

# MAA Southwestern Section Spring Conference “The Art of Mathematics”

Hosted by the Western New Mexico University (WNMU)  
March 26, 2021



Michael Metcalf, Professor of Sculpture, WNMU

## Virtual Program (Mountain Daylight Time)

9:00 am to 9:15 am Introduction  
President Joseph Shepard, Western New Mexico University.

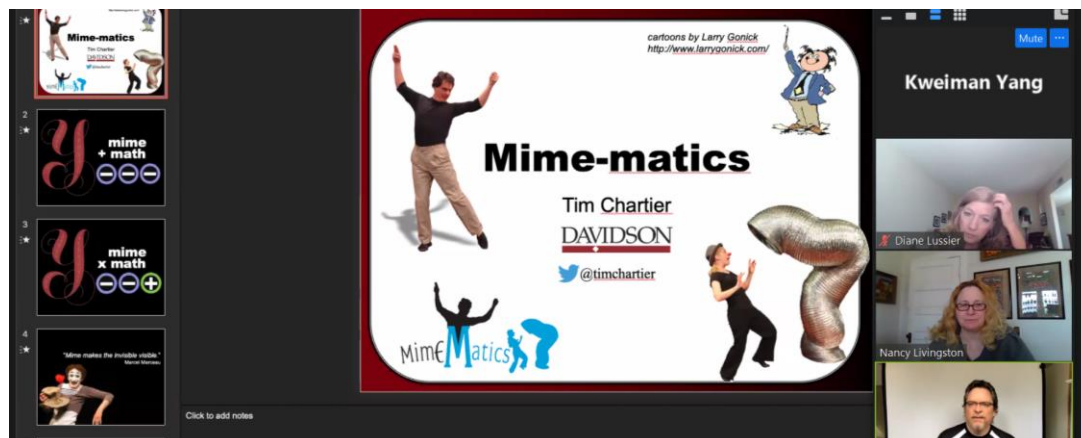
9:15 am to 10:30 am Invited Section Speaker  
Tim Chartier, Professor of Mathematics, Davidson College and  
Chair, MAA Congress

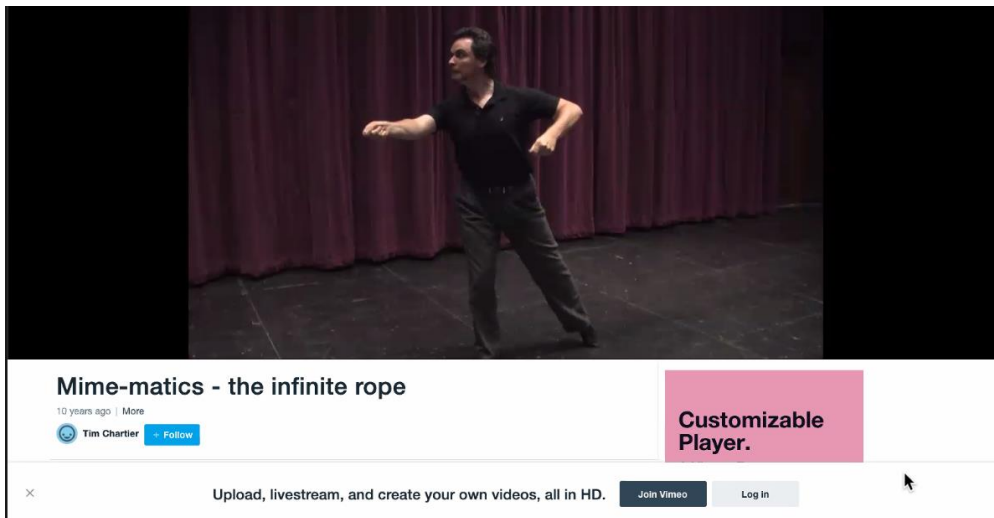
**Title:** Mime-matics

**Abstract:** In Mime-matics, Tim Chartier explores mathematical ideas through the art of mime. Whether creating an illusion of an invisible wall, wearing a mask covered with geometric shapes or pulling on an invisible rope, Dr. Chartier delves into mathematical concepts such as estimation, tiling, and infinity. Through Mime-matics, audiences encounter math through the entertaining style of a performing artist who have performed at local, national and international settings.

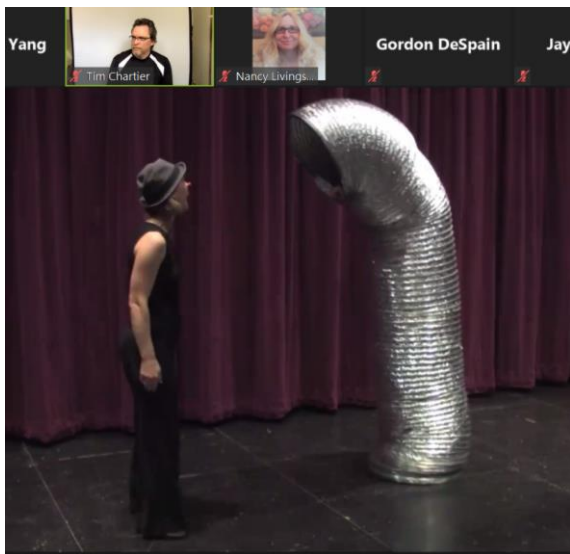
**Video:** Welcome by President Shepard and Mime-matics by Tim Chartier

<https://mediasite.wnmu.edu/Mediasite6/Play/ce9c59feef544affa5826327fc3cf41e1d>






Mime-matics – the infinite rope at <https://www.youtube.com/watch?v=--nbhhuabHo>

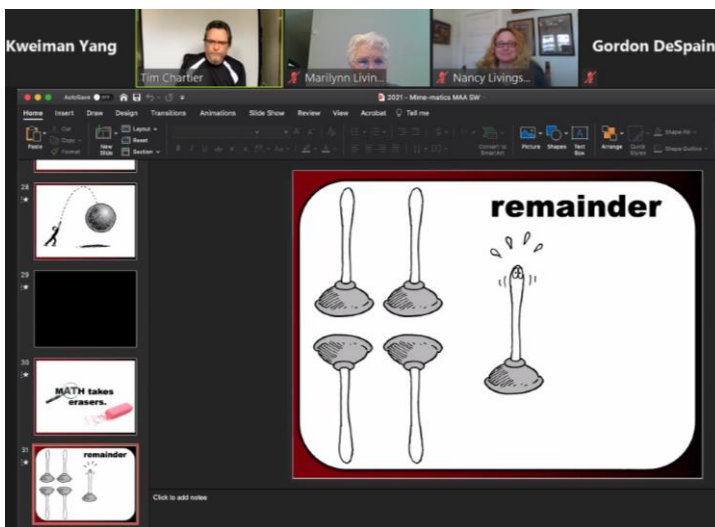


## Rules



- Two objects will be mathematically similar if
- Slinky can move from one shape to another
- without detaching or attaching the ends of the tube.

Mimematics – The Tube at <https://www.youtube.com/watch?v=Phb8wciVBdU>



10:30 am to 10:45 am Break

10:45 am to Noon

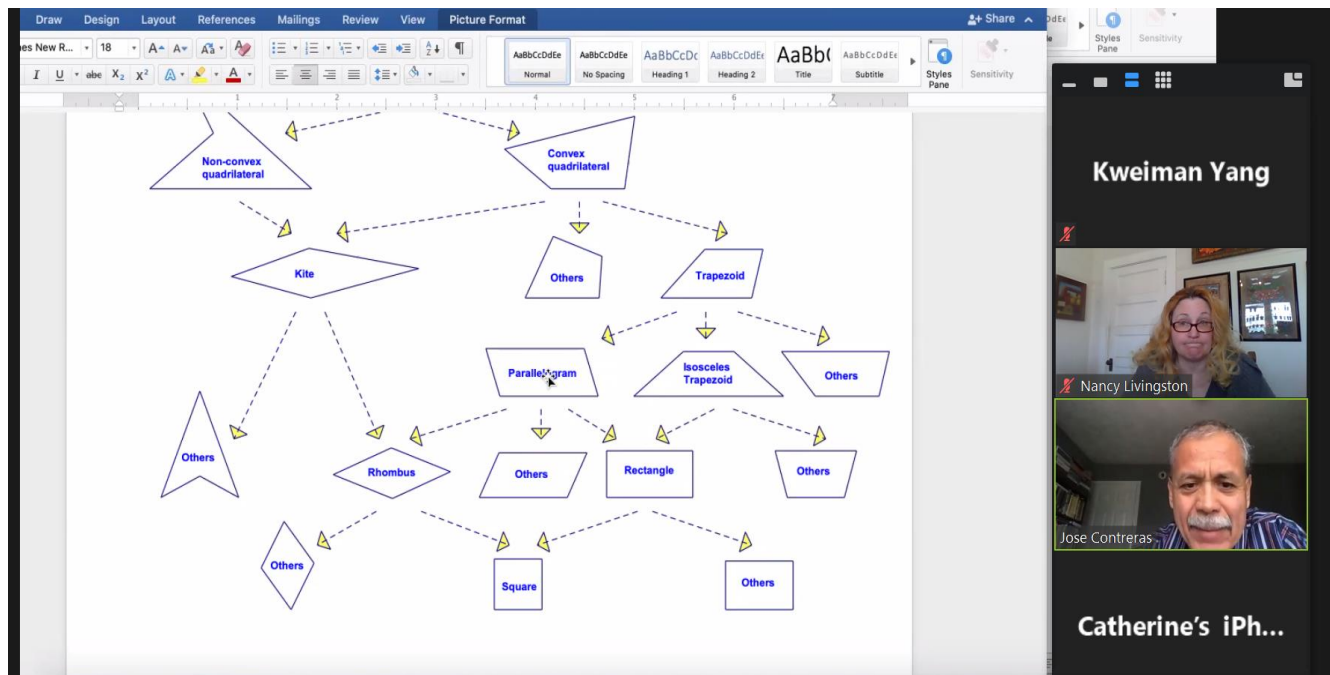
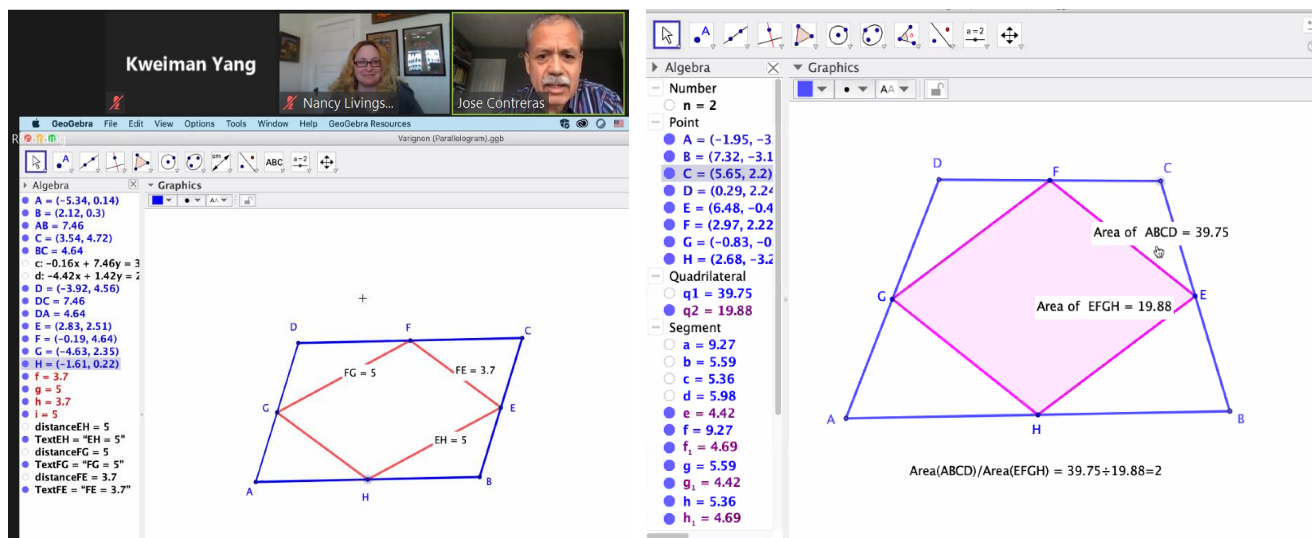
Invited Speaker

José N. Contreras, Ball State University

**Title:** Learning to Pose and Solve Problems within Interactive Learning Environments.

**Abstract:** I will illustrate how my students and I have used a problem-posing framework and GeoGebra to pose and solve Varignon problems using four main strategies: Specializing, generalizing, extending, and reversing. To enrich the students' experience, I start the investigation with the following version of the Varignon's problem: Let E, F, G, and H be the midpoints of the consecutive sides of a parallelogram ABCD. What type of quadrilateral is EFGH?

**Videos:** <https://mediasite.wnmu.edu/Mediasite6/Play/535fa362a15e444485748bf56be923531d>  
<https://mediasite.wnmu.edu/Mediasite6/Play/b93ac7c8175b49e39a8e3a17e112ea3e1d>



Noon – 1:00 pm Lunch Break



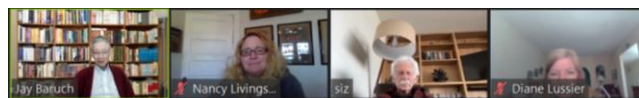
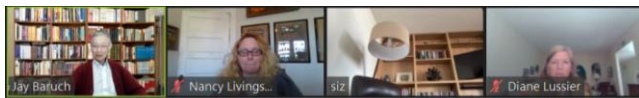
1:00 pm – 2:15 pm

Invited Distinguished Mathematician  
Chung-Wu Ho, Emeritus Professor, Southern Illinois University and  
Evergreen Valley College.

**Title:** Think Mathematically; Life is More Mathematical than You Think.

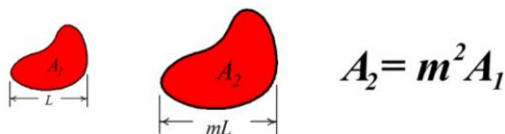
**Abstract:** Imagine that if all humans shrink to the size of little ants. We would suddenly find considerable open space around us: the whole city could be in a parking lot, we would not require as much energy, produce as much waste, and environmental problems would all disappear! But can we still enjoy our current lifestyle in our new world? Why not? All we need is to live in small houses, read small books, and drive small cars. We will show that these are impossible. All creatures large or small are subject to a few simple mathematical limitations. How fast we can run, how far we can walk, what we can see, what we can hear all depend on the size we are in. The world for ants will be drastically different from that to a human. Our life would never be the same if we are the size of little ants.

**Video:** <https://mediasite.wnmu.edu/Mediasite6/Play/10dcdcc235604bddac90bea64afdb8021d>

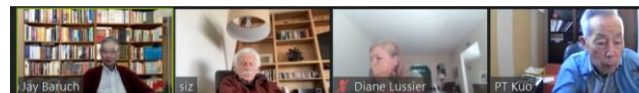
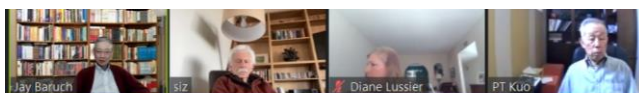
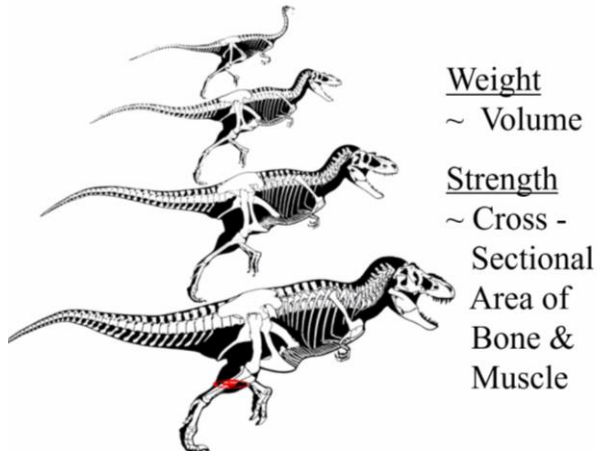
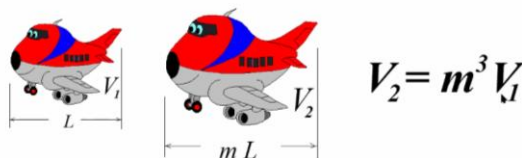


## Two Math Principles

- Area increases by the square.



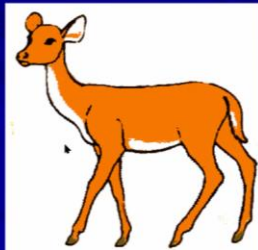
- Volume increases by the cube.



## On Being Warm-Blooded

Heat Content ~ Volume V  
Heat Loss ~ Surface Area S

When an animal double its size, its heat content increases  $2^3 = 8$  times, but its heat loss increases only  $2^2 = 4$  times. It retains heat twice as efficiently.



## 3. Size and Speed (Uphills)

Power required  
= Weight  $\times$  Velocity  
 $\sim L^3 \times v$

Power that can be generated  
 $\sim L^2$

Power required = Power generated  
 $L^3 \times v = L^2$ , or  $v \sim 1/L$

Velocity is inversely proportional to the size



2:15 pm – 2:30 pm

Break

2:30 pm – 3:15 pm

Invited Distinguished Artist

Michael Metcalf, Professor of Sculpture, Western New Mexico University

**Title:** Mathematics and Engineering in Sculpture

**Abstract:** Learn about how mathematics and problem-solving skills are incorporated in the creative process of sculpturing. This process begins with developing an initial idea using the artist's aesthetics and then problem solving to refine the ideas into a physical object. The incorporation of Math and Engineering into the sculpture process is discussed using exemplars of the artist's own creations.

**Video:** <https://mediasite.wnmu.edu/Mediasite6/Play/98274b575669471f99d7a87b275cfbd61d>

Kweiman Yang

Joanne Peeples

Michael Metcalf

Nancy Livings...

Tanya Rivers

Jay Baruch

- I am not a mathematician or an engineer, I am a sculptor.
- I am a curious person who learn by doing.
- I take chances because I was brought up to believing that anything was possible.

### Math related concepts I use in my sculpture practice

In graduate school I took several architectural structures courses to learn statics and how to make simple structural calculations. The principles stuck with me.

**Geometry** – I learned to complete proofs with a compass – best math segment I ever had as it was visual. I still use those principles when drawing with circles in AutoCAD.

**Fulcrum** or lever – I use to move and lifting objects.

**Vectors** – A pushing force can be replaced by a pulling force, I intuitively balance forces with my sculptures

**Proportions** – vital when scaling up a model

**Calculations** - I roughly calculate weights, sizes and angles using the **Pythagorean Theorem** and "**SOHCAHTOA**"

**Empirical reasoning** – through observation and physical testing I make decisions – it started as a child climbing trees, deciding which branch would hold me. A little flexing was ok, a lot of flexing was a no go.

I now ask my phone a lot of questions.

Joanne Peeples

Michael Metcalf

Nancy Livings...


Tanya Rivers

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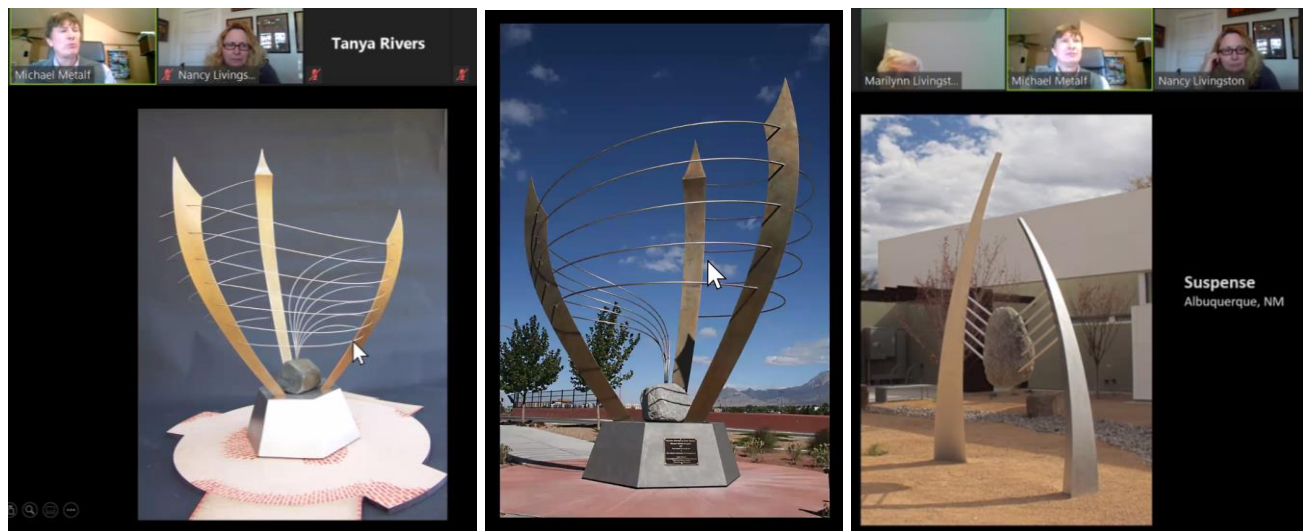


Tension Arch



Barbara Hepworth





3:15 pm – 3:30 pm

Break

3:30 pm – 4:00 pm

Careers2communities Project  
Tanya Rivers, Assistant Professor of Mathematics, Western New Mexico University

**Video:** <https://mediasite.wnmu.edu/Mediasite6/Play/8a48dabe9b1f4586b570b26395ddf0171d>

4:00 pm – 5:00 pm

Business Meetings



Having trouble with...	You should...
Logging into MAA Connect?	Use the "Contact Us" form or email <a href="mailto:maaservice@maa.org">maaservice@maa.org</a> for login
Finding emails from our Section?	Lookout for "SouthwestSection Digest" in your inbox!
Joining new communities?	Click on Communities > All Communities, then change the filter to "communities I can join"
Seeing your leadership/committee community?	Email <a href="mailto:communities@maa.org">communities@maa.org</a>