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Professor
Dept. of Apparel, Textiles, and Interior Design

Areas of Expertise

Heat transfer and comfort properties of textiles
Liquid barrier properties of textiles
Development and evaluation of protective clothing and sleeping bags

Education

Doctor of Philosophy, August, 1978, The University of Tennessee. Major: Textile Science.
Dissertation: "Flammability Characteristics of Layered Fabric Assemblies."

Master of Science, December, 1975, The University of Tennessee. Major: Textiles and Clothing.
Thesis: "Attitudes of Black and White College Females Toward Sensuous Clothing, Selected Body Attributes, and the Use of Sensuous Clothing."

Bachelor of Science, June, 1974, The Ohio State University. Major: Vocational Home Economics Education. Graduated *Summa Cum Laude*.

Experience

1993-present Co-Director (1987-1993 Associate Director), Institute for Environmental Research, Kansas State University (Manhattan, Kansas).

Administrative responsibilities include coordinating and facilitating interdisciplinary research projects and assisting with office management. Research responsibilities include conducting research projects for manufacturers and the military that involve measuring the thermal properties of fabrics, clothing systems, bedding systems, and sleeping bags using electrically-heated manikins, other heat transfer devices, and human subjects in environmental chambers. They also include quantifying the cooling effectiveness of personal cooling systems using a sweating manikin and human subjects.

1988-present Professor (1978-1982 Assistant Professor; 1982-1988 Associate Professor), Department of Apparel, Textiles, and Interior Design, Kansas State University (Manhattan, Kansas).

Teaching responsibilities have included undergraduate courses (Textiles, Textiles for Interiors, Textiles for Merchandising, Textile and Apparel Industry) and graduate courses (Clothing and Textiles

Seminar, Textile and Clothing Literature, Research Methods, Contemporary Topics in Clothing and Textiles, Family Consumption of Textile Products, Textile and Apparel Economics, Thermal and Barrier Properties of Textiles, Comfort and Performance of Protective Clothing, Grantsmanship and Publication, Internship in Textiles, Experimental Textiles, Dissertation Proposal Seminar, and Professional Development Seminar).

Research responsibilities have included directing graduate student and honors student research projects as well as independent faculty research.

Committee service at the University level has included the Traffic and Parking Council, Commission of the Status of Women, Faculty Senate, Faculty Senate Committee on University Planning, Faculty Salary and Fringe Benefits Committee, the Provost's Ad Hoc Committee on Impact of Tenure Policies on University Excellence, Provost's Committee on Research, Provost's Academic Misconduct Review Committee (chair), Provost's Committee on Developing a Conflict of Interest Policy, Provost's Selection Committee for University Excellence in Teaching Awards, Provost's Selection Committee for the Coffman University Chair for Distinguished Teaching Scholars (chair), Provost's Task Force on Program Review, Provost's Task Force on Graduate Education and Research, Provost's Review Committee for BGR Faculty Research Grants and Faculty Development Awards, Graduate Program Assessment Committee, Intercollegiate Athletic Council, College Representative to Graduate Council, Graduate Faculty, and advisor to the Collegiate International Trade Association and to the KSU Men's Tennis Club.

Committee service in the College of Human Ecology has included the Honors Program Coordinating Group, the Quality Improvement Committee (chair), Coordinating Committee for the Ph.D. Program (secretary, chair), dean's ad hoc Task Force on Graduate Education, Faculty Affairs Committee (chair), College Promotion and Tenure Committee (chair), Search Committee for the Dean of the College, Promotion and Tenure Committee (chair), and Human Subjects Committee.

Departmental service has included the Graduate Faculty (chair), the Apparel and Textile Curriculum Group, the Ad Hoc Committee on Faculty Evaluation, Promotion, and Tenure (chair), Ad Hoc Committee on Chronic Low Achievement (chair), advisor to the student chapter of the American Association of Textile Chemists and Colorists, and numerous faculty search committees.

1974-78 Graduate Assistant, Department of Textiles and Clothing, The University of Tennessee (Knoxville, Tennessee).

Refereed Publications (does not include abstracts)

McCullough, Elizabeth A., "Evaluation of Cold Weather Clothing Using Manikins," in Textiles for Cold Weather Apparel, John Williams (ed.), Cambridge, England: Woodhead Publishing Ltd., 2009, pg. 244-255. (editor reviewed)

McCullough, Elizabeth A., Zuo, Jing, and Huang, Jianhua. "The Effect of Auxiliary Products on the Insulation Provided by Sleeping Bag Systems," International Textile and Apparel Association (ITAA) Proceedings, Vol. 66, 2009 (ITAAonline.org).

McCullough, Elizabeth A. and Zuo, Jing. "Factors Affecting the Insulation Provided by Sleeping Bags," International Textile and Apparel Association (ITAA) Proceedings, Vol. 66, 2009 (ITAAonline.org).

McCullough, Elizabeth A. and Eckels, Steve. "Evaluation of Personal Cooling Systems for Soldiers," Proceedings of the 13th International Conference on Environmental Ergonomics, Boston, August, 2009. (available on CD Rom and www.environmental-ergonomics.org)

Bernard, Thomas E., Caravello, Victor, McCullough, Elizabeth A., and Ashley, Candi D. "Apparent Total Evaporative Resistance and Clothing Adjustment Factors at Different Humidities and Metabolic Rates," Proceedings of the 13th International Conference on Environmental Ergonomics, Boston, August, 2009. (available on CD Rom and www.environmental-ergonomics.org)

McCullough, Elizabeth A. "Issues Concerning the EN 13537 Sleeping Bag Standard," Outdoor Industry Association, June, 2009. (invited 11-page paper, available at outdoorindustry.org)

McCullough, Elizabeth A., Eckels, Steve, and Harms, Craig. "Determining Temperature Ratings for Children's Cold Weather Clothing," Applied Ergonomics, Vol. 40, 2009, pp.870-877.

McCullough, Elizabeth A. and Eckels, Steve. "Evaluation of Personal Cooling Systems for Soldiers Using Human Subjects," International Textile and Apparel Association (ITAA) Proceedings, Vol. 65, 2008 (ITAAonline.org).

McCullough, Elizabeth A., Eckels, Steve, and Schlabach, Meredith. "Evaluation of Personal Cooling Systems for Soldiers Using a Sweating Manikin," International Textile and Apparel Association (ITAA) Proceedings, Vol. 65, 2008 (ITAAonline.org). (*Winner: Best Paper Award*)

Shim, Huensup and McCullough, Elizabeth A. "Evaluation of Comfort and Hand Characteristics of Lining Fabrics," Journal of the Korean Society of Clothing Industry, Vol. 10, No. 4, 2008, pp. 537-543.

Caravello, Victor, McCullough, Elizabeth A., Ashley, Candi D., and Bernard, Thomas E. "Apparent Evaporative Resistance at Critical Conditions for Five Clothing Ensembles," European Journal of Applied Physiology, Vol. 104, 2008, pp. 361-367.

Caravello, Victor, McCullough, Elizabeth A., Ashley, Candi D., and Bernard, Thomas E. "Total Evaporative Resistance Using Wear Trials for Five Clothing Ensembles," in Environmental Ergonomics XII: Proceedings of the 12th International Conference, (I. B. Mekjavic, N. A. S. Taylor, R. Pisot eds.), Piran, Slovenia, August 2007, pp. 137-140.

Wesley, Erica D., McCullough, Elizabeth A., Eckels, Steve, and Davis, Elizabeth. "Performance Evaluation of Western Saddle Pads," Article # 9329, TheHorse.com, April 2007. (editor reviewed, 9 pages)

McCullough, Elizabeth A. and Shim, Huensup. "The Use of Phase Change Materials in Outdoor Clothing," in Intelligent Textiles and Clothing, H. Mattila, Ed., Cambridge, England: Woodhead Publishing Ltd., 2006, pp. 63-81. (editor reviewed)

Dionne, Jean-Philippe, Wang, Jinkai, and McCullough, Elizabeth A. "Development and Application of ASTM F2371-05 - Standard Test Method for Measuring the Performance of Personal Cooling Systems using Sweating Manikins," Proceedings of the Third European Conference on Protective Clothing (ECPC) and NOKOBETEF 8, May 10-12 2006, Gdynia, Poland, paper No.8 on CD.

McCullough, Elizabeth A., Jianhua Huang, and Kim, Chil Soon. "An Explanation and Discussion of Sweating Hot Plate Standards," in Performance of Protective Clothing: Global Needs and Emerging Markets, 8th Volume, ASTM STP 1462, P. Yarborough and C.N. Nelson, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2005, pp. 121-133.

Zuo, Jing and McCullough, Elizabeth A. "Heat Transfer Characteristics of Sports Apparel," in Performance of Protective Clothing: Global Needs and Emerging Markets, 8th Volume, ASTM STP 1462, P. Yarborough and C.N. Nelson, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2005, pp. 99-108.

Richards, Mark and McCullough, Elizabeth A., "Revised Interlaboratory Study of Sweating Manikins including Results from the Sweating Agile Thermal Manikin," in Performance of Protective Clothing: Global Needs and Emerging Markets, 8th Volume, ASTM STP 1462, P. Yarborough and C.N. Nelson, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2005, pp. 27-39.

McCullough, Elizabeth A., "Evaluation of Protective Clothing Using Manikins," in Textiles for Protection, Richard A. Scott (ed.), Cambridge, England: Woodhead Publishing Ltd., 2005, pp. 217-232. (editor reviewed)

McCullough, Elizabeth A., Huang, Jianhua, and Jones, Byron W., "Evaluation of EN 13537 and other Models for Predicting Temperature Ratings of Sleeping Bags," in Environmental Ergonomics XI: Proceedings of the 11th International Conference, (I. Holmér, K. Kuklane, and C. Gao, eds.), Ystad, Sweden, May 2005, pp. 425-428.

McCullough, Elizabeth A., Huang, Jianhua, and Deaton, Shawn, "Methods of Measuring the Clothing Area Factor," in Environmental Ergonomics XI: Proceedings of the 11th International Conference, (I. Holmér, K. Kuklane, and C. Gao, eds.), Ystad, Sweden, May 2005, pp. 433-436.

McCullough, Elizabeth A., "The Use of Thermal Manikins to Evaluate Clothing and Environmental Factors," in Environmental Ergonomics: The Ergonomics of Human Comfort, Health, and Performance in the Thermal Environment. Y. Tochihara and T. Ohnaka (ed.), United Kingdom: Elsevier Ltd., 2005, pp. 403-407.

McCullough, Elizabeth A., Jianhua Huang, and Kim, Chil Soon. "An Explanation and Comparison of Sweating Hot Plate Standards," ASTM International Journal, Vol. 1, No. 7, July/August, 2004, Online ISSN: 1546-962X, Paper ID JAI12098 (available online at ASTM.org).

Zuo, Jing and McCullough, Elizabeth A. "Heat Transfer Characteristics of Sports Apparel," Journal of ASTM International, Vol. 1, No. 10, Nov. 2004, Online ISSN: 1546-962X, Paper ID: JAI12143 (available online at ASTM.org).

Richards, Mark and McCullough, Elizabeth A., "Revised Interlaboratory Study of Sweating Manikins including Results from the Sweating Agile Thermal Manikin," Journal of ASTM International, Vol. 2, No. 4, April, 2005, Online ISSN: 1546-962X, Paper ID JAI12109 (available online at ASTM.org).

McCullough, Elizabeth A. "Comfort vs. Safety: The Protective Clothing Dilemma," (Distinguished Scholar Lecture), International Textiles and Apparel Association (ITAA Proceedings), Vol. 60, Savannah, GA, 2003. (invited paper SP4, ITAAonline.org).

McCullough, Elizabeth A., Kwon, Myoungsook, and Shim, Huensup. "A Comparison of Standard Methods for Measuring Water Vapor Permeability of Fabrics," Measurement Science and Technology, Vol. 14, No. 8, 2003, pp. 1402-1408.

Dionne, Jean-Philippe, Semeniuk, Kevin, Makris, Aris, and McCullough, Elizabeth A., "Using Thermal Manikins to Compare the Performance of Various Personal Cooling Garments," Proceedings of the Second

- European Conference on Protective Clothing (ECPC) and NOKOBETEF 7, Montreux, Switzerland, May 21-24, 2003.
- McCullough, Elizabeth A., Kwon, Myoungsook, and Shim, Huensup, "Water Vapor Permeability of Shell Fabrics: A Comparison of Methods," Proceedings of the Industrial Fabrics Association International EXPO 2003, IFAI: Roseville, MN, 2003.
- McCullough, Elizabeth A. and Kenney, W. Larry. "Thermal Insulation and Evaporative Resistance of Football Uniforms," Medicine & Science in Sports & Exercise, Vol. 35, No. 5, 2003, pp. 832-837.
- McCullough, Elizabeth A. "The Use of Thermal Manikins to Evaluate Clothing and Environmental Factors," Environmental Ergonomics X, Papers from the Tenth International Conference on Environmental Ergonomics, Fukuoka, Japan, September, 2002, pp. 427-430.
- McCullough, E., Barker, R., Giblo, J., Higenbottam, C., Meinander, H., Shim, H., and Tamura, T. "Interlaboratory Evaluation of Sweating Manikins," Environmental Ergonomics X, Papers from the Tenth International Conference on Environmental Ergonomics, Fukuoka, Japan, September, 2002, pp. 467-470.
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- Shim, Huensup, McCullough, Elizabeth A., and Jones, Byron W., "The Use of Phase Change Materials in Clothing," Textile Research Journal, Vol. 71, No. 6, June 2001, pp. 495-502.
- McCullough, Elizabeth A., "The Development of Standards for Protective Clothing," Journal of the Korean Society of Living Environmental System, Vol. 8, No. 2, 2001, pp. 113-118.
- McCullough, Elizabeth A. "Interlaboratory Study of Sweating Manikins," Proceedings of the Fourth International Meeting on Thermal Manikins, EMPA, Switzerland, September 28, 2001. (CD Rom)
- McCullough, Elizabeth A., "Phase Change and Protective Possibilities," Industrial Fabric Products Review, Vol. 78, No. 1, May 2001, pp. 64-67.
- McCullough, Elizabeth A., "The Use of Clothing in Thermal Comfort Standards," Conference Proceedings: Moving Thermal Comfort Standards into the 21st Century, Windsor, United Kingdom, April, 2001, pp. 292-300.
- Shim, Huensup and McCullough, Elizabeth A., "The Effectiveness of Phase Change Materials in Outdoor Clothing," in Ergonomics of Protective Clothing, Kalev Kuklane and Ingvar Holmer, Eds., Arbete Och Halsa, Stockholm, Sweden, 2000, pp. 90-93.
- Shim, Huensup and McCullough, Elizabeth A., "The Effectiveness of Phase Change Materials in Outdoor Clothing," Proceedings of the International Conference on Safety and Protective Fabrics, Industrial Fabrics Association International, Roseville, MN, April 26-28, 2000. (14 pages, document not paginated)

McCullough, Elizabeth A., Johnson, P.W., and Shim, H., "A Comparison of ASTM F 1670 and F 1819 Standards for Measuring the Barrier Properties of Protective Clothing Using Synthetic Blood," in Performance of Protective Clothing: Issues and Priorities for the 21st Century: Seventh Volume, ASTM STP 1386, C.N. Nelson and N.W. Henry, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2000, pp. 181-189.

Kim, C.S. and McCullough, Elizabeth A., "Static and Dynamic Insulation Values for Cold Weather Protective Clothing," in Performance of Protective Clothing: Issues and Priorities for the 21st Century: Seventh Volume, ASTM STP 1386, C.N. Nelson and N.W. Henry, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2000, pp. 233-247.

McCullough, Elizabeth A. and Johnson, Phillip W., "A New Standard for Measuring the Barrier Properties of Protective Fabrics with a Mechanical Pressure Tester," Proceedings of the International Conference on Safety and Protective Fabrics, Baltimore, MD, May 1998, pp. 11-20.

Jones, B.W., Hong, Sungae, and McCullough, Elizabeth A., "Detailed Projected Area Data for the Human Body," ASHRAE Transactions, Vol. 104, Part 2, 1998, pp. 1327-1339.

McCullough, Elizabeth A. and Johnson, Phillip W., "Evaluation of a New Mechanical Pressure Tester for Barrier Fabrics," in Performance of Protective Clothing: 6th Volume, ASTM STP 1273, Jeffrey O. Stull and Arthur S. Schwoppe, Eds., American Society for Testing and Materials, 1997, pp. 37-46.

McCullough, Elizabeth A. and Kim, Chil Soon, "Insulation Values for Cold Weather Clothing Under Static and Dynamic Conditions," in Environmental Ergonomics: Recent Progress and New Frontiers, Y. Shapiro, D.S. Moran, and Y. Epstein (eds.). Tel Aviv: Freund Publishing House, Ltd., 1996, pp. 271-274.

McCullough, Elizabeth A., "New Developments in Barrier Test Methods," IDEA '95 Conference Papers, Association of the Nonwoven Fabrics Industry, Philadelphia, 1995, pp. 187-190.

McCullough, E.A., Fosha, A. and Hosni, M., "Hydrostatic and Mechanical Pressure Applied in Barrier Test Methods," International Nonwovens Journal, Vol. 7, No. 2, 1995, pp. 57-63.

Jones, Byron W., He, Qing, Sipes, Jerry M., and McCullough, Elizabeth A., "The Transient Nature of Thermal Loads Generated by People," ASHRAE Transactions, Vol. 100, Pt. 2, 1994, pp. 432-438.

McCullough, Elizabeth A. and Hong, Sungae, "A Data Base for Determining the Decrease in Clothing Insulation Due to Body Motion," ASHRAE Transactions, Vol. 100, Pt. 1, 1994, pp. 765-775.

McCullough, Elizabeth A., Olesen, Bjarne W., and Hong, Sungae, "Thermal Insulation Provided by Chairs," ASHRAE Transactions, Vol. 100, Pt. 1, 1994, pp. 795-802.

McCullough, Elizabeth A., "Measuring the Barrier Properties of Medical Nonwovens," Proceedings of the Third Annual TANDEC Conference, Knoxville, TN, November 1-3, 1993.

McCullough, Elizabeth A., "Methods for Determining the Barrier Efficacy of Surgical Gowns," American Journal of Infection Control, Vol. 21, No. 5, Part 2, 1993, pp. 365-373.

Goodyear, Gail E., McCullough, Elizabeth A., and Jones, Byron W., "Evaluating the Water Vapor Transfer of Fabrics Utilized in Protective Apparel," Proceedings of the Second International Symposium on

Consumer Environmental Issues: Safety, Health, Chemicals, and Textiles in the Near Environment, St. Petersburg, FL, May 5-8, 1993.

McCullough, Elizabeth A., "Factors Affecting the Resistance to Heat Transfer Provided by Clothing," Journal of Thermal Biology, Vol. 18, No. 5 and 6, December, 1993, pp. 405-407.

McCullough, Elizabeth A., "Methods for Measuring the Barrier Properties of Surgical Gowns," Proceedings of the INDEX 93 Congress, European Disposable and Nonwovens Association, Geneva, Switzerland, April 1993. (10 pages)

McCullough, Elizabeth A., "Comfort vs. Barrier Protection in Surgical Gown Fabrics," Proceedings of the 1992 Industrial Fabric and Equipment Exposition, Industrial Fabrics Association International, October, 1992, pp. 135-142.

McCullough, Elizabeth A., "Liquid Barrier and Thermal Comfort Properties of Surgical Gowns," in Progress in Pacific Polymer Science 2, Yukio Imanishi (ed.), Berlin Heidelberg: Springer Verlag, 1992, 316-322.

McCullough, Elizabeth A., "The Transient Thermal Responses of Different Types of Clothing Due to Humidity Step Changes," Proceedings of the Second International Symposium on Clothing Comfort Studies in Mt. Fuji, Fuji Institute of Education and Training, Japan, 1991, pp. 1-22.

McCullough, Elizabeth A., "Factors Affecting the Resistance to Heat Transfer Provided by Clothing," in The Human-Environment System, Y. Kawashima et al. (ed.), Tokyo: Pergamon Press, 1991, pp. 139-141.

McCullough, Elizabeth A. and Schoenberger, Lucinda, "A Comparison of Methods for Measuring the Liquid Barrier Properties of Surgical Gowns," Performance of Protective Clothing: Fourth Volume, ASTM STP 1133, James P. McBriarty and Norman W. Henry, Eds., American Society for Testing and Materials, Philadelphia, 1992, pp. 83-98.

Crews, Patricia, Sievert, Shiela A., Woepfel, Lisa T., and McCullough, Elizabeth A., "Evaluation of Milkweed Floss as an Insulative Fill Material," Textile Research Journal, Vol. 61, No. 4, April 1991, pp. 203-210.

McCullough, Elizabeth A. and Averell, Robert, "Highloft Batting Improves Mattress Comfort," INDA Journal of Nonwovens Research, Vol. 3, No. 1, 1991.

McCullough, Elizabeth A. and Schoenberger, Lucinda, "Liquid Barrier and Thermal Comfort Properties of Surgical Gowns," INDA-TEC Book of Papers, April, 1991, pp. 53-67.

McCullough, Elizabeth A. and Schoenberger, Lucinda, "Liquid Barrier Properties of Nine Surgical Gown Fabrics," INDA Journal of Nonwovens Research, Vol. 3, 1991, pp. 14-20.

McCullough, Elizabeth A., Jones, Byron W., and Tamura, Teruko, "A Data Base for Determining the Evaporative Resistance of Clothing," ASHRAE Transactions, Vol. 95, Pt. 2, 1989, pp. 316-328.

McCullough, Elizabeth A., "Methods for Measuring and Estimating the Insulation of Clothing Systems," Proceedings of the International Symposium on Clothing Comfort Studies in Mt. Fuji, Fuji Institute of Education and Training, Mt. Fuji, Japan, 1988, pp. 149-168.

- Huck, Janice and McCullough, Elizabeth A., "Fire Fighter Turnout Clothing: Physiological/Subjective Evaluation," in ASTM Special Technical Publication 989 on Performance of Protective Clothing, S.Z. Mansdorf, Richard Sager, and Alan P. Nielsen (eds.), Philadelphia, PA: ASTM, December 1988, pp. 439-451.
- McCullough, Elizabeth A., Zbikowski, Patricia J., and Jones, Byron W., "Measurement and Prediction of the Insulation Provided by Bedding Systems," ASHRAE Transactions, Vol. 93, Part 1, 1987, pp. 1055-1068.
- McCullough, Elizabeth A., "Research Note: Estimating Clothing Insulation," ASHRAE Journal, Vol. 29, No. 4, April 1987, pp. 45.
- McCullough, Elizabeth A. and Jones, Byron W., "A Comparison of Methods for Estimating Clothing Insulation," Proceedings of the CLIMA 2000 World Congress on Heating, Ventilating and Air-Conditioning, Copenhagen, Denmark, 1985 (Volume 4), pp. 71-76.
- Jones, Byron W. and McCullough, Elizabeth A., "Computer Modeling for Estimation of Clothing Insulation," Proceedings of the CLIMA 2000 World Congress on Heating, Ventilating and Air-Conditioning, Copenhagen, Denmark 1985 (Volume 4), pp. 189-194.
- McCullough, Elizabeth A., Jones, Byron W., and Huck, Janice, "A Comprehensive Data Base for Estimating Clothing Insulation," ASHRAE Transactions, Vol., 91, Part 2, 1985, pp. 29-47.
- Choi, Hei-Sun, McCullough, Elizabeth A., and Rohles, Frederick H., "A Cross-Cultural Study of Clothing and Thermal Comfort," ASHRAE Transactions, Vol. 91, Part 2, 1985, pp. 469-477.
- Zhu, Xian-Sen, McCullough, Elizabeth A., and Jones, Byron W., "Thermal Insulation of Layered Chinese Clothing," ASHRAE Transactions, Vol. 91, Part 2, 1985, pp. 493-505.
- McCullough, Elizabeth A., "Man, Clothing, and the Environment," Chapter in Man and the Indoor Environment by Wei Runbai, Peking: China Building Industry Press, 1985. (written in Chinese).
- Huck, Janice and McCullough, Elizabeth A., "Insulation Characteristics of Outdoor Garments and Fabric Systems," Home Economics Research Journal, Vol. 13, No. 3, 1985, pp. 324-333.
- McCullough, Elizabeth A. and Wyon, David P., "Insulation Characteristics of Winter and Summer Indoor Clothing," ASHRAE Transactions, Vol. 89, Part 2, 1983, pp. 614-633.
- McCullough, Elizabeth A., Jones, Byron W., and Zbikowski, Patricia J., "The Effect of Garment Design on the Thermal Insulation Values of Clothing," ASHRAE Transactions, Vol. 89, Part 2, 1983, pp. 337-352.
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- Konz, Stephan A., Rohles, Frederick H., and McCullough, Elizabeth A., "Male Responses to Intermittent Heat," ASHRAE Transactions, Vol. 89, Part 1, 1983, pp. 79-100.
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McCullough, Elizabeth A. and Rohles, Frederick H., "Quantifying the Thermal Protection Characteristics of Outdoor Clothing Systems," Human Factors, Vol. 25, No. 2, 1983, pp. 191-198.

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McCullough, Elizabeth A., Rohles, Frederick H., and Konz, Stephan A., "Measuring the Thermal Insulation and Permeability of Protective Clothing Using a Copper Manikin," Proceedings of the International Conference on Protective Clothing Systems, Stockholm, Sweden, August 26, 1981.

Konz, Stephan A., Rohles, Frederick H., and McCullough, Elizabeth A., "The Effectiveness of Water Cooling Under Protective Clothing at Temperatures Between 22 and 55°C," Proceedings of the International Conference on Protective Clothing Systems, Stockholm, Sweden, August 26, 1981.

Rohles, Frederick H., Konz, Stephan A., and McCullough, Elizabeth A., "A Scaling Procedure for Evaluating the Comfort Characteristics of Protective Clothing," Proceedings of the International Conference on Protective Clothing Systems, Stockholm, Sweden, August 25, 1981.

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Bresee, Randall R. and McCullough, Elizabeth A., "Discrimination Among Acrylic Fiber Types by Small-Angle Light Scattering of Single Fibers," Journal of Forensics Science, Vol. 26, No. 1, January 1981, pp. 184-192.

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McCullough, Elizabeth A. and Noel, Charles J., "Flammability Characteristics of Layered Fabric Assemblies," Journal of Consumer Product Flammability, Vol. 6, June 1979, pp. 119-135.

McCullough, Elizabeth A., et al., "Sexually Attractive Clothing: Attitudes and Usage," in Dimensions of Dress and Adornment: A Book of Readings, Gurel, L.M. and Beeson, M.S. (editors). Dubuque, Iowa: Kendall/Hunt Publishing Company, 1979, pp. 132-137.

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McCullough, Elizabeth A., Miller, Mary Fran, and Ford, Imogene M., "Sexually Attractive Clothing: Attitudes and Usage," Home Economics Research Journal, Vol. 6, No. 2, 1977, pp. 164-170.

Papers Presented at Professional Meetings (name of actual presenter underlined)

Winter, Erica D. and McCullough, Elizabeth A. "Cushioning Characteristics of Saddle Pads Before and After Use," Annual Meeting of the International Textile and Apparel Association, Montreal, Canada, Oct. 27-30, 2010. (poster)

McCullough, Elizabeth A. "A Comparison of ASTM D1518 and F1868 Hot Plate Standards," Bi-annual meeting of the D13 Textiles Committee of the American Society for Testing and Materials, San Antonio, TX, January 25, 2010. (invited presentation)

McCullough, Elizabeth A., Zuo, Jing, and Huang, Jianhua. "The Effect of Auxiliary Products on the Insulation Provided by Sleeping Bag Systems," Annual Meeting of the International Textile and Apparel Association, Seattle, Oct., 28-31, 2009. (poster)

McCullough, Elizabeth A. and Zuo, Jing. "Factors Affecting the Insulation Provided by Sleeping Bags," Annual Meeting of the International Textile and Apparel Association, Seattle, Oct., 28-31, 2009. (poster)

McCullough, Elizabeth A. and Eckels, Steve. "Evaluation of Personal Cooling Systems for Soldiers," 13th International Conference on Environmental Ergonomics, Boston, August 4, 2009. (poster)

Bernard, Thomas E., Caravello, Victor, McCullough, Elizabeth A., and Ashley, Candi D. "Apparent total Evaporative Resistance and clothing Adjustment Factors at Different Humidities and Metabolic Rates," 13th International Conference on Environmental Ergonomics, Boston, August 3, 2009.

McCullough, Elizabeth A. "Issues Concerning the EN 13537 Sleeping Bag Standard," Meeting of the Outdoor Industry Association, Salt Lake City, UT, July 22, 2009. (invited presentation)

McCullough, Elizabeth A. and Eckels, Steve. "Evaluation of Personal Cooling Systems for Soldiers Using Human Subjects," Annual Meeting of the International Textile and Apparel Association, Chicago, IL, November 6, 2008. (poster)

McCullough, Elizabeth A., Eckels, Steve, and Schlabach, Meredith. "Evaluation of Personal Cooling Systems for Soldiers Using a Sweating Manikin," Annual Meeting of the International Textile and Apparel Association, Chicago, IL, November 6, 2008. (poster) (*Winner: Best Paper Award*)

McCullough, Elizabeth A. "Standard Methods for Measuring the Heat Transfer Properties of Protective Clothing," 6th International Conference on Safety and Protective Fabrics, (part of the IFAI Expo 2008), October 20, 2008.

Caravello, Victor, McCullough, Elizabeth A., Ashley, Candi D., and Bernard, Thomas E. "Total Evaporative Resistance Using Wear Trials for Five Clothing Ensembles," 12th International Conference on Environmental Ergonomics, Piran, Slovenia, August 19-24, 2007.

Dionne, Jean-Philippe, Wang, Jinkai, and McCullough, Elizabeth A., "Development and Application of ASTM F 2371-05 Standard Test Method for Measuring the Performance of Personal Cooling Systems Using Sweating Manikins," Third European Conference on Protective Clothing (ECPC) and NOKOBETEF 8, Gdynia, Poland, May 10-12, 2006 (poster).

McCullough, Elizabeth A., Huang, Jianhua, and Jones, Byron W., “Evaluation of EN 13537 and other Models for Predicting Temperature Ratings of Sleeping Bags,” Eleventh International Conference on Environmental Ergonomics, Ystad, Sweden, May 2005 (poster).

McCullough, Elizabeth A., Huang, Jianhua, and Deaton, Shawn, “Methods of Measuring the Clothing Area Factor,” Eleventh International Conference on Environmental Ergonomics, Ystad, Sweden, May 2005 (poster).

McCullough, Elizabeth A. and Huang, Jianhua, “Determining Temperature Ratings for Sleeping Bag Comfort,” Annual Meeting of the International Textiles and Apparel Association, Portland, OR, November 2-9, 2004.

McCullough, Elizabeth A., “Methods for Measuring and Predicting the Thermal Comfort of Clothing,” invited presentation at a workshop entitled, “Interface: Materials, Technology, and Design for Apparel,” held at Nike Headquarters in conjunction with the Annual Meeting of the International Textiles and Apparel Association, Portland, OR, November 3, 2004. (invited presentation)

McCullough, Elizabeth A., “Methods for Measuring and Predicting the Thermal Comfort of Clothing,” Meeting of the Fiber Society, Ithica, NY, October 13, 2004.

McCullough, Elizabeth A., “Methods for Predicting the Temperature Ratings of Sleeping Bags,” Meeting of the Outdoor Industry Association, Salt Lake City, UT, August 14, 2004. (invited presentation)

McCullough, Elizabeth A., “Methods for Measuring the Performance Characteristics of Sleeping Bags,” Meeting of the Outdoor Industry Association, Salt Lake City, UT, August 13, 2004. (invited presentation)

McCullough, Elizabeth A., “Methods for Measuring and Predicting Clothing Comfort,” invited presentation to research personnel at the Kimberly-Clark Corporation in Atlanta, GA, March 25, 2004.

McCullough, Elizabeth A., “An Explanation and Discussion of Sweating Hot Plate Standards,” Eighth ASTM Symposium on the Performance of Protective Clothing, Tampa, FL, January 13-14, 2004.

Zuo, Jing and McCullough, Elizabeth A., “Heat Transfer Characteristics of Sports Apparel,” Eighth ASTM Symposium on the Performance of Protective Clothing, Tampa, FL, January 13-14, 2004. (poster)

Richards, Mark and McCullough, Elizabeth A. “Validation of the Sweating Agile Thermal Manikin Under Steady-State Conditions,” Eighth ASTM Symposium on the Performance of Protective Clothing, Tampa, FL, January 13-14, 2004.

McCullough, Elizabeth A. “Comfort and Safety: Protective Clothing Dilemma,” Annual Meeting of the International Textiles and Apparel Association, Savannah, GA, October 11, 2003 (Distinguished Scholar Lecture).

McCullough, Elizabeth A., Kwon, Myoungsook, and Shim, Huensup, “A Database of Water Vapor Permeability Values for Shell Fabrics,” Industrial Fabrics Association International EXPO 2003, Las Vegas, NV, October 1, 2003.

McCullough, Elizabeth A. and Zuo, Jing, “Thermal Insulation and Evaporative Resistance Values for Sports Apparel,” Annual Meeting of the American College of Sports Medicine, San Francisco, CA, May 28, 2003.

Dionne, Jean-Philippe, Semeniuk, Kevin, Makris, Aris, and McCullough, Elizabeth A., "Using Thermal Manikins to Compare the Performance of Various Personal Cooling Garments," Second European Conference on Protective Clothing (ECPC) and NOKOBETEF 7, Montreux, Switzerland, May 21-24, 2003.

McCullough, Elizabeth A., "Comfort and Safety: Protective Clothing Dilemma," Spring Technical Meeting of the AATCC Midwest Section, Lincoln, NE, April 25, 2003. (invited presentation)

McCullough, Elizabeth A., "The Use of Thermal Manikins to Evaluate Clothing and Environmental Factors," invited keynote presentation at the International Conference on Environmental Ergonomics, Fukuoka, Japan, September 23-27, 2002.

McCullough, Elizabeth A., "Interlaboratory Evaluation of Sweating Manikins," International Conference on Environmental Ergonomics, Fukuoka, Japan, September 23-27, 2002.

McCullough, Elizabeth A., "Textile Competencies Needed by Interior Designers," Annual Meeting of the International Textile and Apparel Association, Kansas City, MO, November 11, 2001.

McCullough, Elizabeth A., "Phase Change Applications in Clothing," invited presentation at the Industrial Fabrics Association International Expo, Nashville, TN, October 18, 2001.

McCullough, Elizabeth A., "Interlaboratory Study of Sweating Manikins," Fourth International Meeting on Thermal Manikins, St. Gallen, Switzerland, September 27-28, 2001.

McCullough, Elizabeth A., "Standards for Evaluating the Performance of Protective Clothing," KSCT/ITAA Joint Word Conference, Seoul, Korea, June 12-15, 2001. (invited presentation)

Kwon, Myoung Sook and McCullough, Elizabeth A., "Methods for Evaluating the Performance of Shell Fabrics used in Outdoor Apparel," KSCT/ITAA Joint Word Conference, Seoul, Korea, June 12-15, 2001. (poster)

Shim, Huensup and McCullough, Elizabeth A., "The Effectiveness of Phase Change Materials in Clothing," KSCT/ITAA Joint Word Conference, Seoul, Korea, June 12-15, 2001. (poster)

McCullough, Elizabeth A., "The Use of Clothing in Thermal Comfort Standards," International Conference on Moving Thermal Comfort Standards into the 21st Century, Windsor, United Kingdom, April 5-8, 2001.

McCullough, Elizabeth A., "Factors Affecting the Thermal Comfort of Clothing," Human Ecology Centennial Celebration, Cornell University, Ithica, NY, March 31, 2001. (invited presentation)

McCullough, Elizabeth A., "The Effectiveness of Phase Change Materials in Outdoor Clothing," Textile Update 2000, Winnipeg, Manitoba, Canada, November 4, 2000. (invited presentation)

McCullough, Elizabeth A., "Factors Affecting the Thermal Comfort of Clothing," Human Ecology 90th Anniversary Celebration, University of Manitoba, Winnipeg, Manitoba, Canada, November 3, 2000. (invited presentation)

McCullough, Elizabeth A. and Shim, Huensup, "Protective Clothing Materials and Their Contribution to Heat Stress," International Conference on Occupational Health, Symposium on Heat Stress, Singapore, August 26, 2000.

Shim, Huensup and McCullough, Elizabeth A., “The Effectiveness of Phase Change Materials in Outdoor Clothing,” European Conference on Protective Clothing, Stockholm, Sweden, May 7-10, 2000.

Shim, Huensup and McCullough, Elizabeth A., “The Effectiveness of Phase Change Materials in Outdoor Clothing,” IFAI International Conference on Safety and Protective Fabrics, Arlington, VA, April 26-28, 2000.

McCullough, Elizabeth A. and Kim, Chil Soon, “Static and Dynamic Insulation Values for Cold Weather Protective Clothing,” ASTM International Symposium on the Performance of Protective Clothing,” Seattle, WA, June 29-30, 1999.

McCullough, Elizabeth A. and Johnson, Phillip W., and Shim, H., “A Comparison of ASTM F1670 and ASTM F1819 Standards for Measuring the Barrier Properties of Protective Clothing,” ASTM International Symposium on the Performance of Protective Clothing,” Seattle, WA, June 29-30, 1999.

McCullough, Elizabeth A., “Standard Methods for Measuring the Barrier Properties of Textiles,” Index ‘99 International Nonwovens Exhibition and Congress, Geneva, Switzerland, May 3-5, 1999.

McCullough, Elizabeth A., “Hot Plate vs. Manikin Measurements of Thermal Resistance,” International Conference on Environmental Ergonomics, San Diego, CA, October 20, 1998.

Jones, Byron W., Hong, Sungae, and McCullough, Elizabeth A., “Detailed Projected Area Data for the Human Body,” Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Toronto, Canada, June 1998.

McCullough, Elizabeth A. and Johnson, Phillip W., “A New Standard for Measuring the Barrier Properties of Protective Fabrics with a Mechanical Pressure Tester,” The Industrial Fabrics Association’s International Conference on Safety and Protective Fabrics, May 1, 1998.

McCullough, Elizabeth A., “The Use of Thermal Manikins at Kansas State University: Sam and Fred,” The First International Thermal Manikin Forum, Halifax, Nova Scotia, Canada, June 22, 1997.

McCullough, Elizabeth A., “Hot Plate vs. Manikin Measurements of Thermal Resistance,” The First International Thermal Manikin Forum, Halifax, Nova Scotia, Canada, June 22, 1997.

McCullough, Elizabeth A., “Measuring the Insulation Provided by Battings, Apparel, and Bedding,” INDA Highloft Conference, Charlotte, NC, March 25, 1997.

McCullough, Elizabeth A. and Kim, Chil Soon, “Insulation Values for Cold Weather Clothing Under Static and Dynamic Conditions,” International Conference on Environmental Ergonomics, Jerusalem, Israel, October 30, 1996.

McCullough, Elizabeth A. and Johnson, Phillip W., “Evaluation of a New Mechanical Pressure Tester for Barrier Fabrics,” ASTM International Symposium on Protective Clothing, Orlando, FL, June 19, 1996.

Kim, Chil Soon and McCullough, Elizabeth, “An Insulation Data Base for Cold Weather Clothing Under Static and Dynamic Conditions,” Meeting of the Korean Society of Clothing Textiles, Seoul, Korea, April 12, 1996.

McCullough, Elizabeth A., "New Developments in Barrier Test Methods," IDEA '95 - The International Nonwovens Conference and Exhibition, Philadelphia, PA, April 26, 1995.

McCullough, Elizabeth A., "New Developments in Manikin Technology," International Conference on Environmental Ergonomics, Montebello, Quebec, Canada, September 28, 1994.

McCullough, Elizabeth A., "Selecting Surgical Gowns Based on the Level of Risk of Exposure to Bloodborne Pathogens," Symposium on Exposure to Bloodborne Pathogens sponsored by the American College of Surgeons and the Centers of Disease Control and Prevention, Atlanta, GA, March 10, 1994.

McCullough, Elizabeth A., "Determining the Insulation Value and Temperature Rating of Sleeping Bags," Meeting of the Outdoor Retailer Coalition of America, Reno, NV, August 20, 1994. (invited presentation)

McCullough, Elizabeth A. and Hong, Sungae, "A Data Base for Determining the Decrease in Clothing Insulation Due to Body Motion," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, New Orleans, LA, January 24, 1994.

McCullough, Elizabeth A., Olesen, Bjarne W., and Hong, Sungae, "Thermal Insulation Provided by Chairs," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, New Orleans, LA, January 24, 1994.

McCullough, Elizabeth A. and Hong, Sungae, "A Data Base for Determining the Decrease in Clothing Insulation Due to Body Motion," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, New Orleans, LA, January 23, 1994.

Hong, Sungae and McCullough, Elizabeth A., "Prediction of Dynamic Insulation from Clothing and Textile Characteristics," Meeting of the Korean Society of Clothing Textiles, Seoul, Korea, October 16, 1993.

McCullough, Elizabeth A., "Selection of Surgical Gowns: Comfort, Safety, and Cost," Workshop of the Association of Operating Room Nurses, Baltimore, MD, November 20, 1993. (invited presentation)

McCullough, Elizabeth A., "Measuring the Barrier Properties of Medical Nonwovens," Third Annual TANDEC Conference, Knoxville, TN, November 1, 1993.

McCullough, Elizabeth A., "Evaluation of the Barrier Properties of Surgical Gowns," Symposium on Blood Exposure in the Operating Room: Risks and Prevention Strategies, Sponsored by the Association for Practitioners in Infection Control, Orlando, FL, May 22, 1993.

Goodyear, Gail E., McCullough, Elizabeth A., and Jones, Byron W., "Evaluating the Water Vapor Transfer of Fabrics Utilized in Protective Apparel," Second International Symposium on Consumer Environmental Issues: Safety, Health, Chemicals, and Textiles in the Near Environment, St. Petersburg, FL, May 5-8, 1993.

McCullough, Elizabeth A., "Methods for Measuring the Barrier Properties of Surgical Gowns," Meeting of the South American Institute of Rationalization in Analysis of Materials (IRAM), Buenos Aires, Argentina, May 6, 1993. (invited presentation)

McCullough, Elizabeth A., "The Role of Materials in Preventing Infection in the Operating Room," Aids '93 International Symposium, Buenos Aires, Argentina, May 7, 1993.

McCullough, Elizabeth A., "Methods for Measuring the Barrier Properties of Surgical Gowns," INDEX 93 Congress of the European Disposables and Nonwovens Association, Geneva, Switzerland, April 23, 1993.

McCullough, Elizabeth A., "New ASTM Test Methods for Evaluating the Barrier Properties of Surgical Apparel," Annual Meeting of the Association of Operating Room Nurses, Anaheim, CA, March 2, 1993.

McCullough, Elizabeth A. and Hong, Sungae, "A Data Base for Determining the Effect of Walking on Clothing Insulation," Fifth International Conference on Environmental Ergonomics, Maastricht, the Netherlands, November 3, 1992.

McCullough, Elizabeth A., "Comfort vs. Barrier Protection in Surgical Gown Fabrics," Industrial Fabric and Equipment Exposition, Phoenix, AZ, October 5, 1992.

Schoenberger, Lucinda K. and McCullough, Elizabeth A., "Liquid Barrier and Thermal Comfort Properties of Selected Surgical Gowns," Meeting of the International Textile and Apparel Association, San Francisco, CA, October 31, 1991.

McCullough, Elizabeth A., "Liquid Barrier and Thermal Comfort Properties of Surgical Gowns," Pacific Polymer Conference, Shiga, Japan, November 28, 1991.

McCullough, Elizabeth A., "The Transient Thermal Responses of Different Types of Clothing Due to Humidity Step Changes," Second International Symposium on Clothing Comfort Studies in Mt. Fuji, Fuji Institute of Education and Training, Japan, November 30, 1991.

McCullough, Elizabeth A., "Factors Affecting the Resistance to Heat Transfer Provided by Clothing," International Conference on Human-Environmental System in Tokyo, Japan, December 4, 1991.

McCullough, Elizabeth A. and Schoenberger, Lucinda, "A Comparison of Methods for Measuring the Liquid Barrier Properties of Surgical Gowns," Fourth International Symposium on the Performance of Protective Clothing, Montreal, Quebec, Canada, June 19, 1991.

Goodyear, Gail E., McCullough, Elizabeth A., and Jones, Byron W., "A Comparison of Methods for Evaluating the Water Vapor Resistance of Fabrics," Fourth International Symposium on the Performance of Protective Clothing, Montreal, Quebec, Canada, June 19, 1991.

McCullough, Elizabeth A. and Schoenberger, Lucinda, "Liquid Barrier and Thermal Comfort Properties of Surgical Gowns," INDA-TEC meeting, Orlando, FL, April 10, 1991.

Searle, Cherry and McCullough, Elizabeth A., "Comfort Properties of Selected Lingerie Fabrics," National Meeting of the Association of College Professors of Textiles and Clothing, Denver, CO, November 1, 1990.

McCullough, Elizabeth A., "Physical Techniques for Determining the Resistance to Heat Transfer Provided by Clothing," Fourth International Conference on Environmental Ergonomics, Austin, TX, October 2, 1990.

Jones, Byron W., Ito, Masumi, and McCullough, Elizabeth A., "Transient Thermal Response of Clothing Systems," Fourth International Conference on Environmental Ergonomics, Austin, TX, October 2, 1990.

McCullough, Elizabeth A. and Averell, Robert, "Improved Mattress Comfort Through the Use of Highloft Batting," IDEA '90 Conference and Exposition, Meeting of the Association of the Nonwoven Fabrics Industry, Washington, D.C., September 26, 1990.

McCullough, Elizabeth A., "Protective Clothing Research Techniques," Meeting of the American Home Economics Association, San Antonio, TX, June 27, 1990.

Crews, Patricia, Sievert, Sheila, and McCullough, Elizabeth A., "Evaluation of Milkweed Floss as an Insulative Fill Material," Meeting of the American Chemical Society, Miami, FL, September 10-15, 1989.

McCullough, Elizabeth A., Jones, Byron W., and Tamura, Teruko, "A Data Base for Determining the Evaporative Resistance of Clothing," Meeting of the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Vancouver, British Columbia, Canada, June 25, 1989.

Tamura, Teruko, McCullough, Elizabeth A., and Jones, Byron W., "Estimation of Dry and Evaporative Heat Resistance of Clothing," 12th Man-Thermal Environment Symposium, Tokyo Institute of Technology, Japan, December 9-10, 1988.

McCullough, Elizabeth A., "Methods for Evaluating Clothing Comfort," Regional Meeting of the Association of College Professors of Textiles and Clothing, Kansas City, MO, October 22, 1988.

McCullough, Elizabeth A., "Methods for Evaluating Clothing Comfort," Meeting of the Japan Research Association for Textile End-Uses, Nara, Japan, September 1, 1988.

McCullough, Elizabeth A., "Methods for Measuring and Estimating the Insulation of Clothing Systems," International Symposium on Clothing Comfort Studies, Mt. Fuji, Japan, August 29, 1988.

McCullough, Elizabeth A., "Moisture Permeability of Clothing," Third International Conference on Environmental Ergonomics, Helsinki, Finland, August 10, 1988.

McCullough, Elizabeth A., "A Systematic Approach to Work Clothing Selection," Meeting of the Clothing Science Group, London, England, December 3, 1987.

McCullough, Elizabeth A., "Methods for the Evaluation of Cold Weather Clothing Systems," Symposium on Cold Weather Clothing, University of Alberta, Edmonton, Alberta, Canada, May 15, 1987.

McCullough, Elizabeth A., Zbikowski, Patricia J., and Jones, Byron W., "Measurement and Prediction of the Insulation Provided by Bedding Systems," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, New York City, NY, January 18, 1987.

Huck, Janice and McCullough, Elizabeth A., "Fire Fighter Turnout Clothing: Physiological/Subjective Evaluation," Second International Symposium on the Performance of Protective Clothing, Tampa, FL, January 22, 1987.

Zbikowski, Patricia J. and McCullough, Elizabeth A., "Insulation Characteristics of Bedding Systems," National Meeting of the Association of College Professors of Textiles and Clothing, Houston, TX, October 24, 1986.

Huck, Janice and McCullough, Elizabeth A., "Evaluation of Protective Clothing Systems for Structural Fire Fighting," National Meeting of the Association of College Professors of Textiles and Clothing, Houston, TX, October 24, 1986.

McCullough, Elizabeth A., and Jones, Byron W., "Measurement and Estimation of Indoor Clothing Insulation," Second International Conference on Environmental Ergonomics, Whistler, British Columbia, Canada, July 21-25, 1986.

McCullough, Elizabeth A., and Jones, Byron W., "A Comparison of Methods for Estimating Clothing Insulation," International CLIMA 2000 Meeting, Copenhagen, Denmark, August 25-30, 1985.

Jones, Byron W. and McCullough, Elizabeth A., "Computer Modeling for Estimation of Clothing Insulation," International CLIMA 2000 Meeting, Copenhagen, Denmark, August 25-30, 1985.

McCullough, Elizabeth A., Jones, Byron W., and Huck, Janice, "A Comprehensive Data Base for Estimating Clothing Insulation," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Honolulu, HI, June 23, 1985.

Choi, Hei-Sun, McCullough, Elizabeth A., and Rohles, Frederick H., "A Cross-Cultural Study of Clothing and Thermal Comfort," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Honolulu, HI, June 23, 1985.

Zhu, Xian-Sen, McCullough, Elizabeth A., and Jones, Byron W., "Thermal Insulation of Layered Chinese Clothing," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Honolulu, HI, June 23, 1985.

McCullough, Elizabeth A., "Measurement and Prediction of Clothing Insulation," Symposium on Fabric Comfort, North Carolina State University, Raleigh, NC, September 20-21, 1984. (invited presentation)

McCullough, Elizabeth A., "The Effect of Garment Design and Fabric Type on the Thermal Insulation Provided by Clothing," National Meeting of the Association of College Professors of Textiles and Clothing, Honolulu, HI, July 7, 1983.

Huck, Janice and McCullough, Elizabeth A., "Thermal Insulation Values of Outdoor Garments and Fabric Systems," National Meeting of the Association of College Professors of Textiles and Clothing, Honolulu, HI, July 7, 1983.

McCullough, Elizabeth A. and Wyon, David P., "Insulation Characteristics of Winter and Summer Indoor Clothing," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Washington, D.C., June 28, 1983.

McCullough, Elizabeth A., Jones, Byron W., and Zbikowski, Patricia J., "The Effect of Garment Design on the Thermal Insulation of Clothing," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Washington, D.C., June 28, 1983.

Holzle, Amy M., Munson, Deanna M., McCullough, Elizabeth A., and Rohles, Frederick H., "A Validation Study of the ASHRAE Summer Envelope," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Atlantic City, NJ, January 28, 1983.

Konz, Stephan A., Rohles, Frederick J., and McCullough, Elizabeth A., "Male Responses to Intermittent Heat," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Atlantic City, NJ, January 28, 1983.

Wagner, Janet and McCullough, Elizabeth A., "A Comparison of the Ability of Family Life Cycle and Family Composition Models to Predict Family Clothing Expenditures," Regional Meeting of the Association of College Professors of Textiles and Clothing, Minneapolis, MN, October 29, 1982.

McCullough, Elizabeth A., Arpin, Emily J., Jones, Byron W., Konz, Stephan A., and Rohles, Frederick H., "Heat Transfer Characteristics of Clothing Worn in Hot Industrial Environments," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning, Houston, TX, January 28, 1982.

McCullough, Elizabeth A., Arpin, Emily J., Jones, Byron W., Konz, Stephan A., and Rohles, Frederick H., "Heat Transfer Characteristics of Clothing Worn in Hot Industrial Environments," Meeting of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Houston, TX, January 28, 1982.

McCullough, Elizabeth A., Rohles, Frederick H., and Konz, Stephan A., "Measuring the Thermal Insulation and Permeability of Protective Clothing Using a Copper Manikin," International Conference on Protective Clothing Systems, Stockholm, Sweden, August 26, 1981.

Konz, Stephan A., Rohles, Frederick, and McCullough, Elizabeth A., "The Effectiveness of Water Cooling Under Protective Clothing at Temperatures Between 22 and 55°C," International Conference on Protective Clothing Systems, Stockholm, Sweden, August 26, 1981.

Rohles, Frederick H., Konz, Stephan A., and McCullough, Elizabeth A., "A Scaling Procedure for Evaluating the Comfort Characteristics of Protective Clothing," International Conference on Protective Clothing Systems, Stockholm, Sweden, August 25, 1981.

McCullough, Elizabeth A., "Measuring the Thermal Insulation of Jackets and Sleeping Bags Using a Copper Manikin," National Meeting of the Association of College Professors of Textiles and Clothing, Washington, D.C., October 30, 1980.

Rohles, Frederick H., McCullough, Elizabeth A., and Munson, Deanna, "How Warm is a Warm Jacket?," A Symposium on Human Factors and Industrial Design in Consumer Products, Tufts University, Medford, MA, May 28-30, 1980.

Rohles, Frederick H., and McCullough, Elizabeth A., "Clothing as a Key to Energy Conservation," Annual Meeting of the American Chemical Society Symposium on Thermal Comfort, Houston, TX, March 26, 1980.

McCullough, Elizabeth A., "Insulation Values of Clothing Worn in Heat Stress Industries," Annual Meeting of the North Central Region Committee No. 65, Manhattan, Kansas, February 7, 1980.

McCullough, Elizabeth A. and Noel, Charles J., "Flammability Characteristics of Layered Fabric Assemblies," Twelfth Annual Meeting of the Information Council of Fabric Flammability, New York, NY, December 7, 1978.

McCullough, Elizabeth A., "Flammability Characteristics of Layered Fabric Assemblies," Regional Meeting of the Association of College Professors of Textiles and Clothing, Chicago, IL, October 27, 1978.

Sponsored Research Grants and Contracts from External Funding Sources

2010 Contract from the U.S. Army PM Special Operations Forces Survival, Support & Equipment Systems for a project entitled, "Thermal Insulation Values for Military Cold Weather Clothing," \$1,317.

- 2010-12 Grant from the U.S. Army for a project entitled, "Evaluation of Personal Cooling Systems for Soldiers," \$359,927 (Elizabeth McCullough, Principal Investigator, Steve Eckels, Co-Principal Investigator).
- 2008 Contract from the Taiwan Textile Research Institute for a project entitled, "Heat Transfer Evaluation of Materials and Clothing Ensembles," \$24,477.
- 2007-09 Contract from the U.S. Army for a project entitled, "Thermal Properties of Military Textile Products," \$1,000; 28,000 (amount increases as testing services are ordered; cap of \$5,500,000).
- 2006 Grant from Lands' End, Inc. for a project entitled, "Determining the Insulation Values and Temperature Ratings for Children's Outdoor Clothing," \$40,057.
- 2006 Contract from the Taiwan Textile Research Institute for a project entitled, "An Interlaboratory Study of Hot Plate Tests," \$20,586.
- 2005-06 Grant from the U.S. Army for a project entitled, "A Comprehensive Evaluation of Personal Cooling Systems for Soldiers," \$474,503 (Elizabeth McCullough, Principal Investigator, Steve Eckels, Co-Principal Investigator).
- 2005 Grant from Professionals Choice Sports Medicine Products for a project entitled, "Performance Evaluation of Saddle Pads," \$22,513.
- 2005 Contract from the U.S. Army for a project entitled, "Evaluation of the New Modular Sleeping Bag System," \$14,454.
- 2005 Grant from the U.S. Army Rapid Equipping Force for a project entitled, "Evaluation of New Clothing Technologies for Military Applications," \$69,451.
- 2005 Contract from the U.S. Army for a project entitled, "Thermal Insulation Values for T-Shirt Fabrics," \$24,090.
- 2004 Contract from W.L. Gore and Associates for a project entitled, "Development of a Multifunctional Airflow Hood for a Sweating Hot Plate," \$10,000.
- 2000-04 Grant from BHA Technologies, Inc. for a project entitled, "Moisture Vapor Transmission Properties of Fabric/Film Laminates," \$68,000; extension of \$10,000, then \$5,000.
- 2003 Contract with MSX International (for Ford Motor Company) for a project entitled, "Comfort Evaluation of Automobile Seats," \$17,024 (with Steve Eckels).
- 2002 Contract with Underwriter's Laboratory and numerous manufacturers for a project entitled, "Certification of the Total Heat Loss Values for Fire Fighter Fabric Assemblies for Underwriters Laboratory," \$21,800.
- 2001 Grant from Cotton Incorporated for a project entitled, "Fabric Hand Characteristics," \$3,987.
- 2001 Contract with Underwriter's Laboratory and numerous manufacturers for a project entitled, "Certification of the Total Heat Loss Values for Fire Fighter Fabric Assemblies for Underwriters

- Laboratory,” \$107,600. Specific sponsors were: Southern Mills, Lion Apparel, Securitex, DuPont, and Ricochet Manufacturing.
- 2001 Grant from DuPont Nonwovens for a project entitled, “Fabric Hand Characteristics of Medical Nonwovens,” \$5,020.
- 2001 Grant from BHA Technologies, Inc. for a project entitled, “Development of a Dynamic Moisture Permeation Cell,” \$25,000.
- 2001 Grant from RefrigiWear, Inc. for a project entitled, “Comparing the Insulating Properties of Transport Bags,” \$1,746.
- 2001 Contract from U.S. Army Natick RD & E Center for a project entitled, “Evaluation of Super-Absorbent Fibers in Cooling Garments,” \$1,826.
- 2001 Contract with Underwriter’s Laboratory and numerous manufacturers for a project entitled, “Certification of the Total Heat Loss Values for Fire Fighter Fabric Assemblies for Underwriters Laboratory,” \$46,200. Specific sponsors were: Southern Mills, Lion Apparel, Securitex, DuPont, and Ricochet Manufacturing.
- 2000 Contract with Underwriter’s Laboratory and numerous manufacturers for a project entitled, “Certification of the Total Heat Loss Values for Fire Fighter Fabric Assemblies for Underwriters Laboratory,” \$248,400. Specific sponsors were: Globe Manufacturing, Quaker Safety Products, Southern Mills, Lion Apparel, Securitex, Morning Pride, Westex, Starfield Safetywear, Difco Performance Fabrics, Stedfast, Inc., Coated Fabrics International, BASF, Fire-Dex, and Bristol.
- 1999 Grant from Polo Ralph Lauren for a project entitled, “The Use of Phase Change Materials in Clothing,” \$20,046.
- 1998 Grant from Celanese Acetate for a project entitled, “A Comparison of the Comfort and Hand Characteristics of Jacket Linings,” \$24,433.
- 1996 Grant from the United Kingdom Ministry of Defense (DRA) for a project entitled, “The Evaporative Resistance of Aircrew Clothing,” \$12,994.
- 1994 Grant from Oceaneering Space Systems for a project entitled, "Physiological Evaluation of an Advanced Worker Protection System," \$13,227.
- 1994 Grant from 3M Corporation for a project entitled, "A Comparison of the Barrier Properties of Surgical Gowns Using Different Pressure Methods," \$6,000.
- 1994 Grant from Mayo Foundation for a project entitled, "A Comparison of the Barrier Properties of Surgical Gowns Using Different Pressure Methods," \$9,965.
- 1994 Grant from Kimberly-Clark Corporation for a project entitled, "The Effects of Laundering and Sterilization on the Barrier Properties of ROTECNO Surgical Gowns," \$26,790.
- 1993 Grant from 3M Corporation for a project entitled, "Evaluation of the Thermal Insulation Properties of Sleeping Bags," \$24,000.

- 1994 Grant from 3M Corporation and the Mayo Foundation for a project entitled, "A Comparison of the Barrier Properties of Surgical Gowns Using Different Pressure Methods," \$15,965.
- 1992 Grant from the 3M Corporation for a project entitled, "Thermal Comfort Properties of Selected Surgical Gowns," \$27,046.
- 1991 Grant from American Society of Heating, Refrigerating, and Air-Conditioning Engineers for a project entitled, "Character of Thermal Loads Imposed by Mass Rapid Transit Passengers on Vehicles' Environment Control Systems," with Byron W. Jones, \$98,798.
- 1991-92 Grant from W.L. Gore and Associates, Inc. for a project entitled, "Liquid Barrier and Thermal Comfort Properties of Reinforced Surgical Gowns," \$25,295.
- 1991-92 Grant from the Simmons Company for a project entitled, "Field Evaluation of Mattress Comfort," \$22,180.
- 1990-91 Grant from the Department of the Army for a project entitled, "Expansion of an Insulation Data Base for Military Clothing," \$49,283.
- 1990 Grant from Hoechst Celanese Corporation for a project entitled, "Thermal Evaluation of Sleeping Bags," \$8,356.
- 1989 Grant from Kansas Technology Enterprise Corporation and Surfaces Research and Applications for a project entitled, "Thermal Comfort Properties of Textiles with Novel Heat-Retentive Coatings," \$25,880.
- 1989 Contract with U.S. Army Natick Research, Development and Engineering Center on measuring the insulation values of selected sleeping bags, \$25,200, with Byron W. Jones.
- 1989 Grant from Allied Fibers for a project entitled, "Evaluation of the Comfort Properties of Lingerie Fabrics," \$24,547.
- 1989 Grant from Hoechst Celanese Corporation for a project entitled, "Evaluation of the Comfort Properties of Pillows, Part II," \$20,591.
- 1988-89 Grant from Hoechst Celanese Corporation for a project entitled, "Evaluation of the Comfort Properties of Pillows," \$20,219.
- 1988 Grant from the Simmons Company for a project entitled, "Field and Laboratory Evaluation of the Comfort Characteristics of Mattresses," \$15,000.
- 1987-88 Grant from the Department of the Army for extending a project entitled, "An Insulation Data Base for Military Clothing," \$6,895.
- 1987 Grant from Celanese Corporation for a project entitled, "Evaluation of the Comfort Properties of Selected Mattresses," \$65,665.
- 1986-87 Grant from the Department of the Army for extending a project entitled, "An Insulation Data Base for Military Clothing," \$49,965.

- 1985 Grant from the Department of the Army for a project entitled, "An Insulation Data Base for Military Clothing," \$49,941.
- 1985 Equipment grant from the National Science Foundation for a computer control system, a sweating hot plate, and a thermography system, \$27,000 plus KSU matching funds, with Byron W. Jones.
- 1984-85 Grant from the American Society for Engineering Education for a project entitled, "Astronaut Glove Design Team Competition," \$29,945, with Stephan A. Konz, Byron W. Jones, and George W. Eggeman.
- 1983-84 Grant from American Society of Heating, Refrigerating, and Air-Conditioning Engineers for a project entitled, "A Comprehensive Data Base for Estimating Clothing Insulation," \$30,564.
- 1981-82 Grant from American Society of Heating, Refrigerating, and Air-Conditioning Engineers for a project entitled, "The Effect of Garment Design and Fabric Thickness and Weight on the Thermal Insulation Value of Clothing," \$28,570.
- 1980-81 Grant from U.S. Public Health Service for continuation of a project entitled, "Physiological Responses to Exposure to Intermittent Heat," \$73,000, with Frederick H. Rohles, Jr. and Stephan A. Konz.
- 1979-80 Grant from U.S. Public Health Service for a project entitled, "Physiological Responses to Exposure to Intermittent Heat," \$230,000, with Frederick H. Rohles, Jr. and Stephan A. Konz.
- 1978-79 Grant from Consumers Union for a project entitled, "Comparison of the Performance Characteristics of Synthetic Suede Fabrics," \$1,300.

Testing Contracts (\$3,321,519)

Dr. McCullough has generated extramural funding for testing the thermal properties of fabrics, sleeping bags, and clothing systems using a sweating hot plate and thermal manikins. She has also evaluated the performance of products using human subjects in environmental chambers and in the field. Some companies have sponsored numerous projects. The technical reports written for these projects are too numerous to reference here, and most are not available to the public. Some of the company sponsors are listed below.

Company Sponsors of Testing Projects

180's Inc.	Brookwood Laminating	Fleet Street
3M Canada	BSAF	Free Country
3M Corporation	Bureau Veritas, Inc	GE Energy
Adventure One	Burlington Industries	Gehring Textiles, Inc.
Adventure Tech	Cabela's	Gentex Corporation
Aerostar International	Camp Spa	Geomet Technologies
AITEX	Canadian Recreation Products	Globe Manufacturing
Albany International	Cardinal Health	Golite
Aldan Industries	Caribbean Needlepoint, Inc.	Greenland Sales, Ltd.
Allen-Vanguard	Caribou Mountaineering	H & S Integrated
Allied Signal, Inc.	Carter Industries	H. Koch & Sons
Aluminum Company of America	Cascade Designs	Hansen-WeatherPORT
American Allsafe Company	Celanese Advanced Materials	Helbling Precision Engineer.
American Eagle Outfitters	Coleman Company	Hoechst Celanese Corporation
American Quality Assurance	Columbia Sportswear	Industrias Notesa
American Recreation Products	Consumers Union	Intel
Amoco Fabrics	Corra Consulting	International Down and Feather Lab
Apex Mills Corporation	Cotton Incorporated	International Personnel Protection
Archipel	D.V. Talbott Company	Intertek Testing Services
Arctic Shield, Inc.	Difco Performance Fabrics	Invista
Ariat International	Diversified Sales, Inc.	Isratex
Arthur D. Little, Inc.	Donaldson Company	J.C. Penney
Ash City	Donovan Enterprises	Jim Wagner Designs
Ashburn Hill Corp.	Draper Knitting Company	Jinwoong USA
Aspen Aerogel	E.I. DuPont De Nemours & Co., Inc.	Johnson Outdoors Gear
Bacou-Dalloz	Early Winters, Ltd.	Kappler
Barbour International	Eastern Mountain Sports	Kathmandu
Bata Shoe Corporation	East-West Industries	Kelty Pack, Inc.
Berkshire Blanket, Inc.	Ecostat Systems Co.	Kenyon Industries
BHA Technologies, Inc.	Eddie Bauer	Kiddopotamus & Company
Big Agnes, Inc.	Eleventh Floor Apparel, Ltd.	Kimberly-Clark Corporation
BioCool Technologies	Europe Bound	KOSA
Bird's Eye View Engineering	ExposureWear, Inc.	L. L. Bean
Black Water Designs	Exxel Outdoors	LaCrosse Footwear, Inc.
Blackbird Technologies	Exxon Chemical Company	Lands' End
Blank Textiles	Ezrasons, Inc.	Leggett & Platt, Inc.
Boulder Outdoor Specialty Grp	Fabrictex	Lion Apparel
Boy Scouts of America	Fiber Industries	London Fog
Bristol Uniforms	Fittex	

Lortex	Quaker Safety Products	United Feather and Down
LVC Corp.	Reebok	Vartest Labs
MACPAC, Ltd.	RefrigiWear, Inc.	Volcom
Malden Mills	REI	W.L. Gore & Associates, Inc.
Marathon Apparel	Ricochet Manufacturing	Walls Industries, Inc.
Marmot Mountain Int.	S.D. Miller & Associates	Wellman, Inc.
Marv Holland	Safariland	Western Mountaineering
Massif Mountain Gear	Sant Law International Co.	Western Nonwovens
Med-Eng Systems	Securitex	Westex Inc.
Milliken	Sierra Designs	Wild Things Gear
Mitsui and Company	Simms Fishing Products	Woods Canada
Molynycke	Southern Mills	Zbag
Montbell Co., Ltd.	Specialty Plastic Products	
Moonstone Mountaineering	Springs Industries	
Mountain Equipment Co-op	Starfield Safetywear	
Mountain Hardware	Stedfast, Inc.	
Mountain's Best Gear	Sympatex Technologies	
Mountainsmith	Tectonic Outdoors	
Multi-Tech Corporation	Tennier Industries	
Nanopore, Inc.	Texas IM-EX, Inc.	
Natural Fiber Corporation	Thermalon Industries	
NEMO Equipment	ThermoAnalytics	
New Balance	Tomen America	
Nike	Total Quality Apparel	
Nitritex Canada	Resource	
North Atlantic Group, Inc.	Trace Laboratories	
North Coast Ventures	TRI/Environmental	
North Face	Triosyn Corp.	
North Pole	Triton Systems, Inc.	
Novecon Technology	TTI-Blakemore Group	
Pacific Coast Feather Co.	Tullahoma Industries	
Pacific Outdoor Equipment	TYCO Healthcare Group LP	
PBI Performance Products, Inc.	U.S. Army	
Proctor and Gamble	Under Armour, Inc.	
Propper International	Underwriters Laboratory	
	Unistar International	

Internal Funding Awards

- 1991 Kansas State University Faculty Development Award for travel to Japan, \$600.
- 1983 Kansas State University Faculty Research Award, \$1,000.
- 1983 Received Summer Research Fellowship from the College of Home Economics at Kansas State University, \$2,250.
- 1982 Kansas State University Faculty Research Award, \$1,150.
- 1979 Kansas State University Faculty Research Award, \$1,500.
- 1978 Kansas State University Faculty Research Award, \$815.
- 1978 Funding from Agricultural Experiment Station at Kansas State University for a Random Tumble Pilling Tester, \$925.

Induction into Honoraries

Phi Kappa Phi Scholarship Honorary
Alpha Lambda Delta Scholarship Honorary
Kappa Omicron Nu Home Economics Honorary
Phi Upsilon Omicron Home Economics Honorary
Chimes Junior Women's Honorary
Mortar Board Senior Honorary
Scarlet and Gray Service Honorary
Archons Greek Honorary
Sigma Xi Scientific Research Society

Membership in Professional Organizations

American Association for Textile Chemists and Colorists (1976 – 2007)

- Advisor of the KSU Student Chapter (2003 – 2007)

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (1980-1994)

- Member and Secretary of Standards Committee for Revision of 55-1981 "Thermal Environmental Conditions for Human Occupancy" (1988 – 1989).
- Member and Secretary of Technical Committee 2.1 "Physiology and Human Environment" (1982 – 1994)
- Chair of Honors and Awards Subcommittee (1987 – 1991)

American Society for Testing and Materials (ASTM) Committee F-23 on Protective Clothing (1990-present)

- Subcommittee chair for F23.60 Human Factors (1994 – 2007)
- Chair of Awards ad hoc committee (2003)
- Nominating committee (2005)

ASTM Committee D-13 on Textiles (2009-present)

- Member D13.51 on Conditioning, and Chemical and Thermal Properties

ASTM Committee F-8 on Sports Equipment and Facilities

- Member F8.22 Camping (1992 – present)

Industrial Fabrics Association International (1990 – 2009)

International Textile and Apparel Association (1978 – 2010)

- Distinguished Scholar Award (2003)
- Vice-President for Research and Education (1991 – 1992)
- ITAA National Board (1989 – 1993)
- Graduate Education Committee, Chair (1987 – 1990)
- Local Arrangements Chairperson, Kansas City meeting (1988)
- Nominating Committee (1986)
- Treasurer (1986 – 1987)
- Publicity Committee Chairperson, Ames meeting (1985)
- Research Reports Committee Chair, Knoxville meeting (1984)
- Resource Exhibit Committee Chair, St. Louis meeting (1981)

INDA (Association of the Nonwoven Fabrics Industry) – Council of Universities (1990 – 2006)

International Conference on Environmental Ergonomics – Program Committee (Austin, TX 1990, Maastricht, Netherlands 1992, Montebello, Canada 1994, Fukuoka, Japan 2002, Sweden 2005)

International Organization for Standardization (ISO) Working Group 38/-/WG17 Physiological Properties of Textiles and Clothing (U.S. rep 1992 – 2006)

Honors and Awards

- 2009 Received the 2009 Distinguished Service Award from ASTM Committee F23 on Protective Clothing “in recognition of your outstanding leadership as Chair of the F23.60 Human Factors Subcommittee during a period of significant expansion of standards for the protection of workers against heat stress and determining the physiological response of workers wearing PPE.”
- 2008 Received the “Best Paper Award” from the International Textile and Apparel Association for a paper entitled, “Evaluation of Personal Cooling Systems for Soldiers Using a Sweating Manikin,” which was presented at the annual meeting in Chicago, Nov. 6, 2008.
- 2007 Received the Kansas State University Professorial Performance Award for sustained excellence in teaching, research, and service; \$5,235 added to base pay.
- 2005 Received the 2005 Service Award from ASTM Committee F23 on Protective Clothing “in recognition of your outstanding service and dedicated support in evaluating methods, conducting research, participating in interlaboratory study programs, assisting with the committee by-laws, and for the exemplary leadership and knowledge you shared as the Chairman of the Human Factors Subcommittee”.

- 2003 Received the 2003 Distinguished Scholar Award and \$500 from the International Textile and Apparel Association.
- 2000 Received the Harold DeWitt Smith Memorial Medal and \$1,000 Award from ASTM Committee D13 on Textiles and Albany International Research Company for “outstanding achievement in the science of textile fiber utilization”.
- 1997 Honored as one of the 100 Leaders in the history of the College of Human Ecology at the University of Tennessee as part of their Centennial Celebration, August 29, 1997.
- 1997 Honored as one of the 100 Outstanding Alumni and Friends of the College of Human Ecology at the Ohio State University, May 10, 1997.
- 1995 Received the 1995 Kansas State University Outstanding Undergraduate Teaching Award, \$1000.
- 1992 Received the Best Technical Paper Award for 1991 from INDA (the Association of the Nonwoven Fabrics Industry), \$1,000.
- 1990 Received the Manufactured Fibers Research Award from the American Fiber Manufacturers Association and the American Home Economics Foundation, \$1000.
- 1990 Received the Kappa Omicron Nu Award of Excellence for Research in the area of protective clothing.
- 1989 Received the Faculty Research Excellence Award from the College of Human Ecology at Kansas State University, \$500.
- 1985 Received Ralph F. Nevins Award for "significant accomplishment in the general area of physiology and human response to the environment" by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, \$500.
- 1985 Received the Outstanding Young Professional Award from the Ohio State University Home Economics Alumni Association.

Special Activities

Reviewer for Clothing and Textiles Research Journal, ASHRAE Transactions, International Nonwovens Journal, Ergonomics, Applied Ergonomics, Fire Safety Journal, Textile Research Journal, Medicine and Sciences in Sports and Exercise, American Journal of Infection Control, Journal of the American Industrial Hygiene Association, Measurement Science and Technology, and three special ASTM publications on the Performance of Protective Clothing.

May-June 1982 Guest researcher at the National Swedish Institute for Building Research, Gavle, Sweden.

June-July 1980 Research internship at the U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.

National Appointments

1979-81 National Advisory Committee for the Flammable Fabrics Act; advised Consumer Product Safety Commission concerning policies and standards for textile flammability.

National Competition Winner

1985 Member of the Kansas State spacesuit glove design team which won a national competition sponsored by the National Aeronautics and Space Administration (NASA) and the American Society for Engineering Education (ASEE).