

# Dr. John M. Ennis

## Curriculum Vitae



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The Institute for Perception ▪ 7629 Hull Street Road ▪ Richmond, Virginia 23235

### ***EDUCATION***

Ph.D. (2004) Mathematics: University of California, Santa Barbara  
M.A. (2004) Mathematics: University of California, Santa Barbara  
B.S. (1998) Mathematics: Virginia Polytechnic Institute and State University  
B.S. (1998) Philosophy: Virginia Polytechnic Institute and State University

### ***EMPLOYMENT***

#### ***The Institute for Perception - Richmond, Virginia (1994 – Present)***

Vice President – Research Operations (2009 – Present)  
Research Consultant (2008 – 2009)  
Scientific Editor - IFPress Newsletter (1998 – 2007)  
Data Analyst (1994 – 1998)

#### ***University of California, Santa Barbara (2004 – 2007)***

Postdoctoral Researcher – Psychology Department

### ***PROFESSIONAL EXPERTISE***

Advertising Claims Support, Concept Testing, Discrimination Testing, Market Research, Product Development, Project Management, Sensory Science Consulting, Short Course Instruction, Software Development, Statistical Analysis, Statistical Consulting

### ***SELECTED PRODUCT CATEGORY EXPERIENCE***

Alcoholic Beverages, Child Care, Condiments, Cosmetics, Fine Fragrances, Household Care, Over-the-Counter Medications, Packaged Foods, Packaging, Personal Care, Snack Foods, Soft Drinks

### ***PROFESSIONAL MEMBERSHIPS***

American Society for Testing and Materials (ASTM), Sensometrics Society,  
Society of Sensory Professionals (SSP), The Institute of Food Technologists (IFT)

### ***SERVICE POSITIONS CURRENTLY HELD***

Chair of ASTM subcommittee E18.04 – “Fundamentals of Sensory”  
Editorial board member – Journal of Sensory Studies  
Editorial board member – Journal of Experimental Agriculture  
Secretary - Sensometrics Society  
Scientific programming committee member – IFT 2012, 2013 SCSD

### ***REVIEW ACTIVITY***

American Journal of Experimental Agriculture, Communications in Statistics, Food Quality and Preference, Journal of Chemosensory Perception, Journal of Sensory Studies

## PUBLICATIONS

- Ennis, D.M., & **Ennis, J. M.** (*in press*) Multivariate Mapping of Hedonic Data: A Process-Based Review. Submitted to *Journal of Sensory Studies*.
- Ennis, J. M.** & Christensen, R. H. B. (*in press*) Precision of measurement in Tetrad testing. Submitted to *Food Quality and Preference*.
- Christensen, R. H. B., **Ennis, J. M.**, Ennis D. M., & Brockhoff, B. (*in press*) Paired preference data with a no-preference option - statistical tests for comparison with placebo data. Submitted to *Food Quality and Preference*.
- Ennis, J. M.** (*in press*) A Thurstonian analysis of the Two-Out-of-Five test. Submitted to *Journal of Sensory Studies*.
- Rousseau, B. & **Ennis, J. M.** (*in press*) The importance of correct instructions in the Tetrad test. Submitted to *Journal of Sensory Studies*.
- Jesionka, V., Rousseau, B., & **Ennis, J. M.** (*in press*) Transitioning from Proportion of Discriminators to a more meaningful measure of sensory difference. *Food Quality and Preference*.
- Ennis, D. M. & **Ennis, J. M.** (2013) Analysis and Thurstonian scaling of applicability scores. *Journal of Sensory Studies*, 28, 188-193.
- Worch, T. & **Ennis, J. M.** (2013) Investigating the single ideal assumption using Ideal Profile Method. *Food Quality and Preference*, 29, 40-47.
- Ennis, D. M. & **Ennis, J. M.** (2013) A Thurstonian ranking model with rank-induced dependencies. *Journal of Classification*. 30, 124-147
- Jervis, S. M., **Ennis, J. M.**, & Drake, M. A. (2012) A Comparison of adaptive choice-based conjoint and choice-based conjoint to determine key choice attributes of sour cream with limited sample size. *Journal of Sensory Studies*. 27(6), 452-462.
- Ennis, J. M.** (2012) Guiding the switch from triangle testing to tetrad testing. *Journal of Sensory Studies*. 27(4), 223-231.
- Garcia, K., **Ennis, J. M.**, and Prinyawiwatkul, W. (2012) A large-scale experimental comparison of the tetrad and triangle tests in children. *Journal of Sensory Studies*. 27(4), 217-222.
- Ennis, J. M.**, Fayle, C. M., & Ennis, D. M. (2012) . Assignment-minimum clique coverings. *Journal of Experimental Algorithmics (JEA)*. 17(1), 1.5:1-1.5:17.
- Ennis, J. M.** & Ennis, D. M. (2012). Justifying count-based comparisons. *Journal of Sensory Studies*, 27(2), 130-136.
- Ennis, J. M.**, & Ennis, D. M. (2012). A comparison of three commonly used methods for treating no preference votes. *Journal of Sensory Studies*, 27(2), 123-129.
- Nestrud, M. A., **Ennis, J. M.**, & Lawless, H. T. (2012). A group level validation of the supercombinatorality property: Finding high-quality ingredient combinations using pairwise information. *Food Quality and Preference*, 25(1), 23-28.
- Ennis, J. M.**, Fayle, C. M., & Ennis, D. M. (2012). eTURF: A competitive TURF algorithm for large datasets. *Food Quality and Preference*, 23(1), 44-48.
- Ennis, D. M. & **Ennis, J. M.** (2012). Accounting for no difference/preference responses or ties in choice experiments. *Food Quality and Preference*, 23(1), 13-17.
- Ennis, J. M.** & Jesionka, V. (2011). The power of sensory discrimination methods revisited. *Journal of Sensory Studies*, 26(5), 371-382.
- Ennis, J. M.** & Ennis, D. M. (2011). Confidence bounds for multiplicative comparisons. *Communications in Statistics: Theory and Methods*, 40(17), 3049-3054.
- Nestrud, M. A., **Ennis, J. M.**, Fayle, C. M., Ennis, D. M., & Lawless, H. T. (2011). Validating a graph theoretic screening approach to food item combinations. *Journal of Sensory Studies*, 26(5), 331-338.
- Ennis, D. M. & **Ennis, J. M.** (2010). Equivalence hypothesis testing: Reply to Bi. *Food Quality and Preference*, 21, 261.
- Ennis, D. M. & **Ennis, J. M.** (2010). Equivalence hypothesis testing. *Food Quality and Preference*, 21(3), 253-256.
- Ennis, J. M.** & Wei, G. (2010). Describing the universal cover of a noncompact limit. *Geometry & Topology*, 14, 2479-2496.
- Ennis, D. M. & **Ennis, J. M.** (2009). Hypothesis testing for equivalence based on symmetric open intervals. *Communications in Statistics - Theory and Methods*, 38(11), 1792-1803.

- Ennis, D. M., **Ennis, J. M.**, Palen, J., & Lampe, R. (2008). Confidence bounds for positive ratios of normal random variables. *Communications in Statistics - Theory and Methods*, **37**, 307-317.
- Ashby, F.G., **Ennis, J. M.** & Spiering, B. (2007). A neurobiological theory of automaticity in perceptual categorization. *Psychological Review*, **114**(3), 632-656.
- Ashby, F. G. & **Ennis, J. M.** (2006). The role of the basal ganglia in category learning. *The Psychology of Learning and Motivation*, **46**, 1-36.
- Ennis, J. M.** & Wei, G. (2006). Describing the universal cover of a compact limit. *Differential Geometry and its Applications*, **24**(5), 554–562.
- Bi, J., Templeton-Janik, L., **Ennis, J. M.**, & Ennis, D. M. (2000). Replicated difference and preference tests: How to account for inter-trial variation. *Food Quality and Preference*, **11**, 269-273.
- Ennis, J. M.**, Ennis, D. M., Yip, D. & O'Mahony, M. (1998). Thurstonian models for variants of the method of tetrads. *British Journal of Mathematical and Statistical Psychology*, **51**, 205-215.

### **ARTICLES UNDER REVIEW**

- Garcia, K., **Ennis, J. M.**, and Prinyawiwatkul, W. (*in review*) Reconsidering the Specified Tetrad Test. Submitted to *Journal of Sensory Studies*.

### **BOOKS**

- Ennis, D. M., Rousseau, B. & **Ennis, J. M.** (2013). *Short Stories in Sensory and Consumer Science*, Richmond, VA: The Institute for Perception.

### **TECHNICAL REPORTS**

- Ennis, J. M.**, Rousseau, B., and Ennis, D. M. (2012). Proper Task Instructions and the Two-out-of-Five Test. *IFPress*, **15**(4), 4-5.
- Ennis, J. M.** and Ennis, D. M. (2012). Efficient Representation of Pairwise Sensory Information. *IFPress*, **15**(3), 3-4.
- Rousseau, B., **Ennis, J. M.**, and Ennis, D. M. (2012). Deciphering the Language of Emotions to Develop an Emotion Lexicon. *IFPress*, **15**(2), 3-4.
- Ennis, J. M.** & Rousseau, B. (2012). Reducing Costs with Tetrad Testing. *IFPress*, **15**(1), 3-4.
- Ennis, D. M. & **Ennis, J. M.** (2011). Interpreting Applicability Scores. *IFPress*, **14**(4), 3-4.
- Ennis, J. M.**, Fayle, C.M. & Ennis, D.M. (2011). From Many to Few: A Graph Theoretic Screening Tool for Product Developers. *IFPress*, **14**(2), 2-3
- Ennis, D. M. & **Ennis, J. M.** (2011). How to Set Identity Norms for No Preference Data. *IFPress*, **14**(1), 2-3.
- Ennis, D. M. & **Ennis, J. M.** (2010). How to Account for “No Difference / Preference” Counts. *IFPress*, **13**(3), 2-3.
- Ennis, J. M.** & Fayle, C. M. (2010). Portfolio Optimization Based on First Choice. *IFPress*, **13**(2), 2-3.
- Ennis, J. M.**, Fayle, C. M. & Ennis, D. M. (2011). Optimum Product Selection for a Drivers of Liking Project. *IFPress*, **13**(1), 2-3.
- Ennis, J. M.** & Ennis, D. M. (2009). Multiplicative versus Ratio Comparisons. *IFPress*, **12**(2), 2-3
- Ennis, D. M. & **Ennis, J. M.** (2008). New Developments in Equivalence Testing. *IFPress*, **11**(4), 2-3.
- Ennis, J. M.** & Ennis, D. M. (2008). Conditional Ratio Statements. *IFPress*, **11**(2), 2-3.

### **WORKSHOPS ORGANIZED AT INTERNATIONAL MEETINGS**

- Ennis, J. M.**, Cowden, J., Garcia, K., & Punter, P. (2012). An Exploration of Tetrad Testing. Workshop chaired at 2012 Society of Sensory Professionals, Jersey City, USA.
- Ennis, J. M.**, Loss, C. R., Nestrud, M. A., & Rossi, F. (2011). Combinatorial Tools in Sensory Science and Consumer Research. Workshop chaired at 2011 Pangborn Sensory Science Symposium, Toronto, Canada.

## ***PRESENTATIONS AT INTERNATIONAL MEETINGS***

- Ennis, J. M.**, Christensen, R. H. B., Ennis, D. M., Rousseau, B. (2012). The Sensitivity of the Tetrad, Triangle, and Degree of Difference Tests. Talk given at 2012 Society of Sensory Professionals, Jersey City, USA.
- Ennis, J. M.** & Rousseau, B. (2012). Developing an Emotional Lexicon Using Landscape Segmentation Analysis (LSA) and Graph Theoretic Analysis (GTA). Poster presented at 2012 Society of Sensory Professionals, Jersey City, USA.
- Ennis, J. M.**, Lu, J. C., & Carr, B. T. (2012). A New Approach to Product Selection with Numerous Practical Constraints. Poster presented at 2012 Society of Sensory Professionals, Jersey City, USA.
- Ennis, D. M. & **Ennis, J. M.** (2012). Analysis and Thurstonian Scaling of Applicability Scores. Poster presented at 2012 Society of Sensory Professionals, Jersey City, USA.
- Worch, T. & **Ennis, J. M.** (2012). A Cooperative Approach to Product Optimization. Poster presented at 2012 Society of Sensory Professionals, Jersey City, USA.
- Christensen, R. H. B., **Ennis, J. M.**, Ennis, D. M., & Brockhoff, P. B. (2012). A New Statistic to Detect Segmentation or Unequal Variance in 2-Alternative Choice (2-AC) Testing. Talk given at 2012 Sensometrics Conference, Rennes, France.
- Ennis, J. M.** & Corbett, C. (2012). Finding Best Product-bundles of Sparkling Fruit-juice Beverages using Graph Theoretic Analysis (GTA). Talk given at 2012 Sensometrics Conference, Rennes, France.
- Ennis, J. M.** & Christensen, R. H. B. (2012). Advances in Tetrad Testing. Talk given at 2012 Sensometrics Conference, Rennes, France.
- Ennis, J. M.**, Fayle, C. M., & Ennis, D. M. (2012) Compact Letter Displays to Concisely Represent Pairwise Sensory Information. Poster presented at 2012 Sensometrics Conference, Rennes, France.
- Christensen, R. H. B., **Ennis, J. M.**, Ennis, D. M., & Brockhoff, P. B. (2012). A Thurstonian model for the Degree of Difference Test with Extensions to Unequal Variance, Sequence Effects and Replicated Data. Talk given at 2012 Sensometrics Conference, Rennes, France.
- Jesionka, V., **Ennis, J. M.**, & Rousseau, B. (2012). Transitioning from Proportion of Distinguishers to a More Meaningful Measure of Sensory Difference. Talk given at 2012 Sensometrics Conference, Rennes, France.
- Ennis, J. M.** & Rousseau, B. (2012). An Introduction to Graph Theoretic Tools for Sensory and Consumer Scientists. Tutorial taught prior to 2012 Sensometrics Conference, Rennes, France.
- Ennis, J. M.**, Fayle, C.M., & Ennis, D.M. (2011). Selecting the Best Combinatorial Tool for Your Specific Challenges. Talk given at 2011 Pangborn Sensory Science Symposium, Toronto, Canada.
- Ennis, J. M.** & Ennis, D. M. (2011). Establishing Identity Norms for No Preference Data. Poster presented at 2011 Pangborn Sensory Science Symposium, Toronto, Canada.
- Ennis, J. M.**, Ennis, D. M., & Fayle, C. M. (2011). Searching for a Single Grain of Sand: How to Find Optimal Combinations of Features or Components. Poster presented at 2011 Pangborn Sensory Science Symposium, Toronto, Canada.
- Ennis, J. M.** (2011). Busting the Myth that the Power of the 3\_AFC over the Triangle comes from Attribute Awareness. Talk given at 2011 ASTM, Anaheim, USA.
- Ennis, J. M.** & Ennis, D. M. (2010). How to Best Account for 'No Preference' Counts. Talk given at 2010 Society of Sensory Professionals, Napa, USA.
- Ennis, J. M.** & Ennis, D.M. (2010). Recommendations for 'No Preference' Responses. Talk given at 2010 Sensometrics Conference, Rotterdam, The Netherlands.
- Ennis, J. M.** & Ennis, D.M. (2010). Chi Square Control Charts. Talk given at 2010 Sensometrics Conference, Rotterdam, The Netherlands.
- Ennis, J. M.** (2010). New Methods - Alternate Methods for Consideration. Talk given at 2010 ASTM, St. Louis, USA.
- Ennis, J. M.**, Rousseau, B., & Ennis, D.M. (2010). Successful Product Development using a Consumer Perspective. Talk given at 2010 ASTM, St. Louis, USA.
- Ennis, J. M.** & Ennis, D. M. (2009). Multiplicative Comparisons of Normal Variables. Talk given at 2009 ASTM, Vancouver, Canada.
- Ennis, J. M.** & Ennis, D. M. (2009). Lower Bounds for Multiplicative Comparisons. Talk given at 2009 Joint Statistical Meetings, Washington DC, USA.
- Ennis, J. M.**, & Ennis, D. M. (2008) Ratios of Normal Variables in Superiority Claims. Talk given at 2008 Sensometrics Conference, St. Catherine's, Canada.

## ***THEORETICAL CONTRIBUTIONS TO SENSORY SCIENCE***

- Innovation of the Tetrad test as an alternative to the Triangle test (with Daniel Ennis and Michael O'Mahony)
- Invention of Graph Theoretic Analysis (GTA) for analysis of pairwise sensory data (with Daniel Ennis and Charles Fayle)
- Validation of Graph Theoretic Analysis at individual and group levels (with Michael Nestrud and Harry Lawless)
- Invention of eTURF, the first exact algorithm for Total Unduplicated Reach and Frequency of large datasets (with Charles Fayle)
- Statistical and psychological analysis of the proper treatment of “no-preference votes (with Daniel Ennis, Rune Christensen, and Per Brockhoff)
- Solution to problem of multiple ideal points in unfolding, using Ideal Profile Method (with Thierry Worch)
- Statistics for equivalence testing of sensory quantities (with Daniel Ennis)
- Statistics for multiplicative and count-based comparisons of sensory quantities (with Daniel Ennis)

## ***PROFESSIONAL COURSES TAUGHT***

### ***Tools and Applications of Sensory and Consumer Product Testing***

Williamsburg, Virginia (2008, 2009)

White Sulphur Springs, West Virginia (2008, 2009)

### ***Seeing the Market through the Eyes of the Consumer***

Williamsburg, Virginia (2008, 2009)

White Sulphur Springs, West Virginia (2008, 2009)

### ***Creating Optimal Products and Portfolios***

Rotterdam, The Netherlands (2010)

### ***Sensory Product and Concept Testing: Analyses, Applications and Computer Workshop***

Williamsburg, Virginia (2010, 2011)

### ***Drivers of Liking<sup>™</sup>, Segmentation and Portfolio Optimization***

White Sulphur Springs, West Virginia (2010, 2011)

### ***Sensory Testing for Product Development and Claims Support***

New Orleans, Louisiana (2011) [Invited Pre-IFT short course]

### ***Combinatorial Tools for Sensory and Consumer Scientists***

New Orleans, Louisiana (2011) [Invited Pre-IFT short course]

### ***Current Topic in Sensory and Consumer Science***

Toronto, Canada (2011)

### ***A Powerful Framework for Sensory Product Testing***

Brussels, Belgium (2011, 2012)

Williamsburg, Virginia (2012)

### ***Drivers of Liking<sup>®</sup> and Product Portfolio Optimization***

Brussels, Belgium (2011, 2012)

### ***Combinatorial Tools for Product and Brand Optimization***

White Sulphur Springs, West Virginia (2011, 2012)

### ***Descriptive Analysis and Panel Training***

Williamsburg, Virginia (2012)

### ***Advertising Claims Support: Case Histories and Principles***

Sea Island, Georgia (2012)

### ***Drivers of Liking<sup>®</sup> and Emotion Mapping***

White Sulphur Springs, West Virginia (2012)

### ***SOFTWARE DEVELOPMENT***

IFPrograms™ Software libraries (developed in FORTRAN 95)

### ***AWARDS AND SCHOLARSHIPS***

ASTM E18 - Award of Appreciation (2012)  
University of California, Santa Barbara - Outstanding Educator (2003)  
Virginia Polytechnic Institute - Outstanding Graduating Senior – Mathematics (1998)  
Virginia Polytechnic Institute - Outstanding Graduating Senior – Philosophy (1998)  
Virginia Polytechnic Institute – Hatcher Scholarship for Mathematics (1994, 1995)

### ***PERSONAL NOTES***

Con conversationally proficient in Dutch, French, and Portuguese  
Competitive swing dancer: Amateur Grand Slam winner, 2007 National Jitterbug Championship  
Swing dance instructor (with wife Ruth Brown) in Richmond, VA, USA  
Passionate about the preservation and development of vintage jazz dancing