Abstracts for all parallel session presentations

A Bayesian/information theoretic approach to friendship Adam Johnson

Bayesian inference forms an expanding foundation for cognitive science. It has long been used to explain perceptual inference processes and more recently been used to learning hierarchical representations within cognitive processes. However, most research on Bayesian inference within the cognitive sciences has focused on offline (post-hoc) analysis of extant observational data rather than online sampling procedures that inform active learning. We combine hierarchical Bayesian approaches to structural learning from cognitive science with normative statistical sampling to develop a model of active learning. This statistically informed approach suggests that some observations are more meaningful than others. We then use this approach to model the interactions between multiple inferential agents that are capable of (1) selectively acquiring meaningful observations from others and (2) selectively offering meaningful observations to others. We hypothesize that these actions form the foundation of friendship.

A Different Approach Catherine L. Crockett

In this talk, I discuss an approach to getting science majors to rethink their study habits using two simple techniques. The techniques are showing students how to outline concepts in a manner that they understand and in-class quizzes with the intent to give a self-evaluation of where more study time is needed. After using both methods in two sections in a first semester calculus course, I surveyed the students to determine if these activities were successful. A majority of the students felt theses activities were helpful in the course and wanted to continue them.

A Mathematician's Reflections on James K. A. Smith's Desiring the Kingdom Bryant Mathews

The discipline of mathematics, perhaps more than any other, emphasizes the cognitive aspect of our being. In its attempt to reduce objects and statements to symbolic notation and formal logic, pure mathematics may appear to make little contact with the affective or sensory realms. Mathematicians even have a reputation of being so cognitively involved that their emotional and physical beings are left to atrophy. Yet mathematical discovery is itself a visceral experience for those who breathe its air and behold its vistas. In Desiring the Kingdom: Worship, Worldview, and Cultural Formation, James K. A. Smith argues that Christian education should be concerned not just with information but with formation, not just with the dissemination of ideas but with the shaping of desires. The communal practices in which we engage form our habits, whether virtues or vices, which in turn strengthen our desires for a particular version of "the good life." These desires then help to constitute our identity and give direction to our worship. What vision of 'the good life' do students absorb in our classes? Which desires motivate, and are reinforced by, their mathematical study? What behavioral and emotional habits do they develop through participation in our community? And finally, what pedagogical 'liturgies' can help our students to be conformed to the likeness, and not just the mind, of Christ? This talk will share some of my reflections, as a mathematician, on Smith's work, with the goal of sparking your desire to embody his holistic vision of Christian education.

Adventues In Flipping Roberto Bencivenga

Unlike many former students, I never had the experience of flipping burgers to support my education, but recently I have had plenty of exciting and successful experiences in flipping classrooms. The concept behind the "flipped classroom" model is gaining momentum and is briefly described in the document and video available at http://robertosmathnotes.weebly.com/2013-acms-conference.html. If you plan to attend this session, it is essential that you read the document and watch the video beforehand. Together they will take no more than 10-15 minutes, but will make the actual session much more meaningful. In my session I will address any issues and questions that you will bring in relation to flipping the classroom, as well as share some important lessons I have learned from my experience. Finally, the ideas we shall discuss there can be applied to academic settings as well as to any theological presentations, from individual evangelization opportunities to Sunday school and beyond.

Al-Khwarizmi: Father of Algebra? Calvin Jongsma

Adopting a historically defensible definition of "algebra," we will begin by exploring a few examples of algebra prior to al-Khwarizmi. We will then examine what algebra became through al-Khwarizmi's work. In conclusion, we will assess the historical importance of al-Khwarizmi's contributions for developments in European algebra.

An Investigation of Hi Ho! Cherry-O Using Markov Chains Nicholas Zoller

In the children's board game Hi Ho! Cherry-O, players attempt to move 10 cherries from their trees to a bucket in the center of the game board. A spinner determines whether a turn includes moving cherries from tree to bucket or bucket to tree. The winner of the game is the first player to move all of her cherries from her tree to the bucket. We model the game play using a Markov chain and calculate the expected number of turns needed to complete one game. Then we investigate what happens when the rules are changed. We discover that rules changes designed to either increase or decrease the length of the game have the desired effect. However, when rules changes are combined, we find that rules changes designed to decrease the length of a game can hide the effect of rules changes designed to increase the length of a game.

Analysis of Potentiation Bias Within Non-Random Data: Excitation Transfer Theory in Liturgy (Poster Session) Dallas F. Bell

Potentiation's enhancement of one agent by another agent causes the combined effect to be greater than accomplished separately. Over time a bias for repetition develops between those entities. Sequence data can be shown to be non-random. Beginning with mathematical sets, it is argued that there can be no true randomness. DNA sequences, biological and behavioral sequences are also demonstrated to be chronologically a priori of intellect to outcome. Excitation of emotions transfers an emotion to other emotions in cause and effect potentiation(s). The religious practices of liturgical standards culminate in the highest accretion sequence of collective behavioral bias for the human worship experience.

Calculus methods from the early 1600s Gordon Swain

The French mathematician Gilles Personne de Roberval lived from 1602 to 1675. He developed methods for finding areas and arclengths, as well as working on mechanics, and solving problems later attributed to Pascal and Torricelli. In this talk we will discuss ideas and methods that Roberval used to integrate $y = x^n$ in his Traite des indivisibles.

Case Study for Numerical Methods: Components in Audio Recordings Brian Turnquist

Linear Algebra students learn that the same vector can be expressed as a linear combination of different bases. If a transducer is sampled at regular intervals, then the resulting signal may be viewed as a vector in n-space. Examples would include audio recordings, force sensor recordings, and recordings of biological neural activity. Such vectors typically have a tonal component, an impulsive component made up of pops and crackle, and a noise component. A worthwhile case study in teaching Numerical Methods is to demonstrate that by expressing such vectors as a linear combination of a Fourier basis or alternately a wavelet basis, we can choose which features in the signal we wish to see.

Chaos and the Sea: Randomness and Purpose in the World. Troy Riggs

Is there any true wildness or chaos in the world? Some theological viewpoints suggest that there are not. But the Book of Revelation describes a day in which "there will be no sea." Does God interact with people outside of tightly ordered systems in purposeful ways? In this talk we examine how humans are able to work within stochastic systems or even intentionally use randomization methods to accomplish their purposes. Mathematicians, statisticians are able to gain knowledge and manage results in situations where direct control or precise prediction is extremely limited.

Chaos, Reality and Language Kyle Spyksma

Chaos Theory, the mathematical media darling of the '90s, has become less of a societal fad and research interest over the past couple of decades. However, from a mathematical physicists' perspective, issues surrounding Chaos Theory can be valuable aides in forming views on how mathematics, science and reality relate. In this talk, I will briefly explore how Chaos Theory can shape views of these relationships, with a focus on the language we use and (perhaps unintentionally) abuse when doing science and mathematics.

Code Ye into All the World: Leading a Successful Computer Science Missions Trip Tom and Darci Nurkkala

The global missions community goes wanting for skilled workers in almost every discipline. However, even students at a Christian institution that emphasizes global engagement remain largely clueless about the impact they could make in missions by leveraging their own academic specialty. Particu- larly in our on-line, cloud-based, mobile-enabled, global technology ecosystem, the need in missions for skilled workers in Computer Science (CS) and Information Systems (IS) has never been greater. At Taylor, our CS and IS students have ample opportunity to apply their skills to missions computing while on campus through both class and volunteer projects. But it's when students experience on-site work with full-time missions technologists that they develop an understanding and a vision for how they can contribute to missions by leveraging

their own skill and passion. In this paper, we draw on our experience leading CS missions trips. We discuss the need for students to experience missions firsthand, and the student outcomes we have observed in intercultural awareness and spiritual formation. A key student outcome we explore is increased willingness to consider vocational missions service in both internships and full-time service after graduation. We also offer practical guidance for faculty or staff interested in leading discipline-specific missions trips with their students. Although our examples are drawn from our CS trips, much of the material here should be applicable across academic disciplines.

Computing Foundations for the Scientist Catherine Bareiss / Larry Vail

There is a need for a new style of supporting a computer course. Although it is widely recognized that computer technology provides essential tools for all current scientific work, few university curricula adequately ground science majors in the fundamentals that underlie this technology. Introducing science students to computational thinking in the areas of algorithms and data structures, data representation and accuracy, abstraction, performance issues, and database concepts can enable future scientists to become intelligent, creative and effective users of this technology. The intent of this course is not to turn scientists into computer scientists, but rather to enhance their ability to exploit computing tools to greatest scientific advantage.

Creation Care As A Focus For A General Mathematics Course John Roe

Issues of environmental sustainability are a focus of growing concern for many students, and this is a concern that unites profound worldview questions with extremely down-to-earth quantitative ones. A mathematics course built around an environmental theme is therefore a natural context for the integration of faith and learning. I will describe some of the structure for a course that I am developing, inspired by this idea, at a large public (secular) university.

Delaware, Dickeson, Assessment and How You Can Help Maria Zack / Greg Crow

How much release time should a chair receive? What is the cost per unit for a particular academic program? What is a student credit hour (SCH) anyway and why would anyone care? Why are so many boards enamored of Delaware, Dickeson and Assessment? The answer to these and many related questions will be presented in this talk. Analytics and various "efficiency measures" are becoming increasingly important in higher education and mathematicians and computer scientists are being regularly recruited to help university administrators make meaning from large volumes of data. Come and learn about this trend and how you can be of assistance to your institution.

Does research matter? (Panel) Judith Palagallo / Tim Chartier / Matt DeLong / Satyan Devadoss / John Roe / Francis Su

How do the requirements of teaching, research and service shape our career choices? Is the main purpose of a mathematician to produce research and to train students to continue research? Can our involvement in research influence our teaching in a positive way?

Euler and the Ongoing Search for Odd Perfect Numbers Brian D. Beasley

Leonhard Euler, after proving that every even perfect number has the form given by Euclid, turned his attention to finding odd perfect numbers. Euler established a basic factorization pattern that every odd perfect number must have, and mathematicians have expanded upon this Eulerian form ever since. This talk will present a brief summary of Euler's result and some recent generalizations. It will also note connections between odd perfect numbers and the abundancy index (the abundancy index of a positive integer is the ratio of the sum of its positive divisors to itself). In particular, finding a positive integer with an abundancy index of 5/3 would finally produce that elusive odd perfect number.

Explore Global Opportunities for Mathematics Scholarship, Teaching, and Service Ron Benbow

There are numerous overseas opportunities in which to apply your knowledge and interest in mathematics. These international experiences allow you to expand your scholarship, extend your teaching skills, to offer professional services to K-12 teachers or other university instructors, and provide much personal enrichment as well. Examples from recent professional experiences in Liberia, Haiti, Guatemala, and Ecuador will be shared to illustrate the connections to teaching, scholarship, and service. Information regarding MAA Study Tours, Fulbright Specialist grants, and other relevant organizations will be provided.

Factorizations in Strong Divisibility Sequences Stephen Lovett

A strong divisibility sequence is a sequence of integers a_n that satisfies $gcd(a_m, a_n) = a_{gcd(m,n)}$. Such sequences include many recursively defined sequences, including the Fibonacci sequence, and sequences created by repeatedly applying a polynomial to some initial condition. In this talk, we prove a factorization property about strong divisibility sequences in the more general context of a UFD, illustrating consequences for cyclotomic and dynatomic polynomials. Furthermore, a converse to this talk's main theorem provides a simple necessary and sufficient condition for a divisibility sequence to be a rigid divisibility sequence.

Faith Integration Panel Discussion Jamie K. Fugitt / Derek Schuurman

A panel session on the integration of faith and discipline in the undergraduate curriculum. As a part of the session, Russ Howell will present an opportunity coming from the Journal of the American Scientific Affiliation. Several submitted essays in response to a broader article will be selected by a committee of editors for publication.

Faith Integration Projects for Students Doug Phillippy

This talk will consider the use of projects to motivate students to think deeply about how their faith connects with mathematics. This talk will begin by describing what a faith integration project is, including the goals and objectives of such a project. The talk will briefly describe a number of projects written by the speaker, with a more detailed look at one of those projects. The talk will conclude by discussing how these projects are being used to assess how students are doing at articulating a maturing understanding of the connection between faith and mathematics.

Getting Freshmen Interested in the Infinite Nicholas Willis

How do you get freshmen interested in Mathematics? How do you integrate faith and Mathematics? How do you describe cardinality to non-majors? Solutions to these questions will be discussed in the context of a freshman seminar course at George Fox University.

Googol-part Fugue: Another Imagination of Game Theory and Divine Providence Gideon Lee

The problem of evil presents an intellectual hurdle for some to believe in a good and omnipotent God. The emergence of open theism could be seen as an attempt to make a stronger case for the free will defense. However, in denying divine foreknowledge as traditionally understood, open theism contradicts biblical revelation not only in its direct claims, but also when its logical implications for divine providence are worked out. The open theist Alan Rhoda has sought to explain through game theory how some degree of divine providence is possible under open theism. That explanation is astonishing since the open theist view of libertarian free will is intrinsically at odd with the rational actor model presupposed by game theory. In this essay, the free will defense of open theism and two other responses to the problem of evil are examined. Game theory and other mathematical theorems are employed in illustrating the theological claims. This essay seeks to show that the historic Christian doctrine of divine sovereignty can be reasonably explained given the presence of evil. The key is to recognize the biblical picture of the present age as a development ground and worthiness-demonstrating trial for a perfectible authentic humanity, chosen for a glorious leadership role in the new heavens and new earth, where everything will be knowable, optimal, and predictable.

Ideas For a Math Capstone Course Robert Brabenec

After teaching a majors capstone course on the history and foundations of mathematics for over forty years, I tried several variations this past semester. I will discuss these in my talk, along with an assessment of their effectiveness. Some of the ideas can be introduced into other mathematics courses for variety and enrichment.

Individualized Tests and Projects in Introductory Statistics Courses Clifford H. Wagner

I have written text processing software to enable instructors in introductory statistics courses to produce multiple versions of tests and projects. In the case of tests, having several similar but significantly different versions of a test helps reduce security concerns in large classes. In the case of projects, most students are more interested when they are asked to analyze their own personal data set. This software, Automatic Statistics Test Generator, is available for sharing and allows the instructor to add special code to a standard LaTeX file, and thereby produce multiple versions of a given document, each with its own answer sheet.

Insights on the Neyman-Pearson Lemma: Alternative critical regions, and their power. David E. Wetzell

The Neyman-Pearson Lemma is a powerful fundamental lemma in the area of hypothesis testing in Statistics. It gives the best test when testing simple vs. simple hypotheses. In this talk we would like to investigate testing a population mean $H_0 \ \ \mu = \mu_0$ vs. $H_1 \ \ \mu = \mu_1 > \mu_0$. As a result of the N-P Lemma, the best test is of the form, "Reject H_0 if $\overline{x} > c$" , where c is chosen so that the Type I error probability is a. Let n be small. What are some alternative decision rules of size a, what is their power in comparison to the best test? The talk should be of interest to a person who has had a first course in Probability and Statistics.

Integrating Faith through Writing in Calculus I Rebekah Yates

For many calculus students, there is no connection between mathematics and their faith beyond praying that God will help them survive the course. To create space for my students to explore how their learning in Calculus I and their Christan faith can inform and enrich each other, I give several short writing assignments over the course of the semester. I will share highlights from these assignments and student responses to them.

Inverted Classroom in Abstract Algebra: Daniel Kiteck

I was interested in trying something different than lecture in my abstract algebra class. I had heard of Inquiry-Based Learning, but I wasn't ready to make the full commitment of preparing a class where the students "found" proofs on their own to the main theorems, after being given minimal axioms. I decided, instead, on doing a type of "inverted classroom" where the students, in pairs, wrestled with the examples and proofs outside of class, so that they could present them during class-time. During class, I called on different students to present, where the students did not know who I would call on beforehand. Almost every class was almost entirely students leading the class. This resulted in rich class-times where the students were engaged, asking deep questions, and, getting more out of the material.

Invitation to the mathematical community: blog discussions in a transition course Kristin A. Camenga

Transition courses help students learn the basic logic and proof techniques they will need to be successful as a math major. However, these courses can also invite students more broadly into the discipline, preparing them to participate in the mathematical community. We share blog assignments and resulting discussions from a 7-week Introduction to Proof class which are intended to place the students' work with proof in a larger context. Topics include the interaction of math and faith, the nature of proof, and beauty in mathematics.

Lessons from "The Lesson of Grace in Teaching" Francis Su

At the Joint Winter Meetings in January 2013, I received the Haimo teaching award, and in my acceptance speech I chose to speak about how grace has shaped my teaching. In particular, I explained how giving and receiving grace can challenge the academic notion that you are defined by your accomplishments. I will share excerpts of this speech, as well as reactions to my speech, which subsequently went viral online and has been shared five thousand times on Facebook.

Life Lessons from Leibniz Andrew Simoson

The tri-centennial of Leibniz's death is nigh (2016). And 2013 is not too early to begin a special celebration of this man of mathematics. Besides being the co-discoverer of calculus and the implementer of binary numbers, formal logic, and formal languages, all of which foreshadowed the computer age, Leibniz is said to be one of the last to know almost everything that was known about almost anything. Professionally, his occupation was librarian in the princely court of Hanover in old Germany. Serving under three different princes, the last of whom became George I of England, Leibniz had to continually re-invent himself—somewhat like us older teachers and professors who have continually re-invented ourselves over the years as classroom technology changed from slide rule to hand-held calculators to computers to a profusion of computational schema and distance-learning on the web—-under changing administrations and expectations. Throughout his long life, he traveled extensively, maintained a vibrant, voluminous correspondence with a host of theologians, scientific savants, politicians, and friends. In fact, Leibniz is said to have "fine-tuned" the notion and practice of "the balance of power" among nations and pioneered the idea and practice of ecumenicalism within the fragmented church universal. He has much to teach us about math, life, and faith. In our time slot on the program—we give a short sketch with a few life lessons from this giant of a man.

Mapping Biblical Commandments to an Iterated Prisoner's Dilemma Framework Nathan Gossett / Adam Johnson

In his writings on Game Theory, an d the Iterated Prisoner's Dilemma in particular, Robert Axelrod outlined four properties that are predictors of a successful strategy: Niceness, Reciprocity, Forgiveness, and Understandability. On the topic of Reciprocity, Axelrod makes the claim that not only does The Golden Rule lead to a suboptimal strategy, but that one of the most successful strategies (Tit for Tat) shows that a command of "An eye for an eye" leads to a much more optimal strategy. In this paper, we will discuss the details of Axelrod's four properties, outline Biblical support for all four, and discuss how, within the framework of an Iterated Prisoner's Dilemma, neither "Do unto others..." nor "An eye for an eye" are the Biblical command that most closely matches the behavior of winning strategies in regards to the Reciprocity property.

Math Services (Birds of a Feather) Patrice Conrath

A gathering of those interested in math services (including Math Labs, testing, etc.).

Mathematical Affections: Assessing Values in the Math Classroom Josh Wilkerson

When am I ever going to use this? As a math teacher, this is the number one question that I hear from students. It is also a wrong question; it isn't the question the student truly intended to ask. The question they are really asking is "Why should I value this?" and they express their inquiry in terms of practicality because that is the language in which their culture has conditioned them to speak. While the utility of mathematical concepts are certainly important, we as educators need to utilize the mathematics classroom to address the more fundamental issue of fostering a proper sense of values. Learning has little meaning unless it produces a sustained and substantial influence on the way people think, act, feel, and ultimately worship. According to the NCTM standards it is through assessment that we most clearly communicate to students what aspects of mathematics are to be valued. This talk will address two essential questions:

1) *Why* is it necessary to develop assessments that equip students to not only know and practice but also love that which is true, good and beautiful?

2) *How* do we design worthwhile mathematical assessments that synthesize something seemingly non-objective like personal values with something seemingly non-subjective like mathematics?

The title of this talk is in homage to Jonathan Edwards' *Treatise on Religious Affections*. Edwards' goal was to discern the true nature of religion and in so doing dissuade his congregation from merely participating in a Christian culture (a mimicked outward expression) and motivate them to long for true Christian conversion (an inward reality of authentic Christian character). The purpose of this talk is to engage ACMS members in discerning the true nature of mathematical assessment and how we use it in the classroom: does it simply mimic the modern culture of utility by requiring outward demonstrations of knowledge retention and application, or does it aim deeper at analyzing true inward character formation? In closing, examples of affective mathematical assessments will be presented as resources for consideration and classroom use.

Modern Portfolio Theory Pays Dividends in Math Class (Poster Session) Ken Constantine

This poster indicates how simple linear regression, as employed in Modern Portfolio Theory, can be exploited as a finance-related application in a variety of Mathematics courses. The setting, with a linear relationship between a single investment's return and a market surrogate's return is first described. This setup can be a springboard to classroom examples or student projects including:

- Linear relationships – slope and intercepts – as in a PreCalculus course
- Simple linear regression – least squares and $\mathbb{R}^2$ – as in Introductory Statistics
- Calibration intervals – as in an upper level Statistics course

In addition to the technical content, discussion topics are indicated including:

- Implications of the fitted model for investment strategy
- Limitations of mathematical models and portfolio theory in actual implementation
- Financial stewardship – for personal finance, for charitable giving, for church investments

Normal Mode Analysis and Gaussian Network Model for protein structure fluctuations Jun-Koo Park

Functions of bio-structures are related to the dynamics, especially various kinds of large-amplitude motions. With some assumptions, those motions can be investigated by Normal Mode Analysis (NMA) and Gaussian Network Model (GNM). In this work, I review the NMA and GNM and evaluate GNM, based on how well it predicts the structural fluctuations, compared to experimental data. Then, I propose more refined GNM to reflect more physical interaction between atoms and compare the refined GNM with GNM.

Open Source Software: What it is, and why should we care? Karl-Dieter Crisman

We are all familiar with the difference between software on the desktop and the cloud, as well as software with varying price tags. But the distinction between proprietary and open source software is far less familiar, though I will argue in this talk it is also crucial. After giving an overview of what the question is really about (with an emphasis on mathematics instruction and research), I will summarize four main intersection points between Christian thought and the nature of open source software, at its best.

Pedagogical Enhancements to the DeSymbol Logic Translator Darren F. Provine / Nancy Lynn Tinkham

DeSymbol is a program that translates first-order predicate logic expressions into English. It is intended to be a practice tool for students who are learning logic for the first time or who are trying to refresh their memories if they need to use symbolic logic for an upper-level course. Students start with an English sentence and translate it by hand into symbolic logic notation; then they can check their work by using DeSymbol to translate their notation back into English. If the English sentence produced by DeSymbol differs significantly from the original English sentence, this helps the student to see what error was made in the logic expression. The latest version of DeSymbol adds support for prepositions, so that the student can now test expressions such as as $\text{on}(a, b)$ and $\forall X \forall Y (\text{on}(X, Y) \rightarrow \text{under}(Y, X))$. It also now supports a wider variety of idiomatic translations, including improved translations of common student mistakes. For example, the student who begins with the English sentence "All cats are mammals" and writes the expression $\forall X (\text{cat}(X) \wedge \text{mammal}(X))$ will see DeSymbol re-translate the expression as "Everything is a cat and a mammal", which helps the student to see why the expression is incorrect.

Philosophy Motivates Undergraduates in Mathematics Dusty Wilson

Is mathematics discovered or invented? After a sabbatical and years of study, I am not much nearer an answer, but I have watched this enigma transform students. The history and mystery of mathematics helps connect students from across the curriculum. Additionally, I have used the philosophy of mathematics as the core of small student seminars. These seminars have been foundational to prospective mathematics majors and drastically altered the academic pursuits of others. While appropriate within any small college setting where resources are limited and freedom great, I will present within the context most familiar to me. Given that over 40% of students receiving a bachelor's degree in mathematics earn credit at a community college, these simple steps at a public two year college may have a lasting and resounding influence on mathematicians and math education for years to come.

Philosophy of "spinning wheels" Loredana Ciurdariu

In this material I will speak about some well-known mechanisms studied by students and engineers emphasizing the impact which "spinning wheels" had and have in development of the society, on Christians and the church. Also the discovery of these machineries determines major changes in the people's outlook and leads to new trends in philosophy and Christianity. Then, I will give some examples from the Bible where "spinning wheels" it seems to appear: Judge 16:21, Ezekiel 1 and Revelation. In addition, an avi file where we can notice the movement of the "spinning wheels" (a crank-slider mechanism for example) will be attached.

Planning a Calculus II Class Dali Luo

A calculus II course typically includes these two parts: integration techniques and series. In this presentation, the following chart will be introduced which not only assists me in planning for the course but also helps the students to see the big picture of each of the two parts and, as a result, put together the numerous formulas.

	One-Mile Run	
Warm-up		review
Lap 1	Determination	preview
Lap 2	Persistence	new formulas
Lap 3	Endurance	more formulas
Lap 4	sprint	integration
Finish line		test

Reading Assignments and Assessments: Are Your Students Reading Math Text Before Class, After Class, Both, or Neither? Dave Klanderman / Mandi Maxwell / Sharon Robbert / Bill Boerman-Cornell

In his recent book What the Best College Students Do, Ken Bain defines a number of different types of students including "surface learners," "strategic learners," "routine experts," and finally, "deep learners." In our mathematics courses at Trinity, we have found examples of all of these student types, and a major determinant of their preferred approach to learning appears to be the ways and degrees to which mathematical texts and other written materials are read prior to class sessions. Each full-time member of the department both assigns and assesses the reading of mathematical materials prior to class sessions. Assessment methods vary significantly as well as the corresponding pedagogical choices. During this session, we discuss the results of a survey of over 100 Trinity undergraduates enrolled in a mathematics course during fall 2012. The courses included those at the introductory level such as statistics, calculus, and math for teachers, and those at the advanced level such as geometry, history of mathematics, and senior capstone seminar. Assigned reading materials ranged from textbooks, supplementary readings (e.g. Dunham's Journey Through Genius), and readings engaging a Christian worldview (e.g. Mathematics Through the Eyes of Faith). A summary of student evaluations of the assigned readings and related assessments will provide participants with issues for further reflection and potential future implementation in their own mathematics courses.

Service Learning in College Algebra Tedd Szeto

Azusa Pacific University, located in an extremely diverse part of Southern California, partners with many local agencies to provide its students with experiences that intentionally integrate academic learning with community service. For the past eight semesters, multiple sections of APU's College Algebra course have participated in this type of service-learning project by teaching prepared lessons to local fifth graders. This talk will detail the designing this program, discuss mutually beneficial aspects for all students involved, examine some of the challenges, and report the results from statistical data generated from the elementary students' pre- and post-tests.

Service Learning Panel Karl-Dieter Crisman / Josh Wilkerson / Dave Klanderman / Maria Zack

Many of us have wanted to incorporate service experiences in courses, or are being asked by our institutions to do so. Service-learning is a way of looking at service as being a partner with and leading to learning for our students. But in math, there are not a lot of resources to use! Our panelists will present classroom-tested ideas from several different levels of course, and we will end with a short time for more brainstorming among all participants.

Shaping a Digital World Derek Schuurman

The talk will present a book project about faith and computing that I have been working on - the book is called "Shaping a Digital World" and will be published by Intervarsity Press in June 2013. I hope to share my journey in writing the book along with an outline of the book.

Simulation Projects in an Operations Research Course Patrice Conrath

Bethel's junior/senior level course, Operations Research, involves a simulation project that utilizes the whole class as a project team. Five of the last eight course projects have helped to optimize various systems at Bethel. The remaining three projects include the local McDonald's drive through, a missions air base network, and most recently, a local food packing model for an agency called Feed My Starving Children. We will explore the advantages of each type of project and some of the impacts on students beyond mathematics/computer science knowledge (such as considering using their talents to help a non-profit). I will also share materials related to the project management structure, portfolio requirements, and other project management issues.

Successes and Challenges in Interdisciplinary Teaching Lori Carter

In the fall of 2012, after 2 years of research and planning, we launched a Computational Science minor at Point Loma Nazarene University. This meant that we were now inviting Biology, Chemistry, and Physics students to be primary players in mathematics and computer science courses. In some cases, we re-tooled existing computation-based classes to emphasize science-related examples and applications. In other cases we created brand new courses that were designed to blend the introduction of science-related problems with the introduction of computational tools to help solve them. In these courses, science students and computational students were on equal footing. Sometimes the science students knew more about the subject and were helping to teach the computational students, and sometimes it was the other way around. Most participants would agree that it has been a wonderful and fruitful adventure so far. But, it has not been without its surprises. The goal of

this presentation is to share what we've learned about interdisciplinary teaching, projects, expectations, learning styles, and recruitment.

Teaching Complex Analysis as a Lab-Type Course with a Focus on Geometric Interpretations using Mathematica Bill Kinney

I taught Complex Analysis for the first time in my career during the spring of 2013. I decided to do something "radical" and teach it as a lab-type course with a focus on geometric interpretations using the computer program Mathematica. We met in a computer lab and, during most meetings, we spent a large portion of our time experimenting and exploring using Mathematica to visualize key concepts in Complex Analysis. Because of this, there was a heavy emphasis on viewing analytic functions as conformal mappings as well as considering associated vector fields and flows. Mathematica was used to make the concepts "come alive" through its animation capabilities. The demonstration of these animations will be the main focus of my talk. I will also briefly show how I helped students learn more basic content through the use of many 10-minute video lectures (I also taught basic Mathematica code during these lectures).

Teaching Virtuous Computer Programming Victor Norman

Teaching computer programming means teaching students a skill – how to program a computer in a certain language. An instructor must teach the language syntax, data types, problem decomposition, debugging, and testing. However, an instructor of computer programming can teach more than just the skill of programming, but also incorporate and emphasize certain virtues, including hospitality and humility. This paper argues that a student who learns these virtues as they relate to computer programming will learn to produce code that is cleaner, better documented, more reliable, more robust, simpler, and better tested.

The Centrality of Christ: The Bell Curve As A Biblical Type of Christ Jason Wilson

Over two hundred years after his death, an unfinished notebook of Jonathan Edwards' was published for the first time in 1993. Edwards was a father of the Evangelical movement, but because his work on typology was not published until recently, it has received almost no attention. In his notebook, Edwards makes an explicit argument for extending biblical typology to nature in a biblically grounded manner. This study is an attempt to extend that research program into mathematics/statistics. We will consider the following proposition, "The normal distribution (the graph of which is the bell curve) is a biblical type of Christ." The basic idea is that as the normal distribution is the center of the discipline of Statistics, so Christ is the center of the plan of God (Eph 1:9-10). Evidence for the proposition will be given from four different statistical phenomena regarding the normal distribution: the Central Limit Theorem, limiting distributions, its striking conditional and marginal distributions, and its unique name.

The Founding of the Analytical Society at Cambridge University Richard Stout

Mathematics played a prominent role at Cambridge University from the end of the 1700's on through the nineteenth century, however by the early 1800's Britain was far behind the rest of Europe in producing important mathematicians and significant mathematics. Changes were needed and many historians point to the founding of the Analytical Society in 1812 as an important turning point in reforming British mathematics. One of the remarkable features of this group is that it was not composed of faculty members, but was a student-led organization, whose leadership was a group that the historian Joan Richards claims "went on to become the core of English science for the first half of the nineteenth century." While there is little doubt about the influence of the Analytical Society on British mathematics, this presentation will focus on the mathematical and institutional factors that contributed to the founding of the Analytical Society, especially the student-led efforts to establish a Cambridge branch of the British and Foreign Bible Society.

The Structures of the Actual World Walter J. Schultz / Lisanne D'Andrea Winslow

Scripture teaches that God has a plan for the universe. In this paper we argue that in order for it to function as a plan, it must have a temporal structure, a representational structure, and a proto-causal structure. This paper presents a formal model of the these three structures. As it turns out, the structures of God's plan are best understood as the structures of a musical composition. We, then very briefly describe its implications. The first is that this model (based ultimately in the doctrine of God) grounds a metaphysics of science. Second, it grounds a structuralist philosophy of mathematics. Third, since the composite structure is a complex relational structure (some of whose parts are themselves mereological sums defined predicatively) global self-reference is eliminated. Therefore, if in the spirit of Leibniz we take God's plan to be the actual world for a metaphysics of modality, we are able to preclude the incoherence that plagues set-theoretic constructions

of platonic entities such as Roberts Adams' maximal propositions and Alvin Plantinga's 'book' on the actual world. Yet, in one sense, our model is a logical extension of Plantinga's 'actual world' as a maximal, temporally-invariant state of affairs. So, the model also grounds a metaphysics of modality in the biblical doctrine of God. Fourth, the model provides the basis of a world-inclusion semantics for systems of formal logic.

The Unity of Knowledge and the Faithfulness of God-The Theology of Mathematical Physicist John Polkinghorne Matt DeLong

The Rev. John Polkinghorne is arguably the greatest living Christian voice in the dialogue on science and religion. A well-decorated mathematical physicist, Polkinghorne resigned his academic post mid-career to study for the Anglican priesthood. He has since become an influential theologian and a prolific author. Polkinghorne is widely admired by Christian academics for his thoughtful and winsome defense of the harmony between science and faith, and yet his theological views are not without controversy. This talk will give a brief survey of Polkinghorne's theology, including his thoughts on the Trinity, the Bible, creation, prayer, providence, and eschatology, with a particular view for the ways in which his mathematical and scientific thought has influenced his theology.

Using Anime and Manga to Strengthen Content Retention Eric Gossett

Mathematics and Computer Science are subjects that many Japanese consider to be normal parts of life. Consequently, these subjects appear fairly often in popular culture. In particular, anime (Japanese animated cartoons) and manga (Japanese comic books and graphic novels) contain many examples of significant content in these disciplines. I have found many of these examples to be helpful as tools to reinforce idea retention. Of great interest is the series of Manga Guides to many subdisciplines in the STEM fields, including linear algebra, statistics, and database. In this session I will share some of my favorite examples.