Meeting materials from the 2005 Section Meeting, held April 1-2, 2005 at University of Texas at El Paso. Originally posted at

http://ia.utep.edu/Default.aspx?tabid=23469

and

http://oak.ucc.nau.edu/hagood/MAASW/EPBack/ia.utep.htm

MAA Meeting Schedule

UTEP Department of Mathematical Sciences

MAA Online

Meeting Schedule

Conference Abstracts

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CONFERENCE SERVICES BY:

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ur@utep.edu

Annual Meeting of the Southwestern Section

Mathematical Association of America

El Paso, Texas April 1-2, 2005

8:30 am - 5:00 pm both days

The UTEP Mathematical Sciences Department is pleased to host the MAA Southwest Sectional Conference, April 1-2, 2005, at the Union-East Building, 3rd floor at the University of Texas at El Paso. The conference will be running sessions on a wide range of topics: content mathematics, undergraduate mathematics education, and preK-12 mathematics education of pre-service teachers, as well as technology use in mathematics classrooms. You will have the wonderful opportunity to network with mathematicians, mathematics educators from Arizona, New Mexico and Texas, and El Paso area high school teachers.

CONFERENCE HIGHLIGHTS

Invited Talks:

- **Two Research Traditions Separated by a Common Subject: Mathematics and Mathematics Education**, Annie and John Selden, New Mexico State University. Friday, 10:00 a.m., Tomas Rivera Conference Center.

  "There are no proofs in mathematics education." While this is true, claims are made in mathematics education research and evidence is provided for them. In this talk, we will explore the nature of such research, the kinds of claims and evidence, and what such research might have to offer teachers of mathematics, especially at the undergraduate level. Along the way, we will point out differences between the ways research is done in the two fields.

- **Why Things Go Quasi in Higher Dimensions,** Bruce Palka, University of Texas at Austin, and editor of the American Mathematical Monthly. Saturday, 8:30 a.m., Tomas Rivera Conference Center.

  The talk will discuss Liouville's 1850 theorem to the effect that there is a general paucity of conformal mappings in Euclidean spaces of dimensions three and higher { say, in comparison with the situation in the plane, where the Riemann mapping theorem ensures a wealth of conformal mappings.

Special sessions

- **How to engage students in mathematics**, organized by Deborah Hughes Hallett, University of

Generous support provided by the
El Paso Math/Science Partnership
MSPnet

Prizes for Graduate and Undergraduate Talks The best Graduate Presentation and best Undergraduate Presentation will receive the latest version of **Mathematica**, courtesy of Wolfram Inc.

Arizona. Friday, 2:00 p.m. - 3:30 p.m. and 3:45 p.m. - 5:15 p.m., Barry room.

Airport to UTEP

This session will address a problem we all face: finding ways to capture students' interest and attention | an essential prerequisite to successful learning. The session will bring together MAA distinguished teaching award winners to share ideas and techniques. Comments and discussion from the audience are welcomed!

- **Bioinformatics**, organized by Ming-Ying Leung, University of Texas at El Paso. Friday, 3:45 p.m. - 5:15 p.m., Elkins room.

  The session will conclude with a 10 minute open discussion, led by Dr. Ming-Ying Leung on bioinformatics in general.

- **A sample of mathematics-centered educational and outreach activities at New Mexico State University**, organized by Josefina Alvarez, New Mexico State University. Saturday, 9:30 a.m. - 11:30 a.m., 1:00 p.m. - 3:00 p.m., 3:30 p.m. - 4:00 p.m., Elkins room.

- **Mathematics motivated by computations: case studies**, organized by Vladik Kreinovich, University of Texas at El Paso. Saturday, 9:30 a.m. - 11:30 a.m., Wiggins room.

Banquet, Friday, April 1:

Entertainments:

- **Dr. Larry Lesser**, Mathematical Songwriter. Some of Lesser's Greatest Hits include "American Pi". Audience participation is encouraged. For more information, or to preview Lesser's work, visit **http://www.math.utep.edu/Faculty/lesser/Mathemusician.html**.
- **"Count Her In!"** a play about female mathematicians' lives, performed by high school students. Director: Sherry Lowell-Lewis.

Holiday Inn Sunland Park
900 Sunland Park Dr
El Paso, TX 79922
1-800-658-2744
1-915-833-2900
Fax: 1-915-833-6338

Official host hotel for the MAA Sectional Meeting
Room Rate: $68 single or double + tax

When making reservations please use the code:
"UTEP MAA Sectional Meeting"

Located 4.7 miles from the UTEP Campus, 14 miles from the Airport. Complimentary Airport Shuttle provided.

Transportation between the Holiday Inn-Sunland Park and UTEP will be provided for conference attendees

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Additional rooms will be available at the

Howard Johnson Express Inn El Paso TX
500 Executive Center Boulevard
El Paso, TX 79902
Phone: 915-532-8981

NOTE: Transportation to UTEP will NOT be provided from the Howard Johnson Express Inn.

If your are driving, you may enter campus from either the East-entrance (via Mesa St.

UTEP Campus Map

and University Ave.) or the West-entrance (via Sun Bowl Dr. and University Ave.). Please stop at the guard shack and let the guard know you are here for the MAA meeting. Each participant will be issued a temporary Visitor Parking pass for the day. Proceed on University Ave. to the Union Building.

Click on the map to for a printable map [PDF]

Annual Meeting
Southwestern Section
Mathematical Association of America

University of Texas at El Paso
April 1–2, 2005

Organizing committee: Hamide Dogan-Dunlap (Chair), Art Duval, and Larry Lesser, University of Texas at El Paso.

The MAA Southwestern Section meeting is supported by:

- The El Paso Mathematics and Science Partnership, funded by the National Science Foundation;
- The College of Science, University of Texas at El Paso; and
- Mathematical Sciences Department, University of Texas at El Paso.

The play *Count Her In!* is partially sponsored by THOMSON Publishing.

The prizes for the best graduate and undergraduate presentations are provided by Wolfram Inc.

Invited talks

Two Research Traditions Separated by a Common Subject: Mathematics and Mathematics Education, **Annie and John Selden**, New Mexico State University. *Friday, 10:00 a.m., Tomas Rivera Conference Center.*

"There are no proofs in mathematics education." While this is true, claims are made in mathematics education research and evidence is provided for them. In this talk, we will explore the nature of such research, the kinds of claims and evidence, and what such research might have to offer teachers of mathematics, especially at the undergraduate level. Along the way, we will point out differences between the ways research is done in the two fields.

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The talk will discuss Liouville's 1850 theorem to the effect that there is a general paucity of conformal mappings in Euclidean spaces of dimensions three and higher – say, in comparison with the situation in the plane, where the Riemann mapping theorem ensures a wealth of conformal mappings.

Special sessions

How to engage students in mathematics, organized by Deborah Hughes Hallett, University of Arizona. *Friday, 2:00 p.m.–3:30 p.m. and 3:45 p.m.–5:15 p.m., Barry room.*

This session will address a problem we all face: finding ways to capture students' interest and attention — an essential prerequisite to successful learning. The session will bring together MAA distinguished teaching award winners to share ideas and techniques. Comments and discussion from the audience are welcomed!

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A sample of mathematics-centered educational and outreach activities at New Mexico State University, organized by Josefina Alvarez, New Mexico State University. *Saturday, 9:30 a.m.–11:30 a.m., 1:00 p.m.–3:00 p.m., 3:30 p.m.–4:00 p.m., Elkins room.*

Mathematics motivated by computations: case studies, organized by Vladik Kreinovich, University of Texas at El Paso. *Saturday, 9:30 a.m.–11:30 a.m., Wiggins room.*

All activities take place on the third floor of the Union-East building, on the campus of the University of Texas at El Paso.

Friday

8:00 a.m.– 9:00 a.m.	Continental Breakfast	Rivera
8:00 a.m.– 5:00 p.m.	Registration	Rivera
8:00 a.m.– 5:30 p.m.	Exhibits/book sales	Rivera
9:00 a.m.–10:00 a.m.	Welcoming remarks	Rivera
10:00 a.m.–11:00 a.m.	Invited address – Annie and John Selden	Rivera
11:30 a.m.–12:30 p.m.	Contributed talks	Barry
11:30 a.m.–12:30 p.m.	Contributed talks	Elkins
11:30 a.m.–12:30 p.m.	Student talks	Wiggins
12:30 p.m.– 2:00 p.m.	Lunch on your own	
1:00 p.m.– 2:00 p.m.	Section business meeting	Elkins
2:00 p.m.– 3:30 p.m.	How to engage students in mathematics	Barry
2:00 p.m.– 3:30 p.m.	Contributed talks	Elkins
2:00 p.m.– 3:30 p.m.	Student talks	Wiggins
3:45 p.m.– 5:15 p.m.	How to engage students in mathematics	Barry
3:45 p.m.– 5:15 p.m.	Bioinformatics	Elkins
3:45 p.m.– 4:45 p.m.	Student talks	Wiggins
5:30 p.m.– 8:30 p.m.	Banquet	Rivera

Saturday

8:00 a.m.– 8:30 a.m.	Continental Breakfast	Rivera
8:00 a.m.– 2:00 p.m.	Registration	Rivera
8:00 a.m.– 5:30 p.m.	Exhibits/book sales	Rivera
8:30 a.m.– 9:30 a.m.	Invited address – Bruce Palka	Rivera
9:30 a.m.–11:30 a.m.	Contributed talks	Barry
9:30 a.m.–11:30 a.m.	A sample of . . . activities at NMSU	Elkins
9:30 a.m.–11:30 a.m.	Student talks	Rivera
9:30 a.m.–11:30 a.m.	Mathematics motivated by computations	Wiggins
11:30 a.m.– 1:00 p.m.	Lunch on your own	
1:00 p.m.– 2:30 p.m.	Contributed talks	Barry
1:00 p.m.– 3:00 p.m.	A sample of . . . activities at NMSU	Elkins
1:00 p.m.– 3:00 p.m.	Student talks	Rivera
1:00 p.m.– 3:00 p.m.	Contributed talks	Wiggins
3:30 p.m.– 4:30 p.m.	Contributed talks	Barry
3:30 p.m.– 4:00 p.m.	A sample of . . . activities at NMSU	Elkins
3:30 p.m.– 4:30 p.m.	Student talks	Rivera
3:30 p.m.– 5:00 p.m.	Contributed talks	Wiggins

FRIDAY, April 1

Tomas Rivera Conference Center

8:00 a.m.–9:00 a.m. **Continental Breakfast**
8:00 a.m.–5:00 p.m. **Registration**
8:00 a.m.–5:30 p.m. **Vendor exhibits and MAA book sales**

Welcoming remarks
Tomas Rivera Conference Center, 9:00 a.m.–10:00 a.m.

Mike Eastman, Dean, College of Science, University of Texas at El Paso.

Helmut Knaust, Chair, Department of Mathematical Sciences, University of Texas at El Paso.

Invited address
Tomas Rivera Conference Center, 10:00 a.m.–11:00 a.m.

Two Research Traditions Separated by a Common Subject: Mathematics and Mathematics Education, **Annie and John Selden**, New Mexico State University.

Contributed talks
Barry room, 11:30 a.m.–12:30 p.m.

11:30 *Algebraic Characterizations of Exponential Series*, **Emil Daniel Schwab**, University of Texas at El Paso.

12:00 *A Generalized "Problem of the Week"*, **Michael Ratliff**, Northern Arizona University.

Contributed talks
Elkins room, 11:30 a.m.–12:30 p.m.

11:30 *Prior Knowledge and Mathematical Cognition*, **Hamide Dogan-Dunlap, Fan Chen (G),** and **Cristina Torres (G)**, University of Texas at El Paso.

12:00 *Capstone Courses for Future Secondary Mathematics Teachers*, **Matthew Winsor**, University of Texas at El Paso.

Student talks
Wiggins room, 11:30 a.m.–12:30 p.m.

11:30 *A Numerical Galerkin Method and the Ginzburg Landau Superconductivity Model for Cooling in Thin Cylindrical Samples*, **Ty Thompson (G)**, Northern Arizona University.

12:00 *Numerical Comparison of Optimization Techniques for Solving a Nonlinear Hyperboloid Least Squares Problem*, **Brenda Bueno (U)**, University of Texas at El Paso.

Lunch on your own, 12:30 p.m.–2:00 p.m.

Business meeting, MAA Southwestern Section
Elkins room, 1:00 p.m.–2:00 p.m.

Special session
"How to engage students in mathematics", Part I
Barry room, 2:00 p.m.–3:30 p.m.

2:00 *Introduction: Characteristics of Successful Engagement: Examples from Calculus and Statistics*, **Deborah Hughes Hallett**, University of Arizona.

2:30 *The Mathematics Parole Board: Imaginary Scenarios that Provide Incentives for Students to Participate in Class*, **John Hagood**, Northern Arizona University.

3:00 *Applications and Mathematical Modeling*, **William Stone**, New Mexico Tech.

Contributed talks
Elkins room, 2:00 p.m.–3:30 p.m.

2:00 *Learning Math Methods Online: Promises and Challenges for Teachers of Young Children*, **Ellen Treadway**, University of Texas at El Paso.

2:30 *Pi Day and Other Interventions: Real-life Research on Middle School Motivation*, **Larry Lesser, Sally Blake,** and **Paulette Adams (U)**, University of Texas at El Paso.

3:00 *Draw Infinity Project: Middle Grades Students' Concept Images of Infinity*, **Mourat Tchoshanov, Sally Blake,** and **Beverley Calvo**, University of Texas at El Paso, **Sue Spotts** and **Alex Bustillos**, Wiggs Middle School, and **Susie Villalobos (G)**, University of Texas at El Paso.

Student talks
Wiggins room, 2:00 p.m.–3:30 p.m.

2:00 *Rectangular Polyomino Set* $(1,2)$*-Achievement Games*, **Edgar Fisher (G)**, Northern Arizona University.

2:30 *Dirichlet's Theorem: Revolutionizing Number Theory*, **Enrique Treviño (U)**, University of Texas at El Paso.

3:00 *Using Functions and Relations to Form Equations Defining Already Established Groups*, **Antony Adair (U)**, University of Texas at El Paso.

Special session
"How to engage students in mathematics", Part II
Barry room, 3:45 p.m.–5:15 p.m.

3:45 *Using Exploratory Problems to Engage Students from Grade 4 to Grade 16*, **Fred Stevenson**, University of Arizona.

4:15 *KAW – Knowing, Asking and Writing*, **Janet McShane**, Northern Arizona University.

4:45 *How to Beat the Lecture/Textbook Trap! An Active Student Classroom via Student Reading, Writing, or Primary Historical Sources*, **David Pengelley**, New Mexico State University.

Special session
Bioinformatics
Elkins room, 3:45 p.m.–5:15 p.m.

3:45 *Bioinformatics: Convincing the Biology Major that Mathematics and Computer Science are Relevant*, **Steve Aley**, University of Texas at El Paso.

4:15 *Stochastic Models in Carcinogenesis Modeling*, **Li Deng (G)**, Rice University.

4:45 *The Computational Biosciences Professional Sciences Masters Program at Arizona State University*, **Rosemary A. Renaut**, Arizona State University.

Student talks
Wiggins room, 3:45 p.m.–4:45 p.m.

3:45 *Predicting Student Performance on Exam Questions from Terminology Present on Concept Maps*, **Fan Chen (G)** and **Cristina Torres (G)**, University of Texas at El Paso.

4:15 *Are Pre-service Teachers Implementing Math Methods/Ideas Learned at the University Level in the Classroom?*, **Melinda Ramos Camarillo (G)**, University of Texas at El Paso.

Banquet
Tomas Rivera Conference Center, 5:30 p.m.–8:30 p.m.

5:30 *Count Her In!*, a play about female mathematicians' lives, performed by high school students. Director: **Sherry Lowell-Lewis**, University of Texas at El Paso. (Open to all conference attendees.)

6:30 Dinner. (Ticket required.)

7:30 *Math Song Sing-Along!*, **Dr. Larry Lesser**, University of Texas at El Paso. Resources related to this presentation are available at `http://www.math.utep.edu/Faculty/lesser/Mathemusician.html`

SATURDAY, April 2

Tomas Rivera Conference Center

8:00 a.m.–8:30 a.m. **Continental Breakfast**
8:00 a.m.–2:00 p.m. **Registration**
8:00 a.m.–5:30 p.m. **Vendor exhibits and MAA book sales**

Invited address
Tomas Rivera Conference Center, 8:30 a.m.–9:30 a.m.

Why Things Go Quasi in Higher Dimensions, **Bruce Palka**, University of Texas at Austin, and editor of the American Mathematical Monthly.

Contributed talks
Barry room, 9:30 a.m.–11:30 a.m.

9:30 *Fixed Point Theory: Past, Present, and Future*, **Mohamed Amine Khamsi**, University of Texas at El Paso.

10:00 *Fixed Point Theorems with Applications to Variational Inequalities*, **Behzad Djafari Rouhani**, University of Texas at El Paso.

10:30 *Nonlinear Boundary Conditions for Elliptic Equations*, **Osvaldo Mendez**, University of Texas at El Paso.

11:00 *Recovering a Function from a One-sided Derivative*, **John Hagood**, Northern Arizona University.

Special session
"A sample of mathematics-centered educational and outreach activities at New Mexico State University", Part I
Elkins room, 9:30 a.m.–11:30 a.m.

9:30 *A New University Algebra and Geometry Course for Middle and High School Teachers*, **Patricia Baggett**, New Mexico State University, and **Andrzej Ejrenfeucht**, University of Colorado, Boulder.

10:00 *UBM: A Training Program for Research on the Interface of Mathematics and Biology at New Mexico State University*, **Mary M. Ballyk** and **William J. Boecklen**, New Mexico State University.

10:30 *Introducing Primary Historical Sources in Discrete Mathematics and Computer Science Curriculum*, **Guram Bezhanishvili, Joel Lucero-Bryan (G),** and **Karen Villaverde**, New Mexico State University.

11:00 *The Reversal Error and Its Influence on Physics Problem Solving*, **Elaine Cohen (G) and Stephen Kanim**, New Mexico State University.

Student talks
Tomas Rivera Conference Center, 9:30 a.m.–11:30 a.m.

9:30 *MathTECHmatics Projects*, **Elizabeth Rayas (G)**, University of Texas at El Paso.

10:00 *Differences in Teachers' Choice of Technology and Its Implementation Amongst Ability-Grouped High School Math Classes*, **Cristina Torres (G)**, University of Texas at El Paso.

10:30 *Using Technology to Assist Students in Comprehension of Graphs of Linear and Quadratic Equations*, **Fariba Ansari (G)**, University of Texas at El Paso, and **Francisco Nolasco**, Chapin High School.

11:00 *Technology in the Geometry Classroom*, **Stella Woo (G), Sandra Kneeskern (G),** and **Miles Kettel (G)**, University of Texas at El Paso.

Special session
"Mathematics motivated by computations: case studies"
Wiggins room, 9:30 a.m.–11:30 a.m.

9:30 *Fast Algorithm for Computing the Upper Endpoint of Sample Variance for Interval Data: Case of Sufficiently Accurate Measurements*, **Gang Xiang**, University of Texas at El Paso.

10:00 *Differentiation Beyond Traditional Definitions: Cases Studies of Application-motivated Extensions*, **Vladik Kreinovich**, University of Texas at El Paso, and **Hung T. Nguyen**, New Mexico State University.

10:30 *Egyptian Fractions Revisited*, **Olga Kosheleva** and **Vladik Kreinovich**, University of Texas at El Paso.

11:00 *Exploring Random Sets in Teaching Elementary Applied Statistics*, **Hung T. Nguyen**, New Mexico State University.

Lunch on your own, 11:30 a.m.–1:00 p.m.

Contributed talks
Barry room, 1:00 p.m.–2:30 p.m.

1:00 *Multiplicative Bases of the Algebra of Matrices*, **Piotr J. Wojciechowski**, University of Texas at El Paso.

1:30 *Counting Multiplicative Bases of the Algebra of Matrices*, **Carlos De la Mora (U)**, University of Texas at El Paso.

2:00 *Eigenvalues of Combinatorial Laplacians*, **Art Duval**, University of Texas at El Paso.

Special session

"A sample of mathematics-centered educational and outreach activities at New Mexico State University", Part II
Elkins room, 1:00 p.m.–3:00 p.m.

1:00 *The Master of Arts in Teaching Mathematics Degree at NMSU*, **David R. Finston**, New Mexico State University.

1:30 *Students' Difficulties With the Concept of Tension*, **Sergio Flores (G)**, New Mexico State University.

2:00 *Lesson Study as a Tool for Professional Development*, **Catherine Kanim** and **Susana Salamanca-Riba**, New Mexico State University.

2:30 *Classroom Assessment Techniques to Improve the Pass Rate in an Intermediate Algebra Course*, **Shakir Manshad**, Doña Ana Branch Community College and New Mexico State University, and **Amal Mostafa** and **Linda Zimmerman**, New Mexico State University.

Student talks
Tomas Rivera Conference Center, 1:00 p.m.–3:00 p.m.

1:00 *Students with Learning Disabilities and their Social Adjustments*, **Cesar Ramirez (G)**, University of Texas at El Paso.

1:30 *Attitude and Perception: Mathematics Learning*, **Jesus Jordan (G), Damian Pillatzke (G),** and **Gerald Smith (G)**, University of Texas at El Paso.

2:00 *The Effects of Doing Research on History of Mathematics*, **Claudia Liliana Talamantes (G)**, University of Texas at El Paso.

2:30 *The Effects of a History-based Mathematics Project on the Motivation and Appreciation of a Class of Geometry*, **Andrew N. Streeter (G)**, University of Texas at El Paso.

Contributed talks
Wiggins room, 1:00 p.m.–3:00 p.m.

1:00 *Bayesian Variable Selection in Multinomial Probit Models to Identify Molecular Signatures of Disease Stage*, **Naijun Sha**, University of Texas at El Paso.

1:30 *Logistic Regression with Applications to Education*, **Peter Moschopoulos**, University of Texas at El Paso.

2:00 *It's a Holiday!!*, **Janet McShane**, Northern Arizona University.

2:30 *Project-Based Learning in Mathematical Statistics*, **Vera Ioudina**, University of Texas at El Paso.

Contributed talks
Barry room, 3:30 p.m.–4:30 p.m.

3:30 *Halving Ham Sandwiches and Combing Hairy Spheres: Some Topological Aspects of Reality*, **Luis Valdez-Sanchez**, University of Texas at El Paso.

4:00 *Dimensions of Learning in Teaching Mathematics*, **Sharon Yu-Shattuck**, El Paso Community College.

Special session
"A sample of mathematics-centered educational and outreach activities at New Mexico State University", Part III
Elkins room, 3:30 p.m.–4:00 p.m.

3:30 *Mathematical Finance Course at New Mexico State University: Portfolio Optimization*, **Yang Liu (G)** and **Maria Cristina Mariani**, New Mexico State University.

Student talks
Tomas Rivera Conference Center, 3:30 p.m.–4:30 p.m.

3:30 *Using Concept Maps to Improve Test Scores*, **Roger A. Winter (G)**, University of Texas at El Paso.

4:00 *The Effect of Teacher Collaboration on Student Performance*, **Jodi Copley (G), Joseph Blas (G),** and **Candace Warren (G)**, University of Texas at El Paso.

Contributed talks
Wiggins room, 3:30 p.m.–5:00 p.m.

3:30 *Finding Extreme Points of a Finite Set Using Random Hyperplanes*, **Shafiu Jibrin**, Northern Arizona University.

4:00 *An Inexact Newton Interior-Point Method for Nonnegative Constrained Minimization*, **Miguel Argaez, Roberto Saenz (G),** and **Leticia Velazquez (speaker)**, University of Texas at El Paso.

4:30 *The Notion of the Quasicentral Path in Linear Programming*, **Miguel Argaez (speaker), Osvaldo Mendez,** and **Leticia Velazquez**, University of Texas at El Paso.

Before you leave, please remember to turn in your ballot of student talks at the information table outside the Tomas Rivera Conference Center. Ballots turned in after 5:30, Saturday, will not be counted.

Abstracts of contributed and student talks, and special session talks.

Abstracts appear in order of the last name of the first presenter.

Antony H. Adair (U), University of Texas at El Paso, *Using functions and relations to form equations defining already established groups.* Fri., 3:00, Wiggins.

I will touch on some background info. My own research then will be presented, as well as all the research from different authors available on the subject, contrasting if my theories for defining groups were correct, incorrect, unknown, or new.

Steve Aley, Department of Biological Sciences, University of Texas at El Paso, *Bioinformatics: Convincing the Biology Major that Mathematics and Computer Science are Relevant.* Fri., 3:45, Elkins.

Too often in science education, mathematic courses are perceived as "gatekeeper" courses, providing a hurdle for students to cross, but not really providing necessary knowledge for future careers. The logical extension is that the science program requiring the lowest hurdle, usually Biological Sciences, becomes the final refuge of students who enjoy science but are uncomfortable, or even afraid, of mathematics. Contrary to this perception, modern research in Biology topics including ecology, evolution, physiology, and molecular biology requires biology investigators with facility and understanding in a range of statistical and mathematical disciplines not included in traditional degree plans. To provide these future researchers, education of Biology majors in quantitative science needs to change in both attitude and in subject matter. Training in quantitative science, and mathematics in particular, needs to be made more relevant to biology applications and to emphasize a broader range of disciplines in addition to — or even in place of — calculus. In this talk, the Bioinformatics of Genome and Proteome research is presented as a rich source of material for examples of quantitative biology across a range of mathematical and computational disciplines.

Fariba Ansari (G), University of Texas at El Paso and Chapin High School, and **Francisco Nolasco**, Chapin High School, *Using Technology to Assist Students in Comprehension of Graphs of Linear and Quadratic Equations.* Sat., 10:30, Rivera.

In our activity, we selected four classes for a total of 89 high school students, grades 9-12. By using a TI-83 Plus calculator, we demonstrated the application of transformation to explore the graphing of both linear functions and quadratic equations. We provided each individual student with this calculator, which already had the APPS Transform application installed on it. Students inputted given linear functions, and they were able to see the changes in the resulting graphs by altering the parameters. As a result, all the students could visualize the differences in the functions and were able to draw conclusions. In another activity involving quadratic equations, students were given functions one at a time, and they investigated the effect of each parameter in the equations. In addition, they were able to view an automatic play of those parameters' changes simultaneously. In summary, we saw how those activities resulted in a significant increase in the students' engagement in the topic, which led to enthusiastic classroom discussion about it. From this, we have seen how technology can be used as a tool to enhance student learning. Most of the students were indicating that those activities were useful for TAKS examination.

Miguel Argaez (speaker), Osvaldo Mendez, and **Leticia Velazquez**, University of Texas at El Paso, *The Notion of the Quasicentral Path in Linear Programming.* Sat., 4:30, Wiggins.

The notion of the central path plays an important role in the development of most primal-dual interior-point algorithms. In this work we prove that a related notion called the quasicentral path, introduced by Argaez and Tapia in nonlinear programming, while being a less restrictive notion it is sufficiently strong to guide the iterates towards a solution of the problem. We use a new merit function for advancing to the quasicentral path, and weighted neighborhoods as proximity measures of this central region. We prove global convergence theory, and present some numerical results that demonstrate the effectiveness of the procedure.

Miguel Argaez, Roberto Saenz (G), Leticia Velazquez (speaker), University of Texas at El Paso, *An Inexact Newton Interior-Point Method for Nonnegative Constrained Minimization.* Sat., 4:00, Wiggins.

In this talk we present a path-following interior-point algorithm for solving nonnegative constrained minimization problems with the capability of handling large scale and/or degenerate problems. We use the notion of the quasicentral path as a central region, a new merit function, and inexact Newton directions. Some promising numerical results are reported.

Patricia Baggett, New Mexico State University, and **Andrzej Ehrenfeucht**, Department of Computer Science, University of Colorado, Boulder,. *A New University Algebra and Geometry Course for Middle and High School Teachers.* Sat., 9:30, Elkins

We will describe a new algebra and geometry course for middle and high school teachers and future teachers, offered for the first time at NMSU in fall 2004. The mathematics course, the sixth in a series emphasizing hands-on applications taught in a lab format, combines teachers and future teachers in the same class. Its mathematics content is unusual in that it introduces solving equations using the fixed point method, drawing and rotating pictures on a graphing calculator, and finding patterns using matrices, requiring the extensive use of scientific and graphing calculators. We will show some units from the course and report on what units teachers tried with their own pupils, what students liked and didn't like in the course, and how they evaluated the class.

Mary M. Ballyk, New Mexico State University, and **William J. Boecklen**, Department of Biology, New Mexico State University, *UBM: A Training Program for Research on the Interface of Mathematics and Biology at New Mexico State University.* Sat., 10:00, Elkins.

The goal of this program is to enhance undergraduate education and training at the intersection of the biological and mathematical sciences and to better prepare undergraduate mathematics or biology students to pursue graduate studies and careers in fields that integrate the biological and mathematical sciences. The talk will describe the components of the program and the various ways in which undergraduates may participate.

Guram Bezhanishvil, New Mexico State University, **Joel Lucero-Bryan (G)**, New Mexico State University, and **Karen Villaverde**, Computer Science Department, New Mexico State University,. *Introducing Primary Historical Sources in Discrete Mathematics and Computer Science Curriculum.* Sat., 10:30, Elkins.

We explore how a sense of discovery can be captured in the classroom by reading primary historical sources, particularly those which inaugurated concepts and procedures that would eventually become part of a present-day course in discrete mathematics. The original motivating problems and pioneering solutions provide an alternative to traditional textbooks, which present the facts and formulae of the subject, with little mention of the journey that led to such modern concepts as induction, recursion or algorithm. This methodology allows students to hone their verbal and deductive skills through reading, answering key questions, and studying the original works of great minds in history. The students are given the opportunity to react to the original source in much the same way as the contemporaries of the historical masterpiece, explore the development of ground-breaking ideas, and rediscover the conceptual roots common to discrete mathematics. We shall discuss this method and outline two projects recently implemented at New Mexico State University. See `www.math.nmsu.edu/hist_projects/` for more information.

Brenda Bueno (U), University of Texas at El Paso, *Numerical Comparison of Optimization Techniques for Solving a Nonlinear Hyperboloid Least Squares Problem.* Fri., 12:00, Wiggins.

We present a numerical comparison of several optimization strategies applied to a nonlinear least squares problem. This problem arises when beta sheet residues from an allosteric enzyme are fitted onto a hyperboloid by using Newton type methods. Numerical results show that a modified version of a multistart algorithm introduced by Velazquez, Phillips, Tapia and Zhang works best on this problem. *Partially supported by the UTEP/MARC grant.*

Melinda Ramos Camarillo (G), University of Texas at El Paso, *Are Pre-service Teachers Implementing Math Methods/Ideas Learned at the University Level in the Classroom?.* Fri., 4:15, Wiggins.

The purpose of this study is to determine whether or not students who took part in an integrated, collaborative, field based approach to teaching and learning during their pre-service instruction carried out the ideas and methodology they learned for teaching mathematics in their own classrooms. Two students who took part in this type of instruction during their pre-service education are the main subjects of this study. These two students were interviewed right after completing their university course work (before beginning their teaching careers), after one semester of teaching, and after their first year of teaching. Questions asked included, "What is the best way to teach math?, What do you think is the best way for students to learn math?, Describe a typical math lesson in your classroom." Responses given before, during, and after these teachers' first year of teaching are being compared to determine whether or not their ideas and plans for teaching match up with what actually took place in the classroom. Initial findings indicate that these first

year teachers changed their way of thinking about math instruction after being exposed to the classroom.

Fan Chen (G) and **Cristina Torres (G)**, University of Texas at El Paso, *Predicting Student Performance on Exam Questions from Terminology Present on Concept Maps*. Fri., 3:45, Wiggins.

This study used student concept maps on function to determine whether concepts predict performance on exam questions relating to function. Seventy-five students from two sections of College Algebra completed concept maps on function during the fall 2003 semester. Students completing the second map and the first exam and/or the fourth map and the final exam were considered in the analysis. Students were given a concept score based on the number of relevant concepts present on their maps and a test score based on a rubric score of one to six. Correlations were run on concept and test scores as a whole, by class section, and by type of exam. Initial findings indicate that there may be a relation between the presence of relevant concepts on the maps and the success of the students on the function related questions. *The work is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Elaine Cohen (G), New Mexico State University, and **Stephen Kanim**, Physics Department, New Mexico State University, *The Reversal Error and Its Influence on Physics Problem Solving*. Sat., 11:00, Elkins.

Given a written problem statement about a proportional relationship between two quantities, many university students will place the constant of proportionality on the wrong side of the equal sign. This is known in the mathematics education literature as a "reversal error." We describe an experimental investigation into three possible factors contributing to this reversal error: 1) labeling of variables, 2) structure of sentences, and 3) familiarity of context. We present results from sections of a calculus-based physics course and an intermediate algebra course.

Jodi Copley (G), Joseph Blas (G), and **Candace Warren (G)**, University of Texas at El Paso, *The Effect of Teacher Collaboration on Student Performance*. Sat., 4:00, Rivera.

In this article we have been studying ninth grade TAKS scores of 2002-2003 and 2003-2004 from two different High Schools. The study looked at teacher collaboration and the effect it has on standardized test scores. We compared data among the two schools, one school did this study on a volunteer basis and the other was on a non-volunteer, administrator driven basis. The study was done before collaborative teaching was done 2002-2003 and after it was implemented in 2003-2004.

In particular we found that teachers in the volunteer school lead some teachers to take an inquiry stance concerning their own teaching, resulting in self sustaining change in mathematics instructional practices. This implies that teachers were reaching more students due to different teaching styles and professional growth of the teacher. The non-volunteer school curriculum became more in line with the other teachers, which helped the students if they had their schedules changed. It showed that teachers were cooperating resulting in teamwork which the student benefited from. The administrator driven school also showed considerable growth in student scores, but seemed to have a negative effect on teacher morale which may affect future results. *The work is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Carlos De la Mora (U), University of Texas at El Paso, Sat., 1:30, Barry. *Counting Multiplicative Bases of the Algebra of Matrices*.

We know that in the full algebra of $n \times n$ real matrices the number of nonisomorphic multiplicative bases (treated as semigroups with zero) is equal to the number of the orbits of an action of the group $S_n \times S_n$ on the set of all nonsingular zero-one matrices. We will demonstrate a formula that will facilitate the computation of the number of the nonisomorphic multiplicative bases. In this we will use the Sloane sequence A055165 of nonsingular zero-one matrices. We will illustrate the ideas with some examples.

Li Deng (G), Department of Statistics, Rice University, *Stochastic Models in Carcinogenesis Modeling*. Fri., 4:15, Elkins.

The two-stage clonal expansion model (TSCE) is one of the most popular stochastic models in assessing environmental risk factors' influence on cancer development. In this talk I will give a review of carcinogenesis models with emphasize on the two-stage clonal expansion model (TSCE). Also a new algorithm of computing a three-stage clonal expansion model based on TSCE is proposed. This model adds one more transition stage to the TSCE model and allows more than one pathways in the carcinogenesis. A comparison between my algorithm and an approximation formula derived by Waiyuan Tan will be presented. In the end I will discuss about the application of TSCE models to lung cancer data through a case-control study dataset.

Art Duval, University of Texas at El Paso, *Eigenvalues of Combinatorial Laplacians*. Sat., 2:00, Barry.

Combinatorial Laplacian operators, defined on simplicial complexes (higher-dimensional analogues of graphs), are a discrete version of the classical Laplacian operator defined on manifolds. The combinatorial Laplacian eigenvalues of some special simplicial complexes (matroids and shifted complexes) are integers, and have nice formulas and recursions.

Hamide Dogan-Dunlap, Fan Chen (G), and **Cristina Torres (G)**, University of Texas at El Paso, *Prior Knowledge and Mathematical Cognition*. Fri., 11:30, Elkins.

We will present a college mathematics student's concept maps, definitions, and essays to support the thesis that language-based prior knowledge can influence students' cognitive processes of mathematical concepts. A group of intermediate algebra students who displayed terms mainly from the spoken language on the first and the second concept maps and essays included terms reflecting more of an equation/formula-based conceptualization of the function concept on their third and the last concept maps and essays.

David R. Finston, New Mexico State University, *The Master of Arts in Teaching Mathematics Degree at NMSU*. Sat., 1:00, Elkins.

Building upon the long history of collaborative efforts with Las Cruces area high schools and middle schools, the Department of Mathematical Sciences at NMSU is developing six distance education courses for inservice middle school mathematics teachers in support of the Master of Arts in Teaching degree offered by the College of Education and to enable teachers to meet new state certification requirements. The talk will describe some of our history and discuss the content and delivery methods of the new courses.

Edgar Fisher (G), Northern Arizona University, *Rectangular Polyomino Set* $(1, 2)$*-Achievement Games*. Fri., 2:00, Wiggins.

Polyominos are connected subsets of the square lattice tiling of the plane. These are often classified by their number of squares. Thus, a domino has two squares, and a pentomino has five. For any set of rectangular polyominos, we try to determine whether the set is winning or losing in the $(1, 2)$-achievement game. In the $(1, 2)$-achievement game, the first player marks one cell while the second player marks two cells. In this research, we hope to establish a basis of sets that will classify all possible sets as either winning or losing.

Sergio Flores (G), Physics Department, New Mexico State University, *Students' Difficulties With the Concept of Tension*. Sat., 1:30, Elkins.

Despite the efforts of physics instructors aimed at improving students' understanding of physics concepts, there is still a lot of work to do. In the physics department at New Mexico State University, we are in the process of modifying our laboratories to attempt to address some of the common conceptual difficulties exhibited by students. Through interviews and analysis of student responses to questions on midterm and final examinations and on laboratory pretests, we are gaining a better understanding of student difficulties with many mechanics topics. In this talk, I will give examples of these difficulties related to concepts of tension and to addition of vectors. In addition, I will describe modifications we have made to a traditional force table lab based on our research.

John Hagood, Northern Arizona University, *The Mathematics Parole Board: Imaginary Scenarios that Provide Incentives for Students to Participate in Class*. Fri., 2:30, Barry.

All the world is a stage and the students are merely players. For some, it is easier to play a role than to be oneself (Jim Carey comes to mind). We will present some sly means of causing students to think about mathematical concepts during the class period including various imaginary scenarios.

John Hagood, Northern Arizona University, *Recovering a Function from a One-sided Derivative*. Sat., 11:00, Barry.

A function can be recovered up to an additive constant from its derivative using a Riemann integral or other integral based on Riemann sums, but can the same be said of a one-sided derivative? It has been known since 1878 that a continuous function is determined by a finite Dini derivative, but the first successful approach to recovering a function from a Dini derivative required the heavy machinery of measure theory and so-called totalization method. We will present a more elementary approach that uses a Riemann sum process. The investigation is similar in some ways to the case using the derivative, but is more interesting, more varied, and even surprising at points. The presentation will be seasoned with historical perspectives to the extent that time allows.

Deborah Hughes Hallett, University of Arizona, *Characteristics of Successful Engagement: Examples from Calculus and Statistics*. Fri., 2:00, Barry.

Engaging students can be done in many ways; each instructor brings different talents to the task. Two avenues I have found productive are (1) Questions that the students find genuinely interesting (which may or may not be what their instructors find interesting!) and (2) Activities that challenge students, but are not perceived as humiliating. In this talk, I will give examples from calculus and statistics and talk about in what ways they satisfy, or fail to satisfy, these criteria.

Vera Ioudina, University of Texas at El Paso, *Project-Based Learning in Mathematical Statistics*. Sat., 2:30, Wiggins.

The purpose of my presentation is to encourage the exchange of experiences of teaching mathematical statistics to students from the Department of Education. It is well documented that students lack basic mathematical preparation, and enter classes in statistics with great apprehension. The question is, then, how can we make mathematical statistics more attractive for students and to involve them in the process of statistical research? Over the course of three semesters with three different groups of students I required my students to carry out statistical research on the relationship between any two social and economic variables, using the mathematical model of simple linear regression. The projects were completed in teams, which independently chose a problem of their interest and found the enough big statistical samples existed to study the issue. Statistical calculations were made with use of standard procedures of EXCEL. The final presentations of the models and discussion about their interpretation have shown the real enthusiasm for this teaching method.

Shafiu Jibrin, Northern Arizona University, *Finding Extreme Points of a Finite Set Using Random Hyperplanes*. Sat., 3:30, Wiggins.

Given a finite set S of n points in $\mathbf{R}^d$, we describe a probabilistic hit-and-run algorithm for finding the extreme points of S. We define a region $R(S)$ in $\mathbf{R}^d$ that corresponds to the set of all linear inequality constraints containing the set S. We use a correspondence between points of S and certain linear inequality constraints in $\mathbf{R}^d$. We show that a point p in S is an extreme point of S if and only if its corresponding linear inequality constraint is necessary with respect to $R(S)$.

We introduce and use the coordinate direction algorithm for detecting necessary linear constraints to determine the extreme points, which searches along the coordinate directions. Each search along a single coordinate direction requires $O(n)$ time. The algorithm also estimates the density of points around each extreme point.

Jesus Jordan (G), Damian Pillatzke (G), and **Gerald Smith (G)**, University of Texas at El Paso, *Attitude and Perception: Mathematics Learning*. Sat., 1:30, Rivera.

Recent studies show that pre-service teachers' attitude, perception and beliefs have a strong influence on their evaluation of their ability, and on their willingness to engage in math tasks. Even though pre-service teachers may possess the potential to learn mathematics, high math anxiety and the pessimistic beliefs they hold divert attention of many from content learning to self-esteem issues, which consequently deteriorate their cognitive processes This study presents findings that a carefully designed, collaborative, inquiry-based, learner-centered approach among pre-service teachers' math content, math methods, and pedagogy courses does contribute to the improvement of pre-service teacher's attitude toward and perception of mathematics. These changes may result in increased participation in mathematics learning leading to higher achievement. *The work is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Catherine Kanim, Department of Civil Engineering, New Mexico State University, and **Susana Salamanca-Riba**, New Mexico State University, *Lesson Study as a Tool for Professional Development*. Sat., 2:00, Elkins.

IAS/Park City Mathematics Institute is funding the New Mexico State University Professional Development and Outreach group. Working in collaboration with the "Mathematically Connected Communities" project in the College of Education we have facilitated three research lesson cycles with high school teachers in the area. Lesson study is a collaborative process that focuses on student learning and uses the following five steps: Design, teach, refine, re-teach and write-up for distribution.

Mohamed Amine Khamsi, University of Texas at El Paso, *Fixed Point Theory: Past, Present, and Future*. Sat., 9:30, Barry.

In this talk, we will give a brief historical background of the Fixed Point Theory, discuss the current research directions, and hint to what future lies for this theory.

Olga Kosheleva and **Vladik Kreinovich**, University of Texas at El Paso, *Egyptian Fractions Revisited.* Sat., 10:30, Wiggins.

It is well known that the ancient Egyptians represented each fraction as a sum of unit fractions — *i.e.*, fractions with unit numerators; this is how they, *e.g.*, divided loaves of bread. What is not clear is why they used this representation. In this paper, we propose a new explanation: crudely speaking, that the main idea behind the Egyptian fractions provides an optimal way of dividing the loaves. We also analyze the related properties of fractions.

Vladik Kreinovich, University of Texas at El Paso, and **Hung T. Nguyen**, New Mexico State University, *Differentiation Beyond Traditional Definitions: Cases Studies of Application-motivated Extensions.* Sat., 10:00, Wiggins.

Differentiation was originally invented by Newton and Leibniz to find local and global maxima and minima and to describe dynamics of real-life systems (by using differential equations). In the traditional calculus definitions, we have an exactly known function $f(x_1, ..., x_n)$ from real numbers to real numbers. In real life problems, the situation is often more complicated:

- In practice, we often know a few values of the (unknown) function, and even these values come from measurement and are thus known with uncertainty (*e.g.*, with interval uncertainty); what can we then tell about the local extrema? about the possible values of the derivative?

  At first glance, it may look like we cannot tell much (*e.g.*, a maximum can be anywhere), but some math enables us to make conclusions even in the case of interval uncertainty. For example, we can efficiently locate intervals that are guaranteed to contain at least one local maximum, and, more generally, for every interval $[a, b]$, compute values that the derivative $f'(x)$ is guaranteed to take somewhere on $[a, b]$.

- In some practical problems, e.g., in design, we want to find a function or a set that would optimize the desired objective. In such case, we deal with a function defined on functions or on sets.

  While there exist many useful formalisms for differentiation on function spaces, differentiation has not been widely used for optimizing functions $f(S)$ of set-valued variables S. We describe a new formalism that can help in problems like dividing territory and finding confidence sets.

- Finally, in some physical problems, we would like to describe the dynamics of a system whose parameters are not real numbers.

  We explore one such example: the Einstein-Bergmann circular-5th-dimension model of Kaluza-Klein 5-dimensional space-time — the predecessor of the modern string theory multi-dimensional space-times, and we show how new (and, we hope, physically natural) mathematical definitions can explain the related heuristic physical assumptions.

Larry Lesser, Sally Blake, and **Paulette Adams (U)**, University of Texas at El Paso, *Pi Day and Other Interventions: Real-life Research on Middle School Motivation.* Fri., 2:30, Elkins.

During the 2004-05 school year, this UTEP faculty-student team has been engaged in a partnership of research, outreach and professional development at EPISD's Henderson Middle School to improve attitudes, motivation and perceptions about mathematics on campus, hopefully translating into stronger performance. Though the work is still "in progress", we will discuss some of the emerging insights and preliminary examination of the qualitative and quantitative data collected before and after a portfolio of interventions, including a Pi Day rally on March 14. *This work is supported through the NSF Mathematics Science Partnership (MSP), PETE/Noyce and the Texas Teacher Quality Grants.*

Yang Liu (G), New Mexico State University, and **Maria Cristina Mariani**, New Mexico State University, *Mathematical Finance Course at New Mexico State University: Portfolio Optimization.* Sat., 3:30, Elkins.

The course is intended for students of the College of Arts and Sciences, Engineering and Business. We will describe the contents of the course, as well as some applications to real life problems.

Shakir Manshad, General Studies, Doña Ana Branch Community College and NMSU, **Amal Mostafa**, New Mexico State University, and **Linda Zimmerman**, New Mexico State University,. *Classroom Assessment Techniques to Improve the Pass Rate in an Intermediate Algebra Course.* Sat., 2:30, Elkins.

A significant problem for today's math faculty is how to meet the needs of students having minimal skills in mathematics without ignoring those who are well-prepared and highly motivated. In this presentation we will talk about different classroom techniques we have developed for an Intermediate Algebra Course. These techniques will involve some fundamental issues such as math placement, time management survey, Intermediate Algebra course survey. We will also discuss a proposal for changing the Intermediate Algebra course and the College Algebra course into a three semester sequence, Intermediate Algebra, College Algebra, and Pre-calculus.

Janet McShane, Northern Arizona University, *KAW – Knowing, Asking and Writing*. Fri., 4:15, Barry

In this presentation, I will discuss some simple strategies for engaging students in the classroom. Many of these ideas are "commons sense" sort of things but we sometimes overlook them. Join me to hear about KAW – that is, what should you know, what should you ask (and how) and what should they write.

Janet McShane, Northern Arizona University, *It's a Holiday!!*. Sat., 2:00, Wiggins.

There are many well-known holidays that are celebrated throughout the world. The dates or days on which these holidays are celebrated often change from year to year. Here we will consider the 10 USA federal holidays and Easter Sunday. Some federal holidays, such as Memorial Day, are ordained to fall on the same weekday every year and for these holidays we will consider the distribution of the occurrences of these holidays over the set of possible dates. Other federal holidays, such as Christmas Day, all occur on a fixed date. Here we are interested in the distribution of the days of observance over the set of possible weekdays. Finally we consider the distribution of the date of observance of Easter Sunday over the set of possible dates. After making some minor adjustments, we will find that the Easter Sunday distribution can be nicely approximated by the sum of two random variables.

Osvaldo Mendez, University of Texas at El Paso, *Nonlinear Boundary Conditions for Elliptic Equations*. Sat., 10:30, Barry.

I will present a work devoted to the study of the elliptic equation $\Delta u = f(x, u)$ in a bounded domain $\Omega \subset \mathbf{R}^n$ with a nonlinear boundary condition. We obtain various existence results applying Leray-Schauder degree theory and the method of upper and lower solutions.

Peter Moschopoulos, University of Texas at El Paso, *Logistic Regression with Applications to Education*. Sat., 1:30, Wiggins.

In the regression model, a quantitative response is related to a number of observed variables with the main purpose to predict the response on the basis of these variables, which are commonly called predictor variables. The relation is that of a statistical function that involves a fixed part depending on the predictor variables and a random part commonly termed as random error. The logistic regression model is also a prediction model for the response variable with one main difference: the response variable is binary, that is the response is either one or zero. As such, rather than relating the response variable to the predictor variables, the logistic regression model links those variables to the probability of the response. The logistic regression model is a model that utilizes a special "link" function that is called logit. The model has found increased popularity in recent years in the analysis of binary response data, in particular because of its application in epidemiological and medical sciences and other fields. In this talk, we consider the general formulation of the logistic regression model along with applications from medicine and education.

Hung T. Nguyen, New Mexico State University, *Exploring Random Sets in Teaching Elementary Applied Statistics*. Sat., 11:00, Wiggins.

This lecture addresses some aspects of education and research in applied statistics. This is done by taking a closer look at sampling from a finite population. Stochastic sampling designs are viewed as random experiments whose outcomes are subsets of the population. On the pedagogical side, this viewpoint provides the first concrete example of statistical inference models which could be used to suggest general statistical models. In a related vein, this viewpoint of random set models in survey sampling turns out to be useful in recent research activities in which observations (data) are somewhat imprecise. This is typically the case of coarse data, *e.g.*, in biostatistics.

David Pengelley, New Mexico State University, *How to Beat the Lecture/Textbook Trap!: An Active Student Classroom via Student Reading, Writing, Projects, and Primary Historical Sources.*. Fri., 4:45, Barry.

I will discuss student projects as a teaching tool, and also the idea that having students read and learn

directly from primary historical sources creates richness in unique ways. I will mention how these approaches are currently being combined in discrete mathematics courses in an interdisciplinary collaboration. But mostly I will discuss what I have found to be the hardest challenge in reinventing myself as a teacher: moving away from the typical day-to-day lecture/textbook paradigm. I see a vicious cycle: students don't read the textbook because they know we will lecture, and we lecture on the textbook because we know they don't read it. What a waste of precious classroom time. I will explain my own methods for beating this trap, with or without a textbook. I am very heartened at the results; surprise, my students CAN learn a lot from reading, but only if I design the process right!

Cesar Ramirez (G), Faith Christian Academy and University of Texas at El Paso, *Students with Learning Disabilities and their Social Adjustments*. Sat., 1:00, Rivera.

The Discovery Program at a Faith Christian Academy has been very successful over the past twelve years in improving the academic skills for students who have been diagnosed with a learning disability. The program from start to completion may be from three to five years depending on the diagnoses. Many of the students in the program were not only struggling academically but also socially. Poor eye contact, poor listening skills, temper flare ups, and no friends contributed to a difficult school setting for these students. By the completion of the first year the staff observed an improvement in the social adjustment of the students. Surveys were conducted with former discovery students, parents, and friends and the data suggests that there was an improvement in there social skills. The article concludes that more research needs to be conducted in this field to better serve the whole student. *The program sponsored by the National Institute for Learning Disabilities raises I. Q. scores. Can the program also improve the social skills for learning disabled students? And the paper is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Michael Ratliff, Northern Arizona University, *A Generalized "Problem of the Week"*. Fri., 12:00, Barry.

Original Problem: Given a regular hexagon, construct from each vertex a line segment connecting the vertex to the midpoint of the nearest side not incident with the vertex, in a counter-clockwise fashion. The six line segments so constructed intersect in six points forming another regular hexagon. The problem is to find the ratio of areas of the two hexagons.

Generalized Problem: Given a regular n-gon, construct from each vertex a line segment connecting the vertex to a point t , $0 < t < 1$, of the way along the nearest side not incident to the vertex, in a counter-clockwise fashion. The n line segments so constructed intersect in n points forming another regular n-gon. We consider several problems:

1. What are the coordinates of the vertices of these n intersection points?
2. As t varies from 0 to 1, what is the locus of these n intersection points?
3. If we continue making new n-gons in this fashion, what is the ratio of areas of the new n-gons to the original n-gon?
4. If t is uniformly distributed on $[0, 1]$, what is the distribution of the area ratios?

In this talk, we will answer these questions, as well as discuss the importance of "Problem of the Week" problems for both students and faculty.

Elizabeth Rayas (G), Socorro High School and University of Texas at El Paso, *MathTECHmatics Projects*. Sat., 9:30, Rivera.

This is a presentation of four Mathematics and Technology projects that enhance cooperative learning, technology literacy, and student understanding, while enjoyable for students. Project topics include: parent functions, trigonometry applications, graphs of functions, perimeter/area of basic geometric shapes. Technology used in projects includes: graphing utility/software, geometry software, Microsoft Word, Power-Point, internet resources, and more. Correlation to TEKS/TAKS. Ready-to-use project sheets will be provided. Projects can be applied to Pre-Calculus, Geometry, Algebra II courses. Grades 8-12.

Rosemary A. Renaut, Department of Mathematics and Statistics and Director of Computational Biosciences Program, Arizona State University, *The Computational Biosciences Professional Sciences Masters Program at Arizona State University*. Fri., 4:45, Elkins.

In this presentation I will give a brief background of the history of the CBS program at ASU. This will lead to our curriculum for the CBS students. I will then focus on the specific courses which are designed to review mathematical details for advanced graduate students from other disciplines. The field of computational biosciences is rich with examples in which one can review or introduce concepts in multivariable calculus, linear algebra and differential equations. It is our view at ASU that graduate students aiming for careers in the technical areas of the life sciences, need familiarity with these concepts, but can learn to appreciate the mathematical concepts in terms of very relevant applications. I will present a few examples in which I have discussed the basics behind numerical optimization for problems as diverse as phylogenetics and pattern recognition.

Behzad Djafari Rouhani, University of Texas at El Paso, *Fixed Point Theorems with Applications to Variational Inequalities*. Sat., 10:00, Barry.

We present a simple proof to an extension of Fan-Browder and Tarafdar's fixed point theorems for multivalued mappings and show its equivalence to a KKM type result. We then apply the fixed point theorem to show the existence of solutions to variational inequalities in not necessarily reflexive Banach spaces.

Emil Daniel Schwab, University of Texas at El Paso, *Algebraic Characterizations of Exponential Series*. Fri., 11:30, Barry.

Defining a new operation on the ring of formal power series, we establish algebraic characterizations of the exponential series.

Naijun Sha, University of Texas at El Paso, *Bayesian Variable Selection in Multinomial Probit Models to Identify Molecular Signatures of Disease Stage*. Sat., 1:00, Wiggins.

Here we focus on discrimination problems where the number of predictors substantially exceeds the sample size and we propose a Bayesian variable selection approach to multinomial probit models. Our method makes use of mixture priors and Markov chain Monte Carlo techniques to select sets of variables that differ among the classes. We apply our methodology to a problem in functional genomics using gene expression profiling data. The aim of the analysis is to identify molecular signatures that characterize two different stages of rheumatoid arthritis.

Fred Stevenson, University of Arizona, *Using Exploratory Problems to Engage Students from Grade 4 to Grade 16*. Fri., 3:45, Barry.

William Stone, New Mexico Tech, *Applications and Mathematical Modeling*. Fri., 3:00, Barry.

Andrew N. Streeter (G), University of Texas at El Paso, *The Effects of a History-based Mathematics Project on the Motivation and Appreciation of a Class of Geometry Students*. Sat., 2:30, Rivera.

Motivation is an integral part of a young student's success. Mathematics teachers at the high school level must find creative ways to connect with their students and motivate them. The history of mathematics can be used to enhance students' motivation to study math, and it can also increase their appreciation of both the subject and the people who developed it. This article describes the study of a history-based project on a class of high school Geometry students, and the results of that study. It brings to light several positive aspects of the student projects. *The work is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Claudia Liliana Talamantes, University of Texas at El Paso, *The effects of Doing Research on History of Mathematics*. Sat., 2:00, Rivera.

Do your students know about the history of mathematics? Wouldn't it be exciting to have conversations with them about some great mahematicians? Have they asked you who came up with all these formulas, rules and/or definitions? If that's the case this article describes the effects of assigning a project on some of the famous founders of mathematics and their history. It concludes that the assignment enlighten's student's interest in mathematics and their perception of mathematics is changed. *The work is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Mourat Tchoshanov, Sally Blake, and **Beverley Calvo**, University of Texas at El Paso, **Sue Spotts** and **Alex Bustillos**, Wiggs Middle School, and **Susie Villalobos (G)**, University of Texas at El Paso, *Draw Infinity Project: Middle Grades Students' Concept Images of Infinity*. Fri., 3:00, Elkins.

The main purpose of this study is to investigate middle grades students' initial ideas of infinity and limit

through the series of structured activities. Sample of the study consisted of 41 middle grades students selected randomly from different local El Paso, TX school districts. They participated in the intensive summer class on Visual Calculus. Students were asked to draw infinity. They were also tested in their understanding of concepts of infinity and limit at the beginning and at the end of the class. Students were engaged into journal writing activities and cognitive interviews. The presentation will discuss the results of this study.

Ty Thompson (G), Northern Arizona University, *A Numerical Galerkin Method and the Ginzburg Landau Superconductivity Model for Cooling in Thin Cylindrical Samples*. Fri., 11:30, Wiggins.

In this research, the Ginzburg Landau (GL) Model is studied as it applies when estimating the onset of superconductivity in a sample with the "thin disk" geometry immersed in constant magnetic field as it is cooled through critical temperatures. With a variational approach, we estimate the critical points of the GL functional by applying Newton's method to its Frèchet derivative in a nite-dimensional Galerkin-type expansion. With this method, we track critical points of arbitrary stability by treating temperature as a bifurcation parameter, and characterize the invariant subspaces which manifest when following primary, secondary and tertiary solution branches. With a sufficient theoretical development and knowledge of the symmetry exhibited by the system, we analyze the implications of the simulation results and provide context for their verification.

Cristina Torres (G), University of Texas at El Paso, *Differences in Teachers' Choice of Technology and Its Implementation Amongst Ability-Grouped High School Math Classes*. Sat., 10:00, Rivera.

This paper investigated the differences in types of technology, methods of technology implementation, and frequency for the types and methods of technology used in Pre-AP, regular, and trailer classes of Algebra and Geometry. Fifty-one high school math teachers from two districts and eight schools completed technology surveys. Additionally, two teachers were interviewed and observed teaching. Data indicated that no one ability group was favored in all three aspects of the investigation, although differences did exist. Regular classes implemented the most types and methods, and Pre-AP and trailer classes had higher overall and individual frequencies for types and methods used. The data also suggested the frequent use of technology, particularly the Carnegie Cognitive Tutor, in trailer courses may be due to teachers' desires to provide new experiences to previously unsuccessful students. Pre-AP and regular Algebra classes had higher percentages of lessons using technology for critical thinking, while regular Algebra teachers were the only ones to submit lessons involving technology use for application problems and assessment. Overall, teachers of all subjects and ability groups highly favored graphing calculator use in a structured environment for procedural knowledge.

Ellen Treadway, Cindy Morales (G), and **Sylvia Guerrero (G)**, University of Texas at El Paso, *Learning Math Methods Online: Promises and Challenges for Teachers of Young Children*. Fri., 2:00, Elkins.

The University of Texas at El Paso offers many online distance learning courses to graduate students of teacher education, including math methods for teaching young children. In this course for practicing educators, including Alternative Teacher Certification Teachers, students choose a variety of virtual manipulatives to review basic math concepts taught in early childhood education classrooms. The goal of the course is better conceptual understanding of fundamental math concepts taught to young children through activities that require students to think about math in new and innovative ways.

In this session, the course instructor will discuss the format of her online math methods course and present findings from an attitudinal survey of current students. Survey data indicate that graduate students are challenged by the online course environment and enjoy the new experience of using virtual manipulatives to learn to teach math concepts in the real world. The consensus is that virtual manipulatives are an effective tool for learning new concepts and serve as a catalyst for reflection on the application of teaching strategies for optimal concept development. This math methods course, which is offered in Blackboard through the University of Texas TeleCampus, will be shown to session participants during the presentation.

In addition, graduate students currently enrolled in this online course will share their perspectives on the promises and challenges of distance learning early childhood education courses. These graduate students are teachers in area primary schools and enrolled in the MEd program in early childhood education at UTEP.

Finally, the presenters will invite session participants to discuss the pros and cons of online courses for graduate students of teacher education. This session will be of interest to educators exploring new ways to motivate students to learn math using innovative learning technologies. This session will also interest educators who may be considering a graduate degree in early childhood education and would like to learn

more about the program from students currently enrolled in distance learning courses at UTEP. A handout with websites with virtual manipulatives and other resources for exploring math concepts and math methods online will be provided.

Enrique Treviño (U), University of Texas at El Paso, *Dirichlet's Theorem: Revolutionizing Number Theory*. Fri., 2:30, Wiggins.

Dirichlet's Theorem states: The arithmetic progression $a + bx$ has infinitely many primes if $(a, b) = 1$. Because of time contraints I will prove the theorem for b a prime. The proof revolutionized number theory, because it was one of the first times mathematicians used analysis in number theory to prove something unknown (Euler had proved infinity of primes, yet it was known). The approach is beautiful, introduction to Dirichlet's characters, the Dirichlet series and the fact that there are no zeros in the Dirichlet series generated by the Dirichlet characters in this specific problem. I would also point out a few of the applications mathematicians did later, like Riemann's hypothesis, mention important theorems proved with analysis (Prime Number Theorem jumps to mind) and the past, with Leonhard Euler leading the way as he did in many fields. If time allows (which is very probable it won't) I will mention some historic facts about Dirichlet.

Luis Valdez-Sanchez, University of Texas at El Paso, *Halving Ham Sandwiches and Combing Hairy Spheres: Some Topological Aspects of Reality*. Sat., 3:30, Barry.

We will discuss some very real life questions whose mathematical modelling is best presented in the topological category. We will see the mathematical modelling of concepts like length, area, and volume in action from the point of view of tilings of the plane and surfaces, slicing of ham sandwiches into equal volume pieces with a single blow of a knife, the impossibility of combing most hairy surfaces, and how knots and links intervene in our understanding of the space we live in. The discussion will be expository and informal. Some recent research results in knot theory will also be presented.

Matthew Winsor, University of Texas at El Paso, *Capstone Courses for Future Secondary Mathematics Teachers*. Fri., 12:00, Elkins.

The mathematics that future teachers understand is critical to their ability to be good mathematics teachers (Carlsen, 1993; Brown & Borko, 1992; Mosenthal & Ball, 1992; Stein, Baxter, & Leinhardt, 1990; Van Dooren, Verschaffel, & Onghena, 2002; Winsor, 2003). Thus it is important that mathematics faculty pay close attention to future teachers' mathematical understanding. This paper will describe a capstone course for secondary preservice teachers, as recommended by CBMS (2001). Topics of this paper will include what future mathematics teachers know and do not know mathematically, how a capstone course might benefit future teachers, and how the capstone course is administered. Data from the capstone course at UTEP will be used to help demonstrate the need and effects of the capstone course on future secondary teachers.

Roger A. Winter (G), University of Texas at El Paso, *Using Concept Maps to Improve Test Scores*. Sat., 3:30, Rivera.

In the world of today, exam performance is a very real entity that students are faced with. In addition to examinations encountered in regular coursework and final exams, students are also expected to perform at high levels on college entrance and placement exams, state-mandated tests required for high school graduation in some states, as well as on exams essential for obtaining certification in many professions. The focus of this study is to investigate the effect that the implementation of concept maps, in the reviewing process, will have on student performance on examinations. *The work is partially supported by the El Paso Mathematics and Science Partnership grant, funded by NSF.*

Piotr J. Wojciechowski, University of Texas at El Paso, *Multiplicative Bases of the Algebra of Matrices*. Sat., 1:00, Barry.

A *multiplicative basis* of a finite-dimensional algebra is such a basis $\mathcal{B}$ that $\mathcal{B} \cup \{0\}$ is closed under multiplication. The algebra of $n \times n$ matrices over a subfield of the reals admits many multiplicative bases. One of them is the standard E_{ij}-basis. Every multiplicative basis is uniquely, up to an isomorphism, associated with a lattice order on the algebra. Since all lattice orders of the full matrix algebra have been determined, it is possible to describe the multiplicative bases. All of them arise from nonsingular zero-one matrices.

Stella Woo (G), Sandra Kneeskern (G), and **Miles Kettel (G)**, University of Texas at El Paso, *Technology in the Geometry Classroom: A Pilot Study*. Sat., 11:00, Rivera.

The focus of this project was on whether implementing technology into geometry lesson planning will enhance traditional teaching methods and help students to create visual images of abstract mathematical concepts. Our hypothesis is that once students begin to understand geometry concepts better and experience success in the course, their attitudes towards mathematics may change. *El Paso MSP Research Action Grant through the University of Texas at El Paso and the National Science Foundation supported this research.*

Gang Xiang, Department of Computer Science, University of Texas at El Paso, *Fast Algorithm for Computing the Upper Endpoint of Sample Variance for Interval Data: Case of Sufficiently Accurate Measurements.* Sat., 9:30, Wiggins.

When we have n results $x_1, ..., x_n$ of repeated measurement of the same quantity, the traditional statistical approach usually starts with computing their sample average E and their sample variance V. Often, due to the inevitable measurement uncertainty, we do not know the exact values of the quantities, we only know the intervals X_i of possible values of x_i. In such situations, for different possible values x_i from X_i, we get different values of the variance. We must therefore find the range $[V]$ of possible values of V. It is known that in general, this problem is NP-hard. For the case when the measurements are sufficiently accurate, so that for some integer c, no sub-collection of $> c$ "narrowed" intervals of X_i has a common intersection, it is known that we can compute the interval $[V]$ in quadratic time $O(n^2)$. In this paper, we describe a new algorithm for computing $[V]$ that requires time $O(n \log n)$ (which is much faster than $O(n^2)$ especially for large n).

Sharon Yu-Shattuck, El Paso Community College, *Dimensions of Learning in Teaching Mathematics.* Sat., 4:00, Barry.

What are the dimensions of learning? What is conceptual knowledge? What is procedural knowledge? How do we teach them in different dimensions? This section is to introduce the dimensions of learning, especially in teaching all levels of mathematics.

Click on the appropriate field to enter your information – then print the completed form

MAA Southwest Sectional Meeting

April 1-2, 2005

CONFERENCE REGISTRATION FORM

Registration Information

PLEASE TYPE OR PRINT CLEARLY

Last Name _____ First _____ Middle _____

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Special Needs* If you have any special needs that require assistance to fully participate in this conference, please specify your needs below:

☐ Vegetarian*

☐ I will need transportation from the Hotel*

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*We will do our best to accommodate your needs, but cannot make any guarantees for requests received after March 25.

Registration Fees

REGISTRATION DEADLINE MARCH 25, 2005

MEALS AND MATERIALS ARE NOT GUARANTEED FOR REGISTRATIONS SUBMITTED AFTER THE DEADLINE

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General Registration	$15	
Retirees & Students*	$5	
FRIDAY NIGHT BANQUET	$25	
Registration Total	$	

PLEASE SELECT ALL THAT APPLY

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*TO QUALIFY FOR THE STUDENT RATE, STUDENTS MUST BE CURRENTLY ENROLLED, AND SUBMIT A PHOTOCOPY OF THEIR VALID STUDENT ID WITH THEIR REGISTRATION.

Payment Information

PAYMENT, INCLUDING PURCHASE ORDERS, MUST BE RECEIVED WITH REGISTRATION FORMS

☐ Check ☐ Money Order ☐ Purchase Order # _____ Amount $ _____

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Cardholder Name _____ Signature _____

NOTE: No registration will be processed without payment or Purchase Order. All substitutions must be submitted via e-mail to lchee@utep.edu by March 25, 2005. Cancellations prior to March 25, 2005 will be charged a $5 cancellation fee. There is no refund for cancellations postmarked after March 25, 2005.

Please complete all sections of this form (one form per participant) and mail or fax to:

MAA Sectional Meeting
UTEP University Relations
1608 Hawthorne St.
El Paso, TX 79902

Fax: (915) 747-8248

For Registration Information:
Lourdes Chee
(915) 747-8565
lchee@utep.edu

For Conference Content Information:
Dr. Hamide Dogan-Dunlap
(915) 747-6769
hdogan@utep.edu

For further information and updates, visit the conference web site at:
http://ia.utep.edu/universityrelations then click on MAA

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Invitation to Exhibit

The UTEP Mathematical Sciences Department is pleased to host the ***MAA Southwest Sectional Conference***, **April 1-2, 2005**, at the Union-East Building, 3rd floor at the University of Texas at El Paso. The conference will be running sessions on a wide range of topics: content mathematics, undergraduate mathematics education, and preK-12 mathematics education of pre-service teachers, as well as technology use in mathematics classrooms.

We are looking for numerous exhibitors whose products, technology and software directly benefit constituents of our conference.

*Exhibitors and Sponsors have the following options:

- **Exhibitor 1** ($100) the basic exhibit space, includes **one** 3' x 8' table.
- **Exhibitor 2** ($200) the secondary exhibit space, includes **two** 3' x 8' tables.
- **Exhibitor Presentation** ($100) for an hour long presentation. This is in addition to the costs for Exhibitor 1 or Exhibitor 2 packages.
- **Breaks** ($100 x number of breaks contributing to) this is a contribution separate from the previous three options (indicate the number of breaks contributing to).

The registration deadline for Exhibitors is **March 11, 2005** on a ***space available*** basis. To register, simply complete the **Exhibitor Agreement** attached and fax it to (915) 747-8248. If you are paying with check/money order, please attach it to your form and mail to:

MAA Meeting
Office of University Relations
ATTN: Frank Montes de Oca III
1608 Hawthorne St.
El Paso, TX 79902

Exhibitors must indicate on the agreement the need for access to an electrical outlet (outlets are limited). The exhibit area does have wireless internet access available for display needs. Please indicate the need on the agreement

For meeting content information, please contact Dr. Hamide Dogan at (915) 747-6769.

*Exhibitor tables covered upon request.

Click on the appropriate field to enter your information – then print the completed form

MAA Southwest Sectional Meeting

April 1-2, 2005

Exhibitor / Sponsor Agreement

SPONSOR/EXHIBITOR INFORMATION (Please type or print clearly)

Corporation / Agency _____

Contact _____

Last Name *First* *Title*

Address _____

City _____ State _____ Country _____ Zip Code _____

Daytime Telephone _____ E-mail Address _____

Include Area Code, and Country Code if outside of U.S. *Required For Exhibitor Confirmation*

Mobile Telephone _____ Fax Number _____

Name(s) of Exhibitor/Sponsor Representative(s) who will attend: _____

DESCRIPTION OF MATERIAL/PRODUCTS/SERVICES TO BE EXHIBITED:

EXHIBITOR PACKAGES

- ☐ **Exhibitor 1** ($100)
- ☐ **Exhibitor 2** ($200)
- ☐ **Presentation** ($100)

Total Due 0

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☐ **Breaks** ($100 x ___breaks)

Total Due 0

EXHIBITOR SET-UP REQUIREMENTS

- ☐ Will need access to an electric outlet
- ☐ Will need table(s) covered & skirted
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FORM OF PAYMENT (Please Check One) AGREEMENT CANNOT BE PROCESSED WITHOUT PAYMENT

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NOTE: Due to the University of Texas System Board of Regents policy, the sale of merchandise is **NOT** allowed on University property. Only the exhibition of material/products/services is permitted.

UTEP shall not be liable for any damages or loss of goods, wares, merchandise or other property which may be sustained by an exhibitor. Furthermore, each exhibitor shall be liable for any damages or loss of goods, wares, merchandise or other property which may be sustained by UTEP.

Exhibitor **Cancellations** are accepted through March 25, 2005 and must be sent via email to fmontesdeoca@utep.edu A $75.00 Processing fee will be assessed for cancellations. No refunds will be given after March 25, 2005.

The Registration deadline for Exhibitors/Sponsors is March 11, 2005 on a SPACE AVAILABLE basis.

Please complete all sections of this form (one form per Sponsor/Exhibitor) and mail or fax to:

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