



# The Y-Distribution

Brigham Young University

Department of Statistics

Vol. XVII October 2012

## From the Chair

### Dr. H. Dennis Tolley



Friends and alumni, as you may already be aware, Del Scott has stepped down as Chair of the Department. I have taken over as Chair with Gil Fellingham as Associate Chair. Del continues to serve

as our new Undergraduate Advisor.

We are saddened to report that our computer specialist (CSR), Loren Harshbarger, died in a motorcycle accident in April. He had only been the CSR for a short time, but during that time had a significant positive impact. He started the ball rolling in several key areas regarding our computer resources.

Evan Johnson and David Whiting of our faculty both left to pursue their careers elsewhere. Evan went to work at Boston University. His research in the development and application of statistical methods for the analysis of data from emerging genomic technologies seemed better served there than here. He has remained in contact with us and drops by occasionally. Though we recognize his move as a loss to the faculty, we also recognize that as a friend and colleague in Boston, Evan is a connection that can open up opportunities for our students.

David Whiting went to work in analytics at Travelers Insurance in Hartford, Connecticut. David had been active here in pioneering our data analytics program. His work at Travelers is applying and extending data analytic methods to insurance problems. Again, though we recognize the loss, we now also have a colleague and friend in Connecticut that may open up opportunities for our students. David has already given us feedback regarding our curriculum and some suggestions to improve the employability of our students

On a more positive note, David Dahl has recently joined our faculty. David received his Ph.D. at the University of Wisconsin and joins us from Texas A&M University where he was an associate professor. We have been actively recruiting David for some time, and we are grateful that he has chosen to join us. David's research interests are in nonparametric Bayesian methods.

Pete Dotson has joined our department as the new CSR. Some of you may remember that Pete was the CSR here many years ago. His willingness to rejoin our department is a great blessing. He is having a positive impact already.

We are pleased to report that we have recently been able to purchase a new computational server. This new server significantly increases the computing resources available to faculty and students in support of their research. Test runs indicate that this server will process some of our largest simulations twice as fast as previously.

As we begin the new academic year, we do so with a productive and hard working faculty and an enthusiastic student body. We currently have 259 undergraduate majors, of whom 118 are actuarial science majors. We also have 22 graduate students, eight of whom are first-year students and five who are in our integrated program. The department is in great shape.

We have noticed over the past few years that potential employers have an increasing expectation that our students have filled an internship. This is particularly true for actuarial students and is increasing in other specialty areas. This is an area where we can use your help. We hope that those of you currently working for a company that has an internship program will look into the program and help us get our

students involved. For those of you who work at companies without a current internship program, will you please take the opportunity to let your management know that internships can be helpful both in recruiting permanent employees and in completing focused summer work projects? We are organizing an active internship placement and management component in our department. We look forward to your help as we implement this new program.

In addition to internships, we can use your help in placing our graduates. Although we have always been able to place graduates in the past, the recent economic challenges have affected us as well as others. Consequently, as you become aware of any entry-level openings, please be sure to keep us in mind. As with the internships, we are initiating an active placement program.

I have noticed an increasing number of senior-level job opportunities crossing my desk. Overall, these jobs are not for our entry-level graduates. However, they often seem like a nice opportunity for someone with 5 to 10 years of industrial experience. These are being posted on our web site. So if you are looking, or just gathering data, please visit our site under the "Opportunities" tab ([statistics.byu.edu](http://statistics.byu.edu)).

I thank all of you for your support. We are proud of the work you do, and grateful for the association we share.♦

## 37th Annual Summer Institute of Applied Statistics



This year we were pleased to have **Dr. Gilbert W. Fellingham** present the 37th Annual Summer Institute of Applied Statistics, held June 13 - 15, 2012. He gave a three-day seminar entitled, "Applied Bayesian Analysis in

WinBUGS and SAS®!” In his presentation, he discussed how Bayesian statistical methods are more commonly encountered in today’s quantitative world. ♦

**New Faculty**



**David B. Dahl** is an Associate Professor in the Department of Statistics at BYU. He received B.S. and M.S. degrees from Brigham Young University in 1997 and 1998, working on his masters with Dr. Scott Grimshaw in the Department of Statistics. He started his academic career at Texas A&M University as an Assistant Professor in 2004. He did doctoral work at the University of Wisconsin - Madison in the Department of Statistics and the Department of Biostatistics and Medical Informatics under the direction of Michael Newton, receiving his Ph.D. in 2004. From 2007 - 2012, Dr. Dahl was an adjunct faculty member in the Division of Quantitative Sciences at the University of Texas, M.D. Anderson Cancer Center.

David B. Dahl’s research focuses on Bayesian nonparametrics, model-based clustering, random partition models, and statistical computing. His work has appeared in journals including the Journal of the American Statistical Association, Annals of Applied Statistics, and Bayesian Analysis. He teaches both undergraduate and graduate classes, including Bayesian statistics, statistical methods, and statistical computing. ♦

**Prestigious Faculty Awards**



At the 2011 JSM in Miami Beach, Florida, **Dr. Gilbert W. Fellingham** was awarded the Chapter Service Recognition Award. Dr. Fellingham received this award for the extraordinary contributions he’s made as a Chapter Member. According to the ASA, this award consists of a certificate, an announcement of the name of the recipient at the Council of Chapters (COC) Business Meeting during the Joint Statistical Meetings each summer, and a listing in the ASA award program. We would like to congratulate Dr. Fellingham on his achievement. ♦

**JSM Friends and Alumni of BYU Open House Breakfast 2012**



The Joint Statistical Meeting (JSM) was held on July 28 - August 2, 2012 in San Diego, California, at

the San Diego Convention Center. The following professors presented these papers.



**Candace Berrett**  
“Space-Time Dynamical Modeling of Aerosol Transport” and “Bayesian Nonparametric Methods for Material Identification from Large Remotely Sensed Hyperspectral Space-Time Data Sets”



**Shane Reese**  
“The Public Health Effects of DHA Supplementation on the Joint Distribution of Birthweight and Gestational Age with Implications on Clinical Trials Design and

Analysis”



**David Dahl**  
“Cluster Analysis via Random Partition Distributions” and “Bayesian Nonparametrics Methods: Practical Issues and Current Frontiers”



**David Engler**  
“Bayesian Modeling of Regime-Switching Models: An Application in Multistream Asset Pricing”



**Scott Grimshaw**  
“Spatial Control Charts for the Mean”



**Natalie Blades**  
“Spatial Control Charts for the Mean”



**Shannon Tass**  
“Bayesian Factor Analysis with Spatial Factor Loadings”



**William Christensen**  
“Bayesian Factor Analysis with Spatial Factor Loadings”



**Dennis Tolley**  
“Statistical Programming of Chemical Separation Profiles”

For full abstracts visit:

<http://www.amstat.org/meetings/jsm/2012/onlineprogram/index.cfm?fuseaction=main>

Scroll down and search professor by last name.

Thank you to all that attended the 2012 JSM in San Deigo, California. It was a successful meeting.



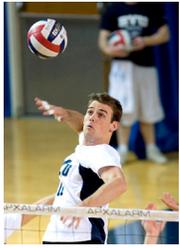
Next year, the JSM will be held August 3 - 8, 2013, in Montréal, Québec, Canada at the Palais de congrès de Montréal. We hope to see you there! ♦

## Dr. Fellingham and Dr. Reese: The 2012 London Olympics



In 2004, Dr. Fellingham and Dr. Reese were asked by the U.S. Olympic committee to evaluate the men's volleyball team

and determine which skills—such as serves, passes, and kills—were most important to the team's scoring success. They then built a statistical model that showed the best practice



sessions based on previous data from players and line-ups. This data has become a "coaching bible" for the U.S.A. volleyball coaches. Dr. Reese and Fellingham refined the

model for the U.S.A. Women's Volleyball team in preparation for the 2012 Summer Olympics in London. "The point of this [project] was a way to look at skills, to grade skills, so that as a coach you can decide what you ought to focus on in a practice," Dr. Gilbert Fellingham said. "What's the skill set that I should be spending the most time on? Because these are the ones that are going to be making the most difference." ♦

## Fall 2012 Seminar Speakers

Two of the speakers for this year's Fall Seminars were Allie Tomlinson and Dr. Lajos Horvath.

The first speaker was Allie Tomlinson, Chairman of the Actuary Advisory Board, on September 13, 2012. This seminar was geared toward undergraduate students. She spoke about the importance of obtaining an internship as well as some tips on how to get an internship. She touched on interview skills, resume writing, and resources available for finding opportunities.

The next speaker was Dr. Lajos Horvath, from the University of Utah's Department of Mathematics, on September 20, 2012. Dr. Horvath is a well-known mathematician who specializes in math statistics, probability theory, and stochastic processes. He spoke to our department about the statistical inference of data when the observations are functions. ♦

## Dr. Reese interviewed by Classical 89 Radio



On September 12, 2012, Dr. Shane Reese was interviewed by Classical 89 Radio about "New Statistics." Dr. Reese explained how statistics has become more popular and appealing in the professional world. The method that statisticians use is a different problem solving method than most other scientists. He explained Bayesian Statistics and how it incorporates all the information to refine uncertainty both numerically and mathematically. The more information used, the less uncertainty there is. Statisticians use data to continually update knowledge to get closer and closer to a higher percentage of certainty. Examples of breast cancer and climate change were used to explain such method's application. He also spoke about his time with the Olympic team and the models used to improve their performance. ♦

To listen to the full broadcast visit :  
[www.classical89.org/thinkingaloud/archive/](http://www.classical89.org/thinkingaloud/archive/)

## Faculty-Student Collaborations

**Tolley, H.D.**, Oliphant, J., **Eliason, R.** (2011) "Modeling Aggregate Interaction Effects in Many Variable Observational Studies," *Statistics in Biopharmaceutical Research*, 210-216.

**Lawson, J.**, Aggarwal, P., **Leininger, T.**, **Fairchild, K.** (2011) "Characterizing Variability in Smestad and Gratzel's Nanocrystalline Solar Cells: A Collaborative Learning Experience in Experimental Design," *Journal of Statistics Education, Online*.

Schultz, G.G., Thurgood, D.J., **Olsen, A.N.**, **Resse, C.S.** (2011) "Analyzing Raised Median Safety Impacts Using Bayesian Methods," *Transportation Research Record*, 96-103.

Department of Statistics Website:  
[statistics.byu.edu](http://statistics.byu.edu)

Please keep us up-to-date on your  
contact information!  
To update your address, email  
[alumni@stat.byu.edu](mailto:alumni@stat.byu.edu)

**Thomas, A.**, Rupper, S., **Christensen, W.** (2011) "Characterizing the Statistical Properties and Interhemispheric Distribution of Dansgaard-Oeschger Events," *Journal of Geophysical Research*, 1-9.

Lyon, G.J., Jiang, T., Van Wijk, R., Wang, W., Bodily, P., Xing, J., Tian, L., Robison, R., Clement, M., Yang, L., Zhang, P., Liu, Y., Moore, B., Glessner, J., Elia, J., Reimherr, F., Van Solinge W., Yandell, M., Hakonarson, H., Wang, J., **Johnson, W.E.**, **Wei, Z.**, Wang, K. (2011) "Exome Sequencing and Unrelated Findings in the Context of Complex Disease Research: Ethical and Clinical Implications," *Discovery Medicine*, 41-55. ♦

## MS Statistics Graduates 2011-2012

### December 2011

Kenneth Fairchild

### April 2012

Brent Shepherd

Jonathan Christensen

Natalie Noel Ellison-Munson

### June 2012

Cameron Willden

Jordan Pyper

Spencer Rogers

Scott Huddleston

Owen Francis

### August 2012

Wei Zhou

Jessica Olsen

## MS Statistics Graduates

### December 2011

**Kenneth Fairchild** plans to get his Ph.D. in Statistics or Finance in the near future.

### April 2012

**Brent Shepherd** successfully defended his project entitled, "Predicting Maximal Oxygen Consumption (VO<sub>2</sub>max) Levels in Adolescents." He is in medical school at the University of Utah and has started research with the epidemiological faculty there.

**Jonathan Christensen** successfully defended his project entitled, "Bayesian Pollution Source Apportionment Incorporating Multiple

Simultaneous Measurements.” He is currently a student at Duke and hopes to get his Ph.D.

**Natalie Noel Ellison-Munson** successfully defended her project entitled, “The Effect of Smoking on Tuberculosis Incidence in Burdened Countries.” She is currently working at Pentaracorp. In the future, she hopes to get her Ph.D. in Public Health or work for the CDC.

### June 2012

**Cameron Willden** successfully defended his project entitled, “Using an Experimental Mixture Design to Identify Experimental Regions with High Probability of Creating a Homogeneous Monolithic Column Capable of Flow.” He landed his dream job, developing innovative products like GORE-TEX®, high-tech guitar strings, and anti-friction rope.

**Jordan Pyper** successfully defended his project entitled, “Estimation of the Effects of Parental Measure on Child Aggression Using Structural Equation Modeling.” He works part-time at the University of Utah.

**Spencer Rogers** successfully defended his project entitled, “Support Vector Machines for Classification and Imputation.” He is currently working at Golman Sachs.

**Scott Huddleston** successfully defended his project entitled, “Hitters vs. Pitchers: A Comparison of Fantasy Baseball Player Performances Using Hierarchical Bayesian Models.” He is currently working in California as an actuary.

**Owen Francis** successfully defended his project entitled, “Species Identification and Strain Attribution with Unassembled Sequencing Data.” He would like to get his PhD in Biostatistics or Computational Statistics.

### August 2012

**Wei Zhou** successfully defended his project entitled, “XPRIME-EM: Eliciting Expert Prior Information for Motif Exploration Using the Expectation-Maximization Algorithm.” He is currently looking for work in the statistics field.

**Jessica Olsen** successfully defended her project entitled, “An Applied Investigation of Gaussian Markov Random Fields.” She is currently working for Adobe. ♦

## Graduate Internships

**Jared Fisher** interned with Savvysherpa in Provo, Utah. They’re a small research consulting group, that originated in Minneapolis. He is currently working with them on a learning project for their clients involving big-data and machines.

**Devin Francom** interned at the National Center for Atmospheric Research in Boulder, Colorado. He worked on calibrating a space weather computer model. That project will most likely become his master’s project as he continues to research there.

**Brian Holt** interned for 12 weeks at the Office of the Comptroller of the Currency (OCC) in Washington D.C. The OCC is part of the Department of the Treasury and is the official administrator of all national banks. He worked mainly with macroeconomic data in this internship. He plans on applying to work there as a research analyst.

## Deans List

### Fall 2011

William Arthur Baumann  
David Jeffrey Bean  
Anna England  
Devin C. Francom  
Cameron Kevin Glead  
Matthew Joseph Heiner  
James Mahlan Marriott  
Nathan Gene Sandholtz  
Justin See

### Winter 2012

Matthew Thomas Bean  
On Yi Chan  
Kaylea Renea Drake  
Matthew Goodwin  
Matthew Joseph Heiner  
Merrick Kendall Johnson  
Mathew Dell Madsen  
Richard Daniel Payne  
Jessica Elise Peterson  
Ammon Lot Slade  
Brittany Sumsion Spencer  
Faith Arianna Sutherland  
Theresa Antoinette Tardiff  
Brandon Romish West  
Meng Zhang

**Nick Martineau** interned this past summer with Banyan Ventures. They are a venture capital company located in Salt Lake City. It was more of a business/finance internship than a purely statistical internship. He worked as an analyst doing research and due diligence on potential investments. He concluded the formal internship, but is still wrapping up a few of the projects he was leading. The company has offered him a position, but he has deferred the offer until he finishes graduate school.

**Aleena Mosher** had a summer internship at Hill Air Force base in Clearfield, Utah with Northrop Grumman. Her internship is continuing through this school year. Her master’s project is a research question from Northrop Grumman.

**Nathan Sandholtz** worked for the Department of Justice this past summer in Washington D.C. He was part of the National Crime Victimization Survey unit at the Bureau of Justice Statistics (BJS). He created a report on trends in hate crime over the past decade that will be published by BJS early next year. ♦

## Actuarial Advisory Board

The Actuarial Advisory Board continues to move forward. Five alumni with industry experience are serving on the board. Allie Tomlinson is the chairman of the board with Michael Bahr, Mark Brown, Lee Gold, and Trevar Withers as board members. The board’s mission is to assist our actuarial faculty in raising the effectiveness of our program by identifying opportunities to produce competitive actuarial graduates and by providing recommendations for implementing changes. The Department continues to bring added value to the education of our actuarial students. ♦

## Undergraduate Mentoring

In 2011, over 20 statistics students benefitted from undergraduate mentoring provided by several faculty members, including Dr. Candace Berrett, Dr. William Christensen, Dr. Gilbert Fellingham, Dr. Del Scott, Dr. Shane Reese, Dr. Natalie Blades, and Dr. Dennis Tolley. The undergraduate mentoring projects ranged from pollution, smoking and tuberculosis to Women’s Volleyball using Bayesian hierarchical models. ♦

## Student Information

The Department of Statistics had 432 undergraduate majors in 2011 consisting of 230 Actuarial Science majors and 81 Statistics majors. Within the Statistics Major, the Applied Statistics and Analytical Emphasis had 87 majors, Biostatistics had 29 majors, and Business Analysis had 5 majors. There were 49 BS graduates in 2011, with 25 Actuarial Science graduates and 11 Statistics graduates (4 Biostatistics, 2 Business Analysis, and 7 Statistics and Analytics). Five students earned Magna Cum Laude, one student earned Summa Cum Laude, and four students earned Cum Laude. Eight students earned their master's degree in 2011.

Twenty-four of our students have made the Dean's List (3.75 GPA with at least 14 credit hours per semester) at least one semester. 4,893 students were enrolled in service classes taught by the department. 4,317 students were enrolled in Statistics 121. 1,250 students enrolled in our major courses. ♦

## Alvin C. Rencher Mentoring Awards

In 2011, Jonathan Christensen and Bradley Ferguson received the Alvin C. Rencher Award. Jonathan was mentored by Dr. William Christensen and Bradley was mentored by Dr. Shane Reese.

Jonathan Christensen worked with William Christensen on Bayesian pollution source apportionment. Using measured concentrations of about 30 different pollutants in the Milwaukee area, they used Bayesian statistical methods to separate out the contributions of nine different sources. He extended some of Dr. Christensen's earlier work to combine measurements from multiple measurement stations in the same area to estimate the sources, rather than only using one source or analyzing the sources separately.

Under the guidance of Dr. Shane Reese, Bradley's research dealt with developing a more effective and cost-efficient way of testing threat detection technologies. Detection of biological and chemical threats is an important consideration in the modern national defense policy. Much of the testing and evaluation of threat detection technologies is performed without appropriate uncertainty quantification. He utilized a

Bayesian Gaussian Process model that allows for a more flexible and robust model fit. He also developed an adaptive experimental design scheme that provides more information than a typical experimental design by performing more tests at more informative concentrations. ♦

## 2012 Student Research Conference

The Department had four Session Winners in this year's Student Research Conference (SRC). The winners were Cameron Willden, Brent Shepherd, Spencer Rogers, and Noel Ellison.



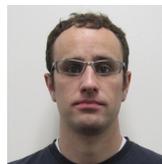
**Cameron Willden's** project was "Mixture Design to Refine a Constrained Experimental Region." He used a filtering device that students from the

Chemistry Department had developed to find the ideal polymer. To accomplish this task, an experimental mixture design was created and carried out to model the relationship between the variables related to the creation of the polymer and the probability of creating an acceptable polymer.



**Brent Shepherd's** project was "Predicting Maximal Oxygen Consumption ( $VO_{2max}$ ) Levels in Adolescents." He proposed a set of Bayesian

hierarchical models to predict  $VO_{2max}$  levels in adolescents. Two models were developed separately and compared: one used submaximal exercise data and the other used physical fitness questionnaire data.



**Spencer Roger's** project was "Support Vector Machines For Classification and Imputation." Support vector machines were applied to a classic data set. Then an algorithm for using support vector machines for the imputation of missing categorical data was shown.



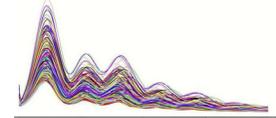
**Noel Ellison's** project was "The Effect of Smoking on Tuberculosis Incidence." Her analysis combined data from multiple sources in order to determine if smoking is a statistically significant factor in predicting the number of incident tuberculosis cases in a country. ♦

## Data Analysis Conference



At the Conference on Data Analysis in Santa Fe, NM, **Devin Francom** presented a poster detailing how functional data analysis can be used

to calibrate a computer model for cosmic microwave background radiation. The output of the computer model is inherently smooth, making functional data analysis preferable. Landmark warping and classical functional data analysis using a functional linear model provide functional coefficients for the effects of 10 computer model parameters. ♦



Above: A portion of Francom's poster showing warped data.

## The International Year of Statistics

The International Year of Statistics ("Statistics2013") is a worldwide celebration and recognition of the contributions of statistical science. Through the combined energies of organizations worldwide, Statistics2013 will promote the importance of Statistics to the broader scientific community, business and government data users, the media, policy makers, employers, students, and the general public.

The goals of Statistics2013 are to increase public awareness, nurture Statistics as a profession, and promote creativity and development in the sciences of Probability and Statistics. ♦

## 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. ♦

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