

## **MD/DC/VA SPRING 2006 UNDERGRADUATE CONFERENCE STUDENT POSTER ABSTRACTS**

### **Bret Ewing Newton, Hampden-Sydney College Resource Allocation in Presidential Elections Based on Past Voting Patterns**

My talk is on original research using past voting results of individual states for the past eleven Presidential elections to get a states power by using regression and the Shapley-Shubik Power Index. Presidential campaign resource allocation is determined after the states power has been calculated.

### **Diana D. Ray, Randolph Macon College Mathematical Origami: The Buckyball**

The poster will discuss how to construct the Buckyball from PHIZZ units and show how the Buckyball can be properly three-colored using Hamiltonian circuits. Also, it will discuss how using Euler's formula you can prove that all Buckyballs contain 12 pentagons and how this relates to the number of pieces needed to construct the spheres with PHIZZ units.

### **Daniel Ryan, United States Naval Academy God's Algorithm on the Edges & Corners of the Rubik's Cube**

The poster is meant to cover the topic of God's algorithm on the edges and corners of the Rubik's Cube. Using proofs for the size of the Rubik's Cube group, along with computer programs that make use of these proofs, the poster will show/ describe/ explain God's Algorithm for the edges alone (and the corners alone) of the Rubik's Cube.

### **Dylan P. Terrana (dylan.terrana.04@cnu.edu) Christopher Newport University Generating Functions for the Powers of Fibonacci Numbers**

The poster will demonstrate the use of generating functions to determine mathematical identities within the Fibonacci Sequence.

## **STUDENT PAPER ABSTRACTS**

### **Lisa Byrne, St. Mary's College of Maryland: Magic Squares and Elliptic Curves**

This talk will introduce elliptic curves and magic squares and the connection between them. It will answer the question: Do points of order dividing  $n$  on elliptic curves form a magic square? Algorithms for forming these magic squares will be introduced and discussed.

### **David Clewell, St. Mary's College of Maryland: The Wave Equation and The Violin**

On a violin string, harmonics only occur at rational points; however, the probability of hitting a rational point on  $[0,1]$  is 0. In light of this, one wonders how a harmonic can be generated so easily on a real violin. We discuss this point in the context of the wave equation.

### **Ron Davis, Virginia State University (\*\*) Biquadratic Identity of the Cevian line subalgebra**

We define the Cevian Algebra on the interior points of a triangle. We will present some properties of Cevian Algebra including the Biquadratic identity.

### **Jeff Dudas, Virginia Military Institute: Finding Patterns in the Binary Representation of the Fibonacci Sequence**

When Fibonacci numbers are represented in binary form many interesting patterns arise. In this talk we will discuss and explain some of these patterns.

### **Chamir Lawson, Morgan State University: Walking With Proteins**

We hypothesize that self-avoiding walk problems serve as a sufficient model for polymers. In this study, using square lattices to depict certain subclasses of self-avoiding walks we claim to get adequate

two-dimensional representations of chains of polymers. Thus, the significance of this research is that we will analyze mathematically certain subclasses of self-avoiding walks to determine whether the subclasses of walks serve as a sufficient model for polymers

**Kathryn Linehan, Hood College: Ramsey Theory**

In this talk I will first cover the basics of Ramsey Theory. Then I will go into Schur's Theorem and my work on discovering the general Schur number  $S(3,3,3)$ .

**Laura MacIntyre, Norfolk State University: A Study of Chaotic Models**

My senior mathematics project/research paper focuses on the study of existing chaotic models. Various aspects of chaos are discussed, specifically bifurcations and oscillations. Models such as the logistic model, the Lorenz model, the Rossler attractor, and the Chua Circuit are explored and graphed using Mathematica software.

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**Jesse Ozbat & John Gichuru, Virginia State University  
(\*\*) Automorphisms of the Cevian line Algebra**

We define the Cevian Algebra on the interior points of a triangle. In this Algebra, Cevian lines are subalgebras. We show that a certain class of automorphisms of a Cevian line subalgebra  $L$  called class of refractive automorphisms forms an abelian subgroup the group of all automorphisms of  $L$ .

**Beverly Raffa, Hood College: A Brief Introduction to Hypergraphs**

In this talk we will meet hypergraphs, a generalization of vertex-line graphs, and compare their behavior to that of ordinary vertex-line graphs. We'll also see how these hypergraphs can be used.

**William Rankin, Virginia State University  
(\*\*) Geometric Properties of the Cevian Box**

A Cevian box is a plane figure composed of 8 vertices and 12 line segments that form 6 Cevian quadrilateral faces. We show that the four long diagonals of a Cevian box are concurrent. We also show that a Cevian box is generated in natural way by two noncoceval points.

**Kelly Schultz, Hood College: NFL Quarterback Ratings**

The NFL gives a very convoluted formula for calculating quarterback ratings but it turns out that we can describe the ratings using linear combinations. This talk was adapted from an article in a UMAP Module (1997) by Roger Johnson titled "How Does the NFL Rate Passers" for my final project in Linear Algebra.

**Elizabeth Twentyman, Washington and Lee University  
Factoring Primes and Factoring Factor Rings**

We are all familiar with the primes in  $\mathbf{Z}$ . Yet in quadratic rings like  $\mathbf{Z}[i]$  and  $\mathbf{Z}[\sqrt{7}]$ , these familiar primes can sometimes factor. For example,  $5 = (2+i)(2-i)$  in  $\mathbf{Z}[i]$ , and  $3 = (2\sqrt{7}+5)(2\sqrt{7}-5)$  in  $\mathbf{Z}[\sqrt{7}]$ . We can also ask about factor rings, like  $\mathbf{Z}[\sqrt{7}]/\langle 5+2\sqrt{7} \rangle$  and  $\mathbf{Z}[\sqrt{-7}]/\langle 5+2\sqrt{-7} \rangle$ . One of these rings has 53 elements and the other only 3. Come to the talk to find out which ring is which.