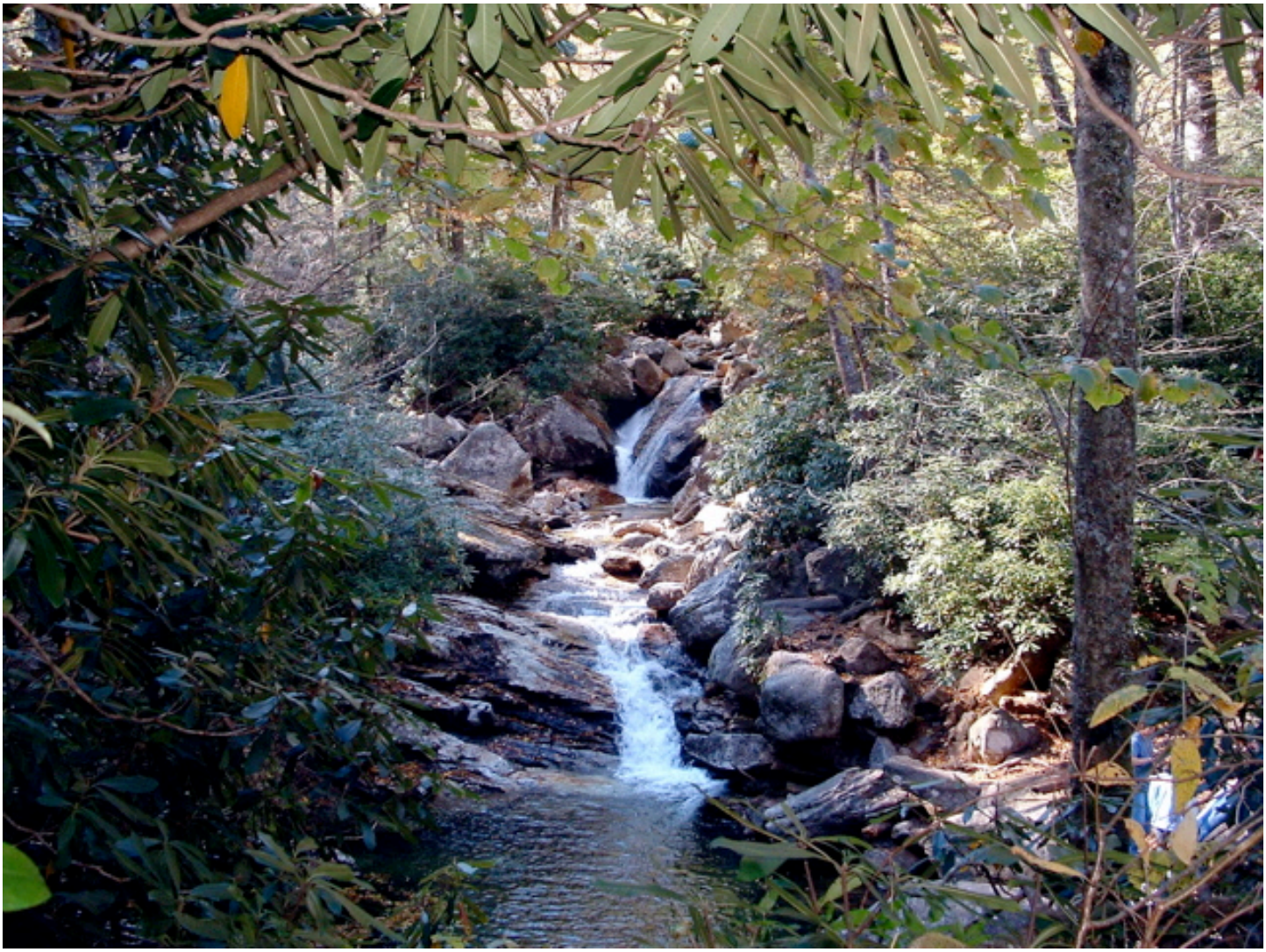
Smoky Mountain

UNDERGRADUATE CONFERENCE ON THE HISTORY OF MATHEMATICS



SMURCHOM V

20 MARCH 2010

SCHEDULE OF EVENTS

8:30-9:30 Registration and breakfast ..... Lobby, Stillwell Building

9:30-9:40 Welcoming Remarks ..... Niggli Theater, Stillwell Building
Wendy Ford, Dean, College of Arts and Sciences

9:40-10:40 Keynote Address ..... Niggli Theater, Stillwell Building
The Harmonic Series: A Primer, **Adrian Rice**, Randolph Macon College

10:50-11:30 Parallel Activities
Contributed Paper Session I ..... Niggli Theater, Stillwell Building
10:50-11:10, El Sumario Compendioso*: First Mathematics Work Published in the New World*
Fabiola Arce, Xavier University
11:10-11:30, *Natural Ability, Practical Experience, and Education: A History of the Competing Views That Influenced the American Engineer*,
Kevin Knox, University of Maryland University College
Sonia Kovalevsky Day Career Panel ..... 425 Stillwell Building
Natalie Almond, Research & Development, Uwharrie Capital Corp
Amanda Collins, Smoky Mountain High School
Ayse Sahin, Department of Mathematical Sciences, DePaul University
April Stepp, Actuarial Assistant – International ESC, Assurant Solutions
Sally Wahba, School of Computing, Clemson University

11:45-12:45 Poster Session .....Multipurpose Rooms A&B, University Center

1:00-2:00 Buffet Lunch† .....Courtyard Dining Hall

2:20-3:20 Contributed Paper Sessions*
Parallel Session II ..... Niggli Theater, Stillwell Building
2:20-2:40, *E. T. Bell - Now That's Entertainment,*
Sal Frontauria, Western Carolina University
2:40-3:00, *The Effect of the Nazi Regime on the World of Mathematics and Individual Mathematicians*
Devin Smith, University of Central Oklahoma
3:00-3:20, *What is the* Suan shu shu *and how has its discovery impacted historian's views on ancient Chinese mathematics during the Han dynasty?*
Caitlin Yencha, Western Carolina University

Parallel Session III ..... 253, Stillwell Building
2:20-2:40, *Michel Rolle and Rolle's Theorem*
Christopher Washington, Georgia College and State University
2:40-3:00, *Constructions of Regular Polygons*
Craig DeFelice, Western Carolina University
3:00-3:20, *Gauss and the Fundamental Theorem of Algebra,*
Timothy Bushnell, Western Carolina University

3:25-3:55 Afternoon Refreshments .....Lobby, Stillwell Building

4:00-4:40 Contributed Paper Sessions IV ..... Niggli Theater, Stillwell Building
4:00-4:20, *Mathematics Education Through The Eyes of George Polya,*
Naomi Roberts, Western Carolina University
4:20-4:40, *R. L. Moore's Method and The Success of his Female PhD Students*,
Jackie Selevan, Western Carolina University

4:40-4:50 Closing Remarks .....Niggli Theater, Stillwell Building

* During Parallel Sessions, feel free to switch between rooms.

† We will eat lunch with participants of Sonia Kovalevsky Mathematics Day for High School-Aged Women. They will also attend the poster presentation.

Keynote Speaker

The Harmonic Series: A Primer

Adrian Rice
Randolph-Macon College

Students in upper-level math courses are often bewildered by many things, but perhaps the main difficulties they encounter are centered around three fundamental concepts: the notion of infinity and infinite processes; the phenomena of convergence and divergence; and the construction of rigorous proofs.

A good illustration is provided by the Harmonic Series, which, as well as having a rich history and many related mathematical topics which arise from its study, is often the first example that students ever see of a divergent series.

This talk will attempt to use examples from the history of mathematics to introduce this important series, as well as to shed light on a fascinating connection with one of the most crucial results in the whole of number theory.

Adrian C. Rice *is associate professor of mathematics at Randolph-Macon College in Ashland, Virginia. He received a B.Sc. in mathematics from University College London in 1992 and a Ph.D. in the history of mathematics from Middlesex University in 1997 for a thesis on Augustus De Morgan and the development of university-level mathematics in 19th century London. His research focuses on the 19th- and early 20th-century British mathematical research community, with especial reference to the role of the London Mathematical Society. He recently co-authored, with Eve Torrence, "Lewis Carroll's Condensation Method for Evaluating Determinants", Math Horizons (November 2006), pp.12-15, which won he was awarded Trevor Evans Award, "presented by the Mathematical Association of America to authors of exceptional articles that are accessible to undergraduates."*

Abstracts of Talks

El Sumario Compendioso*: First Mathematics Work Published in the New World*

Fabiola Arce, Xavier University

El Sumario Compendioso is considered the first mathematics book published in the New World. The book was published in 1556 in Mexico City and was written by Juan Díez Freyle, a mysterious Spanish mathematician. This talk will cover a brief history of the Spanish colony New Spain and a review of the algebra of that time period. In addition, I will give an outline of the contents of the *Sumario.* We will review a multiplication method presented by Díez Freyle which is very strange looking to modern readers and an algebra problem similar to a problem in Leonardo Fibonacci's *Liber Quadratorum,* or "The Book of Squares."

Natural Ability, Practical Experience, and Education: A History of the Competing Views That Influenced the American Engineer

Kevin Knox, University of Maryland University College

A distinct dichotomy of views regarding the proper approach to engineering has existed throughout history. Beginning with Aristotle and Archimedes in ancient times and continuing on to Einstein and Timoshenko in the recent past, one side has insisted that theory is the beginning of understanding while the other claims ability and experience are the keys. The essence of what makes an engineer or how engineers might be made has been an active area of social science research for over a century. Yet engineers themselves have largely stood by watching the tug-of-war, viewing the university with suspicion, and treating their discipline more as an art than a science. This paper will present the history of this inimical relationship as it pertains to the American engineer.

Abstracts of Talks, continued

Michel Rolle and Rolle's Theorem
Christopher Washington, Georgia College and State University

We will explore the history of Michel Rolle, famous for the calculus theorem bearing his name, Rolle's Theorem. We will discuss his contributions to mathematics including his method of cascades, which led to his discovery of Rolle's Theorem. We will also try to extend Rolle's Theorem from single variable calculus into a complex analysis version as well as a multivariate version.

Constructions of Regular Polygons
Craig DeFelice, Western Carolina University

The presentation will cover a history of the classic problem of constructing regular polygons with only a straight edge and a compass. The talk will start with Euclid's contributions, and finish with a brief look at Galois Theory and an application to solving this problem.

Gauss and the Fundamental Theorem of Algebra,
Timothy Bushnell, **Western Carolina University**

The "Prince of Mathematics," Carl Friedrich Gauss, published four different proofs of the Fundamental Theorem of Algebra. This talk identifies possible motivations, meanings and purposes behind Gauss' proofs of the Fundamental Theorem. Information and other issues surrounding both Gauss and the Fundamental Theorem will also be discussed.

E. T. Bell - Now That's Entertainment,
Sal Frontauria,
Western Carolina University

In this presentation I plan to contrast E. T. Bell's historical treatment of mathematicians against widely-accepted modern histories. I plan to show, through case studies, that though Bell's basic facts are correct, his presentation of these facts makes all the difference. While Bell may not have let the details get in the way of a good story, his presentations were nonetheless inspiring for a generation of mathematicians.

The Effect of the Nazi Regime on the World of Mathematics and Individual Mathematicians

Devin Smith, University of Central Oklahoma

During the 1920's and 30's the University of Göttingen in Germany was considered to be the center of mathematics, with a long line of famous mathematicians from Gauss to Klein. As the Nazis gained power, many Jewish mathematicians were forced to leave the University and flee from their own country. In this talk we will explore some of the personal experiences of these mathematicians. Of course not all mathematicians in Germany were Jewish. We will also discuss mathematicians of "true" German decent who remained in their teaching positions, some of whom even persecuted fellow mathematicians of Jewish decent. We will conclude by looking at the effect these emigrating mathematicians had on American mathematics, as well as how German mathematics was affected by losing so many great mathematicians.

What is the Suan shu shu *and how has its discovery impacted historian's views on ancient Chinese mathematics during the Han dynasty?*

Caitlin Yencha, Western Carolina University

In 1983, archeologists uncovered a tomb in the Hubei province of China and what was found in it has opened a doorway into the mathematical practices of ancient China during the Han dynasty. A collection of 190 bamboo strips, named the *Suan shu shu*, or *Writings on Reckonings*, had laid on the floor of the tomb since 186 BCE when a civil servant of sorts was buried within its walls. While using the *Suan shu shu* text as a primary source, one can learn a great deal about how the ancient Chinese people viewed the importance of mathematics. Before an actual primary source was found that dated back to the early Han dynasty, historians of mathematics only had two methods for looking back at that time period. However, since its discovery, the *Suan shu shu* has changed historians' views on mathematics from the Han dynasty.

Mathematics Education Through The Eyes of George Polya,
Naomi Roberts, Western Carolina University

George Polya (1887-1985) was a Hungarian mathematician who came to mathematics later in life. The focus of this presentation will be on Polya's influences and ideas in mathematics education. His primary goal was to get students to think and discover for themselves. Problem solving is the technique he felt was most effective. In his book, *How To Solve It,* he provided a detailed layout of student expectations as well as teacher expectations. Although Polya was not in Hungary during much of his later life, his ideas and influences on mathematics education are still used there today; we argue that his ideas could also be beneficially applied to how mathematics is currently taught in the US.

R. L. Moore's Method and the Success of his Female PhD Students
Jackie Selevan, Western Carolina University

This talk opens with a background of R. L. Moore's Method, which was a unique way of teaching mathematics. It then focuses in on his female PhD students and what successes they were able to achieve. It also looks at what extent Moore considered them to be successes and to what degree they attribute Moore's role in their careers to their success.

Poster Abstracts

Napier's Logarithms and the Public

Jennifer Annas, Western Carolina University

Napier's logarithms were a huge contribution to mathematics. Most were greatly pleased with his hard work and amazing invention, but there were those who claimed others were the real heroes.

Harriot: Father of Modern Notation

Layla Biddix, Western Carolina University

This poster discusses Thomas Harriot's creation and use of symbolism in mathematics. This poster also gives insight into Harriot's reasoning for using symbolism and the response of the mathematics community.

Decline of the 20th Century: American Women in Mathematics

Roxy Boone, Western Carolina University

This poster will discuss the decline of women mathematicians earning Ph.D.s after 1940 due to the end of World War II. It will also give statistics and facts from the late 19th century to the present.

Cardano's *Liber de Ludo Aleae*

Nathan Bowman, Western Carolina University

The aim of this poster is to give insight to why Cardano's book, *Liber de Ludo Aleae*, was disliked in the mathematical community. It also aims at clearing up any misconceptions on why the book has been so hard to read and understand.

How did Robert Recorde change the way mathematics was taught in England?

Darci Brush, Western Carolina University

Robert Recorde was famous for four books that he wrote. They were *Ground of Artes*, *The Pathway of Knowledge*, *The Castle of Knowledge*, and the *Whetstone of Witte*. Robert Recorde also changed the way mathematics was taught in England.

Alice's Adventures in Wonderland

Erica Byrd, Western Carolina University

One of the reasons Charles Dodgson, a.k.a. Lewis Carroll, wrote *Alice's Adventures in Wonderland* was as an attempt to criticize mathematicians of the 19th century. The mathematicians that he specifically targeted were Augustus De Morgan, William Rowan Hamilton, and Victor Poncelet. Their mathematical ideas of geometry, negative and imaginary solutions, and symbolic algebra went against Carroll's mathematical beliefs which were grounded in Euclidean geometry and in turn, these ideas ended up in his book.

Grace Chisholm Young

Tom Cashman, Hood College

Grace Chisholm Young was a 20th-century English mathematician. Upon graduating from Göttingen University in 1895, she became the first woman to receive a doctorate in any field in Germany. She later collaborated with her husband, William Henry Young, to publish more than 200 mathematical papers and books, covering subjects like calculus, geometry, and set theory.

Pythagorean Numerology

Ben Chamberlain, Western Carolina University

Not much is known for certain regarding the historical figure of Pythagoras or his disciples. Yet Pythagorean philosophies and numerology are known to have influenced scholars stretching from Plato to Johannes Kepler. This poster traces the main strands of Pythagorean numerology, from its origins in harmonics to its extrapolations into astrology, cosmology, and metaphysics.

Overcoming Obstacles: Notable Women in Mathematics

Sydney Clark and April Engstrom, High Point University

Throughout history, women have been important in shaping mathematical development, despite education being predominantly aimed at males. From advancing mathematics to expanding their roles in society, several women have laid the foundation of mathematical thought and gender equality in education today. This poster considers six significant women who produced original works that have had a lasting impact in this field.

Teaching style in the 1800's compared to today

Lindsey Creasman, Western Carolina University

Mathematics today is taught very differently from how it was taught in the 1800's. This poster will highlight some of these changes and the reasons behind them.

Poster Abstracts, continued

Emile du Chatelet

Kendall Dolly, Hood College

Emile du Chatelet was an eighteenth-century mathematician who lived a very social and academic life. She lived in a life of luxury, but never let her lifestyle detract her from her studies. She is responsible for writing the only French translation of Newton's *Principia Mathematica.* This translation helped to spread Newton's scientific knowledge to large portion of Europe.

Richard Dedekind and the Real Numbers

Andy Hall, Western Carolina University

This poster discusses the motivations and consequences of Richard Dedekind's redefinition the real numbers as a continuum.

Ada Lovelace

Laura Hines, Hood College

Ada Byron Lovelace was a mathematician who lived from 1815 to 1852 in London. Her father, Lord Byron, died when she was only eight. She was raised by her mother, Annabella Milbanke, who had a higher than average interest in mathematics. Her mathematical studies were also encouraged by her husband, Willam King, who had no problems accepting her skills in mathematics and even took pride in her accomplishments. She worked with Charles Babbage translating papers, but began writing her own papers to explain the mathematics behind Babbage's Difference Engine. Ada Lovelace wrote many papers on the computers and was the first expositor of computer language and programming. Lovelace enjoyed games and attempted to find mathematical ways to solve certain games like solitaire and Tic-Tac-Score. Lovelace also worked on understanding the method of finite differences. She died at the age of 36 from cancer.

The Ballistics Revolution

Nate Jarrett and Kambria Rosengarth, High Point University

This poster discusses the developmental relationship between mathematics and military engineering in the 18th century.

David Hilbert And His 23 questions

Stephanie Lindsey, Western Carolina University

This poster gives historical information about David Hilbert and considers why Hilbert posed his 23 questions. The poster also details these influential questions and discusses their current status.

Kepler's Harmonice Mundi

Melody McDaniel, Western Carolina University

Kepler's *Harmonice Mundi* is about Kepler's ideas on how the planets create a musical Harmony. By using music theory, mathematics (particularly proportions), and astrology, Kepler calculates to prove his idea. During his research of *Harmonice Mundi*, Kepler discovers other incredible things, such as planetary laws and the Hedgehog polyhedron.

Why was calendrical form a political issue?

Drew Miller, Western Carolina University

This poster displays the history of the calendar and the people involved in the reform. It shows the timeline of the calendar reform and when the calendar as we know it today, the Gregorian calendar, was adopted.

Galileo and His Support for Heliocentricity

Jenna Reese, Western Carolina University

When Galileo made known his support for the Copernican theory that relied on a heliocentric solar system, many conflicts arose. His push for such a theory was evident in his work *Dialogue Concerning the Two Chief World Systems,* which was written during the Inquisition. In this specific time period it was particularly dangerous to go against the Roman Catholic Church, which yielded tremendous political power. Galileo's views differed with those of the Church during this time on both a religious and scientific basis. It is interesting to see what drove his beliefs and how his faith played a role in how he viewed scripture and science and how one related to the other.

Hilbert's Axioms

Lindsey Robinson, Western Carolina University

This poster gives a biography of Hilbert throughout his life, from his first stages of school to his doctoral degree. Throughout Hilbert's life, he was interested in many different aspects of mathematics. This poster focuses on Hilbert's proposal of Axioms for geometry and his purpose for doing so.

Poster Abstracts, continued

The Logistic Equation

Joseph Shackelford, Georgia College State University

The Malthus equation was first introduced in 1798 in Thomas Malthus's essay, *Principle of Population*. This equation modeled a rather pessimistic view of the future in the sense that the human race would inevitably grow higher than the amount of resources available leading to widespread death. The mathematician Pierrre Verhulst proposed an additional interference term in Malthus's equation that set a limiting factor "carrying capacity" variable to show that the population will level off at a certain point. The actual models of the population growth and decay on Earth have shown to be very close to the models proposed by this logistic equation.

The Treatment of Women in Flatland

Sarah Swartzel, Western Carolina University

My research is a comparison of women in the book *Flatland* by Edwin Abbott Abbott and women in Victorian England. I also look at other satire within *Flatland* that relates back to Victorian England.

Maria Agnesi: Female Mathematician of 18th-Century Italy

Hannah Watson, Western Carolina University

Maria Agnesi was a female mathematician who lived in eighteenth-century Italy. She is well known for her calculus textbook, *Analytical Institutions*, and her discovery of a geometrical curve, known today as the "Witch of Agnesi." This poster looks at how a woman of this time period was able to overcome gender bias and earn respect as a mathematician and scholar.

"Pythagorean" Theorem, Western Europe vs. Chinese

Christine Wilson, Western Carolina University

This poster compares and contrasts the ideas surrounding the Pythagorean Theorem in western Europe with those in China. There are diagrams from both cultures presented on the poster. It is found that the Chinese had their version of the Pythagorean Theorem, the *xian tu*, long before Pythagoras was born. The poster shows that one version of the theorem did not influence the other, but they were both accurate in finding the hypotenuse of a right triangle.

How did the use of mathematics in navigation aid the age of discovey?

Elizabeth Witt, Western Carolina University

This poster describes the instruments and mathematical processes used to help sailors during the age of discovery (1400-1700) to find their way.

Institutions Represented at SMURCHOM V:

Brevard College
Clayton State Univeristy
East Tennessee State University
Fayetteville Technical Community College
Florida Department of Education
Florida State University
Georgia College and State University
High Point University
Hood College
Randolph Macon College
Southwestern Community College
University of Maryland University College
University of Central Oklahoma
Warren Wilson College
Western Carolina University
Xavier University

Kathy Clark, co-editor of the online journal *Convergence*, will invite the authors of the best presentations to submit their work for publication in *Convergence*, the MAA's online journal about the history of mathematics and its use in teaching.

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