

## CURRICULUM VITAE

**Karl W. Broman**

### Work

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### Home

7210 Longmeadow Road  
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### EDUCATION

- |             |   |
|-------------|---|
| 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

Faculty member, Computational Systems Biology Cluster, University of Wisconsin–Madison  
Affiliate faculty member, Department of Statistics, University of Wisconsin–Madison  
Member, Genome Center of Wisconsin, 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 molecular biology. 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 humans and model organisms.

## SCIENTIFIC ADVISORY BOARDS

2010 – present Wisconsin Genomics Initiative

2009 – present Nature Source Genetics, Ithaca, New York

## HONORS AND AWARDS

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

## EDITORIAL ACTIVITIES

### Editorial Board Membership

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; 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 Proceedings; BMC Research Notes; Cancer Research; Circulation Research; Computational Statistics & Data Analysis; Crop Science; 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; 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 Statistical Planning and Inference; Journal of Statistical Software; Mammalian Genome; Molecular Biology and Evolution; Molecular Genetics and Genomics; Nature Genetics; Nature Methods; Nature Protocols; Nature Reviews–Genetics; Nucleic Acids Research; Ophthalmic Epidemiology; Pacific Symposium on Biocomputing;

Physiological Genomics; PLoS Biology; PLoS Computational Biology; PLoS Genetics; PLoS ONE; Proceedings of the National Academy of Sciences USA; 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

- 2014 – present    Chair of Center for Inherited Disease Research (CIDR) Access Committee, National Human Genome Research Institute, National Institutes of Health
- 2010 – present    Member of Center for Inherited Disease Research (CIDR) Access Committee, National Human Genome Research Institute, National Institutes of Health (Chair 2014 – present)
- 2006 – 2010      Member of 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 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

Kwak I-Y, Moore CR, Spalding EP, **Broman KW**. A simple regression-based method to map quantitative trait loci underlying function-valued phenotypes. *Genetics*, to appear

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

2014    **Broman KW** (2014) Fourteen years of R/qtl: 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. *Amer 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 Genetics* 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, Hoofer 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 SIVmac239 $\Delta$ nef-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 Ś, Johannes F, **Broman KW** (2009) Selective genotyping and phenotyping strategies in a complex trait context. *Genetics* 181:1613–1626
- Manichaikul A, Moon JY, Sen Ś, 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
- Paigen K, Szatkiewicz JP, Sawyer K, Leahy N, Parvanov ED, Ng SH, Graber JH, **Broman KW**, Petkov PM (2008) The recombinational anatomy of a mouse chromosome. *PLoS Genet* 4(7): e1000119
- Bjornsson HT, Albert TJ, Ladd-Acosta CM, Green RD, Rongione MA, Middle CM, Irizarry RA, **Broman KW**, Feinberg AP (2008) SNP-specific array-based allele-specific expression analysis. *Genome Res* 18:771–779
- Peirce JL, **Broman KW**, Lu L, Chesler EJ, Zhou G, Airey DC, Birmingham AE, Williams RW (2008) Genome Reshuffling for Advanced Intercross Permutation (GRAIP): Simulation and permutation for advanced intercross population analysis. *PLoS ONE* 3(4):e1977

Roy-Gagnon M-H, Mathias RA, Fallin MD, Jee SH, **Broman KW**, Wilson AF (2008) An extension of the regression of offspring on mid-parent to test for association and estimate locus-specific heritability: The revised ROMP method. *Ann Hum Genet* 72:115–125

Sinha D, Klise A, Sergeev Y, Hose S, Bhutto IA, Hackler L Jr, Malpic-Ilanos T, Samtani S, Grebe R, Goldberg MF, Hejtmancik JF, Nath A, Zack DJ, Fariss RN, McLeod DS, Sundin O, **Broman KW**, Luty GA, Zigler JS Jr (2008)  $\beta$ A3/A1-crystallin in astroglial cells regulates retinal vascular remodeling during development. *Mol Cell Neurosci* 37:85–95

2007 Rajagopal SK, Ma Q, Obler D, Shen J, Manichaikul A, Tomita-Mitchell A, Boardman K, Briggs C, Garg V, Srivastava D, Goldmuntz E, **Broman KW**, Benson DW, Smoot LB, Pu WT (2007) Spectrum of heart disease associated with murine and human *GATA4* mutation. *J Mol Cell Cardiol* 43:677–685

Manichaikul A, Palmer AA, Sen S, **Broman KW** (2007) Significance thresholds for quantitative trait locus mapping under selective genotyping. *Genetics* 177:1963–1966

Petkov PM, **Broman KW**, Szatkiewicz JP, Paigen K (2007) Crossover interference underlies sex differences in recombination rates. *Trends Genet* 23:539–542

Peirce JL, **Broman KW**, Lu L, Williams RW (2007) A simple method for combining genetic mapping data from multiple crosses and experimental designs. *PLoS ONE* 2(10):e1036

Teuscher F, **Broman KW** (2007) Haplotype probabilities for multiple-strain recombinant inbred lines. *Genetics* 175:1267–1274

Sen S, Satagopan JM, **Broman KW**, Churchill GA (2007) R/qtlDesign: Inbred line cross experimental design. *Mamm Genome* 18:87–93

Lemmerhirt HL, **Broman KW**, Shavit JA, Ginsburg D (2007) Genetic regulation of plasma von Willebrand factor levels: QTL analysis in a mouse model. *J Thromb Haemost* 5:329–335

Nichols KM, **Broman KW**, Sundin K, Young JM, Wheeler PA, Thorgaard GH (2007) Quantitative trait loci by maternal cytoplasmic environment interaction for development rate in *Oncorhynchus mykiss*. *Genetics* 175:335–347

2006 **Broman KW**, Sen S, Owens SE, Manichaikul A, Southard-Smith EM, Churchill GA (2006) The X chromosome in quantitative trait locus mapping. *Genetics* 174:2151–2158

Shrestha S, Smith MW, **Broman KW**, Farzadegan H, Vlahov D, Strathdee SA (2006) Multi-person-use of syringes among injection drug users in a needle exchange program: A gene based molecular epidemiological analysis. *J Acquir Immune Defic Syndr* 43:335–343

Kess D, Lindqvist AK, Peters T, Wang H, Zamek J, Nischt R, **Broman KW**, Blakytyn R, Krieg T, Holmdahl R, Scharffetter-Kochanek K (2006) Identification of susceptibility loci for skin disease in a murine psoriasis model. *J Immunol* 177:4612–4619

Manichaikul A, Dupuis J, Sen S, **Broman KW** (2006) Poor performance of bootstrap confidence intervals for the location of a quantitative trait locus. *Genetics* 174:481–489

Sundin OH, **Broman KW**, Chang HH, Vito ECL, Stark WJ, Gottsch JD (2006) A common locus for late-onset Fuchs corneal dystrophy maps to 18q21.2-q21.32. *Invest Ophthalmol Vis Sci* 47:3919–3926

Feenstra B, Skovgaard IM, **Broman KW** (2006) Mapping quantitative trait loci by an extension of the Haley-Knott regression method using estimating equations. *Genetics* 173:2269–2282

Chadwick LH, Pertz L, **Broman KW**, Bartolomei MS, Willard HF (2006) Genetic control of X chromosome inactivation in mice: definition of the *Xce* candidate interval. *Genetics* 173:2111–2119

Grant GG, Robinson SW, Edwards RE, Clothier B, Davies R, Judah DJ, **Broman KW**, Smith AG (2006) Multiple polymorphic genes determine 'normal' hepatic and splenic iron status in mice. *Hepatology* 44:174–185

Orgogozo V, **Broman KW**, Stern DL (2006) High-resolution QTL mapping reveals sign epistasis controlling ovariole number between two *Drosophila* species. *Genetics* 173:197–205

Shrestha S, Strathdee SA, **Broman KW**, Smith MW (2006) Unknown biological mixtures evaluation using STR analytical quantification. *Electrophoresis* 27:409–415

Reilly KM, **Broman KW**, Bronson RT, Tsang S, Loisel DA, Christy ES, Sun Z, Diehl J, Munroe DJ, Tuskan RG (2006) An imprinted locus epistatically influences *Nstr1* and *Nstr2* to control resistance to nerve sheath tumors in a neurofibromatosis type 1 mouse model. *Cancer Res* 66:62–68

Sundin OH, Jun AS, **Broman KW**, Liu SH, Sheehan SE, Vito ECL, Stark WJ, Gottsch JD (2006) Linkage of late-onset Fuchs corneal dystrophy to a novel locus at 13pTel-13q12.13. *Invest Ophthalmol Vis Sci* 47:140–145

2005 Sundin OH, Leppert GS, Silva ED, Yang J-M, Dharmaraj S, Maumenee IH, Santos LC, Parsa CF, Traboulsi EI, **Broman KW**, DiBernardo C, Sunness JS, Toy J, Weinberg EM (2005) Extreme hyperopia is the result of null mutations in *MFRP*, which encodes a Frizzled-related protein. *Proc Natl Acad Sci USA* 102:9553–9558

Gottsch JD, Sundin OH, Liu SH, Jun AS, **Broman KW**, Stark WJ, Vito EC, Narang AK, Thompson JM, Magovern M (2005) Inheritance of a novel *COL8A2* mutation defines a distinct early-onset subtype of Fuchs corneal dystrophy. *Invest Ophthalmol Vis Sci* 46:1934–1939

Owens SE, **Broman KW**, Wiltshire T, Elmore JB, Bradley KM, Smith JR, Southard-Smith EM (2005) Genome-wide linkage identifies novel modifier loci of aganglionosis in the *Sox10<sup>tm</sup>* model of Hirschsprung disease. *Hum Mol Genet* 14:1549–1558

**Broman KW** (2005) The genomes of recombinant inbred lines. *Genetics* 169:1133–1146  
[Erratum: *Genetics* 173:2419, 2006]

Guler ML, Ligons DL, Wang Y, Bianco M, **Broman KW**, Rose NR (2005) Two autoimmune diabetes loci influencing T cell apoptosis control susceptibility to experimental autoimmune myocarditis. *J Immunol* 174:2167–2173

Congdon N, **Broman KW**, Lai H, Munoz B, Bowie H, Gilbert D, Wojciechowski R, West SK (2005) Cortical, but not posterior subcapsular, cataract shows significant familial aggregation in an older population after adjustment for possible shared environmental factors. *Ophthalmology* 112:73–77

Chen WM, **Broman KW**, Liang KY (2005) Power and robustness of linkage tests for quantitative traits in general pedigrees. *Genet Epidemiol* 28:11–23

2004 Boyadjiev SA, Dodson JL, Radford CL, Ashrafi GH, Beaty TH, Mathews RI, **Broman KW**, Gearhart JP (2004) Clinical and molecular characterization of the bladder exstrophy-epispadias complex: analysis of 232 families. *BJU International* 94:1337–1343

The Complex Trait Consortium [113 authors] (2004) The Collaborative Cross, a community resource for the genetic analysis of complex traits. *Nat Genet* 36:1133–1137

Chen S, Wang W, **Broman KW**, Katki HA, Parmigiani G (2004) BayesMendel: an R environment for Mendelian risk prediction. *Stat Appl Genet Mol Biol* 3(1): article 21

Neff MW, Robertson KR, Wong AK, Safra N, **Broman KW**, Slatkin M, Mealey KL, Pedersen NC (2004) Breed distribution and history of canine *mdr1-1Δ*, a pharmacogenetic mutation that marks the emergence of breeds from the collie lineage. *Proc Natl Acad Sci USA* 101:11725–11730



Tankersley CG, **Broman KW** (2004) Interactions in hypoxic and hypercapnic breathing are genetically linked to mouse chromosomes 1 and 5. *J Appl Physiol* 97:77–84

Congdon N, **Broman KW**, Lai H, Munoz B, Bowie H, Gilbert D, Wojciechowski R, Alston C, West SK (2004) Nuclear cataract shows significant familial aggregation in an older population after adjustment for possible shared environmental factors. *Invest Ophthalmol Vis Sci* 45:2182–2186

Tankersley CG, Campen M, Bierman A, Flanders SE, **Broman KW**, Rabold R (2004) Particle effects on heart-rate regulation in senescent mice. *Inhal Toxicol* 16:381–390

Sivagnanasundaram S, **Broman KW**, Liu M, Petronis A (2004) Quasi-linkage: a confounding factor in linkage analysis of complex disease? *Hum Genet* 114:588–593

Chen WM, **Broman KW**, Liang KY (2004) Quantitative trait linkage analysis by generalized estimating equations: Unification of variance components and Haseman-Elston regression. *Genet Epidemiol* 26:265–272

Kieffer TL, Finucane MM, Nettles RE, Quinn TC, **Broman KW**, Ray SC, Persaud D, Siliciano RF (2004) Genotypic analysis of HIV-1 drug resistance at the limit of detection: Virus production without evolution in treated adults with undetectable HIV loads. *J Infect Dis* 189:1452–1456

2003 Lidman O, Swanberg M, Horvath L, **Broman KW**, Olsson T, Piehl F (2003) Discrete gene loci regulate neurodegeneration, lymphocyte infiltration and major histocompatibility complex class II expression in the CNS. *J Neurosci* 23:9817–9823

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Denny P, Hopes E, Gingles N, **Broman KW**, McPheat W, Morten J, Alexander J, Andrew PW, Brown SDM (2003) A major locus conferring susceptibility to infection by *Streptococcus pneumoniae* in mice. *Mamm Genome* 14:448–453

Lamichhane G, Zignol M, Blades NJ, Geiman DE, Dougherty A, **Broman KW**, Bishai WR (2003) A post-genomic method for predicting essential genes at subsaturation levels of mutagenesis: Application to *Mycobacterium tuberculosis*. *Proc Natl Acad Sci USA* 100:7213–7218

**Broman KW**, Wu H, Sen S, Churchill GA (2003) R/qtl: QTL mapping in experimental crosses. *Bioinformatics* 19:889–890

**Broman KW** (2003) Mapping quantitative trait loci in the case of a spike in the phenotype distribution. *Genetics* 163:1165–1175

Becanovic K, Wallstrom E, Kornek B, Glaser A, **Broman KW**, Dahlman I, Olofsson P, Holmdahl R, Luthman H, Lassmann H, Olsson T (2003) New loci regulating rat myelin oligodendrocyte glycoprotein-induced experimental autoimmune encephalomyelitis. *J Immunol* 170:1062–1069

2002 **Broman KW**, Speed TP (2002) A model selection approach for the identification of quantitative trait loci in experimental crosses (with discussion). *J Roy Stat Soc B* 64:641–656, 737–775

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- 2001 Hunter KW, **Broman KW**, Le Voyer T, Lukes L, Cozma D, Debies MT, Rouse J, Welch DR (2001) Predisposition to efficient mammary tumor metastatic progression is linked to the breast cancer metastasis suppressor gene *Brms1*. *Cancer Res* 61:8866–8872
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- 2000 Kissebah AH, Sonnenberg GE, Myklebust J, Goldstein M, **Broman K**, James RG, Marks JA, Krakower GR, Jacob HJ, Weber J, Martin L, Blangero J, Comuzzie AG (2000) Quantitative trait loci on chromosomes 3 and 17 influence phenotypes of the metabolic syndrome. *Proc Natl Acad Sci USA* 97:14478–14483
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- Broman KW**, Weber JL (2000) Characterization of human crossover interference. *Am J Hum Genet* 66:1911–1926
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- 1999 **Broman KW**, Weber JL (1999) Long homozygous chromosomal segments in reference families from the Centre d'Étude du Polymorphisme Humain. *Am J Hum Genet* 65:1493–1500
- Broman KW**, Weber JL (1999) Method for constructing confidently ordered linkage maps. *Genet Epidemiol* 16:337–343
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- 1998 **Broman KW**, Murray JC, Sheffield VC, White RL, Weber JL (1998) Comprehensive human genetic maps: Individual and sex-specific variation in recombination. *Am J Hum Genet* 63:861–869
- Broman K**, Speed T, Tigges M (1998) Estimation of antigen-responsive T cell frequencies in PBMC from human subjects. *Stat Sci* 13:4–8

- 1996 **Broman K**, Speed T, Tigges M (1996) Estimation of antigen-responsive T cell frequencies in PBMC from human subjects. *J Immunol Meth* 198:119–132
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#### Editorials

- Broman KW** (2005) Mapping expression in randomized rodent genomes. *Nat Genet* 37:209–210
- Broman KW**, Feingold E (2004) SNPs made routine. *Nat Methods* 1:104–105

#### Letters

- Sieberts SK, **Broman KW**, Gudbjartsson DF (2004) “Biased towards the null” means reduced power. *Am J Hum Genet* 75:720–722
- Broman KW**, Caffo BS (2003) Simulation-based *P* values: Response to North et al. *Am J Hum Genet* 72:496
- Ravenel JD, Perlman EJ, **Broman KW**, Feinberg AP (2002) Response: Re: Loss of imprinting of Insulin-Like Growth Factor-II (IGF2) gene in distinguishing specific biologic subtypes of Wilms tumor. *J Natl Cancer Inst* 94:1809–1810
- Broman KW**, Weber JL (1998) Estimation of pairwise relationships in the presence of genotyping errors. *Am J Hum Genet* 63:1563–1564

#### Proceedings and Book Chapters

- Broman KW** (2012) Applied statistics and exposition (commentary). In: Dudoit S (ed) *Selected Works of Terry Speed*, Springer, pp. 353–355
- González-Recio O, López de Maturana E, Vega AT, Engelman CD, **Broman KW** (2009) Detecting single-nucleotide polymorphism by single-nucleotide polymorphism interactions in rheumatoid arthritis by a two-step approach with machine learning and a Bayesian threshold least absolute shrinkage and selection operator (LASSO) model. *BMC Proc* 3(Suppl 7):S63
- Broman KW**, Heath SC (2007) Managing and manipulating genetic data. In: Barnes MR, Gray IC (eds) *Bioinformatics for Geneticists*, 2nd edition, Wiley, pp. 17–31
- Broman KW**, Matsumoto N, Giglio S, Martin CL, Roseberry JA, Zuffardi O, Ledbetter DH, Weber JL (2003) Common long human inversion polymorphism on chromosome 8p. In: Goldstein DR (ed) *Science and Statistics: A Festschrift for Terry Speed*. IMS Lecture Notes-Monograph Series, Vol 40, pp 237–245
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- Broman KW** (1999) Cleaning genotype data. In: Goldin L, Amos CI, Chase GA, Goldstein AM, Jarvik GP, Martinez MM, Suarez BK, Weeks DE, Wijsman EM, MacCluer JE. Genetics Workshop 11: Analysis of genetic and environmental factors in common diseases. *Genet Epidemiol* 17(Suppl. 1):S79–S83
- Broman KW**, Speed TP (1999) A review of methods for identifying QTLs in experimental crosses. In: Seillier-Moisewitsch F (ed) *Statistics in Molecular Biology and Genetics*. IMS Lecture Notes-Monograph Series, Vol. 33, pp. 114–142

#### Technical Reports

- Broman KW** (2013) Thirteen years of R/qtl: Just barely sustainable. Contribution to *First Workshop on Sustainable Software for Science: Practice and Experiences*. arXiv:1309.1192

**Broman KW** (2011) Haplotype probabilities in advanced intercross populations. Technical report #223, Department of Biostatistics & Medical Informatics, University of Wisconsin-Madison

**Broman KW** (2010) Genetic map construction with R/qtl. Technical report #214, Department of Biostatistics and Medical Informatics, University of Wisconsin-Madison

Manichaikul A, Moon JY, Sen S, Yandell BS, **Broman KW** (2008) A model selection approach for the identification of quantitative trait loci in experimental crosses, allowing epistasis. Technical report #205, Department of Biostatistics and Medical Informatics, University of Wisconsin-Madison

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

**Broman KW** (2004) The genomes of recombinant inbred lines: The gory details. Working paper 47, 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

**Broman KW**, Boyartchuk VL, Dietrich WF (2000) Mapping time-to-death quantitative trait loci in a mouse cross with high survival rates. Technical Report MS00-04, Department of Biostatistics, Johns Hopkins University, Baltimore, MD

**Broman K**, Speed T, Tigges M (1996) Estimation of antigen-responsive T cell frequencies in PBMC from human subjects. Technical Report #454, Department of Statistics, University of California, Berkeley

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/qtl                   | An interactive software environment for mapping genes contributing to variation in quantitative traits in experimental crosses ( <a href="http://www.rqtl.org">http://www.rqtl.org</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

Jianan Tian, 3<sup>rd</sup> year PhD student, Statistics, University of Wisconsin – Madison

Il Youp Kwak, 5<sup>th</sup> year PhD student, Statistics, University of Wisconsin-Madison

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

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, 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

|                |                              |                                   |
|----------------|------------------------------|-----------------------------------|
| 2013 – present | Shuang Huang                 | Statistics                        |
| 2013 – present | Richard Wang                 | Genetics                          |
| 2012 – present | Michelle Parmenter           | Genetics                          |
| 2012 – present | Molly McDevitt               | Biochemistry                      |
| 2011 – 2013    | Raja Farhana Raja Mohd Anuar | Plant Breeding and Plant Genetics |
| 2010 – present | 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 Shrestha      | Epidemiology                          |
| 2001 – 2002 | Rasika Mathias       | Epidemiology                          |
| 1999 – 2002 | Cynthia James        | Human Genetics (School of Medicine)   |

## Oral Exams, University of Wisconsin–Madison

|      |             |            |
|------|-------------|------------|
| 2013 | Jianan Tian | Statistics |
|------|-------------|------------|

|      |  |   |
|------|--|---|
|      | Richard Wang<br>Shuang Huang<br>Raja Farhana Raja Mohd Anuar<br>Molly McDevitt       | Genetics<br>Statistics<br>Plant Breeding and Plant Genetics<br>Biochemistry |
| 2012 | Katie Clowers  | Genetics  |
| 2011 | Il Youp Kwak   | Statistics  |
| 2010 | Jee Young Moon<br>John Dawson<br>Elias Chaibub Neto<br>Qinglin Pei<br>Jingfang Zhang | Statistics<br>Statistics<br>Statistics<br>Statistics<br>Oncology            |
| 2008 | Beth Dumont  | Genetics  |

#### Oral Exams, Johns Hopkins University

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

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

|      |                                   |                        |
|------|-----------------------------------|------------------------|
| 2013 | Qinglin Pei                       | Statistics             |
| 2012 | John Dawson                       | Statistics             |
| 2011 | Michael White                     | Genetics               |
| 2010 | Beth Dumont<br>Elias Chaibub Neto | Genetics<br>Statistics |
| 2009 | YounJeong Choi                    | Statistics             |

#### Doctoral Thesis Defenses, Johns Hopkins University

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

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

|      |                              |                                   |
|------|------------------------------|-----------------------------------|
| 2013 | Raja Farhana Raja Mohd Anuar | Plant Breeding and Plant Genetics |
|------|------------------------------|-----------------------------------|

#### Master's Thesis Reading, Johns Hopkins University

|      |  |  |
|------|--|--|
| 2001 | Jane Peredo, MS  | Genetic Counseling                           |
| 2000 | Jennifer Mulle, MHS<br>Heping Hu, MHS<br>Rita Peila, ScM | Epidemiology<br>Epidemiology<br>Epidemiology |

#### Classroom Instruction, University of Wisconsin–Madison

|              |                           |  |
|--------------|---------------------------|--|
| Spring, 2014 | BMI 826-003               | Tools for Reproducible Research ( <i>new</i> )   |
|              | Statistics 877            | Statistical Methods in Molecular Biology<br>(jointly with Drs. Newton, Kendzierski, Larget, Ané,<br>Yandell, Wang, and Keles)          |
| Fall, 2012   | BMI 826-001               | Statistical Methods for QTL Mapping  |
| Spring, 2012 | Statistics 877            | Statistical Methods in Molecular Biology<br>(jointly with Drs. Newton, Kendzierski, Larget, Ané,<br>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<br>(jointly with Drs. Engelman, Payseur, and Meyers)  |
| Spring, 2010 | Statistics 877            | Statistical Methods in Molecular Biology<br>(jointly with Drs. Newton, Kendzierski, Larget, Ané,<br>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<br>(jointly with Drs. Engelman, Payseur, and Skinner)   |
| Spring, 2008 | Statistics 992-002        | Statistical Methods in Molecular Biology ( <i>new</i> )<br>(jointly with Drs. Newton, Kendzierski, Larget, Ané,<br>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<br>Epidemiology 340.631   | Statistics for Laboratory Scientists<br>Methods in Genetic Epidemiology I<br>(jointly with Dr. Beaty)   |
| 2004 – 2005 | Biostatistics 140.776<br><br>Biostatistics 140.668<br><br>Biostatistics 140.615-616<br>Epidemiology 340.631 | Statistical Computing<br>(jointly with Drs. Caffo, Irizarry, and Ruczinski)<br>Special Topics in Genetics and Genomics<br>(jointly with Dr. Ruczinski)<br>Statistics for Laboratory Scientists<br>Methods in Genetic Epidemiology I<br>(jointly with Dr. Beaty) |
| 2003 – 2004 | Biostatistics 140.776<br><br>Biostatistics 140.615-616  | Statistical Computing ( <i>new</i> )<br>(jointly with Drs. Caffo, Irizarry, and Ruczinski)<br>Statistics for Laboratory Scientists  |
| 2002 – 2003 | Biostatistics 140.668<br><br>Biostatistics 140.615-616  | Special Topics in Genetics and Genomics ( <i>new</i> )<br>(jointly with Dr. Parmigiani)<br>Statistics for Laboratory Scientists   |
| 2001 – 2002 | Biostatistics 140.615   | Statistics for Laboratory Scientists ( <i>new</i> )   |
| 2000 – 2001 | Biostatistics 140.778<br>Biostatistics 140.667<br>Biostatistics 140.668                                     | Advanced Statistical Computing ( <i>new</i> )<br>Genetics for Statisticians<br>Statistical Genetics   |
| 1999 – 2000 | Biostatistics 140.846<br>Biostatistics 140.668  | Genetics for Statisticians ( <i>new</i> )<br>Statistical Genetics ( <i>new</i> )  |

## Classroom Instruction, University of California, Berkeley

|              |                 |  |
|--------------|-----------------|--|
| Summer, 1994 | Statistics 131A | Introductory Statistics for Social and Life Scientists |
|--------------|-----------------|--|

## Classroom Instruction, University of Wisconsin–Milwaukee

|             |                 |               |
|-------------|-----------------|---------------|
| 1991 – 1992 | Mathematics 095 | Basic Algebra |
|-------------|-----------------|---------------|

## Other teaching

|             |   |  |
|-------------|---|--|
| 2014        | Lecture on “Creating effective figures and tables” in a manuscript writing workshop, Institute for Clinical and Translational Research, University of Wisconsin–Madison                               |  |
| 2008 – 2013 | Lecture on my consulting experiences in Statistical Consulting (Stat 998), Department of Statistics, University of Wisconsin–Madison  |  |
| 2013        | Lecture on “How to display data badly” to MD/PhD students, School of Medicine and Public Health, 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 |  |



|             |   |
|-------------|---|
| 2008 – 2012 | Instructor and co-organizer, Short Course on Systems Genetics, The Jackson Laboratory, Bar Harbor, Maine  |
| 2012        | Instructor, Training Course on Field Trials & QTL Analysis using R and R/ qtl, ICRISAT, Hyderabad, India  |
| 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

|             |  |
|-------------|--|
| 2004 – 2007 | Co-Director, MHS Program in Bioinformatics, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health |
|-------------|--|

## SERVICE ACTIVITIES

### International and National

- 2013 – present    Personalized Medicine Research Project (PMRP) Oversight Committee, Marshfield Clinic Research Foundation, Marshfield, Wisconsin
- 2013  
2003 – 2004       Co-organizer, Complex Trait Community 12<sup>th</sup> Annual Meeting (Madison, Wisconsin)  
ENAR Distinguished Student Paper Awards Committee
- 2003                IMS Contributed Papers Chair, ENAR/IMS Annual Meeting (Tampa, Florida)

### University

- 2012 – present    Steering Committee, Medical Scientist Training Program, 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       Library Committee, 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

- 2010 – present    Chair, Education and Curriculum Committee, Department of 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

|   |                     |                    |
|---|---------------------|--------------------|
| Statistical Methods and Software for QTL Mapping<br>Karl Broman, PI   | 06/01/05 – 05/31/14 | NIH/NIGMS<br>(30%) |
| <i>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.</i>   |                     |                    |
| Role: Principal Investigator  |                     |                    |
| Genome Dynamics: Evolution, Organization, and Function<br>Gary Churchill (Jackson Laboratory), PI   | 04/01/06 – 06/30/16 | NIH/NIGMS<br>(9%)  |
| <i>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.</i>  |                     |                    |
| Role: Co-Investigator   |                     |                    |
| Genes and Gene Networks Associated with Obesity and Diabetes<br>Alan Attie (UW–Madison), PI   | 12/01/09 – 11/30/14 | NIH/NIDDK<br>(4%)  |
| <i>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.</i>  |                     |                    |
| Role: Co-investigator   |                     |                    |
| A Program of Research in Population Cytogenetics<br>Terry Hassold (Washington State), PI  | 12/01/10 – 7/31/15  | NIH/NICHD<br>(8%)  |
| <i>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.</i> |                     |                    |
| Role: Co-investigator   |                     |                    |
| Systems Genetic Analysis of Methamphetamine's Motivational Effects in Mouse AIL<br>Abraham Palmer (U Chicago), PI   | 07/01/11 – 03/31/16 | NIH/NIDA<br>(10%)  |
| <i>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.</i>  |                     |                    |
| Role: Co-investigator   |                     |                    |
| Statistical Methods for Analysis and Integration in Genomic Studies of Disease<br>Christina Kendzierski, PI   | 08/01/12 – 04/30/16 | NIH/NIGMS<br>(7%)  |
| <i>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.</i>        |                     |                    |
| Role: Co-investigator   |                     |                    |

The Genetics and Evolution of Extreme Body Size in Mice From Gough Island  
 Bret Payseur, PI 09/10/12 – 06/30/16 NIH/NIGMS (10%)  
*This project aims to integrate genetic mapping, comparative morphometrics, and population genetics to provide the first detailed genetic portrait of rapid body size evolution in an island mammal, using the Gough Island wild house mice, which have evolved extreme body size in just hundreds of generations.*  
 Role: Co-investigator

#### Previous Grant Support

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>tm</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 12/01/04 – 6/30/07 NIH/NHLBI (3%)  
*Identify genetic loci contributing to variation in inflammation-induced airway hyperactivity in mice.*  
 Role: Co-Investigator

Center for Epigenetics of Common Human Diseases  
 Andrew Feinberg, PI 04/01/04 – 06/30/07 NIH/NHGRI (10%)  
*Develop tools for medical epigenetics, including epigenome discovery, its quantitative analysis, and its application to medicine.*  
 Role: Co-Investigator

Epigenetic Variation and its Determinants in Depression  
 James Potash, PI 04/01/05 – 06/30/07 NIH/NIMH (10%)  
*Establish the connection between genetic, environmental, and epigenetic factors and susceptibility to depression.*  
 Role: Co-Investigator

Genetic Mechanisms of Autoimmune Myocarditis  
 Noel Rose, PI 07/01/04 – 06/30/07 NIH/NHLBI (4%)  
*Identify genetic loci contributing to susceptibility to autoimmune myocarditis in mice.*  
 Role: Co-Investigator

|   |                     |                    |
|---|---------------------|--------------------|
| Catechol-O-methyltransferase and Breast Cancer<br>James Yager, PI<br><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><br>Role: Co-Investigator | 09/21/04 – 06/30/07 | NIH/NCI<br>(2.5%)  |
| Core Center Grant: Biostatistical Center<br>Sheila West, PI<br><i>Provide biostatistics support for epidemiological research in ophthalmology.</i><br>Role: Senior Biostatistician  | 07/01/04 – 06/30/07 | NIH/NEI<br>(5%)    |
| Older Americans Independence Center<br>Linda Fried, PI<br><i>The Center is dedicated to developing the next generation of research to determine the causes and treatments for frailty in older adults.</i><br>Role: Advisory Board Member   | 06/01/03 – 06/30/07 | NIH/NIA<br>(1.5%)  |
| Statistical Methods for Genetic Epidemiology<br>Kung-Yee Liang, PI; Karl Broman, acting PI<br><i>Develop and implement new statistical methodology useful for genetic epidemiologic studies of complex chronic diseases.</i><br>Role: Co-Investigator   | 12/01/00 – 11/30/05 | NIH/NIGMS<br>(25%) |
| Portable Software for Mapping Quantitative Traits<br>Ken Manly, PI<br><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><br>Role: Co-Investigator   | 09/24/04 – 08/31/05 | NIH/NHGRI<br>(5%)  |
| Center for Craniofacial Development and Disorders<br>Terri Beaty, PI<br><i>Biostatistical Core for program project on the genetics of craniofacial disorders.</i><br>Role: Co-Investigator  | 08/01/01 – 08/01/04 | NIH/NIDR<br>(5%)   |
| Mouse QTL in Endotoxic Shock<br>Roger Reeves, PI<br><i>Identify genomic regions contributing to susceptibility to endotoxic shock in mice.</i><br>Role: Co-Investigator   | 08/01/01 – 07/30/05 | NIH<br>(10%)       |
| Genetic Basis of Nanophthalmos<br>Olof Sundin, PI<br><i>Identify the gene responsible for nanophthalmos in a single large pedigree.</i><br>Role: Co-Investigator  | 08/15/01 – 06/30/04 | NIH/NEI<br>(10%)   |
| Center for Craniofacial Development and Disorders<br>Ethylin Jabs, PI<br><i>Map and identify genes contributing to susceptibility to craniofacial disorders by linkage in multiplex families.</i><br>Role: Co-Investigator  | 08/01/99 – 04/30/04 | NIH/NIDR<br>(10%)  |
| The Genetics of Age Related Cataract in Salisbury<br>Nathan Congdon, PI<br><i>Identify genes contributing to susceptibility to cataract</i><br>Role: Co-Investigator  | 09/30/00 – 08/31/03 | NIH/NIA<br>(10%)   |
| JHSPH Faculty Innovation Fund grant<br>Karl Broman, PI<br><i>Applications of tree-based models to identify epistatic interactions between QTLs in model organisms.</i><br>Role: Principal Investigator  | 05/01/01 – 04/30/02 | JHSPH<br>(30%)     |

## INVITED PRESENTATIONS

### Scientific Meetings

- 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

- 2014 Danforth Plant Science Center, St. Louis, Missouri
- 2013 Graphics Working Group, Department of Statistics, Iowa State University, Ames, Iowa
- 2012 Department of Pathology and Laboratory Medicine, University of Wisconsin–Madison  
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 Pathology and Laboratory Medicine, 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  
Department of Pathology and Laboratory Medicine, 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
- 2004 Department of Biostatistics, Yale University, New Haven, Connecticut  
Marshfield Clinic Research Foundation, Marshfield, Wisconsin  
Genetics and Genomic Biology, Hospital for Sick Children, Toronto, Canada  
Genetic Interest Group, Center for Human Genetic Research, Vanderbilt University, Nashville, Tennessee  
Department of Biostatistics, University of Buffalo  
Immunogenetics, Universität Rostock, Germany  
Department of Epidemiology and Biostatistics, Memorial Sloan–Kettering Cancer Center, New York
- 2003 Departments of Statistics and Biostatistics & Medical Informatics, University of Wisconsin–Madison  
Department of Statistics, University of California, Los Angeles  
Department of Mathematics, Haverford College, Pennsylvania  
Department of Biostatistics, University of North Carolina, Chapel Hill  
Department of Biostatistics, University of California, San Francisco
- 2002 Section on Statistical Genetics, University of Alabama, Birmingham  
Department of Statistics, University of California, Berkeley  
Department of Biostatistics, Johns Hopkins University  
Department of Molecular and Cellular Biology, Roswell Park Cancer Institute, Buffalo, New York  
Department of Mathematics and Statistics, American University, Washington, DC

- 2001 Department of Statistics, Yale University  
Department of Mathematical Sciences, University of Wisconsin–Milwaukee
- 2000 Biometric Research Branch, National Cancer Institute, Bethesda, Maryland  
The Jackson Laboratory, Bar Harbor, Maine
- 1999 Department of Biostatistics, Johns Hopkins University  
Department of Biostatistics, University of Washington, Seattle  
Gemini Research, Cambridge, England  
Department of Biostatistics, Johns Hopkins University  
Department of Statistics, University of California, Berkeley  
Department of Molecular and Cell Biology, University of California, Berkeley
- 1998 Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia  
Queensland Institute for Medical Research, Brisbane, Australia  
Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia  
deCODE Genetics, Reykjavik, Iceland  
Biostatistics Department, University of Michigan, Ann Arbor  
Department of Statistics, University of California, Berkeley  
Department of Mathematical Sciences, University of Wisconsin–Milwaukee
- 1997 Department of Statistics, University of Chicago  
Department of Statistics, University of Wisconsin–Madison  
Department of Statistics, University of California, Berkeley  
Department of Statistics, Stanford University, Palo Alto, California