
The Art of Mathematics
L'art des mathématiques
(Org: **Amenda Chow** and/et **Andrew McEachern** (York))

REBECCA CARTER AND PETER TAYLOR, QUEEN'S University

The Art of Story-Telling

How do we learn?—we learn from stories, we learn most deeply from stories that are powerful, that are engaging, that have integrity, and that flow into our life blood. In RabbitMath, our high-school curriculum project, our objective is to construct such stories. It's a challenging task. We are using technology (Jupyter Notebooks) to put the “active” into active learning. We will give a few examples.

BENOIT CHARBONNEAU, University of Waterloo

A very large and heavy display of 4d geometry

Inspired by the idea to make math visible, I led a project to assemble 21,360 pieces of plastic Zometools into a 3 meters wide 3d projection of a 4d polytope called the omnitruncated dodecaplex. This is a story of success and failure: the story how I had to figure out the complex and beautiful mathematics behind this project, and how I failed to account for the physics.

GERDA DEVRIES, University of Alberta

Making Mathematics with Needle and Thread

The connection between textiles and mathematics is intimate. This is the case in particular for quilts. There is a wealth of mathematical stories to be told about quilts and the act of quilt making, in the context of both traditional and contemporary quilts. In this presentation, I will share some of these mathematical stories, and talk about how I use these stories to educate a wide variety of audiences about the nature, joy, and beauty of mathematics.

AMANDA GARCIA AND GIUSEPPE SELLAROLI, University of Waterloo

Comics for Undergraduate Mathematics

Sequential art (e.g., comics and graphic novels) has been shown in empirical studies to be beneficial to learner understanding and motivation in a diverse range of fields. In this talk, we will discuss some of the findings of our Learning Innovation and Teaching Enhancement Grant study at the University of Waterloo, whose goal was to determine the ways in which comics affect students' experience of first-year linear algebra. We will also briefly outline our personal journeys into comic-making for undergraduate math courses.

SUSAN GEROFKY, University of British Columbia

Integrating mathematics and the arts in secondary mathematics teacher education

Most students I teach in the preservice secondary math teacher education program at the University of British Columbia are new graduates from highly disciplinary, specialized undergraduate degrees in mathematics. Yet as secondary teachers, they are expected to represent both disciplinary and transdisciplinary approaches, aiming to reach all learners in their secondary school classes through integration of mathematics with the arts and humanities as well as with the sciences. This curricular imperative connects with a growing international movement to integrate mathematics with the visual and performing arts, particularly through the Bridges Math and Art organization (bridgesmathart.org) and the affiliated Journal of Mathematics and the Arts (JMA).

Over my fourteen years as a mathematics teacher educator, I have worked to introduce my teacher candidate students (and their future secondary students) to the idea of transdisciplinary identities for themselves and their own students – in other

words, the idea that one does not have to view oneself as either 'a math person' or 'an arts person', but can bring mathematics and the arts together to create deeper mathematical understandings and aesthetically-interesting mathematical representations. In this session, I will explore several successful design experiments supporting UBC teacher candidates in integrating mathematics and the fine and performing arts, including mathematics and dance, poetry, design and the plastic arts. I will describe the pedagogical design experiments, and use two short films and student responses to document the effects of introducing mathematics via the arts early on in our secondary mathematics teacher education program.

PARKER GLYNN-ADEY, University of Toronto, Mississauga
Geometry, Models, and Inquiry

We outline a curriculum for a one semester course in geometry suitable for advanced undergraduates which uses physical models to foster student inquiry. When presented with a kaleidoscope, we have a natural propensity to ask questions about it. Why does it look that way? What accounts for its high degree of symmetry? One will naturally develop a theory of reflection groups to answer these questions with mathematical precision. Kaleidoscopes and models of solids get people inquiring and asking questions. Physical models will be on hand for people to play with, and teaching resources will be made available online.

SKYE GRIFFITH, Queen's University
A Curated Life of Art and Mathematics

Is mathematics an art form? What does a mathematician experience when proving a theorem, and how does this experience compare to that of someone creating a work of art?

As humans, we are captivated by the aesthetic and drama of everyday phenomenon, from riding a tall escalator to watching a dancing flame. We have the potential to live curated lives: taking pleasure not only in life's final products but in creative processes themselves. The creation of art takes an individual on a journey of frustration and satisfaction, excitement and disappointment, blunders, breakthroughs and ecstasy. The curation of our everyday experiences reveals life's underlying beauty and gives an added meaning to the interactions we may normally take for granted.

Mathematics takes us on this same journey. When we learn to view the world through a mathematical lens, we come to understand the patterns and aesthetic hidden in the simplest of phenomenon. We make mistakes, embrace them, and let them propel us in directions previously unexplored.

CRAIG KAPLAN, University of Waterloo
Mathematical animated GIFs

There is an online subculture dedicated to creating abstract looping animations and publishing them as GIFs. Often, these animations are based on feats of geometric ingenuity that position them firmly within the realm of mathematical art. I will show a selection of these artworks, discuss some of the mathematical ideas that underlie them, and introduce basic programming tools that can be used to create your own. Finally, I will talk about my recent research into developing looping animations based on isohedral tilings.

CAMELIA KARIMIANPOUR, University of Toronto
The sound of group actions

In this talk, we explore the connection between algebraic structures and music. In particular, we look at the action of certain groups on a subset of musical chords. Technology permits, we will listen to the chord progressions such actions induce and identify them in a few well-known classical pieces.

STEPHEN MORRIS, U Toronto Physics
Art, outreach and pattern formation

For the past several years, I have been experimenting with the boundary between art and science. I have repurposed my scientific images of pattern formation experiments and pattern-forming natural phenomena by presenting them as art. I have exhibiting images and videos in art galleries and juried art shows. I have brought artists into my research lab for several hands-on workshops. I am the co-organizer of the "ArtSci Salon", an evening meet-up group at the Fields Institute of Mathematical Science in Toronto. I have released a trove of icicle shape data for free use under the Creative Commons. I have collaborated with sound artists and composers to use pattern formation images and videos as input to their creative processes. All these activities can be viewed equally as art-making or as scientific outreach. The scientific field of pattern formation has developed a distinct aesthetic sensibility, informed by mathematics and physics, but inherently visual and dynamic. This aesthetic is an essential motivation for this work. This talk will describe my experiences in this "application" of pattern formation to making, exhibiting and discussing art. My experience shows that unmodified scientific images can be well received as art and generate wide-ranging conversations across traditionally separate disciplines. The art world offers an interesting venue for science outreach activities, as well as being a lot of fun to explore.

SARAH PLOSKER, Brandon University

Beadwork as a method of teaching linear algebra

In collaboration with Cathy Mattes of the Department of Visual and Aboriginal Art at Brandon University, we are working on a study that attempts to see if learning traditional beadwork is useful in students' understanding of linear algebra. This talk will focus on background motivation, relationship building, and other information surrounding the process of the study.

HONGMEI ZHU, York University

Art of Symmetry

Beauty of nature exhibits many types of symmetrical patterns which influences artists and architects throughout the history. Symmetry in mathematics represents specific properties of a structure remain unchanged after a mathematical transformation. In this talk, join us as we apply different types of symmetry to create amazing art.