Pathogen Diversity on Virulence Evolution: Phase VII.* Summer 2019. ($2,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *Pathogen Diversity.* Fall 2019. ($2,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *The Influence of host social status on the virulence of infections agents*. Spring 2020. ($2,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under-represented minority students in science – *Picking Your Poison: Evaluating Two Anticancer Chemotherapeutics Using Organismal Performance Assays (OPAs).* Fall 2020. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Picking Your Poison: Evaluating Two Anticancer Chemotherapeutics Using Organismal Performance Assays (OPAs) Phase 2.* Spring 2021. ($3,463.50)

National Institutes of Health R21 (co-PI) – Genetic and immunological control for development of asymptomatic malaria. June 2021 thru May 2023. ($377,500)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 1).* Summer 2021. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 2).* Fall 2021. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 3).* Spring 2022. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 4).* Summer 2022. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 5).* Fall 2022. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 6).* Spring 2023. ($3,463.50)

Western Alliance to Expand Student Opportunities (WAESO) – NSF funded grant to support under represented minority students in science – *Identifying the genetic basis for resistance to malaria (Phase 7).* Summer 2024 (pending).

**GRANT PROPOSALS UNDER REVIEW OR RECENTLY DENIED**

NIH R01 *Suppressive neutrophils mediate asymptomatic carriage of Plasmodium parasites in mice.* PI Tracy Lamb, co-PI Wayne Potts

NSF Ecology and evolution of infectious disease, DEB. *Transmission of malaria from asymptomatic individuals in mice and men.* PI Tracy Lamb, co-PI Wayne Potts

W.M. Keck Foundation - *Discovering hard-to-detect toxicants that are poisoning us now and tomorrow.* PI Wayne Potts with coPIs Christopher Reilly (Pharmacology and Toxicology) and Sanford Meek (Engineering) - denied.

Semiconductor Research Corp. - *Discovering hard-to-detect toxicants to prevent their use in semiconductor manufacturing.* PI Wayne Potts with coPIs Christopher Reilly (Pharmacology and Toxicology) and Sanford Meek (Engineering) - denied.

**INVITED PRESENTATIONS**

2021 *Host MHC and genomic diversity retards experimental evolution of viral virulence* University of Edinburgh, UK

2019 *Host MHC and genomic diversity retards experimental evolution of viral virulence* Montpellier University, France

2018 *Host MHC and genomic diversity retards experimental evolution of viral virulence* University of Basel, Switzerland

2018 *Host MHC and genomic diversity retards experimental evolution of viral virulence* Oxford University, UK

2018 *A powerful new method for detecting health degradation applied to pharmaceuticals, genomic manipulations and suspected toxins*, University of Zurich, Switzerland

2018 *Host MHC and genomic diversity retards experimental evolution of viral virulence* Utrecht University, Netherlands

2018 *Host MHC and genomic diversity dramatically retards experimental evolution of viral virulence*, University of Lausanne, Switzerland

2018 *A powerful new method for detecting health degradation applied to pharmaceuticals, genomic manipulations and suspected toxins*, Immunology and Medicine, University of Cambridge, UK

2018 *Host MHC and genomic diversity dramatically retards experimental evolution of viral virulence*, Immunology and Pathology, University of Cambridge, UK

2017 *Host Genetic Diversity Dramatically Retards Viral Virulence Evolution: The Genomic Basis?* Scott Edwards Think Tank for Host-Pathogen Coevolution in the Genomic Era, Gothenburg Centre of Advanced Studies in Science, Sweden

2017 *Influence of host and pathogen genetic diversity on viral virulence evolution.* Tennessee State University

2017 *A revolution in toxicity assessment: organismal performance assays (OPAs)*. Park City Rotary.

2016 *Host Genetic Diversity Dramatically Retards Viral Virulence Evolution: The Genomic Basis.* University of Southern California, Los Angeles

2015 *Host Genetic Diversity Dramatically Retards Viral Virulence Evolution: The Genomic Basis.* Gordon Research Conference on Ecological and evolutionary genomics. Maine, USA

2014 *Experimental evolution of retroviral fitness and virulence across mammalian host genotypes.* University of Idaho, Moscow

2014 *Sugar toxicity revealed:* *A novel method for detecting toxicity that provides unparalleled sensitivity, breadth and adversity identification.* Park City Institute.

2014 *A novel method for detecting toxicity that provides unparalleled sensitivity, breadth and adversity identification: the case of added sugar.* Dixie State University.

2013 *Experimental evolution of retroviral fitness, virulence and trade-offs across mammalian host genotypes.* Duke University, North Carolina

2012 *Experimental evolution of retroviral fitness and virulence across mammalian host genotypes*, National Institute of Health, Rocky Mountain Laboratories

2012 *Experimental evolution of viral fitness and virulence in a mammalian host: satisfying the red queen*, Cologne Spring Meeting on Molecular Ecology and Evolution, Cologne, Germany

2011 *Experimental viral evolution is host genotype specific with rapid fitness and virulence increases: satisfying the red queen,* Jacques Monod conference on Coevolutionary arms race between parasite virulence and host immune defense: challenges from state of the art research, Roscoff, France

2010 *Immuno-diversity, pathogens and sweeteners: health consequences of pathogen evolution and dietary fructose,* Auburn University

2010 *MHC-dependent mating preferences*. Mate Choice Symposium. St. Louis

2009 *Health consequences of histocompatibility polymorphisms and using Darwin to reveal cryptic disease.* Public Symposium on Evolution and Medicine, Lausanne Switzerland

2008 *Health, behavior and histocompatibility genes*, Plenary speaker, Human behavior and evolution society, Kyoto Japan

2008 *Should we manage histocompatibility genetic variation in threatened species?*Workshop on "Managing adaptive genetic variation in conservation biology", LaFouly, Switzerland

2008 *Cryptic health degradation and failure rates during reintroduction of captive-bred threatened species.* Workshop on "Managing adaptive genetic variation in conservation biology", LaFouly, Switzerland

2007 *MHC genes cause disease: what good are bad genes?* ARUP Laboratories, Utah

2006 *Pathogens, mutations, sexual selection and histocompatibility polymorphisms.* University of Kentucky

2005 *Functional significance of MHC-mediated recognition systems,* Institut für Immungenetik, Humboldt University, Berlin, Germany

2005 *The functional significance of MHC mediated odors*, Symposium on *Odor signals from the immune system: how the nose detects genetic individuality*, Association for Chemoreception Sciences, Sarasota, Florida

2005 *Pathogens, mutations, sexual selection and histocompatibility polymorphisms.* Purdue University

2004 *Why do disease-causing histocompatibility alleles persist?* University of Chicago

2003 *Ecological approaches for characterizing gene function*, Symposium on *Genes in ecology, ecology in genes*, Kansas City

2003 *Using ecology to reveal gene function.* Gordon Research Conference on *Evolutionary and Ecological Functional Genomics: Finding the Genes that Matter*, New London, New Hampshire

2003 *Pathogen-mediated selection acting on histocompatibility genes*. Symposium on *Evolutionary Dynamics of the Major Histocompatibility Complex,* European Society for Evolutionary Biology Congress, Leeds UK

2002 *Pathogens, mutations, sexual selection and MHC diversity, Epilogue: ecological functional genomics*, Dept. of Genetics, University of Georgia

2002 *MHC-mediated immune/kin/self recognition reduces social, parasite and mutational loads*, Symposium on Ecological implications of self / non-self recognition, Ecological Society of America, Tucson

2001 *Pathogens, mutational load, sexual selection and MHC diversity, Epilogue: ecological functional genomics and phenotrons*, University of Missouri, St. Louis

2001 *MHC polymorphism is a consequence of microbial pressure*, Current Controversies Plenary Debate with Professor Jonathon Howard (moderated by Professor Peter Parham) at the 11th International Congress of Immunology, Stockholm

1. *Diversifying and diversity maintaining selection acting on MHC genes,*

International Colloquium on Modeling Immune Systems, Amsterdam

2001 *Evolution of genetic diversity at histocompatibility genes: pathogens, mutational*

*load and sexual selection*, University of Turku, Finland

1. *Ecological functional genomics: using real ecology to reveal real function,*

Symposium on Evolutionary and Ecological Functional Genomics, Knoxville

2001 *Evolution of diversity at histocompatibility genes: pathogens, mutational load and sexual selection*, University of Nevada, Reno

2000 *Histocompatibility gene diversity and disease: experiments with Salmonella, Theiler’s virus and inbreeding*, University of Texas, Southwestern

Medical Center

2000 *Evolution of diversity at histocompatibility genes: pathogens, mutations and sexual selection*, Brigham Young University

2000 *Histocompatibility genes and disease: experiments with Salmonella, Theiler’s virus and inbreeding*, Kansas State University

1999 *Recognizing kin recognition* and *Does MHC-mediated mate choice function to avoid inbreeding or enhance disease resistance in offspring?* Workshop on: Relatedness: concept, measure and evolutionary implications. LaSage, Switzerland

1999 *Is histocompatibility-mediated sexual selection for disease resistance or outbreeding*, Workshop on: Life history, immunocompetence and parasites, University of Neuchatel, Switzerland

1999 *Parasites, sexual selection, outbreeding and histocompatibility genes*, Humboldt State University

1998 *Testosterone, MHC ‘knockouts’, immunocompetence and social status,* University of Nebraska

1998 *Evolution of MHC genetic diversity: parasites, mutational load and sexual selection,* University of Oregon, Eugene

1998 *Evolution of MHC genetic diversity: parasites, mutational load and sexual selection,* University of California, Riverside

1997 *MHC, sexual selection and immunocompetence* - Plenary Speaker, International Ethological Conference, Vienna, Austria

1997 *Cross-fostering reverses MHC disassortative mating preferences -* Vth International workshop on the evolution of the major histocompatibility complex, Visby, Sweden

1996 *Fitness and behavioral consequences of MHC class I deficiency in seminatural populations of Mus musculus* - International symposium on: MHC and behavior, Kiel, Germany

1996 *The evolution of MHC genetic diversity*, University of California, Irvine

1996 *The evolution of MHC genetic diversity*, City of Hope Medical Center, Duarte, California

1995 *The nature of selection operating against MHC class I deficient mice (ß2 microglobulin "knockouts") in seminatural populations* - IVth International workshop on the evolution of the major histocompatibility complex, St. Augustine

1995 *Pathogen evasion of MHC-dependent immune recognition* - NSF sponsored workshop on: The Biology of Recognition Systems - University of California, Davis

1995 *Molecular ecology of MHC genetic diversity: PCR-based cloning, genotyping variants, MHC "knockouts" and the renaissance biologist* - American Society of Zoologists Symposium on: Molecular approaches to zoology and evolution - St. Louis

1994 *The evolution of MHC-associated sexual selection* - Royal Society Symposium on: Infection, Polymorphism and Evolution, London

1994 *Evolution of genetic incompatibility and histocompatibility systems* - Sewall Wright Seminar Series, University of Chicago

1993 *The evolution of MHC genetic diversity: a tale of incest, pestilence and sexual preference* - IIIrd International workshop on the evolution of the major histocompatibility complex, Cambridge (UK)

1993 *MHC, infectious disease and kin recognition*, Smithsonian and National Zoo

1992 *Disease, inbreeding, kin recognition and MHC genetic diversity* - 8th international *H-2/HLA* cloning workshop - Jekyl Island

1992 *MHC and kin recognition*, Rice University

1991 *Strong MHC-based mating preferences in semi-natural populations of Mus: evidence that they function primarily to avoid inbreeding* - Symposium on: The major histocompatibility complex, olfaction and behavior - Chemical Signals in Vertebrates VI, Philadelphia

1991 *Functional significance of MHC genetic diversity* - NATO Conference on MHC evolution, Miami

1991 *MHC-based mating preferences in Mus are strong and may function to avoid inbreeding* - Workshop on MHC structure and function - FASEB, Atlanta

1991 *Population and evolutionary genetics of MHC genes* - Purdue University

1990 *The maintenance of MHC genetic diversity: disease or genetic incompatibility?* -Vassar College

1989 *The maintenance of MHC genetic diversity: disease resistance, inbreeding depression, and reproduction* - Kansas State University

1988 *Maintenance of MHC polymorphism in Mus: male heterozygote advantage and disassortative reproductive selection* - Symposium on Parasites and sexual selection - American Society of Zoologists - San Francisco

1987 *Can heterozygote advantage account for the maintenance of MHC polymorphisms* - International symposium on *H-2* gene complex: genes, molecules, function - Bar Harbor

## PUBLICATIONS

2023 Female scent accelerates growth of juvenile male mice. Zala, S.M., B. Church, W. K. **Potts,** F. Knauer and D. J. Penn. *Scientific Reports* 2023 May 5;13(1):7371. doi: 10.1038/s41598-023-34548-3.

2022 Friend virus severity is associated with male mouse social status and environmental temperature. Stark DL, Cauceglia JW, Sitzman VN, Repetto MC, Tadje JM, **Potts** WK. *Animal Behavior*. https://doi.org/10.1016/j.anbehav.2022.03.009

2021 Middlebrook EA, Stark DL, Cornwall DH, Kubinak JL, **Potts** WK (2021) Deep sequencing of MHC-adapted viral lines reveals complex recombinational exchanges with endogenous retroviruses leading to high-frequency variants. *Frontiers in Genetics*. 12:716623. doi: 10.3389/fgene.2021.716623

2021 Cornwall DH, Ruff JS, Zachary ER, Young CP, Maguire KM, Painter RJ, Trujillo SM, **Potts** WK. Horizontal transmission of a murine retrovirus is driven by males within semi‐natural enclosures. *Functional Ecology*. First published: 02 February 2021.

2020 Cauceglia JW, Nelson AC, Rubinstein ND, Kukreja S, Sasso LN, Beaufort JA, Rando OJ, **Potts** WK. Transitions in paternal social status predict patterns of offspring growth and metabolic transcription. *Molecular Ecology.* Feb;29(3):624-638. doi: 10.1111/mec.15346. Epub 2020 Jan 19. PMID: 31885115.

2020 Cooper AN, Cunningham CB, Morris JS, Ruff JS, **Potts** WK, Carrier DR. Musculoskeletal mass and shape are correlated with competitive ability in male house mice (*Mus musculus*). *J Exp Biol*. 2020 Feb 7;223(Pt 3). pii: jeb213389. doi: 10.1242/jeb.213389. PMID: 31915200

2018 Cornwall D.H., Kubinak J.L., Zachary E., Stark D.L., Seipel D., **Potts** W.K. Experimental manipulation of population-level MHC diversity controls pathogen virulence evolution in *Mus musculus*. *J Evol Biol*. 31:314-322. doi: 10.1111/jeb.13225. Epub 2018 Jan 12. PMID: 29266576

2017 Ruff J.S., Saffarini R.B., Ramoz L.L., Morrison L.C., Baker S., Laverty S.M., Tvrdik P., Capecchi M.R., **Potts** W.K. Mouse fitness measures reveal incomplete functional redundancy of Hox paralogous group 1 proteins. *PLoS One*. 12(4):e0174975. doi: 10.1371/journal.pone.0174975. eCollection 2017. PMID: 28380068.

2017 Morris J.S., Ruff J.S., **Potts** W.K., Carrier D.R. A disparity between locomotor economy and territory-holding ability in male house mice. *J. Exp. Biol.* 220:2521-2528. doi: 10.1242/jeb.154823. Epub 2017 May 3. PMID: 28468871.

2017 Ruff, J.S., Cornwall, D.H, Morrison, L.C., Cauceglia, J.W., Nelson, A.C., Gaukler, S.M, Meagher, S.M., Carroll, L.S., and **Potts**, W.K. Sexual selection constrains the body mass of male but not female mice. *Ecol. Evol.* 7:1271-1275. doi: 10.1002/ece3.2753. PMID: 28303195 (cover photo article, Jan. 27 issue)

2016 Gaukler SM, Ruff JS, Galland T, Underwood TK, Kandaris KA, Liu NM, Morrison LC, Veranth JM, Potts WK. Quantification of cerivastatin toxicity supports organismal performance assays as an effective tool during pharmaceutical safety assessment. Evol Appl. 2016 Apr 15;9(5):685-96. doi: 10.1111/eva.12365. PMID: 27247619; PMCID: PMC4869410.

2016 Mowry, A., A. Kavazis, A. Sirman, W. Potts, W. R. Hood. Reproduction Does Not Adversely Affect Liver Mitochondrial Respiratory Function but Results in Lipid Peroxidation and Increased Antioxidants in House Mice. *PLoS ONE* 11(8): e0160883. doi:10.1371/journal.pone.0160883

2016Gaukler, S.M., Ruff, J.S., Morrison, L.C. & **Potts**, W.K. Rofecoxib-induced deleterious effects escape detection by organismal performance assays. *J of Negat Pharm Results.*8:4-11.[10.4103/0976-9234.177051](http://dx.doi.org/10.4103/0976-9234.177051)

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## MANUSCRIPTS SUBMITTED OR IN PREPARATION

Derek Stark, Raed Saffarini, James Ruff, Leda Ramoz, Linda Morrison, Kirk Thomas, Mario Capecchi, Wayne **Potts**. Fitness assays cast doubt on functional equivalence of Hoxa3 and Hoxd3 paralogues in mice. *Evolution and development*.

Multiple infections accelerate influenza virulence evolution. Costa, R., Acosta, L., Zarbock, K., Curtis, K., Adler, F., Ruff, J., Potts, W. *Current Biology*

**TEACHING**

1996 - 97 - Molecular Evolution Laboratory (Biol 3125)

1997- 98 - Molecular Evolution Laboratory (Biol 3125)

1998 - 99 - Behavioral Ecology (Biol 3430); Graduate Core Seminar, *Host-parasite coevolution* (Biol 780)

1999 – 2000 - Behavioral Ecology (Biol 3430)

2000 – 01 - Molecular Evolution Laboratory (Biol 3125); Graduate Core Seminar, *Experimental Evolution* (Biol 7406)

2001 – 02 - Behavioral Ecology (Biol 3430)

2002 – 03 - Molecular Evolution Laboratory (Biol 3125)

2003 – 04 - Behavioral Ecology (Biol 3430)

2004 – 05 - Molecular Evolution Laboratory (Biol 3125)

2005 – 06 - Behavioral Ecology (Biol 3430); Graduate Core Seminar, *Antagonistic coevolution* (Biol 7406)

2006-2007 - Molecular Evolution Laboratory (Biol 3125)

2007-2008 - Behavioral Ecology (Biol 3430)

2008-2009 - Molecular Evolution Laboratory (Biol 3125)

2009-2010 - Behavioral Ecology (Biol 3430)

2010 - 2011 - Molecular Evolution Laboratory (Biol 3125)

2011-2012 - Behavioral Ecology (Biol 3430); Advanced topics in ecology and evolution (Biology 7964) (coordinator)

2012-2013 - Molecular Evolution Laboratory (Biol 3125)

2013-2014 - Behavioral Ecology (Biol 3430)

2014-2015 - Molecular Evolution Laboratory (Biol 3125)

2015-2016 - Behavioral Ecology (Biol 3430)

2017-2018 - Molecular Evolution Laboratory (Biol 3125)

2018-2019 – Sabbatical to Cambridge University, UK

2019-2020 – Molecular Evolution Laboratory (Biol 3125) and Fundamentals of Biology II (Biol 1620)

2020-2021 -- Behavioral Ecology (Biol 3430) and Fundamentals of Biology II (Biol 1620)

2021-2022 -- Molecular Evolution Laboratory (Biol 3125) and Fundamentals of Biology II (Biol 1620)

2022-2023 -- Behavioral Ecology (Biol 3430) and Fundamentals of Biology II (Biol 1620)

Over 184 undergraduate students have been research assistants in my laboratory. I have served as a member of Ph.D. graduate committees for the following graduate students:

David Witherspoon

Rachael Lee

### Devin Drown

Janice Ragsdale

Jen Sorensen

Michelle Lefevbre

Dustin Penn (chair)

Lara Carroll (chair)

Andy Pacejka (co-chair)

Brad Demarest

Erin McClelland (chair)

Sarah Zala

Christine Turnbull

Lisa Kelley (chair)

Ann-Marie Torregrossa

Brendan O’Fallon

Adam Nelson (chair)

Jason Kubinak (chair)

James Ruff (chair)

Chris Cunningham

Silvia Smith

Patrick Ely

Jessica Waite

Jennifer Koop

Abhishek Chari

Sarah Knutie

Shannon Gaukler (chair)

Earl Middlebrook (chair)

Doug Cornwall (chair)

Jeremy Morris

Rodrigo Costa (Chair)

Sabrina Mcnew

Derek Stark (Chair)

Alexander Horn

Joseph Cauceglia (Chair)

Matthew Waller

Christian Moreau (Pathology)

**TRAINEES**

Joseph Cauceglia, Ph.D., University of Utah, 2021. Joseph is currently a Research and Development Scientist at Vela Operations, USA

Derek Stark, Ph.D., University of Utah, 2020. Derek is currently a Research Scientist at ARUP, Salt Lake City, UT.

Rodrigo Costa, Ph.D., University of Utah, 2020. Rodrigo is currently a postdoctoral fellow in Jessica Brown’s lab, Department of Pathology, University of Utah.

Earl Middlebrook, University of Utah, 2018. Earl was a postdoctoral fellow at the University of Arizona, 2018 thru 2020. He is currently a Post-Doctoral Research Associate at Los Alamos National Laboratory.

Douglas Cornwall, University of Utah, 2018. Doug is currently a postdoctoral Fellow in Brian Evavold’s laboratory at the University of Utah.

Shannon Gaukler, Ph.D., University of Utah, 2014. Shannon accepted a Post-Doctoral Research Associate position at Los Alamos National Laboratory.

James Ruff, Ph.D., Biology, University of Utah, 2012. James accepted a teaching position at Westminister College for 1 ½ years. He then returned to accept a post-doctoral position in my lab.

Adam Nelson, Ph.D., Biology, University of Utah, 2011. Adam conducted his dissertation work in my laboratory. He accepted an HHMI postdoctoral fellowship at Harvard University in the laboratory of Catherine Dulac and is currently an assistant professor at the University of Wyoming.

Jason L. Kubinak, Ph.D., Biology, University of Utah, 2011. Jason conducted his dissertation work in my laboratory. He accepted a postdoctoral fellowship at Boston University in the laboratory of Thomas Kunz, but tragically the lab shutdown due to a unfortunate accident to Thomas Kunz. Jason then accepted a postdoctoral position in June Round's lab in the Dept. of Pathology at the Univ. of Utah. He accepted an assistant professor position at University of Texas at Arlington and now has moved as an assistant professor to the University of South Carolina Medical School.

Erin M. McClelland, Ph.D. Biology, University of Utah, 2004. Erin conducted her Ph.D. work in my laboratory and her post-doctoral fellowship in Arturo Casadevall’s laboratory at the Albert Einstein College of Medicine. In 2008 she accepted an Assistant Professor position at the Commonwealth Medical College in Scranton, PA. She is currently an associate professor at Marian University.

Petteri Ilmonen, Ph.D. Biology, University of Turku, Finland. Petteri conducted post-doctoral studies in my laboratory between March 2002 and December 2003. Petteri accepted a post-doctoral fellowship at the Konrad Lorenz Institute in Vienna in 2004.

Dustin J. Penn, Ph.D. Biology, University of Utah, 1997. Dustin conducted his Ph.D. work in my laboratory as well as his post-doctoral work. He accepted the Directorship of the Konrad Lorenz Institute in Vienna, Sept. 2002.

Lara S. Carroll, Ph.D. Biology, University of Utah, 2002. Lara conducted her Ph.D. work in my laboratory and is currently a Howard Hughes Postdoctoral Fellow with Dr. Mario Capecchi, University of Utah.

Nigella Hillgarth, Ph.D. Zoology, Oxford University. Nigella joined my laboratory as a postdoctoral fellow in 1997. We were awarded an NSF grant to study mechanisms of androgen-mediated immunocompetence in mice. She accepted a position as Director of the Tracy Aviary in 1999, while maintaining her position as Research Assistant Professor at the University of Utah. She accepted a position at the Scripps Institute for Oceanography as Executive Director of the Birch Aquarium at Scripps in 2002. This is a senior administrative position at both Scripps and the University of California at San Diego.

Shawn Meagher, Ph.D. Zoology, University of Michigan, 1995. Shawn received an NSF postdoctoral award to study the immunogenetics and parasitology of natural populations of *Peromyscus*. Shawn joined the lab in July, 1995 and accepted an assistant professor position at Western Illinois University in 1999.

Scott V. Edwards, Ph.D., Zoology, University of California, Berkeley, 1992 (with Dr. Alan Wilson). Scott was a Sloan Fellow in Molecular Evolution in my laboratory and accepted a position as Assistant Professor in the Department of Zoology at the University of Washington starting Jan. 1 1995. In 2004 Scott accepted a position at Harvard University as Professor of Biology.

C. Jo Manning, Ph.D., Psychology, University of Washington, 1993 (with David Barash). Jo conducted her Ph.D. research at the University of Florida in a collaborative study that used our seminatural populations of wild mice. Jo spent a short period of time in my lab as a postdoctoral fellow in 1994. She accepted a position as an assistant professor in the Department of Psychology at the University of Nebraska (Omaha) in 1996.

Mats Grahn, Ph.D., Animal Ecology, Lund University (Sweden), 1992 (with Dr. Torbjorn von Schantz). Mats was a postdoctoral fellow with support from the Swedish government. Mats accepted a faculty position at the University College of South Stockholm in 1998.

David McDonald, Ph.D., Biology, University of Arizona, 1986 (with Astrid Kodric-Brown). David has primarily been a collaborator on avian microsatellite and MHC studies, although he did receive his molecular genetics training in my laboratory. David accepted an assistant professor position at the University of Wyoming in 1996.

Victor Apanius, Ph.D., Biology, University of Pennsylvania, 1991 (with Dr. Robert Ricklefs). Victor's three year NSERC fellowship started in January of 1994. He is conducting a collaborative project between my laboratory and Dr. Marilyn Scott's laboratory at the Institute of Parasitology, McGill University. The project involves experimental infections of a mouse nematode (Heligmosmoides polygyrus) known to have MHC-dependent susceptibilities. Victor arrived in Gainesville in Oct. 1994. Victor accepted an assistant professor position at Florida International University (Miami) in 1996.

Ramelle Ruff, Ramelle received her MS degree at the University of Florida in 1997 under my mentorship. She started a PhD program in marine mammalogy at the University of Hawaii that same year. Ramelle has subsequently left science.

**RESEARCH INTERESTS**

My research interests focus on the genetics of host-pathogen coevolution. Our current studies focus on the genes of the major histocompatibility complex (MHC), which play a central role in vertebrate immune recognition. MHC genes are also the most polymorphic loci known for vertebrates and many MHC alleles confer susceptibility to autoimmune and infectious diseases. What evolutionary mechanisms account for the extreme diversity of MHC genes? Why are these demonstrably “bad” alleles not eliminated by natural selection? These questions currently form the central focus of my laboratory and lead to at least four major levels of inquiry involving host-parasite interactions, inbreeding, sexual selection and kin recognition systems. Our current understanding suggests the following relationships. Parasite-driven selection favors MHC genetic diversity through both heterozygote advantage and relentless pathogen adaptation to common host genotypes, leading to rare MHC allele advantage. This in turn favors the evolution of MHC-based disassortative mating preferences because they preferentially produce high-fitness (disease-resistant) progeny. Such mating preferences would further increase MHC genetic diversity, making these loci increasingly useful as a kin recognition marker. Consequently, the avoidance of matings with kin (i.e. inbreeding) is an additional factor favoring MHC-based mating preferences. None of these hypothesized interactions enjoy definitive support and we are testing predictions from each. To test these hypotheses we use a varied set of approaches including laboratory experiments involving host-parasite interactions and sexual selection. We also use population and behavioral studies on natural and semi-natural populations of vertebrate species, primarily house mice. Molecular genetic techniques are utilized extensively to characterize the genotypes of both hosts and parasites in these studies. Below I briefly describe four major projects that are either underway or proposed.

# MHC heterozygote superiority

If MHC heterozygotes were superior to both homozygotes in resisting infectious agents, this would contribute to MHC genetic diversity. However, this is seldom seen for single infectious agents. MHC heterozygotes would be superior over the course of multiple infections if resistance is generally dominant. We are testing this hypothesis with multiple pathogen combinations. Our first test using *Salmonella* and Theiler's virus did reveal MHC heterozygote superiority.

# Experimental pathogen evolution studies to characterize how pathogens adapt to hosts

As a pathogen is passaged through a series of genetically similar host individuals, virulence increases in the host of passage, but decreases in previous hosts. This nearly universal result has profound implications for understanding host-pathogen interactions, because it provides a powerful experimental method for identifying and characterizing the complex interactions between hosts and pathogens. We are using this approach to characterize pathogen escape of MHC-dependent immunity and have recently published extensively on this topic.

# Ecological functional genomics: using ecology to reveal gene function

A major problem in determining gene function is that many genes when disrupted reveal no phenotypic change. The organism appears normal. We have argued that many such genes function to solve ecological problems and as such, will fall into a category where expression of their phenotype will be ecology dependent. A particularly important aspect of *Mus* ecology that will help reveal phenotypes that have subtle health and vigor declines is male-male competition over territory ownership. Direct support for this hypothesis comes from our demonstration that the deleterious fitness effects of inbreeding in *Mus* are barely detectable using lab assays (10% effect) but are amplified 50-fold (in males) when analyzed under semi-natural population conditions. We have used this population ecology approach on a number of the developmentally important Hox genes that reportedly showed no-phenotypic change when disrupted. Contrary to these reports, we have discovered large, important health and performance declines using our unique approach. We believe this will be a powerful general approach for determining the function of many genes.

*Toxicity assessment using OPA assays*

All too often, substances once considered safe at a particular dose are later found to have adverse consequences, usually through years or decades of epidemiological or experimental research. As a result, humanity often becomes the guinea pig of its mastery of applied chemistry. To prevent such experimentation on ourselves, there is a great need for broad, sensitive assays able to detect toxicity of many agents. We have discovered such an assay, which we call OPA (**O**rganismal **P**erformance **A**ssays). This assay uses house mice in seminatural populations (phenotrons) where experimental mice treated with the toxin compete directly with sham treated controls. This animal model achieves its breadth and sensitivity because **high performance from most physiological systems** is required for individual success, as determined by survival, social dominance, reproduction and a variety of other components of fitness. Consequently, any potentially toxic substance that reduces performance of any physiological system is likely to be detected in this assay. The first potential toxin tested using this assay, high fructose corn syrup, revealed substantial reductions in survival and competitive ability at doses considered safe and experienced by 20% of Americans. This was the first demonstration of health declines due to human relevant levels of dietary sugar, despite considerable efforts by the research community using more conventional methodologies.

We are also applying OPA approaches to pharmaceutical safety testing. We have tested three pharmaceuticals (Vioxx, Paxil and Baycol) that passed a billion dollars of safety testing, but upon release to the public, discovery of unacceptable health side effects forced their recall (Vioxx and Baycol) or blacklisting (Paxil). Two out of three of these pharmaceuticals show major fitness and health consequences during OPAs that were missed in preclinical and clinical screening.

We envision OPAs as a major new tool to detect toxicities of a variety of treatments relevant to public health. We have patented OPAs for this type of use and have been pursuing these avenues with the University of Utah Technology Commercialization group. We are proposing that FDA and EPA use OPAs to upgrade safety testing for pharmaceuticals and old and new chemical that find their way into the environment.