

Cynthia Ann Brewer

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Curriculum Vitae, January 2015

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EMPLOYMENT**The Pennsylvania State University, Department of Geography:**

Head of Department, 2014 to present

Professor, 2007 to present

Associate Professor, 1998 to 2007

Assistant Professor, 1994 to 1998

Concurrent External Appointment:

Affiliate Faculty, Center of Excellence for Geospatial Information Science (CEGIS), U.S.

Geological Survey, Department of Interior, 2008 to present.

Concurrent Penn State Appointments:

E. Willard Miller and Ruby S. Miller Professor of Geography (Social), 2013 to 2016.

Director, Peter R. Gould Center for Geography Education and Outreach, 2009 to present.

Associate Head, Department of Geography, 2006 to 2008.

Administrative Fellow, Office of the Executive Vice President and Provost, 2003/04.

Faculty Associate, GeoVISTA Center (Geographic Visualization—Science, Technology, and Applications Center), 2000 to present.

Previous University Appointments:**San Diego State University, Department of Geography:**

Assistant Professor, 1991 to 1994.

University of California at Santa Barbara, Department of Geography:

Visiting Lecturer, 1986/87.

EDUCATION

PhD, Geography with emphasis in cartography, Michigan State University, 1986 to 1991.

Dissertation: *Prediction of Surround-Induced Changes in Map Color Appearance*,
adviser J.M. Olson.

PhD coursework, visiting student, Geography, University of California at Santa Barbara, 1986/87.

MA, Geography with emphasis in cartography, Michigan State University, 1983 to 1986.

Thesis: *The Development of Process-Printed Munsell Charts for Selecting Map Colors*,
adviser J.M. Olson.

Honors BA with distinction, Fine Arts major with Geography minor, University of Guelph (Ontario, Canada), 1979 to 1983.

Honors BA coursework, Fine Arts major, McMaster University (Ontario, Canada), 1978/79.

AWARDS

Wilson Award for Outstanding Service, honors exceptional achievement in service. Awarded by the College of Earth and Mineral Sciences, PSU, 2014.

The USGS Henry Gannett Award, recognizes sustained and distinguished contributions to USGS topographic mapping of the Nation. Awarded by the National Geospatial Program, United States Geological Survey, November 2013.

ICC2009 International Cartographic Exhibition, second place jury award in Globes and Atlases category, awarded to *Census Atlas of the United States* (coauthored with T.A. Suchan, M.J. Perry, J.D. Fitzsimmons, A.E. Juhn, and A.M. Tait). Awarded by the International Cartographic Association, 2009. (Atlas reference under *Other Publications and Resources*.)

Best of Show, CaGIS/ACSM Map Design Competition, awarded to *Census Atlas of the United States*. Awarded by the Cartography and Geographic Information Society, 2008.

2007 AAG Globe Book Award for Public Understanding of Geography, awarded to *Census Atlas of the United States*. Awarded by the Association of American Geographers (AAG), 2008.

Fellow, American Congress on Surveying and Mapping (ACSM), 2007 (continues to present as Fellow of the Cartography and Geographic information Society).

Award of Distinction for Exceptional Professional Contributions to the Practice of Cartography, Canadian Cartographic Association, 2006.

G. Montgomery and Marion Mitchell Award for Innovative Teaching, College of Earth and Mineral Sciences, PSU, 2005.

Henry Johns Award, British Cartographic Society, 2004, for most outstanding paper published in *The Cartographic Journal*. (Paper reference under *Peer-Reviewed Publications*.)

Blue Pencil Award, First Place in the Report category awarded to *Mapping Census 2000: The Geography of U.S. Diversity* (coauthored with T.A. Suchan) for excellence in government communication. Awarded by the National Association of Government Communicators, 2001. (Atlas reference under *Other Publications and Resources*.)

Honorable Mention awarded to *Mapping Census 2000: The Geography of U.S. Diversity* (coauthored with T.A. Suchan) in the 29th Annual Map Competition. Awarded by the American Congress on Surveying and Mapping, 2001. (Atlas reference under *Other Publications and Resources*.)

Contractor of the Year Award, Population Distribution Branch, Population Division, U.S. Census Bureau, 2001.

J. Warren Nystrom Award, Association of American Geographers, 1992, for best paper and presentation based on recent Geography dissertation.

Andrew McNally Award, American Congress on Surveying and Mapping, 1990, for ACSM 1989 publication that contributed most to the theory and practice of cartography. (Paper reference under *Peer-Reviewed Publications*.)

Student Honors Paper Award, winner of third annual competition, Cartography Specialty Group, AAG, 1990.

The National Geographic Society Award in Cartography, 1983.

PEER-REVIEWED JOURNAL PUBLICATIONS

1. Raposo, P., and C.A. Brewer, **2014**, "Landscape Preference and Map Readability in Design Evaluation of Topographic Maps with an Orthoimage Background," *The Cartographic Journal* 5(1): 25-37.
Based on ICC2011 proceedings paper.
2. Brewer, C.A., L.V. Stanislawski, B.P. Battenfield, K.A. Sparks, J. McGilloway, and M.A. Howard, **2013** "Automated Thinning of Road Networks and Road Labels for Multiscale Design of *The National Map* of the United States." *Cartography and Geographic Information Science* 40(4): 259-270.
Based on AutoCarto 2012 proceedings paper.
3. Roth R.E., C.A. Brewer and M.S. Stryker, **2011**, "A Typology of Operators for Maintaining Legible Map Designs at Multiple Scales," *Cartographic Perspectives*, 68: 29-64.
4. Battenfield, B.P., L.V. Stanislawski, and C.A. Brewer, **2011**, "Adapting Generalization Tools to Physiographic Diversity for the United States National Hydrography Dataset," in U.S. National Report to the International Cartographic Association, *Cartography and Geographic Information Science*, 38(3): 289-301.

5. Butzler, S.J., C.A. Brewer, and W.J. Stroh, **2011**, "Establishing Classification and Hierarchy in Populated Place Labeling for Multiscale Mapping for *The National Map*," *Cartography and Geographic Information Science*, 38(2): 100-109.
Based on AutoCarto 2010 proceedings paper.
6. Brewer, C.A., and B.P. Battenfield, **2010**, "Mastering Map Scale: Balancing Workloads Using Display and Geometry Change in Multi-scale Mapping," *Geoinformatica*, 14(2): 221-239.
7. Kern, J.P., and C.A. Brewer, **2008**, "Automation and the Map Label Placement Problem," *Cartographic Perspectives*, 60: 22-45.
8. Brewer, C.A., and B.P. Battenfield, **2007**, "Framing Guidelines for Multi-Scale Map Design Using Databases at Multiple Resolutions," *Cartography and Geographic Information Science*, 34(1): 3-15.
9. Brewer, C.A., **2006**, "Basic Mapping Principles for Visualizing Cancer Data Using Geographic Information Systems (GIS)," *American Journal of Preventive Medicine*, 30(2S): S25-S36.
10. Harrower, M.A., and C.A. Brewer, **2003**, "ColorBrewer.org: An Online Tool for Selecting Color Schemes for Maps," *The Cartographic Journal*, 40(1): 27-37.
Winner of the British Cartographic Society's Henry Johns Award, 2004.
11. Brewer, C.A., **2003**, "A Transition in Improving Maps: The ColorBrewer Example" (invited), U.S. Report to the International Cartographic Association, special issue of *Cartography and Geographic Information Science*, 30(2): 155-158.
12. Brewer, C.A., G.W. Hatchard, and M.A. Harrower, **2003**, "ColorBrewer in Print: A Catalog of Color Schemes for Maps," *Cartography and Geographic Information Science*, 30(1): 5-32.
13. Brewer, C.A., and L.W. Pickle, **2002**, "Evaluation of Methods for Classifying Epidemiological Data on Choropleth Maps in Series," *Annals of the Association of American Geographers*, 92(4): 662-681.
14. Brewer, C.A., **2001**, "Reflections on Mapping Census 2000," *Cartography and Geographic Information Science*, 28(4): 213-235.
15. Eicher, C.L., and C.A. Brewer, **2001**, "Dasymetric Mapping and Areal Interpolation: Implementation and Evaluation," *Cartography and Geographic Information Science*, 28(2): 125-138.

16. Suchan, T.A., and C.A. Brewer, **2000**, "Qualitative Methods for Research on Mapmaking and Map Use," *The Professional Geographer*, 52(1): 145-154.
17. Brewer, C.A., and R.B. McMaster, **1999**, "The State of Academic Cartography," *Cartography and Geographic Information Science*, 26(3): 215-234.
18. Wentz, E.A., J.C. Vender, and C.A. Brewer, **1999**, "An Evaluation of Teaching Introductory Geomorphology using Computer-based Tool," *Journal of Geography in Higher Education*, 23(2): 167-179.
19. MacEachren, A.M., C.A. Brewer, and L.W. Pickle, **1998**, "Visualizing Georeferenced Data: Representing Reliability of Health Statistics," *Environment & Planning A*, 30(9): 1547-1561.
20. Brewer, C.A., and A.J. Campbell, **1998**, "Beyond Graduated Circles: Varied Point Symbols for Representing Quantitative Data on Maps," *Cartographic Perspectives*, 29: 6-25.
21. Brewer, C.A., **1997**, "Spectral Schemes: Controversial Color Use on Maps," *Cartography and Geographic Information Systems*, 24(4): 203-220.
22. Brewer, C.A., A.M. MacEachren, L.W. Pickle, and D.J. Herrmann, **1997**, "Mapping Mortality: Evaluating Color Schemes for Choropleth Maps," *Annals of the Association of American Geographers*, 87(3): 411-438.
23. Brewer, C.A., **1997**, "Evaluation of a Model for Predicting Simultaneous Contrast on Color Maps," *The Professional Geographer*, 49(3): 280-294.
24. Olson, J.M., and C.A. Brewer, **1997**, "An Evaluation of Color Selections to Accommodate Map Users with Color-Vision Impairments," *Annals of the Association of American Geographers*, 87(1): 103-134.
25. Brewer, C.A., **1996**, "Guidelines for Selecting Colors for Diverging Schemes on Maps," *The Cartographic Journal*, 33(2): 79-86.
26. Brewer, C.A., **1996**, "Prediction of Simultaneous Contrast between Map Colors with Hunt's Model of Color Appearance," *Color Research and Application*, 21(3): 221-235.
27. Brewer, C.A., **1992**, "Review of Colour Terms and Simultaneous Contrast Research for Cartography," *Cartographica*, 29(3&4): 20-30.
28. Brewer, C.A., **1989-90**, "Color Chart Use in Map Design," *Cartographic Perspectives*, 4: 3-10.

29. Brewer, C.A., **1989**, "The Development of Process-Printed Munsell Charts for Selecting Map Colors," *The American Cartographer*, 16(4): 269-278.
Winner of the Andrew McNally Award.

BOOKS

1. Brewer, C.A., (in production for 2015), *Designing Better Maps: A Guide for GIS Users*, second edition, ESRI Press, Redlands CA.
2. Brewer, C.A., **2008**, *Designed Maps: A Sourcebook for GIS Users*, ESRI Press, Redlands CA, 170 pp (ISBN 1-58948-160-2).
3. Suchan, T.A., M.J. Perry, J.D. Fitzsimmons, A.E. Juhn, A.M. Tait, and C.A. Brewer, **2007**, *Census Atlas of the United States*, U.S. Census Bureau, Census 2000 Special Report, Series CENSR-29, U.S. Government Printing Office, Washington DC, 302 pp, 12.5x15.5" (ISBN 1-58-769010-5).
Winner: an ICC2009 International Cartographic Exhibition jury award, 2009; AAG Globe Award, 2008; and Best of Show, CaGIS/ACSM Map Design Competition, 2008.
4. Brewer, C.A., **2005**, *Designing Better Maps: A Guide for GIS Users*, first edition, ESRI Press, Redlands CA, 203 pp. (ISBN 1-58948-089-9).
5. Brewer, C.A., and T.A. Suchan, **2001**, *Mapping Census 2000: The Geography of U.S. Diversity*, Census 2000 Special Report, Series CENSR/01-1, U.S. Government Printing Office, Washington DC, 108 pp.
Reprinted by ESRI Press, 2001 (ISBN 1-58948-014-7).

BOOK CHAPTERS, PROCEEDINGS PAPERS AND OTHER RESOURCES

1. Fish, C., and C.A. Brewer, **2015**, "GIS as a Tool for Mapmaking," Chapter in *The History of Cartography, Volume 6: Cartography in the Twentieth Century*, edited by M. Monmonier, University of Chicago Press, Chicago (book chapter; ISBN: 9780226534695).

2. Duchêne, C., B. Baella, C.A. Brewer, D. Burghardt, B.P. Battenfield, J. Gaffuri, D. Käuferle, F. Lecordix, E. Maugeais, R. Nijhuis, M. Pla, M. Post, N. Regnauld, L.V. Stanislawski, J. Stoter, K. Tóth, S. Urbanke, V. van Altena, and A. Wiedemann, **2014**, "Generalisation in Practice Within National Mapping Agencies," Chapter 11 (pp. 329-391) in *Abstracting Geographic Information in a Data Rich World: Methodologies and Applications of Map Generalisation*, edited by D. Burghardt, C. Duchêne, and W. Mackaness, Springer International Publishing, Zurich (refereed book chapter; ISBN 978-3-319-00202-6).
3. Stanislawski, L.V., B.P. Battenfield, P. Bereuter, S. Savino, and C.A. Brewer, **2014**, "Generalisation Operators," Chapter 6 (pp. 157-195) in *Abstracting Geographic Information in a Data Rich World: Methodologies and Applications of Map Generalisation*, edited by D. Burghardt, C. Duchêne, and W. Mackaness, Springer International Publishing, Zurich (refereed book chapter; ISBN 978-3-319-00202-6).
4. Brewer, C.A., E.M. Guidero, L.V. Stanislawski, B.P. Battenfileld, and P. Raposo, **2013**, "Labeling Through Scale Using Hierarchies of Thinned Road Networks for Design of *The National Map* of the United States," *Proceedings, International Cartographic Conference 2013 (ICC2013)*, Dresden, August, 19 pp (refereed proceedings).
5. Brewer, C.A., and P. Raposo, **2013**, "Guidelines for Consistently Readable Topographic Vectors and Labels with Toggling Backgrounds," *Proceedings, ICC2013*, Dresden, August, 11 pp (refereed proceedings).
6. Stanislawski, L.V., B.P. Battenfield and C.A. Brewer, **2013**, "Integration Metrics for Cartographic Generalization: Assessment of 1:1,000,000 Scale Hydrography and Terrain," *Proceedings, ICC2013*, Dresden, August, 9 pp (refereed proceedings).
7. Raposo, P., C.A. Brewer and L.V. Stanislawski, **2013**, "Label and Attribute-Based Topographic Point Thinning," *Workshop Proceedings, ICA Commission on Generalisation and Multiple Representation*, Dresden Germany, August, 8 pp (refereed proceedings).
8. Invited expert testimonial for video "US Topo," **2012**, produced by James Maxwell, USGS <youtu.be/hv0jxsW3qgY>
9. Brewer, C.A., L.V. Stanislawski, B.P. Battenfield, P. Raposo, K. Sparks, and M. Howard, **2012**, "Multiscale Design for The National Map of the United States: Road Thinning for Topographic Mapping" *Proceedings, AutoCarto 2012*, Columbus OH, September (refereed proceedings; revision published in journal special issue).

10. Stanislawski, L.V., M-O Briat, E. Punt, M. Howard, C.A. Brewer, and B.P. Battenfield, **2012**, "Density Stratified Thinning of Road Networks to Support Automated Generalization for The National Map" *Workshop Proceedings, ICA Commission on Generalisation and Multiple Representation*, Istanbul, Turkey, September (refereed proceedings).
11. Brewer, C.A., B.P. Battenfield, and L.V. Stanislawski, **2011**, "Choosing between Geometry Change and Display Change for Multiscale Mapping: The Role of Elimination in Design," *Proceedings, International Cartographic Conference 2011 (ICC2011)*, Paris, July, 11 pp.
12. Brewer, C.A., and P. Raposo, **2011**, "Comparison of Topographic Map Designs for Overlay on Orthoimage Backgrounds," *Proceedings, ICC2011*, Paris, July, 10 pp.
13. Brewer, C.A., J.E. Thatcher and S.J. Butzler, **2011**, "Combining Varied Federal Data Sources for Multiscale Map Labeling of Populated Places and Airports for *The National Map* of the United States," *Workshop Proceedings, ICA Commission on Generalisation and Multiple Representation*, Paris, June/July (refereed proceedings).
14. Battenfield, B.P., L.V. Stanislawski, and C.A. Brewer, **2011**, "A Comparison of Star and Ladder Generalization Strategies for Intermediate Scale Processing of USGS National Hydrography Dataset Workshop," *Workshop Proceedings, ICA Commission on Generalisation and Multiple Representation*, Paris, June/July (refereed proceedings).
15. Brewer, C.A., and A.C. Robinson, **2011**, "GIScience at Penn State," in U.S. National Report to the International Cartographic Association, *Cartography and Geographic Information Science*, 38(3): 332-334.
16. Brewer, C.A., C.L. Hanchett, B.P. Battenfield, and E.L. Usery, **2010**, "Performance of Map Symbol and Label Design with Format and Display Resolution Options Through Scale for *The National Map*," *Proceedings, AutoCarto 2010*, Orlando FL, November, 6 pp. (refereed proceedings).
17. Stroh, W.J., S.J. Butzler, and C.A. Brewer, **2010**, "Establishing Classification and Hierarchy in Populated Place Labeling for Multiscale Mapping for *The National Map*," *Proceedings, AutoCarto 2010*, Orlando FL, November, 6 pp. (refereed proceedings; revision published in journal special issue).
18. Wilmer, J.M., and C. A. Brewer, **2010**, "Application of the Radical Law in Generalization of National Hydrography Data for Multiscale Mapping," *Proceedings, AutoCarto 2010*, Orlando FL, November, 6 pp. (refereed proceedings).

19. Bittenfield, B.P., L.V. Stanislawski, and C.A. Brewer, **2010**, "Multiscale Representations of Water: Tailoring Generalization Sequences to Specific Physiographic Regimes," *Proceedings, GIScience 2010*, Zurich, Switzerland, September, 6 pp. (selected as a 'top four short paper' at the conference; refereed proceedings).
20. Brewer, C.A., **2010**, "Teaching Cartographic Design with GIS Tools," *Proceedings, GeoCart'2010*, Auckland, New Zealand, September, 20 pp. (refereed proceedings).
21. Brewer, C.A., **2010-present**, NationalMapping.us
The National Mapping Expertise Exchange promotes innovation and excellence in national mapping by building connections among mapmakers, educators, researchers, and software developers at academic, commercial, and governmental organizations. This initiative is part of Brewer's Directorship of the Gould Center and Affiliate Faculty work with CEGIS-USGS (see *Grants and Contracts*).
22. Brewer, C.A., B.P. Bittenfield, and E.L. Usery, **2009**, "Evaluating Generalizations of Hydrography in Differing Terrains for *The National Map* of the United States," *Proceedings, 24th International Cartographic Conference (ICC2009)*, Santiago, Chile, November, 12 pp.
23. Brewer, C.A., and M.K. Akella, **2008**, "Multi-resolution Multi-scale Topographic Map Design: Toward a New Look for *The National Map*," *Proceedings, AutoCarto 2008*, Shepherdstown WV, September, 12 pp. (refereed proceedings; revision published in journal special issue).
24. Stryker, M., R.E. Roth, and C.A. Brewer, **2008**, "ScaleMaster.org: Illustrating and Constructing the Multi-scale Mapping Process," *Proceedings, 5th International Conference on Geographic Information Science (GIScience 2008)*, Park City UT, September.
25. Brewer, C.A., **2008-present**, ScaleMaster.org
ScaleMaster is an online resource that offers a collection of presentations, publications, and interactive resources produced by B.P. Bittenfield and C.A. Brewer as part of grant-funded research from USGS-CEGIS and consulting for ESRI.
26. National Research Council, **2007**, "A Research Agenda for Geographic Information Science at the United States Geological Survey," The National Academies Press, Washington DC.
Report by Committee on Research Priorities for the USGS Center of Excellence for Geospatial Information Science (R. Denaro, K. Beard-Tisdale, C. Brewer, M. Domaratz, P. Gong, R. McMaster, M. Tsou, and J. Wilson).

27. Brewer, C.A., B.P. Battenfield, C. Frye, and J. Acosta, **2007**, "ScaleMaster: Multi-Scale Mapmaking from Multiple Database Resolutions and for Multiple Map Purposes," *Proceedings, 23rd International Cartographic Conference (ICC2007)*, Moscow, Russia, August, 10 pp.
 28. Brewer, C.A., and B.P. Battenfield, **2006**, "Mastering Map Scale: Formalizing Guidelines for Multi-Scale Map Design," *Proceedings, AutoCarto 2006*, Vancouver WA, June, 10 pp.
 29. Brewer, C.A., and C. Frye, **2005**, "Comparison of GIS and Graphics Software for Advanced Cartographic Symbolization and Labeling: Five GIS Projects," *Proceedings, 22nd International Cartographic Conference*, International Cartographic Association (ICA), A Coruña, Spain, July, 10 pp.
 30. Suchan, T.A., C.A. Brewer, and A. Tait, **2005**, "Overview of *The Census Atlas of the United States*," *Proceedings, 22nd International Cartographic Conference*, ICA, A Coruña, Spain, July, 10 pp.
 31. Brewer, C.A., **2005-present**, "Cartographic Design Using ArcGIS 9" online course, ESRI Virtual Campus.
 32. Brewer, C.A., **2004**, "Color Research Applications in Mapping and Visualization" (invited keynote), *Proceedings, IS&T/SID 12th Color Imaging Conference*, Society for Imaging Science and Technology, Springfield, VA, November, pp. 1-3.
- Series of ten atlases:* Each prepared as a booklet and CD-ROM pair for the National Park Service, Washington DC, and intended for use by each park for regional planning communication and collaboration:
33. McKendry, J.E., C.A. Brewer, and S.D. Gardner, **2004**, *A Socioeconomic Atlas for Flight 93 National Memorial and its Region*.
 34. McKendry, J.E., C.A. Brewer, and S.D. Gardner, **2004**, *A Regional Socioeconomic Atlas for National Capital Parks*.
 35. McKendry, J.E., C.A. Brewer, and S.D. Gardner, **2004**, *A Socioeconomic Atlas for Chicamauga and Chattanooga National Military Park and its Region*.
 36. McKendry, J.E., C.A. Brewer, S.D. Gardner, and J.M. Staub, **2004**, *A Socioeconomic Atlas for Big Thicket National Preserve and its Region*.
 37. McKendry, J.E., C.A. Brewer, J.P. Harahush, and J.M. Staub, **2004**, *A Socioeconomic Atlas for Rosie the Riveter/World War II Home Front National Historical Park and its Region*.
 38. McKendry, J.E., C.A. Brewer, and J.M. Staub, **2004**, *A Socioeconomic Atlas for Canyon de Chelly National Monument and its Region*.
 39. McKendry, J.E., C.A. Brewer, and J.M. Staub, **2004**, *A Socioeconomic Atlas for Kings Mountain National Military Park and its Region*.
 40. McKendry, J.E., C.A. Brewer, and J.M. Staub, **2004**, *A Socioeconomic Atlas for New River Gorge National River and its Region*.

41. McKendry, J.E., C.A. Brewer, and J.M. Staub, **2004**, *A Socioeconomic Atlas for John Day Fossil Beds National Monument and its Region*.
42. McKendry, J.E., C.A. Brewer, and J.M. Staub, **2003**, *A Socioeconomic Atlas for Saguaro National Park and its Region*.
43. Zhou, B., C.A. Brewer, and F. Hardisty, **2003**, "ColorBrewer in GeoVISTA Studio: Construction and Application of Bivariate Color Schemes," *Proceedings, American Statistical Association Joint Statistical Meetings*, August.
44. Brewer, C.A., T.A. Suchan and A. Tait, **2003**, "Mapping Census 2000 in the *Census Atlas of the United States*," *Proceedings, 21st International Cartographic Conference*, ICA, Durban, South Africa, August, 7 pp.
45. Brewer, C.A., **2002-2004**, "Cartographic Design" online course, PSU World Campus and ESRI Virtual Campus.
46. Brewer, C.A., **2002-present**, ColorBrewer.org.
ColorBrewer is an online resource offering color specifications in multiple formats (RGB, CMYK, Hex) for color schemes suitable for thematic mapping; approximately 1200 unique users per week. Mark Harrower and Axis Maps assist with maintenance and hosting of this popular site.
47. Brewer, C.A., **2000**, "A Cognitive Study of Methods for Classifying Epidemiological Data on Choropleth Maps in Series," Final Report to the National Center for Health Statistics, Project No. RM98-203, May, 40 pp.
48. Brewer, C.A., **1999**, "Color Use Guidelines for Data Representation," *Proceedings, Section on Statistical Graphics, American Statistical Association*, Baltimore, August, pp. 55-60.
49. Brewer, C.A., **1999**, "Preface: The State of U.S. Cartography" and editor of special issue "U.S. National Report to the International Cartographic Association," *Cartography and Geographic Information Science*, 26(3): 165-166.
Preface reprinted in 1999 as "In the Journals," *ACSM Bulletin*, 179: 7-8.
50. Brewer, C.A., **1999**, "Letter from the President," *Cartographic Perspectives*, 32: 1, 72.
51. *Book review:* Brewer, C.A., **1998**, of *Number by Colors: A Guide to Using Color to Understand Technical Data*, by B. Fortner and T.E. Meyer, in *Color Research and Application*, 23(3): 190-191.
52. Brewer, C.A., and E.A. Wentz, **1997**, "A Simplified GIS Interface for Learning Introductory Geomorphology," *Geocal*, 16: 6-10.

53. MacEachren, A.M., and C.A. Brewer, **1995**, "Reliability Representation for the NCHS Mortality Atlas," Final report to the National Center for Health Statistics, Project No. RM91.2, Task 3, August, 57 pp.
54. MacEachren, A.M., C.A. Brewer, and L.W. Pickle, **1995**, "Mapping Health Statistics: Representing Data Reliability," *Proceedings, 17th International Cartographic Association Conference*, Barcelona, September, pp. 311-319.
Reprinted in 1995 in *Cognitive Aspects of Statistical Mapping*, Cognitive Methods Staff Working Paper Series, No. 18, edited by L.W. Pickle and D.J. Herrmann, NCHS Office of Research and Methodology, June, pp. 291-299.
55. Brewer, C.A., and A.M. MacEachren, **1995**, "Evaluation of Map Color Schemes for the NCHS Mortality Atlas," Final report to the National Center for Health Statistics, Project No. RM91.2, Task 2, June, 50 pp.
56. Brewer, C.A., A.M. MacEachren, and L.W. Pickle, **1995**, "Evaluation of Map Color Schemes for the NCHS Mortality Atlas," *Proceedings, International Symposium on Computer Mapping in Epidemiology and Environmental Health*, February (published April 1997), pp. 14-20.
Reprinted in 1995 in *Cognitive Aspects of Statistical Mapping*, Cognitive Methods Staff Working Paper Series, No. 18, edited by L.W. Pickle and D.J. Herrmann, NCHS Office of Research and Methodology, June, pp. 191-200.
57. Brewer, C.A., **1994**, "Color Use Guidelines for Mapping and Visualization," Chapter 7 (pp. 123-147) in *Visualization in Modern Cartography*, edited by A.M. MacEachren and D.R.F. Taylor, Elsevier Science, Tarrytown, NY (refereed book chapter; ISBN 978-0080424156).
58. Brewer, C.A., **1994**, "Guidelines for Use of the Perceptual Dimensions of Color for Mapping and Visualization," *Color Hard Copy and Graphic Arts III*, edited by J. Bares, Proceedings of the International Society for Optical Engineering (SPIE), San José, February, Vol. 2171, pp. 54-63.
59. *Book review:* Brewer, C.A., **1994**, of *Cartography: Thematic Map Design*, Third Edition, by B.D. Dent, in *Cartographic Perspectives*, 17: 26-27.
60. Brewer, C.A., and K.A. Marlow, **1993**, "Color Representation of Aspect and Slope Simultaneously," *Proceedings, Eleventh International Symposium on Computer-Assisted Cartography (Auto-Carto-11)*, Minneapolis, October/November, pp. 328-337.
Maps from this research are cover art for *Visualization in Modern Cartography*, 1994, and *Research/Penn State*, September 1995.
61. *Software review:* Brewer, C.A., **1992**, of *Interactive Color: A Guide for Color in Computer Graphics*, by the San Diego Supercomputer Center, in *Cartographic Perspectives*, 12: 7-9.

62. *Book review:* Brewer, C.A., **1992**, of *Envisioning Information*, by Edward R. Tufte in *Photogrammetric Engineering and Remote Sensing*, 58(5): 543-544.
63. Brewer, C.A., **1991**, "Modelling Surround-Induced Changes in Map Color Appearance," *Proceedings, International Cartographic Association*, Bournemouth, England, September, Vol. 1, pp. 522-526.
64. Brewer, C.A., **1990**, "The Effect of Color on the Perception of Map Scale," *Student Honors Competition Winning Papers*, Proceedings edited by E. Wingert, Cartography Specialty Group Publication #3, AAG, Toronto, April, pp. 1-12.
65. *Map:* Brewer, C.A., **1988**, "Pacific Travellers Supply Map of Santa Barbara, Goleta, Montecito and Carpinteria," Map Link, Santa Barbara, CA. Wall map is 24x74" (map production assisted by 8 students at UCSB).
 Updated and printed as a folded map in 1990 by C.A. Brewer, 24x41".
 Updated and reprinted in 1997 and 2000 by Map Link.
66. *Book review:* Brewer, C.A., **1987**, of *Southern Ontario Atlas of Agriculture*, by P.D. Keddie and J.A. Mage, in *Cartographica*, 24(3): 120-121.

GRANTS AND CONTRACTS

1. Principal Investigator, "U.S. Topo Evaluation and Cartographic Application," **Cooperative Ecosystem Studies Unit (CESU)** Cooperative Agreement, Department of Interior (U.S. Geological Survey, USGS), \$40,000, **2014-2015**.
2. Principal Investigator, "Symbol and Label Design Solutions for Electronic Topographic Mapping for *The National Map* of the United States," CESU Cooperative Agreement, Department of Interior (USGS), \$600,000, **2008-2013**.
3. CAUSE course funding, "Undergraduate Collaborative Research in Earth and Mineral Sciences" (EM SC 470W) with topic "National Mapping Agencies, Geospatial Data Use, and World Travel" and travel with undergraduates to Frankfurt, Abu Dhabi, and Tokyo. Center for Advancement of Undergraduate Studies and Experience, College of Earth and Mineral Sciences, Penn State, \$22,000, **2012** (with additional travel funding from the Penn State Office of Global Programs, \$3,000).
4. Principal Investigator, "Research on the Cartographic Design and Presentation of Topographic Map Symbols Over a Digital Image (Areal Photograph) Background," CESU Cooperative Agreement, Department of Interior (USGS), \$34,000, **2010/11**.

5. Principal Investigator, "Cartographic Enhancement for New Generation Topographic Map Graphics," CESU Cooperative Agreement, Department of Interior (USGS), \$25,000, **2008**.
6. Research contract, "ESRI Project on Multi-scale Map Design and Data Modeling," ESRI Inc., \$35,740, **2006/07**.
7. Research contract, "Development of a Socioeconomic Indicator Monitoring Protocol for the Eastern Rivers and Mountains Network," National Park Service Cooperative Agreement, Department of the Interior, \$39,760, **2006-2008**.
8. Collaborator, "Geostatistical Software for Space-Time Analysis and Detection of Cancer Disparities." National Cancer Institute, Small Business Innovation Research (SBIR) grant Phase I, \$100,000 to BioMedware (PI is Pierre Goovaerts), Ann Arbor, MI, **2004-2006**.
9. Co-Investigator with Jean McKendry (National Park Service), "NPS SocioEconomic Atlas Project," Cooperative Ecosystem Studies Unit (CESU) Cooperative Agreement, Department of Interior, \$57,130 to PSU, **2003-2004**.
10. Collaborator (expert panel member), "Stroodle: A GIS Foundation Class Library," National Institute of Environmental Health Sciences, Small Business Innovation Research (SBIR) grant Phase II, \$800,000 to BioMedware (PI is Geoffrey Jacques), Ann Arbor, MI, **2001-2003**.
11. Co-PI on "Quality Graphics for Federal Statistical Summaries," NSF Digital Government Collaborative Research Grant with three PIs: Alan MacEachren (PSU), Daniel Carr (George Mason), and David Scott (Rice), \$330,700 to PSU, **2000-2003**.
12. Research contract, National Center for Health Statistics, \$20,005, **1998** (for research on comparison of choropleth classifications for maps in series).
13. George H. Deike, Jr. Research Grant, College of Earth and Mineral Sciences, PSU, \$45,000, **1996-1999** (for research on using visualization in epidemiological research).
14. Faculty Investigator in the "Cognitive Analysis of Visualization in Education" group within *Visualizing Earth*, a \$1.8-million multidisciplinary research project funded by NSF with Co-PIs at PSU, SDSU, UCSD, and TERC in Boston. Received \$6,000 in summer salary, **1995-1998**.
15. Funding awards for improvement of GEOG 115, "Landforms of the World:" Wilson Education Grant, College of Earth and Mineral Science, PSU, \$7,500, **1996** (for assessment and improvement of computer-based laboratories, including undergraduate experience taking oblique aerial photos of landforms).

United Federal Bank Endowment and Fund for Improvement of Undergraduate Education grant, Instructional Development Program, PSU, \$3,000 in **1996** and \$1000 in **1995**.

CAUSE grant, College of Earth and Mineral Science, PSU, \$5,000, **1995** (for initial preparation of course).

16. Office of Undergraduate Education and CAUSE grants, PSU, \$4,200, **1995** (purchase of 5 global positioning system (GPS) receivers for undergraduate teaching).
17. Research contract with A.M. MacEachren, National Center for Health Statistics, \$17,500, **1994** (for research on the design of color maps for the NCHS mortality atlas).
18. Research, Scholarship and Creative Activity grant and Affirmative Action Faculty Development Program grant, College of Arts and Letters, SDSU, \$3,100, **1991** (for additional research on dissertation topic).
19. Travel grant, U.S. National Committee for the ICA, \$1,500, **1991** (for presentation at the International Cartographic Association meeting in Bournemouth, UK).
20. Doctoral Dissertation Research Improvement Grant, National Science Foundation, \$8,500, **1989**.

PRESENTATIONS

• denotes Brewer was presenter.

Presentations are oral papers unless otherwise noted.

*Bold **conference names** are listed by acronym alone in earlier listings.*

2015

Two submitted presentations—International Cartographic Conference 2015 (ICC2015),
Rio de Janeiro, Brazil, August 2015:

1. "Custom Cartography for Frank Lloyd Wright Sites for UNESCO World Heritage Nomination" (first author with B.P. Limpisathian and S.W. Perkins). •
2. "Updated Lessons for ArcGIS-based Cartography Teaching at Penn State" (second author with M. Lenze).

Four upcoming presentations—Association of American Geographers (AAG), Chicago IL,
April 2015:

3. "Making a New Edition of *Designing Better Maps*," (first author with E.M. Guidero, A. Dennis, B.P. Limpisathian, C. Frye, and P. Raposo). •
4. "Custom Cartography for Frank Lloyd Wright Sites for UNESCO World Heritage Nomination," (illustrated paper; fourth author with B.P. Limpisathian, H. Clauss, and S.W. Perkins).

5. "Updated Lessons for ArcGIS-based Cartography Teaching at Penn State" (poster; second author with M. Lenze).
6. "Cognition, Behavior and Design, IV: Designing Effective Maps" (session organizer with A. Griffin and session chair).

2014

7. "Multiscale Topographic Map Design Using Advanced GIS Methods" (invited presentation), Interagency Visual Media Group (IVMG) meeting, Washington DC, October 2014. •
8. "Exploring Across-Scale Relationships in Spatially Aggregated Data: Informing the Modifiable Areal Unit Problem" (poster; second author with J.K. Nelson) at **North American Cartographic Information Society (NACIS)** annual meeting, Pittsburgh PA, October 2014.
9. "Identifying Transformative Research in the Geographical Sciences: A Workshop" (invited panelist), Board on Earth Sciences and Resources (BESR), National Research Council (NRC), Irvine California, August 2014.
10. "Esri Press Authors' Holistic Testing Event" (invited participant), Esri Press, Redlands California, March 2014.
11. "Key Themes for Automating Map Design from USGS Topographic Map Research" (invited talk), CARTOCON 2014, Olomouc, Czech Republic, February 2014. •

2013

12. "Multiscale Design for *The National Map*," invited talk for Henry Gannett Award Ceremony, USGS Headquarters, Reston VA, November 2013. •
- Two refereed presentations*—NACIS annual meeting, Greenville SC, October 2013:
13. "Guidelines for Consistently Readable Topographic Vectors and Labels With Toggling Backgrounds" (second author with P. Raposo). Invited re-presentation of ICC2013 talk.
 14. "Automated Attribute Enrichment for Automated Multiscale Maps" (second author with P. Raposo).
- Three refereed presentations*—ICC2013, Dresden Germany, August 2013:
15. "Labeling Through Scale Using Hierarchies of Thinned Road Networks for Design of *The National Map* of the United States" (first author with E.M. Guidero, L.V. Stanislawski, B.P. Buttenfileld, P. Raposo). •
 16. "Guidelines for Consistently Readable Topographic Vectors and Labels with Toggling Backgrounds" (second author with P. Raposo).
 17. "Integration Metrics for Cartographic Generalization: Assessment of 1:1,000,000 Scale Hydrography and Terrain" (third author with L.V. Stanislawski and B.P. Buttenfield).

18. "Label and Attribute-Based Topographic Point Thinning" (refereed presentation; second author with P. Raposo and L.V. Stanislawski), Workshop, **International Cartographic Association (ICA)** Commission on Generalisation and Multiple Representation, Dresden Germany, August 2013

Four invited presentations—Center of Excellence for Geospatial Information Science (CEGIS) meeting, U.S. Geological Survey (USGS), Rolla MO, June 2013:

19. "Multiscale Design for The National Map 2012/13" (first author with P. Raposo, E. Guidero, K. Meckler, C. Price). •
20. "Road Networks and Populated Places: Generalization Through Scale" (third author with E. Guidero and K. Meckler).
21. "Airports Through Scale" (second author with K. Meckler)
22. "Automated Attribute Enrichment for Automated Multiscale Cartography" (second author with P. Raposo).
23. "Road Thinning Through Scale for *The National Map* of the United States" (invited Webex presentation; first author with E.M. Guidero and P. Raposo), ICA Commission on Generalisation and Multiple Representation meeting on *Designing MRDB and Multi-scale DCMs: Sharing Experience Between NMAs*, Barcelona, Spain, March 2013. •
24. "Schematization of Maps: Suggestions about Subway Data" (second author with Y. Ju), AAG annual meeting, Los Angeles, April 2013.

Two related presentations—"Mapping Around the World: A Cartographic Study Abroad Experience" (third related presentation at NACIS in 2012):

25. AAG annual meeting, Los Angeles (second author with P. Raposo and A.C. Robinson), April 2013.
26. Coffee Hour, Department of Geography Colloquium, PSU (invited presentation, co-presenter with A.C. Robinson), January 2013. •
Broadcast and posted online through the department's *Coffee Hour to Go* program:
<http://e-education.mediasite.com/mediasite/Viewer/?peid=cb06c12010e34e69b4477cb3d22f87e71d>

2012

27. "Redesign of *The National Map* and US Topo," (invited *Adobe Connect* presentation), TOPS CRADA Automated Finishing Services (AFS) Project, National Geospatial Intelligence Agency (NGA) and BAE Systems, November 2012. •

Two presentations—NACIS annual meeting, Portland OR, October 2012:

28. "Mapping Around the World: A Cartographic Study Abroad Experience" (first author with A.C. Robinson and P. Raposo). •
29. "Techniques for Cartographic Presentation of Upsampled Raster Land Cover Data" (third author with P. Raposo and K. Sparks).

30. "Multiscale design for The National Map of the United States: Road Thinning for Topographic Mapping" (refereed submission; first author with L.V. Stanislawski, B.P. Battenfield, P. Raposo, K. Sparks, and M. Howard), AutoCarto 2010, Columbus OH, September 2012. •
31. "Density Stratified Thinning of Road Networks to Support Automated Generalization for The National Map" (refereed submission; fifth author with L.V. Stanislawski, M-O Briat, E. Punt, M. Howard, and B.P. Battenfield), Workshop, ICA Commission on Generalisation and Multiple Representation, Istanbul Turkey, September 2012.
32. *Invited commentator*: "US Topo," video produced by J. Maxwell, U.S. Geological Survey, Department of Interior, released August 2012: •
gallery.usgs.gov/videos/568 or www.youtube.com/watch?v=hv0jxsW3qgY
- Four invited presentations*—CEGIS meeting, USGS, Rolla MO, June 2012:
33. "National Mapping Around the World" (first author with A. Robinson and P. Raposo). •
34. "Multiscale Design for *The National Map* 2011/12" (first author with K.A. Sparks and P. Raposo). •
35. "Multiscale Land Cover Design for *The National Map*" (third author with K.A. Sparks and P. Raposo).
36. "Multiscale Land Cover Processing for *The National Map*" (third author with P. Raposo and K.A. Sparks).
- Five related presentations*—"Multiscale Design for *The National Map* of the U.S.":
37. Association of American Geographers, Middle States Division annual meeting (first author with P. Raposo), Shippensburg PA, November 2012. •
38. Division Geoinformation, Bundesamt für Kartographie und Geodäsie (BKG; Federal Agency for Cartography and Geodesy), Frankfurt am Main, Germany, June 2012. •
39. Abu Dhabi Systems & Information Center, Abu Dhabi, UAE, June 2012. •
40. Center for Spatial Information Science, The University of Tokyo—Hongo, Tokyo, Japan, June 2012. •
41. Invited colloquium, Department of Geography, Ohio State University, Columbus OH, May 2012. •

2011

42. "Multiscale Redesign of *The National Map* with USGS" (invited presentation), Coffee Hour, Department of Geography Colloquium, PSU, December 2011. •
 Broadcast and posted online through the department's *Coffee Hour to Go* program:
e-education.mediasite.com/mediasite/Viewer/?peid=982eb32231c84250b725e25db4c215dc1d
- Two presentations*—NACIS annual meeting, Madison, WI, October 2011:
43. "NACIS Presentations on Terrain Inspire Penn State *Applied Cartographic Design* Course" (first author with J. McGilloway and S.J. Butzler). •

44. "Multiscale Terrain Representation for *The National Map*" (poster; second author with A. Stauffer).

Two refereed presentations—ICC2011, Paris, July 2011:

45. "Choosing between Geometry Change and Display Change for Multiscale Mapping: The Role of Elimination in Design" (first author with B.P. Buttenfield and L.V. Stanislawski). •
46. "Comparison of Topographic Map Designs for Overlay on Orthoimage Backgrounds" (second author with P. Raposo).

Two refereed presentations—Workshop, ICA Commission on Generalisation and Multiple Representation, Paris, June/July 2011:

47. "Combining Varied Federal Data Sources for Multiscale Map Labeling of Populated Places and Airports for *The National Map* of the United States" (first author with J.E. Thatcher and S.J. Butzler). •
48. "A Comparison of Star and Ladder Generalization Strategies for Intermediate Scale Processing of USGS National Hydrography Dataset" (third author with B.P. Buttenfield and L.V. Stanislawski).

Two invited presentations—CEGIS meeting, USGS, Rolla MO, June 2011:

49. "Generalization" (third author with L.V. Stanislawski and B.P. Buttenfield).
50. "Electronic Topographic Map Design" (co-presenter with A. Stauffer; coauthors P. Raposo, S.J. Butzler, J. Thatcher). •

Two presentations—*The National Map* Users Conference, Denver, May 2011:

51. "Establishing Classification and Hierarchy in Populated Place Labeling for Multiscale Mapping for *The National Map*" (second author with S.J. Butzler, J.E. Thatcher, and W.J. Stroh).
52. "Comparison of topographic map designs for overlay on orthoimage backgrounds" (second author with P. Raposo).

53. "Panel Discussion: Publishing," (invited panel member with A. Patel-Campillo and E. Smithwick), no)Boundaries (interdisciplinary graduate student conference), PSU, March 2011. •

54. "Map Design and Geographic Visualization for Health" (invited one-day workshop, offered twice; co-presenter with A. Robinson), Geography and Geospatial Science Working Group (GeoSWG), Centers for Disease Control (CDC), Atlanta GA, February 2011. •

55. "Cartographic Design with GIS Tools," (invited lecturer; two-day class), Independent Activities Period (IAP) Special Studies Class 11.959, Department of Urban Studies and Planning, Massachusetts Institute of Technology, Boston MA, January 2011. •

2010

Three presentations—AutoCarto 2010, Orlando FL, November 2010:

56. “Performance of Map Symbol and Label Design with Format and Display Resolution Options Through Scale for *The National Map*” (first author with C.L. Hanchett, B.P. Buttenfield, and E.L. Usery). •
57. “Establishing Classification and Hierarchy in Populated Place Labeling for Multiscale Mapping for *The National Map*” (third author with W.J. Stroh and S.J. Butzler).
58. “Application of the Radical Law in Generalization of National Hydrography Data for Multi-Scale Mapping” (second author with J.M. Wilmer).

Three presentations—NACIS annual meeting, St. Petersburg FL, October 2010:

59. “Design Examples for Multiscale Topographic Mapping for *The National Map*” (poster; first author with C.L. Hanchett and B.P. Buttenfield). •
60. “Tapered Symbols for NHD Flowlines Systematically Adjusted for Dry Versus Humid Zones” (second author with A. Stauffer).
61. “Populated Place Label Classification and Hierarchy for Multiscale Mapping” (third author with S.J. Butzler and W.J. Stroh).
62. “Multiscale Representations of Water: Tailoring Generalization Sequences to Specific Physiographic Regimes” (refereed short paper; third author with B.P. Buttenfield and L. Stanislawski), GIScience 2010, Zurich, Switzerland, September 2010.

Four presentations—GeoCart'2010 (New Zealand National Cartographic Conference) and International Cartographic Association (ICA) Symposium on Cartography for Australasia and Oceania, Auckland, New Zealand, August/September 2010:

63. “Designing USGS Topographic Mapping for Multiscale Online Use” (invited keynote; first author with B.P. Buttenfield and E.L. Usery). •
64. “Teaching Cartographic Design with GIS Tools” (invited talk). •
65. Plenary Panel of Keynote Speakers (invited panelist). •
66. “Map Design with ArcGIS” (invited two-day workshop; workshop leader with contributions by I. Drecki and C. McDowall). •
67. “Advanced Map Design Using GIS” (invited talk), Education and Public Outreach Seminar Series, NASA Goddard Space Flight Center, Greenbelt MD, August 2010. •
68. “Designing USGS Topographic Mapping for Multiscale Online Use” (first author with B.P. Buttenfield and E.L. Usery), Esri International User Conference, San Diego CA, July 2010. •
69. Co-organizer (with B.P. Buttenfield and K. Clarke) and panelist, GDI2010 Symposium: Generalization and Data Integration, Boulder CO, June 2010.

Four presentations—CEGIS meeting, U.S. Geological Survey (USGS), Denver CO, June 2010 (invited presentations):

- 70. “Progress and Rationale for Electronic Topo Map Design Decisions” (first author with B.P. Battenfield and L.V. Stanislawski). •
- 71. “Multiscale Design: ScaleMaster Decisions and MXD Settings for Symbol Evaluation” (second author with C.L. Hanchett).
- 72. “Evaluation of Map Symbols by Screen Resolution and File Format Through Scale” (first author with C.L. Hanchett). •
- 73. “Tapered Symbols for NHD Flowlines Systematically Adjusted for Dry Versus Humid Zones” (second author with A. Stauffer).

Three presentations—AAG annual meeting, Washington DC, April 2010:

- 74. “Judy Olson Retires—Her Cartography Advisees Gather to Talk Shop” (panelist; co-organizer of panel session with A. Lobben). •
- 75. “Teaching Cartographic Design with GIS Tools” (first author with W.J. Stroh). •
- 76. “Map Design” (organizer for paper session).
- 77. “Basic Mapping Principles for Visualizing Cancer Data Using Geographic Information Systems (GIS)” (invited keynote presentation), 22nd Annual Primary Care Research Methods & Statistics Conference, San Antonio TX, January 2010. •

2009

- 78. “Recommendations for Symbol and Label Design for Multiscale Online Topographic Mapping for *The National Map*” (briefing). USGS Headquarters, Reston VA, December 2009. •
- 79. “Evaluating Generalizations of Hydrography in Differing Terrains for *The National Map* of the United States” (refereed paper; first author with B.P. Battenfield and E.L. Usery). ICC2009, Santiago, Chile, November 2009. •

Two presentations—NACIS annual meeting, Sacramento CA, October 2009:

- 80. “Designing *The National Map* by USGS for Multi-scale Online Use” (first author with B.P. Battenfield and E.L. Usery). •
- 81. “Place Still Matters: Generalizing the National Hydrography Dataset by Local Terrain and Climate” (second author with B.P. Battenfield and E.L. Usery).
- 82. “Topographic Map Design to Support Evaluation of Generalization Solutions” (invited presentation; co-presenter with B.P. Battenfield), CEGIS-USGS, Rolla MO, August 2009. •
- 83. “Advanced Cartography within GIS: Research and Books” (invited presentation), Departamento de Geografía y Ordenación del Territorio, Universidad de Zaragoza, Spain, May 2009. •

84. "Cartographic Generalization by Physiographic Region" (fourth author with J. Wendel, B.P. Battenfield, and C. Anderson-Tarver), AAG annual meeting, Las Vegas NV, March 2009.

2008

85. "Redesigned Maps" (invited in-class presentation), Department of Geography, University of Colorado—Boulder, November 2008. •
- Two presentations*—NACIS annual meeting, Missoula MT, October 2008:
86. "ScaleMaster.org: Multi-scale Mapping Made Easy" (third author with R.E. Roth and M. Stryker).
 87. "Typology of Multi-scale Mapping Operators" (poster; third author with R.E. Roth and M. Stryker).
- Two presentations*—GIScience 2008, Park City UT, September 2008:
88. "ScaleMaster.org: Illustrating and Constructing the Multi-scale Mapping Process" (refereed paper; third author with M. Stryker and R.E. Roth).
 89. "Typology of Multi-scale Mapping Operators" (poster; third author with R.E. Roth and M. Stryker).
90. "Multi-resolution Multi-scale Topographic Map Design: Toward a New Look for *The National Map*" (first author with M.K. Akella), AutoCarto 2008, Shepherdstown WV, September 2008. •
- Two presentations*—ESRI International User Conference, San Diego CA, August 2008:
91. "Designed Maps: A Sourcebook for GIS Users" (invited presentation for ESRI Press authors panel "Map Design with the User in Mind") •
 92. "Multi-Resolution Multi-Scale Topographic Map Design" (Map Gallery poster; first author with M.K. Akella). •
93. "Electronic Topographic Map Design" (invited presentation), CEGIS and National Geospatial Technical Operations Center (NGTOC), U.S. Geological Survey, Rolla MO, July 2008. •
 94. "Students Flourish by Mixing Research with Learning in GIS and Cartography" (invited presentation), Symposium on the Development of the Standard Curriculum for Geographic Information Science and Technology, University of Tokyo—Hongo, Japan, March 2008. •
 95. Podcast author interview on *Designed Maps: A Sourcebook for GIS Users*, February 2008. •
www.esri.com/news/podcasts/audio/speaker/uc07press_brewer.mp3

2007

96. "Advanced Cartography within GIS" (invited keynote speaker), ESRI Mid Atlantic User Group Conference, Philadelphia PA, November 2007. •
97. "Cartographic Symbolization Principles Applied to Mapping Complicated Features" (invited presenter and workshop participant), National Geospatial-Intelligence Agency (NGA) Complicated Features Workshop, Warrenton VA, October 2007. •
- Three presentations—NACIS annual meeting, St. Louis MO, October 2007:*
98. "ScaleMaster Characterization of Types of Design Change Through Scale for Mapping from Multi-Resolution Databases" (first author with J. Acosta, B.P. Buttenfield, C. Frye, and A. Buckley). •
99. "Automating Label Placement in Dense Utility Maps" (second author with J.P. Kern).
100. "What is a Base Map?" (second author with B.P. Buttenfield, C. Frye and A. Buckley).
101. "A Research Agenda for Geographic Information Science at the United States Geological Survey" (co-presenter with R. Denaro and R.B. McMaster), briefing at USGS Headquarters, Reston VA, September 2007. •
102. "Scalemaster: Multi-Scale Mapmaking from Multiple Database Resolutions and for Multiple Map Purposes" (refereed paper; first author with B.P. Buttenfield, C. Frye, and J. Acosta), ICC2007, Moscow, Russia, August 2007. •
103. "Students Flourish by Mixing Research with Learning in GIS and Cartography" (invited co-presenter with B.P. Buttenfield), ESRI Education User Conference, San Diego CA, June 2007. •

2006

104. "Advanced Cartography within GIS" (invited colloquium speaker), Department of Geography, Ryerson University, Toronto, November 2006. •
105. "Cartographic Inspirations for Designing Better Data Visualizations" (invited seminar and one-day workshop), Applied Information Management (AIM) Institute, Gallup Campus, Omaha NE, October 2006. •
106. "Map Design through Scale Change and Varied Map Purpose" (first author with C. Frye and B.P. Buttenfield), NACIS annual meeting, Madison WI, October 2006. •
107. "Cartography: Modeling GIS Data for Map Making" (invited presenter for preconference seminar; with A. Buckley, C. Frye and B.P. Buttenfield), ESRI International User Conference, San Diego CA, August 2006. •

Three presentations—“Mastering Map Scale: Formalizing Guidelines for Multi-Scale Map Design:”

- 108. Conference paper (first author with B.P. Buttenfield), AutoCarto 2006, Vancouver WA, June 2006. •
- 109. Invited talk, UMR 8504 Géographie-cités: CNRS (Centre National de la Recherche Scientifique) and Universités Paris 1 and 7, Paris, France, May 2006. •
- 110. Invited talk, Laboratoire COGIT (Conception Objet et Généralisation de l’Information Topographique), Institut Géographique National (IGN), Paris, France, May 2006. •
- 111. “Color Research Applications in Mapping and Visualization” (invited talk), Laboratoire COGIT, IGN, Paris, France, May 2006. •

Two presentations—Dangermond Lecture, “Advanced Cartography within GIS:”

- 112. Invited colloquium, Department of Geography, University of California—Santa Barbara, May 2006. •
- 113. Invited colloquium, ESRI and University of Redlands, May 2006. •
- 114. “Innovative Integration of Professional and Research Experience into Undergraduate Mapping Courses” (invited Mitchell Award talk), College of Earth and Mineral Sciences, PSU, March 2006. •
- 115. “Map Design for Demography” (invited presentation), Population Research Institute, Pennsylvania State University, February 2006. •

2005

Two presentations—Department of Geography, Michigan State University, December 2005:

- 116. “Map Design Research and Teaching: MSU Beginnings” (invited colloquium for 50th anniversary celebration). •
- 117. “Advanced Cartography within GIS” (invited in-class presentation). •
- 118. “Map Design” (invited in-class presentation), Department of Geography, University of Colorado—Boulder, November 2005. •

Four presentations—21st New York State GIS Conference, Rochester NY, October 2005:

- 119. “Advanced Cartography within GIS” (invited keynote speaker). •
- 120. Poster competition judging (invited judge). •
- 121. On-the-spot map critique session (invited adviser). •
- 122. ‘Doctor’s office’ help session (invited adviser). •
- 123. “The Future of Map Design: Two New Map Design Textbooks Critiqued” (invited panelist), NACIS annual meeting, Salt Lake City UT, October 2005. •

Two presentations—XXII Congresso Brasileira de Cartografia, Sociedade Brasileira de Cartografia, Geodésia, Fotogrametria e Sensoriamento Remoto (SBC), Macaé, Brazil, September 2005:

- 124. “Cartographic Visualization” (invited keynote speaker). •
- 125. “Cartographic Design for GIS Mapmakers” (invited two-day short course). •

Two presentations—ICC2005, A Coruña, Spain, July 2005:

- 126. “Comparison of GIS and Graphics Software for Advanced Cartographic Symbolization and Labeling” (first author with C. Frye). •
- 127. “Overview of *The Census Atlas of the United States*” (second author with T.A. Suchan and A. Tait.)
- 128. “Categories of Hypotheses Generated using Epidemiological Maps” (invited talk), Geostatistical Analysis of Health Disparities Conference, sponsored by BioMedware, Ann Arbor MI, May 2005. •
- 129. “Cartograms in Action: Electoral College Mapping used During the 2004 Election” (poster; first author with J.M. Olson), AAG annual meeting, Denver CO, April 2005. •

2004

- 130. “Color Research Applications in Mapping and Visualization” (invited keynote speaker), 12th Color Imaging Conference, IS&T (Society for Imaging Science and Technology) and SID (Society for Information Display), Scottsdale AZ, November 2004. •
- 131. “GIS Science Priorities for Comprehensive Cancer Control” (invited specialist participant in Focus Group 2), Division of Cancer Prevention and Control, Centers for Disease Control and Prevention (CDC) with RTI International and the National Center for Geographic Information and Analysis, Santa Barbara CA, November 2004. •

Two presentations—NACIS annual meeting, Portland ME, October 2004:

- 132. “From GIS to Graphics Software: When Do You Bail?” (first author with C. Frye). •
- 133. “The NACIS Map-Off” (invited panel member for comparative map critique). •
- 134. “Socioeconomic Atlas Series for U.S. National Parks” (Map Gallery poster; first author with J.M. McKendry, J.S. Staub, and S.D. Gardner), selected for Conservation Hall, ESRI International User Conference, San Diego CA, August 2004. •
- 135. “Tips and Tools for Color Symbolization in Mapping and Visualization” (invited colloquium), Hunter College, New York NY, May 2004. •
- 136. “A Transition in Improving Maps: The ColorBrewer Example” (invited poster), American Congress on Surveying and Mapping (ACSM) annual meeting, Nashville TN, April 2004. •

137. "University Collaboration in Production of a Socioeconomic Atlas Series for U.S. National Parks" (illustrated paper; second author with J.M. Staub and J.E. McKendry), AAG annual meeting, Philadelphia PA, March 2004.

2003

138. "Mapping Census 2000 in the *Statistical Atlas of the United States 2003*" (first author with T.A. Suchan and A. Tait), ICC2003, Durban, South Africa, August 2003. •
 139. "Java-based Visualization of Multivariate Geospatial Data" (invited paper; second author with B. Zhou and F. Hardisty), American Statistical Association (ASA) Joint Statistical Meetings, Seattle WA, August 2003.
 140. "Communication of Aquatic Condition and Stressor Data on a Watershed-scale: A Case Study in the Upper Juniata Watershed in Central Pennsylvania" (poster; third author with K. Hychka and R. Brooks), Society of Wetland Scientists, New Orleans LA, June 2003.
 141. "EM SC 300: An Undergraduate Course in Student e-Portfolio Design and Development" (co-presenter with G. Johnson, R. Orndorff), Colloquy IX, Schreyer Institute for Teaching Excellence, PSU, May 2003. •
- Two presentations*—III Colóquio Brasileiro de Ciências Geodésicas, Universidade Federal do Paraná, Curitiba, Brazil, May 2003:
142. "Symbolization and Design of Thematic Maps of Epidemiological and Census Data" (invited two-day short course). •
 143. "Using Color to Visualize Geographic Data" (invited keynote). •
 144. "Using Color for Presentation and Exploration of Data" (invited paper), American Association for the Advancement of Science (AAAS) annual meeting, Denver CO, February 2003. •
 145. "A Tutorial on Color Symbolization and Data Classification for Mapping and Visualization" (invited presentation), Space-Time Information Systems II, meeting sponsored by BioMedware, Ann Arbor MI, January 2003. •

2002

146. "Mapping Census 2000: The Geography of U.S. Diversity" (invited colloquium), Department of Geography, University of Delaware, November 2002. •
- Three presentations*—NACIS annual meeting, Columbus OH, October 2002:
147. "Map Design Tools in ArcMap 8: What We Learned While Creating an Online Course" (first author with S.P. Faith). •
 148. "Mapping Census 2000: Evaluating an Atlas Designed to Accommodate Impaired Color Vision" (second author with G.W. Hatchard).

149. "ColorBrewer in Print: A Catalog of Color Schemes for Maps" (poster; first author with G.W. Hatchard and M.A. Harrower). •
 150. "Mapping Census 2000: The Geography of U.S. Diversity" (invited colloquium), Department of Geography, Syracuse University, September 2002. •
- Three presentations— American Statistical Association (ASA) Joint Statistical Meetings, New York NY, August 2002:*
151. "ColorBrewer: A Web Tool for Selecting Color Schemes for Maps and Graphs" (invited paper; first author with M.A. Harrower). •
 152. "Using ColorBrewer to Design Color Schemes for Maps of Demographic Data" (invited technical exhibit; second author with M.A. Harrower). •
 153. "Color as an Analytical Symbol for Data Representation" (invited host of luncheon roundtable). •
 154. "ColorBrewer: A Web Tool for Selecting Color Schemes for Maps" (Map Gallery poster; first author with M.A. Harrower), ESRI International User Conference, San Diego CA, July 2002. •
 155. "Demonstration of ColorBrewer: A Web Tool for Selecting Color Schemes for Maps" (demonstration; first author with M.A. Harrower), dg.o2002, NSF National Conference for Digital Government Research, Los Angeles CA, May 2002. •
 156. "Color for Dummies: Online Tools for Selecting Map Color Schemes" (second author with M.A. Harrower), AAG annual meeting, Los Angeles CA, March 2002.
- Two presentations—State University of New York at Buffalo, March 2002.*
157. "Tips and Tools for Color Symbolization in Mapping and Visualization" (invited IGERT colloquium—Integrative Graduate Education and Research Training). •
 158. "Mapping Census 2000: The Geography of U.S. Diversity" (invited colloquium), Department of Geography. •
 159. "Analytical Color Use in Visualization: Symbolizing Space-Time Data" (invited presentation), Space-Time Information Systems meeting sponsored by BioMedware, Ann Arbor MI, January 2002. •

2001

- Four presentations—"Mapping Census 2000: The Geography of U.S. Diversity:"*
160. Paper (second author with T.A. Suchan), NACIS annual meeting, Portland OR, October, 2001.
 161. Poster (first author with T.A. Suchan), NACIS annual meeting, Portland OR, October 2001. •
 162. Invited colloquium, Department of Geography, Pennsylvania State University, September 2001. •

- 163. Map Gallery poster (second author with T.A. Suchan), ESRI International User Conference, San Diego CA, July 2001. •
- 164. “Practical Approaches to Mapping Epidemiological Data” (invited presentation to staff), Medical Examiner’s Office, Delaware County PA, May 2001. •
- 165. “Prototype for a First Atlas of Census 2000” (first author with T.A. Suchan), AAG annual meeting, New York NY, February/March 2001. •

2000

- 166. “Planning a First Atlas of Census 2000: *Mapping Change*” (poster, second author with T.A. Suchan), NACIS annual meeting, Knoxville TN, October 2000. •
- 167. “A Cognitive Study of Methods of Classifying Epidemiological Data on Choropleth Maps in Series” (third author with E.B. Steiner, C.L. Eicher, and L.W. Pickle), AAG annual meeting, Pittsburgh PA, April 2000.
- 168. “Evaluation of a Model for Predicting Simultaneous Contrast on Color Maps,” Inter-Society Color Council (ISCC) Second Panchromatic Meeting, Savannah GA, February 2000. •
- 169. “Recommendations for Redesign of the Net Assessment Map Series” (invited presentation and workshop participant), Net Assessment Map Workshop, International Research Institute for Climate Prediction (IRI), Lamont-Doherty Earth Observatory of Columbia University, Palisades NY, January 2000. •

1999

- Two presentations—“A Cognitive Study of Methods of Classifying Epidemiological Data on Choropleth Maps in Series” (invited talks):*
- 170. National Cancer Institute, Division of Cancer Control and Population Sciences, Bethesda MD, November 1999. •
 - 171. National Center for Health Statistics, Office of Research and Methodology, Bethesda MD, November 1999. •
 - 172. “Hypothesis Generation Using Visualizations of Health Data,” ICA conference, Ottawa, Canada, August 1999. •
 - 173. “Color Use Guidelines for Data Representation” (invited paper), Section on Statistical Graphics, American Statistical Association (ASA) Joint Statistical Meetings, Baltimore MD, August 1999. •
 - 174. “Selecting Hue Pairs for Maps using Color Naming and Color Vision Research,” Inter-Society Color Council (ISCC) annual meeting, Vancouver, Canada, May 1999. •

175. "Teaching Concepts in Geography with GIS-based Tools" (second author with E.A. Wentz), AAG annual meeting, Honolulu HI, March 1999.

1998

176. "Cognitive Aspects of Statistical Map Design: II. Specific Map Elements" (fourth author with L.W. Pickle, D.J. Herrmann, and A.M. MacEachren), International Health Geographics Conference, Baltimore MD, October 1998.

177. "Evaluation of Map Color Schemes for the NCHS Atlas of U.S. Mortality" (invited paper; first author with A.M. MacEachren and L.W. Pickle), Sixth Annual Pennsylvania Geographic Information Systems Conference (PAGIS), Harrisburg PA, May 1998. •

Two presentations—AAG annual meeting, Boston MA, April 1998:

178. "State of the Art in Academic Cartography" (invited by the Cartography Specialty Group; first author with R.B. McMaster). •
179. "State of the Art in Cartography: Can Anyone Make Any Map?" (organized session requested by AAG).

1997

180. GIS and Epidemiology Workshop (invited participant), National Center for Geographic Information and Analysis (NCGIA), State University of New York at Buffalo, November 1997.

181. "Revise and Resubmit: The Future of Cartographic Research Publications" (organizer and chair of panel discussion), NACIS annual meeting, Lexington KY, October 1997.

182. "Designing Color Displays for Color Vision Impairments" (co-presenter with J.M. Olson; paper invited for education program), Inter-Society Color Council (ISCC), Baltimore MD, September 1997. •

Two presentations—AAG annual meeting, Fort Worth TX, April 1997:

183. "Student Use of Simplified GIS Interface for Learning Introductory Geomorphology" (first author with E.A. Wentz and J.C. Vender). •
184. "Qualitative Research Methods for Cartographers" (second author with T. Suchan).

1996

185. "Learning Advanced Mapping Methods in the *Applied Cartographic Design* Course at Penn State," NACIS annual meeting, San Antonio TX, October 1996. •

Four presentations—AAG annual meeting, Charlotte NC, April 1996:

186. "Evaluation of Map Color Schemes for the NCHS Mortality Atlas" (first author with A.M. MacEachren and L.W. Pickle). •
187. "Assessing Methods for Depicting Data Reliability on Mortality Maps" (second author with A.M. MacEachren and L.W. Pickle).

- 188. "The NCHS *Atlas of United States Mortality*" (organizer for paper session).
- 189. "Ninth Annual Student Honors Competition" (organizer for paper session).

1995

- 190. "Spectral Schemes: Controversial Color Use on Maps" (first author with A.M. MacEachren and L.W. Pickle), NACIS annual meeting, Wilmington NC, October 1995. •
- 191. "Mapping Health Statistics: Representing Data Reliability" (second author with A.M. MacEachren and L.W. Pickle), ICA conference, Barcelona, Spain, September 1995.
- 192. "Representing Uncertainty on Statistical Maps" (invited paper; second author with A.M. MacEachren and L.W. Pickle), Statistical Graphics Section of the American Statistical Association (ASA) meeting, Orlando FL, August 1995.
- Two presentations—AAG annual meeting, Chicago IL, March 1995:*
- 193. "Question Construction Effects on Response-Time Results in Cartographic Color Research." •
- 194. "Facing the Digital Map: A Discussion of Solutions to Computer Production and Publication Problems" (discussant for paper session). •
- 195. "Evaluation of Map Color Schemes for NCHS Mortality Atlas" (first author with A.M. MacEachren and L.W. Pickle), International Symposium on Computer Mapping in Epidemiology and Environmental Health, Tampa FL, February 1995. •

1994

- 196. "Geographic Visualization: Understanding Map Reliability and Making Reliable Maps" (invited video-taped lecture presented with A.M. MacEachren), NCHS Cartography Guest Lecture Series to the Department of Health and Human Services, National Center for Health Statistics/CDC, Hyattsville MD, July 1994. •
- 197. "Teaching Cartography Today: From Crow Quill to Computer" (panel member), AAG annual meeting, San Francisco CA, March/April 1994. •
- 198. "Guidelines for Use of the Perceptual Dimensions of Color for Mapping and Visualization," Color Hard Copy and Graphic Arts III conference of IS&T and SPIE, San José CA, February 1994. •

1993

199. "Color Representation of Aspect and Slope Simultaneously" (first author with K.A. Marlow), Auto-Carto-11, Minneapolis MN, October/November 1993. •
200. "Guidelines for Use of the Perceptual Dimensions of Color for Mapping and Visualization" (invited talk), Department of Geography, University of California at Santa Barbara, October 1993. •
201. "Color Selection for Geographic Data Analysis and Visualization" (invited talk), Department of Geography, Pennsylvania State University, January 1993. •

1992

202. "Color Selection for Geographic Data Analysis and Visualization," GIS/LIS annual conference, San José CA, November 1992. •
 203. "An Extension of the Hunt Model of Color Appearance to Predict Simultaneous Contrast Effects on Computer-Displayed Map Colors," Inter-Society Color Council (ISCC) annual meeting, Princeton NJ, June 1992. •
- Two presentations—AAG annual meeting, San Diego CA, April 1992:*
204. "Prediction of Surround Effects on Map Color Appearance: Model Evaluation" (winning paper in Nystrom Competition). •
 205. "Mapping with the Macintosh Computer" (workshop leader with D.E. Fitzsimons and E.J. Turner). •

1985 – 1991 as graduate student

206. "Modelling Surround-Induced Changes in Map Color Appearance" (poster), ICA conference, Bournemouth, England, September 1991. •
 207. "The Effect of Color on the Perception of Map Scale," AAG annual meeting, Toronto, Canada, April 1990. •
 208. "Color Chart Use in Map Design," NACIS annual meeting, Ann Arbor MI, October 1989. •
 209. Color Education Panel (invited panel member), Inter-Society Color Council (ISCC) annual meeting, Chicago IL, April 1989. •
- Two presentations—AAG annual meeting, Baltimore MD, March 1989:*
210. "Use of Thematic Mapper Imagery for Updating a Vector-Based GIS." •
 211. "Maps for the Color Deficient: Experimental Results" (second author with J.M. Olson, J.B. Moore, and M.H. Martel).
 212. "Color in Cartography: Useful Theory for Production and Research" (workshop leader with J.M. Olson), AAG annual meeting, Portland OR, April 1987.

213. "Printed Munsell Charts for Selecting Map Colors," AAG annual meeting, Minneapolis MN, May 1986. •
214. "Color Harmony in Cartography," AAG annual meeting, Detroit MI, April 1985. •

TEACHING AND ADVISING

Courses Taught

The Pennsylvania State University, Department of Geography, 1994 to present:

- Cartography—Maps and Map Construction
- Applied Cartographic Design
- Undergraduate Collaborative Research in Earth and Mineral Sciences (CAUSE)
- Seminar in Cartography
- Introduction to Geographic Research
- Professional e-Portfolio Development
- Landforms of the World

San Diego State University, Department of Geography, 1991 to 1994:

- Maps and Graphic Methods
- Automated Cartography
- Intermediate Cartography (map design)
- Advanced Automated Cartography

Michigan State University, Department of Geography, 1990/91:

- Map Design
- Introduction to Cartography

University of California at Santa Barbara, Department of Geography, 1986/87:

- Introduction to Cartography
- Production Cartography
- Compilation and Cartographic Design

Graduate Advisees

PSU

Paulo Raposo (MS), *Scale-Specific Automated Map Line Generalization by Vertex Clustering on a Hexagonal Tessellation*, 2011.

James Wilmer (MS), *Application of the Radical Law in Generalization of National Hydrography Data for Multiscale Mapping*, 2010.

Adrienne Gruver (MS), *Epidemiological Exploratory Data Analysis Tasks in a Geovisualization Environment*, 2009.

Mamata Akella (MS), *First Responders and Crisis Map Symbols: Making Communications Clearer*, 2008.

Jill Phelps Kern (MGIS), *Automating Label Placement in Dense Utility Maps*, 2007.

Alistair Geddes (PhD), *Statistically Modified Farming: The Spatial Politics in Scottish Farming Statistics*, 2006.

- Steven Gardner (MS), *Evaluation of the ColorBrewer Color Schemes for Accommodation of Map Readers with Impaired Color Vision*, 2005.
- Sohyun Park (MS), *Comparison of Detailed and Generalized Maps for Campus Wayfinding with a Pocket PC*, 2005.
- Amy Trauger (PhD), *Social, Economic and Environmental (In)Justice: A Network Analysis of Sustainable Agriculture in Pennsylvania*, 2005.
- Geoffrey Hatchard (MS), *A Study of Road Network Representation on a Typical Highway Map*, 2003.
- Erik Steiner (MS), *Region Representation and Cognitive Distance Distortion*, 2001.
- Michael DeGennaro (MS), *Mapping with Chorodots: An Examination of Methods and their Effects on Geographic Data Interpretation*, 2000.
- Shaun Faith (MS), *Effective Monochromatic Maps and Graphics: Perceptual Grayscales, Ruling, and Xerographic Reproduction*, 1999.
- Cory Eicher (MS), *The Implementation and Evaluation of Dasymetric Mapping Methods*, 1999.
- Elizabeth Fauerbach (MS), *Examining Electronic Atlases: A Definition and Case Study*, 1997.
- David Barnes (MS), *Hypsometric Colors and Hill-Shading for Base Maps and Relief Representation: An Historical Perspective*, 1997 (two MS papers).

SDSU

- Robert Marin (MS), *Evaluating Three-Dimensional Digital Terrain Maps for Visual Interpretation of Thematic Data*, 1994.
- Laura Edgeman (MS), *Teaching Successional Vegetation Dynamics: An Evaluation of the Effectiveness of Animated and Static Graphics*, 1994.
- Cheryl Rogers (MS), *Evaluation of the Use of Color Saturation to Depict Data Uncertainty on Digital Maps*, 1994.
- Caroline Sallaway (MS), *Evaluation of the Effectiveness of Perceptually Ordered Color Schemes for Maps*, 1994.

Graduate Committee Member

- Mark R. Read (PhD), *Embracing Uncertainty: Scenario Planning for Climate Change-Security Challenges and Opportunities*, 2014.
- David P. Retchless (MS), *Public Perceptions of Spatial Analogs for Climate Change: A Survey of Centre Region, Pennsylvania Residents*, 2011.
- Robert E. Roth (PhD), *Interacting with Maps: The Science and Practice of Cartographic Interaction*, 2011.
- Sara Bier (PSU Geosciences, PhD), *Kinematics of the Collision of the Wrangellia Composite Terrane: Insight from the Kahiltna Assemblage, South-Central Alaska*, 2010.
- María Zúñiga Anton (University of Zaragoza, Spain, PhD), *Propuesta Cartográfica Para la Representación y Análisis de la Variable Población Mediante Sistemas de Información Geográfica e Infografía: El Caso Español* (Mapping Population), 2009.
- Tom Auer (MS), *Explicitly Representing Geographic Change in Map Animations with Bivariate Symbolization*, 2009.
- Anthony Robinson (PhD), *Design for Synthesis in Geovisualization*, 2008.

- Tania del Mar López Marrero (PhD), *Adaptive Capacity and Resilience to Floods in the Caribbean: A Case Study of Two Flood-Prone Communities in Puerto Rico*, 2008.
- Jamison Conley (PhD), *Automated Hypothesis Generation of Processes Causing Clusters in Geographic Datasets*, 2008.
- Liv Detrick (MS), *A Comparative Usability Study of GIS for K-12 Education*, 2007.
- Latika Bharadwaj (PSU Agricultural, Environmental and Regional Economics, PhD), *Work Participation, Motivation, and Benefit Receipt from Off-Farm Work on U.S. Farms: A Household Bargaining Approach*, 2007.
- Elisabeth Chesneau (University of Marne-le-Vallée, France, PhD), *Modèle d'Amélioration Automatique des Contrastes de Couleur en Cartographie: Application aux Cartes de Risque (Model for the Automatic Improvement of Color Contrasts in Cartography: Application to Risk Maps)*, 2006.
- Anthony Robinson (MS), *Assessing Geovisualization in Epidemiology: A Design Framework for an Exploratory Toolkit*, 2005
- Biliang Zhou (MS), *Constructing Bivariate Color Schemes in CIECAM02 Color Space for Geovisualization Applications*, 2004.
- Joel Staub (MS), *Re-Creating Hollow Landscapes: The Former Shenandoah National Park Residents*, 2004.
- Amy Griffin (PhD), *Understanding How Scientists Use Data-Display Devices for Interactive Visual Computing with Geographical Models*, 2004.
- Latha Baskaran (MS), *Analyzing the Effect of Topography on Remote Sensing Imagery*, 2003.
- Steven Norman (PhD), *Legacies of Anthropogenic and Climate Change in Fire Prone Pine and Mixed Conifer Forests of Northeastern California*, 2002.
- Trudy Suchan (PhD), *Categories in Geographic Representation*, 1998.
- Beverley Evans (MS), *Cartographic Display of Data Reliability: Does it Benefit the Map User?* 1995.
- Anne Gibson (Clark University, PhD), *A Model for Parallel Data/Color Structuring in the Context of the Choropleth Map*, 1995 (external reviewer).
- Michele Limoges (SDSU, MS), *Applying Cartographic Expertise to Determine Tolerance Values for Automated Simplification of Linear Features*, 1994.

SERVICE

Elected University and College Service Positions at Penn State

University Promotion and Tenure Committee:

Chair, 2010/11; Member, 2009 to 2013.

University Faculty Senate:

Standing Joint Committee on Tenure (SJCT), 2013 to 2016.

Chair of Senate Faculty Affairs Committee, 2006 to 2008.

Chair of Promotion, Tenure, Appointments and Leaves subcommittee of Faculty Affairs, 2005/06.

Member of Senate Faculty Affairs Committee, 2004/05.

University Faculty Senate Committee on Faculty Rights and Responsibilities, 2005 to 2007.

College of Earth and Mineral Sciences:

Chair, Faculty Advisory Committee, 2004 to 2007.

Membership and Service to Professional Associations

National Research Council (NRC), National Academy of Sciences:

Panelist for Workshop on Identifying Transformative Research in the Geographical Sciences, 2014.

Member of Committee on Research Priorities for the USGS Center of Excellence for Geospatial Information Science, 2006/07.

Association of American Geographers (AAG) member:

Member of Editorial Board for *The Professional Geographer*, 2008 to 2012, and 1997 to 2000.

Member of Nominating Committee, 2001/02.

Academic Director of Cartography Specialty Group, 1994 to 1996.

Local Arrangements Committee, 1992.

Student Director of Cartography Specialty Group, 1984.

Gamma Theta Upsilon (GTU), The International Geographical Honor Society:

Member of Alpha Tau Chapter at PSU, 2012-present.

International Cartographic Association (ICA):

Scientific Program Chair, International Cartographic Conference (ICC2017), Washington D.C., planned for July 2017.

Member of Organizing Committee, ICC2017, Washington D.C., planned for July 2017.

Member, Scientific Program Committee, ICC2015, Rio de Janeiro, Brazil, planned for August 2015.

Member, Scientific Program Committee, 14th Workshop, Commission on Generalisation and Multiple Representation, 2011.

Judge, International Map Exhibition, 2003, 2005, 2007.

Chair, U.S. National Committee to the International Cartographic Association, 2004 to 2008.

Webmaster for www.usnc-ica.org, 2004 to 2008.

Member, U.S. National Committee to the International Cartographic Association, 2003/04.

North American Cartographic Information Society (NACIS) member:

Vice President 1997/98, President 1998/99, and Past President 1999/2000.

Organized Annual Meeting, Milwaukee, 1998.

Member of Board of Directors, 1995 to 1997.

Member of Editorial Board for *Cartographic Perspectives*, 1992 to 1997, 2010-present.

American Congress on Surveying and Mapping (ACSM) and

Cartography and Geographic Information Society (CaGIS) member:

Fellow of ACSM, 2007; continues to present as Fellow of the Cartography and Geographic Information Society.

Member of Editorial Board for *Cartography and Geographic Information Science*, 2000 to 2013.

Invited guest editor for 1999 U.S. National Report to the International Cartographic Association (Special Issue of *Cartography and Geographic Information Systems*).

The British Cartographic Society (BCS):

Member of Editorial Board for *The Cartographic Journal*, 2009 to present.

Canadian Cartographic Association (CCA) member.

Inter-Society Color Council (ISCC) member:

Member of Awards Committee, 2002 and 2004.

Organized 2nd Panchromatic Conference on "Color in its Surround," 2000.

Member of Board of Directors, 1995 to 1999.

Peer Review

Reviewed manuscripts for:

Annals of the Association of American Geographers, The Professional Geographer, Cartography and Geographic Information Science (The American Cartographer), Cartographica, Cartographic Perspectives, The Cartographic Journal, International Journal of Geographical Information Science, International Journal of Health Geographics, Computers & Geosciences, Journal of Computational and Graphical Statistics, Color Research and Application, Journal of Experimental Psychology: Applied Research in Geographic Education, Regional Studies, EOS

Served on NSF and NIH panels.

Reviewed proposals from NSF, NIH, NOAA, and NOW Exacte Wetenschappen.

Reviewed book prospectus for Esri Press.

Reviewed cartography textbook revisions for Wm. C. Brown and John Wiley & Sons.

SERVICE ADDENDUM

Served as committee member unless identified as chair or officer.

University Level

Standing Joint Committee on Tenure (SJCT), Faculty Senate, 2013 to 2016.

Search Committee for Executive Director of Faculty Senate, 2013.

Immediate Tenure Committee, 2013/14.

General Education Study Group (Office of Undergraduate Education), 2011/12.

Standing Committee on Tenure and Promotion (University P&T), chair 2010/11, elected member 2009-2013.

University Faculty Senator, elected by EMS, 2004-2008.

Senate Faculty Affairs Committee, chair 2006-2008, member 2004-2008.

Promotion, Tenure, Appointments and Leaves subcommittee of Faculty Affairs, chair 2005/06.

Faculty Senate Committee on Faculty Rights and Responsibilities, 2005-2007.

Online SRTE Committee, 2005.
Faculty and Staff Achievement Awards Committee, 2004-2006.
e-Portfolio Information Fair Planning Committee, 2005.
Faculty/Staff Satisfaction Survey Committee, 2003/04.
Evaluation of Shaver's Creek Environmental Center Committee, 2003/04.
Diversity Framework Review Team, 2003/04.
Committee on Racial and Ethnic Diversity (CORE), 2003/04.
Commission for Women (CFW), 2003/04.
Equal Opportunity Planning Committee (EOPC), 2003/04.

College of Earth and Mineral Sciences

EMS Promotion and Tenure Committee, 2013/14.
Undergraduate Programs Advisory Committee (UPAC), 2012-2014.
Search Committee for Undergraduate Academic Adviser, Ryan Family Student Center, 2013.
Scholarship Committee, 2014.
Advisory Search Committee for Associate Dean for Educational Equity, 2010/11.
EMS Graduate Student Poster Competition, judge 2010, 2011, 2013.
Faculty Advisory Committee, chair 2004-2007, member 1998-2000.
Dean's Executive Council, 2004-2007.
Ad Hoc GI Committee to plan EMS Intercultural course development, chair 2004/05.
Ad Hoc Dean's Facilities Task Force, 2002.
EMS Representative to the College of Communications, 1994-2000.
Ad Hoc committee on Classroom Technology and Integration of Residential and Distance Education, 1996/97.

Department of Geography

Undergraduate Officer, 1995/96, 2012-2014.
Miller Lecture Committee, chair 2013/14.
Society of Woman Geographers Graduate Fellow Committee, 2006-2013.
Fixed Term and Research (FT&R) Faculty Promotion Committee, 2009-2012.
Associate Head, 2006-2008.
Graduate Officer, 1998-2000, 2001-2003, 2006-2008.
Graduate Program Committee, chair 2006-2008, member 2009-2012.
Curriculum Committee, chair 2006-2008.
GIScience Faculty Search Committee, 2007/08.
E. Willard Miller Award in Geography Committee, 1996-1998, 2006/07.
Geography Promotion and Tenure Committee, 1998-2000, 2001-2003, 2004-2006.
Writer-Editor Search Committee, chair 2005.
Graduate Admissions Committee, 1994/95, 1996/97, 2004/05.
Fixed-Term and Research Faculty Committee, 2005.
Ad hoc committee to draft procedures for Geography P&T committee, 2004.
Undergraduate Program Review Committee, 1994/95.
Library Committee, 1997/98.