

DISCOVERING THE ART OF MATHEMATICS PROMOTING INQUIRY-BASED LEARNING (IBL)



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Discovering the Art of Mathematics is an NSF/Harry Lucas supported project in which we are creating a library of *Inquiry-based Learning Guides for Mathematics for Liberal Arts*. These guides provide accessible, yet intellectually challenging mathematical explorations. In addition to the guided discovery approach, each guide provides *connections* between the mathematics and the arts, philosophy, history, humanism and culture. These books contain connections between current

research such as the Millennial Problems, historical moments, popular cultural, and philosophical trends.

One of our goals for this project is to make our materials as easily accessible and affordable as possible. To this end, we have posted, for each book, draft materials in PDF (either full versions or completed chapters) on our website, artofmathematics.wsc.ma.edu.

We encourage you to examine these materials and use any part of them that would be appropriate for your course. We only ask that you give us feedback on whatever you download.

We hope that you find our materials helpful and that you will pass this newsletter on to other colleagues who may be interested in our project. Please do not hesitate to contact one of us if you have any questions or comments.

FACULTY IBL WORKSHOPS

- SALEM STATE UNIVERSITY, SPRING 2011
- WESTFIELD STATE UNIVERSITY, SUMMER 2011

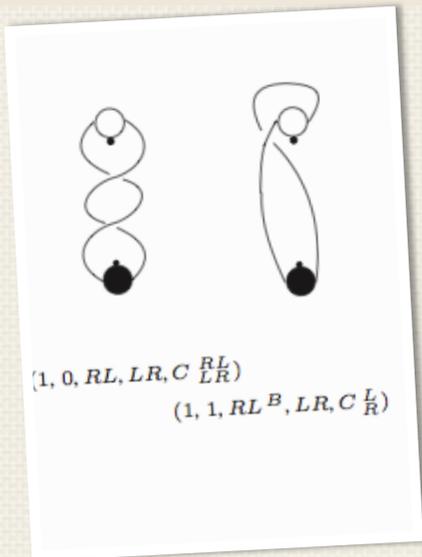
PUBLISHED PAPERS

- EXPLORING 3D WORLDS
- MATH AND SALSA DANCING,
- NAVIGATING BETWEEN THE DIMENSIONS
- MUSICAL PALINDROMES

NEW MATERIALS IN OUR BOOKS

- [TUNING AND INTERVALS USING STRAWS](#)
- [RADON-KACZMARZ PUZZLES](#)

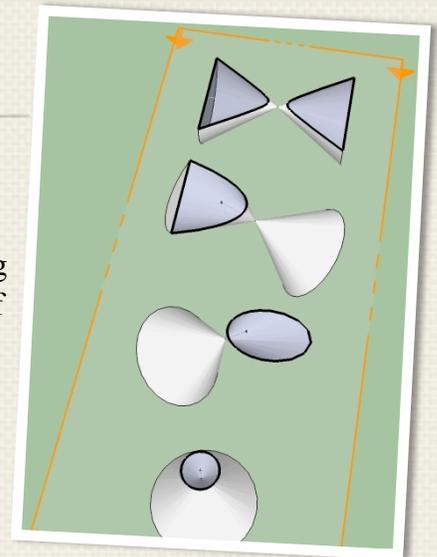
MATH AND SALSA DANCING



Published in the March 2011 issue of the *Journal of Mathematics and the Arts*, “Mathematics and Salsa Dancing” by Christine von Renesse and Volker Ecke is a significant new contribution to the small but growing literature connecting mathematics and dance. The paper traces how a mathematician faced the challenge of creating a mathematical model for a very large and seemingly chaotic set of dance movements. Sketching out the “space of salsa dance moves” helps to understand more fully the rich and varied choices that are available when dancing.

EXPLORING 3D WORLDS

“Exploring 3D Worlds Using Google SketchUp” by Jenny Livingstone and Julian F. Fleron is the first major, refereed publication on the use of the free, powerful, Computer Aided Design software Google SketchUp in the teaching of mathematics. The paper will soon be appearing in the National Council of Teachers of Mathematics journal *Mathematics Teacher*. Intended to serve as an introduction to the remarkable Google SketchUp software, the paper is centered around classroom activities of sufficient depth to illustrate why we believe this software has the “potential to revolutionize the teaching and learning of geometry.”



NAVIGATING BETWEEN DIMENSIONS



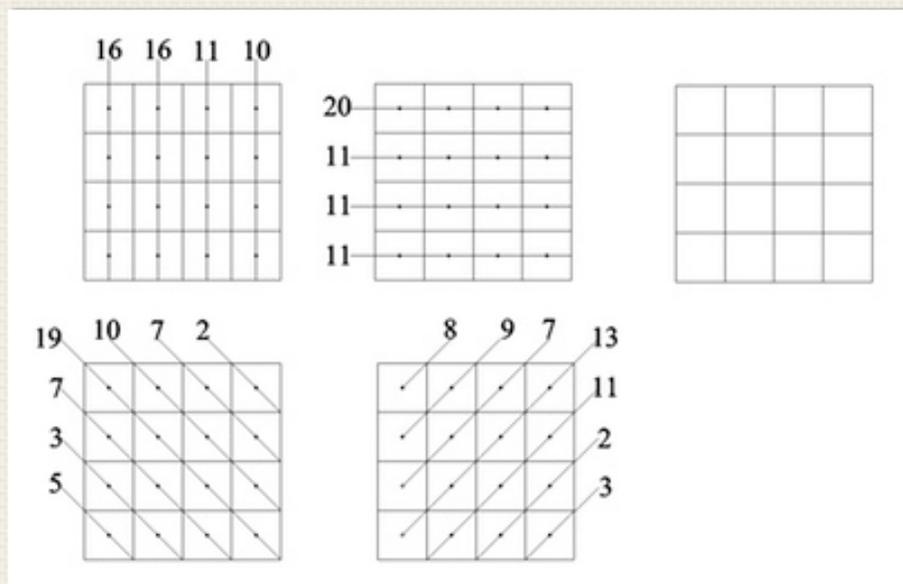
“Navigating Between the Dimensions” by Volker Ecke and Julian F. Fleron provides a number of in-depth activities to help students develop the ability to navigate the dimensional cycle $2D \leftrightarrow 3D$ via cross sectioning, the original Flatland Game, and the creation of original *sliceforms* – solids created from articulated cross sections. Sliceforms motivated the remarkable, award-winning structure *Metropol Parasol* which recently opened in center of Seville, Spain. This paper will be appearing the upcoming Geometry Focus Issue of the National Council of Teachers of Mathematics journal *Mathematics Teacher*.

TUNING AND INTERVALS USING STRAWS

How do you tune an instrument? In this new chapter of [Discovering the Art of Mathematics -- Music](#) students discover Pythagorean tuning and equal temperament and are able to compare the two mathematically. To explore the depth and subtlety of this ancient question, students build their own basic flutes out of straws and discover how to tune them. An online piano is used to connect these sounds with the structure of Western Music and to visualize the structure of scales. This exploration is captured mathematically with fraction division, square roots and other roots and exponents, and some basic algebra. While the students explore tunings they also learn about the history of instruments, the history of tuning, how the human brain perceives octaves, Pythagoras and the Pythagoreans, irrational numbers and sound waves. ([Download Tuning Chapter](#))

RADON-KACZMARZ PUZZLES

Can you fill each of the empty cells in the empty grid at right with the digits 1 – 9 so that the sum of each *aggregate* is as indicated by the four clue grids on the left? In a Sudoku puzzle each row and column contains each of the digits 1- 9 exactly once, so these aggregates are 45. Our new, original puzzles are thus a variant of the popular Sudoku. Solving our puzzles requires similar reasoning and problem solving abilities. But our new puzzles have the benefit of directly illustrating the mathematical reconstruction problems that are at the heart of CAT scans and other forms of medical imaging. We've named these puzzles **Radon-Kaczmarz puzzles** after two mathematicians whose work on such reconstruction problems might have launched the revolution in medical imaging a half century earlier had it not been forgotten. Chapter 3 of [Discovering the Art of Mathematics – Games and Puzzles](#) has a full development of these and related puzzles. ([Download Radon-Kaczmarz Chapter](#))



Faculty IBL Workshops

Are you and your colleagues interested in approaches that will help your classrooms support more active student inquiry? Have you found effective ways to engage your Mathematics for Liberal Arts students in intellectually challenging mathematical experiences? Do you want additional resources which provide substantive connections between mathematics and the arts, philosophy, history, humanism and culture?

What we offer:

- Modeling teaching in an Inquiry-based Classroom, with your students, at your school, using our materials, as appropriate for your classroom (MLA, teacher ed, or math major)
- Mentoring faculty who are interested in facilitating an inquiry-based classroom, or in developing their own materials

- Illustrating the use of inquiry-based materials in a Mathematics for Liberal Arts classroom
- A rich library of free materials to get you started

CONTACT US IF YOU ARE INTERESTED IN A WORKSHOP AT YOUR COLLEGE OR UNIVERSITY!

What is most effective:

- Bring a buddy to the workshop and continue the collaboration
- Bring a significant portion of your department to the workshop
- Make time to reflect and keep the conversation going after the workshop

OUR BOOKS:

DISCOVERING THE ART OF MATHEMATICS:

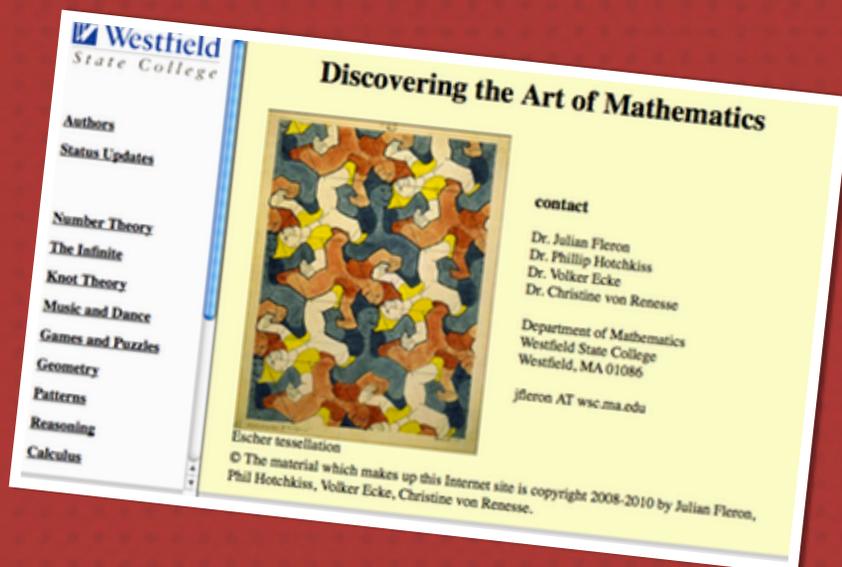
- NUMBER THEORY
- GEOMETRY
- MUSIC AND DANCE
- GAMES AND PUZZLES
- KNOT THEORY
- THE INFINITE
- PATTERNS
- REASONING
- ART AND SCULPTURE
- CALCULUS

STUDENT MANUAL AND TEACHER MATERIALS ARE IN PREPARATION.

BETA TESTING

IF YOU ARE INTERESTED IN BETA TESTING OR REVIEWING OUR MATERIALS, CONTACT US. FUNDS ARE AVAILABLE.

<http://artofmathematics.westfield.ma.edu>



Contact us

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