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Annual Report Executive Summary, 2006-07

Department of Statistics

Learning: Undergraduate
Number of undergraduates 68 majors, 22 minors Graduated 10
Learning: Graduate
Number of graduate students 70 Number of PhDs awarded: 6 Number of Masters awarded: 14 Funded on grants 6 Post-doctoral students funded 4 Funded on fellowships 2
Discovery
Number of grants 10 Amount of grants: $2,644,703

Number of publications 26 (2.6 per faculty)

Number of papers in press 30

Awards 2

Engagement

Consulting center activites 173 clients, billable dollars: $33,363

Corporate partners program – added two member resulting in 8 members

Secured funding for graduate student support from MINITAB and RJ Reynolds

Five faculty are on editorial boards of journals, one is a major journal

Diversity

Presentation at STATFEST

Mentoring of one minority graduate student to completion of Masters degree

Enhance graduate education through research topic courses

Enhance graduate experience through graduate student led seminars

Goals for 2007-08

Mentoring new faculty

Increase grant submissions and funding

Rebuild the Statistical Consulting Center

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Details

New Grants

J.P. Morgan: NSF DMS 06-04997. Symmetry and Asymmetry in Experimental Design. $144,276. Award period: September 2006 - September 2008.

E.P. Smith and Dan Spitzner. Planning support for the fisheries and aquatic resourses node of the national biological infrastructure. Subcontract with Conservation Management Institute, USGS. $25,300.

Becton – Dickinson, 2006. Total amount awarded: $46,605 ($32,793 direct and $13,812 indirect). PI: **Geoff Vining**. Project Title: BD Assistantship

Grants (continuing):

Dissecting soybean resistance to Phytophthora by QTL analysis of host and pathogen expression profiles. PI: Brett Tyler. Co PI: **Ina Hoeschele**. Source of Support: National Science Foundation. Total Amount Awarded PI Program: $6,764,465 ($693,456 Hoeschele). Total Award Period Covered: 10/1/2002-9/30/2007. Effort: 2.4 mos.

Biostatistics Consulting. Comprehensive Cancer Center Of Wake Forest University. PI: Hoeschele. Source of Support: Wake Forest University / National Institutes of Health. Total Amount Awarded: $255,612 (**Hoeschele**). Total Award Period Covered: 02/01/2006-01/31/12. Effort: 1.8 mos.

Project Title: Haplotyping and Qtl Mapping in Pedigrees with Missing Data. PI: Guimin Gao. Co-PI: Hoeschele. Source of Support: National Institutes of Health. VBI portion of amount awarded: $71,834 (**Hoeschele**). Total Award Period Covered: 4/1/2007-3/31/2011. Effort: .6 mos.

Project Title: Haplotyping and Qtl Mapping in Pedigrees with Missing Data. PI: Guimin Gao. Co-PI: Hoeschele. Source of Support: National Institutes of Health. VBI portion of amount awarded: $71,834 (**Hoeschele**). Total Award Period Covered: 4/1/2007-3/31/2011. Effort: .6 mos.

Eric P. Smith Co-PI (with S. Prisley, L. Carstensen, Jr. and K. Ye. Application of spatial uncertainty models to automate and enhance data fusion. National Geospatial Intelligence Agency. (8/1/05-7/31/08 $449,643 roughly 25% to statistics).

Eric P. Smith, Samantha Bates, Saied Mostaghimi, Gene Yagow, Kevin Brannan, Donald Orth, Jim Berkson Model-based Clustering for Classification of Aquatic Systems and Diagnosis of Ecological Stress. USEPA (10/1/2003– 9/30/2006 $844,310 over 1/3 goes to Statistics)

E.P. Smith. Fiscal Year 2006 Work Plan for the Water Quality Advisory Committee Stream Condition Index, $1,650

Eric P. Smith: Principal Investigator (with Penelope Pooler). 2006. Cooperation And Collaboration On Vital Signs Monitoring Program Of The Northeast Coastal And Barrier Network And Eastern Rivers And Mountain Network Of The National Park Service. National Park Service $112,017 (100% to statistics).

Books (published or in-press):

Montgomery, D.C., Peck, E.A., and Vining, G.G. (2006). *Introduction to Linear Regression Analysis*, 4th ed. New York: John Wiley. (2006).

Papers Published:

Williams, James D., Woodall, William H., Birch, Jeffrey B., and Sullivan, Joe H. 2006. Distributional Properties of the Multivariate T2 Statistic Based on the Successive Differences Covariance Matrix Estimator. *Journal of Quality Technology* 38, 3, pp 217-229.

Du, P., and Gu, C., (2006), Penalized likelihood hazard estimation: efficient approximation and Bayesian confidence intervals. *Statistics and Probability Letters*, 76, 244-254

Hoeschele I. (2007) Mapping quantitative trait loci in outbred populations. Handbook of Statistical Genetics, DJ Balding, M Bishop & C Cannings (eds.), Wiley, 45 pages. (In press).

Betthauser, J.M., Pfister-Genskow, M., Xu, H., Gouleke, P.J., Lacson, J.C., Koopang, R.W., Liu, B., Hoeschele, I., Eilertsen, K.J., and Leno, G.H. (2006) Nucleoplasmin facilitates reprogramming and in vivo development of bovine nuclear transfer embryos. Molecular Reproduction and Development 73:977-986.

Stock, K.F., Distl, O., and Hoeschele, I. (2007) Influence of priors in Bayesian estimation of genetic parameters for multivariate threshold models using Gibbs sampling. Genetics-Selection-Evolution 39:123-137.

Bailey, R.A., Cameron, P. J., Dobscyani, P., Morgan, J. P., and Soicher, L.S. (2006). Designs on the web. *Discrete Mathematics*, 306, 3014-3027.

Morgan, J. P. (2007). Nested Designs. In *Handbook of Combinatorial Designs,* 2nd~ed., editors C. J. Colbourn and J.H. Dinitz, pp. 535-540. Chapman & Hall/CRC, BocaRaton.

Morgan, J. P. and Parvu, V. (2007). Optimal row-column designs for three treatments. *Journal of Statistical Planning and Inference,* 137, 1474-1487.

Morgan, J. P. and Reck, B. (2007). E-optimal design in irregular BIBD settings. *Journal of Statistical Planning and Inference*, 137, 1658-1668.

Murtaugh, P.A., and Pooler, P.S., (2006), Evaluating Ecological Indicators: Lakes in the Northeastern United States. Environmental Monitoring and Assessment, 119, 83-96.

Reynolds, M. R., Jr. and Cho, G. Y. (2006). Multivariate Control Charts for Monitoring the Mean Vector and Covariance Matrix. *Journal of Quality Technology*, 38, 230-253.

Reynolds, M.R., Jr. and Stoumbos, Z.G. (2006). Comparisons of Some Exponentially Weighted Moving Average Control Charts for Monitoring the Process Mean and Variance. *Technometrics*, 48, 550-567.

Reynolds, M. R. Jr. and Stoumbos, Z. G. (2006). Does the Rational Subgroups Concept Provide an Effective Guide to Process Sampling? *Frontiers in Intelligent Statistical Quality Control*, 8th ed., Lenz, H.J. and Wilrich, P.T., eds., pp. 247-256.

Peterson, Brennan D.; Newton, Christopher R.; Rosen, Karen H.; Schulman, Robert S. Coping Processes of Couples Experiencing Infertility. *Family Relations*, 55 (2006), 227-239.

Adamec, V. Cassell B.G. and Smith E.P. (2006). Effects of inbreeding in the dam on dystocia and stillbirths in US Holsteins. *Journal of Dairy Science* 89(1):307-314.

Duan, Y.Y, Smith, E.P., Ye, K. (2006) Using power priors to improve the binomial test of water quality. *Journal of Agricultural, Biological and Environmental Statistics* 11(2):151-168.

Wang, Y, Myers, R, Smith, EP and Ye, K. (2006) D-optimal designs for Poisson regression models in toxicity testing. *Journal of Statistical Planning and Inference* 136(8):2831-2845.

Wang, Y, Smith, EP and Ye, K. (2006) Sequential designs for a Poisson regression model for medical and toxicity studies. *Journal of Statistical Planning and Inference* 136(9): 3187-3202.

Lee A. Fuiman, Kenneth A. Rose, James H. Cowan, Jr., Jr., and Eric P. Smith. (2006) Survival skills required for successful evasion of predators and their relationship to laboratory measures of performance. *Animal Behavoir* 71: 1389-1399.

Bates Prins, S.C. and Smith, E.P. (2007). Using biological metrics to score and evaluate sites: A nearest-neighbour reference condition approach. *Freshwater Biology*, 52, 98–111.

Karpanty, S.M., Fraser, JD, Berkson, J., Niles, L.J., Dey, A. And Smith, EP. Horseshoe Crab Eggs Drive Red Knot Distribution In Delaware Bay Habitats. *Journal of Wildlife Management.* 70(6): 1704-1710

Zipper, C., J.J. Ney, L.A. Smock, E.P. Smith, J.C. Little, K. Stephenson, P. A. Bukaveckas, G.R. Yagow, J.L. Walker, T. Younos. (2005) Issues Related to Freshwater Nutrient Criteria for Lakes And Reservoirs in Virginia. Virginia Water Resources Research Center Report SR-27. http://www.vwrrc.vt.edu/publications/AAC-SR27-2005.pdf

Vining, G.G. and Kowalski, S.M. (2006). "An Overview of Composite Designs Run as Split-Plots," *Frontiers in Intelligent Statistical Quality Control*, 8th ed., Lenz, H.J. and Wilrich, P.T., eds., pp. 342-351.

Parker, P.A., Kowalski, S.M., and Vining, G.G. (2006). "Classes of Split-Plot Response Surface Designs for Equivalent Estimation," *Quality and Reliability Engineering International*, 22, pp. 291-305.

Kowalski, S.M., Vining, G.G., Montgomery, D.C., and Borror, C.M. (2006). "Modifying a Central Composite Design to Model the Process Mean and Variance when There are Hard-to-Change Factors," *Applied Statistics*, 55, pp. 615-630.

Gupta, S., Montgomery, D. C., and Woodall, W. H. (2006), Performance Evaluation of Two Methods for Online Monitoring of Linear Calibration Profiles. *International Journal of Production Research*, 44, 1927-1942.

Williams, J. D., Woodall, W. H., Birch. J. B., and Sullivan, J. H. (2006), On the Distribution of Hotelling's T^2 Statistic Based on the Successive Differences Covariance Matrix Estimator. *Journal of Quality Technology*, 38, 217-229.

Jensen, W. A., Jones-Farmer, L. A., Champ, C. W., and Woodall, W. H. (2006), Effects of Parameter Estimation on Control Chart Properties: A Literature Review. *Journal of Quality Technology* 38, 349-364.

Woodall, W. H. (2006), Use of Control Charts in Health Care Monitoring and Public Health Surveillance (with discussion). *Journal of Quality Technology*, 38, 89-104. (Brumbaugh Award)

Papers In Press:

Pickle, S. M., T. J. Robinson, J. B. Birch, and C. Anderson-Cook. A Semi-Parametirc Approach to Robust Parameter Design. *Journal of Statistical Planning and Inference* to appear in 2007.

Willis A. Jensen, Jeffrey B. Birch, and William H. Woodall. High Breakdown Estimation Methods for Phase I Multivariate Control Charts. *Quality and Reliability Engineering International* to appear in 2007.

Williams, J.D., J.B. Birch, W.H. Woodall, and N. M. Ferry. Statistical Monitoring of Heteroscedastic Dose-Response Profiles from High-throughput Screening. *Journal of Agricultural, Biological and Environmental Statistics* to appear in 2007.

Williams, J. D., Woodall, W. H., and Birch, J.B. Statistical Monitoring of Quality Profiles of Products and Processes. *Quality and Reliability Engineering International* to appear in 2007.

Liu, B., de la Fuente, A., and Hoeschele, I. (2007) From genetics to gene networks: Evaluating approaches for integrative analysis of genetic marker and gene expression data for the purpose of gene network inference. BMC Genomics (in revision).

Liu, B., de la Fuente, A., and Hoeschele, I. (2007) From genetics to gene networks: Gene network inference via structural equation modeling in genetical genomics experiments. BMC Genomics (in revision).

Stock, K.F., Distl, O., and Hoeschele, I. (2007) Bayesian estimation of genetic parameters for multivariate threshold and continuous phenotypes and molecular genetic data using Gibbs sampling. BMC Genetics (in revision).

Stock, K.F., Distl, O., and Hoeschele, I. (2007) Bayesian prediction of breeding values for multivariate threshold and continuous phenotypes and molecular genetic data using Gibbs sampling. Animal Science (in revision).

Jin, B. and Morgan, J. P. (2007). Optimal saturated block designs when errors are correlated. *Journal of Statistical Planning and Inference*, to appear.

Morgan, J. P. and Reck, R. (2007). Resolvable designs with large blocks. *Annals of Statistics*, to appear.

Morgan, J. P. (2007). Optimal incomplete block designs. *Journal of the American Statistical Association*, to appear.

Parvu, V. and Morgan, J. P. (2007). E-optimal designs for three treatments. *Journal of Statistical Planning and Inference*, to appear.

Morgan, J. P. and Parvu, V. (2007). Most robust BIBDs. *Statistica Sinica*, to appear.

Reynolds, M.R., Jr. and Kim, K. Multivariate Control Charts for Monitoring the Process Mean and Variability Using Sequential Sampling. Invited paper to appear in the special volume of *Sequential Analysis* in honor of Walter Shewhart.

Reynolds, M. R., Jr. and Stoumbos, Z. G. Variable Sampling Rate Control Charts. To appear as an entry in *Encyclopedia of Statistics in Quality and Reliability* edited by Fabrizio Ruggeri, Frederick Faltin, and Ron Kenett, John Wiley & Sons Ltd.

Sego, L., Woodall, W. H., and Reynolds, M. R., Jr. A Comparison of Surveillance Methods for Small Incidence Rates. Provisionally accepted by *Statistics in Medicine*.

Lipkovich, I., E.P. Smith, K. Ye. Detecting Pattern in Biological Stressor Response Relationships Using Model Based Cluster Analysis. *Ecological and Environmental Statistics* (to appear)

Vining, G.G. (2007). "Adapting Response Surface Methodology for Computer and Simulation Experiments," *Grammar of Technology Development*, to appear.

Kowalski, S.M., Parker, P.A., and Vining, G.G. (2007). "Tutorial on Split-Plot Experiments," *Quality Engineering*, to appear.

Parker, P.A., Kowalski, S.M., and Vining, G.G. (2007). "Construction of Balanced Equivalent Estimation Second-Order Split-Plot Designs," *Technometrics*, 49, to appear.

Parker, P.A., Kowalski, S.M., and Vining, G.G. (2007). "Unbalanced and Minimal Point Equivalent Estimation Second-Order Split-Plot Designs," *Journal of Quality Technology*, to appear.

Mahmoud, M. A., Parker, P. A., Woodall, W. H., and Hawkins, D. M. (2007), A Change Point Method for Linear Profile Data. To appear in *Quality & Reliability Engineering International*.

Runger, G. C., Barton, R. R., Del Castillo, E., and Woodall, W. H. (2007), Optimal Monitoring of Multivariate Data for Fault Detection. To appear in the *Journal of Quality Technology*.

Marshall, J. B., Spitzner, D. J., and Woodall, W. H. (2007), Use of the Local Knox Statistic for the Prospective Monitoring of Disease Occurrences in Space and Time. To appear in *Statistics in Medicine*.

Jensen, W. A., Birch, J. B., and Woodall, W. H. (2007), High Breakdown Estimation Methods for Phase I Multivariate Control Charts. To appear in *Quality and Reliability Engineering International.*

Williams, J. D., Birch, J. B., Woodall, W. H., and Ferry, N. M. (2007), Statistical Monitoring of Heteroscedastic Dose-Response Profiles from High-Throughput Screening. To appear in the *Journal of Agricultural, Biological and Environmental Statistics*.

Woodall, W. H., Marshall, J. B., Joner, M. D., Jr., Fraker, S. E., and Abdel-Salam, A. G. (2007), On the Use and Evaluation of Prospective Scan Methods in Health-Related Surveillance. Conditionally accepted to appear in the *Journal of the Royal Statistical Society*, Series A.

Woodall, W. H. and Borror, C. M. (2007), Some Relationships between Gage R&R Criteria. To appear in *Quality and Reliability Engineering International*.

Williams, J.D., Woodall, W. H., and Birch, J. B. (2007), Statistical Monitoring of Nonlinear Product and Process Quality Profiles. To appear in *Quality & Reliability Engineering International*.

Woodall, W. H. (2006). Profile Monitoring, entry in *Encyclopedia of Statistics in Quality and Reliability* edited by Fabrizio Ruggeri, Frederick Faltin, and Ron Kenett, John Wiley & Sons Ltd.

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Fall 2006 Graduates

Abdel-Salam, Abdel-Salam Gomaa	MS
Bocanegra, Joseph L	MS
De Oliveira, Adam Miranda	MS
Duggins, Jonathan William	MS
Freeman, Laura June	MS
Frydenlund, Erika Fumi	MS
Fu, Qianhong	MS
Kaputa, Stephen James	MS
Olteanu, Denisa Anca	MS
Sell, Franklin Joseph	MS
Wilson, Sara Rue	MS
Liu, Bing	PHD
Zhang, Ying	PHD

Spring 2006 Graduates

Lee, Jaejun	MS
Lou, Jianying	MS
Zhao, Sunan	MS
Jensen, Willis Aaron	PHD
Modarres-Mousavi, Shabnam	PHD
Sego, Landon Hugh	PHD
Zhong, Xin	PHD

5/18/07

Corporate Partners Program

New Partners:

Becton Dickinson Diagnostics
Capital One.

Continuing Corporate Partners:

DuPont
Eli Lilly
General Electric
Kraft
Minitab
Pratt & Whitney
SAS

5/18/07

Service

Jeff Birch

Chair, Teaching Evaluation Committee, 2000-present.
Chair, Graduate Committee, 2001-present.
Chair, Internal Departmental Review Committee, 2006-2007 (ad-hoc).

Director of Graduate Programs in Statistics, 2001-present.
Coordinator for STAT 3005-3006
Faculty advisor, Mu Sigma Rho. (National Statistics Honor Society) 1991-present

Ina Hoeschele

Personnel and Faculty Search committee, Department of Statistics
Faculty Search Committee, VBI
Steering committee of GBCB Ph.D. program
Admissions committees of GBCB Ph.D. program

Associate Editor for two journals: Biometrics and Genetics-Selection-Evolution

Regular reviewer for many journals and multiple funding agencies (US: NSF, NIH, International: BARD, The International Human Frontier Science Program, Vienna Science and Technology Fund)

Member of NIH Special Emphasis Panel: National Centers for Biocomputing Collaboratories (October 2006).

Golde Holtzman

Corporate Partners Committee, chair (2000-2007)

> During the period under review we added two additional corporate partners, Becton Dickinson Diagnostics, and Capital One. The continuing corporate partners are DuPont, Eli Lilly, General Electric, Kraft, Minitab, Pratt & Whitney, SAS.
>
> Elected Mu Sigma Rho national secretary-treasurer, 1997-2000, re-elected 2000-2003, re-elected 2004-2007.

JP Morgan

Personnel Committee, Department of Statistics
Search Chair, Department of Statistics
Graduate Committee, Department of Statistics
Policy & Procedures Committee, Department of Statistics
Faculty Subcommittee of the COS Diversity Committee

Associate Editor, Journal of Statistical Planning and Inference. Handled 9 papers submitted during 2006.
Referee for additional eight papers from other journals.
External reviewer for one promotion case.

Marion Reynolds

Departmental Review Committee
Personnel Committee
Cluster Hiring Search committee
Chair of the Instructor Search Committee
Computing Committee
Qualifying Exam Committee
Policy/Procedures Committee

College of Science Committee
Honorifics Committee

Editorial Board Member
Journal of Quality Technology
IIE Transactions

Refereeing:
Journal of Quality Technology (3 papers)
Technometrics (3 papers)
IIE Transactions
Sequential Analysis
Forest Science
International Journal of Production Economics

Member of the Advisory Board of the Quality, Statistics, and Reliability Section of The Institute for Operations Research and the Management Sciences

Eric Smith

Interim Department Head
Consulting Committee
Computing Committee
External Funding Committee
Personnel Committee
Advisory Committee (we invested a lot of time on goals and departmental planning)

Successfully completed a departmental five-year review and external review.

Coordinated the hosting for four external reviewers

Awards committee for the Environmental Section of the ASA
Associate editor for Environmentrics
Editorial Collaborator for Environmental and Ecological Statistics

Review for tenure/promotion case: Oregon State University

Member of the organizing committee for the conference on Multivariate Environmental Statistics held in Chicago, October, 2006.

Member of the nominations committee for the ENVR section of ASA

George Terrell

Associate Editor for 4 papers for the Journal of Computational and Graphical Statistics, and as referee for two papers for the same journal

Geoff Vining

Department Head of Statistics (through June 30, 2006)

College of Science Outreach Committee

Development Activities:

R.J. Reynolds Internship (2006)	$ 75,000
Minitab Scholar (2006 – 2010)	$150,000

Chair, Statistics Division of the American Society for Quality (until June 30, 2006)
Past Chair, Statistics Division (July 1, 2006 – Present)

Chair, Publications Management Board, American Society for Quality.

Member, Awards Board, American Society for Quality

Member, Body of Knowledge SOAR Committee, American Society for Quality.

External Reviewer, Department of Statistics, University of Idaho.

General Conference Chair, Fifth International Symposium on Business and Industrial Statistics, Lima Peru.

Editorial Review Board, *Journal of Quality Technology*.

Advisory Board, *Quality Engineering*.

Led Professional Workshop, 16th Simposio de Estadísdica Sponsored by the Universidad Nacional de Colombia (2006) – Bucaramanga, Colombia, An Overview of Response Surface Methodology, presented by G.G. Vining.

Bill Woodall

College Cluster Hiring Committee

Departmental Personnel Committee

Departmental Graduate Committee

Departmental Corporate Partners Committee (with responsibility for organizing the Student Research Seminar)

Member of the Editorial Review Board of the *Journal of Quality Technology*

Member of the American Statistical Association (ASA) Deming Lecturer Committee

Member of the American Society for Quality (ASQ) Shewhart Medal Committee

ASQ Lloyd S. Nelson Award Committee

Reviewer for *Computational Statistics and Data Analysis* (2), *Management Science News*, *Journal of Quality Technology* (6), *Quality & Reliability Engineering* (3), *Journal of Statistical Planning and Inference*, *Computers & Industrial Engineering*, *Statistical Papers*, *Technometrics* (2), *Advances in Disease Surveillance*, *IIE Transactions*, *Quality Engineering* (6), *Communications in Statistics*, Research Council of Canada, *Statistics in Medicine*.

Board of Directors for American Society for Quality Roanoke/Radford Section 1107: Student Liaison

Outside reviewer: Promotion to Professor, University of Minnesota; Promotion to Associate Professor, University of Wisconsin.

INFORMS Student Paper Competition Selection Committee

5/18/07

Honors and awards

Fellows of the American Statistical Association

Active Faculty

Marion Reynolds
Eric Smith
Geoff Vining
Bill Woodall

Emeritus Faculty

Jesse Arnold
I.J. Good
Klaus Hinkelmann
Dick Krutchkoff
Ray Myers

Fellows of the American Society for Quality

Geoff Vining
Bill Woodall

Elected Members, International Statistics Institute

Marion Reynolds
Eric Smith
Geoff Vining
Bill Woodall

Others

Bill Woodall received the Brumbaugh Award for the best paper for his paper, Use of Control Charts in Health Care Monitoring and Public Health Surveillance (with discussion). *Journal of Quality Technology*, 38, 89-104.

Geoff Vining received the 2005 Lloyd Nelson Award for the paper published in the 2005 issue of the Journal of Quality Technology having the greatest immediate impact to practitioners.

Graduate Learning Enhancements

We have instituted a number of enhancements to our program to acquaint students with current interdisciplinary research in statistics in general and current research of our faculty. These activities are directly related to the areas of learning and discovery for our graduate students.

A Research Home is composed of a group of students and a faculty member who meet to discuss, in broad terms, research topics in statistics. These presentations are attended by all first year students and other interested students and faculty. The presentations are aimed at enhancing student interest in research in statistics and acquainting students to current research interests of our faculty. Research Teams are comprised of faculty and graduate students working on common research problems or centered on research grants. Teams typically meet weekly or bi-weekly to keep members appraised of recent developments, to provide accountability for timely progress, and to share common expertise.

Special Topics in Statistics is a one-hour graduate course which emphasizes recent developments in statistical theory and subject matter not found elsewhere in the curriculum. Primary aims are to stimulate student interest in research and to inspire further studies for the Ph. D.