



The Y-Distribution

Brigham Young University

Department of Statistics

Vol. XV July 2010

See You In Vancouver!

From the Chair Dr. Del T. Scott



The end of the 2009-10 academic year signifies that the Department of Statistics has existed for 50 years. Dr. Howard Nielsen organized the department in September 1960. You may have seen an article about the formation of the department in the *College Frontiers Magazine* titled "Rolling the 'Cubicle Number Generating Devices,'" Fall 2009. It can also be found at http://cpms-new.byu.edu/wp-content/uploads/2010/02/FRONTIERS_Fall2009.pdf.

The first undergraduates to receive their degree graduated in May 1961, and consisted of David W. Batchelor, Ronald P. Duncan, Edwin H. Huband, Wayne A. Larsen, and Karl L. Smith. Our first master's degrees were earned by Ross M. Buckwalter and Frank Medgin in August 1966 (on a personal note, Ross Buckwalter was my Stat 221 teacher in the summer of 1965). Our 100th undergraduate degree was awarded in 1972, and our 100th master's degree was awarded in 1985. In 1995 we had awarded a total of 500 undergraduate degrees. By the end of 2009, the department had awarded a total of 1,045 undergraduate degrees and 312 master's degrees.

In September of 1960, the department consisted of 2.5 faculty members and no full-time staff. We currently have 18 faculty positions assigned to the department, one full-time staff position, and two full-time administrative positions. This growth is directly related to the increase in demand for our service classes and the number of freshmen and sophomores declaring a statistics major.

Last fall and winter semesters, we taught Statistics 221 in a large lecture setting (over 750 seats). Dr. Shane Reese taught in the fall, and Dr. William Christensen taught the winter class.

Both professors received extremely high student satisfaction ratings. There was no decrease in student performance from the larger class as compared to the students enrolled in the smaller sections. In fact, the College of Physical and Mathematical Sciences recognized Dr. Reese's passion for teaching and awarded him a college teaching award for his success with not only our undergraduate and graduate students, but also the many non-majors he impacted (see "College Awards").

After analyzing assessment data related to the undergraduate curriculum, we changed our gateway classes. These changes will accommodate the growing number of students who have had AP Statistics and Calculus and that choose a statistics major as a freshman or sophomore. This will also allow students to get started into our curriculum with a minimum number of prerequisites. Changes are described on our web site, <http://statistics.byu.edu>, and in the 2010-11 undergraduate catalog. We invite you to visit <http://learningoutcomes.byu.edu> and make comments or suggestions about our programs.

We continue to meet our goal that our master's students graduate with their degrees in two years. Our integrated BS/MS program, where students complete both degrees in five years, is a path that we encourage our undergraduates to pursue if they desire a graduate degree from our department.

We are always looking for ways to give undergraduate students meaningful research experiences. Dr. Reese, Dr. Christensen, and Dr. Johnson received significant support through outside funding. Others on the faculty continue to contribute to science by collaborating or providing consulting to colleges across campus and others in the discipline.

Congratulations are in order to Drs. Reese and Christensen for their advancement to the rank of professor in September 2009.

We are pleased to announce the appointment

of Candace Berrett from The Ohio State University as an assistant professor. Candace is completing her PhD this summer and will join us in August, 2010. She is a welcome addition to our department (see "New Faculty").

Also joining us this fall as a visiting professor is Suzanne Dubnicka from Kansas State University. In addition to collaborating with faculty on Bayesian methodology, she will teach a nonparametric class and a special-topics class on missing data.

We hope you enjoy browsing this newsletter that spotlights some of the faculty and students. We look forward to seeing you at our JSM open house breakfast in Vancouver, Canada. Thank you for your continued support of our department. ◇

JSM Friends and Alumni of BYU Open House Breakfast



If you are attending the JSM Conference in Vancouver, British Columbia, we invite you to join us Wednesday,

August 4, 2010 at 7:00 am for a Friends and Alumni Breakfast. We will meet in the Malaspina Room of the Fairmont Waterfront Hotel. A delicious breakfast will be served! We hope to see you there! ◇

New Faculty



Candace Berrett received her BS in Actuarial Science from Brigham Young University and her MS in Statistics from The Ohio State University. She is finishing her PhD this summer at The Ohio State

University, working with Dr. Catherine A. Calder on developing Bayesian probit regression models for spatially-dependent categorical data. She is excited to join the faculty at BYU this fall and is looking forward to returning to the mountains. ◇

Summer Institute of Applied Statistics

This year we were pleased to have Dr. Shane Reese present the 35th Annual Summer Institute, held June 16-18, 2010. He gave a three-day seminar entitled “Bayesian Reliability.” Topics of his presentation included Bayesian Computation, Hierarchical Models, and Component Reliability. ♦

Leland J. Hendrix Classroom

This year at the Summer Institute Closing Luncheon, Dr. Leland J. Hendrix, emeritus professor and former chair of the Department of Statistics, was surprised with the honor of having his name given to a newly remodeled high-tech classroom.

Dr. Hendrix, while chair, was responsible for the remodeling of the new space the department



received when the computer science wing of the Talmage Building was added. His vision made lab

space available when the number of statistics majors increased and enrollments in Stat 221 exploded.

Dr. Hendrix was instrumental in revising the curriculum found in our gateway classes, Stat 336 and 337. A specific example is the introduction of concepts, techniques, and methods into Stat 337 that were previously only available in graduate classes. Despite the increased rigor that Dr. Hendrix brought to Stat 336 and



Dr. Lee Hendrix, right, and Dr. Del Scott in the new Hendrix Classroom

337, students continued to honor him as the “best statistics professor”. Referring to our new resource as the Leland J. Hendrix classroom is in recognition and gratitude not only for his vision while serving three terms as chair, but specifically

for his example as a teacher.

The Hendrix Classroom was created by removing the wall between two lab rooms, 203 and 250. This new classroom is furnished with two projectors, two screens and a document camera. The university standard media podium contains a computer, an external laptop port, and a switch controlling which media source is projected on each screen. Student computers can connect to the network either wirelessly or through ports at each seat. Laptop computers are available for each student if the instructor wishes to convert the facility to an instructional computer lab. ♦

Prestigious Faculty Awards



At the 2009 Joint Statistical Meetings of the American Statistical Association in Washington, D.C., **Dr. William Christensen** was awarded The Distinguished Achievement Award by the

ASA's Section on Statistics and the Environment. This award is in honor of outstanding contributions to the development of methods, issues, concepts, applications and initiatives of environmental statistics. Dr. Christensen's award reads, “For promotion of undergraduate research in environmental statistics, outstanding record of collaboration with environmental scientists, innovative research on receptor modeling and pollution source apportionment and service to the profession.” ♦

College Awards



Dr. Shane Reese has shared his passion for research through undergraduate and graduate mentoring. In addition to working with seven students on their projects and theses since receiving continuing faculty status, he is committed to working with undergraduates on research experiences. He has run an undergraduate research group on Bayesian methods the last two years and was instrumental in creating the Statistics Undergraduate Research Computing Laboratory (SURCL). He has four papers in peer-reviewed journals with student co-authors. Although Dr. Reese excels as a teacher, he is also a renowned scholar in the areas of Bayesian methods and statistics in sports and reliability analysis.

Dr. Reese is an exemplary scholar and professor who uses his enthusiasm, research and real-world experience to motivate and energize his students, who have responded with equally-matched enthusiasm about his impact on their lives. His teaching is well-known within the department. Many current and former faculty have attended a semester of Dr. Reese's Bayesian Statistics course for instruction and insight. ♦

Faculty Research

Dr. William Christensen recently received a grant from the Wisconsin Focus On Energy. This research is titled “Contributions of Fossil Fuel-Fired Electric Power Generation to PM_{2.5} Concentrations in WI.” This approach will incorporate daily synoptic classifications into a source apportionment, and will be of high potential value to the air quality research community. Using synoptic data, they will obtain not only a clearer understanding of the relationship between the synoptic patterns and the source contributions, but will actually estimate the source contributions with greater accuracy.

Dr. Dennis Eggett, Director of the Center for Statistical Consultation and Collaborative Research, is often involved in projects in a variety of fields because of his consulting work with entities across campus and Utah Valley.

One recent study in particular has drawn more attention to the importance of statistics in many different fields. Dr. Eggett worked on a study with Dr. Bryan Hopkins of the Department of Plant and Wildlife Sciences which researched the effects of phosphorous-based fertilizer on potato yield. Dr. Hopkins and others did actual experiments on levels of fertilizer in fields with different soil compositions and Dr. Eggett's statistical analysis helped them draw their conclusions.

Using two different kinds of potatoes, the study determined that for large potatoes, more fertilizer increased poundage, while more fertilizer decreased the poundage of small potatoes. With the current rate of population growth, studies dealing with effective land use are becoming increasingly important.

Dr. Evan Johnson is the principal investigator on a \$1.7 million grant this year from the National Institutes of Health, with Mark Clement and Quinn Snell from Computer Science as co-investigators. The grant, titled “Statistical tools and methods for next-generation sequencing in

epigenomics,” is for five years and is in cooperation with the Fred Hutchinson Cancer Institute in Seattle.

Dr. Johnson commented, “The aims of this project are to provide statistical and computational methods for the analysis of data for the genome profiling of epigenetic marks. We plan to integrate data from multiple sources including expression, transcription factor binding, nucleosome positioning, histone marks and DNA methylation to better understand the mechanisms that regulate the behavior of a cell. Much of our proposal involves not just the development of new statistical and computational methods, but also the design, implementation and delivery of software tools that support these ideas. The many useful applications of next-generation sequencing which assure that well-developed methods will have a broad impact in molecular biology, specifically in transcription regulation, chromatin dynamics, development, and cancer.”

Dr. Shane Reese recently received a grant from the National Science Foundation, which he is using to create more accurate climate predictions through a better understanding of the magnetosphere, the upper layer of the atmosphere. This work is not only going to save time and money and improve predictions, but is allowing Dr. Reese to do research to better understand the world of physics so he can make accurate models. Of the project, he says, “The goal [of better climate models] is a long way down the road, but in the short-term outlook, our goal is to predict well, to validate, and to verify.”

Dr. H. Dennis Tolley published twice in 2009 in the *Proceedings of the National Academy of Sciences* (one of the top three scientific journals in the world). His first article, “NIH funding trajectories and their correlations with US health dynamics from 1950 to 2004,” dealt with the relationship between increases in NIH funding and reductions in national cause-specific mortality rates. His second article, “Long-term economic growth stimulus of human capital preservation in the elderly,” makes the conclusion that with expanded health care coverage and benefits, more Americans will stay in the workforce longer, increasing government revenue and decreasing the financial impact of reform legislation. ◇

Faculty Publications

Lawson, John S. Design and Analysis of Experiments with SAS. Boca Raton, FL: CRC Press, 2010. ◇



Faculty-Student Collaborations

Larsen, R.A., Schaalje, G.B., Lawson, J.S. “Food shelf life: estimation and optimal design,” *Journal of Statistical Computation and Simulation* (2009)

Lawson, J.S. and Manortey, S. “Optimal maintenance strategy for technology-enhanced classrooms: a case study.” *Quality and Reliability Engineering International* (2009)

Poulsen, R.L., Johnson W.E., Hollenhorst, P.C., Chandler, K.J., Speck, N.A., Graves, B.J. “DNA specificity determinants associated with distinct transcription factor functions,” *PLoS Genetics*, 5: e1000778, (2009)

Wang, J. and Schaalje, G.B. “Model selection for linear mixed models using predictive criteria.” *Communications in Statistics—Simulation and Computation*, 38, 788-801 (2009) ◇

MS Statistics Graduates

December 2009

Brenda Ginos- Brenda is working as a data manager at the Epidemiology Data Center (EDC) located on the University of Pittsburgh campus. She is involved in two projects; the first is a nation-wide study on Hepatitis B in children and adults. The second is a local study on utilizing modern technology as a tool for long-term weight loss. Brenda uses SAS daily to organize, clean, and monitor collected data from these studies.

April 2010

Tomohiko Funai- Tomo is working for the Department of Pediatrics, Critical Care Division at the University of Utah in a data management center for clinical research performed in hospitals throughout the nation. Tomo extracts all pertinent data from the database and performs the necessary analysis to provide quantitative evidence to approve certain medical practices and medication for infants who are in critical condition.

August 2010

Thomas J. Leininger- Thomas has been working with Dr. Shane Reese on a collaborative project modeling criminology data in order to study the behavior of juvenile delinquents. Another project models biomechanics data to study the effect of pain on a person’s biomechanics. Thomas will be starting his PhD at Duke in August where he plans to study Bayesian hierarchical modeling and their applications in sociology, business and defense.

Erika Hernandez- Erika has been working with Dr. Reese and several scientists at the National Center for Atmospheric Research (NCAR) on a project calibrating a model that simulates the so-called “space weather” in the magnetosphere and ionosphere around the earth. Besides her internship, Erika also spent a week teaching the IMPACT Statistics Boot Camp Course. She and her husband, Steven, recently moved to Bloomington, IN where Steven will pursue a PhD at Indiana University. Erika is currently getting settled in Bloomington and will begin looking for a job.

Scott L. Morris- Scott is an Associate Energy Analyst at Pacific Northwest National Laboratory. He is working on a variety of projects involving research and applications concerning energy, the environment and economics. He is also working on a paper about the research he started during his summer internship last year at Pacific Northwest, which is a complex hierarchical Bayesian model. ◇

MS Statistics Graduates 2009-2010

December 2009

Brenda Ginos

April 2010

James Hattaway
Tomohiko Funai

August 2010

Erika Hernandez
Thomas Leininger
Scott Morris

Please keep us up-to-date on your contact information!
To update your address, email
alumni@stat.byu.edu

Graduate Internships

Serena Baker- This summer Serena is working as an intern with the Biostatistics group in the Clinical Research Department at Watson Pharmaceuticals in Salt Lake City, UT. She is learning much about the drug approval process and the role that statisticians play in clinical trials. Serena will be moving to Tucson, AZ for a PhD program in Biostatistics at the University of Arizona in August.

Allison Butler- Allison is working for Intermountain Healthcare at the LDS Hospital in Salt Lake City, UT. She is working in the Statistical Data Center with Dr. Greg Snow. The Statistical Data Center helps researchers to design experiments, analyze data, and interpret results. Allison has already worked on many different projects from healthcare to education. She is enjoying this opportunity to use what she has learned, to explore new methods and techniques, and to learn more about healthcare.

Ryan Eliason- Ryan held an actuarial role for CIGNA Health in Bloomfield, CT. He worked to improve the prediction methodology of CIGNA's primary insurance pricing engine. Specifically, he considered a variety of formal approaches to build and compare claim distributions for particular demographic cohorts. Ryan defended his recommendations to FSA's including the director of CIGNA's actuarial program. He will be taking a two year hiatus from BYU to serve in the Canada Toronto East Mission. Ryan is excited to be a missionary and knows Toronto is where he is meant to be.

Kenneth Fairchild- Kenneth remained in Provo this summer and has been working in the Center for Statistical Consultation and Collaborative Research as well as teaching Statistics 324, Statistical Computing I. Kenneth and his wife have been blessed with their first child, Jonas Julius Fairchild, who was born on June 2. They are having fun with the new addition to their family and enjoying the changes he has brought to their lives.

Bradley Ferguson- Bradley has been at the National Center of Atmospheric Research working on a grant funded by the NSF. The goal of the research is to use Bayesian Gaussian Process models to calibrate complex physics-based numerical models, which are used to emulate processes in the magnetosphere. Bradley uses

data from solar storms along with simulated data from computer models to make inference on input parameters in these numerical models. He is enjoying learning and implementing advanced Bayesian methods and collaborating with the interesting people at NCAR.

Heidi Lindsey- Heidi is working with Dr. Gilbert Fellingham this summer to compile class notes in LaTeX for Statistics 151 (formerly)331, Introduction to Bayesian Statistics. These notes will be made available for future students in the course as a replacement for a textbook to facilitate their studies. Heidi is also enjoying the opportunity to spend more time with her two children.

Angie Nelson- Angie is working as a research assistant for Matthew Butler in the BYU Department of Economics. They are hoping to find evidence of people moving from states with stricter Medicaid eligibility requirements to states with more lenient eligibility requirements. In addition, Angie is working with Dr. Natalie Blades to illustrate Howard Nielsen's 1957 estimation of the population of the church in 2000 compared to actual church membership in 2000. This project has allowed Angie to explore the literature on graphical representation of spatial data.

Mark Nielsen- Spring and summer semesters have been busy for Mark at BYU. He has been working as a TA for introductory level statistics courses and working with Dr. Dennis Eggett in the Center for Statistical Consultation and Collaborative Research. He is currently working part time for the department and part time on his master's project. His goal is to finish his project by the end of the summer. In addition to his work and research, Mark is enjoying participating on intramural teams and in other activities in Provo.

Andrew Olsen- Andrew remained at BYU this summer to teach Stat 124, the SAS Base Certification course, and to assist with Stat 224, the Applied SAS Project course. He is also actively involved in research with the Utah Department of Transportation where he is fitting hierarchical Bayesian models to answer questions regarding safety and effectiveness of roadways. This research is supervised by Dr. Shane Reese and will continue to develop into Andrew's master's project.

Jessica Olsen- Jessica is enjoying her summer vacation with a mix of working within the Department of Statistics and extracurricular activities outside the department. Currently, she is working on formulating a research project with Dr. Shannon Neeley. She hopes that the focus of the project will center around modeling the BP Oil Spill crisis. When not at school, Jessica enjoys sports, such as playing on the department's intramural kickball team. Jessica is looking forward to the start of school again this fall.

Taylor Redd- Taylor is working as a summer intern for Raytheon. He is currently working on implementing Bayesian methods to calculate reliability of cruise missiles. He has been working on programming these implementations in MATLAB®. The experience has already proven to be very valuable as he has already used the experience in his research using Bayesian methods to model NFL player performance. In his free time, Taylor enjoys playing on a recreational summer lacrosse league.

Douglas VanDerwerken- Douglas is doing research with Dr. Dennis Tolley this summer. They are collaborating with the Chemistry Department in experimental design and analysis, related to differentiation of the bacterium that causes anthrax from its harmless genetic neighbors. Other projects include development of a likelihood procedure which simultaneously estimates parameters and shrinks nonsignificant effects to zero. Lastly, they are working on a project to improve existing methods for estimating bacterial concentration from plate count data.

Michelle Withers- Michelle has been working remotely from Colorado Springs on research for Dr. Evan Johnson. She is working on developing a method that will determine whether a certain disrupted biological pathway is present in cancer samples based on microarray data, which is critical in assigning a treatment that is more effective for certain subtypes of cancer. Michelle has been simultaneously working on her master's project and preparing a paper to submit to Nature Methods, both of which are based on her research. ♦

Department of Statistics Website:

statistics.byu.edu

Deans List**Fall 2009**

Jonathan Casey Christensen
 Kyle Robert Davis
 Natalie Noel Ellison
 Desiree Elyse Haroldsen
 Matthew Joseph Heiner
 Edward G. Law
 Anthony Charles Mickelsen
 Patrick Christian Staples
 Richard K. Wilde

Winter 2010

David Jeffrey Bean
 Jonathan Casey Christensen
 Timothy Mathias Eaton
 Owen Eric Francis
 Devin C. Francom
 Matthew Joseph Heiner
 Cody Lee Marsh
 Andrew Nolan Olsen
 Robert Alan Richardson
 Samir Johny Zeidan

Spring 2010

Ross Call Andrus
 Michael O. Arnell
 Jonathan Casey Christensen
 Devin C. Francom
 Cameron Kevin Glead
 Brent Allen Hulet

Undergraduate Mentoring

In 2009 the department undergraduate mentoring effort was coordinated under the NSF-funded Interdisciplinary Mentoring Program in Analysis, Computation and Theory (IMPACT). Shane Reese joined Jeff Humpherys as Co-PI, and organized undergraduate research groups led by five faculty: William Christensen, Evan Johnson, Scott Grimshaw, Dennis Tolley, and Shane Reese. 21 undergraduate IMPACT students received training in statistics, mathematics and numerical computation during the summer in preparation for their research experience. Among the students involved in IMPACT, eight were statistics majors. Six of these students, Thomas Leininger, Bradley Ferguson, Sarah Clark, Rachel Teh, Robert Richardson, and Brent Shepherd, had the opportunity to present their research at the Annual Spring Research Conference put on by the college. ♦

Student Information

The Department of Statistics had 158 undergraduate majors in 2009. There were 79 Actuarial Science majors and 79 Statistics majors. Within the Statistics Major, the Applied Statistics and Analytics Emphasis had 18 majors, Biostatistics had 16, Business Analysis had 17, Information Systems had 1, Statistical Science had 23, and Quality Science had 4. There were 43 B.S. graduates, with 23 Actuarial Science graduates and 20 Statistics graduates (1 Applied Statistics and Analytics, 6 Business Analysis, 3 Biostatistics, 6 Statistical Science, and 4 Quality Science). Two students earned Cum Laude designation, and six earned Magna Cum Laude. Nine students earned their master's degree in 2009. 20 of our students made the Dean's List at least one semester (3.75 GPA with at least 14 credit hours per semester). Our students passed a total of 32 Actuarial Exams. 4692 students were enrolled in service classes taught by the department. 4182 students were enrolled in Statistics 221. Approximately 830 students registered for Stat 221 Independent Study. 865 students enrolled in our major courses. ♦

Alvin C. Rencher Mentoring Awards

The 2009–10 Alvin C. Rencher Mentoring Awards were given to Thomas Leininger and Bradley Ferguson, both of whom were mentored by Dr. Shane Reese.

Thomas and Dr. Reese worked to develop better statistical methodology for clinical drug trials. The process for getting a new drug approved by the FDA can be long and expensive, sometimes taking several years, and usually results in denial by the FDA. They proposed using a Bayesian dynamic linear model and an adaptive design, which, when combined, would shorten the length of the trial without sacrificing statistical certainty. Thomas and Dr. Reese performed a simulation study where they showed that their proposed approach vastly improved efficiency, both in time and money. Further, their approach outperformed the standard models in cases where the dose-response relationship of the drug was non-monotone.

Bradley Ferguson and Dr. Reese have been trying to analyze the effectiveness of biological threat detectors. They are working with success/failure data and want to effectively model the relationship between biological threats and biological threat detectors. Often, simple parametric

models are used, which turn out to be inflexible and ineffective. Brad and Dr. Reese are working on applying nonparametric models that allow for more flexible models. They are also working on developing a Bayesian adaptive design that would allow them to more efficiently choose where to perform the next biological threat test. ♦

Students Pass ASQ Certified Quality Process Analyst Exam

The American Society for Quality is the leading authority on career-boosting certifications for quality professionals, with more than 60 years of experience. An ASQ certification demonstrates an individual's dedication to quality. During the fall 2009 semester in Stat 462 (Quality Control and Industrial Statistics), 13 senior students prepared for the ASQ Certified Quality Process Analyst exam. This is one of the two ASQ certifications that do not require job experience. They do, however, require a college degree. All 13 students passed the exam and will be awarded their certificate at graduation. This certificate will give the graduates a definite advantage in the job market. The students passing the exam this year were: Chris Barbakos, Sara Gividen, Erik Josephson, Scott Morris, David Paul, Timothy Perkins, Chad Pharo, Regan Russell, Richard Smith, Casey Stoddard, Michael Ulmer, Brian Wells, and Jacob Wilkes. ♦

Call for Donations

While evaluating student applications for Department of Statistics scholarships, it was obvious that there were more qualified students in need than the Department's endowments allowed. Please support the Department of Statistics at Brigham Young University, and continue the tradition of giving. To make contributions to the BYU Department of Statistics, mail your check to:

Brigham Young University
 Department of Statistics
 223 TMCB
 Provo, UT 84602

Checks should be made out to BYU Statistics. You have the power to make an incredible difference in the lives of our students. ♦

