

# Anthony Hayter, Ph.D.

Full Professor  
Department of Statistics and Operations Technology  
Daniels College of Business  
University of Denver  
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## Degrees

Ph.D., 1985, Cornell University, Statistics,  
M.Sc., 1984, Cornell University, Statistics,  
M.A., 1986, Cambridge University, Mathematics,  
B.A., 1982, Cambridge University, Mathematics (triple first class).

## Employment

Department Chair and Full Professor, Department of Statistics and Operations Technology,  
Daniels College of Business, University of Denver, 2006-2010.  
Associate Professor, School of Industrial and Systems Engineering,  
Georgia Institute of Technology, 1991-2006.  
Visiting Assistant Professor, Department of Statistics, Ohio State University, 1991.  
Lecturer, University of Bath, United Kingdom, 1987-1990.

## **Professional and Corporate Relations**

Consultancy work in statistics and mathematics.

Expert witness and trial testimony.

Consulting clients: ADA Environmental Solutions, Alta Colleges, Association of Veterinary Practice Management Consultants and Advisors, Coca Cola, Cooper Industries, CVS Pharmacy, Department of Defense, First Data, Freeport-McMoRan Mining Company, Georgia Department of Transportation, Hartford Insurance, Huber Corporation, Location3 Media, Metro Wastewater Reclamation District, Quiznos, The Kroger Company.

Site Review Team Member at the National Institutes of Health. Review of scientific procedures and management of the Division of Epidemiology, Statistics and Prevention Research at the National Institute of Child Health and Human Development, 2008.

Attended the ABEST21 meeting concerning the development of accreditation procedures for Asian business schools, 2008.

Workshop for business leaders on “The Importance of Statistical and Quantitative Analytical Skills in Business and Management Today - how they can help you if you have them, or hurt you if you don't have them.”

Module 1 - Using Data Effectively

Module 2 - The Data Analyst's Toolbox - Extracting Information from Data

Module 3 - Building Models for Understanding and Prediction

Module 4 - What can Probability Theory do for You?

Module 5 - Ethical Considerations in Probability and Statistics.

Five week Executive MBA class on “Statistical Data Analysis.”

## **Professional Memberships**

Member of the American Statistical Association, 1991-present.

Member of the Institute for Operations Research and the Management Sciences, 2006-present.

### **Keynote Speaker**

Keynote Speaker at the German Biometric Society Meeting, 1998.

Keynote Speaker at the International Conference on Recent Advances in Statistics, Institute of Mathematical Statistics, Tokyo, Japan, 2000.

Keynote Speaker at the Osaka Meeting of the Japanese Society for Quality Control on Quality Management and Global Competition, Japan, 2009.

### **Published Textbook**

“Probability and Statistics for Engineers and Scientists”

1<sup>st</sup> edition, PWS, 1996,

2<sup>nd</sup> edition, Duxbury, 2002,

3<sup>rd</sup> edition, Brooks-Cole, 2006.

This textbook has been adopted by over 60 universities in the USA, Canada, Australia, England, Korea, Malaysia, Mexico, Singapore, Sweden, Taiwan, and Thailand.

#### **Table of Contents for my Textbook**

- Probability Theory
- Random Variables
- Discrete Probability Distributions
- Continuous Probability Distributions
- The Normal Distribution
- Descriptive Statistics
- Statistical Estimation and Sampling Distributions
- Inference on a Population Mean
- Comparing Two Population Means
- Discrete Data Analysis
- The Analysis of Variance
- Simple Linear Regression and Correlation
- Multiple Linear Regression and Nonlinear Regression
- Multifactor Experimental Design and Analysis
- Nonparametric Statistical Analysis
- Quality Control Methods
- Reliability Analysis and Life Testing
- Case Study: Microelectronic Solder Joints

### Panelist

Panelist at Corporate Counsel Conference on Employment Litigation Issues, Las Vegas, 2007.

Panelist on “How to Attain Quality Excellence by Statistical and Related Methodologies,” 7<sup>th</sup> Asian Network for Quality Congress, Tokyo, Japan, 2009.

### Editorial and Review Work for Journals

Associate Editor of the “Journal of Statistical Computation and Simulation,” 1997-2001.

Associate Editor of the “Journal of the Japanese Statistical Society,” 2001-2008.

Associate Editor of the “Annals of the Institute of Statistical Mathematics,” 2002-present.

#### **Referee work for the following journals:**

Annals of Statistics, Applied Statistics, Biometrical Journal, Biometrics, Biometrika, Canadian Journal of Statistics, Communications In Statistics, IIE Transactions, Journal of Quality Control, Journal of Statistical Computation and Simulation, Journal of Statistical Planning and Inference, Journal of the American Statistical Association, Journal of the Royal Statistical Society, Psychometrics, Technometrics, Scandinavian Journal of Statistics, Statistics and Decisions, Journal of Applied Mathematics and Decision Sciences, Statistics in Medicine.

### Research and Teaching Interests

Statistics, probability, data analysis, quantitative skills, survey sampling, quality control, experimental design, management science.

### **Courses Taught – Undergraduate Level**

- Statistics and Applications
- Probability Theory and Applications
- Introduction to Statistical Methods
- Design of Experiments
- Quality Control
- Stochastic Processes

- Mathematical Theory of Statistics
- Business Statistics

### **Courses Taught – Graduate Level**

- Statistical Multiplicity and High-Dimensional Computation
- Statistical Modeling and the Design of Experiments
- Probability and Statistics
- Nonparametric Data Analysis
- Linear Regression Analysis
- Categorical Data Analysis
- Topics in Nonlinear Regression
- Advanced Experimental Design
- Mathematical Theory of Statistics
- Advanced Linear Models
- Survival Analysis and Reliability Theory
- Business Statistics

### **Other Teaching Activities**

Invited contributor to the Video Library, Institute of Statistical Mathematics, Tokyo, “Topics in Directional Inference,” 1998.

Invited contributor to the Video Library, Radiation Effects Research Foundation, Hiroshima, Japan, “An Overview of Simultaneous Inference Procedures,” 1999.

Invited contributor to the Video Library, Institute of Statistical Mathematics, Tokyo, “Multiple Comparisons and Nonlinear Dose Response Analysis,” 2000.

Presentation on “Statistical Process Control” to the Kroger Company, 2007.

### **Refereed Publications**

(1) Hayter, A. J., “A proof of the conjecture that the Tukey-Kramer multiple comparisons procedure is conservative,” *The Annals of Statistics*, vol. 12, 61-75, 1984.

(2) Hayter, A. J., “The maximum familywise error rate of Fisher's least significant difference test,” *Journal of the American Statistical Association*, vol. 81, 1000-1004, 1986.

- (3) Hayter, A. J., "Pairwise comparisons of generally correlated means," *Journal of the American Statistical Association*, vol. 85, 208-213, 1989.
- (4) Hayter, A. J., "Selecting the largest mean when the variances are unequal," *Communications in Statistics, Theory and Methods*, vol. 18, no. 4, 1455-1468, 1989.
- (5) Hirotsu, C., Kuriki, S., and Hayter, A. J., "The multiple comparison procedure based on the maximal component of the cumulative chi-squared statistic-calculation of significance probability and its application to comparison of dose levels," *Japanese Journal of Applied Statistics*, 18, 129-142, 1989.
- (6) Hayter, A. J. and Liu, W., "The power function of the Studentized range test," *The Annals of Statistics*, vol. 18, no. 1, 465-468, 1990.
- (7) Hayter, A. J. and Liu, W., "Power assessment for tests of the equality of several proportions," *Communications in Statistics, Theory and Methods*, vol. 19, no. 1, 19-30, 1990.
- (8) Hayter, A. J., "A one-sided studentized range test for testing against ordered alternatives," *Journal of the American Statistical Association*, vol. 85, 778-785, 1990.
- (9) Hayter, A. J. and Tamhane, A. C., "Sample size determination for step-down multiple comparison procedures: orthogonal contrasts and comparisons with a control," *Journal of Statistical Planning and Inference*, vol. 27, 271-290, 1991.
- (10) Bechhofer, R. E., Hayter, A. J. and Tamhane, A. C., "Optimal sample size allocation for selecting the best of several normal populations with known unequal variances," *Journal of Statistical Planning and Inference*, vol. 28, 271-289, 1991.
- (11) Hayter, A. J. and Stone, G., "Distribution free multiple comparisons for monotonically ordered treatment effects," *Australian Journal of Statistics*, vol. 33, no. 3, 345-346, 1991.
- (12) Hayter, A. J., "Multiple comparisons of three ordered normal means for unbalanced models," *Journal of Computational Statistics and Data Analysis*, vol.13, 153-162, 1992.
- (13) Santner, T. J. and Hayter, A. J., "The least favorable configuration of a two-stage procedure for selecting the largest normal mean," *Multiple Comparisons in Biostatistics: Current Research in the Topics of C.W. Dunnett*, Marcel Dekker, Inc., 247-265, 1992.
- (14) Hayter, A. J. and Liu, W., "Some minimax test procedures for comparing several normal means," *Multiple Comparisons in Biostatistics: Current Research in the Topics of C.W. Dunnett*, Marcel Dekker, Inc., 137-148, 1992.

- (15) Hayter, A. J. and Liu, W., “A method of power assessment for tests comparing several treatments with a control,” *Communications in Statistics, Theory and Methods*, vol. 21, no. 7, 1871-1889, 1992.
- (16) Hayter, A. J. and Hurn, M., “Power comparisons for tests of the equality of several normal means,” *Journal of Statistical Computation and Simulation*, vol. 42, no. 3-4, 173-185, 1992.
- (17) Hirotsu, C., Kuriki, S., and Hayter, A. J., “The multiple comparison procedure based on the maximal component of the cumulative chi-squared statistic,” *Biometrika*, vol. 79, 381-392, 1992.
- (18) Bofinger, E., Hayter, A. J. and Liu, W., “The construction of upper confidence bounds on the range of several location parameters,” *Journal of the American Statistical Association*, vol. 88, no. 423, 906-911, 1993.
- (19) Hayter, A. J. and Dowling, M., “Experimental designs and emission rate modeling for chamber experiments,” *Atmospheric Environment*, vol. 27A, no. 14, 2225-2234, 1993.
- (20) Hayter, A. J. and Hsu, J. C., “On the relationship between stepwise decision procedures and confidence sets,” *Journal of the American Statistical Association*, vol. 89, 425, 128-136, 1994.
- (21) Hayter, A. J., “On the selection probabilities of two-stage decision procedures,” *Journal of Statistical Planning and Inference*, vol. 38, 223-236, 1994.
- (22) Hayter, A. J. and Tsui, K., “Identification and quantification in multivariate quality control problems,” *Journal of Quality Technology*, vol. 26, no. 3, 197-208, 1994.
- (23) Hayter, A. J. and Liu, W., “Exact calculations for the one-sided studentized range test for testing against a simple ordered alternative,” *Journal of Computational Statistics and Data Analysis*, vol. 22, 17-25, 1996.
- (24) Hayter, A. J. and Chen, V. C. P., “Sensitivity analysis of upper confidence bounds on the range of treatment effects,” *Journal of Computational Statistics and Data Analysis*, vol. 23, 257-262, 1996.
- (25) Hayter, A. J. and Liu, W., “A note on the calculation of some order probabilities,” *The American Statistician*, vol. 50, 4, 1996.
- (26) Goldman, D., Hayter, A. J. and Kastner, T., “Multinomial selection procedures with elimination,” *Advances in Statistical Decision Theory and Applications*, 265-274, 1997.

- (27) Hayter, A. J. and Liu, W., “A test for testing against an umbrella alternative and the associated simultaneous confidence intervals,” *Computational Statistics and Data Analysis*, vol. 30, 393-401, 1999.
- (28) Miwa, T. and Hayter, A. J., “Combining the advantages of one-sided and two-sided test procedures for comparing several treatment effects,” *Journal of the American Statistical Association*, vol. 94, 445, 302-307, 1999.
- (29) Hayter, A. J., “Multivariate quality control procedures,” *Statistical Process Monitoring and Optimization*, Marcel Dekker, Inc., 209-222, 1999.
- (30) Miwa, T., Hayter, A. J. and Liu, W., “Calculation of level probabilities for normal random variables with unequal variances with applications to Bartholomew’s test in unbalanced one-way models,” *Computational Statistics and Data Analysis*, vol. 34, 1, 17-32, 2000.
- (31) Hayter, A. J., Miwa, T. and Liu, W., “Combining the advantages of one-sided and two-sided test procedures for comparing several treatments with a control,” *Journal of Statistical Planning and Inference*, vol. 86, 1, 81-99, 2000.
- (32) Liu, W., Miwa, T. and Hayter, A. J., “Simultaneous confidence interval estimation for successive comparisons of ordered treatment effects,” *Journal of Statistical Planning and Inference*, vol. 88, 1, 75-86, 2000.
- (33) Liu, W. and Hayter, A. J., “Selecting and sharpening inferences in simultaneous inference via a Bayesian approach,” *Communications in Statistics, Theory and Methods*, 30, 135-145, 2001.
- (34) Sommerville, P., Miwa, T., Liu, W. and Hayter, A. J., “Combining one-sided and two-sided confidence interval procedures for successive comparisons of ordered treatment effects,” *Biometrical Journal*, 43, 5, 533-542, 2001.
- (35) Hayter, A. J., Miwa, T., and Liu, W., “Efficient directional inference methodologies for the comparisons of three ordered treatment effects,” *Journal of the Japanese Statistical Society*, 31, 2, 153-174, 2001.
- (36) Bretz, F., Hayter, A. J. and Genz, A., “Critical point and power calculations for the studentised range test for generally correlated means,” *Journal of Statistical Computation and Simulation*, 71, 85-97, 2001.
- (37) Koyama, N. and Hayter, A. J., “One-stage and two-stage designs for clinical trials using an indifference zone approach,” *Communications in Statistics, Simulation and Computation*, 32, 1, 2002.

- (38) Kuriki, S., Shimodaira, H. and Hayter, A. J., “On the isotonic range statistic for testing against an ordered alternative,” *Journal of Statistical Planning and Inference*, 105(2), 347-362, 2002.
- (39) Hayter, A. J., “A probability analysis of the playoff system in sumo tournaments,” *Recent Advances in Statistical Research and Data Analysis*, Springer-Verlag, 2002.
- (40) Miwa, T., Hayter, A. J. and Kuriki, S., “The evaluation of general non-centered orthant probabilities,” *Journal of the Royal Statistical Society, Series B*, 65, 223-234, 2003.
- (41) Tamhane, A. C. and Hayter, A. J., “Comparing variances of several measurement methods using a randomized block design with repeat measurements: a case study,” *Advances in Ranking and Selection, Multiple Comparisons and Reliability*, Birkhauser, 165-178, 2005.
- (42) Hayter, A. J., “Recursive integration methodologies with statistical applications,” *Journal of Statistical Planning and Inference*, 136, 2284-2296, 2006.
- (43) Bath, S. K., Hayter, A. J., Cairns, D. A. and Anderson, C., “Characterization of home range using point peeling algorithms,” *Journal of Wildlife Management*, 70(2), 422-434, 2006.
- (44) Hayter, A. J., Wynn, H. and Liu, W., “Slope modified confidence bands for a simple linear regression model,” *Statistical Methodology*, 3, 186-192, 2006.
- (45) Ganesh, S., Hayter, A.J., Kim, J., Sanford, J., Sprigle, S. and Hoenig, H., “Wheelchair use by veterans newly prescribed a manual wheelchair,” *Archives of Physical Medicine and Rehabilitation*, 88, 4, 434-439, 2007.
- (46) Hayter, A. J., Liu, W. and Wynn, H., “Easy-to-construct confidence bands for comparing two simple linear regression lines,” *Journal of Statistical Planning and Inference*, 137, 1213-1225, 2007.
- (47) Hayter, A. J., “A combination multiple comparisons and subset selection procedure to identify treatments strictly inferior to the best,” *Journal of Statistical Planning and Inference*, 137, 7, 2115-2126, 2007.
- (48) Liu, W., Hayter, A. J. and Wynn, H., “Operability region equivalence: simultaneous confidence bands for the equivalence of two regression models over restricted regions,” *Biometrical Journal*, 49, 1, 144-150, 2007.
- (49) Liu, W. and Hayter, A. J., “Minimum area confidence set optimality for confidence bands in simple linear regression,” *Journal of the American Statistical Association*, 102, 477, 181-190, 2007.

- (50) Kim, J. and Hayter, A. J., “Efficient confidence interval methodologies for the non-centrality parameter of a non-central  $t$ -distribution,” *Communication in Statistics, Simulation and Computation*, 37 (4), 660-678, 2008.
- (51) Liu, W., Hayter, A. J. and Wynn, H., “Statistical inferences for linear regression models when the covariates have functional relationships: polynomial regression,” *Journal of Statistical Computation and Simulation*, 78, 4, 315-324, 2008.
- (52) Kim, J. and Hayter, A. J., “Testing the equality of the non-centrality parameters of two non-central  $t$ -distributions with identical degrees of freedom,” *Communication in Statistics, Simulation and Computation*, 37 (9): 1709-1717, 2008.
- (53) Lin, C. and Hayter, A. J., “A stepdown procedure with feedback for identifying inferiority among three treatments,” *Biometrical Journal*, 50, 5, 884-896, 2008.
- (54) Hayter, A. J., Kim, J. and Liu, W., “Critical point computations for one-sided and two-sided pairwise comparisons of three treatment means,” *Computational Statistics and Data Analysis*, 53, 463-470, 2008.
- (55) Liu, W., Hayter, A. J., Piegorsch, W. W. and Ah-Kine, P., “Comparison of Hyperbolic and Constant Width Simultaneous Confidence Bands in Multiple Linear Regression under MVCS Criterion,” *Journal of Multivariate Analysis*, 100, 1432-1439, 2009.
- (56) Hayter, A. J., Liu, W. and Ah-Kine, P. “A ray method of confidence band construction for multiple linear regression models,” *Journal of Statistical Planning and Inference*, 139, 2, 329-334, 2009.
- (57) Liu, W., Bretz, F., Hayter, A. J. and Wynn, H. P., “Assessing non-superiority, non-inferiority or equivalence when comparing two regression models over a restricted covariate region,” *Biometrics*, 65, 4, 1279-1287, 2009.
- (58) Tamhane, A. C. and Hayter, A. J., “Selecting the normal population with the smallest coefficient of variation,” *American Journal of Mathematical and Management Sciences*, 29, 1 & 2, 31-50, 2009.

### Book Review

Hayter, A. J., “Book review of *Constrained Statistical Inference: Inequality, Order, and Shape Restrictions*,” by M. J. Silvapulle and P. K. Sen,” *Biometrics*, 2005.

### Other Publications

- (1) Hayter, A. J. and Turnbull, B. W., “A forward stochastic approximation procedure for scheduling sacrifices in tumorigenicity studies,” *Proceedings of the Biopharmaceutical Section, Annual meeting of the American Statistical Association*, 126-131, 1985.
- (2) Hayter, A. J. and Chen, V. C. P., “Upper confidence bounds on the range of treatment effects,” *Statistics in Industry, Science & Technology*, Tokyo, 1994, 340-345.
- (3) Hayter, A. J. and Bush, H. M., “Nonparametric multivariate quality control procedures,” *International Conference on Statistical Methods and Statistical Computing for Quality and Productivity Improvement*, Seoul, 1995, 225-235.
- (4) Hayter, A. J., “Recent Advances in Multivariate Quality Control Procedures,” *International Conference on Quality*, Yokohama, 1996, 1017-1020.
- (5) Hayter, A. J., “On the pairwise comparisons of means,” *Proceedings of the Conference on Statistical Inference*, Tokyo, 1997.
- (6) Miwa, T. and Hayter, A. J., “Combining one-sided and two-sided effects for pairwise comparisons of means,” *Proceedings of the Annual Conference of the Japanese Statistical Society*, 1998.
- (7) Miwa, T. and Hayter, A. J., “Bartholomew’s test in unbalanced settings,” *Proceedings of the Annual Conference of the Japanese Statistical Society*, 1998.
- (8) Kuriki, S., Shimodaira, H. and Hayter, A. J., “The isotonic range statistic,” *Proceedings of the Conference on Statistical Modeling*, Osaka, Japan, 1998.
- (9) Hayter, A. J., Miwa, T. and Liu, W., “One-sided and two-sided combinations for comparisons with a control,” *Proceedings of the Conference on Statistical Testing*, Kumamoto, Japan, 1998.
- (10) Miwa, T. and Hayter, A. J., “Combining directional inference procedures for all pairwise comparisons of treatment effects,” *Proceedings of the Annual Conference of the Japanese Applied Statistics and Biometric Society*, Tokyo, 1998.
- (11) Miwa, T. and Hayter, A. J., “Combining one-sided and two-sided confidence intervals for ordered treatments,” *Proceedings of the XIXth International Biometric Conference*, Cape Town, South Africa, 1998.
- (12) Miwa, T., Hayter, A. J. and Liu, W., “Calculation of level probabilities for normal random variables with unequal variances,” *Proceedings of the 13<sup>th</sup> Annual Meeting of the Japanese Computational Statistics Society*, Hyogo, Japan, 1999.

- (13) Hayter, A. J., Miwa, T. and Liu, W., “Combining one-sided and two-sided inference procedures,” *Proceedings of the Annual Conference of the Japanese Applied Statistics and Biometric Society*, Tokyo, 1999.
- (14) Hayter, A. J., Miwa, T. and Liu, W., “Combining one-sided and two-sided simultaneous confidence intervals for comparisons against a control,” *Proceedings of the International Statistics Institute Bi-annual Meeting*, Helsinki, Finland, 1999.
- (15) Miwa, T. and Hayter, A. J., “Analysis of non-linear dose response models,” *Proceedings of the Conference on Non-Linear Modeling*, Matsuyama, Japan, 2000.
- (16) Hayter, A. J. and Miwa, T., “General procedure for combining the advantages of one-sided and two-sided confidence intervals in comparisons between ordered treatments,” *Proceedings of the East Asia Statistics Meeting*, Tokyo, 2000.
- (17) Miwa, T., Hayter, A. J. and Liu, W., “Exact calculations of the level probabilities in the unbalanced one-way models with applications to Bartholomew’s test,” *Proceedings of the 2<sup>nd</sup> International Conference on Multiple Comparisons*, Berlin, Germany, 2000.
- (18) Hayter, A. J., Miwa, T. and Liu, W., “Combining the advantages of one-sided and two-sided multiple comparison procedures,” *Proceedings of the 2<sup>nd</sup> International Conference on Multiple Comparisons*, Berlin, Germany, 2000.
- (19) Miwa, T., Hayter, A. J. and Liu, W., “Calculation of Bartholomew’s tests for ordered alternatives in unbalanced one-way models,” *Proceedings of the 20<sup>th</sup> International Biometric Conference*, San Francisco, 2000.
- (20) Miwa, T. and Hayter, A. J., “The null distribution of Bartholomew’s test in unbalanced models,” *Proceedings of the 7<sup>th</sup> Japan-China Symposium on Statistics*, Tokyo, 2000.
- (21) Miwa, T. and Hayter, A. J., “The general procedure for combining one-sided and two-sided confidence intervals of the means of correlated normal random variables,” *Proceedings of the Institute of Statistical Mathematics Symposium*, Tokyo, 2000.
- (22) Hayter, A. J. and Miwa, T., “Multiple comparisons for non-linear dose response models,” *Proceedings of the Annual Meeting of the Japanese Statistical Society*, Sapporo, Japan, 2000.
- (23) Hayter, A. J., “Some probability calculation concerning the playoff system in sumo tournaments,” *Proceedings of the Institute of Statistical Mathematics Symposium*, Tokyo, 2000.
- (24) Miwa, T., Hayter, A. J. and Kuriki, S., “Recursive integration techniques and cone dissections,” *Proceedings of the Symposium on New Developments in Multivariate Analysis and Asymptotic Theory*, Hiroshima, 2000.

- (25) Miwa, T., Hayter, A. J. and Kuriki, S., “The evaluation of multivariate normal probabilities,” *Proceedings of the Annual Conference of the Japan Society of Applied Statistics*, Kobe, 2000.
- (26) Miwa, T., Hayter, A. J. and Kuriki, S., “Simultaneous inference, recursive integration and the evaluation of multivariate normal probabilities,” *Proceedings of the 3<sup>rd</sup> Hakata Symposium on Statistics*, Fukuoka, 2000.
- (27) Miwa, T., Hayter, A. J. and Kuriki, S., “Efficient computation of high dimensional integral expressions,” *Proceedings of the 15<sup>th</sup> Annual Meeting of the Japanese Society of Computational Statistics*, Okayama, 2001.
- (28) Miwa, T., Hayter, A. J. and Kuriki, S., “The calculation of non-centered orthant probabilities,” *Proceeding of the 53<sup>rd</sup> Session of the International Statistics Institute*, Korea, 2001.
- (29) Miwa, T., and Hayter, A. J., “Combining the advantages of one-sided and two sided procedures for environmental risk assessment.” *Proceedings of the International Conference on Statistical Challenges in Environmental Health Problems*, 2001.
- (30) Miwa, T., Hayter, A. J. and Kuriki, S., “The efficient calculation of non-centered orthant probabilities,” *Proceedings of the 69<sup>th</sup> Annual Meeting of the Japan Statistical Society*, 2001.
- (31) Hayter, A. J. “The evaluation of multivariate normal probabilities,” *Proceedings of the Chiba University Workshop on Computational Statistics*, 2002.
- (32) Hayter, A. J. “Evaluating high dimensional probability expressions using recursive integration,” *Proceedings of the Yokohama University Statistics Colloquium*, 2003.
- (33) Miwa, T., Hayter, A. J. and Kuriki, S., “The dissection of polyhedral cones and its application to the evaluation of multi-normal probabilities,” *Proceedings of the 54<sup>th</sup> Session of the International Statistical Institute*, 2003.
- (34) Miwa, T., Hayter, A. J. and Kuriki, S., “The evaluation of singular orthant probabilities,” *Proceedings of the Joint Meeting of the Japanese Statistical Societies*, Hiroshima, Japan, 2005.
- (35) Hayter, A. J., Wynn, H. and Liu, W., “Slope modified confidence bands for a simple linear regression model,” *Proceedings of the Conference on Statistical Theory*, Kagoshima, Japan, 2005.

(36) Hayter, A. J., Lin, C. and Kim, P., “Recent advances in identifying inferior treatments in clinical trials and inferences on non-central t-distributions,” *Proceedings of the Conference on Several Problems on Statistical Inference*, Hokkaido, Japan, 2007.

(37) Lin, C. and Hayter, A. J., “A stepdown procedure with feedback for identifying inferiority among three treatments,” *Proceedings of the Conference on Probability and Statistics*, Kyushuu University, Japan, 2008.

(38) Hayter, A. J., “Recursive integration methodologies with statistical applications,” *Proceedings of the Conference on Computational Algebraic Statistics, Theories and Applications*, Kyoto, Japan, 2008.

### **Other Conference Presentations**

(1) Hayter, A. J., “The conservative nature of the studentized range multiple comparisons procedure,” Aarhus University, Denmark, 1989.

(2) Hayter, A. J., “The construction of upper confidence bounds on the range of several location parameters,” American Statistical Association Annual Meeting, San Francisco, 1993.

(3) Hayter, A. J., “Identification and quantification in multivariate quality control,” American Statistical Association Winter Meeting, Atlanta, 1994.

(4) Hayter, A. J. and Tsui, K., “Identification and quantification in multivariate quality control problems,” 11th Annual Quality and Productivity Research Conference, Rochester, 1994.

(5) Hayter, A. J. and Chen, V.C.P., “Assessing the Equivalence of Several Treatment Means,” Research Conference on Statistics in Industry and Technology, Institute of Mathematical Statistics, Chapel Hill, 1994.

(6) Hayter, A. J., “On the selection probabilities of two-stage decision procedures,” Conference on Multiple Decision Theory and Related Topics, Purdue University, 1995.

(7) Hayter, A. J. and Liu, W., “Exact calculations for the one-sided studentized range test for testing against a simple ordered alternative,” American Statistical Association Annual Meeting, Orlando, 1995.

(8) Hayter, A. J. and Dowling, M., “Experimental designs and emission rate modeling for chamber experiments,” 6th International Environmetrics Conference, Kuala Lumpur, 1995.

- (9) Hayter, A. J., “Recent advances in multivariate quality control,” International Conference on Multivariate Data, Hiroshima, 1997.
- (10) Hayter, A. J., “On the pairwise comparisons of means,” Conference on Statistical Inference, Tokyo, 1997.
- (11) Hayter, A. J., “Power functions of permutation invariant test procedures,” International Conference on Combinatorics and Statistical Sciences, Tokyo, 1998.
- (12) Hayter, A. J., “On the pairwise comparisons of treatment effects,” *Keynote Lecture*, German Biometric Society Annual Meeting, 1998.
- (13) Hayter, A. J., “Recent advances in combining directional inferences,” German Biometric Society Annual Meeting, 1998.
- (14) Hayter, A. J., Miwa, T. and Liu, W., “Combining the advantages of one-sided and two-sided procedures for comparing treatments with a control,” Statistical Conference, Ohio State University, 1999.
- (15) Miwa, T., Hayter, A. J. and Kuriki, S., “The efficient evaluation of multi-dimensional normal distribution functions,” Multiple Comparisons Meeting, 2002.
- (16) Miwa, T., Hayter, A. J. and Kuriki, S., “The efficient evaluation of multi-dimensional normal distribution functions,” Annual Meeting of the American Statistical Association, 2002.
- (17) Miwa, T., Hayter, A. J. and Kuriki, S., “The evaluation of normal orthant probabilities with singular correlation matrices,” Multiple Comparisons Procedures Conference, Shanghai, 2005.
- (18) Liu, W., Hayter, A. J. and Wynn, H., “Recent advances in confidence band construction and inferences,” Multiple Comparisons Procedures Conference, Shanghai, 2005.
- (19) Ganesh, S., Hayter, A.J., Kim, J., Sanford, J., Sprigle, S. and Hoenig, H., “Manual wheelchair use by community dwelling and institutionalized veterans,” Conference of the American Academy of Physical Medicine and Rehabilitation, 2005.
- (20) Ganesh, S., Hayter, A.J., Kim, J., Sanford, J., Sprigle, S. and Hoenig, H., “Manual wheelchair use by community dwelling and institutionalized veterans,” Conference of the American Geriatrics Society, 2006.

- (21) Liu, W. and Hayter, A.J., “Minimum area confidence set optimality for confidence bands in simple linear regression,” 5<sup>th</sup> International Conference on Multiple Comparisons, 2007.
- (22) Hayter, A. J. and Lin, C., “Recent advances in identifying inferior treatments in clinical trials,” East Asia Regional Biometric Conference, Tokyo, 2007.
- (23) Lin, C. and Hayter, A. J., “A stepdown procedure with feedback for identifying inferiority among three treatments,” 4<sup>th</sup> World Conference of the International Association for Statistical Computing, Yokohama, 2008.
- (24) Liu, W., Bretz, F., Hayter, A.J., Jamshidian, M., Wynn, H.P. and Zhang, Y. “Simultaneous confidence bands for regression analysis,” Novartis, Switzerland, 2008.
- (25) Liu, W., Bretz, F., Hayter, A.J., Jamshidian, M., Wynn, H.P. and Zhang, Y. “Simultaneous confidence bands for regression analysis,” International Conference on Multiple Comparisons Procedures, Japan, 2009.
- (26) Hayter, A.J., “Using data to make good management decisions,” International Conference on Advanced Data Analysis, Business Analytics, and Intelligence, Ahmedabad, India, 2009.
- (27) Hayter, A.J., “Choosing the right statistical methodology,” Makerere University Business School 14<sup>th</sup> Annual International Management Conference, Kampala, Uganda, 2009.
- (28) Hayter, A.J., “Using data to make good management decisions,” XVII International Symposium on Mathematical Methods Applied to the Sciences, San Jose, Costa Rica, 2010.

### **Invited Seminars and Presentations**

- (1) *Cornell University*, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1983.
- (2) *Imperial College*, England, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1984.
- (3) *Tsinghua University*, Taiwan, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1986.

(4) *Cheng-Kung University*, Taiwan, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1986.

(5) *National Central University*, Taiwan, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1986.

(6) *Bath University*, England, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1987.

(7) *Tokyo University*, Japan, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1988.

(8) *Tokyo University*, Japan, “Power Assessment of Tests Comparing Several Treatments with a Control,” 1988.

(9) *Osaka University*, Japan, “Minimax Test Procedures for Comparing Several Location Parameters,” 1988.

(10) *Keio University*, Japan, “Power Assessment of Tests Comparing Several Treatments with a Control,” 1988.

(11) *Hiroshima University*, Japan, “Minimax Test Procedures for Comparing Several Location Parameters,” 1988.

(12) *Tsinghua University*, Taiwan, “Power Assessment of Tests Comparing Several Treatments with a Control,” 1988.

(13) *National Central University*, Taiwan, “Minimax Test Procedures for Comparing Several Location Parameters,” 1988.

(14) *Cambridge University*, England, “The Conservative Nature of the Studentized Range Multiple Comparisons Procedure,” 1989.

(15) *City University*, England, “A One-Sided Studentized Range Test for Comparing Several Ordered Location Parameters,” 1990.

(16) *Trier University*, Germany, “A One-Sided Studentized Range Test for Comparing Several Ordered Location Parameters,” 1990.

(17) *Rice University*, “A One-Sided Studentized Range Test for Comparing Several Ordered Location Parameters,” 1990.

(18) *Ohio State University*, “A One-Sided Studentized Range Test for Comparing Several Ordered Location parameters,” 1991.

- (19) *University of Georgia*, “A One-Sided Studentized Range Test for Comparing Several Ordered Location Parameters,” 1991.
- (20) *McMaster University*, Canada, “Minimax Test Procedures for Comparing Several Location Parameters,” 1991.
- (21) *Georgia Institute of Technology*, “A One-Sided Studentized Range Test for Comparing Several Ordered Location Parameters,” 1991.
- (22) *Northwestern University*, “A One-Sided Studentized Range Test for Comparing Several Ordered Location Parameters,” 1991.
- (23) *University of South Carolina*, “Confidence Set Construction for Stepwise Decision Procedures,” 1992.
- (24) *University of Georgia*, “Confidence Set Construction for Stepwise Decision Procedures,” 1992.
- (25) *University of Singapore*, “Confidence Set Construction for Stepwise Decision Procedures,” 1995.
- (26) *University of Central Florida*, “Customized Confidence Set Construction,” 1996.
- (27) *University of North Carolina-Charlotte*, “Recent Advances in Multivariate Quality Control,” 1996.
- (28) *University of Alabama-Huntsville*, “Recent Advances in Multivariate Quality Control,” 1996.
- (29) *Clemson University*, “Customized Confidence Set Construction,” 1996.
- (30) *University of South Alabama*, “Customized Confidence Set Construction,” 1996.
- (31) *Institute of Statistical Mathematics*, Japan, “Customized Confidence Set Construction,” 1996.
- (32) *Institute of Statistical Mathematics*, Japan, “On the Selection Probabilities of Two-Stage Decision Procedures,” 1997.
- (33) *United States Military Academy*, West Point, N.Y., “Applications of Probability and Statistics,” 1997.
- (34) *University of Tokyo*, “On the Selection Probabilities of Two-stage Decision Procedures,” 1997.

- (35) *National Institute of Environmental Agriculture*, Japan, “Multiple Comparison Procedures,” 1997.
- (36) *Tsukuba University*, Japan, “On the Selection Probabilities of Two-Stage Procedures,” 1997.
- (37) *Hiroshima University*, Japan, “Recent Advances in Multivariate Quality Control,” 1997.
- (38) *Tsukuba University*, Japan, “Combining the Advantages of One-sided and Two-sided Inference Methods,” 1997.
- (39) *Institute of Statistical Mathematics*, Japan, “On the Pairwise Comparisons of Means,” 1997.
- (40) *Seoul National University*, “Recent Advances in Multivariate Quality Control,” 1998.
- (41) *Seoul National Polytechnic University*, “Current Trends in Industrial Engineering,” 1998.
- (42) *Institute of Statistical Mathematics*, Japan, “Combining One-sided and Two-sided Inference Procedures,” 1998.
- (43) *Institute of Statistical Mathematics*, Japan, “Decision Theoretic Approaches to Binary Response Data in Reliability Studies,” 1998.
- (44) *Radiation Effects Research Foundation*, Japan, “An Overview of Simultaneous Inference Procedures,” 1999.
- (45) *Institute of Statistical Mathematics*, Japan, “Non-linear Dose Response Analysis,” 2000.
- (46) *Okayama University*, Japan, “Introduction to Multiple Comparisons and Recent Research Results,” 2000.
- (47) *Atomic Radiation Research Laboratory, Hiroshima Medical University*, “Multiple Comparisons and Simultaneous Inference,” 2000.
- (48) *Institute of Statistical Mathematics*, Japan, “Introduction to Multiple Comparisons and Simultaneous Inference,” 2000.
- (49) *Washington State University*, “The Evaluation of Multivariate Normal Orthant Probabilities,” 2002.
- (50) *Kennesaw State University*, Sigma Xi Chapter, “Applications and Misapplications of Probability and Statistics,” 2005.

- (51) *Bentley College*, “Applications and Misapplications of Probability and Statistics,” 2005.
- (52) *Macalester University*, “Applications and Misapplications of Probability and Statistics,” 2005.
- (53) *University of Denver*, “Applications and Misapplications of Probability and Statistics,” 2005.
- (54) *Los Alamos National Laboratory*, “Applications and Misapplications of Probability and Statistics,” 2007.
- (55) *University of New Mexico*, “Applications and Misapplications of Probability and Statistics,” 2007.
- (56) *Colorado State University*, “Statistical Analysis of Rolling Mills in the Steel Industry, Recursive Integration Methodologies, Inferences on the Non-Centrality Parameter of a Non-Central t-Distribution, and Detecting Inferior Drugs,” 2007.
- (57) *United States Air Force Academy*, “The Importance of Statistical and Quantitative Analytical Skills in Business and Management Today,” 2007.
- (58) *Sophia University, Japan*, “Statistical analysis of rolling mills in the steel industry, recursive integration methodologies, and detecting inferior drugs,” 2007.
- (59) *Tsukuba University Business School, Japan*, “The Importance of Statistical and Quantitative Analytical Skills in Business and Management Today,” 2007.
- (60) *National Statistics Center of Japan*, “Comparisons of Statistical Use Around the World,” 2007.
- (61) *Moffitt Cancer Center & Research Institute, University of South Florida*, “Recent Advances in Identifying Inferior Treatments in Clinical Trials,” 2008.
- (62) *Osaka Institute of Technology*, “Using Data for Better Decision Making,” 2008.
- (63) *Adelphi University*, “The Challenges Facing Business Schools,” 2008.
- (64) *Santa Clara University*, “The Challenges Facing Business Schools,” 2009.
- (65) *India Institute of Technology, Mumbai*, “Topics in Inferential Statistics,” 2009.
- (66) *Sophia University, Japan*, “The Importance of Quantitative Skills in Business Decision Making,” 2009.

- (67) *Thammasat University*, Thailand, “How to use Data from CMMI to make Better Decisions,” 2009.
- (68) *Chulalongkorn University*, Thailand, “The Importance of Quantitative Skills in Business Decision Making,” 2009.
- (69) *Ritsumeikan Asia Pacific University*, Oita, Japan, “The Importance of Quantitative Skills in Business Decision Making,” 2010.

### **External Examiner**

Examiner for the doctoral dissertation of Chandra Kumar Biswas, “Design of Multivariate Statistical Process Control Charts with Statistical and Economic Approaches,” *Indian Institute of Technology*, India, 1998.

Examiner for the doctoral dissertation of N. Koyama, “Experimental Designs for Clinical Trials,” *Institute of Statistical Mathematics*, Tokyo, Japan, 2000.

Examiner for the doctoral dissertation of Muhammed Saleem, “Bayesian Analysis of Mixture Distributions,” *Quaid-i-Azam University*, Pakistan, 2009.

Examiner for the doctoral dissertation of Saima Altaf, “Statistical Analysis of Paired Comparison Models Through Bayesian Approach,” *Quaid-i-Azam University*, Pakistan, 2009.

Examiner for the doctoral dissertation of Marcus Seow Guen, “Volatility Behaviour of Malaysian Government Bond Market: Symmetric and Asymmetric Dynamics,” *Multimedia University*, Malaysia, 2010.

Examiner for the doctoral dissertation of Muhammad Zakria, “Stochastic Models for the Population of Pakistan,” *Allama Iqbal Open University*, Pakistan, 2010.

### **Ph.D. Students Supervised**

Wei Liu, 1990, “Power Analysis of Multiple Comparisons Procedures.”

Jennifer Robinson, 1996, “The Construction of Joint Confidence Sets for the Comparison of Two Exponential Distributions.”

Helen Bush, 1996, “Nonparametric Multivariate Quality Control.”

Philip DeCamp, 1997, “Efficiency of Nonparametric Confidence Intervals.”

Tom Kastner, 1997, “Multinomial Selection with Elimination.”

Generazio Hoa, 2000, “Disaggregation from Constructive to Virtual Combat Simulations.”

Jongphil Kim, 2007, “Efficient confidence interval methodologies for the non-centrality parameters of non-central t-distributions.”

Chen-ju Lin, 2007, “New methods for eliminating inferior treatments in clinical trials.”

### **Master Thesis Students Supervised**

Merilee Hurn, 1989, “A Study of the Power Functions of some Optimal Simultaneous Inference Procedures by Exact Evaluation and Simulation Techniques.”

Andy Napoli, 1996, “An Assessment of Current Statistical Analysis in Published Engineering Research.”

### **Ph.D. Student Committee Member**

Saliu Ur Rehman, 1995, “Semiparametric Modeling of Cross-semivariograms.”

Karen Emmanuel, 1996, “Multivariate Control Charts for Autocorrelated data.”

Carolina Barcenas, 1996, “Geometric Tolerance Verification - a Quality Oriented Approach.”

Chris Fowler, 1997, “Heuristic Solution Performance for the Uncapacitated Facility Location Problem with Uncertain Data.”

Chien-ho Hung, 1999, “Development of Leading Models of Metallic Contaminants Solidified by Cement Using Time Series Analysis.” *School of Civil and Environmental Engineering.*

Evelyn Wu, 2000, “Analysis of Traffic Crash Data.” *School of Civil and Environmental Engineering.*

Debora Daberkow, 2002, “A Formulation of Metamodel Implementation Processes for Complex Systems Design.” *School of Aerospace Engineering.*

Glenn Miller, 2003, “Predictive Inference Methods.”

Jennifer Muncy, 2003, “Predictive Failure Model of Flip Chip On Board Component Level Assemblies.” *School of Mechanical Engineering.*

Hyoungtae Kim, 2004, “Load Sharing and Decisions under Uncertainties in Logistics Operations.”

Gwen Malone, 2004, “Bernoulli and Multinomial Ranking and Selection Procedures.”

Seungmook Chae, 2004, “Effect of Follower Forces on Aeroelastic Stability of Flexible Structures.” *School of Aerospace Engineering.*

Ilya Lavrik, 2005, “Novel Wavelet-based Statistical Methods with Applications in Classification, Shrinkage, and Nano-scale Image Analysis.”

Seung Oh Lee, 2006, “Modeling of Local Scour Around Bridge Piers,” *Environmental Fluid Mechanics and Water Resource Group, School of Civil and Environmental Engineering.*

### **M.S. Students Committee Member**

Susan Robertson, 1993, “Usability and Viability of the Dynamic Help Toolkit.”

Tim Petit, 1994, “A Robustness Study of Gupta's Subset Selection Procedure.”

John Picciuto, 1994, “Using Lp-norm Standardized Time Series Variance Estimators for Output Analysis of Simulations.”

Eric Wiedemann, 1995, “Reducing Variance between two Systems by Inducing Correlation.”

Tasha Williams, 1995, “A Comparison of Selection Procedures for the Best Mean from a Set of Normal Populations.”

Bernd F. Schliemann, 1996, “Analysis and Modeling of the Initiative Tenet of Current Army Operations Doctrine.”

Chris Combs, 1996, “Non-Newtonian Conversion of Type II Emulsion Liquid Membranes.” *School of Chemical Engineering.*

Dennis Day, 1997, “Minimization of Cost and Target Escapes in Combat Models Using the Multivariate Polya Distribution.”

Jim Gigrich, 1997, “Comparison of Silver-Meal and Wagner-Whiten Procedures for Material Requirements Planning Under Varying Demand.”

Tadashi Watanabe, 2009, “Japan’s Preventive Strategy: The National Defense Program Guidelines in and after FY 2010.”

### **Post-Doctoral Student Supervision**

Supervisor of post-doctoral student Youngshin Park, support by a grant from the Korea Science and Engineering Foundation, 2001.

### **Novelist**

Published a series of five novels.