

## CURRICULUM VITAE

**Karl W. Broman**

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**EDUCATION**

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|-------------|---|
| 1997 – 1999 | Postdoctoral Fellow, Center for Medical Genetics, Marshfield Medical Research Foundation, Marshfield, Wisconsin (Advisor: James L. Weber)               |
| 1997        | PhD, Statistics, University of California, Berkeley (Advisor: Terry Speed; thesis: <i>Identifying quantitative trait loci in experimental crosses</i> ) |
| 1991        | BS, <i>Summa Cum Laude</i> , Mathematics, University of Wisconsin–Milwaukee   |

**PROFESSIONAL POSITIONS**

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|----------------|---|
| 2009 – present | Professor, Department of Biostatistics and Medical Informatics, School of Medicine and Public Health, University of Wisconsin–Madison           |
| 2007 – 2009    | Associate Professor, Department of Biostatistics and Medical Informatics, School of Medicine and Public Health, University of Wisconsin–Madison |
| 2002 – 2007    | Associate Professor, Department of Biostatistics, Bloomberg School of Public Health, The Johns Hopkins University, Baltimore, Maryland          |
| 1999 – 2002    | Assistant Professor, Department of Biostatistics, Bloomberg School of Public Health, The Johns Hopkins University, Baltimore, Maryland          |
| 1999           | Associate Research Scientist, Center for Medical Genetics, Marshfield Medical Research Foundation, Marshfield, Wisconsin                        |

**ADDITIONAL PROFESSIONAL APPOINTMENTS**

Affiliate faculty member, Department of Statistics, University of Wisconsin–Madison  
 Faculty trainer, Biostatistics Training Program, Cellular and Molecular Pathology Graduate Program, Computation and Informatics in Biology and Medicine Training Program, Genetics PhD Program, Genomic Sciences Training Program, Master of Public Health Program, Plant Breeding and Plant Genetics Program, and Population Health Graduate Program, University of Wisconsin–Madison

## RESEARCH INTERESTS

My research concerns statistical issues arising in problems in genetics and genomics. I focus particularly on the characterization of meiotic recombination and the development of improved methods for detecting and identifying genes contributing to variation in complex phenotypes in experimental organisms.

## SCIENTIFIC ADVISORY BOARDS

2009 – 2016      Nature Source Genetics, Ithaca, New York

2010 – 2011      Wisconsin Genomics Initiative

## HONORS AND AWARDS

Fellow of the American Statistical Association (2016)  
 Graduate of the Last Decade Award, University of Wisconsin–Milwaukee Alumni Association (2001)  
 Best Paper in *Genetic Epidemiology* in 1999, International Genetic Epidemiology Society (2000)  
 John Wasmuth Fellowship in Genomic Analysis, National Human Genome Research Institute (1998)  
 Evelyn Fix Prize for great promise in statistical research, University of California, Berkeley (1997)  
 Outstanding Graduate Student Instructor, University of California, Berkeley (1997)  
 University Fellowship, University of California, Berkeley (1994)  
 Phi Beta Kappa Society (1991)  
 General Chemistry Award, University of Wisconsin–Milwaukee (1989)  
 Wisconsin All-State Scholar (1988)

## PROFESSIONAL SOCIETY MEMBERSHIPS

American Association of University Professors  
 American Statistical Association  
 Genetics Society of America  
 Institute of Mathematical Statistics  
 International Biometric Society (ENAR)

## EDITORIAL ACTIVITIES

### Editorial Board Membership

2016 – present    Senior Editor, *Genetics*

2016 – present    Editorial Board, *BMC Biology*

2017 – 2019      Academic Editor, *PeerJ*

2004 – 2010      Associate Editor, *Genetics*

2006 – 2009      Associate Editor, *Journal of the American Statistical Association*, Applications and Case Studies

2004 – 2007      Associate Editor, *Biostatistics*

### Peer Review Activities

*Referee* for American Journal of Epidemiology; American Journal of Human Genetics; American

Statistician; Annals of Applied Statistics; Annals of Human Genetics; Annals of Statistics; Arteriosclerosis, Thrombosis, and Vascular Biology; Bioinformatics; Biometrics; Biostatistics; BMC Bioinformatics; BMC Biology; BMC Genetics; BMC Genomics; BMC Medical Research Methodology; BMC Proceedings; BMC Research Notes; Cancer Research; Circulation Research; Computational Statistics & Data Analysis; Crop Science; eLife; European Journal of Human Genetics; Evolution; Gene; Genes, Brain, and Behavior; Genes & Immunity; Genetic Epidemiology; Genetica; Genetical Research; Genetics; Genetics Research; Genetics Selection Evolution; Genome; Genome Research; Genomics; Growth, Development, & Aging; Harvard Data Science Review; Heredity; Human Genetics; Human Heredity; Human Molecular Genetics; IEEE/ACM Transactions on Computational Biology and Bioinformatics; Journal of Agricultural, Biological, and Environmental Statistics; Journal of the American Society of Nephrology; Journal of the American Statistical Association; Journal of Applied Genetics; Journal of Bioinformatics and Computational Biology; Journal of Computational and Graphical Statistics; Journal of Fish Biology; Journal of Heredity; Journal of Immunology; Journal of Neuroscience; Journal of Open Source Software; Journal of Statistical Distributions and Applications; Journal of Statistical Planning and Inference; Journal of Statistical Software; Mammalian Genome; Methods in Ecology and Evolution; Molecular Biology and Evolution; Molecular Ecology Resources; Molecular Genetics and Genomics; Molecular Informatics; Nature Communications; Nature Genetics; Nature Methods; Nature Protocols; Nature Reviews–Genetics; Nucleic Acids Research; Ophthalmic Epidemiology; Pacific Symposium on Biocomputing; Physical Review Letters; Physiological Genomics; Plant Cell; PLoS Biology; PLoS Computational Biology; PLoS Genetics; PLoS ONE; Proceedings of the National Academy of Sciences USA; R Journal; Scandinavian Journal of Immunology; Science; Statistical Applications in Genetics and Molecular Biology; Statistics; Theoretical Population Biology; and Trends in Genetics

*Book reviewer* for Arnold Publishers, Chapman & Hall/CRC, Columbia University Press, Oxford University Press, Princeton University Press, Springer–Verlag, and Taylor & Francis

## Review Panels

2010 – 2015	Center for Inherited Disease Research (CIDR) Access Committee, National Human Genome Research Institute, National Institutes of Health ( <i>Chair</i> , 2014 – 2015)
2006 – 2010	Genomics, Computational Biology, and Technology Study Section (GCAT), Center for Scientific Review, National Institutes of Health

## Ad hoc Review of Proposals

Center for Inherited Disease Research Access Committee; Clinical Research Review Committee, National Center for Research Resources; Genomics, Computational Biology, and Technology Study Section (NIH); Hatch grant competition, College of Agriculture and Life Sciences, University of Wisconsin–Madison; Johns Hopkins Center for Alternatives to Animal Testing; Mammalian Genetics Study Section (NIH); Microsoft Research European Fellowship Programme; National Cancer Institute Special Emphasis Panel (NIH); National Institute of Environmental Health Sciences Special Emphasis Panel (NIH); National Institute on Aging Special Emphasis Panel (NIH); National Science Council (Republic of China); National Science Foundation; National Sciences and Engineering Research Council (Canada); Council for Earth and Life Sciences, Netherlands Organization for Scientific Research; Neurological Sciences and Disorders A Study Section (NIH); and Telethon (Italy)

## PUBLICATIONS

### Books

**Broman KW, Sen Ś** (2009) *A Guide to QTL Mapping with R/qtl*. Springer (ISBN: 978-0-387-92124-2)

## Journal Articles

- 2020 Linke V, Overmyer KA, Miller IJ, Brademan DR, Hutchins PD, Trujillo EA, Reddy TR, Russell JD, Cushing EM, Schueler DL, Stapleton DS, Rabaglia ME, Keller MP, Gatti DM, Keele GR, Pham D, **Broman KW**, Churchill GA, Attie AD, Coon JJ (2020) A large-scale genome-lipid association map guides lipid identification. *Nat Metab* 2:1149–1162
- Schwerbel K, Kamitz A, Krahmer N, Hallahan N, Jähnert M, Gottmann P, Lebek S, Schallschmidt T, Arends D, Schumacher F, Kleuser B, Haltenhof T, Heyd F, Gancheva S, **Broman KW**, Roden M, Joost HG, Chadt A, Al-Hasani H, Vogel H, Jonas W, Schürmann A (2020) Immunity-related GTPase induces lipophagy to prevent excess hepatic lipid accumulation. *J Hepatol* 73:771–782
- Broman KW** (2020) Reproducibility report: Identifying essential genes by mutagenesis. *ReScience C* 6(1): #12
- Rodriguez-Gil JL, Watkins-Chow DE, Baxter LL, Elliot G, Harper UL, Wincovitch SM, Wedel JC, Incao AA, Huebeker M, Boehm FJ, Garver WS, Porter FD, **Broman KW**, Platt FM, Pavan BJ (2020) Genetic background modifies phenotypic severity and longevity in a mouse model of Niemann-Pick Disease Type C1. *Dis Model Mech* 13:dmm042614
- 2019 Keller MP, Rabaglia ME, Schueler KL, Stapleton DS, Gatti DM, Vincent M, Mitok KA, Wang Z, Ishimura T, Simonett SP, Emfinger CH, Das R, Beck T, Kendzierski C, **Broman KW**, Yandell BS, Churchill GA, Attie AD (2019) Gene loci associated with insulin secretion in islets from non-diabetic mice. *J Clin Invest* 130:4419–4432
- Kemis JH, Linke V, Barrett KL, Boehm FJ, Traeger LL, Keller MP, Rabaglia ME, Schueler KL, Stapleton DS, Gatti DM, Churchill GA, Amador-Noguez D, Russell JD, Yandell BS, **Broman KW**, Coon JJ, Attie AD, Rey FE (2019) Genetic determinants of gut microbiota composition and bile acid profiles in mice. *PLoS Genet* 15: e1008073
- Boehm FJ, Chesler EJ, Yandell BS, **Broman KW** (2019) Testing pleiotropy vs. separate QTL in multiparental populations. *G3* 9:2317–2324
- Boehm F, Yandell B, **Broman KW** (2019) qtl2pleio: Testing pleiotropy vs. separate QTL in multiparental populations. *J Open Source Software* 4(38):1435
- Broman KW**, Gatti DM, Svenson KL, Sen Ś, Churchill GA (2019) Cleaning genotype data from Diversity Outbred mice. *G3* 9:1571–1579
- Broman KW**, Gatti DM, Simecek P, Furlotte NA, Prins P, Sen Ś, Yandell BS, Churchill GA (2019) R/qtl2: software for mapping quantitative trait loci with high-dimensional data and multi-parent populations. *Genetics* 211:495–502
- 2018 Palus M, Sohrabi Y, **Broman KW**, Strnad H, Šíma M, Růžek D, Volkova V, Slapničková M, Vojtíšková J, Mrázková L, Salát J, Lipoldová M (2018) A novel locus on mouse chromosome 7 that influences survival after infection with tick-borne encephalitis virus. *BMC Neurosci* 19:39
- Keller MP, Gatti DM, Schueler KL, Rabaglia ME, Stapleton DS, Simecek P, Vincent M, Allen S, Broman AT, Bacher R, Kendzierski C, **Broman KW**, Yandell BS, Churchill GA, Attie AD (2018) Genetic drivers of pancreatic islet function. *Genetics* 209:335–356
- Broman KW**, Woo KH (2018) Data organization in spreadsheets. *Am Stat* 72:2–10

- Keele GR, Prokop JW, He H, Holl K, Littrell J, Deal A, Francic S, Cui L, Gatti DM, **Broman KW**, Tschannen M, Tsaih S-W, Zagloul M, Kim Y, Baur B, Fox J, Robinson M, Levy S, Flister MJ, Mott R, Valdar W, Solberg Woods LC (2018) Genetic fine-mapping and identification of candidate genes and variants for adiposity traits in outbred rats. *Obesity* 26:213–222
- 2017 Florek NW, Kamlangdee A, Mutschler JP, Kingstad-Bakke B, Schultz-Darken N, **Broman KW**, Osorio JE, Friedrich TC (2017) A modified vaccinia Ankara vaccine vector expressing a mosaic H5 hemagglutinin reduces viral shedding in rhesus macaques. *PLoS ONE* 12:e0181738
- Wang RJ, Gray MM, Parmenter MD, **Broman KW**, Payseur BA (2017) Recombination rate variation in mice from an isolated island. *Mol Ecol* 26:457–470
- 2016 Keller MP, Paul PK, Rabaglia ME, Stapleton DS, Schueler KL, Broman AT, Ye SI, Leng N, Brandon CJ, Neto EC, Plaisier CL, Simonett SP, Kebede MA, Sheynkman GM, Klein MA, Baliga NS, Smith LM, **Broman KW**, Yandell BS, Kendziorski C, Attie AD (2016) The transcription factor *Nfatc2* regulates  $\beta$ -cell proliferation and genes associated with type 2 diabetes in mouse and human islets. *PLoS Genet* 12:e1006466
- Parmenter MD, Gray MM, Hogan CA, Ford IN, **Broman KW**, Vinyard CJ, Payseur BA (2016) Genetics of skeletal evolution in unusually large mice from Gough Island. *Genetics* 204:1559–1572
- Zigler JS Jr, Hodgkinson CA, Wright M, Klise A, Sundin O, **Broman KW**, Hejtmancik F, Huang H, Patek B, Sergeev Y, Hose S, Brayton C, Xiaodong J, Vasquez D, Maragakis N, Mori S, Goldman D, Hoke A, Sinha D (2016) A spontaneous missense mutation in branched chain keto acid dehydrogenase kinase in the rat affects both the central and peripheral nervous systems. *PLoS ONE* 11:e0160447
- Sloan Z, Arends D, **Broman KW**, Centeno A, Furlotte N, Nijveen H, Yan L, Zhou X, Williams RW, Prins P (2016) GeneNetwork: framework for web-based genetics. *J Open Source Software* 1(2):25
- De Simone M, Spagnuolo L, Lorè NI, Cigana C, De Fino I, **Broman KW**, Iraqi FA, Bragonzi A (2016) Mapping genetic determinants of host susceptibility to *Pseudomonas aeruginosa* lung infection in mice. *BMC Genomics* 17:351
- Tian J, Keller MP, Broman AT, Kendziorski C, Yandell BS, Attie AD, **Broman KW** (2016) The dissection of expression quantitative trait locus hotspots. *Genetics* 202:1563–1574
- Gruhn JR, Al-Asmar N, Fasnacht R, Maylor-Hagen H, Peinado V, Rubio C, **Broman KW**, Hunt PA, Hassold T (2016) Correlations between synaptic initiation and meiotic recombination: A study of humans and mice. *Am J Hum Genet* 98:102–115
- Kwak I-L, Moore CR, Spalding EP, **Broman KW** (2016) Mapping quantitative trait loci underlying function-valued traits using functional principal component analysis and multi-trait mapping. *G3* 6:79–86
- 2015 Tian J, Keller MP, Oler AT, Rabaglia ME, Schueler KL, Stapleton DS, Broman AT, Zhao W, Kendziorski C, Yandell BS, Hagenbuch B, **Broman KW**, Attie AD (2015) Identification of the bile acid transporter *Slco1a6* as a candidate gene that broadly affects gene expression in mouse pancreatic islets. *Genetics* 201:1253–1262
- Broman KW**, Keller MP, Broman AT, Kendziorski C, Yandell BS, Sen Ś, Attie AD (2015) Identification and correction of sample mix-ups in expression genetic data: A case study. *G3* 5:2177–2186
- Gray MM, Parmenter M, Hogan C, Ford I, Cuthbert RJ, Ryan PG, **Broman KW**, Payseur BA (2015) Genetics of rapid and extreme size evolution in island mice. *Genetics* 201:213–228

Whitney KD, **Broman KW**, Kane NC, Hovick SM, Randell RA, Rieseberg LH (2015) Quantitative trait locus mapping identifies candidate alleles involved in adaptive introgression and range expansion in a wild sunflower. *Mol Ecol* 24:2194–2211

**Broman KW** (2015) R/qtcharts: Interactive graphics for quantitative trait locus mapping. *Genetics* 199:359–361

2014 Florek NW, Weinfurter JT, Jegaskanda S, Brewoo JN, Powell TD, Young GR, Das SC, Hatta M, **Broman KW**, Hungnes O, Dudman SG, Kawaoka Y, Kent SJ, Stinchcomb DT, Osorio JE, Friedrich TC (2014) Modified vaccinia Ankara encoding influenza virus hemagglutinin induces heterosubtypic immunity in macaques. *J Virol* 88:13418–13428

Gatti DM, Svenson KL, Shabalin A, Wu L-Y, Valdar W, Simecek P, Goodwin N, Cheng R, Pomp D, Palmer A, Chesler EJ, **Broman KW**, Churchill GA (2014) Quantitative trait locus mapping methods for Diversity Outbred mice. *G3* 4:1623–1633

Street VA, Kujawa SG, Manichaikul A, **Broman KW**, Kallman JC, Shilling DJ, Iwata AJ, Robinson LC, Robbins CA, Li J, Liberman MC, Tempel BL (2014) Resistance to noise-induced hearing loss in 129S6 and MOLF mice: Identification of independent, overlapping, and interacting chromosomal regions. *J Assoc Res Otolaryngol* 15:721–738

Kwak I-Y, Moore CR, Spalding EP, **Broman KW** (2014) A simple regression-based method to map quantitative trait loci underlying function-valued phenotypes. *Genetics* 197: 1409–1416

**Broman KW** (2014) Fourteen years of R/qlt: Just barely sustainable. *J Open Res Softw* 2(1):e11

Rowsey R, Gruhn J, **Broman KW**, Hunt PA, Hassold T (2014) Examining variation in recombination levels in the human female: A test of the production line hypothesis. *Am J Hum Genet* 95:108–112

Huang BE, Raghavan C, Mauleon R, **Broman KW**, Leung H (2014) Efficient imputation of missing markers in low-coverage genotyping-by-sequencing data from multi-parent crosses. *Genetics* 197:401–404

Baier B, Hunt P, **Broman KW**, Hassold T (2014) Variation in genome-wide levels of meiotic recombination is established at the onset of prophase in mammalian males. *PLoS Genet* 10:e1004125

2013 Gruhn JR, Rubio C, **Broman KW**, Hunt PA, Hassold T (2013) Cytological studies of human meiosis: sex-specific differences in recombination originate at, or prior to, establishment of double-strand breaks. *PLoS ONE* 8:e85075

Moore CR, Johnson LS, Kwak IY, Livny M, **Broman KW**, Spalding EP (2013) High-throughput computer vision introduces the time axis to a quantitative trait map of a plant growth response. *Genetics* 195:1077–1086

Bautz DJ, **Broman KW**, Threadgill DW (2013) Identification of a novel polymorphism in X-linked sterol-4-alpha-carboxylate 3-dehydrogenase (*Nsdhl*) associated with reduced HDL cholesterol levels in I/LnJ mice. *G3* 3:1819–1825

Harris M, Burns CM, Becker EA, Braasch AT, Gostick E, Johnson RC, **Broman KW**, Price DA, Friedrich TC, O'Connor SL (2013) Acute-phase CD8 T cell responses that select for escape variants are needed to control live attenuated simian immunodeficiency virus. *J Virol* 87:9353–9364

Maenner MJ, Baker MW, **Broman KW**, Tian J, Barnes JK, Atkins A, McPherson E, Hong J, Brilliant MH, Mailick MR (2013) *FMR1* CGG expansions: Prevalence and sex ratios. *Am J Med Genet B Neuropsychiatr Genet* 162:466–473

- 2012 **Broman KW**, Kim S, Sen S, Ané C, Payseur BA (2012) Mapping quantitative trait loci onto a phylogenetic tree. *Genetics* 192:167–179
- Rice CA, Riehl J, **Broman K**, Soukup JW, Gengler WR (2012) Comparing the degree of exothermic polymerization in commonly used acrylic and provisional composite resins for intraoral appliances. *J Vet Dent* 29: 78–83
- Galvan A, Colombo F, Noci S, Pazzaglia S, Mancuso M, Manenti G, **Broman KW**, Saran A, Dragani TA (2012) The *Lsktm1* locus modulates lung and skin tumorigenesis in the mouse. *G3* 2:1041–1046
- Greene JM, Chin EN, Budde ML, Lhost JJ, Hines PJ, Burwitz BJ, **Broman KW**, Nelson JE, Friedrich TC, O'Connor DH (2012) *Ex vivo* SIV-specific CD8 T cell responses in heterozygous animals are primarily directed against peptides presented by a single MHC haplotype. *PLoS ONE* 7:e43690
- Neto EC, Keller MP, Broman AF, Attie AD, Jansen RC, **Broman KW**, Yandell BS (2012) Quantile-based permutation thresholds for quantitative trait loci hotspots. *Genetics* 191:1355–1365
- King EG, Merkes CM, McNeil CL, Hofer SR, Sen S, **Broman KW**, Long AD, Macdonald SJ (2012) Genetic dissection of a model complex trait using the *Drosophila* Synthetic Population Resource. *Genome Res* 22:1558–1566
- Wang CY, Stapleton DS, Schueler KL, Rabaglia ME, Oler AT, Keller MP, Kendzierski CM, **Broman KW**, Yandell BS, Schadt EE, Attie ED (2012) *Tsc2*, a positional candidate gene underlying a quantitative trait locus for hepatic steatosis. *J Lipid Res* 53:1493–1501
- Arends D, van der Velde KJ, Prins P, **Broman KW**, Möller S, Jansen RC, Swertz MA (2012) xQTL workbench: a web based environment for xQTL analysis. *Bioinformatics* 28:1042–1044
- Amlin-Van Schaick JC, Kim S, **Broman KW**, Reilly KM (2012) *Scram1* is a modifier of spinal cord resistance for astrocytoma on mouse chromosome 5. *Mamm Genome* 23:277–285
- Broman KW** (2012) Genotype probabilities at intermediate generations in the construction of recombinant inbred lines. *Genetics* 190:403–412
- Broman KW** (2012) Haplotype probabilities in advanced intercross populations. *G3* 2:199–202
- Collaborative Cross Consortium [97 authors] (2012) The genome architecture of the Collaborative Cross mouse genetic reference population. *Genetics* 190:389–401
- Amlin-Van Schaick JC, Kim S, DiFabio C, Lee M-H, **Broman KW**, Reilly KM (2012) *Arlm1* is a male-specific modifier of astrocytoma resistance on mouse chr 12. *Neuro Oncol* 14:160–174
- Davis RC, Van Nas A, Castellani LW, Zhao Y, Zhou Z, Wen P, Yu S, Qi H, Rosales M, Schadt EE, **Broman KW**, Peterfy M, Lusis AJ (2012) Systems genetics of susceptibility to obesity-induced diabetes in mice. *Physiol Genomics* 44:1–13
- 2011 Weinfurter JT, Brunner K, Capuano SV III, Li C, **Broman KW**, Kawaoka Y, Friedrich T (2011) Cross-reactive T cells are involved in rapid clearance of 2009 pandemic H1N1 influenza virus in nonhuman primates. *PLoS Pathog* 7:e1002381

Aylor DL, Valdar W, Foulds-Mathes W, Buus RJ, Verdugo RA, Baric RS, Ferris MT, Frelinger JA, Heise M, Frieman MB, Gralinski LE, Bell TA, Didion JD, Hua K, Nehrenberg DL, Powell CL, Steigerwalt J, Xie Y, Kelada SNP, Collins F, Yang IV, Schwartz DA, Branstetter LA, Chesler EJ, Miller DR, Spence J, Liu EY, McMillan L, Sarkar A, Wang J, Wang W, Zhang Q, **Broman KW**, Korstanje R, Durrant C, Mott R, Iraqi FA, Pomp D, Threadgill D, Pardo-Manuel de Villena F, Churchill GA (2011) Genetic analysis of complex traits in the emerging Collaborative Cross. *Genome Res* 21:1213–1222

Greene JM, Wiseman RW, Lank SM, Bimber BN, Karl JA, Burwitz BJ, Lhost JJ, Hawkins OE, Kunstman KJ, **Broman KW**, Wolinsky SM, Hildebrand WH, O'Connor DH (2011) Differential MHC class I expression in distinct leukocyte subsets. *BMC Immunol* 12:39

Bradley KM, Breyer JP, Melville DB, **Broman KW**, Knapik EW, Smith JR (2011) A SNP-based linkage map for zebrafish reveals sex determination loci. *G3* 1:3–9

Moreland AJ, Guethlein LA, Reeves RK, **Broman KW**, Johnson RP, Parham P, O'Connor DH, Bimber BN (2011) Characterization of killer immunoglobulin-like receptor genetics and comprehensive genotyping by pyrosequencing in rhesus macaques. *BMC Genomics* 12:295

Svetec N, Werzner A, Wilches R, Pavlidis P, Álvarez-Castro JM, **Broman KW**, Metzler D, Stephan W (2011) Identification of X-linked quantitative trait loci affecting cold tolerance in *Drosophila melanogaster* and fine-mapping by selective sweep analysis. *Mol Ecol* 20:530–544

2010 Murdoch B, Owen N, Shirley S, Crumb S, **Broman KW**, Hassold T (2010) Multiple loci contribute to genome-wide recombination levels in male mice. *Mamm Genome* 21:550–555

Billings T, Sargent EE, Szatkiewicz JP, Leahy N, Kwak, I-Y, Bektassova N, Walker M, Hassold T, Graber JH, **Broman KW**, Petkov PM (2010) Patterns of recombination activity on mouse chromosome 11 revealed by high resolution mapping. *PLoS ONE* 5:e15340

Arends D, Prins P, Jansen RC, **Broman KW** (2010) R/qtl: High-throughput multiple QTL mapping. *Bioinformatics* 26:2990–2992

Bader HL, Ruhe AL, Wang LW, Wong AK, Walsh KF, Packer RA, Mitelman J, Robertson KR, O'Brien DP, **Broman KW**, Shelton GD, Apte SS, Neff MW (2010) An *ADAMTSL2* founder mutation causes Musladin-Lueke Syndrome, a heritable disorder of beagle dogs, featuring stiff skin and joint contractures. *PLoS ONE* 5:e12817

Jurisc G, Sundberg JP, Bleich A, Leiter EH, **Broman KW**, Buechler G, Alley L, Vestweber D, Detmar M. (2010) Quantitative lymphatic vessel trait analysis suggests *Vcam1* as candidate modifier gene of inflammatory bowel disease. *Genes Immun* 11:219–231

Burrage LC, Baskin-Hill AE, Sinasac DS, Singer JB, Croniger CM, Kirby A, Kulbokas EJ, Daly MJ, Lander ES, **Broman KW**, Nadeau JH (2010) Genetic resistance to diet-induced obesity in chromosome substitution strains of mice. *Mamm Genome* 21:115–129

Greene JM, Lhost JJ, Burwitz BJ, Budde ML, Macnair CE, Weiker MK, Gostick E, Friedrich TC, **Broman KW**, Price DA, O'Connor SL, O'Connor DH (2010) Extralymphoid CD8<sup>+</sup> T cells resident in tissue from Simian Immunodeficiency Virus SIVmac239Δnef-vaccinated macaques suppress SIVmac239 replication *ex vivo*. *J Virol* 84:3362–3372

Wong AK, Ruhe AL, Dumont BL, Robertson KR, Guerrero G, Shull SM, Ziegler JS, Millon LV, **Broman KW**, Payseur BA, Neff MW (2010) A comprehensive linkage map of the dog genome. *Genetics* 184:595–605



- 2009 Shavit JA, Manichaikul A, Lemmerhirt HL, **Broman KW**, Ginsburg D (2009) Modifiers of von Willebrand factor identified by natural variation in inbred strains of mice. *Blood* 114:5368–5374
- Cheng EY, Hunt PA, Naluai-Cecchini TA, Fligner CL, Fujimoto VY, Pasternack TL, Schwartz JM, Woodruff TJ, Cherry SM, Hansen TA, Vallente RU, **Broman KW**, Hassold TJ (2009) Meiotic recombination in human oocytes. *PLoS Genet* 5:e1000661
- Fledel-Alon A, Wilson DJ, **Broman KW**, Wen W, Ober C, Coop G, Przeworski M (2009) Broad-scale recombination patterns underlying proper disjunctions in humans. *PLoS Genet* 5:e1000658
- Cox A, Ackert-Bicknell CL, Dumont BL, Ding Y, Bell, JT, Brockmann GA, Wergedal JE, Bult C, Paigen B, Flint J, Tsaih S-W, Churchill GA, **Broman KW** (2009) A new standard genetic map for the laboratory mouse. *Genetics* 182:1335–1344
- Dumont BL, **Broman KW**, Payseur BA (2009) Variation in genomic recombination rates among heterogeneous stock mice. *Genetics* 182:1345–1349
- Manichaikul A, **Broman KW** (2009) Binary trait mapping in experimental crosses with selective genotyping. *Genetics* 182:863–874
- Venkatesan M, **Broman KW**, Sellers M, Rasgon JL (2009) An initial linkage map of the West Nile Virus vector *Culex tarsalis*. *Insect Mol Biol* 18:453–463
- Sen S, Johannes F, **Broman KW** (2009) Selective genotyping and phenotyping strategies in a complex trait context. *Genetics* 181:1613–1626
- Manichaikul A, Moon JY, Sen S, Yandell BS, **Broman KW** (2009) A model selection approach for the identification of quantitative trait loci in experimental crosses, allowing epistasis. *Genetics* 181:1077–1086 [Erratum: *Genetics* 184:607, 2010]
- 2008 Shao H, Burrage LC, Sinasac DS, Hill AE, Ernest SR, O'Brien W, Courtland HW, Jepsen KJ, Kirby A, Kulbokas EJ, Daly MJ, **Broman KW**, Lander ES, Nadeau JH (2008) Genetic architecture of complex traits: Large phenotypic effects and pervasive epistasis. *Proc Natl Acad Sci USA* 105:19910–19914
- Hill M, **Broman KW**, Stupka E, Smith W, Jiang D, Sidow A (2008) The *C. savignyi* genetic map and its integration with the reference sequence facilitates insights into chordate genome evolution. *Genome Res* 18:1369–1379
- Lupi I, **Broman KW**, Tzuo S-C, Gutenberg A, Martino E, Caturegli P (2008) Novel autoantigens in autoimmune hypophysitis. *Clin Endocrinol* 69:269–278
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#### Editorials

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#### Proceedings and Book Chapters

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### Technical Reports and Preprints

Tran Q, **Broman KW** (2020) Treatment of the X chromosome in mapping multiple quantitative trait loci. *bioRxiv* doi:10.1101/2020.09.11.294017

Lobo AK, Traeger LL, Keller MP, Attie AD, Rey FE, **Broman KW** (2019) Identification of sample mix-ups and mixtures in microbiome data in Diversity Outbred mice. *bioRxiv* doi:10.1101/529040

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**Broman KW** (2006) Use of hidden Markov models for QTL mapping. Working paper 125, Department of Biostatistics, Johns Hopkins University, Baltimore, MD

Blades NJ, **Broman KW** (2002) Estimating the number of essential genes in a genome by random transposon mutagenesis. Technical Report MS02-20, Department of Biostatistics, Johns Hopkins University, Baltimore, MD

Bowman KO, Shenton LR, Kastenbaum MA, **Broman K** (1992) Overdispersion: Notes on discrete distributions. Technical Report ORNL/TM-12167, Oak Ridge National Laboratory

### SOFTWARE AND OTHER RESOURCES

R/qlt	An R package for mapping genes contributing to variation in quantitative traits in experimental crosses ( <a href="http://rqtl.org">rqtl.org</a> ).
R/qlt2	A reimplement of the R package R/qlt, to better handle high-dimensional data and complex cross designs. ( <a href="http://kbroman.org/qlt2">kbroman.org/qlt2</a> ).
R/qltcharts	An R package to create interactive data visualizations for quantitative trait locus mapping data ( <a href="http://kbroman.org/qltcharts">kbroman.org/qltcharts</a> ).
aRxiv	An R package for searching arXiv, a repository of electronic preprints for computer science, mathematics, physics, quantitative biology, quantitative finance, and statistics. ( <a href="https://github.com/ropensci/aRxiv">github.com/ropensci/aRxiv</a> ).

git/GitHub guide	Online tutorial on the git version control system and its use with GitHub.com ( <a href="http://kbroman.org/github_tutorial">kbroman.org/github_tutorial</a> ).
knitr in a knutshell	Online tutorial on knitr, a tool for creating documents that mix code and text ( <a href="http://kbroman.org/knitr_knutshell">kbroman.org/knitr_knutshell</a> ).
minimal make	Online tutorial on GNU Make, for automating computational tasks ( <a href="http://kbroman.org/minimal_make">kbroman.org/minimal_make</a> ).
R package primer	Online tutorial on writing packages for the R statistical software ( <a href="http://kbroman.org/pkg_primer">kbroman.org/pkg_primer</a> ).
simple site	Online tutorial on constructing simple websites with GitHub Pages ( <a href="http://kbroman.org/simple_site">kbroman.org/simple_site</a> ).
RelCheck	Software for the verification of relationships between individuals with use of autosomal genotype data.
Marshfield genetic maps	Genetic maps of the human genome, with internet-based tools for the search for genetic markers and semi-automated map construction.

## EDUCATIONAL ACTIVITIES

### PhD Advisees

Quoc Tran, PhD student, Statistics, University of Wisconsin–Madison

Fred Boehm, PhD student, Statistics, University of Wisconsin–Madison (Thesis: *Testing pleiotropy vs. separate QTL in multiparental populations*), 2019

Jianan Tian, PhD, Statistics, University of Wisconsin–Madison (Thesis: *Dissection and fine-mapping of trans-eQTL hotspots*), 2015

Il-Youp Kwak, PhD, Statistics, University of Wisconsin–Madison (Thesis: *Regression-based methods to map quantitative trait loci underlying function-valued phenotypes*), 2014

Ani Manichaikul, PhD, Biostatistics, Johns Hopkins Bloomberg School of Public Health (Thesis: *Statistical methods for mapping quantitative trait loci in experimental crosses*), 2007

Wei-Min Chen, PhD, Biostatistics, Johns Hopkins Bloomberg School of Public Health (Thesis: *Robust quantitative trait linkage analysis in extended human pedigrees*), 2004

### Master's Advisees

Sungjin Kim, MS, Statistics, University of Wisconsin–Madison, 2011

Laura C. Plantinga, ScM, Biostatistics, Johns Hopkins Bloomberg School of Public Health (Thesis: *Inference of clusters of related individuals with dominant genetic marker data*), 2001

### Undergraduate Advisees

Alexandra Lobo, summer student, Biomedical Data Science Summer Research Program, University of Wisconsin–Madison, summer, 2017

Janel Barnes, summer student, Integrated Biological Sciences Summer Research Program, University of Wisconsin–Madison, summer, 2012



Leah Fehr, summer student, Integrated Biological Sciences Summer Research Program, University of Wisconsin–Madison, summer, 2008

#### Academic Advisees, University of Wisconsin–Madison

2018 – present	Alexandra Spicer	MS candidate, Biomedical Data Science
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#### Academic Advisees, Johns Hopkins University

2006 – 2007	Sheng-Chih Jin	ScM candidate, Biostatistics
2005 – 2007	Ani Manichaikul	PhD candidate, Biostatistics
2005 – 2006	Alex Phan	candidate for MHS in Bioinformatics
2005 – 2006	Jichao Chen	candidate for MHS in Bioinformatics
2004 – 2006	Snaebjorn Gunnsteinsson	PhD candidate, Biostatistics
2003 – 2007	Benilton Carvalho	PhD candidate, Biostatistics
2003 – 2005	Wenyi Wang	PhD candidate, Biostatistics
2000 – 2004	Wei-Min Chen	PhD candidate, Biostatistics
2000 – 2003	Michelle Shardell	PhD candidate, Biostatistics
1999 – 2001	Sora Kim	ScM candidate, Biostatistics

#### Doctoral Thesis Committees, University of Wisconsin–Madison

2019 – present	Athena Golfinos	Cellular and Molecular Pathology
2018 – present	Qijun Zhang	Cellular and Molecular Pathology
2018 – present	Michael Kartje	Genetics
2017 – present	Jeremy Lange	Genetics
2017 – present	Christopher McAllester	Genetics
2016 – present	April Peterson	Genetics
2015 – present	Quentin Sprengelmeyer	Genetics
2018 – 2020	Theeva Chandereng	Statistics
2012 – 2019	Molly McDevitt	Biochemistry
2017 – 2018	Kyubin Lee	Computer Sciences
2015 – 2018	René Welch	Statistics
2012 – 2017	Michelle Parmenter	Genetics
2014 – 2017	Alessandra York	Genetics
2013 – 2017	Richard Wang	Genetics
2013 – 2016	Shuang Huang	Statistics
2011 – 2013	Raja Farhana Raja Mohd Anuar	Plant Breeding and Plant Genetics
2010 – 2015	Katie Clowers	Genetics
2010	Jingfang Zhang	Oncology
2010 – 2011	Michael White	Genetics
2010	Elias Chaibub Neto	Statistics
2007 – 2010	Beth Dumont	Genetics

#### Doctoral Thesis Committees, Johns Hopkins University

2006 – 2007	Meera Venkatesan	Molecular Microbiology and Immunology
2006 – 2007	Ching-Yu Cheng	Epidemiology
2005 – 2007	Robert Wojciechowski	Epidemiology
2004 – 2007	Tanya Teslovich	Human Genetics (School of Medicine)
2004 – 2005	Katherine Swanson	Molecular Microbiology and Immunology
2003 – 2004	Shin Lin	Human Genetics (School of Medicine)
2003 – 2004	Adele Mitchell	Human Genetics (School of Medicine)
2002 – 2003	Rivka Glaser	Human Genetics (School of Medicine)

2002	Shawn Soutiere	Environmental Health Sciences
2001 – 2004	Sadeep Shresthra	Epidemiology
2001 – 2002	Rasika Mathias	Epidemiology
1999 – 2002	Cynthia James	Human Genetics (School of Medicine)

#### Oral Exams, University of Wisconsin–Madison

2020	Qijun Zhang	Cellular and Molecular Pathology
2019	Michael Kartje	Genetics
2018	Christopher McAllester Thevaa Chandereng	Genetics Statistics
2017	Constanza Rojo Quentin Sprengelmeyer Jeremy Lange Kyubin Lee Fred Boehm	Statistics Genetics Genetics Computer Sciences Statistics
2016	April Peterson Alessandra York	Genetics Genetics
2015	René Welch	Statistics
2014	Shuyun Ye Michelle Parmenter Jeea Choi	Statistics Genetics Statistics
2013	Jianan Tian Richard Wang Shuang Huang Raja Farhana Raja Mohd Anuar Molly McDevitt	Statistics Genetics Statistics Plant Breeding and Plant Genetics Biochemistry
2012	Katie Clowers	Genetics
2011	Il Youp Kwak	Statistics
2010	Jee Young Moon John Dawson Elias Chaibub Neto Qinglin Pei Jingfang Zhang	Statistics Statistics Statistics Statistics Oncology
2008	Beth Dumont	Genetics

#### Oral Exams, Johns Hopkins University

2006	Lindsey Garver Benilton Carvalho Yen-Yi Ho Lindsey Enewold Renee Gardner	Molecular Microbiology and Immunology Biostatistics Biostatistics Epidemiology Environmental Health Sciences
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2005	Ani Manichaikul Wenyi Wang Meera Venkatesan Audrey Grant	Biostatistics Biostatistics Molecular Microbiology and Immunology Epidemiology
2004	Katherine Swanson	Molecular Microbiology and Immunology
2003	Sadeep Shrestha Wei-Min Chen	Epidemiology Biostatistics
2002	Marie-Hélène Roy-Gagnon	Epidemiology
2001	Leslie Cope Vivian Yuan Jean-Paul Chretien	Mathematical Sciences (School of Engineering) Mathematical Sciences (School of Engineering) Epidemiology
2000	Xin Liu Tsuo-Hung Lan Halcyon Skinner	Epidemiology Epidemiology Epidemiology
1999	David Kaufman	Epidemiology

#### Doctoral Thesis Defenses, University of Wisconsin–Madison

2020	Thevaa Chandereng	Statistics
2019	Constanza Rojo Fred Boehm Molly McDevitt	Statistics Statistics Biochemistry
2018	Kyubin Lee René Welch	Computer Sciences Statistics
2017	Richard Wang Michelle Parmenter	Genetics Genetics
2016	Shuang Huang	Statistics
2015	Jianan Tian Katie Clowers	Statistics Genetics
2014	Il-Youp Kwak	Statistics
2013	Qinglin Pei	Statistics
2012	John Dawson	Statistics
2011	Michael White	Genetics
2010	Beth Dumont Elias Chaibub Neto	Genetics Statistics
2009	YounJeong Choi	Statistics

### Doctoral Thesis Defenses, Johns Hopkins University

2007	Ani Manichaikul	Biostatistics
2005	Katherine Swanson Laura LaRosa Ji Wan Park Martina Johannesson	Molecular Microbiology and Immunology Environmental Health Sciences Epidemiology Lund University, Sweden
2004	Wei-Min Chen Marie-Hélène Roy-Gagnon	Biostatistics Epidemiology
2001	Alison Klein Tsuo-Hung Lan	Epidemiology Epidemiology

### Master's Thesis Defenses, University of Wisconsin–Madison

2013	Raja Farhana Raja Mohd Anuar	Plant Breeding and Plant Genetics
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### Master's Thesis Reading, Johns Hopkins University

2001	Jane Peredo, MS	Genetic Counseling
2000	Jennifer Mulle, MHS Heping Hu, MHS Rita Peila, ScM	Epidemiology Epidemiology Epidemiology

### Classroom Instruction, University of Wisconsin–Madison

Fall, 2020	BMI 881 BMI 883	Biomedical Data Science Scholarly Literature 1 Biomedical Data Science Professional Skills 1 ( <i>new</i> )
Spring, 2020	BMI 882 BMI 826-001	Biomedical Data Science Scholarly Literature 2 ( <i>new</i> ) Advanced Data Analysis ( <i>new</i> )
Fall, 2019	BMI 881	Biomedical Data Science Scholarly Literature 1 ( <i>new</i> )
Spring, 2019	Statistics 877	Statistical Methods in Molecular Biology (jointly with Drs. Kendzierski, Lu, Dewey, Newton, Keles, Roy, Ané, and Tang)
Spring, 2018	Agronomy 957	Plant Breeding and Plant Genetics seminar (jointly with Brian Yandell)
Spring, 2017	Statistics 877	Statistical Methods in Molecular Biology (jointly with Drs. Kendzierski, Larget, Ané, Newton, Roy, Keles, Wang, and Craven)
Spring, 2016	BMI 826-003	Tools for Reproducible Research
Spring, 2015	BMI 826-003	Tools for Reproducible Research
Spring, 2014	BMI 826-003	Tools for Reproducible Research ( <i>new</i> )

	Statistics 877	Statistical Methods in Molecular Biology (jointly with Drs. Newton, Kendzierski, Larget, Ané, Yandell, Wang, and Keles)
Fall, 2012	BMI 826-001	Statistical Methods for QTL Mapping
Spring, 2012	Statistics 877	Statistical Methods in Molecular Biology (jointly with Drs. Newton, Kendzierski, Larget, Ané, Yandell, Wang, and Keles)
Spring, 2011	Statistics 992-001	Statistical Methods for QTL Mapping ( <i>new</i> )
Summer, 2010	Population Health 904-003	Analytic Methods in Genetic Epidemiology (jointly with Drs. Engelman, Payseur, and Meyers)
Spring, 2010	Statistics 877	Statistical Methods in Molecular Biology (jointly with Drs. Newton, Kendzierski, Larget, Ané, Yandell, Wang, and Keles)
Fall, 2008	Statistics 371-003	Introductory Applied Statistics for the Life Sciences
Summer, 2008	Population Health 904-003	Analytic Methods in Genetic Epidemiology (jointly with Drs. Engelman, Payseur, and Skinner)
Spring, 2008	Statistics 992-002	Statistical Methods in Molecular Biology ( <i>new</i> ) (jointly with Drs. Newton, Kendzierski, Larget, Ané, Yandell, and Keles)

#### Classroom Instruction, Johns Hopkins University

2006 – 2007	Biostatistics 140.668	Special Topics in Genetics and Genomics
2005 – 2006	Biostatistics 140.615–616 Epidemiology 340.631	Statistics for Laboratory Scientists Methods in Genetic Epidemiology I (jointly with Dr. Beaty)
2004 – 2005	Biostatistics 140.776  Biostatistics 140.668  Biostatistics 140.615–616 Epidemiology 340.631	Statistical Computing (jointly with Drs. Caffo, Irizarry, and Ruczinski) Special Topics in Genetics and Genomics (jointly with Dr. Ruczinski) Statistics for Laboratory Scientists Methods in Genetic Epidemiology I (jointly with Dr. Beaty)
2003 – 2004	Biostatistics 140.776  Biostatistics 140.615–616	Statistical Computing ( <i>new</i> ) (jointly with Drs. Caffo, Irizarry, and Ruczinski) Statistics for Laboratory Scientists
2002 – 2003	Biostatistics 140.668  Biostatistics 140.615–616	Special Topics in Genetics and Genomics ( <i>new</i> ) (jointly with Dr. Parmigiani) Statistics for Laboratory Scientists
2001 – 2002	Biostatistics 140.615	Statistics for Laboratory Scientists ( <i>new</i> )

2000 – 2001	Biostatistics 140.778	Advanced Statistical Computing ( <i>new</i> )
	Biostatistics 140.667	Genetics for Statisticians
	Biostatistics 140.668	Statistical Genetics
1999 – 2000	Biostatistics 140.846	Genetics for Statisticians ( <i>new</i> )
	Biostatistics 140.668	Statistical Genetics ( <i>new</i> )

Classroom Instruction, University of California, Berkeley

Summer, 1994	Statistics 131A	Introductory Statistics for Social and Life Scientists
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Classroom Instruction, University of Wisconsin–Milwaukee

1991 – 1992	Mathematics 095	Basic Algebra
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Other teaching

2020	Lecture on “Steps toward reproducible research” in BMI 877 (Statistical Methods for Molecular Biology), Department of Biostatistics & Medical Informatics, University of Wisconsin–Madison	
2020	Lectures on “Steps toward reproducible research” and “Exploratory data analysis” in BMI 773 (Clinical Research Informatics), Department of Biostatistics & Medical Informatics, University of Wisconsin–Madison	
2019 – 2020	Lecture on “Steps toward reproducible research” to MD/PhD students, School of Medicine and Public Health, University of Wisconsin–Madison	
2018 – 2019	Lecture on “Data management” to KL2 scholars, Institute for Clinical and Translational Research, School of Medicine and Public Health, University of Wisconsin–Madison	
2016 – 2018	Instructor, Data Carpentry workshops, Advanced Computing Initiative, University of Wisconsin–Madison	
2017 – 2018	Workshop on Reproducible Research, Summer Institute in Statistics for Big Data, Seattle, Washington	
2013 – 2018	Lecture on “Creating effective figures and tables” to MD/PhD students, School of Medicine and Public Health, University of Wisconsin–Madison	
2018	Instructor, Workshop on Advanced R and R/qtl, ICRISAT, Hyderabad, India	
2018	Lecture on “Steps toward reproducible research” for the Cellular and Molecular Pathology Graduate Program, University of Wisconsin–Madison	
2017	Instructor, Data Carpentry workshop, National Society of Black Engineers Professional Development Conference, Chicago, Illinois	
2017	Workshop on Systems Genetics of Neurodegeneration, Frauenchiemsee, Germany	
2017	Workshop on R/qtl and R/qtl2 software, Complex Trait Community meeting, Memphis, Tennessee	

2017	Workshop on “Steps toward reproducible research” as part of a Data Science and Plant Breeding Simulation Workshop, University of Minnesota, St. Paul, Minnesota
2017	Lecture to AP Statistics students, Madison East High School, Madison, Wisconsin
2008 – 2017	Periodic seminars on “Creating effective figures and tables” in the Department of Pathology and Laboratory Medicine, University of Wisconsin–Madison
2008 – 2017	Lecture on my consulting experiences in Statistical Consulting (Stat 998), Department of Statistics, University of Wisconsin–Madison
2008 – 2016	Instructor and co-organizer, Short Course on Systems Genetics, The Jackson Laboratory, Bar Harbor, Maine
2016	Lecture on “Creating effective figures and tables” at the Demography Training Seminar, Center for Demography of Health and Aging, University of Wisconsin–Madison
2015	R/qtl workshop, Texas A&M, College Station, Texas
2015	Lecture on “Reproducible Research” for undergraduate researchers in the Summer Institute for Training in Biostatistics (SIBS), University of Wisconsin–Madison
2014 – 2015	Instructor, Software Carpentry workshops, Advanced Computing Initiative, University of Wisconsin–Madison
2015	Instructor, Software Carpentry workshop, Washington State University, Pullman, Washington
2014	Lecture on “Creating effective figures and tables” in a manuscript writing workshop, Institute for Clinical and Translational Research, University of Wisconsin–Madison
2013	Lecture on “A brief introduction to git and GitHub” to graduate students, Department of Statistics, University of Wisconsin–Madison
2013	Lecture on “Why aren’t all of our graphs interactive?” to graduate students in the Biostatistics Training Program, Department of Biostatistics & Medical Informatics, University of Wisconsin–Madison
2012	Instructor, Training Course on Field Trials & QTL Analysis using R and R/qtl, ICRISAT, Hyderabad, India
2012	Lecture on “Introduction to QTL mapping in model organisms” for undergraduate researchers in the Summer Institute for Training in Biostatistics (SIBS), University of Wisconsin–Madison
2012	Lecture on “Programming style” to graduate students in the Biostatistics Training Program, Department of Biostatistics & Medical Informatics, University of Wisconsin–Madison
2010	Lecture on “How to give a scientific presentation” to graduate students in the Biostatistics Training Program, Department of Biostatistics & Medical Informatics, University of Wisconsin–Madison

2008	Lecture on “Recombination and linkage” in Human Emphasis Group Graduate Student Seminar (NS 881, Schoeller), Nutritional Sciences, University of Wisconsin–Madison
2008	Lecture on “Recombination and linkage” in Genetic Epidemiology (PHS 904, Engelman), Population Health Sciences, University of Wisconsin–Madison
2007	Instructor, NeuroproMiSe Training Course in Genetic Analysis and Bioinformatics, Lund University, Lund, Sweden
2001 – 2007	Instructor and co-organizer, Short Course on Complex Trait Analysis, The Jackson Laboratory, Bar Harbor, Maine
2000 – 2007	Lecture on quantitative genetics in Advanced Topics in Human Genetics (Reeves and Feinberg) Human Genetics, Johns Hopkins School of Medicine
2004 – 2006	Lecture on “Statistical epigenomics” in Epigenetics (ME260.710, Feinberg), Johns Hopkins University School of Medicine
2003 – 2006	Lecture on “Experimental design and sample size determination for animal-based research”, Johns Hopkins University Animal Care and Use Committee seminar series
2002 – 2006	Instructor, QTL Mapping II module, Summer Institute in Statistical Genetics, formerly at North Carolina State University, now held at the University of Washington, Seattle
2003 – 2005	Lecture on “Perl for human linkage analysis” in Biocomputing I: Perl for Biocomputing (140.636, Pineda), Johns Hopkins Bloomberg School of Public Health
2004	Lecture on experimental design, statistics, and sample size determination, as part of an on-line course on Enhancing Humane Science—Improving Animal Research
1999 – 2000	Special studies course in longitudinal data analysis for Xin Liu, PhD candidate, Epidemiology

## ACADEMIC LEADERSHIP AND PROGRAM DEVELOPMENT

2017 – 2020	Director, Biomedical Data Science PhD Program, University of Wisconsin–Madison
2004 – 2007	Co-Director, MHS Program in Bioinformatics, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health

## SERVICE ACTIVITIES

### International and National

2017	Program Committee, Complex Trait Community 15 <sup>th</sup> Annual Meeting (Memphis, Tennessee)
2016 – 2017	John M. Chambers Statistical Software Award Committee, Statistical Computing Section, American Statistical Association
2013 – 2014	Personalized Medicine Research Project (PMRP) Oversight Committee, Marshfield Clinic Research Foundation, Marshfield, Wisconsin



2013	Co-organizer, Complex Trait Community 12 <sup>th</sup> Annual Meeting (Madison, Wisconsin)
2003 – 2004	ENAR Distinguished Student Paper Awards Committee
2003	IMS Contributed Papers Chair, ENAR/IMS Annual Meeting (Tampa, Florida)

#### University

2020– present	Executive Committee, Plant Breeding and Plant Genetics PhD Program, University of Wisconsin–Madison
2017 – present	Faculty Senator, University of Wisconsin–Madison
2018	Review Committee for Biometry Master of Science Program, College of Agricultural and Life Sciences, University of Wisconsin–Madison
2016	Genomics Advisory Committee, School of Medicine and Public Health, University of Wisconsin–Madison
2012 – 2015	Faculty Advisory Committee, School of Medicine and Public Health, University of Wisconsin–Madison
2011 – 2015	University Library Committee, University of Wisconsin–Madison ( <i>Chair</i> , 2014 – 2015)
2012 – 2014	Steering Committee, Medical Scientist Training Program, School of Medicine and Public Health, University of Wisconsin–Madison
2009 – 2012	Master of Public Health Program Curriculum Committee, School of Medicine and Public Health, University of Wisconsin–Madison
2009 – 2012	Curriculum Planning Committee, Biological Sciences Division, University of Wisconsin–Madison
2008 – 2012	Faculty Senator, University of Wisconsin–Madison
2002 – 2007	Maintainer of the Faculty Senate web site, Johns Hopkins Bloomberg School of Public Health
2001 – 2004	Faculty Senate representative to the Committee on Information Technology, Johns Hopkins Bloomberg School of Public Health
2001 – 2003	Organizer of a monthly discussion forum for junior faculty, Johns Hopkins Bloomberg School of Public Health
2001 – 2002	Secretary of the Faculty Senate, Johns Hopkins Bloomberg School of Public Health
2000 – 2002	Faculty Senator, Johns Hopkins Bloomberg School of Public Health
2000 – 2001	Biochemistry and Molecular Biology Strategic Plan Committee, Johns Hopkins Bloomberg School of Public Health

## Departmental

2015 – present	Scientific Advisory and Steering Committee, Biostatistics Computing Group, Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison
2014 – present	Steering Committee, Biomedical Data Science MS Program, Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison
2010 – 2020	Chair, Education and Curriculum Committee, Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison
2015 – 2016	Co-chair, Faculty Search Committee, Biostatistics and Medical Informatics, University of Wisconsin–Madison
2010 – 2013	Seminar organizer, Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison
2010 – 2012	Steering Committee, Biomedical Computing Group, Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison
2008	Committee for Information Technology Assessment, Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison
2004 – 2007	Intellectual and Social Environment Committee, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health
2000 – 2002	Biostatistics Information Technology Committee, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health
2000 – 2001	Seminar organizer, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health

## GRANT SUPPORT

### Current Grant Support

System Genetic Analysis of Multi-Parent Crosses co-PI with Gary Churchill (Jackson Laboratory) <i>Develop statistical methods and software for the analysis of multi-parent crosses, such as the mouse Diversity Outcross population and the Collaborative Cross.</i> Role: Co-Principal investigator	07/01/15 – 07/31/23	NIH/NIGMS (25%)
NIAID Centers of Excellence for Influenza Research and Surveillance Yoshihiro Kawaoka, PI <i>In a genetics study with Diversity Outbred (DO) mice, identify host genes that, in the context of a functional Mx1 gene, affect the outcome of H5N1 influenza virus infections.</i> Role: Co-investigator	04/01/14 – 08/31/20	NIH/NIAID (8%)

- A Program of Research in Population Cytogenetics  
 Terry Hassold (Washington State), PI 12/01/10 – 07/31/20 NIH/NICHD (8%)  
*Study meiosis in human oocytes and spermatocytes to examine the way in which homologous chromosomes find and synapse with each other and how these processes relate to the formation of crossovers, and to compare the recombination processes between human males and females, including the contribution of chromatin structure and interference to sex-specific differences in recombination rates.*  
 Role: Co-investigator
- Collaborative Cross of the Microbiome and Metabolic Disease  
 Federico Rey, PI 09/23/15 – 08/31/20 NIH/NIDDK (5%)  
*Identify genes and pathways that modulate gut microbial composition and abundance, and their association to disease, in the mouse Diversity Outcross.*  
 Role: Co-investigator
- Genetics of the Island Rule  
 Bret Payseur, PI 09/10/12 – 02/28/21 NIH/NIGMS (5%)  
*This project aims to functionally characterize and fine-map quantitative trait loci (QTL) for body size in Gough Island mice and map QTL for extreme body size evolution in a second island population from Papa Westray.*  
 Role: Co-investigator
- Evolution of the Genome-wide Recombination Rate in Mice  
 Bret Payseur, PI 05/15/17 – 03/31/21 NIH/NIGMS (5%)  
*Develop a portrait of natural genetic variation in recombination rate across multiple evolutionary scales by measuring polymorphism and divergence in genome-wide recombination rate during oogenesis and spermatogenesis, and by profiling natural genetic variation in molecular processes that lead to crossovers, including the generation of double-strand breaks.*  
 Role: Co-investigator
- A Unified High-Performance Web Service for Systems Genetics and Precision Medicine  
 Robert W. Williams and Saunak Sen, PIs 04/15/17 – 03/31/21 NIH/NIGMS (10%)  
*Develop and improve the web services framework GeneNetwork 2, a modular high-performance computational resource that provides statistical and genetic tools to analyze and integrate massive omics datasets jointly with information on disease risk and severity.*  
 Role: Co-investigator
- Previous Grant Support
- Alexander Disease: Mechanisms, Modifiers, and Therapeutics  
 Albee Messing, PI 09/20/14 – 07/31/19 NIH/NIHD (5%)  
*Identify genomic regions, and ultimately specific genes, that contribute to GFAP accumulation and toxicity in a mouse model of Alexander disease.*  
 Role: Co-investigator
- The Collaborative Cross Project of Diabetes  
 Alan Attie, PI 04/01/14 – 01/31/19 NIH/NIDDK (5%)  
*Identify genes involved in type 2 diabetes using two mouse populations derived from the same set of eight founder strains: the Diversity Outcross and the Collaborative Cross. The project includes detailed phenotyping to identify genes and pathways associated with beta cell functions.*  
 Role: Co-investigator
- Genome Dynamics: Evolution, Organization, and Function  
 Gary Churchill (Jackson Laboratory), PI 04/01/06 – 06/30/16 NIH/NIGMS (9%)  
*In a project led by Petko Petkov and Ken Paigen, characterize recombination by detailed mapping of recombination events on a single chromosome in a larger mouse backcross.*  
 Role: Co-Investigator

- Statistical Methods for Analysis and Integration in Genomic Studies of Disease  
Christina Kendzierski, PI 08/01/12 – 04/30/16 NIH/NIGMS (7%)  
*This project aims to develop and disseminate statistical methods to address challenges that arise in genomic based studies of disease, with particular focus on methods that integrate data across multiple platforms and scales to both identify as well as comprehensively characterize genomic features affecting an individual's disease course and/or likelihood of response to treatment.*  
Role: Co-investigator
- Systems Genetic Analysis of Methamphetamine's Motivational Effects in Mouse AIL  
Abraham Palmer (U Chicago), PI 07/01/11 – 12/31/15 NIH/NIDA (10%)  
*Investigate the genetic underpinnings of the methamphetamine preference in mouse advanced intercross lines (AIL) and develop improved statistical methods and software for system genetics analysis in AIL.*  
Role: Co-investigator
- Statistical Methods and Software for QTL Mapping  
Karl Broman, PI 06/01/05 – 05/31/15 NIH/NIGMS (30%)  
*Develop improved model selection methods of multiple QTL mapping in experimental crosses, develop improved methods for the analysis of recombinant inbred lines and related strains, develop and disseminate the R/qtl software for QTL mapping.*  
Role: Principal Investigator
- Genes and Gene Networks Associated with Obesity and Diabetes  
Alan Attie (UW-Madison), PI 12/01/09 – 11/30/14 NIH/NIDDK (5%)  
*Identify genes and gene networks that play a role in the development of obesity-induced type 2 diabetes in a large mouse intercross with detailed clinical phenotypes and gene expression data on multiple tissues.*  
Role: Co-investigator
- Genetic Complexity and Modifiers of Hirschsprung Disease  
Michelle Southard-Smith (Vanderbilt University), PI 07/01/07 – 06/30/12 NIH/NIDDK (8%)  
*The goal of the proposed studies is to identify additional genes and gene interactions that impact aganglionosis in the Sox10<sup>Dom</sup> model.*  
Role: Co-Investigator
- Statistical Methods for Experimental Genome Populations  
Saunak Sen (UCSF), PI 07/01/07 – 06/30/12 NIH/NIGMS (10%)  
*The goal of this proposed research is to develop statistical design and analysis methods that will reduce experimental cost, make efficient use of existing resources, and better infer causation when we have incomplete control over the assignment of genetic factors to individual organisms.*  
Role: Co-Investigator
- Genetic Basis of WNV Competence in *Culex tarsalis*  
Jason Rasgon (Johns Hopkins University), PI 07/01/07 – 10/31/11 NIH/NIAID (2%)  
*Identify genetic loci contributing to variation in West Nile virus vector competence in susceptible and refractory colonies of Culex tarsalis.*  
Role: Co-Investigator
- Genetic Basis of Nanophthalmos and Axial Hyperopia  
Olof Sundin (Texas Tech), PI 09/01/09 – 08/31/11 NIH/NEI (10%)  
*Investigate the genetic and phenotypic diversity of extreme hyperopia, and identify common hypomorphic alleles of MFRP, the gene that causes nanophthalmos, and determine their effect on ocular structure.*  
Role: Co-investigator

Mechanism of Inflammation-Induced Airway Hyperactivity Wayne Mitzner (Johns Hopkins University), PI <i>Identify genetic loci contributing to variation in inflammation-induced airway hyperactivity in mice.</i> Role: Co-Investigator	12/01/04 – 6/30/07	NIH/NHLBI (3%)
Center for Epigenetics of Common Human Diseases Andrew Feinberg, PI <i>Develop tools for medical epigenetics, including epigenome discovery, its quantitative analysis, and its application to medicine.</i> Role: Co-Investigator	04/01/04 – 06/30/07	NIH/NHGRI (10%)
Epigenetic Variation and its Determinants in Depression James Potash, PI <i>Establish the connection between genetic, environmental, and epigenetic factors and susceptibility to depression.</i> Role: Co-Investigator	04/01/05 – 06/30/07	NIH/NIMH (10%)
Genetic Mechanisms of Autoimmune Myocarditis Noel Rose, PI <i>Identify genetic loci contributing to susceptibility to autoimmune myocarditis in mice.</i> Role: Co-Investigator	07/01/04 – 06/30/07	NIH/NHLBI (4%)
Catechol-O-methyltransferase and Breast Cancer James Yager, PI <i>The goal of this project is to conduct a rigorous experimental investigation of the hypothesis that decreased COMT activity results in increased DNA damage that contributes to increased cell transformation and breast cancer.</i> Role: Co-Investigator	09/21/04 – 06/30/07	NIH/NCI (2.5%)
Core Center Grant: Biostatistical Center Sheila West, PI <i>Provide biostatistics support for epidemiological research in ophthalmology.</i> Role: Senior Biostatistician	07/01/04 – 06/30/07	NIH/NEI (5%)
Older Americans Independence Center Linda Fried, PI <i>The Center is dedicated to developing the next generation of research to determine the causes and treatments for frailty in older adults.</i> Role: Advisory Board Member	06/01/03 – 06/30/07	NIH/NIA (1.5%)
Statistical Methods for Genetic Epidemiology Kung-Yee Liang, PI; Karl Broman, acting PI <i>Develop and implement new statistical methodology useful for genetic epidemiologic studies of complex chronic diseases.</i> Role: Co-Investigator	12/01/00 – 11/30/05	NIH/NIGMS (25%)
Portable Software for Mapping Quantitative Traits Ken Manly, PI <i>Design and test a graphical user interface for software R/qtl and ensure that the GUI makes the proper connections with the core program.</i> Role: Co-Investigator	09/24/04 – 08/31/05	NIH/NHGRI (5%)
Center for Craniofacial Development and Disorders Terri Beaty, PI <i>Biostatistical Core for program project on the genetics of craniofacial disorders.</i> Role: Co-Investigator	08/01/01 – 08/01/04	NIH/NIDR (5%)

Mouse QTL in Endotoxic Shock Roger Reeves, PI <i>Identify genomic regions contributing to susceptibility to endotoxic shock in mice.</i> Role: Co-Investigator	08/01/01 – 07/30/05	NIH (10%)
Genetic Basis of Nanophthalmos Olof Sundin, PI <i>Identify the gene responsible for nanophthalmos in a single large pedigree.</i> Role: Co-Investigator	08/15/01 – 06/30/04	NIH/NEI (10%)
Center for Craniofacial Development and Disorders Ethylin Jabs, PI <i>Map and identify genes contributing to susceptibility to craniofacial disorders by linkage in multiplex families.</i> Role: Co-Investigator	08/01/99 – 04/30/04	NIH/NIDR (10%)
The Genetics of Age Related Cataract in Salisbury Nathan Congdon, PI <i>Identify genes contributing to susceptibility to cataract</i> Role: Co-Investigator	09/30/00 – 08/31/03	NIH/NIA (10%)
JHSPH Faculty Innovation Fund grant Karl Broman, PI <i>Applications of tree-based models to identify epistatic interactions between QTLs in model organisms.</i> Role: Principal Investigator	05/01/01 – 04/30/02	JHSPH (30%)

## INVITED PRESENTATIONS

### Scientific Meetings

- 2019 RStudio Conference, Austin, Texas  
American Association for the Advancement of Science (AAAS) annual meeting, Washington, DC  
Michigan State Plant Breeding, Genetics, and Biotechnology (PBGB) Symposium, East Lansing, Michigan
- 2018 Complex Trait Community meeting, Glasgow, Scotland  
Purdue Symposium on Statistics, West Lafayette, Indiana
- 2017 Complex Trait Community meeting, Memphis, Tennessee
- 2016 Genome and Gene Mapping Satellite, Queenstown Research Week, Nelson, New Zealand  
Joint Statistical Meetings, Chicago, Illinois  
Conference on Learning Tools to Promote Reproducible Research and Open Science, Chicago Chapter,  
American Statistical Association, Chicago, Illinois
- 2015 Plant breeding symposium, Texas A&M, College Station, Texas  
Joint Statistical Meetings, Seattle, Washington  
BioC 2015 (Bioconductor annual meeting), Seattle, Washington  
Complex Trait Community annual meeting, Portland, Oregon  
The Challenge of Inference from Genome to Phenome, CSIRO Chief Executive Cutting Edge Symposium,  
Brisbane, Australia  
American Association for the Advancement of Science (AAAS) annual meeting, San Jose, California
- 2014 Fourth Symposium on Biological Data Visualization, Boston, Massachusetts  
Scholarly Publishing Symposium, University of Wisconsin–Madison

- 2013 Open Access, Open Data @ UW, University of Wisconsin–Madison  
Workshop on MAGIC-type populations, Cambridge, United Kingdom  
Kansas State University Plant Breeding and Genetics Symposium, Manhattan, Kansas  
International Biometric Society/ENAR Annual Meeting, Orlando, Florida
- 2012 EvoSysBio meeting, Wisconsin Institutes for Discovery, University of Wisconsin – Madison  
EURATRANS annual meeting, Tutzing, Germany
- 2011 Quantitative Biology and Bioinformatics in Modern Medicine, Dublin, Ireland
- 2010 Fourteenth QTL-MAS Workshop, Poznań, Poland
- 2008 Emerging Statistical Challenges in Genome and Translational Research, Banff, Canada
- 2007 Systems Medicine Workshop, NHLBI, Bethesda, Maryland
- 2005 Fifth Australasian Human Gene Mapping Conference, Mt. Buller, Australia  
Joint Statistical Meetings, Minneapolis, Minnesota  
CSPS/IMS Joint Meeting, Beijing, China
- 2004 Taipei Symposium on Statistical Genomics, Academia Sinica, Taipei, Taiwan  
Seventh Annual Conference on Computational Genomics, Reston, Virginia  
Complex Trait Consortium Third Annual Meeting, Bar Harbor, Maine  
Nobel Symposium on Epigenetic Reprogramming in Development and Disease, Stockholm, Sweden  
Workshop on the Analysis of Complex Genetic Traits, Mathematical Sciences Research Institute,  
Berkeley, California
- 2002 Royal Statistical Society, London, England
- 2001 Classification Society of North America meeting, St. Louis, Missouri  
Modifier Analysis in Cancer Genetics of Experimental Mammals Workshop, Madison, Wisconsin
- 1996 WNAR/IMS Western Regional Conference, Pullman, Washington

## Seminars

- 2019 Providence/Boston Center for AIDS Research Biostatistics Core, Boston University  
Department of Mathematics, Statistics, and Computer Science, St. Olaf College, Northfield, Minnesota
- 2018 Department of Statistics, Colorado State University, Fort Collins, Colorado  
qBio seminar series, Wisconsin Institute for Discovery, University of Wisconsin–Madison  
BBC seminar series, University of California, San Francisco
- 2017 Department of Bioinformatics and Genomics, University of North Carolina at Charlotte  
Berkeley Institute for Data Science, University of California, Berkeley  
Genetics Program, North Carolina State University, Raleigh, North Carolina
- 2016 Department of Genetics, Genomics, and Informatics, University of Tennessee Health Science Center,  
Memphis, Tennessee  
Department of Statistics, University of Auckland, Auckland, New Zealand  
Department of Biological Statistics and Computational Biology, Cornell University, Ithaca, New York  
Graduate Researchers interested in Data (GRiD), University of Massachusetts, Amherst, Massachusetts  
Bioinformatics and Computational Biology, Genentech, South San Francisco, California
- 2015 Holz Series in Research Data Management, University of Wisconsin–Madison

Division of Biostatistics, Department of Preventive Medicine, University of Tennessee Health Science Center, Memphis, Tennessee  
 Bioinformatics Division, Walter & Eliza Hall Institute for Medical Research, Melbourne, Australia

- 2014 Delta Program, University of Wisconsin–Madison  
 Department of Biostatistics, Harvard School of Public Health, Boston, Massachusetts  
 Danforth Plant Science Center, St. Louis, Missouri
- 2013 Graphics Working Group, Department of Statistics, Iowa State University, Ames, Iowa
- 2012 Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland
- 2011 Department of Biostatistics, University of Washington, Seattle  
 Department of Statistics, George Mason University, Fairfax, Virginia  
 Groningen Bioinformatics Centre, University of Groningen, Groningen, The Netherlands  
 Department of Biostatistics, Columbia University, New York
- 2010 Institute of Mathematics and Computer Sciences, Wrocław University of Technology, Wrocław, Poland  
 Department of Genetics and Animal Breeding, Wrocław University of Environmental and Life Sciences, Wrocław, Poland  
 Quantitative Biology and Modeling Initiative Program, Michigan State University, East Lansing, Michigan  
 Integrative Genomics Seminar Series, Vanderbilt University, Nashville, Tennessee  
 Evolution Seminar Series, University of Wisconsin–Madison  
 Curriculum in Genetics and Molecular Biology, University of North Carolina at Chapel Hill
- 2009 Department of Human Genetics, University of California, Los Angeles  
 Laboratory of Genetics, University of Wisconsin–Madison  
 Department of Statistics, University of Wisconsin–Madison  
 Department of Biostatistics & Medical Informatics, University of Wisconsin–Madison  
 Groningen Bioinformatics Centre, University of Groningen, Groningen, The Netherlands  
 Wellcome Trust Centre for Human Genetics, Oxford, United Kingdom
- 2008 Annual Retreat, Genomic Sciences Training Program, University of Wisconsin–Madison  
 Division of Human Genetics, Cincinnati Children’s Hospital, Cincinnati, Ohio  
 Computation and Informatics in Biology and Medicine (CIBM), University of Wisconsin–Madison  
 Evolution Seminar Series, University of Wisconsin–Madison  
 Department of Animal Sciences, University of Wisconsin–Madison
- 2007 Department of Human Genetics, University of Chicago  
 Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland  
 Statistics Program, St. Olaf College, Northfield, Minnesota  
 Center for Interdisciplinary Research, St. Olaf College, Northfield, Minnesota  
 Annual Retreat, Laboratory of Genetics, University of Wisconsin–Madison  
 Division of Statistics, Northern Illinois University, DeKalb, Illinois  
 Department of Biostatistics and Medical Informatics, University of Wisconsin–Madison  
 Department of Human Genetics, University of California, Los Angeles  
 Department of Statistics, University of California, Berkeley  
 The Jackson Laboratory, Bar Harbor, Maine  
 Department of Biostatistics, University of Michigan, Ann Arbor
- 2006 Institute of Genetic Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland  
 Department of Biostatistics, University of Michigan, Ann Arbor  
 Laboratory of Genetics, University of Wisconsin–Madison



Department of Biostatistics, University of Washington, Seattle

- 2005 Department of Statistics, University of California, Davis  
 Department of Genetics, School of Medicine, University of Pennsylvania, Philadelphia  
 Department of Mathematics and Statistics, University of Maryland, Baltimore County  
 Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland  
 Section for Medical Inflammation Research, Department of Cell and Molecular Biology, Lund University, Lund, Sweden
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