# Abstracts for Contributed Papers: 2011 Section Meeting

(Note: due to scheduling constraints, some talks may be moved to other sessions)

## Session: Undergraduate

Speaker: Sarah Newell, East Central University
Title: Inverted Algorithmic Analysis
Abstract: In an attempt to increase the efficiency of genetic inversion, sorting algorithms are used to invert genetic codes. The results of analyzing sorting algorithms for their application to genetic inversion are presented.

Speaker: Kelsea Brewer, Arkansas State University
Title: Generalized Design Criteria for Regular and Nonregular Designs for Statistical Experiments
Abstract: Fractional factorial designs are statistical experimental strategies for minimizing the aliasing of effects and protecting the estimation of main effects and two-factor interactions. Resolution and minimum aberration are traditional criteria for comparing the quality of regular fractional factorial designs. Regular designs have a simple aliasing structure; however, the number of runs must be power of two, leaving large gaps in the choices of run size. In contrast, nonregular fractional factorials exhibit a more complex aliasing structure but can be constructed for every run size that is a multiple of four. Generalized versions of the resolution and minimum aberration criteria allow investigators to effectively use these nonregular designs.

Speaker: Kara Adams, Southern Nazarene University
Title: Optimal Strategies: An Investigation of the Hat Problem
Abstract: An investigation of what strategies might guarantee the best probability that a team of n players will win the hat problem if every player cannot see the color of two of the n hats.

Speaker: Brian Gatewood, University of Central Oklahoma
Title: An Exploration of Independent Events
Abstract: An exploration into the relationships of independent probability events by examination of mutually exclusive components. The mathematics is accessible to most undergraduate students.

Speakers: Jonathan Ly & Cori Bryant, University of Central Oklahoma
Title: Password Security & Birthday Attack
Abstract: The purpose of this study is to investigate password security. We will give a short presentation on how to choose a secure password and how the computer encrypts the password using salt and hash functions. There are several ways to attack an encrypted password. This study focuses on the Birthday attack and in particular on applying it to the Chaum-van Heijt-Pfitzmann hash function.

Speaker: James Grider, University of Central Oklahoma
Title: Computer Applications in Cryptography
Abstract: A famous Number Theory problem is to factor a large integer into a product of prime numbers. In this presentation we will show a computer based method for accomplishing this. We will also demonstrate how to find modular multiplicative inverses.

Speaker: Johnny Stitts, Arkansas State University – Jonesboro
Title: Residues and Real Variable Integration, II
Abstract: We use functions of a complex variable and a contour integral to evaluate certain improper integrals of functions of a real variable. Cauchy's residue theorem provides a fundamental framework for our research.

Speaker: Paul Parks, University of Central Oklahoma
Title: Solutions for a Sixth Order Non-Homogeneous Boundary Value Problem On A Discrete Domain
Abstract: This talk will illustrate the existence of solutions for the sixth order difference equation, $\Delta^6 u(t-3) = \lambda h\left(t, u(t), \Delta^2 u(t-1), \Delta^4 u(t-2)\right)$, for $t \in (0, N+2)_{\mathbf{Z}}$, satisfying the nonhomogeneous conjugate boundary conditions: $u(0) = \Delta^2 u(-1) = \Delta^4 u(-2) = 0$, $u(N+2) = a$, $\Delta^2 u(N+1) = -b$, and $\Delta^4 u(N) = c$ where $h : [0, N+2]_{\square} \times [0,\infty) \times (-\infty, 0] \times [0,\infty) \to (-\infty, 0]$ is continuous, $a, b, c, \lambda \geq 0$, and $a + b + c \neq 0$. By substitution and transformation we can change the 6th order difference equation into a system of second order homogeneous boundary value problems and then, utilizing the Guo-Krasnosel'skii Fixed Point Theorem, we insure the existence of at least three positive solutions.

Speaker: Joshua Cloud, University of Arkansas – Fort Smith
Title: On the algebraic properties of Pin-Wheel Graphs and Applications
Abstract: In the work we study dfferent algebraic properties of Pin-Wheel Graphs and Generalized Pin-Wheel Graphs. In particular we calculate the determinant of both types of graphs using the techniques developed by H. Rara (see [4]), and then the center and radius of the Generalized Pin-Wheel Graph. Further the eigen-values and eigen-vectors are calculated. The center of a graph is a concept related to the closeness centrality measure in social networks, thus we make a natural step in the second half of this work to study real life applications of the Pin-Wheel and Generalized Pin-Wheel Graphs.

Speaker: Xander Rudelis, University of Central Oklahoma
Title: Minor Monotone Floors and Ceilings of Real-Valued Graph Parameters
Abstract: The floors and ceilings of various graph parameters show how the parameters behave over minor relationships. Many minor monotone ceilings and floors are trivial, but others are related to the graph's structure. We give new bounds on the floor of the zero forcing number and the ceiling of the max degree of a graph, as well as discuss relationships over n-partite complete graphs.

Speaker: Kara Adams, Southern Nazarene University
Title: On Properties of Associated Families of Minimal Surfaces
Abstract: An exploration of which surfaces in the associated family of minimal surfaces of the catenoid are not embedded and how they intersect themselves. Additionally, some research over the possibility that more than one surface in a family could be periodic is presented.

Speaker: Jared R. Wolf, Arkansas State University – Jonesboro
Title: Dynamic Contact of Particles
Abstract: In this work, we consider a moving particle which drops down onto a stationary rigid foundation and bounces of after its impact. Based on Newton's laws and Signorini's contact conditions, this dynamic impact problem is formulated by a second ordinary differential equation (ODE) and the complementarity conditions (CCs). The existence of solutions for this problem is proved. Moreover, we prove the uniqueness of the solutions under the assumption that particles have the same coefficient of restitution. A major concern is to show conservation of energy, or energy balance, which has been investigated both theoretically and numerically. Currently, we consider a particle that drops down onto an *adhesive* stationary rigid foundation.

Speakers: Jessica Kyle & Matthew Stephens, University of Central Oklahoma
Title: Frequency Analysis in Cryptography
Abstract: A main goal of Cryptography is to protect data, and this is achieved by encrypting information. One of the most common encryption methods is the substitution cipher, which consists of encoding one letter at a time. In this presentation, we will give a description of the types of substitution ciphers. We will focus on decrypting a message by using frequency analysis.

Speakers: Mary-Beth Hernandez & Ashley Taylor, University of Central Oklahoma
Title: On Diophantine numbers
Abstract: A set of four distinct positive integers where the product of any two given integers plus one is equal to a perfect square is known as the Diophantine quadruples. Our goal in this presentation is to show that w can be written in terms of x.y,z where $x < y < z$ and w, x, y, z are elements of the Diophantine set.

Speaker: Dallas Lewis, Oklahoma Wesleyan University
Title: The Game of Tipsy and other Center of Mass Calculations
Abstract: The popular game-show "Minute to Win It," which is built upon challenges out of everyday objects, offers us challenges in mathematical calculation as well. In particular, we evaluate their games of balance, which can be solved mathematically by determining the center of mass of discrete and continuous systems. In this project, we explore the ideas of center of mass and then analyze several of the show's blueprints, including "Tipsy": How much soda should I drink from a can in order to balance it on its beveled edge?

Speaker: Braycia Dedmon, Langston University
Title: Computing the nth Fibonacci number
Abstract: To create a program for computation of the $n^{th}$ Fibonacci number we have to use at least n steps. In my presentation I would like to show the program which reduces the number of steps. By using matrix representations of special endomorphisms of $R^2$, I will show the explicit method to find the value of the $n^{th}$ Fibonacci number.

Speaker: Ashley Rand Taylor, University of Central Oklahoma
Title: The Effects of Religious Persecutions on Mathematicians during Communist Russia
Abstract: In this talk we will discuss the religious views of several imminent Russian mathematicians and their effects on Russian mathematics. In addition, we will explore the life of the "Russian Leonardo Divinci," Pavel Florensky, and investigate the personal experiences of Dmitri Egorov, Pavel Alexandrov, Nickolai Luzin and other members of the Moscow Mathematical Society.

Speaker: James Roddy, University of Arkansas – Fayetteville
Title: Comparison of Runge-Kutta and Euler Methods
Abstract: I will explore the relative strengths and weaknesses of the various Runge-Kutta and Euler methods. This will include a problem of my design and also problems that will illustrate Runge's phenomenon.

Speaker: Johnny Barham, University of Arkansas – Fayetteville
Title: An Introductory Look at Game Theory and Nash Equilibrium
Abstract: Have you ever played a game and wondered what the best strategy for winning was? John Forbes Nash discovered that every mixed strategy game has an optimal strategy for every player known as the Nash equilibrium. This presentation will explain Nash equilibrium and how to find it.

Speaker: Nathan Wesly Clark, University of Arkansas – Fort Smith
Title: Improved Model for Hyperbolic Geometry With Triangle Classifications
Abstract: There are several models for Hyperbolic Geometry and most have been modernized to be represented using technology such as Geometer's Sketchpad. My paper, attached to my senior project as an undergraduate, covers improvements made to custom tools and geometric figures represented in a Poincare-Beltrami Half-Plane Model using Geometer's Sketchpad. A fully functioning model and set of custom tools were produced with respect to this project. Several fundamental problems regarding the illustration of this model using dynamic technology were overcome and will be discussed. These problems include, but are not limited to, the duality of distance measure and line/segment/ray definition…and software limitations in rendering accurate illustrations of hyperbolic objects. An appendix to this paper includes a complete comparison between the classifications of hyperbolic triangles compared to their Euclidean counterparts and illustrates which triangle congruency theorems hold in which geometry.

Speaker: Krista Baugher, Oklahoma Wesleyan University
Title: Frieze Patterns Buried in the Great Temple Mound
Abstract: We begin with an overview of the group of 2-D Euclidean motions, and then discuss the resulting symmetry classifications know as Frieze patterns. Using these tools, we analyze artifacts found at the Great Temple Mound of Spiro, OK, considered to be one of the greatest Native American archeological sites in the Eastern United States. We dig through the designs to discover the types of symmetries present, and mathematically evaluate the artistic tendencies of Oklahomans a millennium ago.

Speaker: Stephanie Talley, University of Arkansas – Fayetteville
Title: The Trefoil Knot
Abstract: Who knew there was so much to know about knots, or even just one knot? One of the simplest knots is the trefoil knot. I will begin with an overview of knots in general, talking about the unknot and some of the simpler knots. I would like to explain the Reidemeister moves, tricolorability, and then prove that the trefoil knot is not the unknot. I would also like to touch on the left and right handed versions of the trefoil knot if there is time. I will conclude with some fun classroom activities that pertain to knot theory.

Speaker: Sarah Ervin, University of Arkansas – Fayetteville
Title: Is Bridges NP-Complete?
Abstract: This paper proves that the Japanese logic puzzle Hashiwokakero or commonly known as Bridges is Np-Complete. This proof uses the construction method to prove Bridges' NP-Completeness. The paper also discusses what NP-Complete is and other Japanese logic puzzles that have been proven NP-Complete.

Speaker: Karl Schaettle, University of Oklahoma
Title: Directed Graphs from Mathematical Puzzles and the Frobenius Problem
Abstract: Certain mathematical puzzles, such as the "Mad Veterinarian Puzzles" formulated by Robert S. Harris, can be analyzed using the associated semigroups of directed graphs whose vertices correspond to puzzle elements. Under certain circumstances these semigroups are monoids or groups, which can allow us to give an unambiguous value or exchange rate to the equivalence classes of multisets of elements of the Veterinarian Puzzles. Applications to the linear diophantine problem of Frobenius are explored.

Speaker: Andy Tho Le, University of Central Oklahoma
Title: Rational Points of Circles
Abstract: If a circle or a line exists in the real plane, it does not have to exist in the rational plane. In fact, the best that can be hoped for is for the set of rational points on a circle to be a dense subset of the circle in the real plane. I will provide necessary and sufficient conditions for a circle to be dense in the rational plane.

## Session: Graduate

Speaker: Junxia Li, University of Arkansas – Fayetteville
Title: Some Rarita –Schwinger Operators
Abstract: In this paper we study a generalization of the classical Rarita-Schwinger type operators and construct their fundamental solutions. We give some basic integral formulas related to these operators. We also establish that the projection operators appearing in the Rarita-Schwinger operators and the Rarita-Schwinger equations are conformally invariant. We further obtain the intertwining operators for other operators related to the Rarita-Schwinger operators under actions of the conformal group. This is a joint work with Charles Dunkl, John Ryan and Peter Van Lancker.

Speaker: Derek Rush, University of Central Oklahoma
Title: Counting Non-Adjacent Configurations of Objects on a 2-Dimensional Lattice
Abstract: Let L be a discrete 2-dimensional lattice consisting of M row and N columns. Let k be an integer such that k<MN. In how many ways can these objects be placed onto the lattice so that no two objects are adjacent (vertically, horizontally, or diagonally)? We shall first discuss a method to determine the number of ways in which we can place the k objects onto a 1xN lattice (a single row) so that no two objects are adjacent. We shall then discuss two methods for counting the numbers of ways in which the k objects may be placed onto a 2xN lattice. In the final portion of the discussion, we shall describe some ideas in which to generalize the problem to the MxN lattice.

Speaker: Kenneth Ward, Oklahoma State University
Title: The zeta function and automorphisms of a function field over a finite field
Abstract: This is a brief survey of how automorphisms help us to understand function field arithmetic. Examples discussed will include Riemann's hypothesis, Čebotarev's theorem on density, class field theory, and my recent work on the asymptotics of genus and class number.

Speaker: Faryal Bokhari, University of Central Oklahoma
Title: Statistical Analysis of the Middle Seeded Teams in the NCAA Basketball Tournament
Abstract: This paper attempts to determine whether it is better to be seeded 8 or 9 than 10, 11, or 12 in the NCAA basketball tournament. At least 64 teams for both men and women have been included in the study. The analysis shows that the 10, 11 and 12 seeds do not have a statistical advantage over the 8/ 9 seeds, but if only teams with at least one win are considered, the 10 seeds have a greater mean number of wins than the 8/9 seeds in the men’s tournament. Also, among men’s teams with at least one win, the 10, 11, and 12 seeds have advanced in greater proportion to the Sweet Sixteen than the 8/9 seeds. Similar results were found for the 11 seeds among the women’s teams with at least one win.

Speaker: Ben Wescoatt, Oklahoma State University
Title: Understanding Student Conceptions and the Proving of Trigonometric Identities: Developing a Framework
Abstract: Due to a lack of research, students' engagement in proving trigonometric identities is not well understood. I am in the beginning stages of developing a framework that describes students' understanding and problem solving strategies exhibitied during the proving of trigonometric identities. I will share my preliminary findings that are based upon a theoretical analysis and past experience with students.

Speaker: Kazuo Yamazaki
Title: Remarks on the method of modulus of continuity and the modified dissipative porous media equation
Abstract: We review the method of modulus of continuity, recently developed by Kiselev, Nazarov and Volberg, to show global regularity of solutions to active scalars. As an example, we study a modified porous media equation, analogous to the modified quasi-geostrophic equation which interpolates between surface quasi-geostrophic equation and Euler equation.

Speaker: Lizheng Tao, Oklahoma State University
Title: A study on the global regularity for a model of the 3D axisymmetric Navier-Stokes equations
Abstract: We study the global regularity issue concerning a model equation proposed by Hou and Lei to understand the stabilizing effects of the non-linear terms in the 3D axisymmetric Navier-Stokes and Euler equations. The first result is to establish the global regularity of a generalized version with a fractional Laplacian when the fractional power satisfies an explicit condition, which is exactly the same as in the case of the 3D generalized Navier-Stokes equations and is due to the balance between a more regular nonlinearity and a less effective (five-dimensional) Laplacian. The second result assesses a finite-time singularity in a quantity associated with certain solution of the inviscid counterpart of Hou's model.

## Session: General

Speakers: Cassandra S. Linde, University of Arkansas – Fayetteville & Darryl A. Linde, Northeastern State University
Title: The Importance of Being Ernie
Abstract: A class of conditional probability problems is investigated. Particular emphasis is placed on a problem with an unexpected result.

Speaker: Fred Worth, Henderson State University
Title: But I got the right answer: The Sequel
Abstract: Nine years ago I presented this talk. This year's version will include some new examples as well as some of the classic examples from the previous version of the talk.

Speaker: Fred Worth, Henderson State University
Title: Baseball statistics and their correlation to winning games
Abstract: We will look at how various team statistics, like batting average, on base percentage, earned run average, etc. correlate to a team's winning percentage. We will also look to see if those correlations change over time due to different eras and styles of play.

Speakers: Cynthia Murray & Tracy Morris, University of Central Oklahoma
Title: Non-Linear Modeling of Probability Distributions
Abstract: Research conducted at UCO, Forensic Science Institute and Department of Mathematics and Statistics, has developed a non-linear model (power curve) using SAS PROC NLIN for computing probabilities associated with cocaine contamination of US currency.

Speaker: Linus Yu, University of Arkansas – Fort Smith
Title: Eigenvalue and eigenvector for a special 4X4 matrix
Abstract: We will study a special 4 by 4 matrix that we derive from an ordinary differential equation system. We need to know the number of positive and negative eigenvalues and we also need to know a property about our eigenvectors. By knowing the number of the eigenvalues and the property of the eigenvectors, we can prove the existence of solutions of our differential equation system.

Speaker: Daniel Pragel, University of Arkansas - Fort Smith
Title: Homomorphisms of Paths
Abstract: Given graphs G and H, a homomorphism from G to H is a function f mapping vertices of G to vertices of H, such that, if x is adjacent to y in G, then f(x) is adjacent to f(y) in H. We look at a method for computing the number of homomorphisms from a path on n vertices to a path on m vertices.

Speaker: Mark Buckles, Northeastern State University
Title: One Thing Leads to Another
Abstract: The purpose of this talk is to show a surprising connection between the multiple angle identities for sin and cos,Pascal's triangle, and Bezout's theorem from Algebraic Geometry. The theme of the talk is to show how quickly studying one area of mathematics can lead you to studying something else.

Speaker: Michael C. Fulkerson, University of Central Oklahoma
Title: The Mathematics of Leonhard Euler
Abstract: Leonhard Euler (1707-1783) was a Swiss mathematician considered by many to be one of the greatest mathematicians of all time. He was a pioneer in many branches of mathematics including number theory, graph theory, and real and complex analysis . In this talk we investigate some of Euler’s most famous results.

Speaker: Paul Goodey, University of Oklahoma
Title: Concentration: Are the polar caps getting smaller?
Abstract: We will discuss some surprising aspects of spherical Lebesgue measure. A mathematical analysis of global warming … or not!

Speaker: Hermann G W Burchard, Oklahoma State University
Title: The Role of Conscious Attention in Perception
Abstract: Phenomena in the momentary environmental scene, radiate energy to sensory neurons, creating in afferent nerves a data stream. Following Kant, by our inner sense the mind perceives its own thoughts as it ties together sense data into an internalized scene from bits in the garbled, confused data stream applying its conceptual-categorical apparatus, a process called top–down feedback in neuroscience. The brain, logically a Language Machine by Church's Thesis, records a Movie-in-the-Brain, where each movie frame must make rational sense within the Noumenal Cosmos. A stack of frames is processed typically in 40Hz rhythm with 300ms process time each, for about 12 in the stack at any time. The top frame contains the whole scene where the Ego makes an appearance imposing Kantian synthetic unity on the scene. The Ego in the Orbito-Frontal Cortex supervises with its global receptive field. [Found Sci (2011) 16:67–99].

Speaker: Ameya Pitale, University of Oklahoma
Title: Riemann Hypothesis
Abstract: This talk is addressed to undergraduate students. I would like to introduce the students to one of the most intriguing and beautiful open problems in mathematics – the Riemann hypothesis. I will start with some very basic material learned by students in their calculus class and define some special kinds of series, which seem to contain lots and lots of information about prime numbers. This will lead naturally to the Riemann hypothesis – a problem unsolved for the last 150 years, having far-reaching applications in number theory and other fields AND with a million dollar prize for the person to solve it.

## Session: Topology

Speaker: Leonard R. Rubin, University of Oklahoma
Title: Direct Systems in Topology
Abstract: We will define the concept of a direct system **X** of topological spaces. Roughly speaking, **X** is a collection of topological spaces linked together in an organized manner by continuous functions called connecting maps. Such a system has a direct limit $X$, which is a topological space. We will discuss the kinds of properties such a space might have as well as the ones it is not likely to have. We will also mention how to find continuous functions from $X$ to other spaces $Y$ using the system **X**.

Speaker: Ray Hamlett, Oklahoma Christian University
Title: On Weakly Lindelof and Almost Lindelof Spaces
Abstract: A space is almost Lindelof if every open cover has a countable subcollection whose closures cover. A space is weakly Lindelof if every open cover has a countable subcollection whose union is dense in the space. Known results are surveyed and some new results are presented.

Speaker: Djalalidin Djayanbaev, Rogers State University
Title: Uniform continuity defects of mappings of metric spaces
Abstract: By this paper we introduce one version of generalization of the notion of uniform continuity of mappings of metric spaces.

Speaker: Andrew Bucki, Langston University
Title: Algebraic Structures on Topological Groups
Abstract: Traditional approach to study geometrical properties of sets equipped with the Euclidean topology was the use of special invariants of groups of transformations generated by the differentiation of real-valued functions defined on the Euclidean space, that is, the use of methods of Differential Geometry. The main question was how a given manifold differs (up to diffeomorphism) from the product manifolds of spheres and/or tori. Recently, apart from the classical differential geometrical methods, researchers started using algebraic methods to answer this question. The existence of special endomorphisms of tangent spaces of a given manifold is equivalent with the existence of a diffeomorphism between this manifold and one of the standard spaces. In this presentation I will show the existence of certain endomorphisms of tangent spaces of some topological groups leading to geometrical properties of these groups.

## Session: Analysis

Speaker: Tom McNamara. Southwestern Oklahoma State University
Title: Recursion Formulae for Special Functions
Abstract: We demonstrate how Lie algebra methods can be used to derive the recursive and Rodriguez formulas for the classical special functions.

## Session: Algebra

Speaker: J.C. Price, University of Arkansas – Fort Smith
Title: The Jacobian conjecture and positive weights
Abstract: The Jacobian conjecture is one of those infamous problems that are simple to state, yet a proof cannot be found. We will discuss this conjecture along with a simple geometric construction, called the Abhyankar polygon, which can be used to solve certain cases of this problem.

Speaker: Guy Roger Biyogmam, Southwestern Oklahoma State University
Title: Leibniz (co)homology of affine versions of Lie algebras
Abstract: Leibniz algebras and the Leibniz algebra cohomology are non-commutative versions of Lie algebras and the Lie algebra cohomology. In this talk, we review these notions and their generalizations to algebras with $n$-ary operations. In particular Lie algebras are leibniz algebras and it is known that classical lie algebras such as the orthogonal lie algebra, the symplectic Lie algebra, ... have abelian extensions to their affine versions, for instance the Lie algebra of the Euclidean group (for the orthogonal Lie algebra). We calculate the Leibniz cohomology of these extensions and discuss how the Leibniz cohomology functor captures new invariants on them.

Speaker: Lisa Mantini, Oklahoma State University
Title: Origami and Symmetries of the Platonic Solids
Abstract: We illustrate the rotational symmetries of the Platonic solids with origami models. The models are symmetrically colored, in order to facilitate the identification of a rotational symmetry with a permutation, that is, to facilitate the isomorphism of the rotational symmetry group with the well-known permutation groups $A_4$, $S_4$, or $A_5$.

## Session: Applied Math

Speakers: Abebaw Tadesse, Franklin, Fondjo, Joel Snow, Andrew Bucki, Langston University
Title: Application of adaptive simulated annealing to Intensity modulated radiotherapy planning(IMRT)
Abstract: Preliminary results on comparative analysis of several adoptive simulated annealing algorithms as applied to 2D- IMRT phantoms will be presented with particular emphasis to the application of ensemble based simulated annealing(EbSA) to IMRT problems. Future directions and extensions to radiobiological IMRT will also be discussed. This presentation is part of the preliminary results of the IMRT research team at Langston University.

Speaker: Emre Tokgoz
Title: Separation and Fenchel-type duality theorems for functions with integer and real variables.
Abstract: Separation and Fenchel-type duality theorems are two of the fundamental results that are known in real convex analysis (see Rockafellar (1970)). Separation and Fenchel-type duality theorems in discrete convex analysis for L/M-convex functions were initially studied by Fujishige (1984) and Murota (1996). Applications of discrete L/M-convex functions arise, for example, in network flow problems. In this talk, the separation and Fenchel-type duality theorems for a class of convex functions with both integer and real variables will be introduced. Applications of such “mixed”convex functions can be found in queuing systems theory.

Speaker: Nikola Petrov, University of Oklahoma
Title: Self-similarity, fractals, and dimensions
Abstract: We give examples of self-similar structures in mathematics, literature, and everyday life, then consider recursively built self-similar sets, and discuss some of their properties. Motivated by these examples, we introduce the concept of box dimension of a set. The talk is completely elementary and does not assume knowledge of math beyond high-school level.

Speaker: Vincent E. Dimiceli, Oral Roberts University
Title: Estimation of Black Globe Temperature for Calculation of the Wet Bulb Globe Temperature Index
Abstract: The wet bulb globe temperature (WBGT) index is used in industry, sports and other areas to indicate the heat stress level for humans and animals. One of the values needed to calculate the WBGT Index is the black globe temperature. It was determined that a fourth degree polynomial for the black globe temperature in terms of the ambient temperature can be very accurately approximated using a linear expression to estimate the black globe temperature. Some preliminary tests indicate accuracy within 0.5˚F.

## Session: Mathematics Education and Classroom Notes

Speaker: Michael Lloyd, Henderson State University
Title: Geometric Solutions on the TI-nspire
Abstract: Solutions to College Algebra, Trigonometry, and Calculus problems will be demonstrated using the Geometry application on the TI-nspire.

Speaker: Jack L. Jackson II, University of Arkansas – Fort Smith
Title: Classifying Quadrilaterals in Hyperbolic Geometry
Abstract: One classic area of study in Euclidean Geometry is the classification of quadrilaterals and a study of their properties. In this talk we will discuss a similar classification of quadrilaterals in the Beltrami-Poincare Half-Plane model for Hyperbolic Geometry. Comparisons and contrasts to Euclidean Geometry will be made. Geometer's Sketchpad will be used to provide dynamic illustrations of the types of quadrilaterals investigated.

Speaker: Jill E. Guerra, University of Arkansas – Fort Smith
Title: Using the clicker in an inquiry based calculus classroom
Abstract: Calculus I has become a challenging course to teach at the college level. Many universities are faced with a population in Calculus I that is a mixture of students who have had previous experience with calculus in high school and those who have no prior calculus knowledge. The challenge is to create a course that meets the needs of both of these types of students and simultaneously keep all students engaged. We will discuss one approach to the course using inquiry based learning and a classroom response system.

Speakers: Andrew Bucki, Abebaw Tadesse, & Franklin Fonjo, Langston University
Title: Mathematics Education – New Program
Abstract: For several years I have worked on a new program concerning how Mathematics is taught and what minimal central concepts should be covered. The program is based on three fundamental rules: less teaching and more learning; student-teacher partnership; use of technology. Team-teaching and interdisciplinary-teaching methods are also applied. The program was designed as a four-year undergraduate program in Mathematics. In this presentation I will briefly illustrate the main ideas of the program with some concrete examples.

Speakers: Abebaw Tadesse, Andrew Bucki, Franklin Fonjo, Langston University
Title: Mathematics Education – New Program II
Abstract: At Langston University we created a teaching team that tries to implement some ideas of the new educational program based on less teaching and more learning, student-teacher partnership, and use of technology rules. Part of the program is already being implemented at the Oklahoma School of Science and Mathematics, the public boarding school in Oklahoma City. In this presentation we will add more examples illustrating the ideas of the program.

Speaker: David E. Boliver, University of Central Oklahoma
Title: Fundamentalist Approach to Definitions and Learning Mathematics
Abstract: A fundamentalist approach to definitions will be defined and examples given of how this affects the learning of various mathematical topics at many levels, K-College. This leads to a call for a variety of studies involving the beliefs of students and perhaps teachers about how mathematical definitions are formed and should be presented.

Speaker: Janet C. Woodland, University of Arkansas – Fayetteville
Title: Grading from the Hip on a Curve
Abstract: We are teaching a project-based math course for liberal arts students, without traditional homework assignments or exams. Assessment is by means of an "exit interview" with the faculty teaching the course. We will discuss some of the benefits and some of the dangers inherent in this (mostly) non-quantitative way of assigning grades.

Speaker: Steve Hennagin, Ouachita Baptist University
Title: Six + Years of the Moore Method in Geometry and Analysis
Abstract: Review of materials and student success in the learning of Geometry and Advanced Calculus in a modified Moore Method environment. The Geometry course is taken by Secondary Education majors and those minoring in Mathematics. The analysis course is taken by those students who plan for a career in a field of Mathematics which is not geared towards secondary education.

Speaker: Thomas Peter, University of Arkansas – Little Rock
Title: The Power Rule for Rational Exponents Proven with a Difference Quotient
Abstract: Let $n = p/q$ for integers $p$ and $q \neq 0$. For any real number $a$, we prove $\lim_{x \to a}\left( \frac{x^n - a^n}{x - a} \right) = na^{n-1}$, without appealing to the chain rule.

Speaker: Jennifer Moore, Hawkes Learning Systems
Title: Motivate Your Students with Mastery Learning
Abstract: Innovation in the classroom and implementation of technology in mathematics are proven practices to promote student success. Hawkes Learning Systems' unique approach to mastery learning provides the software solution to motivate your students to excel in math. Come learn how to integrate Hawkes in your courses for guaranteed success!

Speaker: Darryl McCullough, University of Oklahoma
Title: A Senior Mathematics Capstone Seminar Course
Abstract: This semester I am teaching our senior seminar for graduating mathematics majors, which fulfills our university's "capstone" degree requirement. I am taking a rather nonstandard approach to it, and will discuss some of the objectives and activities being used.

Speaker: Anita Walker, East Central University
Title: Can I Use My Calculator?!
Abstract: As the number of college/university students requiring math remediation continues to increase, one begins to question whether students entering regular math courses posses even the basic computational skills needed to succeed. The results of arithmetic tests administered in a variety of college math courses are presented.

Speaker: Clyde Greeno, MALEI Mathematics Institute
Title: Mathematics As Common Sense: Instructional Therapy for the "Math Anxiety" Syndrome
Abstract: The title, "math anxiety" is loosely applied to almost any stage of the Mathematics-Learning Distress (MLD) syndrome …which escalates from dismay toward the disabling condition of mathematics phobia. This presentation opens with a (circulated) PowerPoint description of the syndrome … its dangers, causes, detection, treatment, and cures. That backdrop is then used for describing an emerging, therapeutic, Tulsa community-based, instructional program developed through scientific clinical research, toward preventing and overcoming MLD. A quaint feature of the program will be the use of linear algebra for teaching arithmetic. The instructional program is to be funded primarily as a "mathematical literacy" program, but also will serve for the education of teachers and parents, and as a "college prep" alternative to collegiate "developmental mathematics" remedial courses.

Speaker: Clyde Greeno, MALEI Mathematics Institute
Title: Mathematics As Common Sense: Clinical Research in Scientific Mathematics Instructology
Abstract: Mathematics Instructology is the study of how instruction functions to guide the human development of personal mathematical intelligence. Scientific research in that arena requires both theoretical and empirical components, each of which begins with studies of video-documented clinical casework. The research is most productive when the clinical patients are moderate-to-severe cases of Mathematics-Learning Distress (MLD) − and when the clinician relies mostly on eductive (Vs. didactic) methods of learning-guidance. Clinical reliance on eductive instruction guarantees that the learned mathematics is fully common-sensible to the learner. The scientific theory relies on a mathematical model which builds on the established mathematical state-transition theory of "knowledge spaces", by also invoking mathematical methods from scientific "operations research". These methods of clinical research can be used also (even less than scientifically) for creating or continually improving the designs of any mathematics course.

Speaker: Steve Hennagin, Ouachita Baptist University
Title: Six + Years of the Moore Method in Geometry and Analysis
Abstract: Review of materials and student success in the learning of Geometry and Advanced Calculus in a modified Moore Method environment. The Geometry course is taken by Secondary Education majors and those minoring in Mathematics. The analysis course is taken by those students who plan for a career in a field of Mathematics which is not geared towards secondary education.

Speaker: Michael McClendon, University of Central Oklahoma
Title: Synthetic Division Is Not Just For Monic Divisors
Abstract: Synthetic division provides an easier method to perform division when the divisor is a monic linear polynomial. This talk will expand that technique, demonstrating how to easily perform synthetic division allowing for the divisor to be *any* polynomial of any degree. The ability to perfom the synthetic division described in this talk is a simple vital skill that ***all*** mathematics students should learn.

## Session: Special Session on Outreach to Pre-College Students

Speaker: Andy Miller, University of Oklahoma, 2010 Oklahoma-Arkansas Section of MAA Outstanding Teacher of College and University Mathematics
Abstract: This session will be a forum discussion of experiences with high school math contests, regular visitations to schools at elementary, middle, or high school levels, getting high school (or earlier) students involved in mathematical problem solving, special summer math programs for public school students. Everyone is welcome to share their experiences.

## Session: Special Session on Computer-Aided College Algebra

Speakers: Douglas B. Aichele, Cynthia Francisco, Rae Tree, Juliana Utley & Benjamin Wescoatt, Oklahoma State University

Title: College Algebra Students' Perceptions Related to Participating in Computer-aided Instruction

Abstract: **Overview.**
*College Algebra Students' Perceptions Related to Participating in Computer-aided Instruction* is presented in two parts. We will discuss in depth the motivation for the redesign of College Algebra at Oklahoma State University, the delivery model that evolved and is being implemented, and the methodology and results of an extensive research study conducted by the presenters during 2008-09.

**Part I - Motivation for Redesign, Description of the Delivery Model, and Computer Components found Beneficial**
We will briefly discuss: several of the motivating factors for the redesign of the delivery of College Algebra at OSU; the redesign delivery model using MyMathLab including the face-to-face components (Focus Groups and computer lab tutoring); and, the MyMathLab computer components (e.g., View an Example) that students found most and least beneficial.

**Part II - Analysis of Data and Discussion of the Student's Perceptions Related to Participating in Computer-aided College Algebra**
We will discuss in depth the results of the student data collected at two critical points in time during the semester related to student thoughts/feelings at that point in time about taking a MyMathLab section of College Algebra.