





# Self-Folding

[Hawkes, An, Benbernou, Tanaka, Kim, Demaine, Rus, Wood — PNAS 2010]

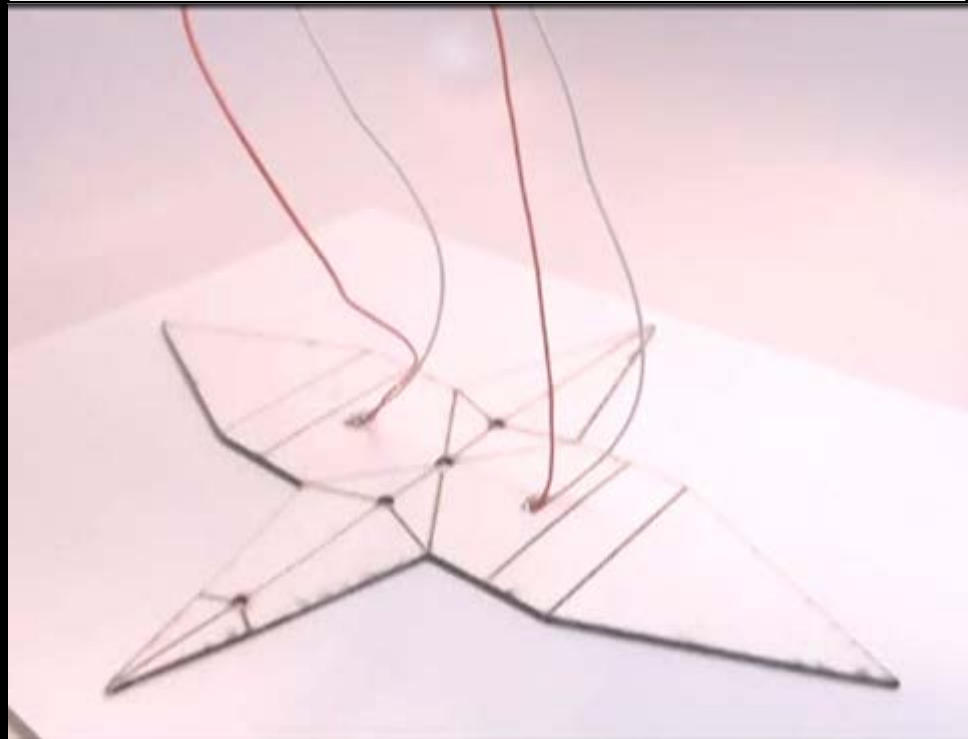
[Felton, Tolley, Demaine, Rus, Wood — Science 2014]

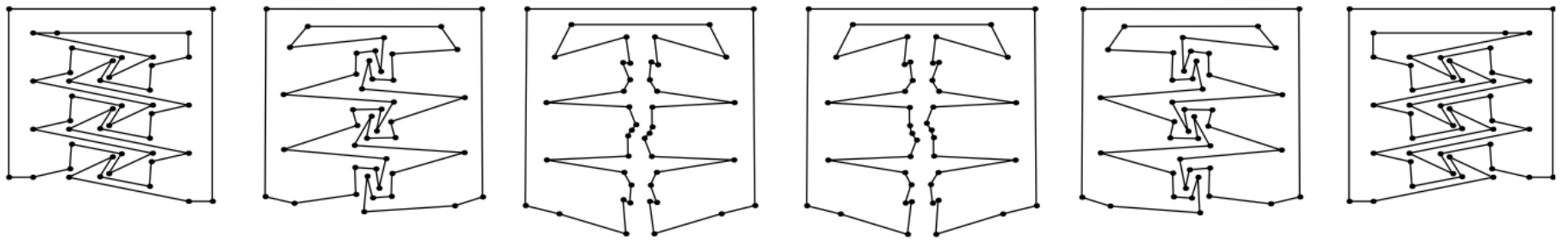
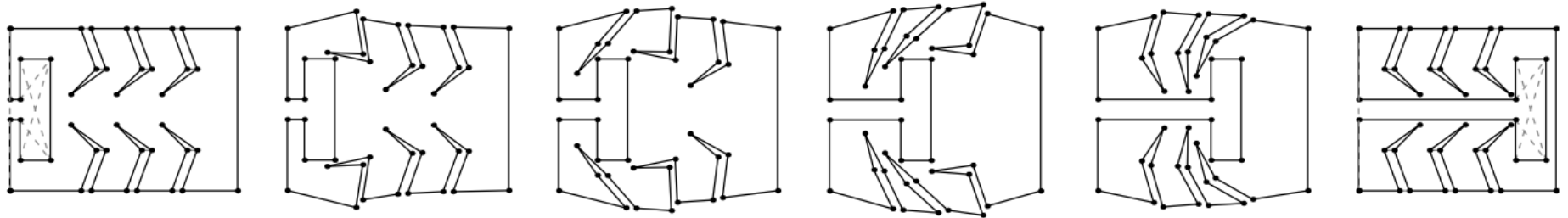
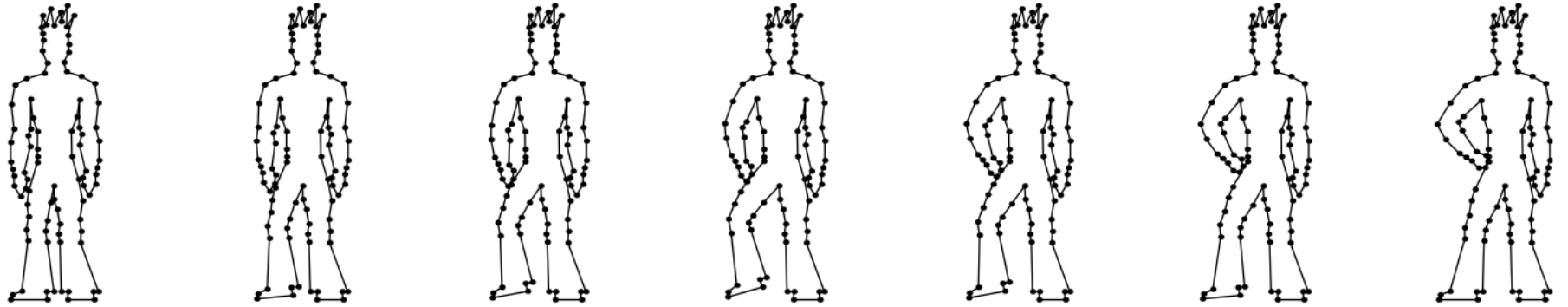
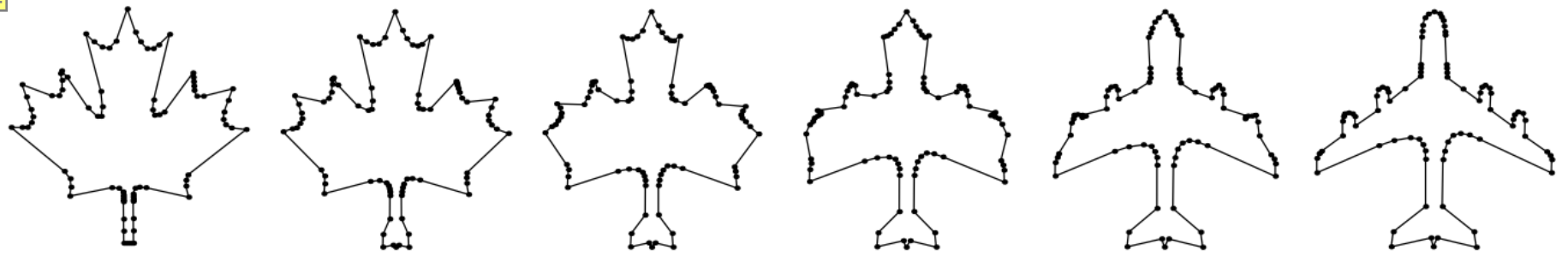
[Felton, Tolley, Shin, Onal, Demaine, Rus, Wood — Soft Matter 2013]



Programmable Matter by Folding

multiple shapes, compound folds





NATURE SERIES.

# HOW TO DRAW A STRAIGHT LINE;

A

LECTURE ON LINKAGES.

BY

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OF THE INNER TEMPLE, ESQ.;  
MEMBER OF THE COUNCIL OF THE LONDON MATHEMATICAL SOCIETY;  
AND LATE SCHOLAR OF TRINITY COLLEGE, CAMBRIDGE.

WITH NUMEROUS ILLUSTRATIONS.



MACMILLAN AND CO.  
1877.

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187. g. 16. Digitized by Google

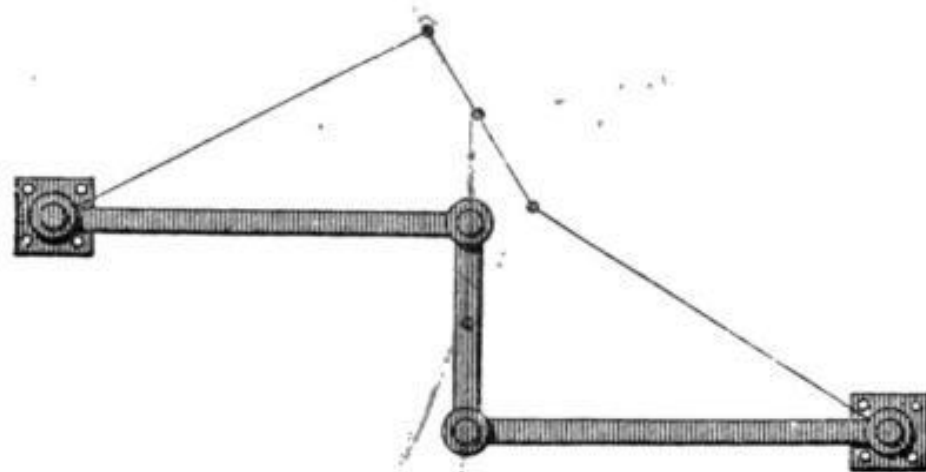


Fig. 2.

Watt 1784

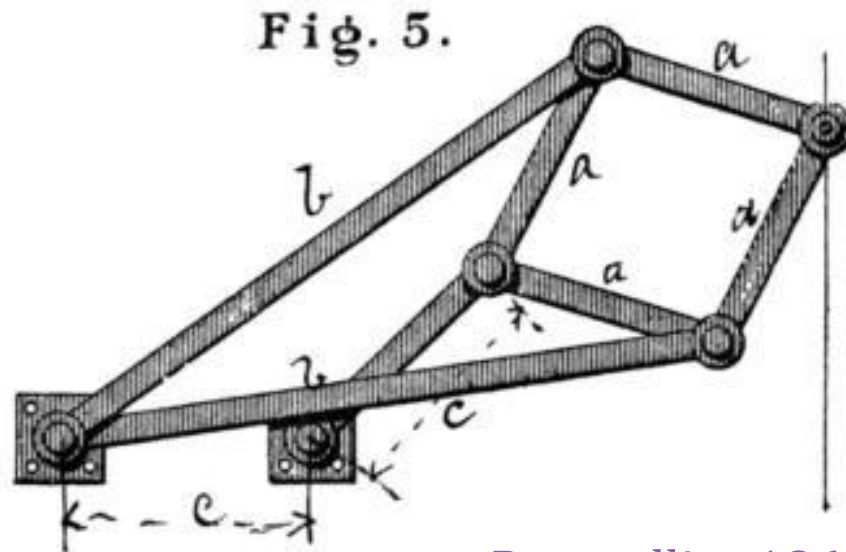
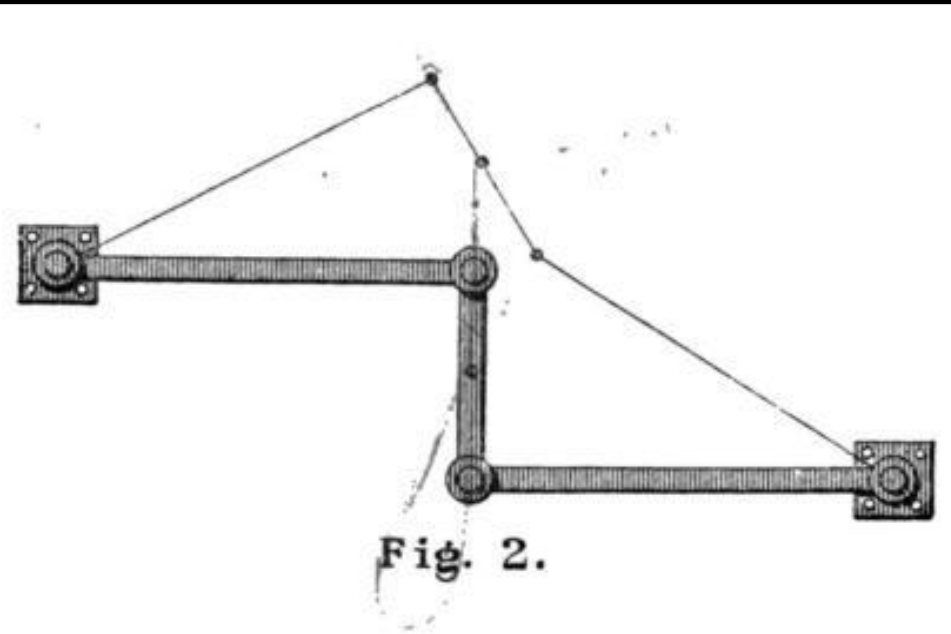
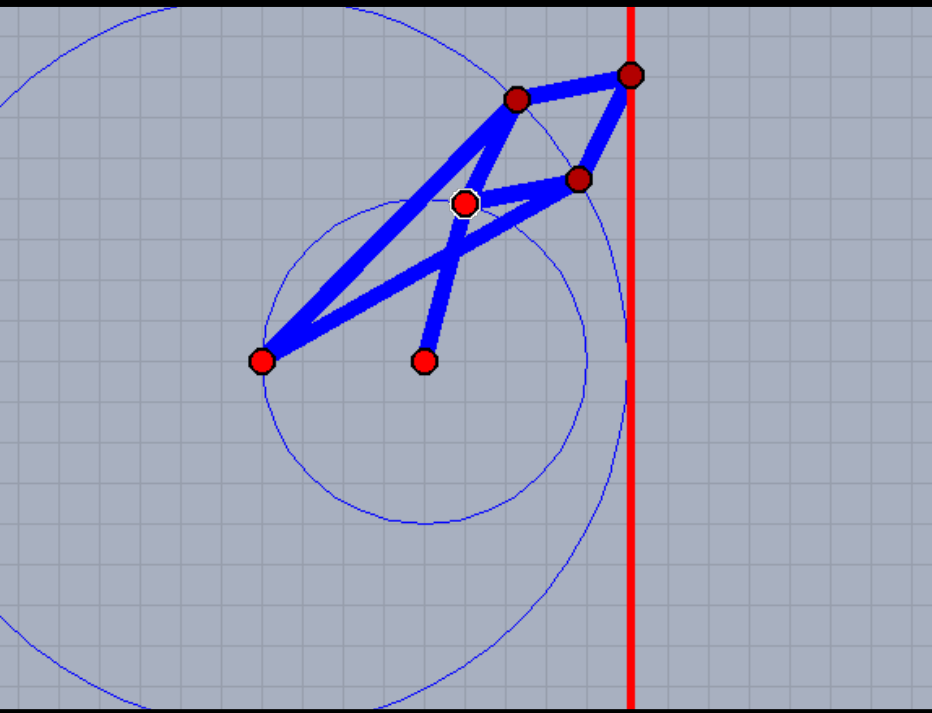
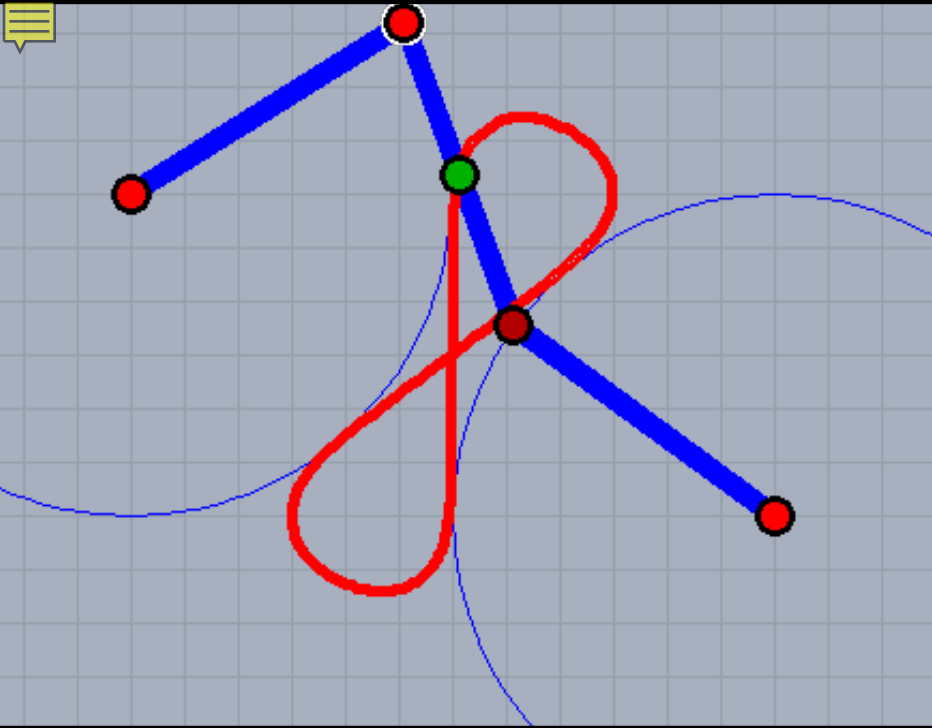
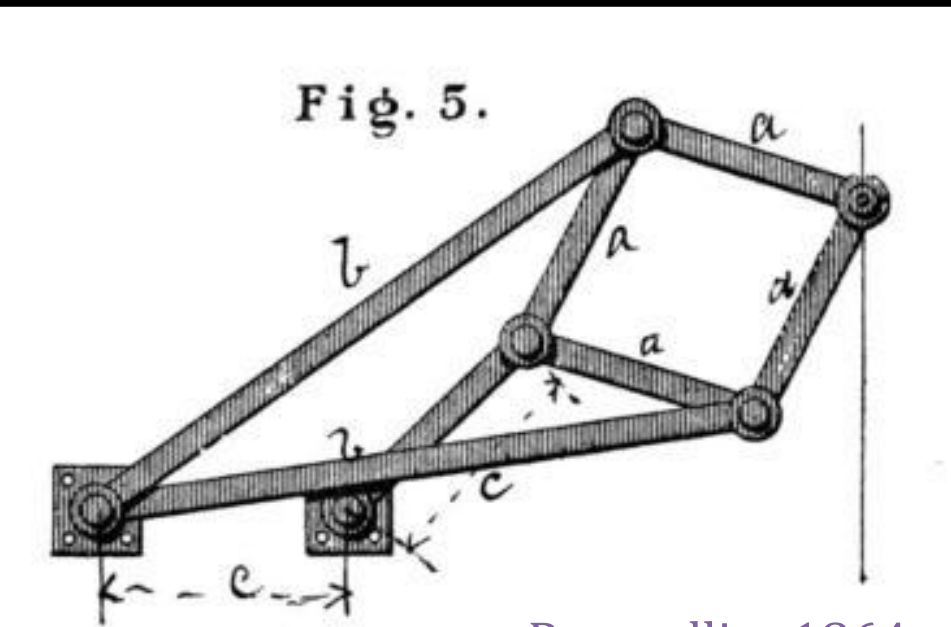


Fig. 5.

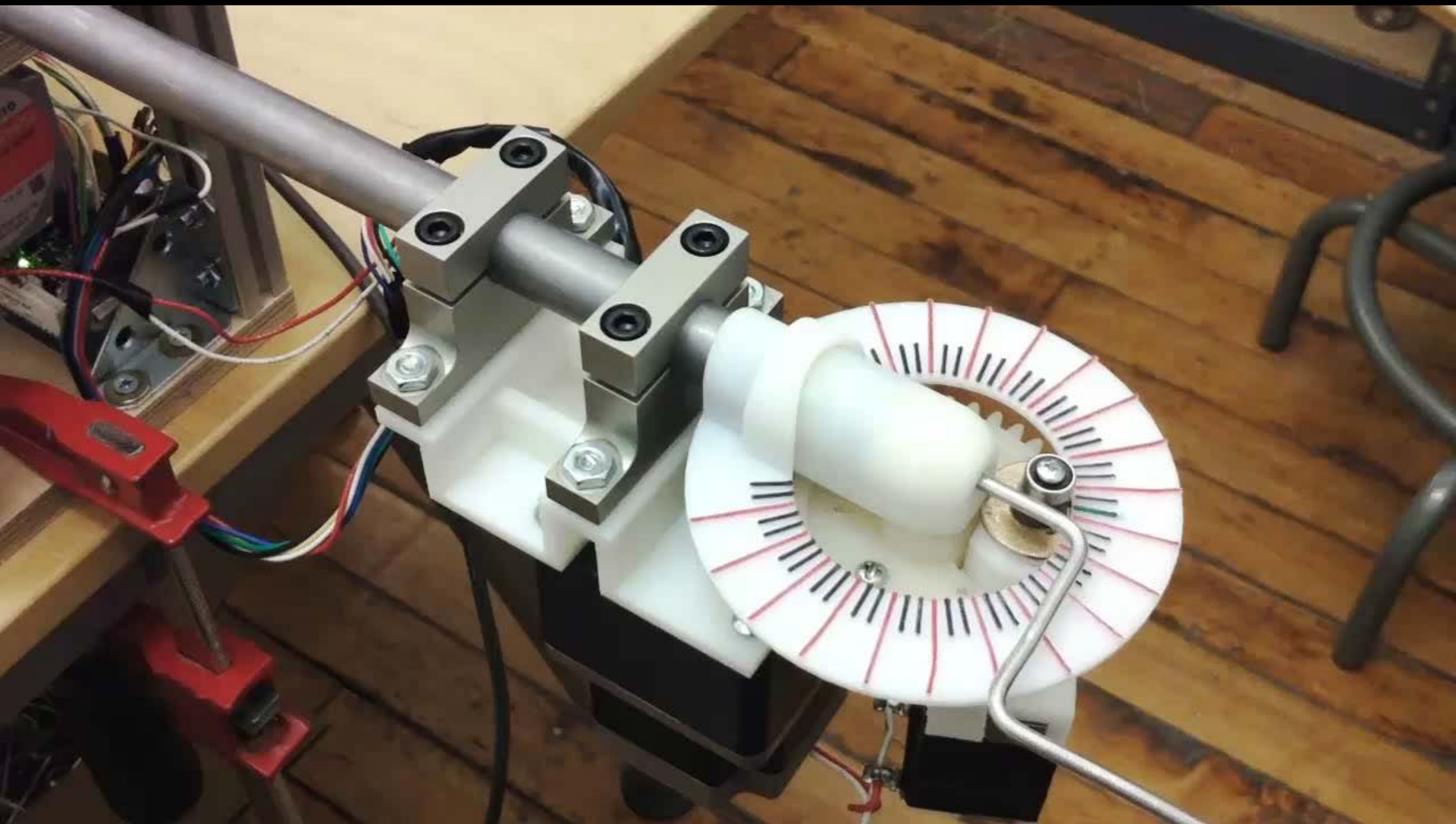
Peaucellier 1864



Watt 1784



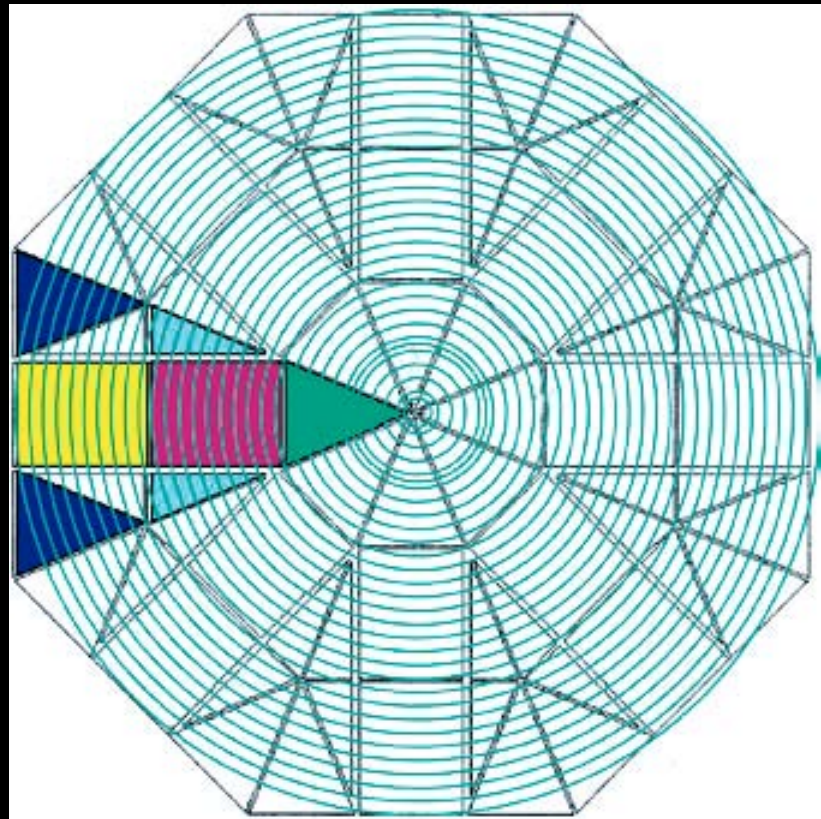
Peaucellier 1864



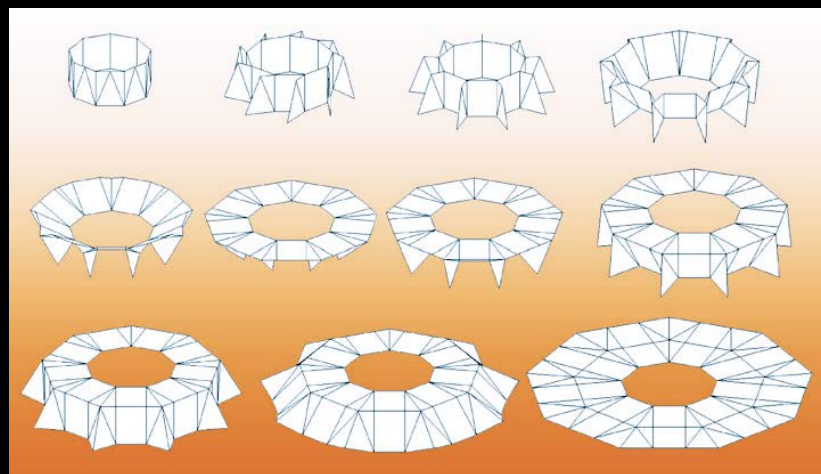


[You & Kuribayashi 2003]

5m →  
100m



[Lang & LLNL 2002]





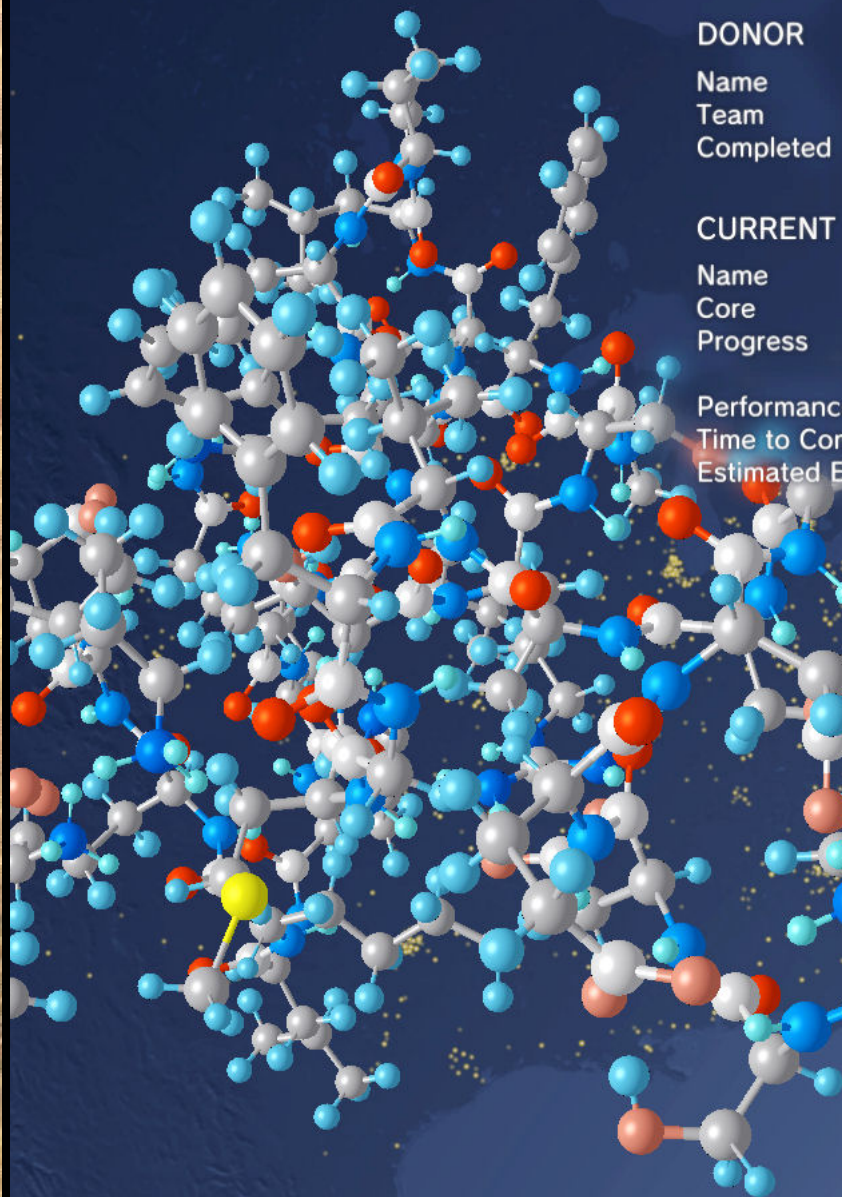
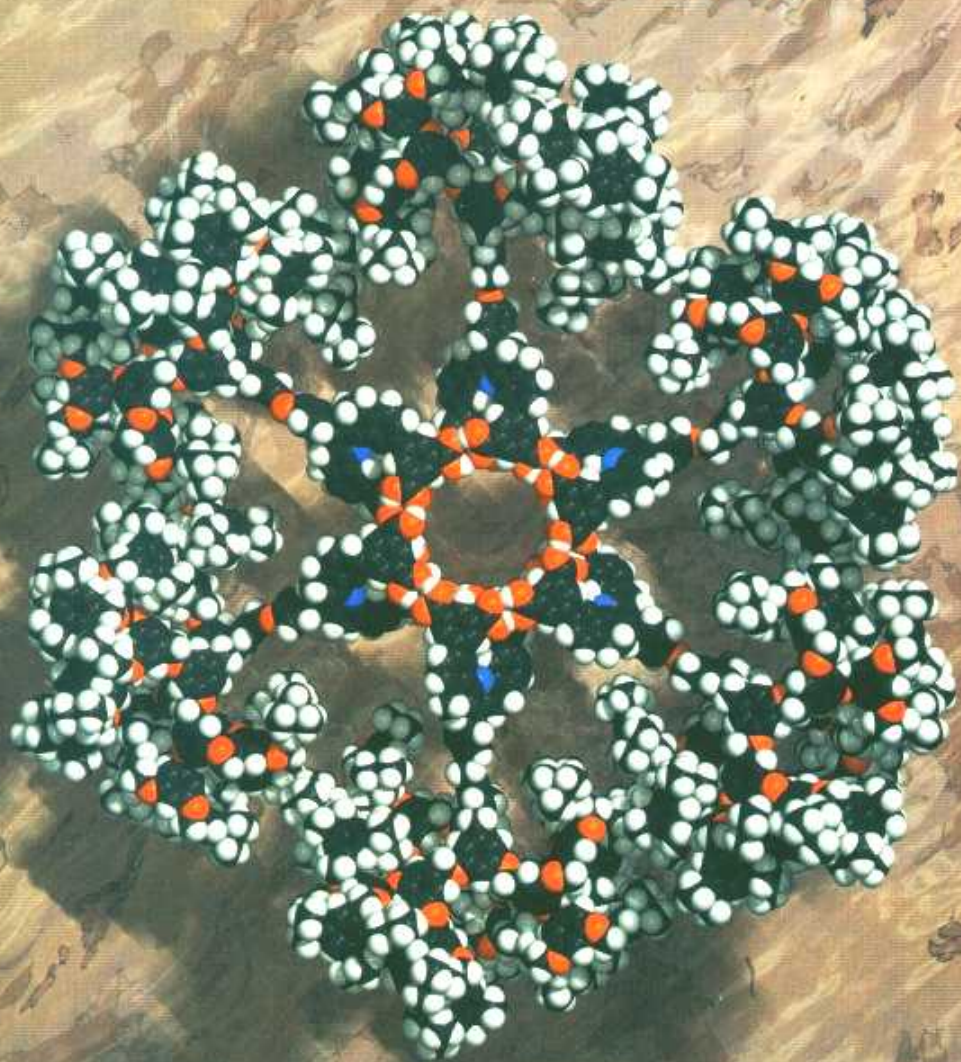


AMERICAN ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

23 FEBRUARY 1996  
VOL. 275/7 PAGES 1025-1100

\$7.00



DONOR

Name  
Team  
Completed

CURRENT

Name  
Core  
Progress

Performance  
Time to Complete  
Estimated E

folding@home



# Nazgul 8.1

Jason Ku

2011



photo by Jason Ku



photo by Brian Chan

# Cerberus

Satoshi Kamiya

2005

Philip West



Brian Chan

Eric Joisel



Brian Chan



Renwick Gallery,  
Smithsonian American  
Art Museum, 2012

Demaine &  
Demaine





# Green Waterfall

Demaine & Demaine, 2011



fullerCRAFT  
museum™



## Earthtone Series

Demaine & Demaine, 2012

GUIDED BY INVOICES

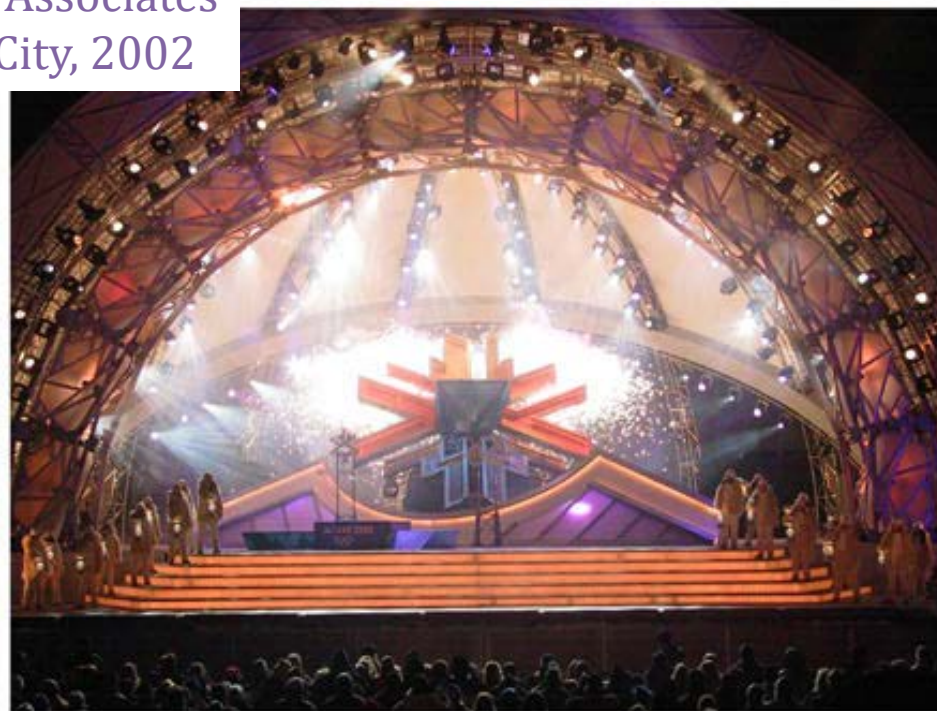


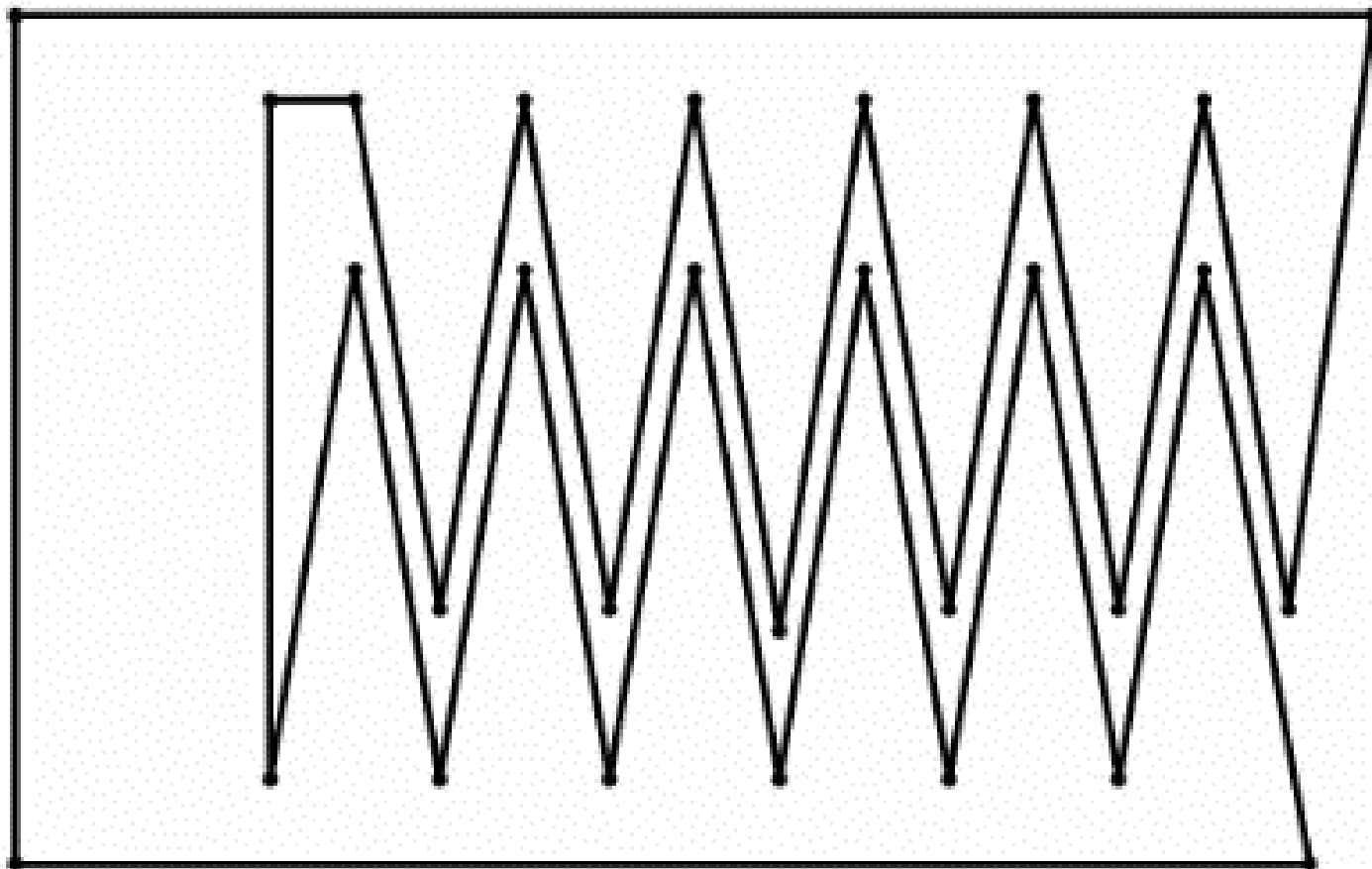
DUNCAN & McCLELLAN

**Waves of Color Series**  
Demaine & Demaine, 2014



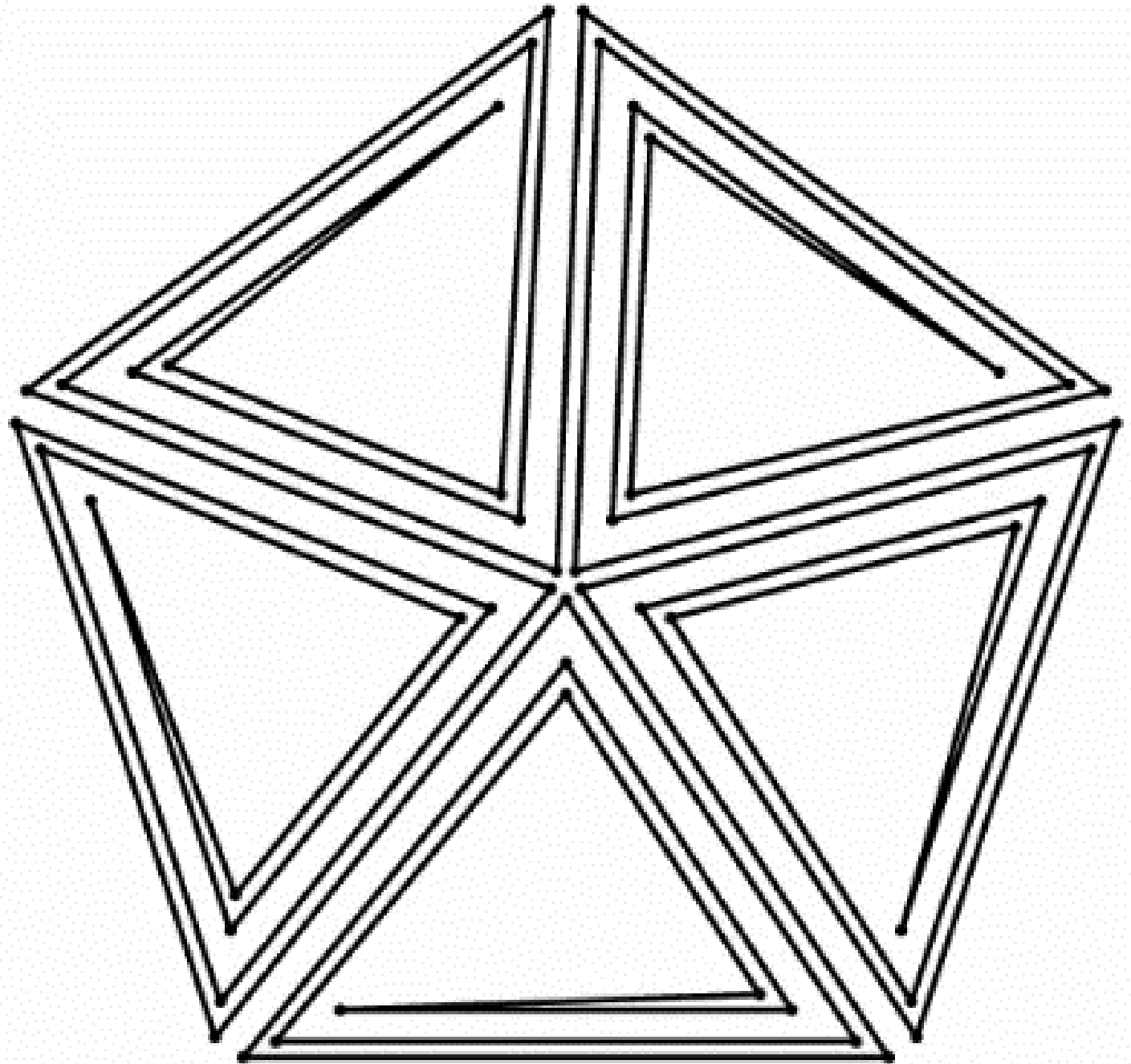
“Hoberman Arch”  
Hoberman Associates  
Salt Lake City, 2002



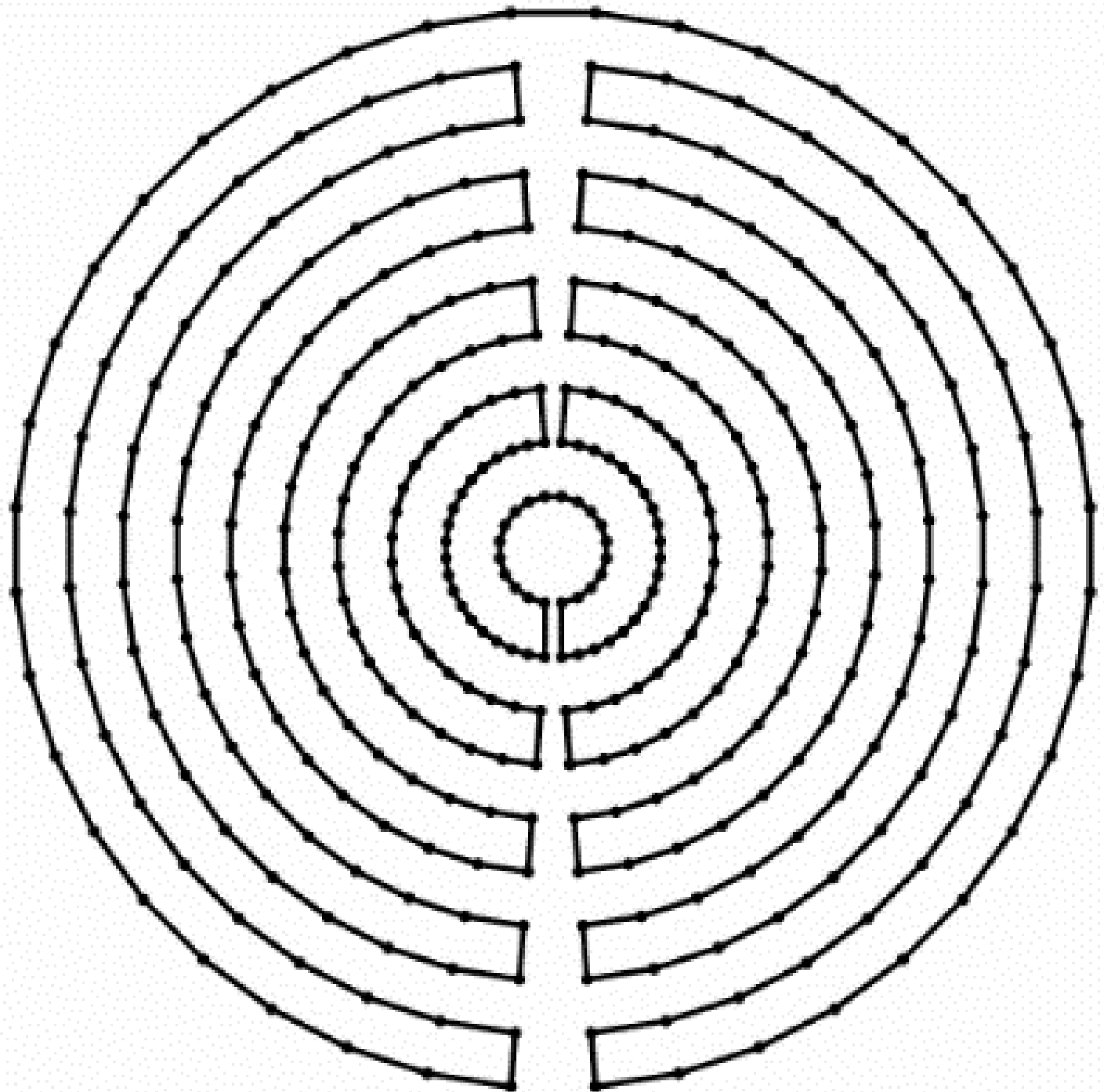


[Cantarella,  
Demaine,  
Iben, O'Brien  
2004]

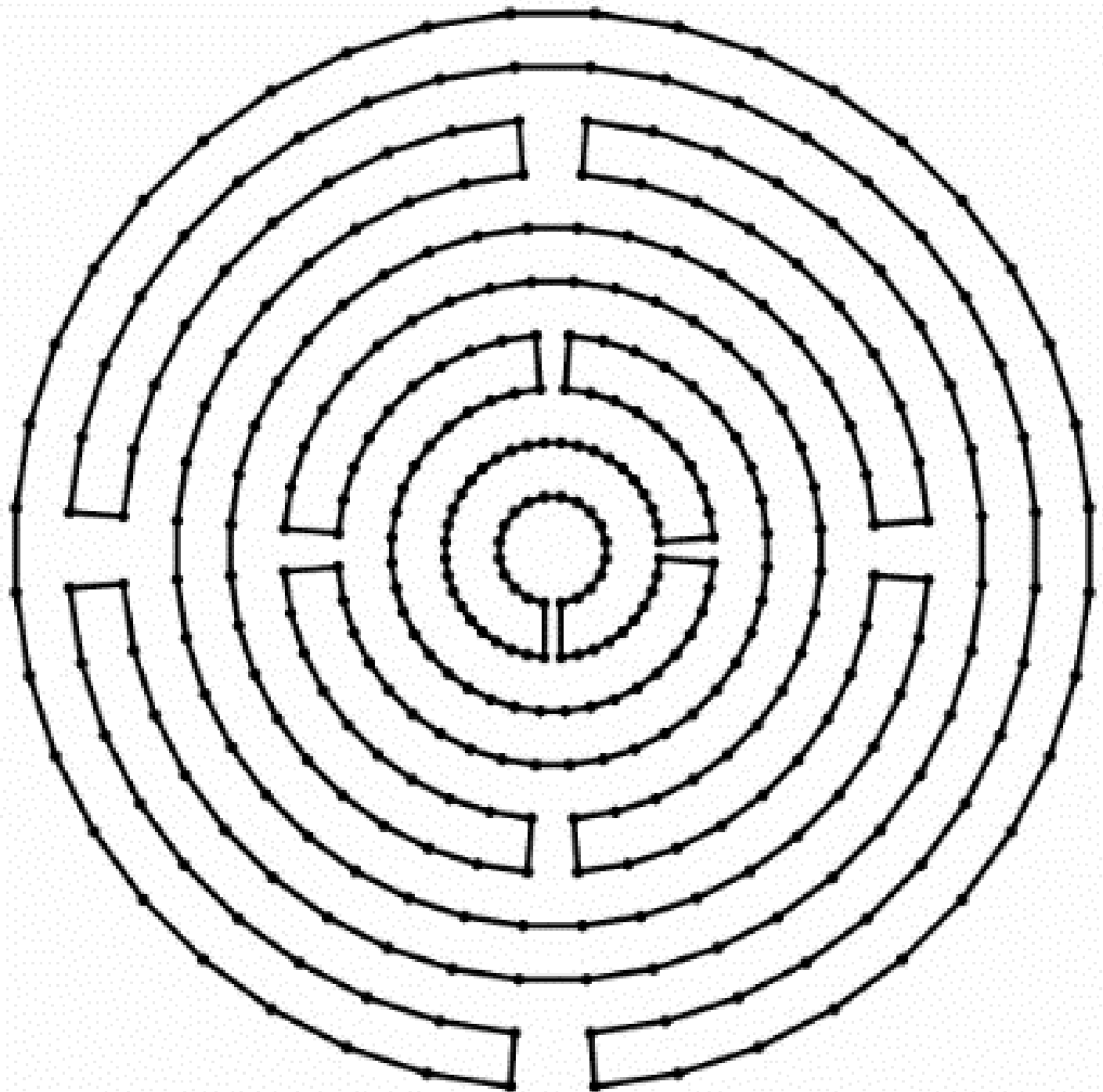




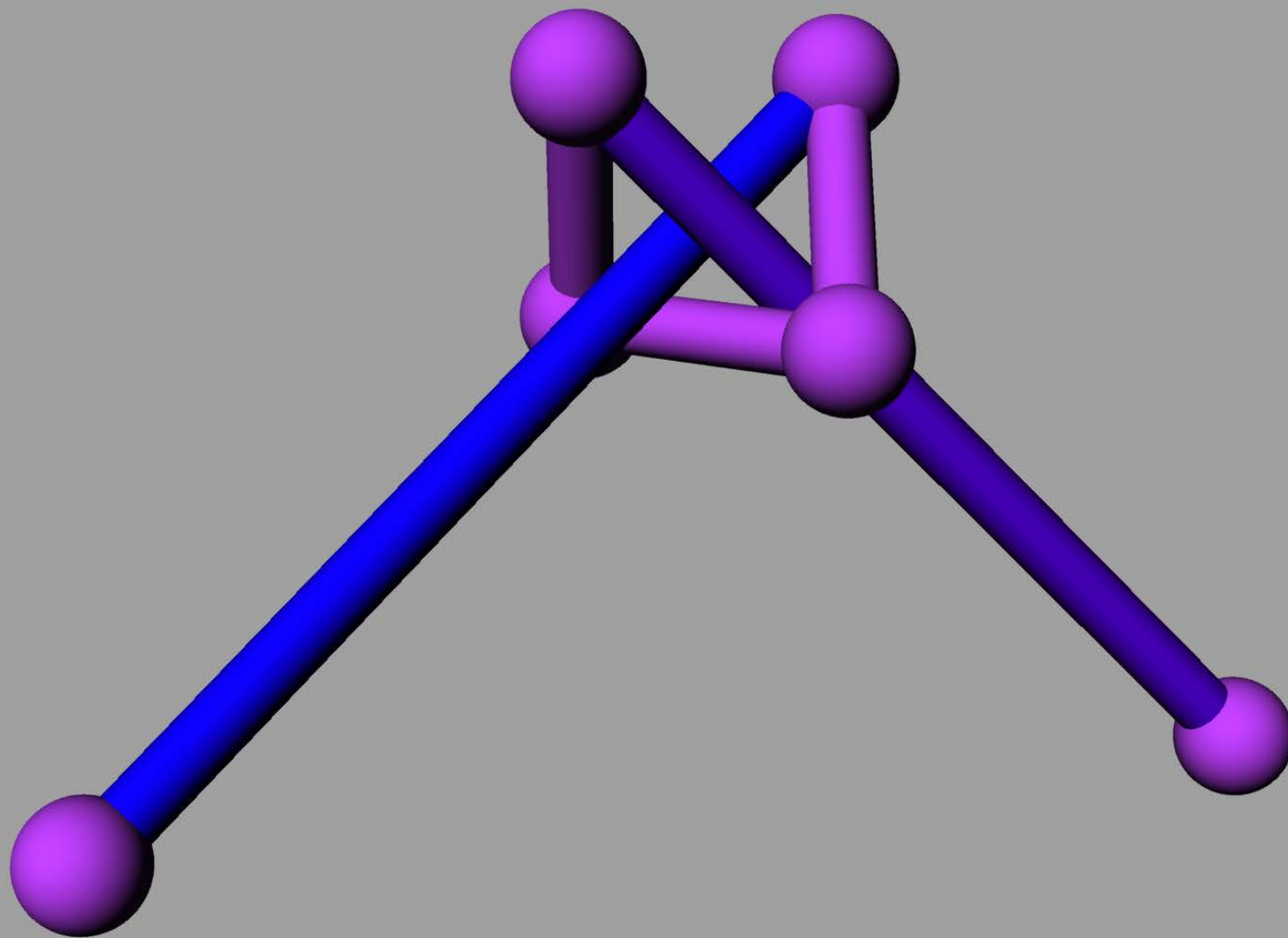
[Cantarella,  
Demaine,  
Iben, O'Brien  
2004]



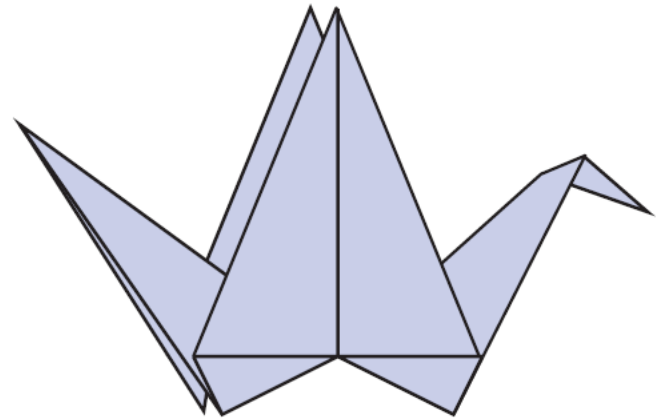
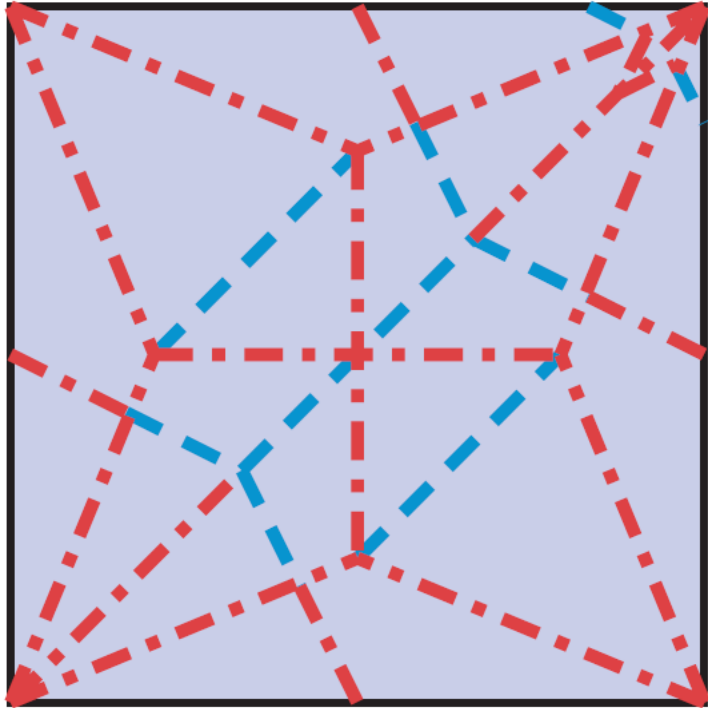
[Cantarella,  
Demaine,  
Iben, O'Brien  
2004]



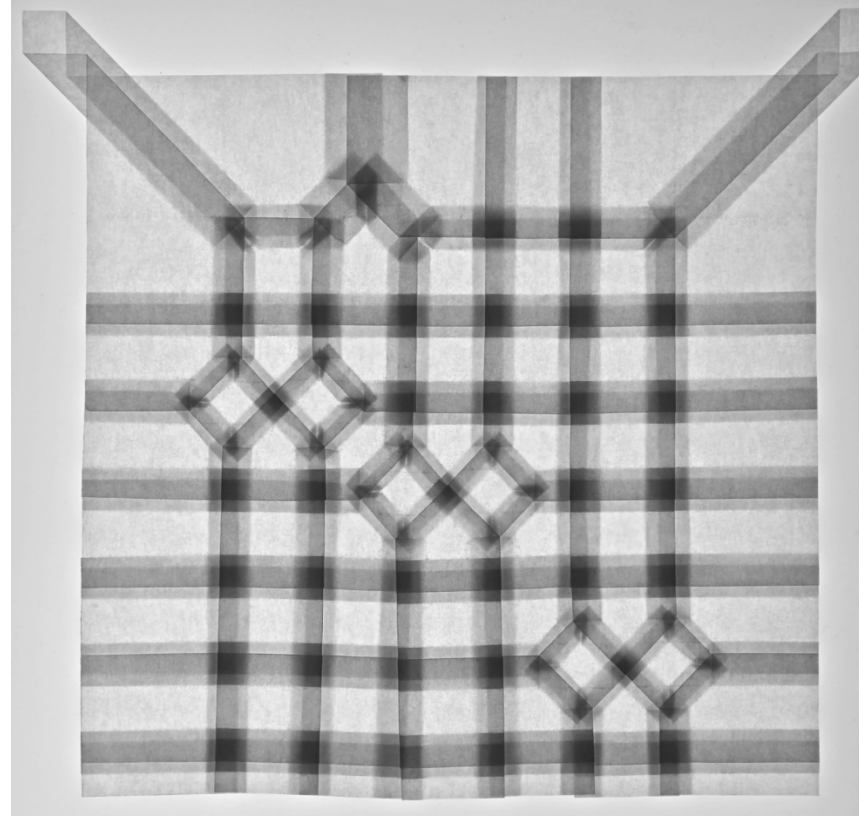
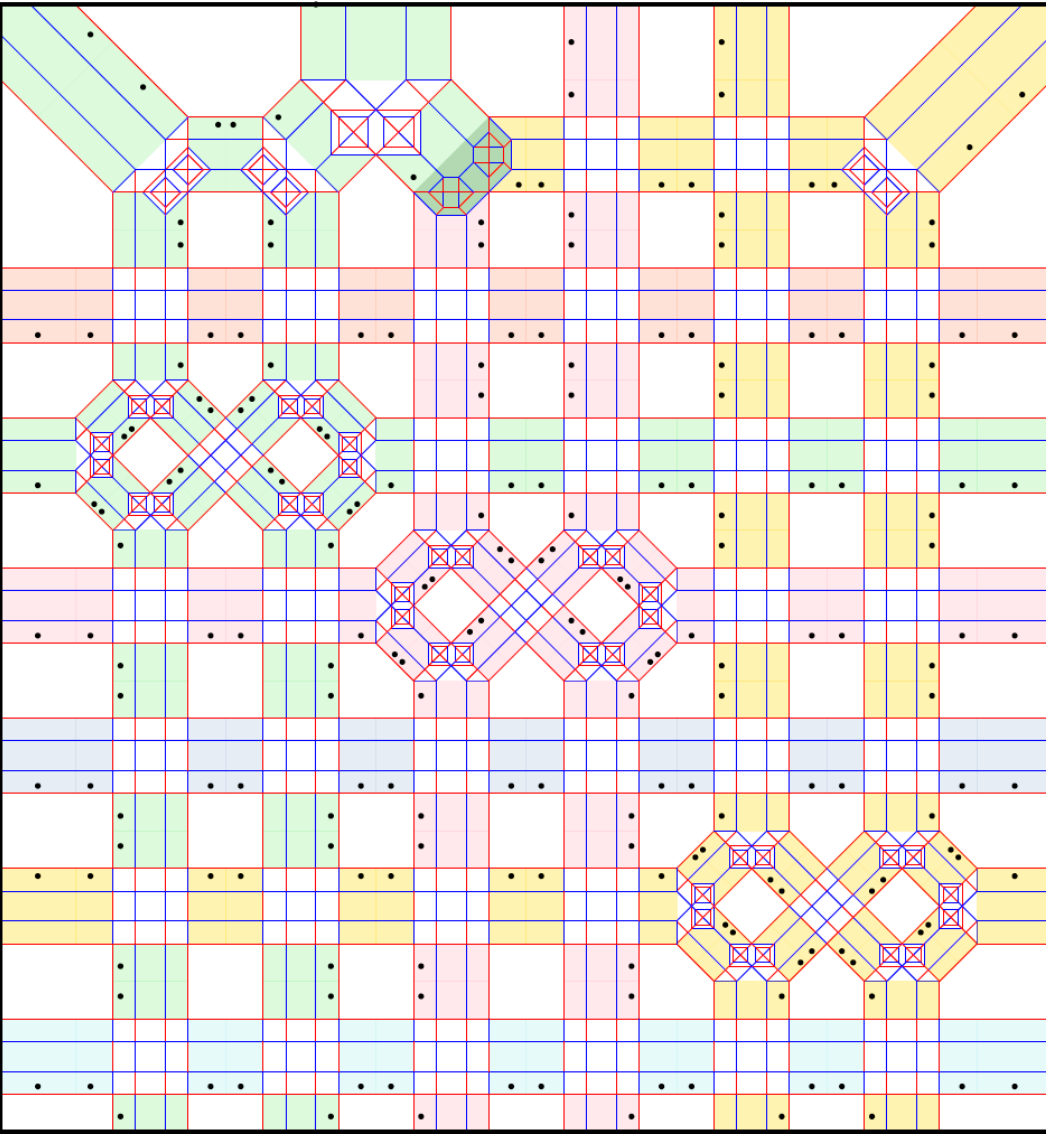
[Cantarella,  
Demaine,  
Iben, O'Brien  
2004]



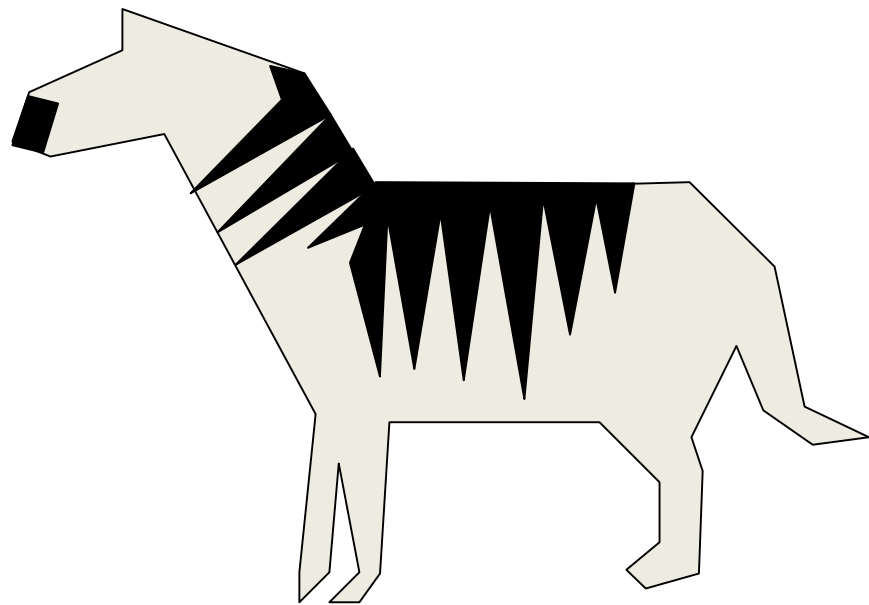
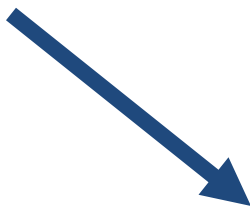
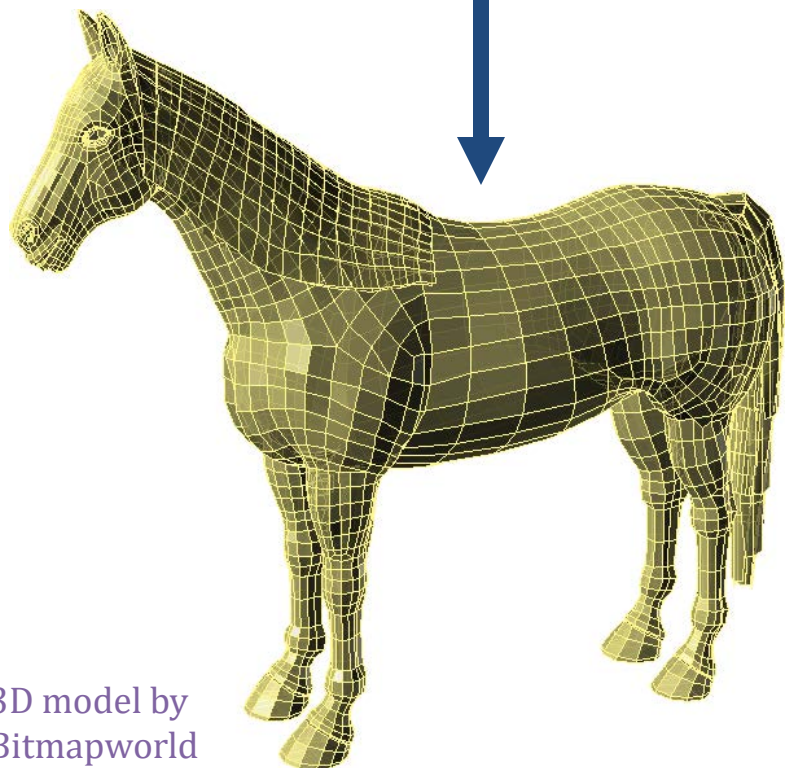
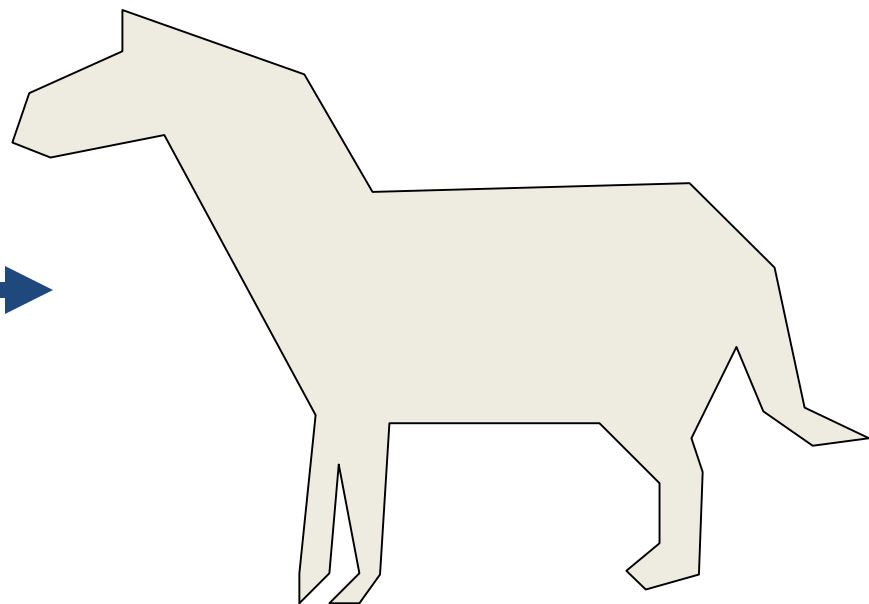
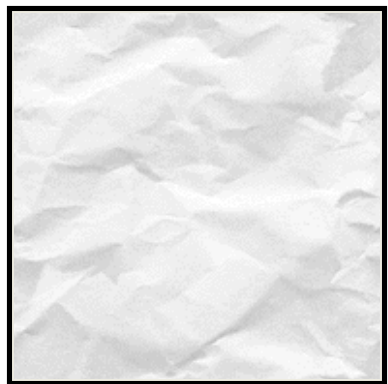
[Cantarella & Johnston 1998]



# Flat Folding of Box-Pleated Assigned Crease Pattern is NP-complete



[Akitaya, Cheung,  
Demaine, Horiyama,  
Hull, Ku, Tachi,  
Uehara 2015]



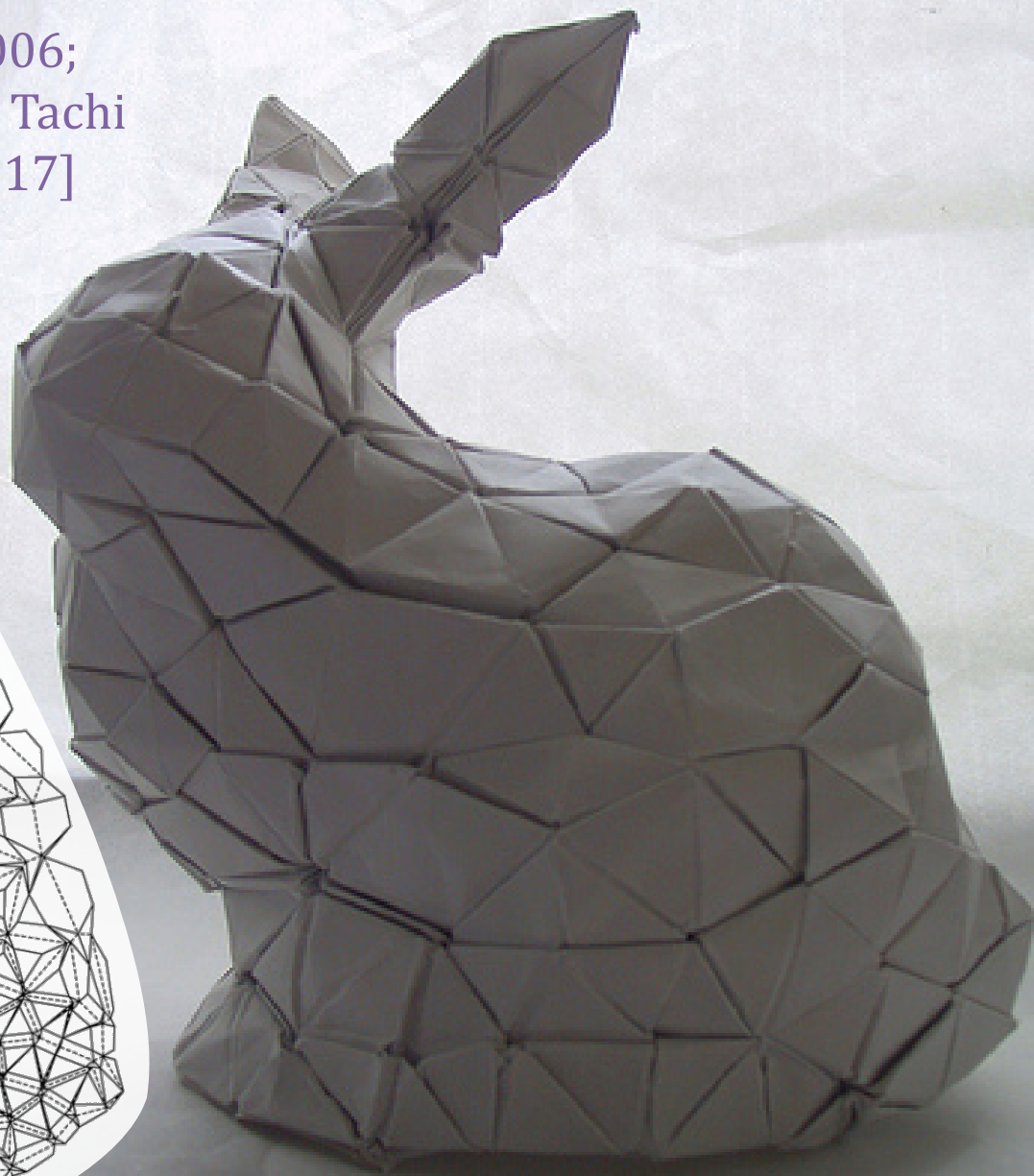
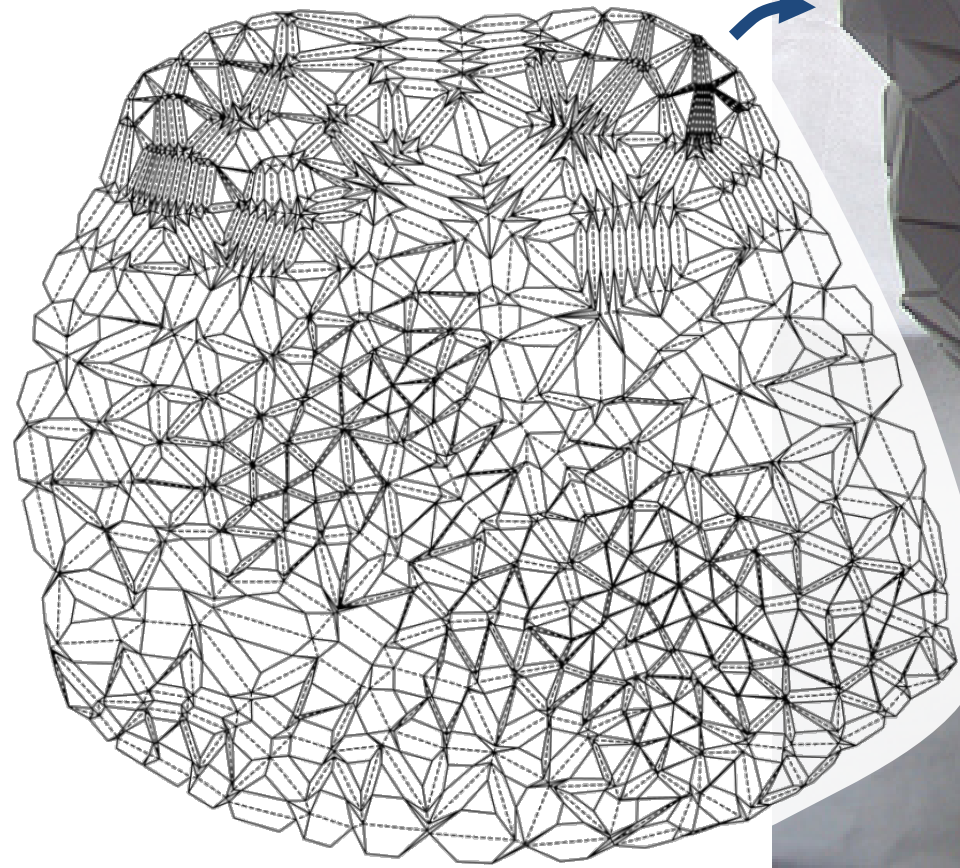
3D model by  
Bitmapworld

[Demaine, Demaine, Mitchell 1999]



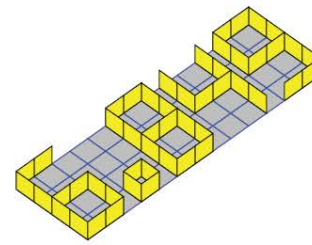
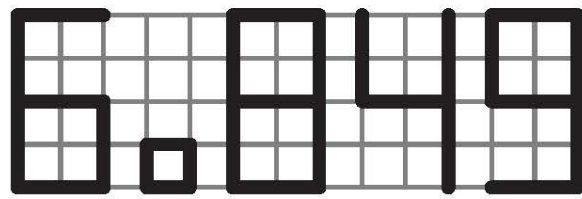
# Origamizer

[Tachi 2006;  
Demaine & Tachi  
2009–2017]



Tomohiro Tachi

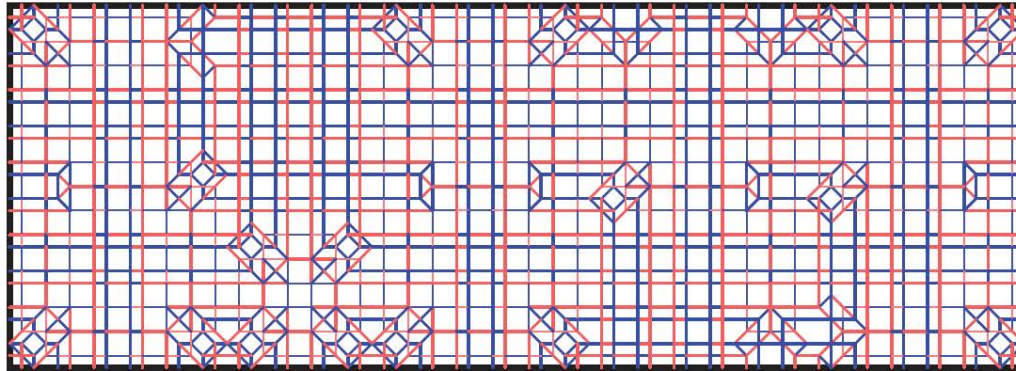




*CONCEPTUAL DESIGN*



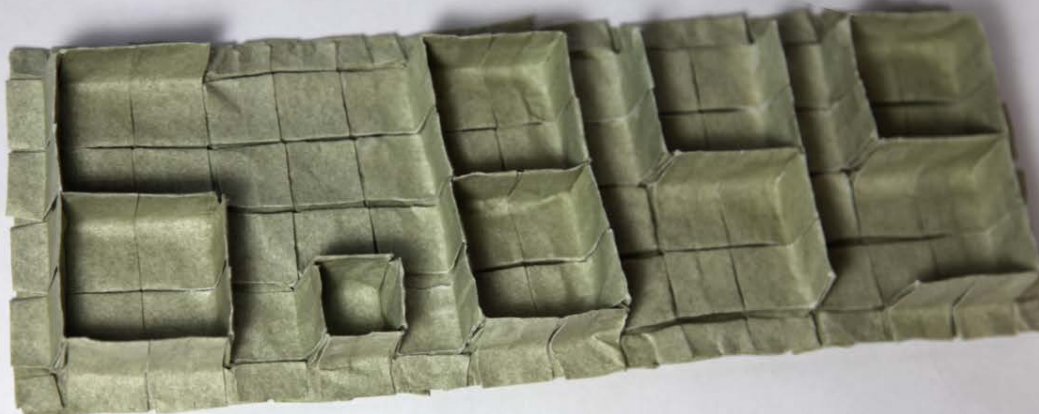
*MAZE FOLDING ALGORITHM*  
[demaine, demaine, & JASON KU, 2010]

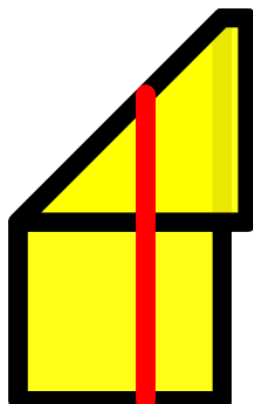
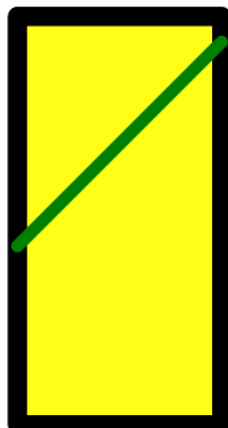
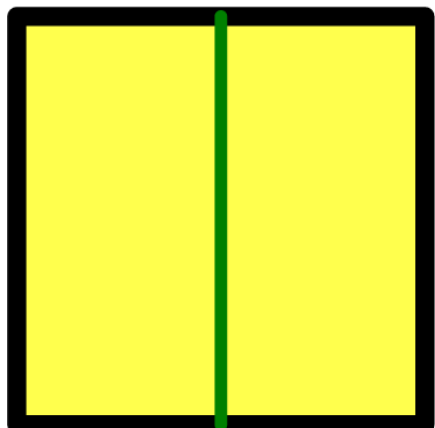
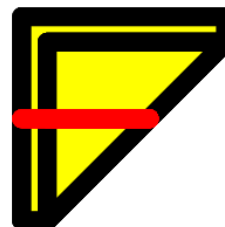
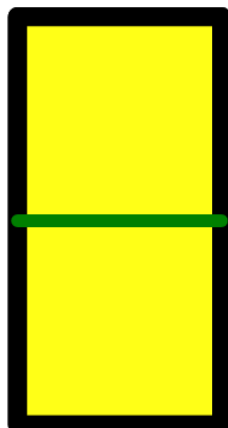
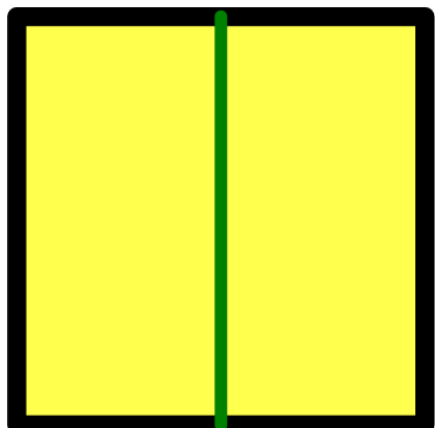
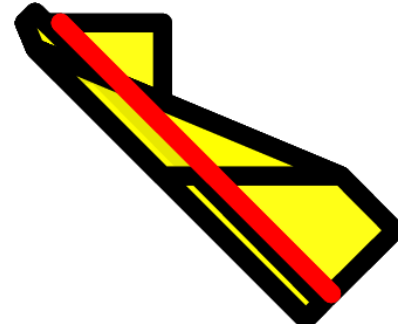
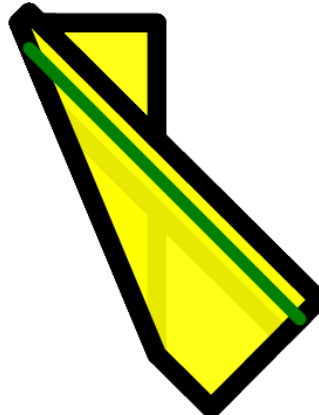
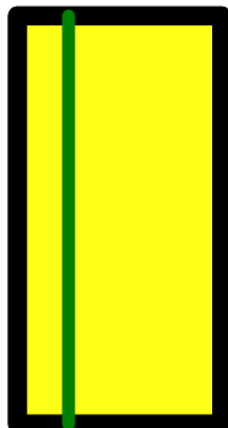
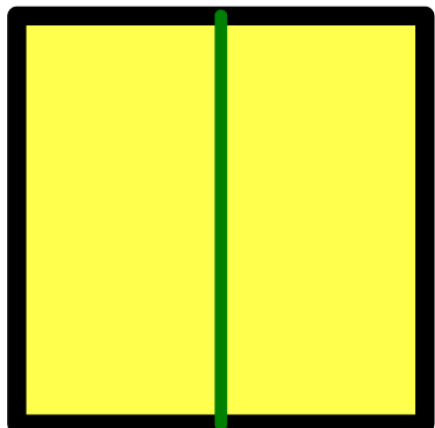


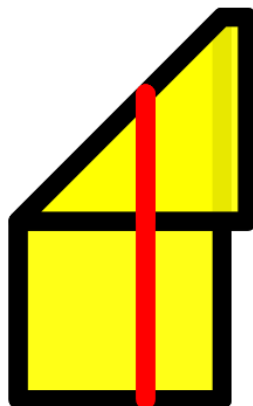
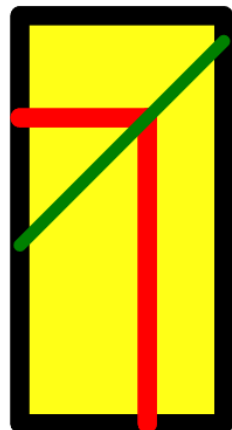
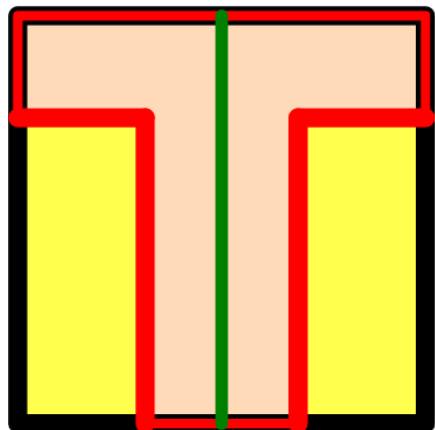
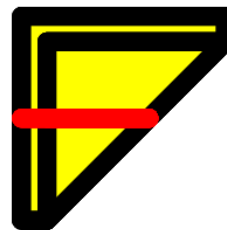
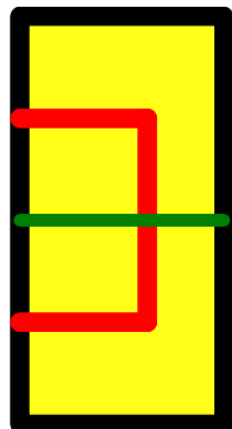
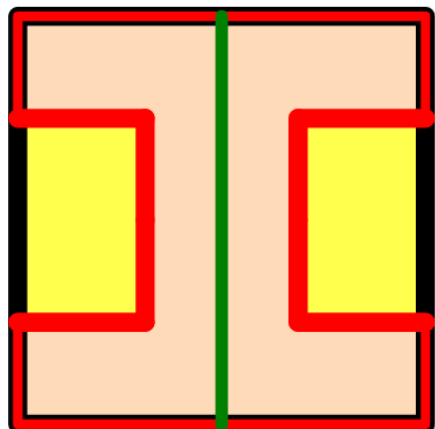
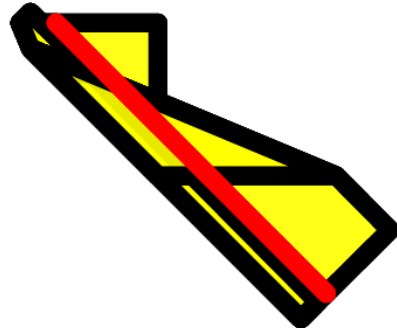
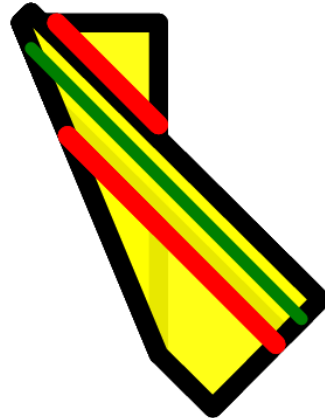
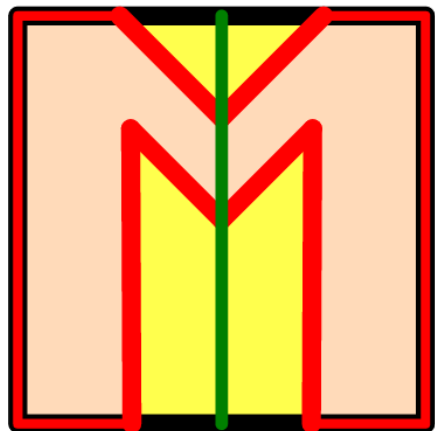
*CREASE PATTERN*



*ACTUAL FOLDING*  
[Jenny ramseyer & eli davis, 2012]



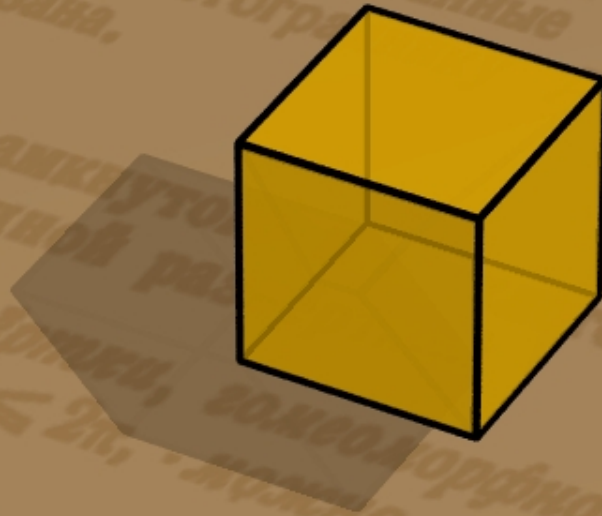






# Metamorphosis of the Cube

Demaine, Demaine, Lubiw, O'Rourke, Pashchenko 1999

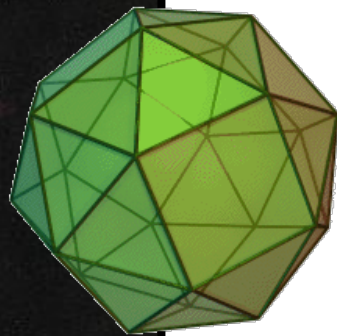
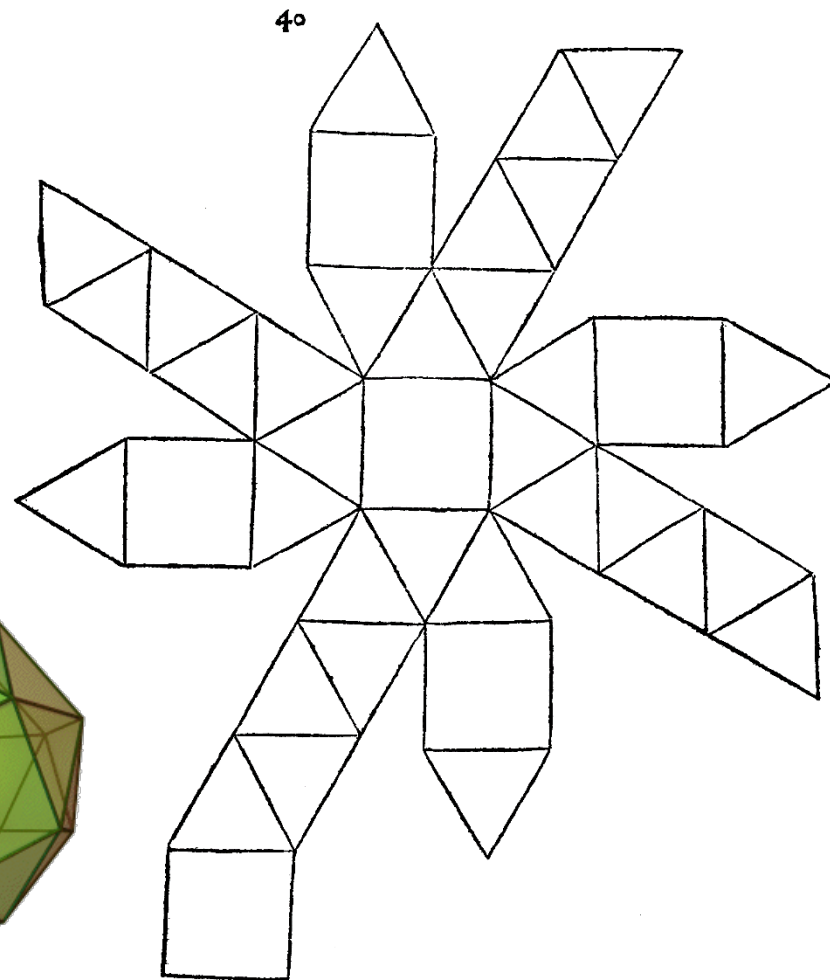






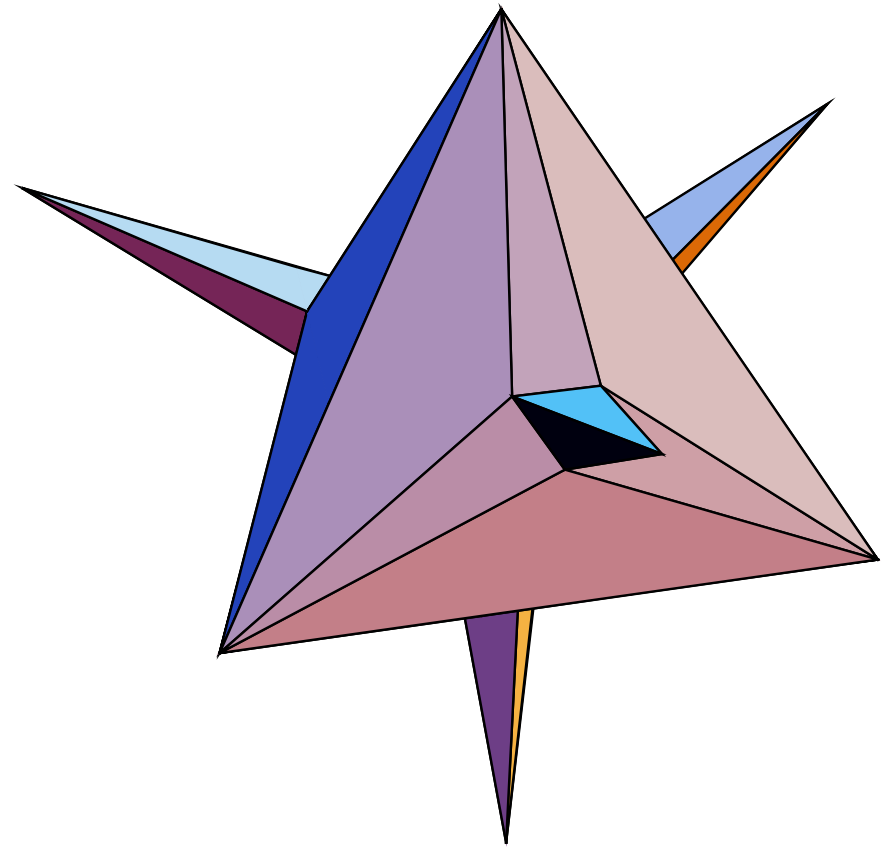
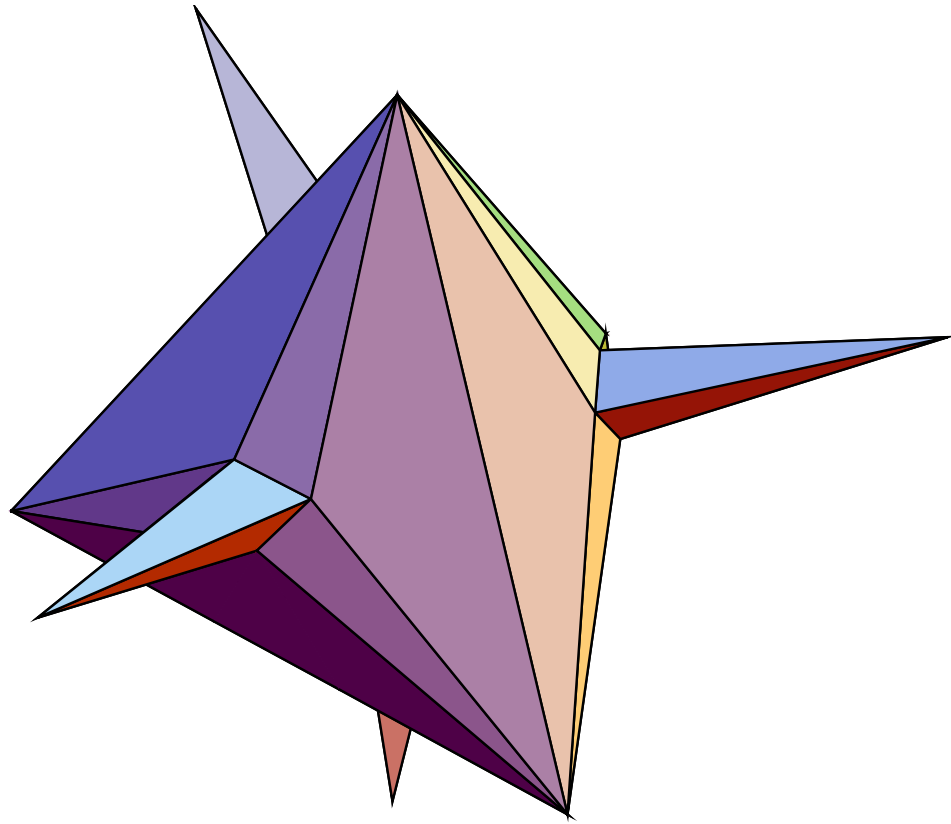
Albrecht Dürer (self-portrait)

**D**as Sechst corpus/so das aufthan wirt/hat es sechs gefierte/vnd zwey vnd dreyßig Dyangli  
che felder/so man das zûsamen leget.gewint es vier vnd zweynßig eck/vnnd sechßig scharp  
pfer seyten.

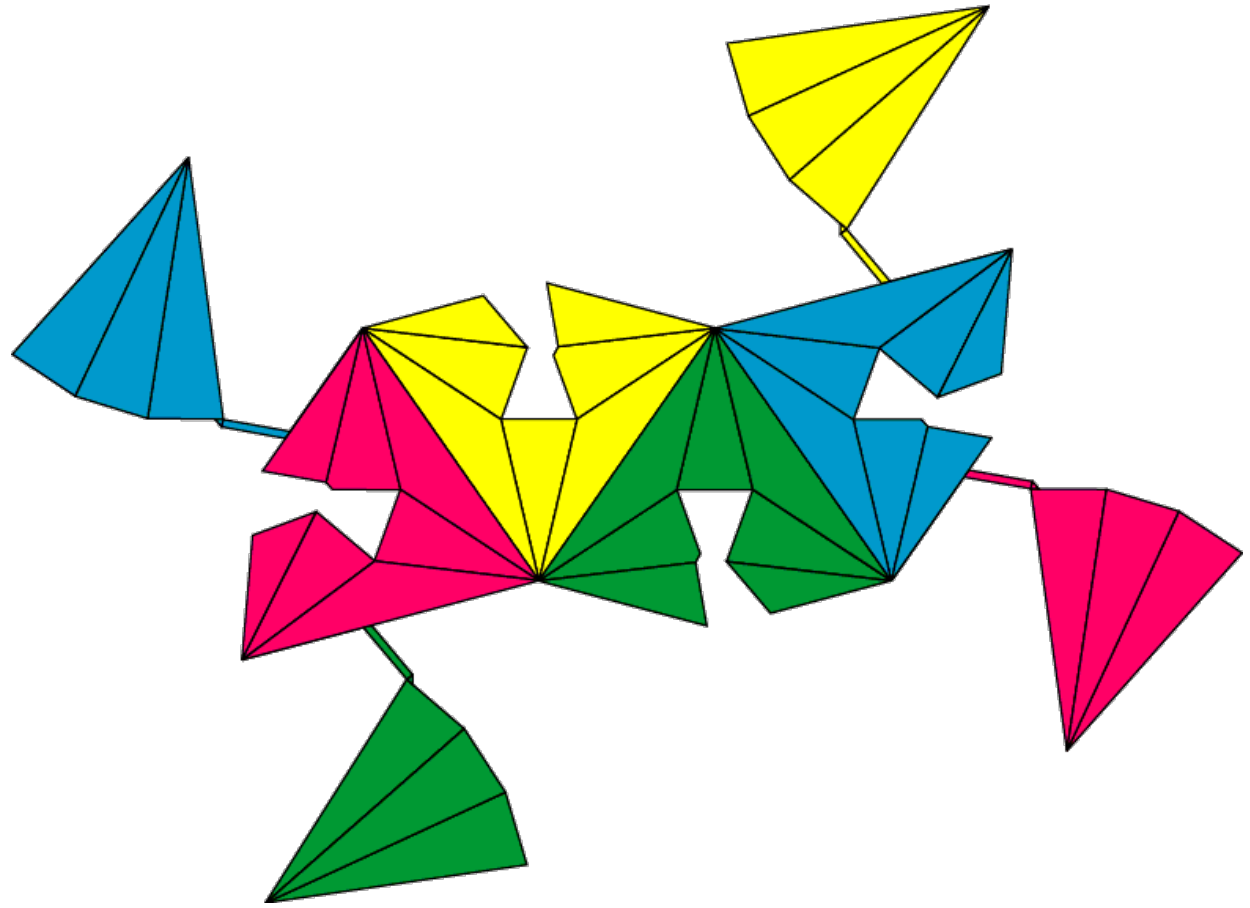
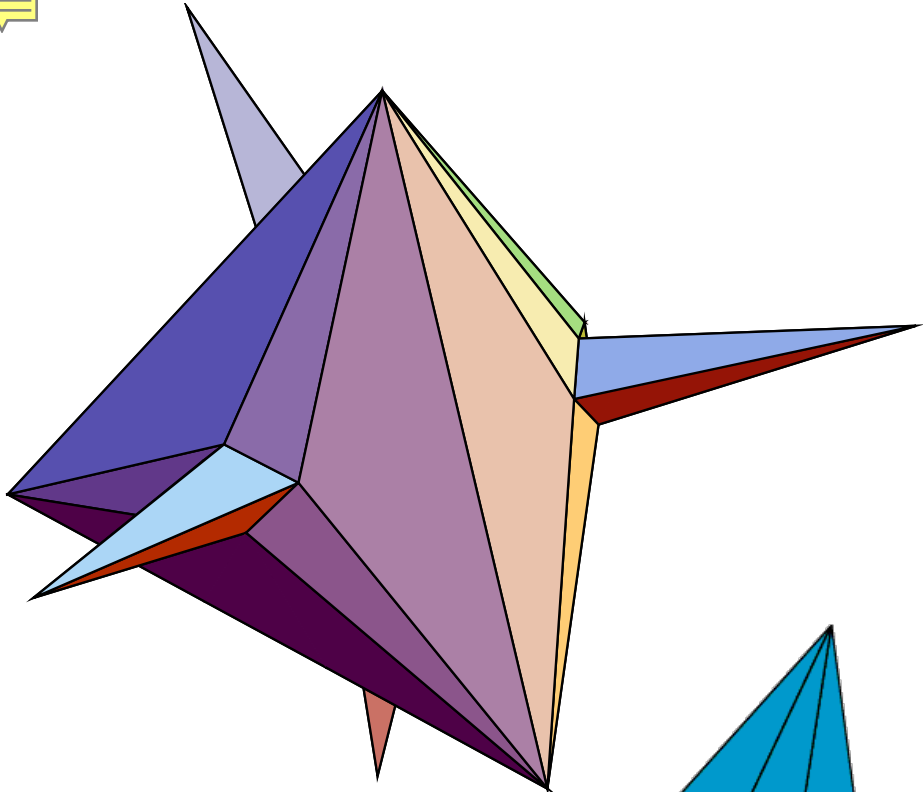


**D**as Sibent vnd nach folget corpus/so es offen leyt/hat es sechs acht ecketter/vñ acht sechs eck  
ter/vnd zwelf vier ecketter felder/vñ so man das zûsamen leget/so gewint es acht vnd vierßig  
eck/vnd zwo vnd sibenzig scharpfer seyten.

The Painter's Manual [1525]



[Bern, Demaine,  
Eppstein, Kuo, Mantler,  
Snoeyink 2003]

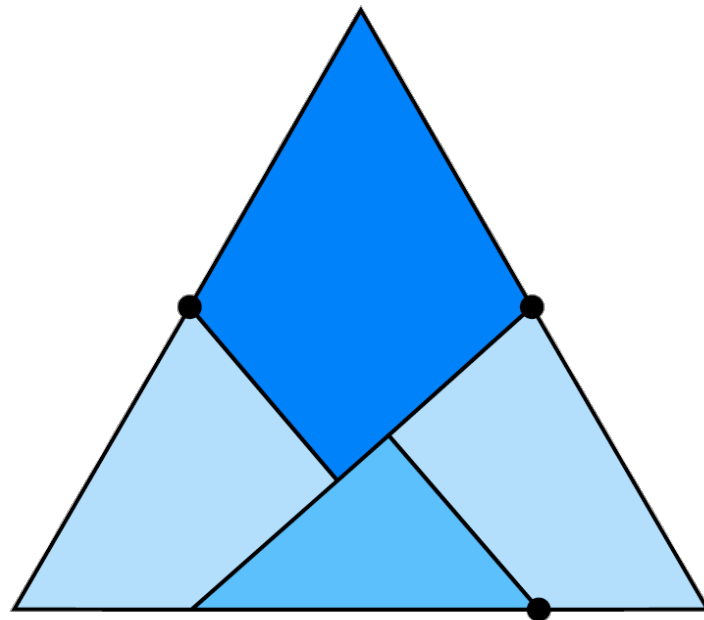
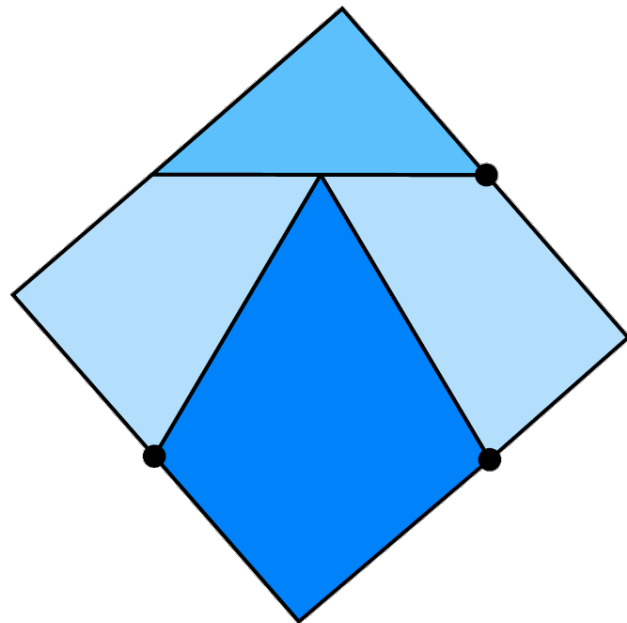
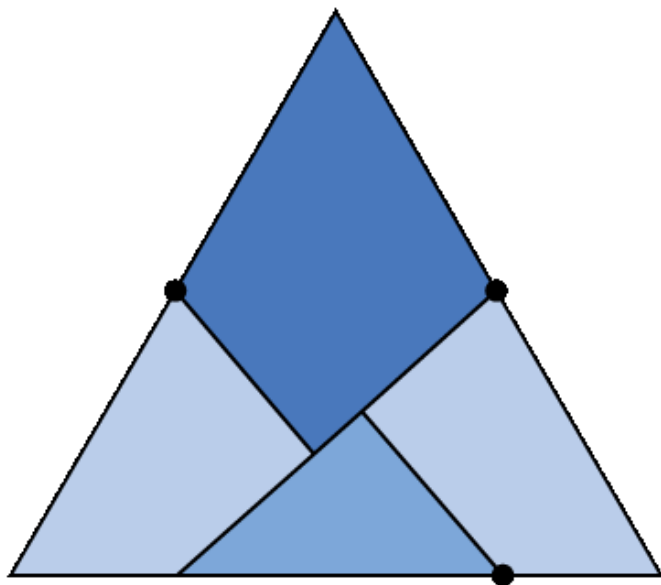


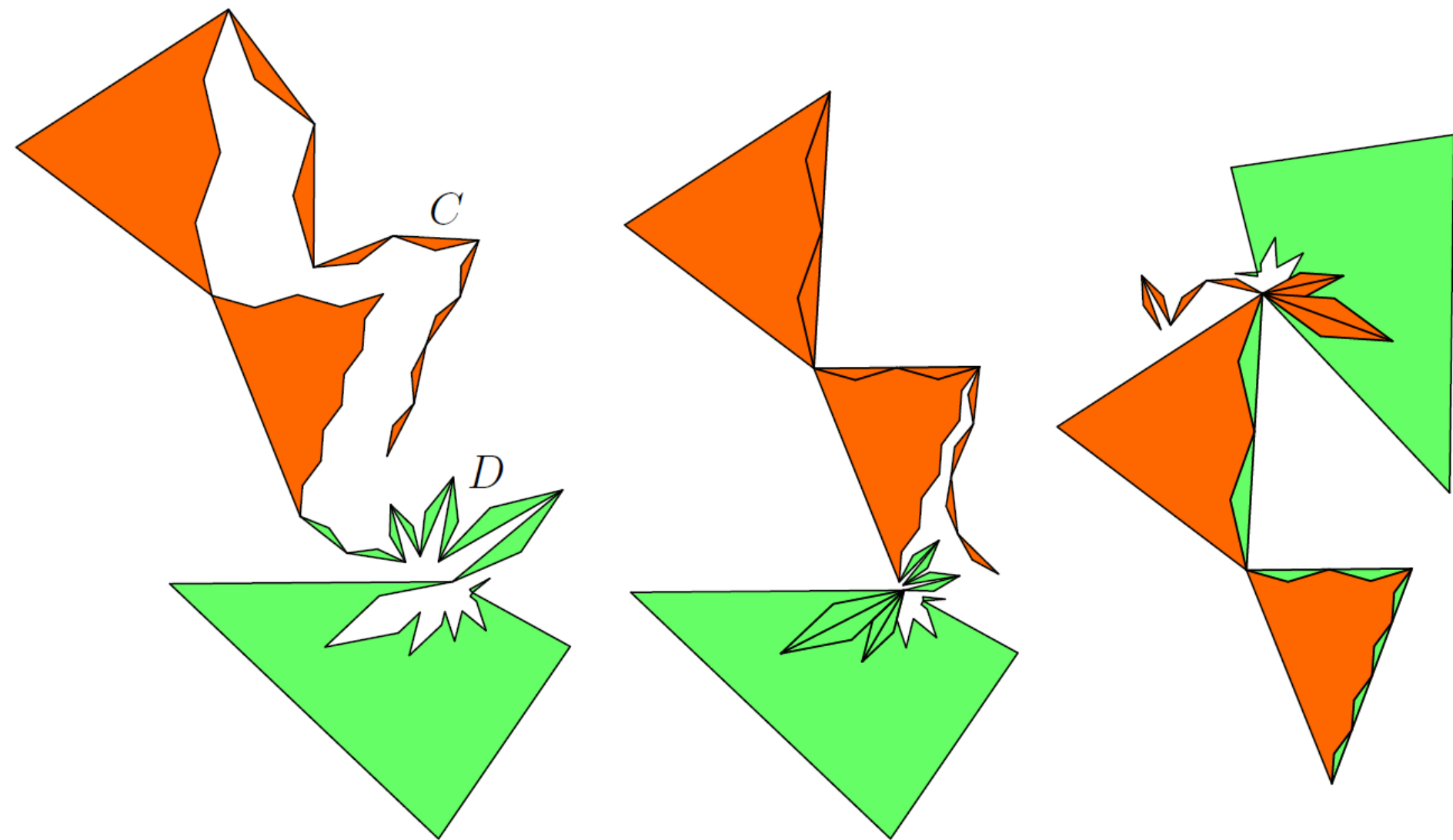
[Bern, Demaine,  
Eppstein, Kuo, Mantler,  
Snoeyink 2003]





[Dudeney 1902]





[Abbott, Abel, Charlton, Demaine, Demaine, Kominers 2010]

**The Helium Stockpile**  
[Demaine, Demaine,  
Palmer 2006]

