ACMS Biennial Conference 2003—Abstracts

May 28-31, 2003
Point Loma Nazarene University
San Diego, CA

Parallel Sessions: Christian Perspectives

Thursday 1:30 - Rohr Science 236
Ron Benbow
"Making Connections: Using Analogies To Enrich Understanding of Mathematical Ideas and Biblical Truths"

Recent standards and research, published by mathematics education professional organizations, place a great emphasis on “connections” in all grade levels. Through this emphasis on interrelatedness, students begin to see the subject not as a collection of separate strands, but rather as an integrated field of study. When linkages between diverse domains of knowledge are formed (by comparing, contrasting, analyzing, and applying), we have increased the likelihood that we develop deeper understandings within both domains.

Thursday 2:00 - Rohr Science 236
Jonathan A. Zderad
"Are the Real Numbers Real?"

Is mathematics real or true is some objective sense? Or is mathematics simply a human or cultural creation? Leopold Kronecker(1823-1891) tried to answer these questions with his well-known Creationist claim that “God created the integers, all else is the work of man.” In this essay, I will assume a weaker form of Kronecker’s hypothesis, namely, that “God created the natural numbers.” I will attempt to demonstrate that such an assumption implies the existence of many other mathematical systems, including the real numbers. As a conclusion, I will be able to support a much more inclusive Creationist philosophy of mathematics.

Thursday 2:30 - Rohr Science 236
Scott Taylor
"Mathematics and the Love of God: An introduction to the thought of Simone Weil"

Simone Weil (1909-1943) was a French philosopher, mystic, and activist. Her brother, André Weil, was a founding member of Bourbaki and one of the twentieth century’s greatest mathematicians. Simone Weil’s search for truth caused her to wrestle with the spiritual significance of mathematics. She praises mathematics’ ability to develop concentration and criticizes the modern scientific establishment for abandoning a religious motivation for mathematical work found in the work of the ancient Greeks. Her writings have much to say regarding the relevance of faith to mathematics and mathematics to faith.

Parallel Sessions: Mathematics Education

Thursday 1:30 - Rohr Science 302
Peter Atwood
"Learning To Construct Proofs In A First Course On Mathematical Proof"

One of the principle adjustments in the mathematics major curriculum in the last thirty years has been the introduction of a transition to advanced mathematics course to address the discontinuity between the emphases on objects and processes in the lower-level courses to the emphases on abstractions and proofs in the upper-level courses. Scripture points out the importance of giving reasons for our claims while maintaining integrity.
Defending the reasonableness of mathematical proof, in turn, honors God. This study examined the conceptions of proof that undergraduate students have upon entry to a transition course on mathematical proof, how they develop skill in planning and reporting proofs, obstacles they encounter, and the effects of instruction on their performance in solidifying schema for proof-planning and proof-reporting.

Thursday 2:00 - Rohr Science 302
Brad Whitaker
"Playing the Chaos Game With Any Regular Polygon: A General Formula for the Simple Rules"

The Chaos Game, resulting in the Sierpinski triangle, first received broad interest as a result of James Gleick's 1987 book, "Chaos: Making a new Science" and a January 1989 episode of Nova titles, "The Strange New Science of Chaos". Over the past fifteen years, many have "rolled the dice" and generated a fractal triangle, with some taking the game further to create the Sierpinski Carpet (rectangle) as well as the "Sierpinski" pentagon and hexagon. But why stop there? Using basic algebra and trigonometry, mathematics educators lead high school and college students in an exploration of the mathematics behind these fractal images and derive a general formula for the simple rules for playing the Chaos Game with any regular polygon. Particularly appealing to mathematics educators, the chaos game provides an avenue through which fundamental concepts of chaos and fractal theory may be presented to mathematics students from high school through college.

Thursday 2:30 - Rohr Science 302
Mary Wagner-Krankel
"Integrating Laptops into a Mathematics Curriculum"

St. Mary's University has recently adopted a laptop program campus-wide. This session will look at the impact of this program on hardware and software support, faculty training, and course offerings in the mathematics department. Research results on student usage and satisfaction with the program will also be discussed.

Parallel Sessions: Computer Science

Thursday 1:30 - Rohr Science 202
Lori Carter
"Predication in DSP Architectures: Maximized Benefits, Minimized Cost"

One of the major limitations on processor performance is hard-to-predict branches. Branches that are incorrectly predicted can incur a significant penalty on execution time. Predication is a compiler optimization that has been used with general purpose processors to effectively remove branches, exploiting available parallel execution slots to execute both paths of the branch. However, modern applications often include complicated branch structures. Applying predication to these structures can result in extensive code expansion, creating a bottleneck in the pipeline and increasing the power consumption of the system. Digital Signal Processors are a class of specialized processors executing programs with simple branching constructs that require precise guarantees on latencies within the system. This presentation argues that in the DSP environment, predication can be used to its fullest extent to increase performance while maintaining the high standards of speed, timing and power consumption required for real-time analysis.

Thursday 2:00 - Rohr Science 202
David Stucki
"Computer Science, Metaphorically Speaking"

I would like to explore one way in which we can think about the relationship between our Christian faith and belief structure and the attitudes and beliefs we hold towards computers and computer science, namely metaphor. I will lay out an idea for a stance that may help us in evaluating our responses to developments in our discipline and then invite discussion.

Thursday 2:30 - Rohr Science 202
Jeff McKinstry
"Synchonous Activity Binds Visual Stimulus Properties Viewed By A Brain-Based Device"

Animals can effortlessly bind the attributes of stimuli to form a coherent scene. A theoretical proposal to solve this binding problem relies upon reentrant signaling that synchronizes activity between cortical areas. We tested this notion with a mobile device that was guided by a simulated visual system based on the primate brain. In the simulation, area V1 contained neuronal units selective for color and orientation having small receptive fields that projected to units in area V4 that had larger receptive fields. V4, in turn, projected non-topographically to a simulated area IT. Reciprocal connections were present within V4 and between V4 and IT. Neural activity was simulated with a mean firing rate model augmented by a phase variable representing the timing of activity. The device explored an enclosure containing objects of various shapes and colors. Analysis of the simulated IT activity showed that reentrant connections were necessary for the device to correctly classify multiple objects that were viewed simultaneously. In a scene containing multiple objects, the phase of neuronal group activity in V4 and IT responding to a given object tended to be similar,yet was distinct from the phase of other objects. Object selective neuronal units in IT emerged, similar to those found in the

primate,with responses that were invariant to shift and scale over the range of views encountered. This study supports the proposal that reentrant connections and synchronization provide plausible mechanisms for solving the binding problem in the presence of self-motion and real-world input.

Parallel Sessions: General Mathematics

Thursday 1:30 - Boney Hall 2
John Byl
"Mathematical Models and Reality"

Mathematical models can serve as powerful and convenient means to represent reality. There is a danger, however, to view such models as not just presentations of reality, but as reality itself. This is most evident in physics and cosmology. One must be careful to distinguish between abstract universals and concrete particulars. Any set of data can be represented by a variety of models. These models are in turn subject to various physical and philosophical interpretations. The choice of model and interpretation is often made on metaphysical grounds, depending on one's worldview.

Thursday 2:00 - Boney Hall 2
Andrew Simoson
"A Greater Tantalizer"

After a brief overview of the five Platonic solids and their lore, we introduce and analyze a combinatorial game involving a set of six octahedra, each face of which is colored with one of six colors. The object of the game is to stack the blocks so that on each of the column faces, all six colors appear. A little bit of graph theory manages to reduce the search space for the solution down from over 300 million different arrangements to the unique solution. Each member of the audience will receive a game set to keep, being 6 plastic octahedra, hand-painted in India!!!

Thursday 2:30 - Boney Hall 2
Eric Gossett
"The Search for the Real Josephus Problem"

The Josephus Problem is the familiar puzzle where n men are seated in a circle and every mth man is killed until only one is left alive. You are to determine which is the ideal position in the initial circle. The puzzle was inspired by an event from the life of Flavius Josephus. However, the actual event did not involve men in a circle and the killing of every mth man (typically described as m=3). The talk will present some partial findings regarding the search for the origins of the problem in its present form. I will also discuss several (very old) variants on the problem, as well as present a mathematical solution for the case m = 2.

Parallel Sessions: Christian Perspectives

Friday 10:30 - Rohr Science 236
Sab Matsumoto
"Quantitative Reasoning from a Christian Perspective"

In educating future leaders and citizens of our fast-changing society as well as “ambassadors” and “representatives” of the Kingdom of God in this world, it is very important for us to teach mathematics with emphases in critical thinking (logic, fallacies, problem-solving, etc.) and quantitative reasoning (data analysis, statistical understanding). I have been teaching courses in critical thinking at Christian institutions and have made efforts to incorporate some contents and methods originating from a Christian perspective. In my talk I will present some of these examples as well as what I consider to be goals and objectives in such a course. More specifically, I will discuss my use of an online discussion board, logical/propositional display of Bible passages, and other practical examples interesting from a Christian standpoint.

Friday 11:00 - Rohr Science 236
Johan de Klerk
"A Christian perspective On Mathematics: History Of Mathematics And Study Guides"

At previous conferences of the ACMS I discussed the matter of a Christian perspective in a mathematics class and a method of giving atttention to such matters in practice via a contextual approach. In this presentation attention will be given to the following two topics:

1. A study of the history of the subject -- does that help in promoting a Christian perspective on the subject? and,
2. The contextual approach of bringing a Christian perspective -- how can it be implemented in a study guide?

Friday 11:30 - Rohr Science 236
Richard E. Sherman
"Non-Random ELS Extensions in the Book of Ezekiel"
A set of equi-distant letter sequences (ELSs) of a pre-defined group of country names was located in the book of Ezekiel and a control text (a Hebrew translation of Tolstoy's War & Peace). Each of these initial ELSs were reviewed by two Hebrew experts for possible extensions. Neither expert had any knowledge of the source text of any of the letter strings they reviewed. Statistically significant differences in the number of extensions discovered in Ezekiel were observed. An extension discovery rate from the control text was used to estimate the probability of chance occurrence of a large cluster of extended ELSs located in Ezekiel 37. That probability was too small to accurately estimate by standard methods.

Parallel Sessions: Mathematics Education

Friday 10:30 - Rohr Science 302
Ken Constantine
"Exploiting the Confidence Interval: Hypothesis Test Equivalence in Statistics Classes"

An emphasis is offered for the inference portion of an elementary Statistics course: the equivalence between confidence intervals and tests of hypotheses. This equivalence is rarely mentioned in basic texts but seems helpful to students. Student reference sheets which employ this equivalence are available on-line.

Friday 11:00 - Rohr Science 302
David E. Boliver
"Preserving Significant Past Events and Studies in Mathematics Education"

Each new generation in mathematics education is tempted to think that it is the first to be truly scholarly. Yet, there are significant past events and studies which remain relevant, but are often forgotten. This presentation will include a selection of those events and studies spread over the last hundred years and outline a proposed network of web pages to spread this knowledge. Attendees are encouraged to prepare by bringing to mind those events and studies they would like to see in such a network.

Friday 11:30 - Rohr Science 302
Wayne Roberts
"State Mathematics League: An Opportunity For Service"

In states or broad geographic areas not having a high school mathematics league, there is a great opportunity for providing a service in the area of our expertise. Such a league serves able and interested students, is appreciated by high school teacher/coaches, and identifies your college as a place supportive of mathematics in the region.

Parallel Sessions: Computer Science

Friday 10:30 - Rohr Science 202
Gene Chase
"A Christian Critique of Stephen Wolfram's*A New Kind of Science*"

Wolfram exposes some ideas about informatics that relate to Christian scholarship: Does Wolfram's definition of free will permit God to have free will? In what way is computer software that is moved to new hardware like human souls who are resurrected to a new body as described by Paul and Aquinas? Jesus' incarnation as in-form-ation. An overview of informatics from Aristotle to the present.

Friday 11:00 - Rohr Science 202

Wayne Iba
"Artificial Service vs. Artificial Servants"

Numerous research projects in Artificial Intelligence have addressed problems within the context of providing personalized assistance. Many of the other efforts in AI could be viewed as developing technologies that are directly applicable to helping individuals solve problems. However, the Microsoft paper-clip is still the most prominent representative of assistant technologies and is particularly unhelpful. Instead of artificial service in the false or vacuous sense, we want artificial servants in the synthetic or computational sense.

Friday 11:30 - Rohr Science 202
Kim Kihlstrom
"Men Are From The Server Side, Women Are From The Client Side: A Biblical Perspective on Men, Women, and Computer Science"

The percentage of women in computer science is small and has decreased over the last twenty years. Why is this the case, when computer science is a wonderful and growing field with many opportunities? I believe that the situation has its roots in the basic differences between men and women, differences that were present from the beginning of creation and are part of the way that God made male and female uniquely. In order to ensure that both talented men and women are attracted to computer science, we need to understand the differences between men and women, and how those differences affect the way we approach computer science.

Parallel Sessions: General Mathematics

Friday 10:30 - Boney Hall 2
Troy Riggs
"Slippery Order"

Far from exhibiting Monod's dualism of "chance and necessity," our current mathematical descriptions of the world exhibit subtle forms of order via the laws of probability, chaos, complexity theory, and ambiguity (fuzzy sets).

Friday 11:00 - Boney Hall 2
Kevin Vander Meulen
"Mathematics, Stranger Than It Used to Be: Mathematical Contributions to Postmodernity"

In this presentation I plan to explore the relationship between mathematics and culture. While there is a very strong link from mathematics to culture in the development of modern thought, the link is not quite as clear in the rise of postmodern thought. My focus will be to examine the role that developments in mathematics played in constructing a postmodern mindset in culture today.

Friday 11:30 - Boney Hall 2

Jeremy Case
"What is a Random Event? A Project for Finite Math or Statistics"

Randomization is an important idea in Finite Mathematics and Statistics. One main idea in these courses is that events that appear to be performed in a random fashion are often not random. Here we present a simple project involving "randomly" opening the Bible. This activity leads to deeper philosophical questions such as how to study the Bible and whether an event can be considered random if God intervenes.

Plenary Session

Saturday 9:30 - The Forum
Sharon Robbert
"The Inverse Problem: Christianity through a Mathematical Lens"

Connecting mathematics in a meaningful way to a Christian perspective is a difficult task. I propose that of the two ways to consider the connection, use of a Christian perspective to inform mathematical thinking is an example of an "inverse problem," the difficult inversion of a direct problem. In this presentation, I will review the concept of an inverse problem, describe several mathematical images of Christianity–potential solutions to the direct problem, and demonstrate a web-resource which compiles these images based on connection to specific course content.

Saturday 10:00 - The Forum
Dave Neuhouser
"Mathematics, Science, Christianity, and George MacDonald"

George MacDonald, nineteenth-century poet, preacher, novelist, and writer of fairy tales, was a science major in college and at times taught science and mathematics. This paper will explore his understanding of the beauty of, and the role of imagination in, mathematics and science and the relation of those two fields to the Christian faith and life.