The Y-Distribution

Brigham Young University **Department of Statistics** **Vol. XVII November 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).

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

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.◆

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 Sciencesat 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.◆

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

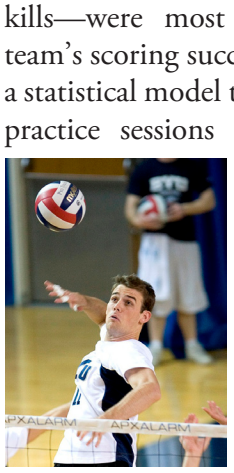
Scroll down and search for professor.

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."◆



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.◆

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
Click on 'Thinking Aloud', then 'Archive.'

Department of Statistics Website:
statistics.byu.edu

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

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.◆

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., Fairshild, K.** (2011) "Characterinzing Variablility in Smestad and Gratzel's Nanocrystalline Solar Cells: A Collaborative Learning Experience in Experimental Design," *Journal of Statistcs 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.

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

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 (VO2max) 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.◆

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

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.

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.◆

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.◆

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 hierarchal models.◆

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.◆

Deans List

Fall 2011

William Arthur Baumann
David Jeffrey Bean
Anna England
Devin C. Francom
Cameron Kevin Gleed
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 Sutherlin
Theresa Antoinette Tardiff
Brandon Romish West
Meng Zhang

Student Information

The Department of Statistics had 432

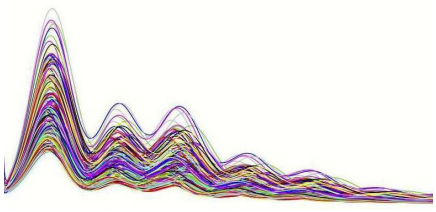
undergraduate majors in 2011 consisting of 230 Actuarial Science majors and 81 Statistics majors. Within the Statistics Major, the Applied Statistics and Analytical Emphasis had 87 majors, Biostatistics had 29 majors, and Business Analysis had 5 majors.

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.◆

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.◆

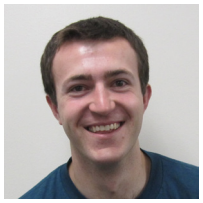


Above: A portion of Francom's poster showing warped data.

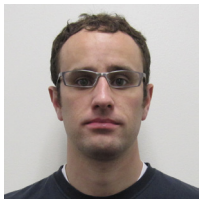
2012 Student Research Conference

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 probability of creating an acceptable polymer.



Brent Shepherd's project was "Predicting Maximal Oxygen Consumption (VO2max) Levels in Adolescents." He proposed a set of Bayesian hierarchical models to predict VO2max 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.◆

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.◆

Dr. Schaalje and the Book of Mormon

Ever since an offensive paper came out twenty years ago about the Book of Mormon, Dr. Schaalje has been defending the book. He responded to that publication and developed a statistical method to support and defend the Book of Mormon.

Recently, Stanford claimed that the author of the Book of Mormon was Sidney Rigdon, due to the word frequencies in the book compared to Rigdon's other writings. Dr. Schaalje supported the Book of Mormon with the use of stylometry, analyzing statistical patterns of words.

Word frequencies establish a pattern know as the centroid. Dr. Schaalje found that although Sidney Rigdon's centroid was the closest match to the Book of Mormon, it wasn't close enough. Just because an individual's centroid is closer than other early Church writer's does not make it a close enough match to be the author of the text. Not only did he statistically disprove the publication's claims, but he justified it with his extensive knowledge in Church History. He is currently teaching a D&C class in the religion department. He continues to guard the Book of Mormon spiritually, historically, and mathematically.◆

Mormon Pioneers Mortality Tables

BYU undergraduate statistics and actuarial students, led by Dr. Dennis Tolley, are exploring pioneer heritage from a new perspective. They are gathering the mortality data on Mormon pioneers who crossed the plains, with the intention of analyzing and creating mortality tables. The pioneers came across with handcarts and covered wagons starting with the first company in 1847 and continued through 1868, due to the finishing of the railroad. As far as they can determine, this data has never been compiled and analyzed from an actuarial perspective, making this project an exciting prospective of adding to what we know about the pioneers. One of the difficulties they are dealing with is the actual gathering of this data

set. The records are old, incomplete, and difficult to trust with so many discrepancies between sources. After they sift through all the information, and are satisfied with their data set they will then begin to analyze it. They hope their analysis will shed new light on the trek and answer a few questions about these Mormon pioneers as a whole.

Did men or women have a higher mortality rate? What were the more likely causes of death? What do the mortality rates look like across the different ages of those traveling? After this analysis is complete, they expect to research and explore new questions that come up during their research taking this project to new places. What did the trek do to the mortality rates of those who made it all the way West? Was it higher or lower than those who stayed in the East? How did those coming from England fair on their extended journey, and so on.

This project is giving students the opportunity to experience the collection and analysis of data using the technical and intellectual skills they've learned. Through the pioneer mortality project they will get a taste of their future professions while learning about their heritage and sharing this knowledge with others. They get to be a part of the step-by-step process of making mortality tables and, in doing so, learn how to think like an actuary/statistician. The future of this project is exciting as those involved take a step into the past.◆

Actuarial Club

The Actuarial club has been busy trying to get approved as an official BYU club, and once they are approved, they plan to have meetings every other week. Many students are excited about the new club and the have great plans. The BYU Actuary meetings fall into three categories: Speakers (Actuarial executives, BYU alumni), Actuarial Job Skills, and Exam preparation. There are approximately 30 members.

BYU Actuaries have two main goals. The first is to establish a strong network of BYU actuarial alumni. Many of the top actuarial firms recruit at BYU because of their experiences with BYU graduates, and we want to strengthen that reputation and make it easier for BYU students to find jobs. Secondly, help students pass exams. An integral part of becoming an actuary is passing difficult exams, and we want to make it easier for students to progress through the certification process. BYU students currently pass exams at a level above the national average, but we feel students helping other students can make that passing mark even higher. If you are interested at all in actuarial topic, have valuable related experience, or if you are planning on becoming an actuary, you should join BYUA.

For those interested (alumni and students) in joining, email **byuact@gmail.com** and request the membership document. ◆

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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