Collaboration in the Time of COVID

Bronna Butler & Jessica K. Sklar
MathArt, ArtMath at MathFest, August 5, 2021
The Mathemalchemy Project

**Founders:** Ingrid Daubechies and Dominique Ehrmann, with Dorothy Buck

**Concept:** “Collaborative sculptural art installation using textile and other media to illustrate mathematical creativity and beauty”

**Funders:** Simons Foundation, Leverhulme Trust, & the Rhodes Information Initiative at Duke University
**January 2020:** Ingrid and Dominique presented the Mathemalchemy concept and a preliminary maquette at JMM.

**The plan:** The project would be primarily developed and constructed during four workshops at Duke University during 2020.
February 2020: Our team grew to 24 people from 14 US states and Quebec, spanning 4 time zones.

Art Director Dominique solicited ideas/stories and we discussed the project via email as a prelude to our planned March workshop at Duke.
We created a shared folder & myriad subfolders on Google Drive and started using Google Docs and Google Sheets.

Tess:
• Shell pattern choice: heptagons.
• Shell size: approx 7.2” L x 6” W x 2.2” H.
• We will wait on the color samples to discuss shell and color decisions. Possibilities for the shell:
  • Only color the outlines of the heptagons
  • Use 4 different tones (shades? I’m not sure of the correct term) of the same color to allude to the Four Color Theorem. DE: I have checked the link, may I suggest that you ask Liz. If I remember well she told us that the colors were difficult to predict. ESP: Yes, I would have to test some underglazes. But I could also play with natural clay body colors using slips—e.g. 100% claybody A, ~66/33 claybody A/claybody B, ~33/66 claybody A/claybody B, 100% claybody B. I’m thinking the shell shouldn’t be too “color busy”—want it still to have a natural tortoise-y look—so will have more thoughts about colors once paint chips arrive.

Ingrid asks: would it be possible to have not a complete undershell but just the margins of an undershell, already attached to the top shell? In a sideview of a walking tortoise one does see the edges of the undershell (see attached). The ceramic shell would then be like a big ceramic jacket, in which it should still be easy to insert the knitted body and get legs through the holes.

Liz: I will experiment with this.

Tasha: An actual shell has a total of two oblong horizontal holes, one at either end, not a total of six with two on each side, and one on either end. Could an undershell be made with a lighter material, 3D printed?

Kim responds: That idea of a more complete is cool, but may still have the problem of being too heavy. Liz will have a better idea about whether a more complete shell would work.
Plane tickets were purchased and hotel reservations made for our March 2020 workshop at Duke.
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COVID struck. Lockdown ensued.

https://ssri.duke.edu/about/facilities
The March workshop took place during three 8-hour days via Zoom.

**March 2020–June 2021:** We continued to meet via Zoom. For 15 months.
Subgroups were formed to work on areas of the installation: Lighthouse, Garden, Knotical, Tortoise, Bakery, and more!

Subgroups and the whole team met weekly for many months.
Elements of the Tortoise story evolved.
Evolution of Riemann Hill
The lighthouse also evolved: it began as a traditional structure and became more interesting and mathematical.
The dodecahedron beacon incorporated a recent mathematics breakthrough by Athreya, Aulicino, & Hooper.
We spent 15 months fabricating locally.

OctoPi graffiti
Lighthouse welding and wiring
CNC wood carving
Tortoise’s story
Mathemalchemy critters
Cavalcade of pages

Eight of the 297 Martin Gardner “Mathematical Games” columns in *Scientific American* Magazine

—*Warning*: Martin Gardner has turned dozens of innocent youngsters into math professors and thousands of math professors into innocent youngsters.— Persi Diaconis
Convergent & divergent ball arches
Garden and Reef
July 2021: We met at Duke to fabricate the final installation!

Building the Lebesgue Terraces
Hanging the Divergent Ball Arch
Painting the Town
Installing the OctoPi mural and constructing the Riemann Cliffs
The fruits of our collaboration!

The Lighthouse
Mandelbrot Bakery and Conway’s Curios
Garden Scenes
Cryptography quilt
Mathematician silhouette & Cavalcade of pages
The installation will be touring before settling into its permanent home at Duke University.

**January-May 2022**

Mathemalchemy will be on display at the National Academy of Sciences in Washington, DC!

If you know of an institution that might be interested in hosting Mathemalchemy, please email Dominique Ehrmann at Do.Ehrmann@hotmail.com.
Many thanks to all the people who helped bring Mathemalchemy to life, including spouses, children, friends, colleagues, students, and more!

Learn more!
mathemalchemy.org
instagram.com/mathemalchemy
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