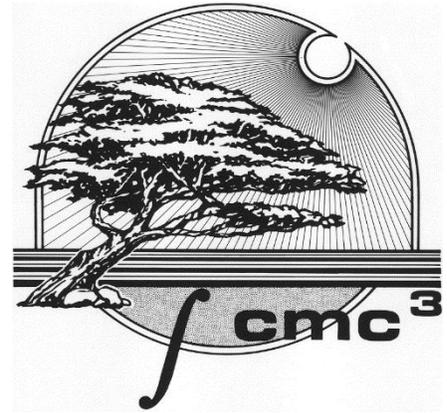


**The California Mathematics Council,  
Community Colleges**



## **23rd Annual Recreational Mathematics Conference**

**April 26 – April 27, 2019  
Lake Tahoe Community College  
South Lake Tahoe, California**



**OFFICIAL CONFERENCE PROGRAM**

# FRIDAY CONFERENCE PROGRAM

**Registration and Foundation Welcome Reception    5:30-7:30 p.m.    Board Room**

## FRIDAY KEYNOTE

**Dr. Naoki Saito, UC Davis**

***Two Excursions Around Laplacians***

**7:30-9:00 p.m.    Board Room**

I will take you to two excursions around Laplacians, ubiquitous operators in mathematics, and their applications. The first excursion will show how the Laplace operator in rectangular domains in  $R^2$  helps image compression such as the JPEG. The second excursion is to introduce the wonderful world of graphs and show what the Laplacians on graphs can do for many applications while paying attention to some dangerous slips.



## SATURDAY CONFERENCE AT-A-GLANCE

	Session 1 9:00 – 10:00	Session 2 10:30 – 11:30	Session 3 2:30 – 3:30	Session 4 4:00 – 5:00
<b>A 208</b>	<b>Carlo Séquin</b> <i>Modular Knots With Optimization</i>	<b>Todd CadwalladerOlsker</b> <i>Mathematical Proof</i>	<b>Deborah Frank</b> <i>Combinatorics and Poker</i>	<b>Stan Isacs and Stuart Moskowitz</b> <i>Charles Dodgson</i>
<b>B 103</b>	<b>Dean Gooch</b> <i>Indian Mathematics and Contributions</i>	<b>Walter Kehowski</b> <i>Power Spectral Numbers</i>	<b>Charles Barnett</b> <i>The Pancake and Ham Sandwich Theorems</i>	<b>Rick Luttmann</b> <i>The Dept. of Lower Mathematics</i>
<b>E 106</b>	<b>Scott Annin and Steven Davis</b> <i>Math Competition Problems</i>	<b>David Caliri</b> <i>The Caliri Circles</i>	<i>No Session</i>	<i>No Session</i>

# SATURDAY CONFERENCE PROGRAM

REGISTRATION

8:30 - 10:30 a.m.

BOARD ROOM

## SESSION ONE: 9:00 a.m. to 10:00 a.m.

Carlo Séquin, UC Berkeley [sequin@berkeley.edu](mailto:sequin@berkeley.edu)

A 208

### ***“Modular Knots with Optimization”***

We aim to construct symmetrical mathematical knots from a single modular component (a short pipe segment that bends through  $30^\circ$ ). For a circular pipe cross-section, we can use gradient descent to find good solutions; for n-gonal cross-sections, we will also need discrete optimization techniques such as simulated annealing.

Dean Gooch, Santa Rosa Junior College [DGooch@santarosa.edu](mailto:DGooch@santarosa.edu)

B 103

### ***“Indian Mathematics, History, Perspectives and Its Contributions to Our Current Understanding”***

Dean spent four months studying Indian mathematics while traveling through India. This talk will discuss what he found about the importance of Indian-derived mathematics to the mathematics that we currently teach and enjoy worldwide.

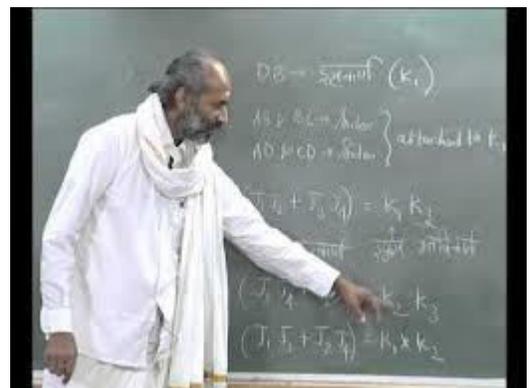
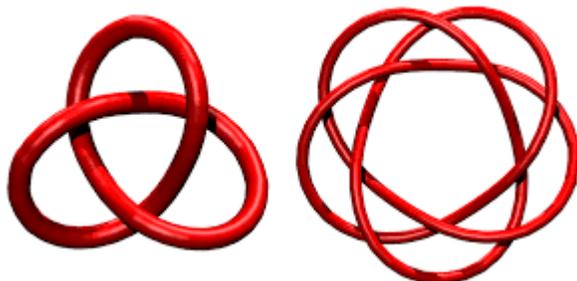
Scott Annin and Steven Davis, CSU Fullerton and Fullerton College

E 106

[sannin@fullerton.edu](mailto:sannin@fullerton.edu) and [sdcomet900@att.net](mailto:sdcomet900@att.net)

### ***“Math Done the Easy Way: Clever Approaches to Math Competition Problems!”***

This interactive session will pose fun problems with both clever and accessible solutions, all within the framework of well-established problem-solving strategies. Intriguing examples will be chosen from many branches of mathematics, such as algebra, geometry, number theory, combinatorics, probability, and more. Contestant interaction will be rewarded with Steven’s cookies!



**SESSION TWO: 10:30 a.m. to 11:30 a.m.**

**Todd Cadwallader Olsker**, CSU Fullerton

[tcadwall@fullerton.edu](mailto:tcadwall@fullerton.edu)

**A 208**

**“What Do We Mean By Mathematical Proof?”**

Mathematical proof lies at the foundations of mathematics, but there are several notions of what mathematical proof is, or might be. In fact, the idea of mathematical proof continues to evolve. In this session, we will discuss what forms mathematical proof make sense for mathematicians, teachers, and students.

**Walter Kehowski**, Glendale Community College

[walter.kehowski@gccaz.edu](mailto:walter.kehowski@gccaz.edu)

**B 103**

**“Power Spectral Numbers”**

Given  $n = p_1^{e_1} \cdots p_k^{e_k}$  there is a canonical isomorphism  $Z_n \approx Z_{p_1^{e_1}} + \cdots + Z_{p_k^{e_k}}$ .

The spectral basis of  $Z_n$  is an explicit realization of this isomorphism within  $Z_n$  itself.

This talk is a study of those numbers whose spectral basis consists of primes and powers.

For example, if  $M_p$  is a Mersenne prime with exponent  $p$ , then  $2M_p$  has spectral basis  $\{M_p, 2^p\}$  while  $2^p M_p$  has spectral basis  $\{M_{p^2}, 2^p\}$ . Isospectral and isotropic numbers are introduced and many other numbers with interesting spectral bases will be presented.

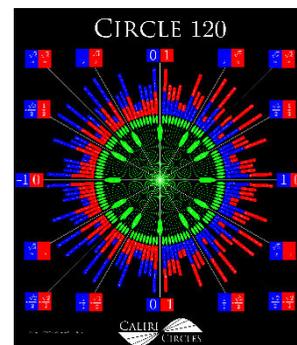
**David Caliri**, Caliri Circles

[davidcaliri@gmail.com](mailto:davidcaliri@gmail.com)

**E 106**

**“Caliri Circles”**

The unit circle can be redone and exalted to such an echelon that it is analogous to the central role that the periodic table plays in chemistry. This session presents the unit circle through many mathematical perspectives by a series of circles in generalized geometries subjected to various divisions.



**Lunch: 11:40 a.m. to 12:30 p.m.**

*At the Student Center*

Lunch will be preceded by a Mathematical Geocaching Competition

## Keynote Presentation

1:00 p.m. - 2:15 p.m. Board Room

Terry Krieger

Rochester Community and Technical College (MN)

### *“The Funny Thing About Math”*

This entertaining presentation takes a look at mathematical oddities, curious results, and humorous anecdotes that have been collected from books, friends, students, and colleagues over the past 30 years. The topics come from courses taught at the university, community college, and high school levels. Several topics are unique to my teaching experience and will not be universally known. Old and new technology, including Python code with documentation, will be used to analyze and solve some curious problems. While the presentation is intended to be entertaining, there are plenty of useful mathematical ideas presented throughout. Math stories will be shared that are often amazing, sometimes confounding, and many times just plain ridiculous.



## SESSION THREE: 2:30 p.m. to 3:30 p.m.

Deborah Frank, College of Southern Nevada [deborah.frank@csn.edu](mailto:deborah.frank@csn.edu)

A 208

### *“Combinatorics and Poker”*

This talk will have two parts. The first being poker facts that we can discover using combinatorics. The second part will be an in depth look at several poker hands. We will use combinatorics to try to determine what cards our opponent can have and the probability that they will fold.

Charles Barnett, Las Positas College [cjbarnett2@comcast.net](mailto:cjbarnett2@comcast.net)

B 103

### **“The Pancake and Ham Sandwich Theorems; Scottish Café; Polish Mathematics during WWII Occupation”**

“Fair” division of an asset is an old and continuing problem. The Supreme Court gerrymandering cases in Wisconsin and Pennsylvania constitute recent examples. The mathematics of fair division, begun in Poland in the 1930s, has matured into a sophisticated branch of modern mathematics. One- and two-dimensional versions are accessible to lower-division math students.



**Ham Sandwich**



**Theor-YUM!**

## SESSION FOUR: 4:00 p.m. to 5:00 p.m.

Stan Isacs and Stuart Moskowitz, College of San Mateo and Humboldt State Univ. A 208

[stan@isaacs.com](mailto:stan@isaacs.com) and [stuart.moskowitz@humboldt.edu](mailto:stuart.moskowitz@humboldt.edu)

### ***“Lewis Carroll in MathematicsLand”***

Charles Dodgson, a.k.a. Lewis Carroll (Alice in Wonderland), was not known as an inspiring math teacher at Oxford University. While the Alice books overshadowed his serious mathematical writings, outside Oxford, he used puzzles and games to make math fun and he used math to bring humor to things not mathematical.

Rick Luttmann, Sonoma State University [rick.luttmann@sonoma.edu](mailto:rick.luttmann@sonoma.edu)

B 103

### ***“The Dept. of Lower Mathematics”***

This talk is based on my file, accumulated over several years, of about 40 examples of non-professional people screwing up simple math. Inconsistencies in menus, logical fallacies, misuse of mathematical terms, wrong conversions between decimals and percentages, obviously grossly incorrect estimations, dividing "by" instead of "into", etc. More of them continue to roll in with alarming frequency.



## TAHOE STUDENT SPEAKER

Board Room, Saturday 5:15 to 5:45 P.M.

**Nathanael Case**

*San Joaquin Delta College*

### ***How the Euler-Lagrange Condition of Variational Calculus Comes from Multi-Variable Calculus***

Various problems involve maximizing/minimizing an integral between two fixed points. This can be done with the Euler-Lagrange equation. The E-L equation can be derived by analogy with directional-derivatives in a way that may be accessible to advanced community college students. The result is important in physics.



Join us for the CMC<sup>3</sup> 47<sup>th</sup> Annual Fall Conference!  
Hyatt Regency Monterey Hotel and Spa  
Friday December 6 – Saturday December 7, 2019  
*Visit [cmc3.org](http://cmc3.org) for information*

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**CMC<sup>3</sup> wishes to express a special "Thank You" to  
Lake Tahoe Community College for providing the venue for this conference.**