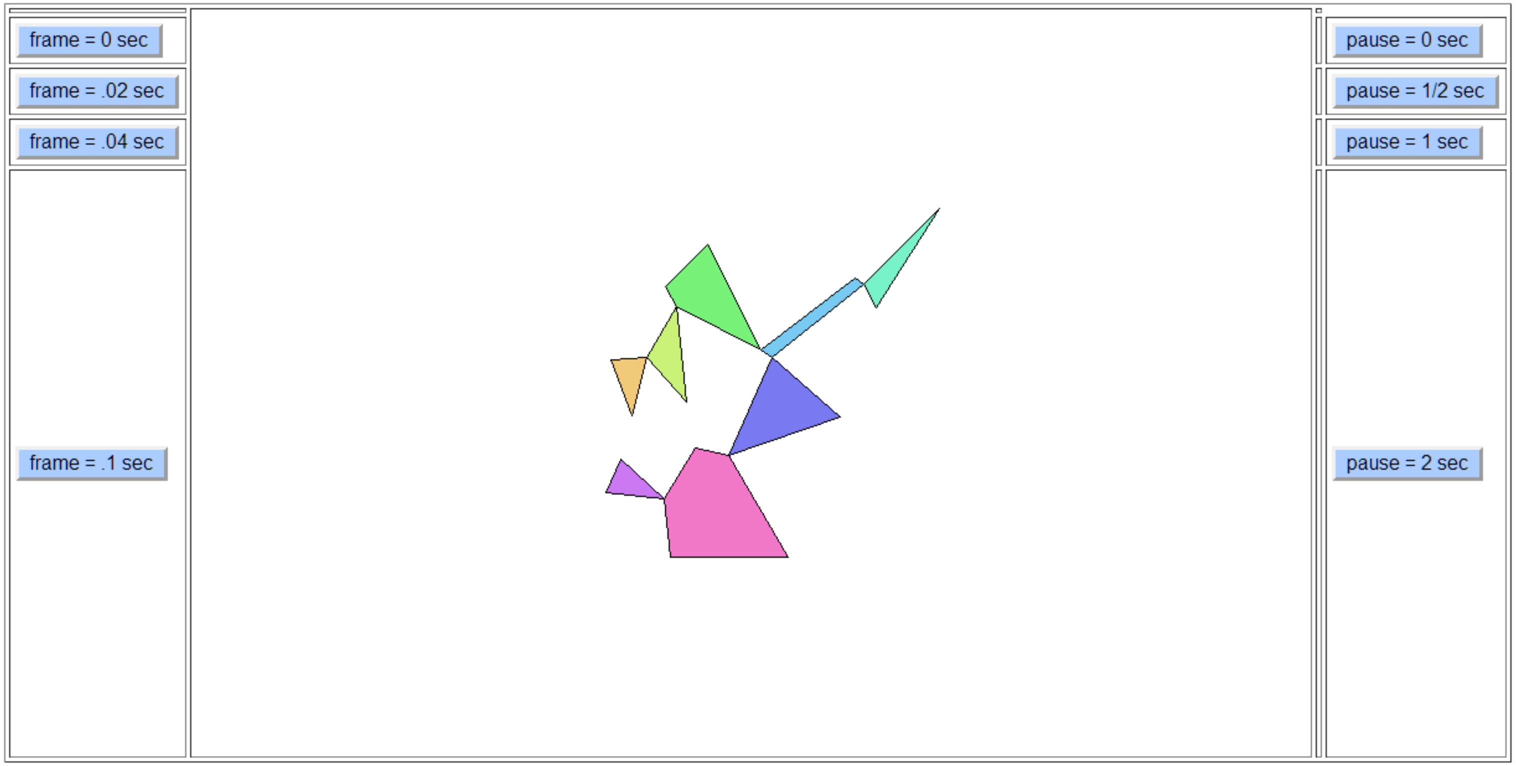
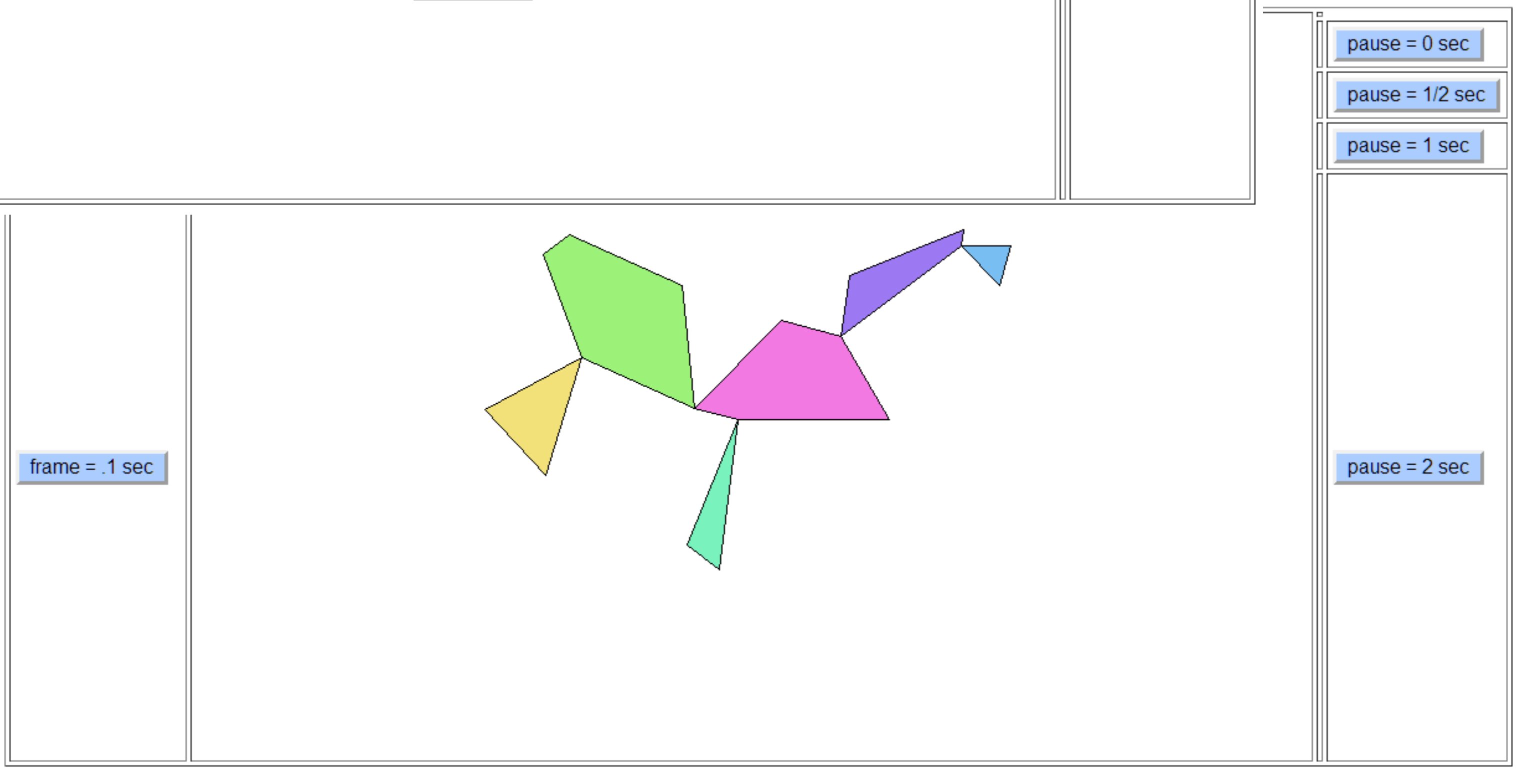
Is there software for hinged dissections?





[Mabry 2005]

Courtesy of Rick Mabry. Used with permission.
Refer to: http://lsusmath.rickmabry.org/rmabry/live3d/hinged-triangle-pentagon.htm.

Cover of books removed due to copyright restrictions.

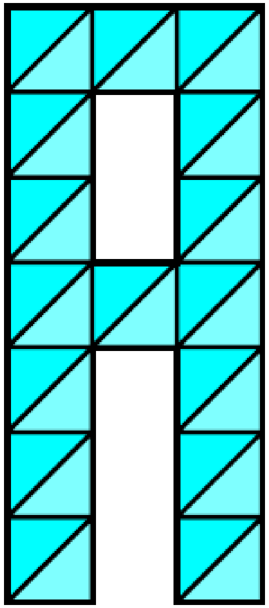
Refer to:

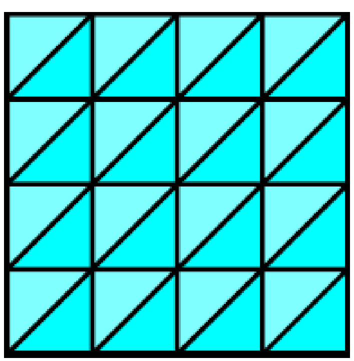
Frederickson, Greg N. *Dissections: Plane & Fancy*. Cambridge University Press, 1997.
Frederickson, Greg N. *Hinged Dissections: Swinging & Twisting*. Cambridge University Press, 2002.
Frederickson, Greg N. *Piano-Hinged Dissections*. Cambridge University Press, 2006.

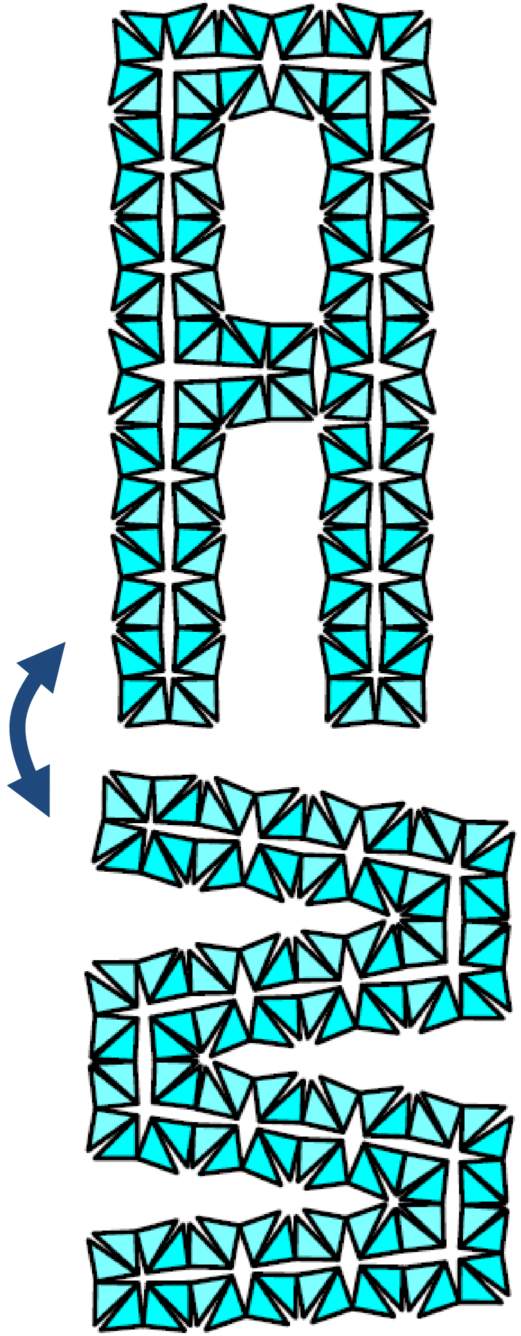
“Hinged alphabet”

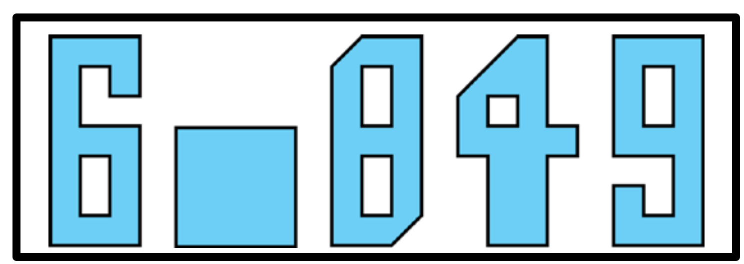
Erik & Martin Demaine

2003

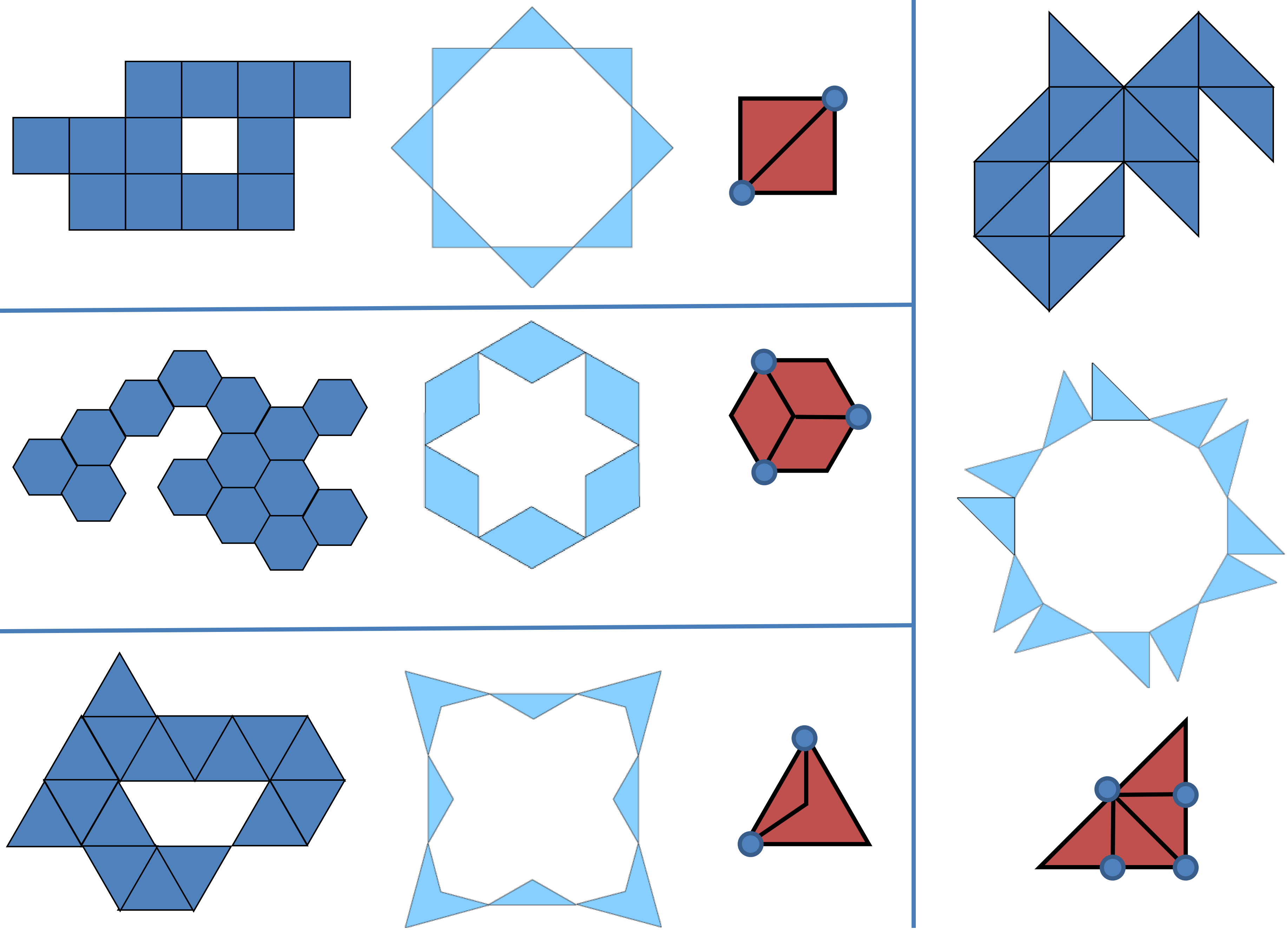






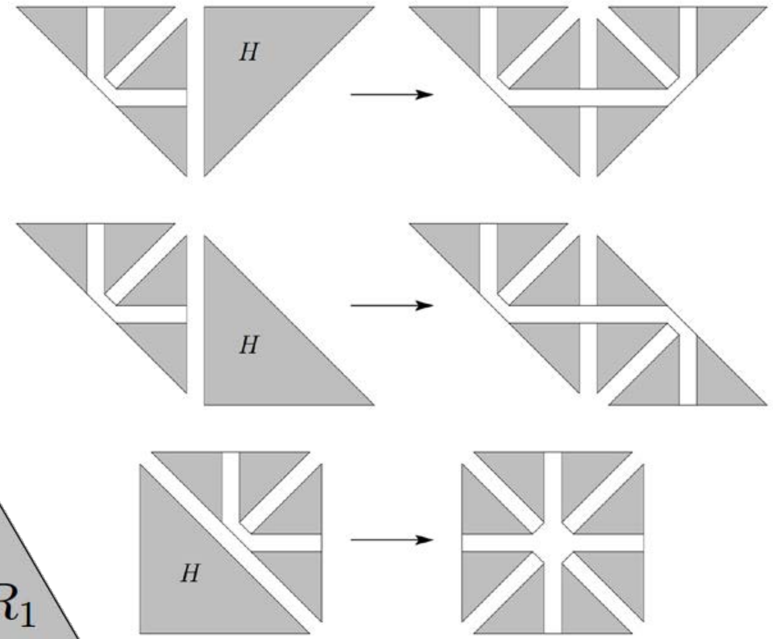


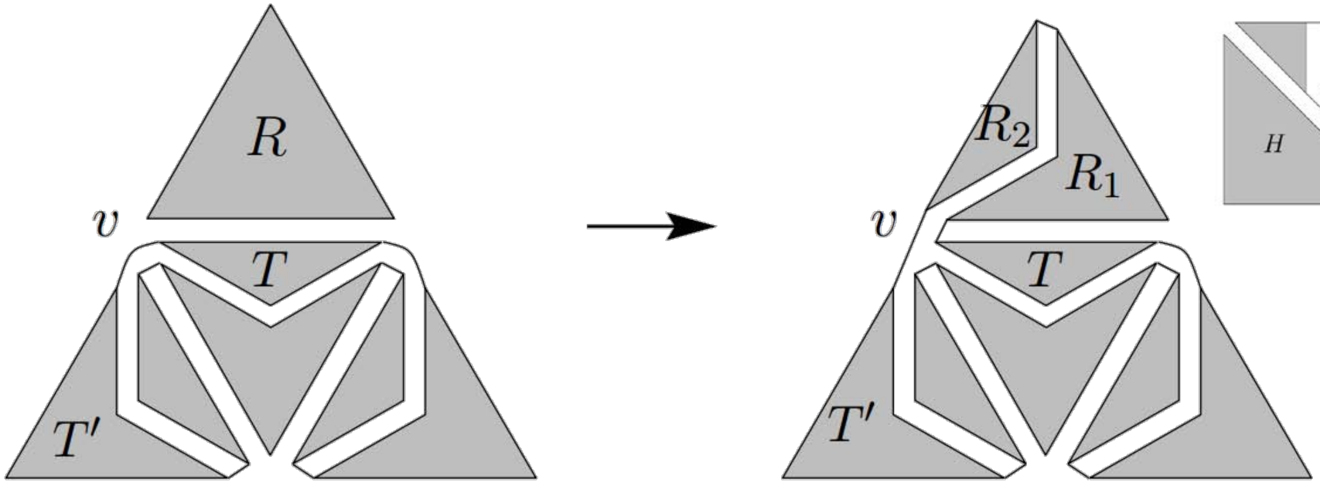
Courtesy of Erik Demaine and Martin Demaine. Used with permission.

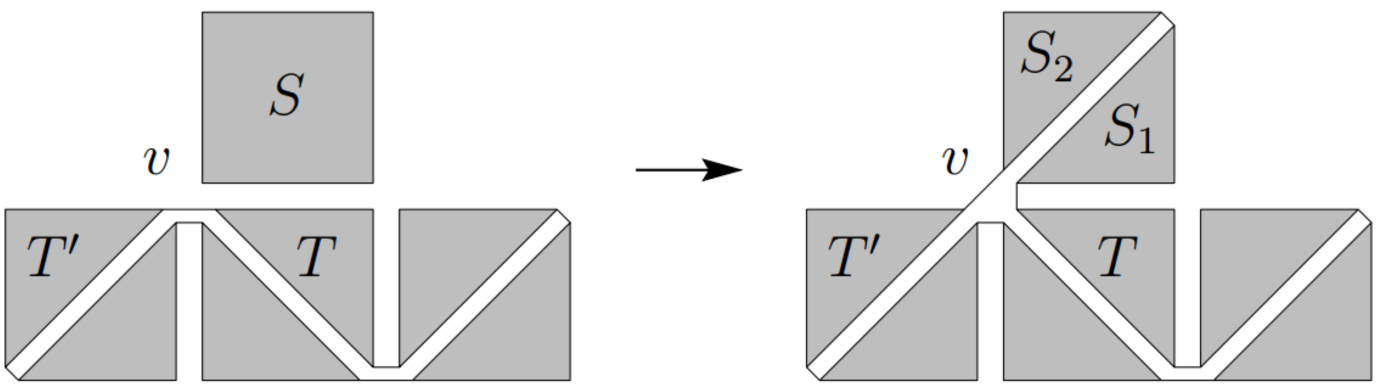


[Demaine, Demaine, Eppstein, Frederickson, Friedman 1999/2005]

[Demaine, Demaine, Eppstein, Frederickson, Friedman 1999/2005]







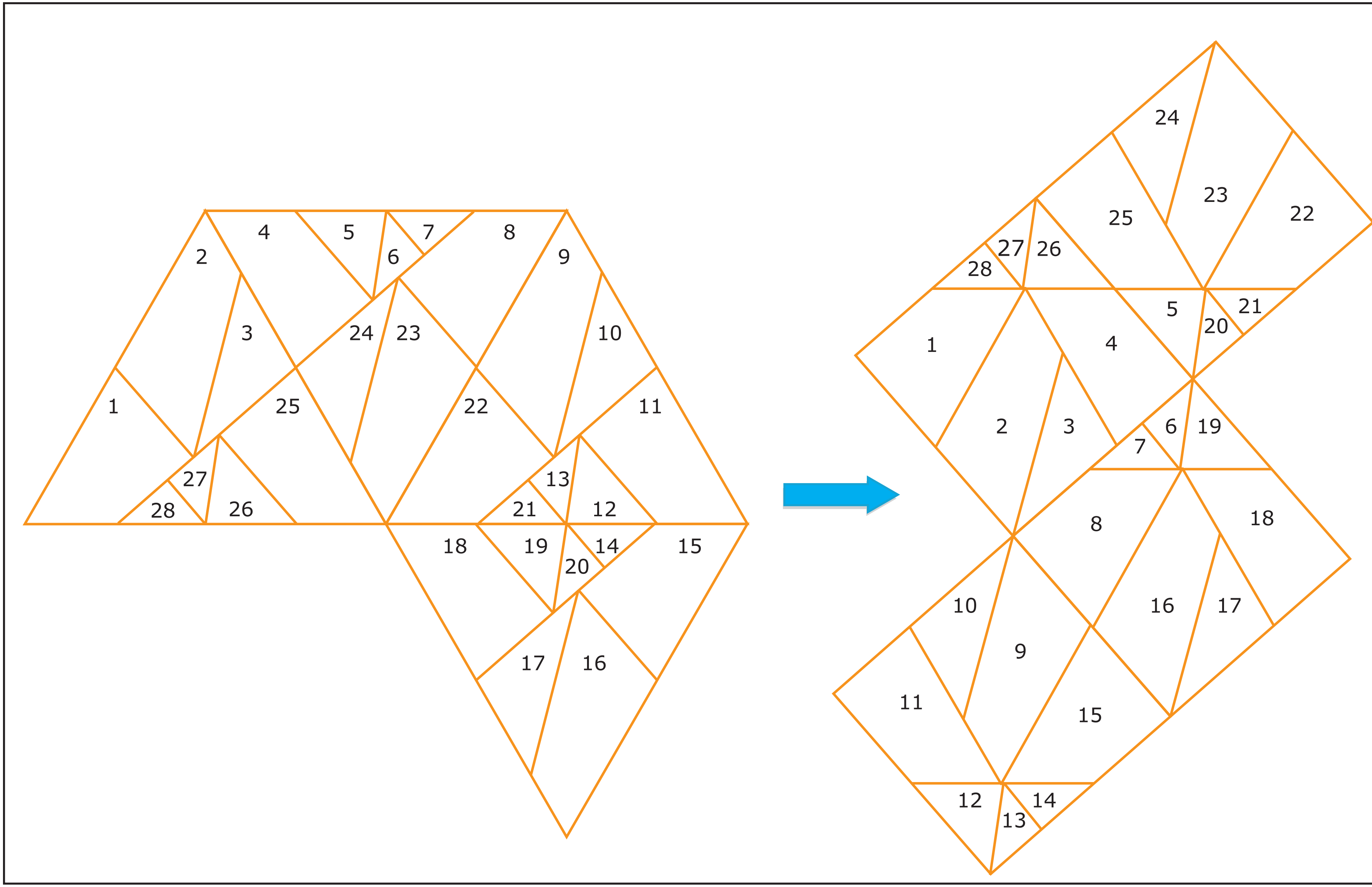
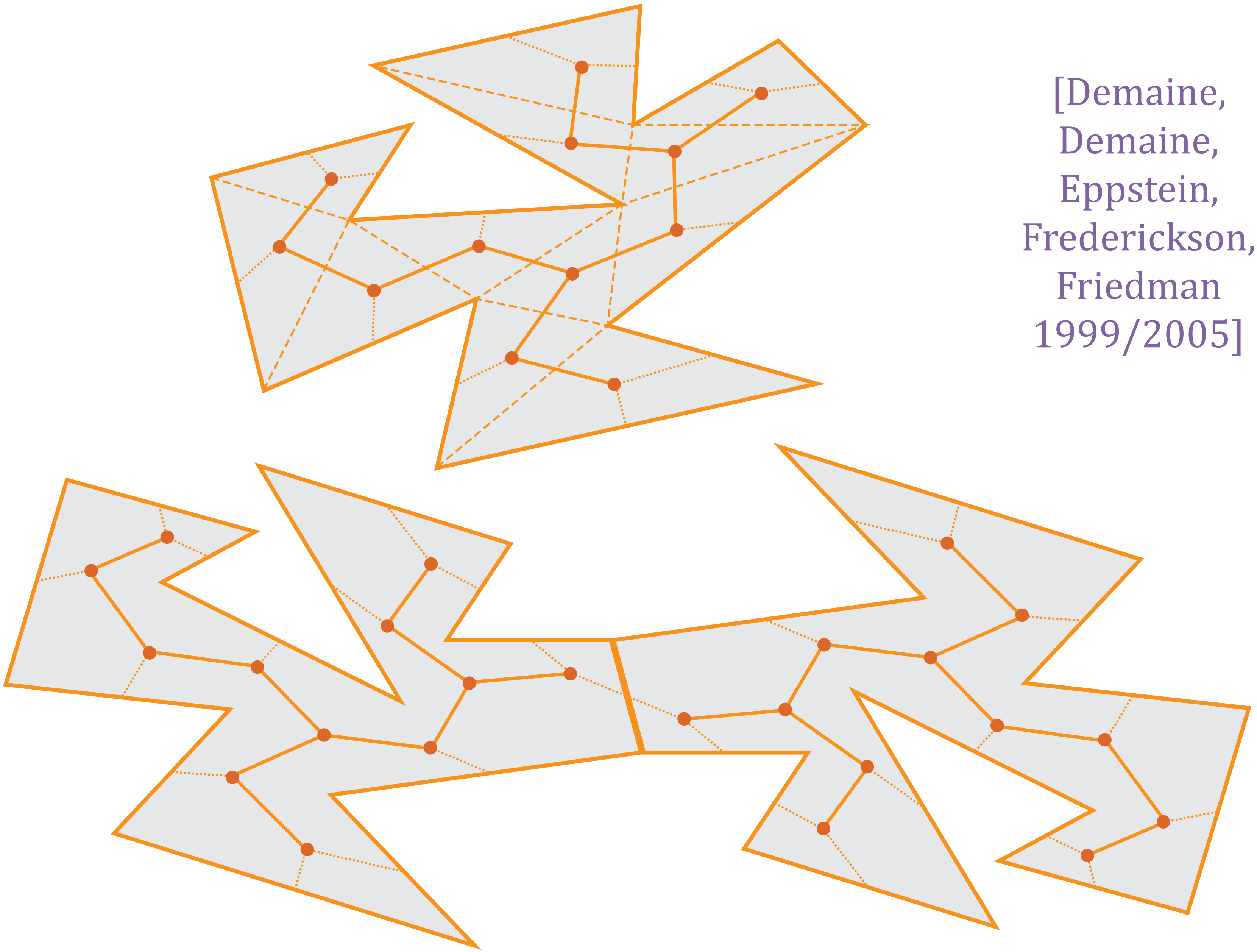


Image by MIT OpenCourseWare.

[Demaine, Demaine, Eppstein, Frederickson, Friedman 1999/2005]



[Demaine, Demaine, Eppstein, Frederickson, Friedman 1999/2005]

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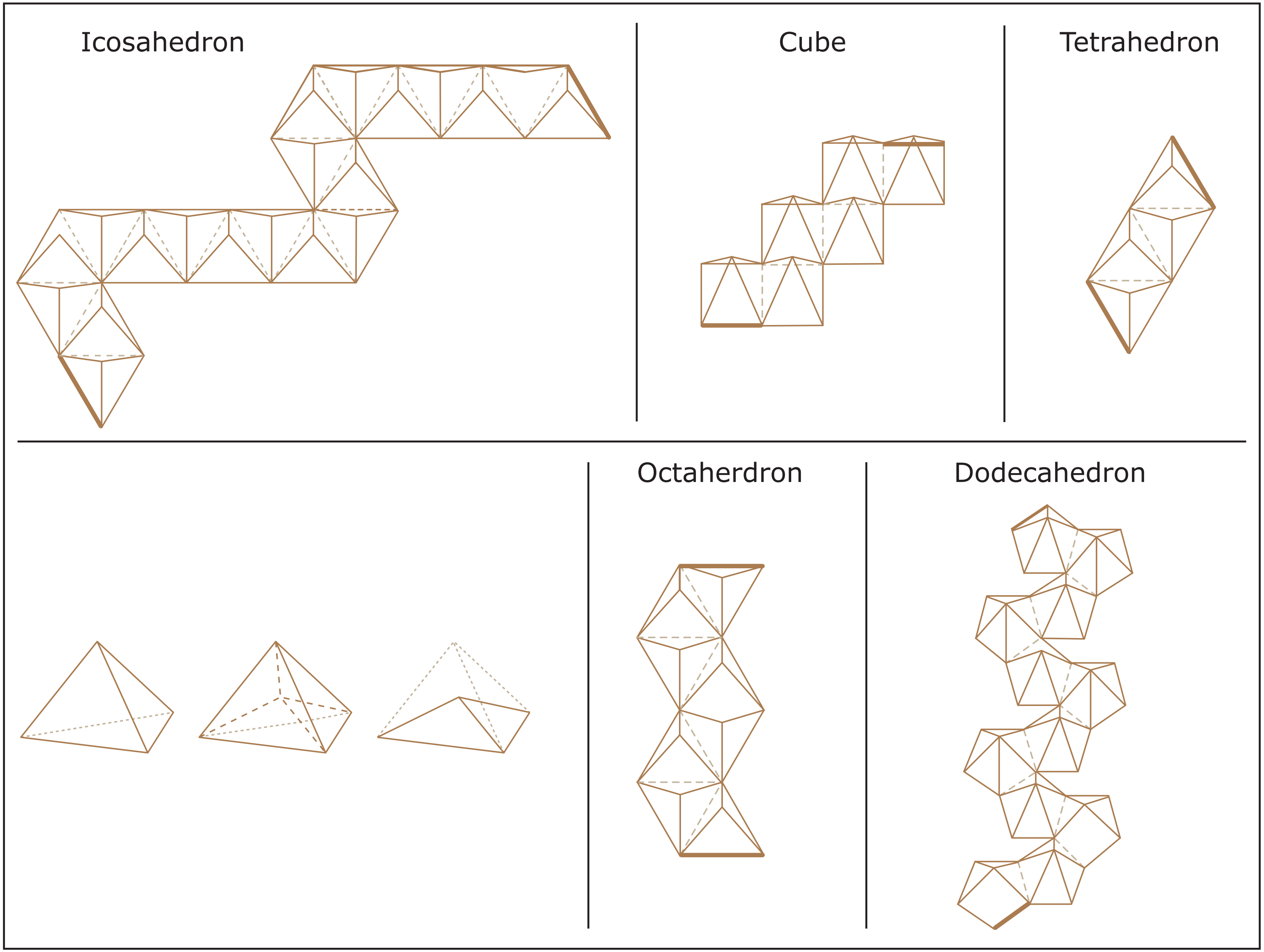


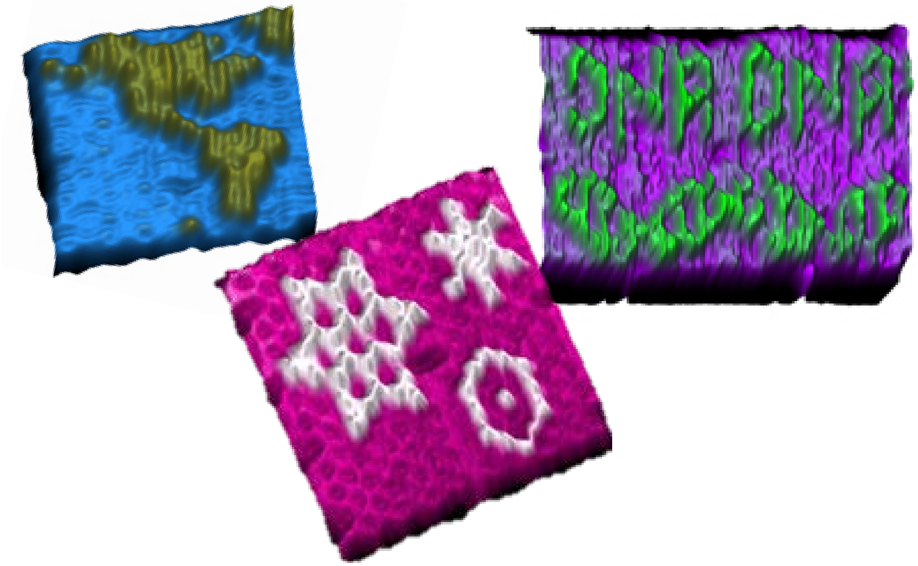
Image by MIT OpenCourseWare.

[Demaine, Demaine, Lindy, Souvaine 2005]

Images removed due to copyright restrictions.

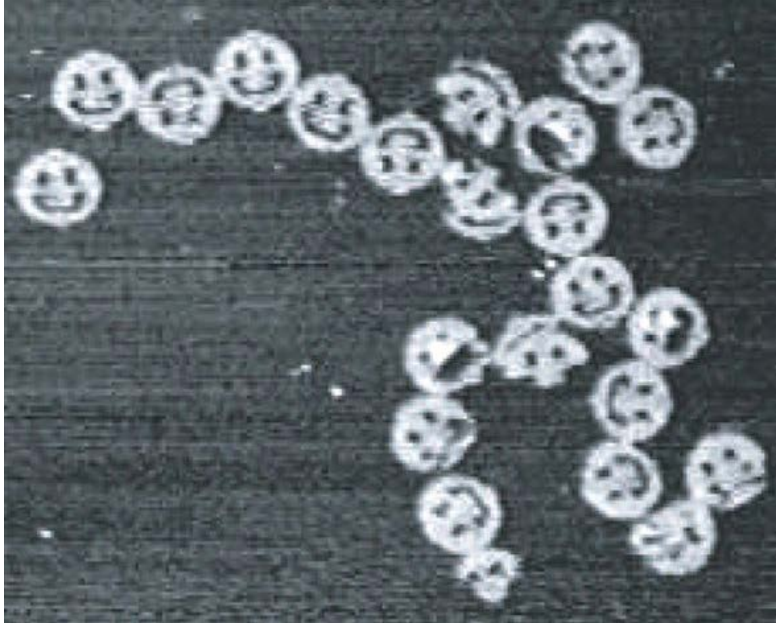
Refer to: Fig. 2, 3 from Chengede, M., V. R. Thalladi. "Communication Dissections: Self-Assembled Aggregates That Spontaneously Reconfigure Their Structures When Their Environment Changes." *J. Am. Chem. Soc.* 124, no. 49 (2002): 14508–9.

[Mao, Thalladi, Wolfe, Whitesides, Whitesides 2002]

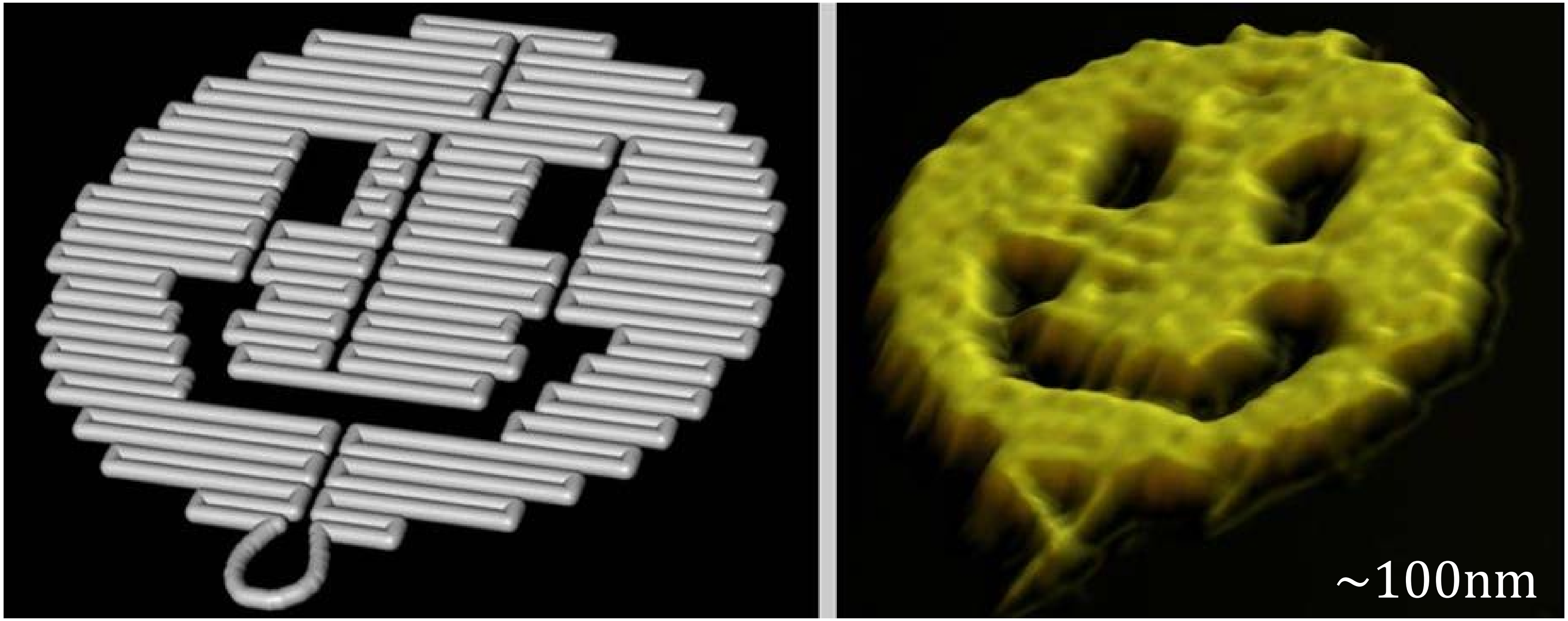


Courtesy of Paul W. K. Rothemund. Used with permission.

[Rothemund — Nature 2006]



Courtesy of Nature Publishing Group. Used with permission.



Courtesy of Paul W. K. Rothemund. Used with permission.

Programmable Assembly With Universally Foldable Strings (Moteins)

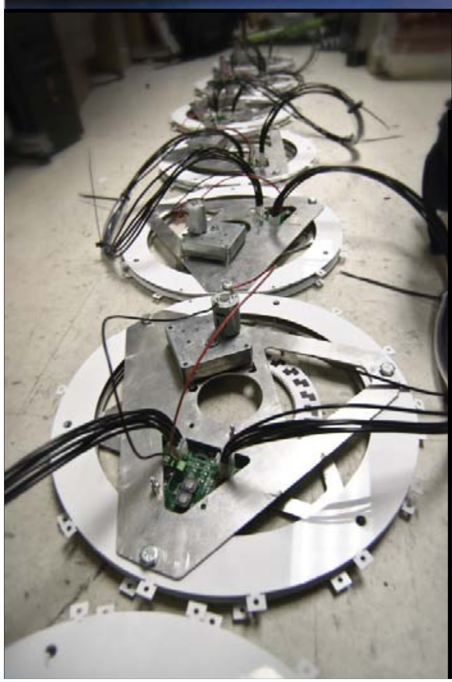
Kenneth C. Cheung, Erik D. Demaine, Jonathan R. Bachrach, and Saul Griffith

To view video: http://vimeo.com/4855377.

Macrobot

Decibot, 144″ × 18″ × 18″

MIT Center for Bits & Atoms



To view video: http://vimeo.com/8002813.

Crystalline (3x) [Dartmouth/ MIT 2001]

Photograph of robots removed due to copyright restrictions.

Refer to: CSAIL wiki for the Self-Reconfiguring Crystal Robot; webpage for M-TRAN; video of Molecubes.

M-TRAN (8x) [Tokyo 2002–2006] Molecubes (4x) [Cornell 2005]

Can we see the dissection of a rectangle into a rectangle of another height?

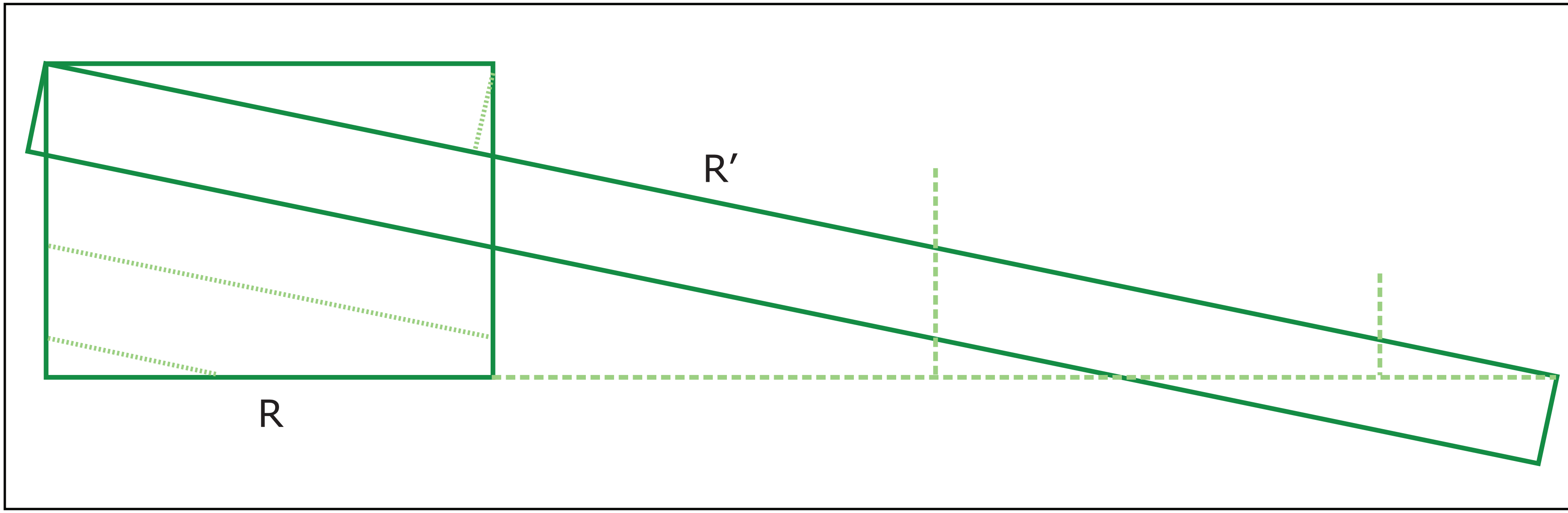
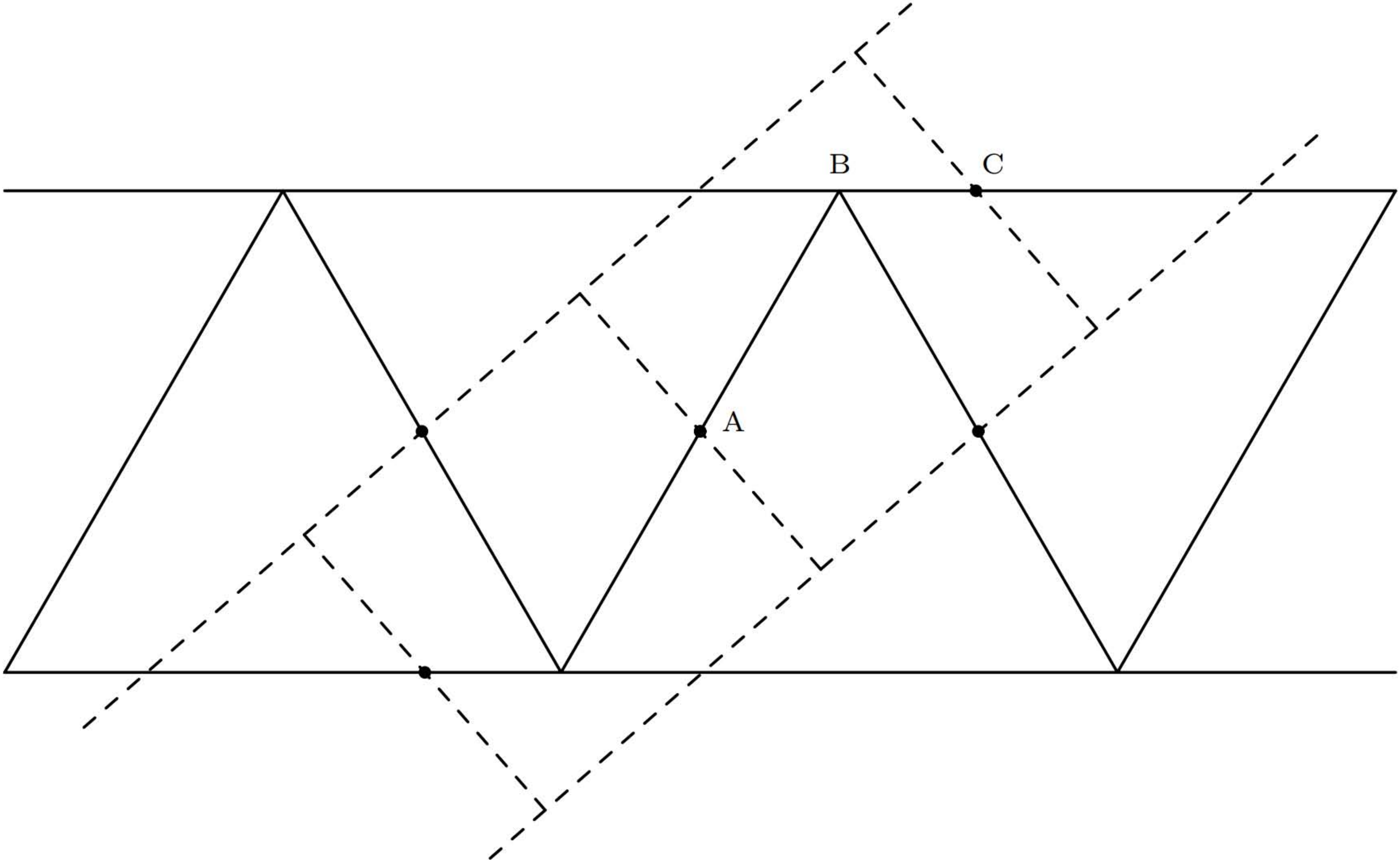
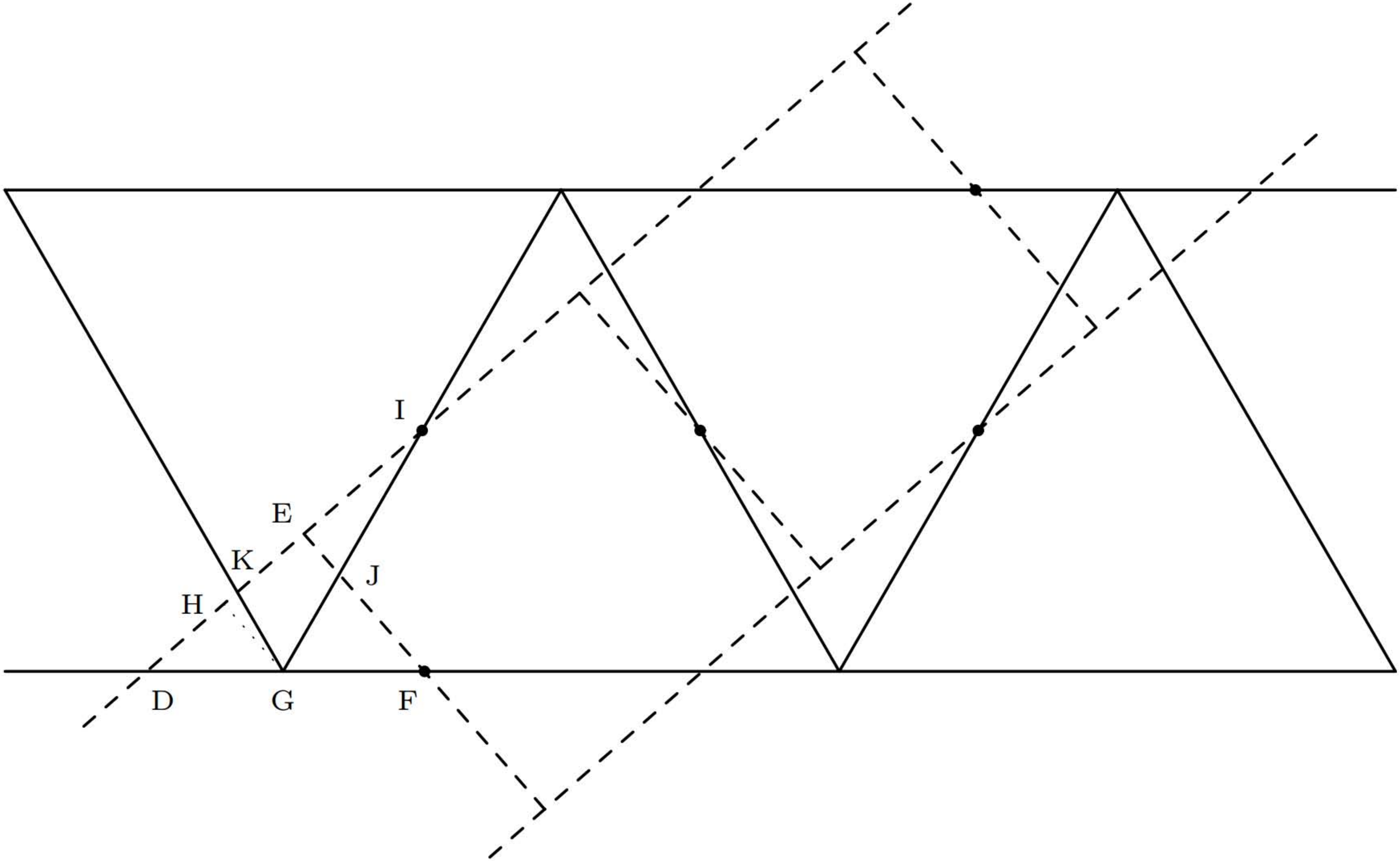


Image by MIT OpenCourseWare.

[Montucla]
[Ozanam 1778]
[Frederickson 1997]

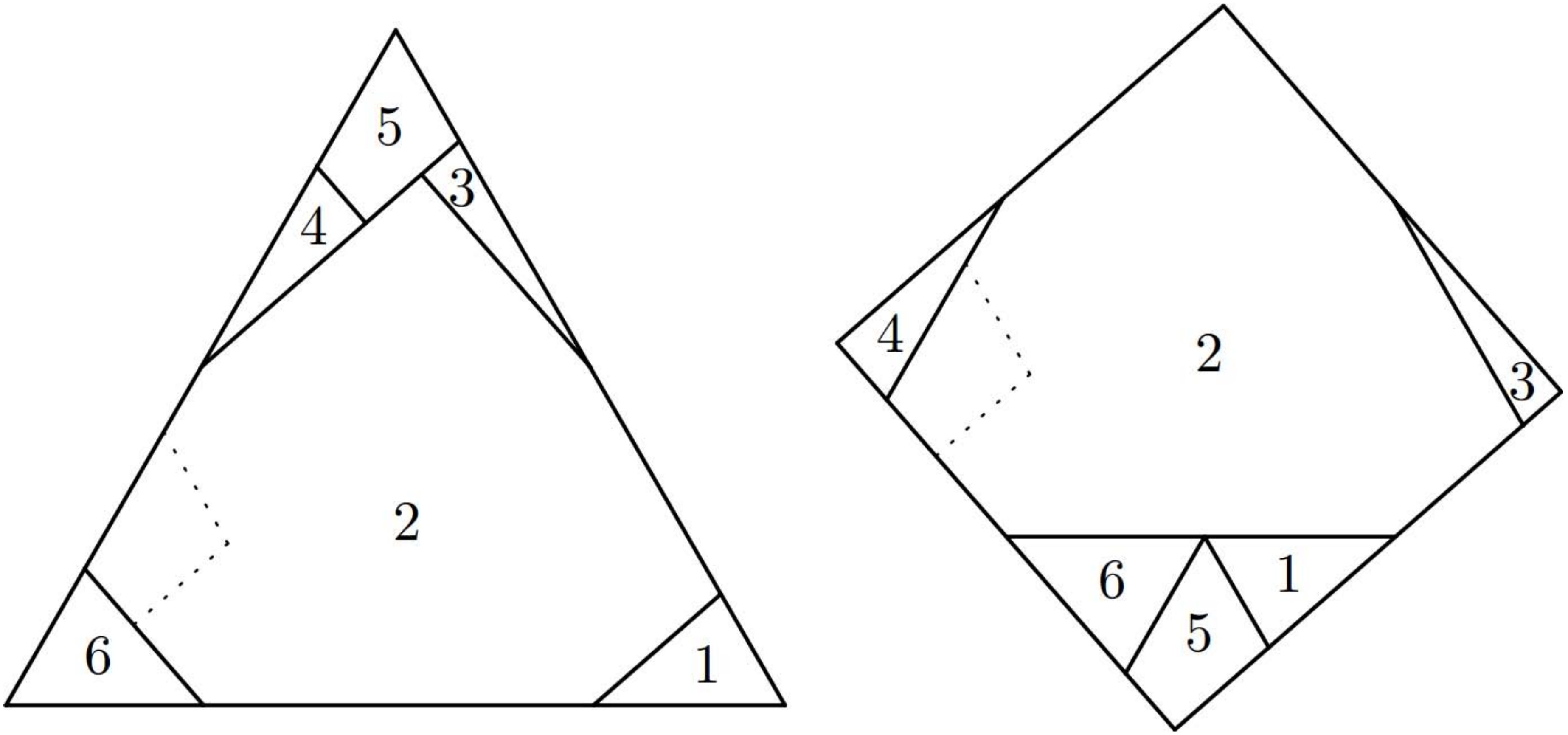


[Dudeney 1902]
[Frederickson 2008]

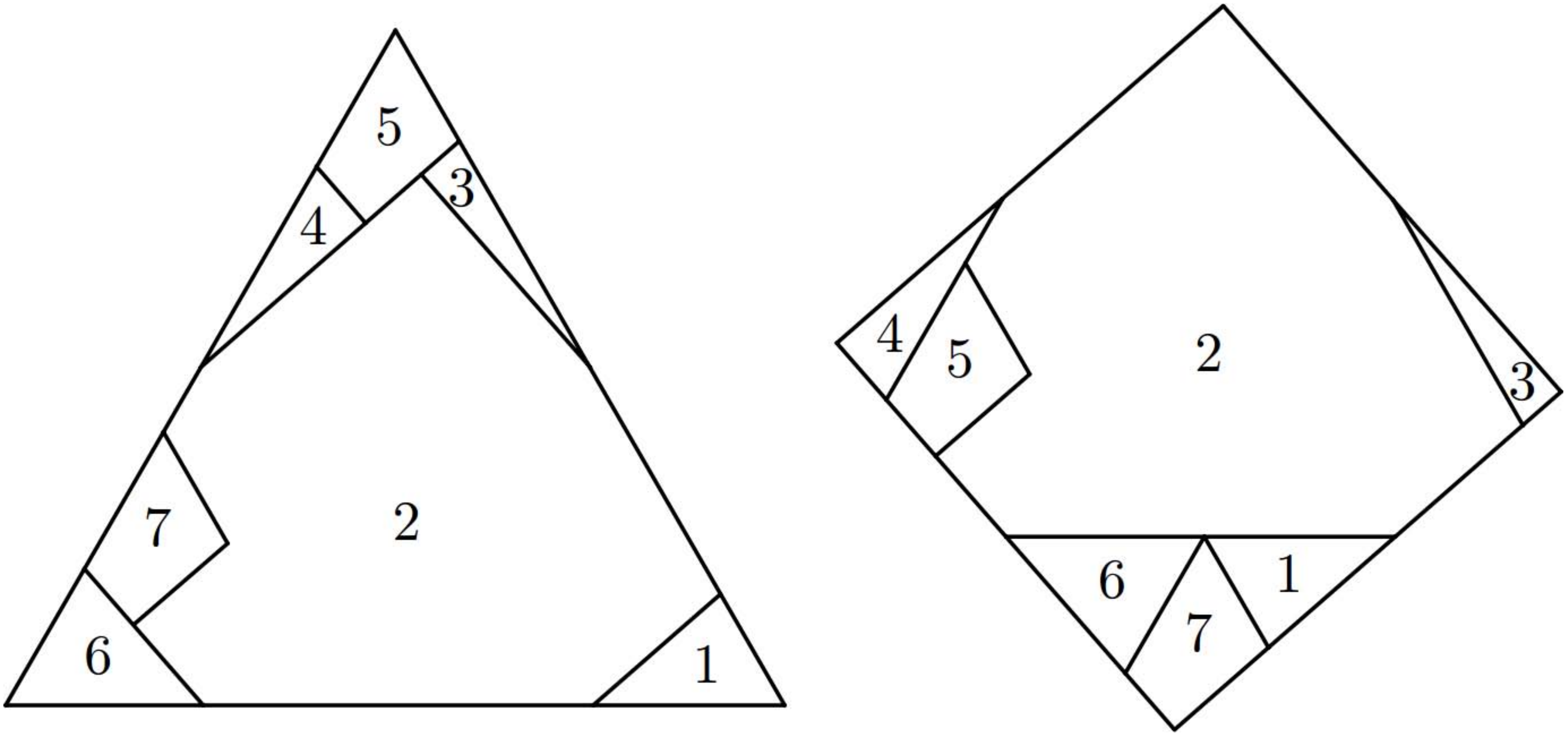


Frederickson, Greg N. "Designing a Table Both Swinging and Stable." *The College Mathematics Journal* 39, no. 4 (2008): 258-66.

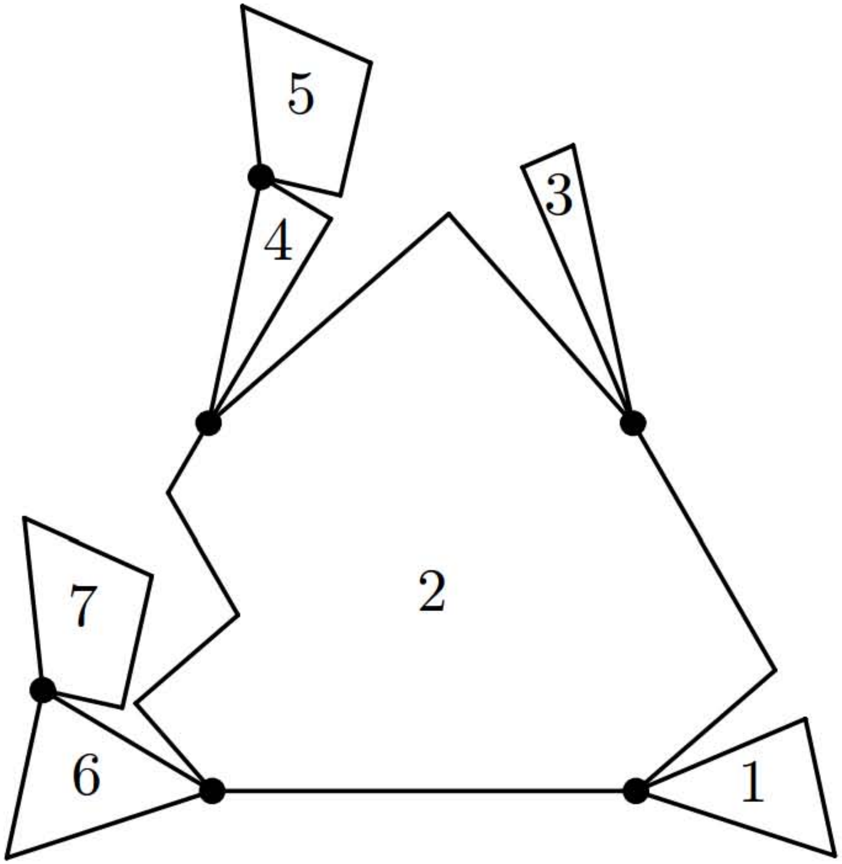
[Frederickson 2008]

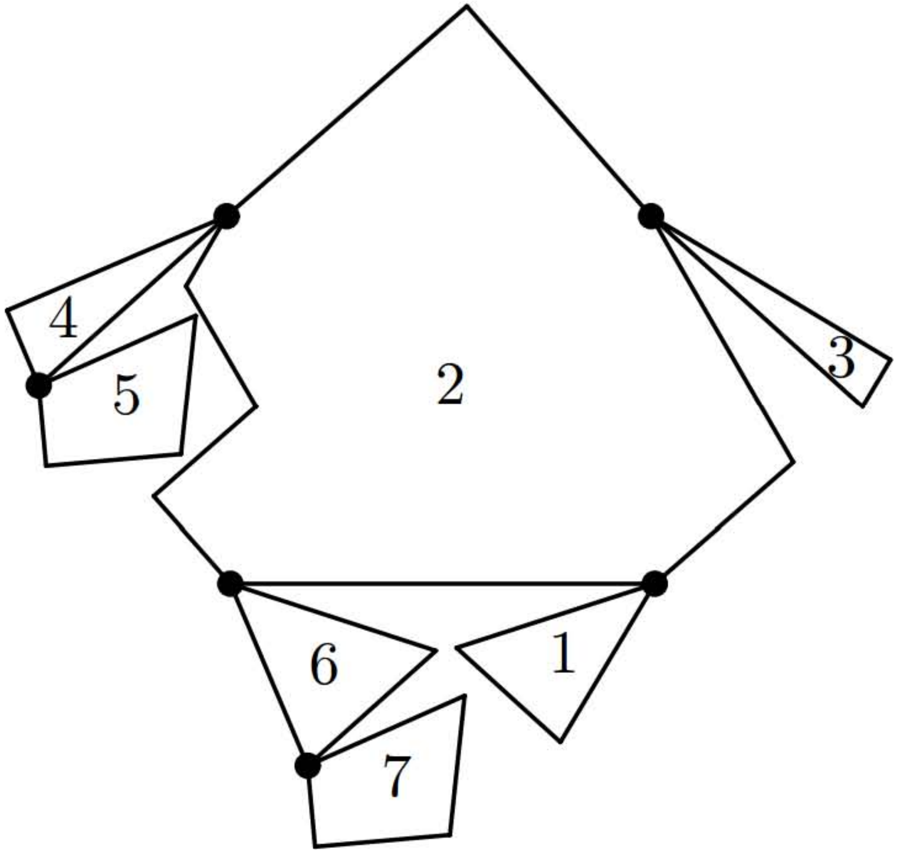


[Frederickson 2008]



[Frederickson 2008]





[Frederickson 2008]

Still from animation of hinging triangle to square removed due to copyright restrictions.
To view animation: http://www.cs.purdue.edu/homes/gnf/book2/anim34SS.mpg.

[Frederickson 2008]

Photograph removed due to copyright restrictions.
To view video: http://vimeo.com/37822655.

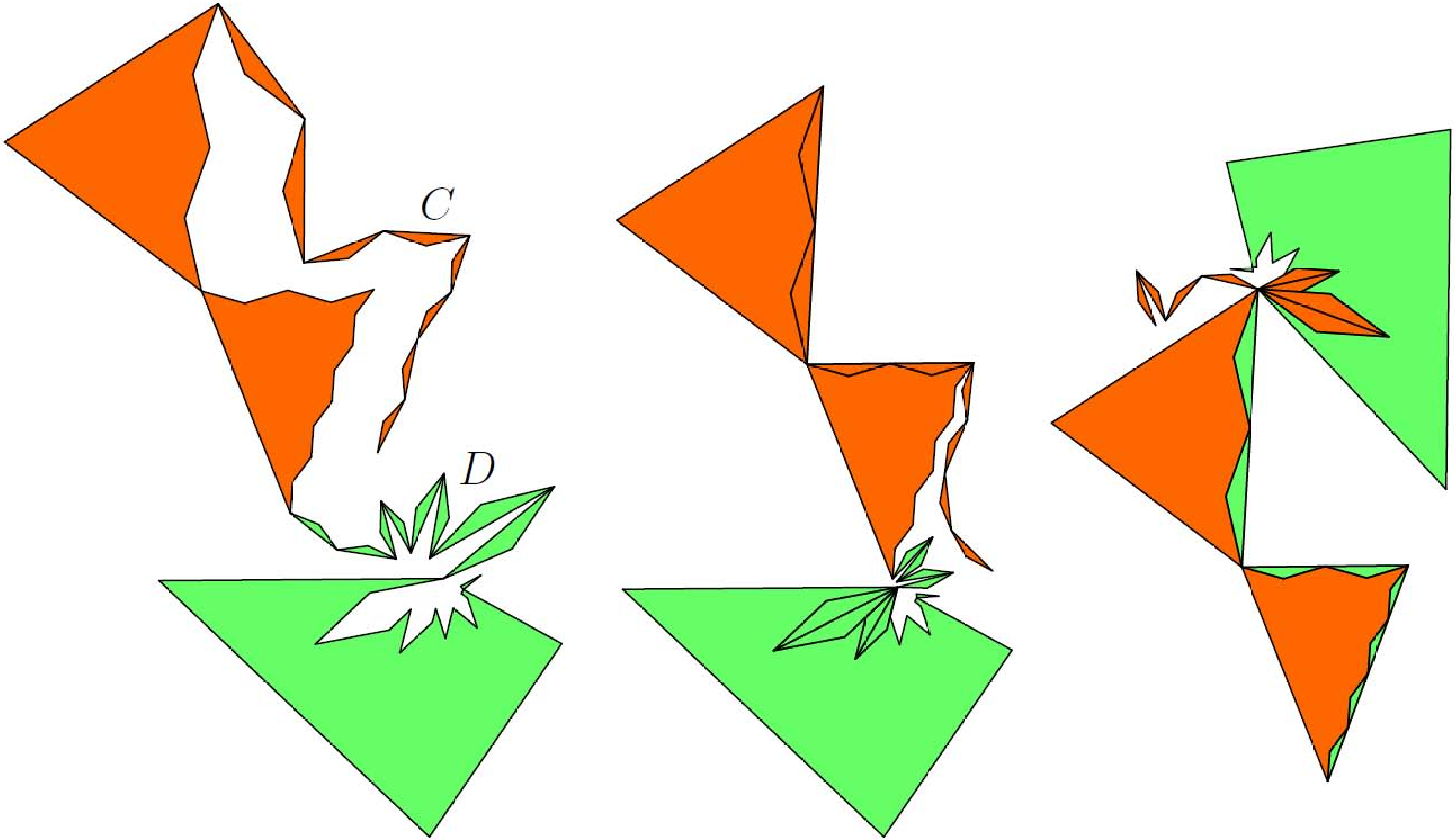
[D*Haus Company Ltd, 2012]

Photograph removed due to copyright restrictions.

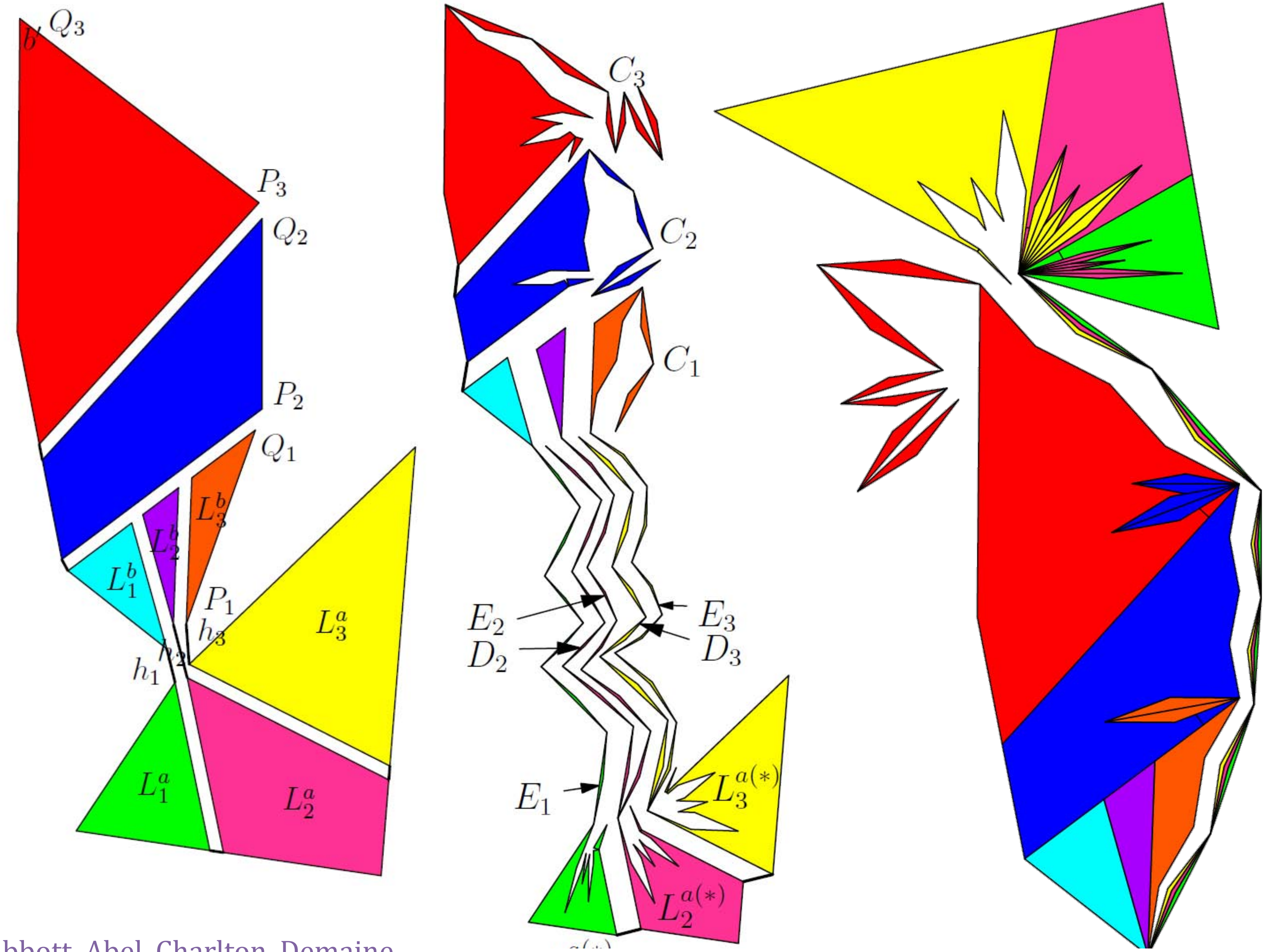
To view video: http://vimeo.com/30108578.

[D*Haus Company Ltd, 2011]

For step 3 of hinged dissections, you said that the number of pieces roughly doubles at each step, but from the diagrams it looks like the number of pieces would more than double.

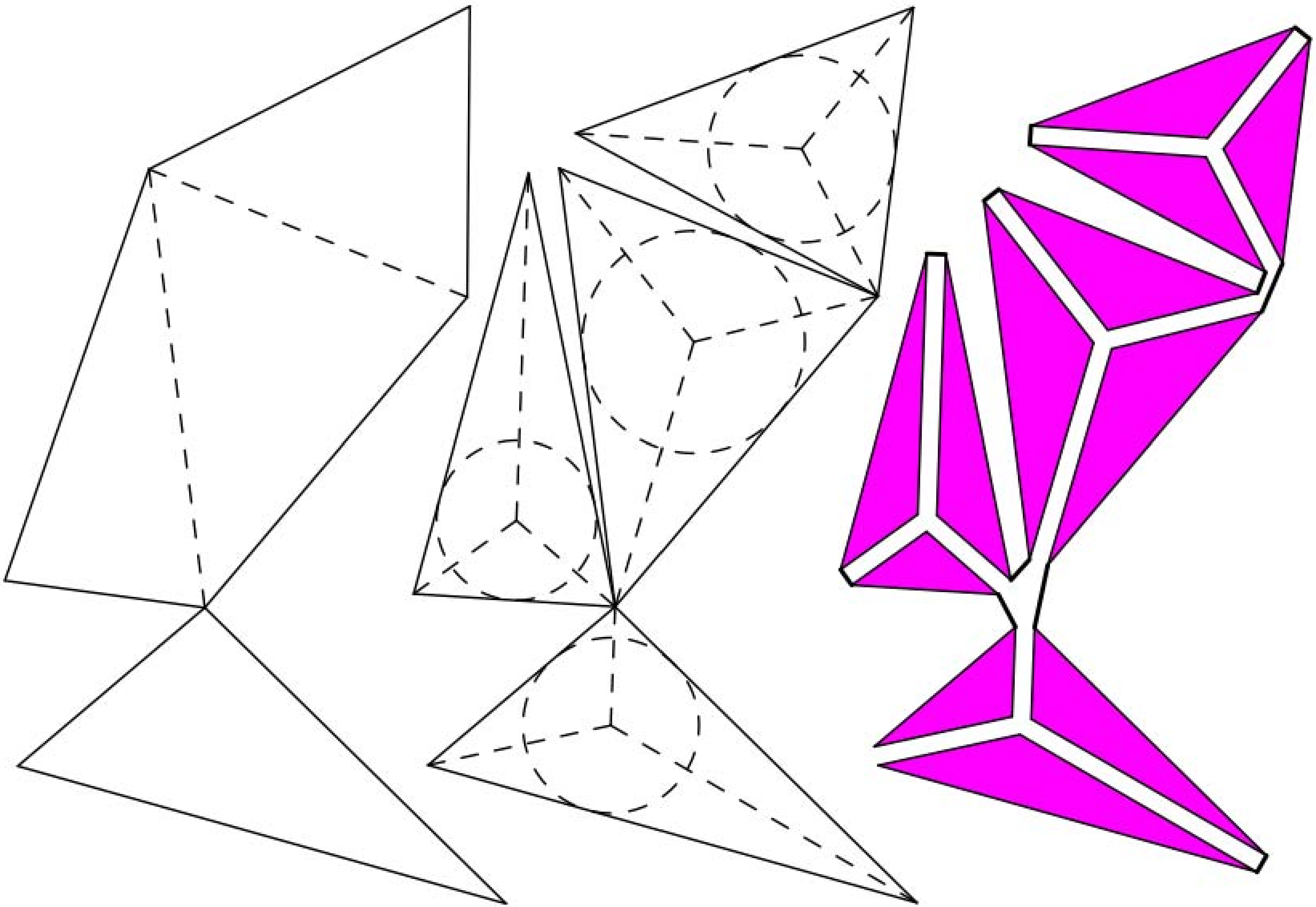


[Abbott, Abel, Charlton, Demaine, Demaine, Kominers 2010]



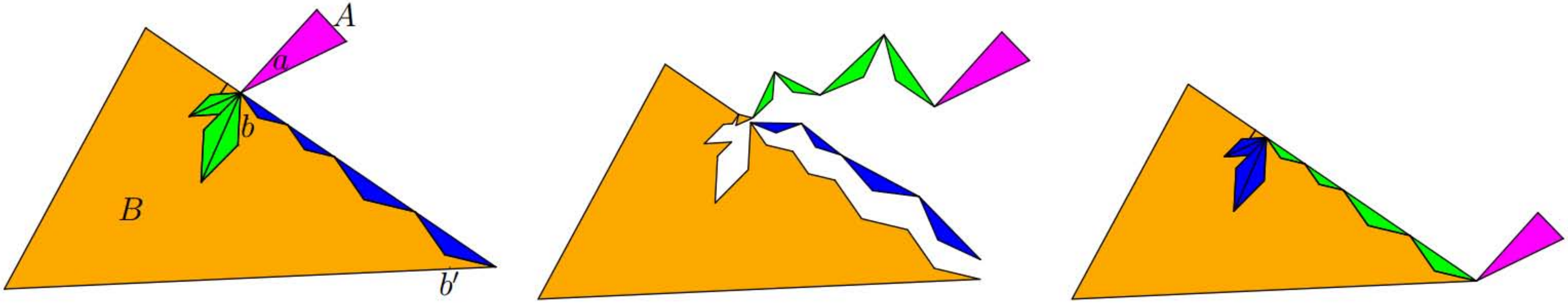
[Abbott, Abel, Charlton, Demaine, Demaine, Kominers 2010]

I’m curious about the pseudopolynomial bound for hinged dissection into a long rectangle, like you briefly mentioned.



Courtesy of Timothy G. Abbott, Zachary Abel, David Charlton, Erik D. Demaine, Martin L. Demaine, and Scott Duke Kominers. Used with permission.

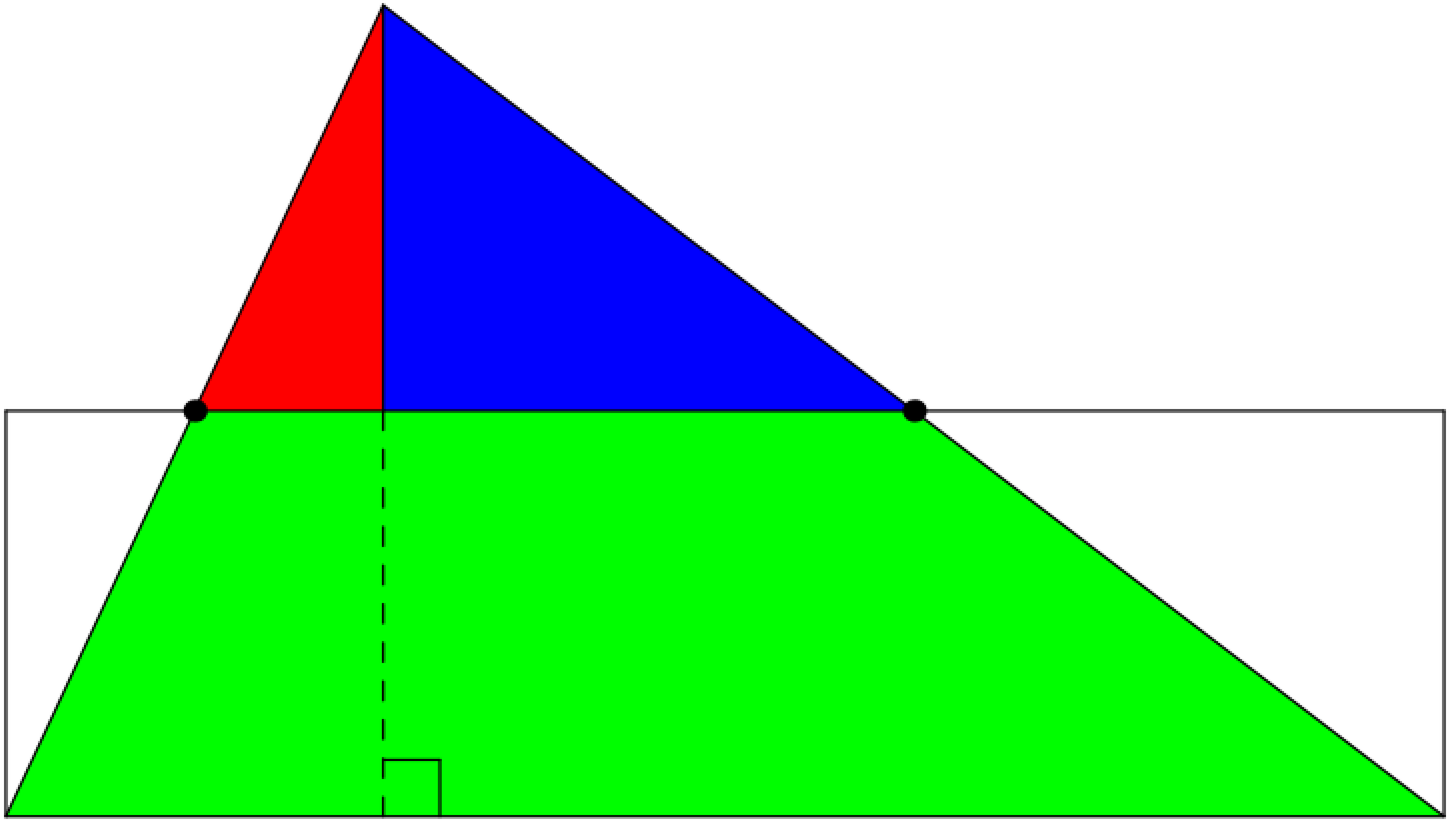
[Abbott, Abel, Charlton, Demaine, Demaine, Kominers 2010]



(a) (b) (c)

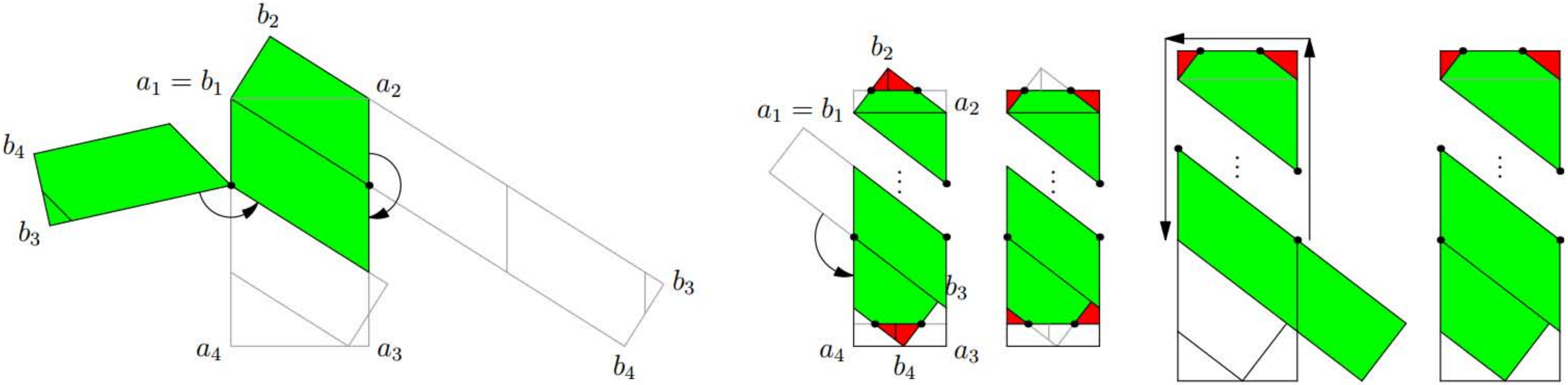
Courtesy of Timothy G. Abbott, Zachary Abel, David Charlton, Erik D. Demaine, Martin L. Demaine, and Scott Duke Kominers. Used with permission.

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



Courtesy of Timothy G. Abbott, Zachary Abel, David Charlton, Erik D. Demaine,
Martin L. Demaine, and Scott Duke Kominers. Used with permission.

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

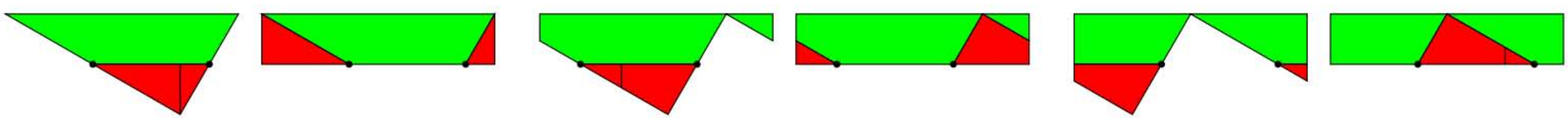


(a) Swinging B back and forth to cover A.

(b) Capping the top and bottom of B.

(c) Moving the end of B to "wrap around" A.

Figure 13: The stages of the rectangle-to-rectangle transformation.

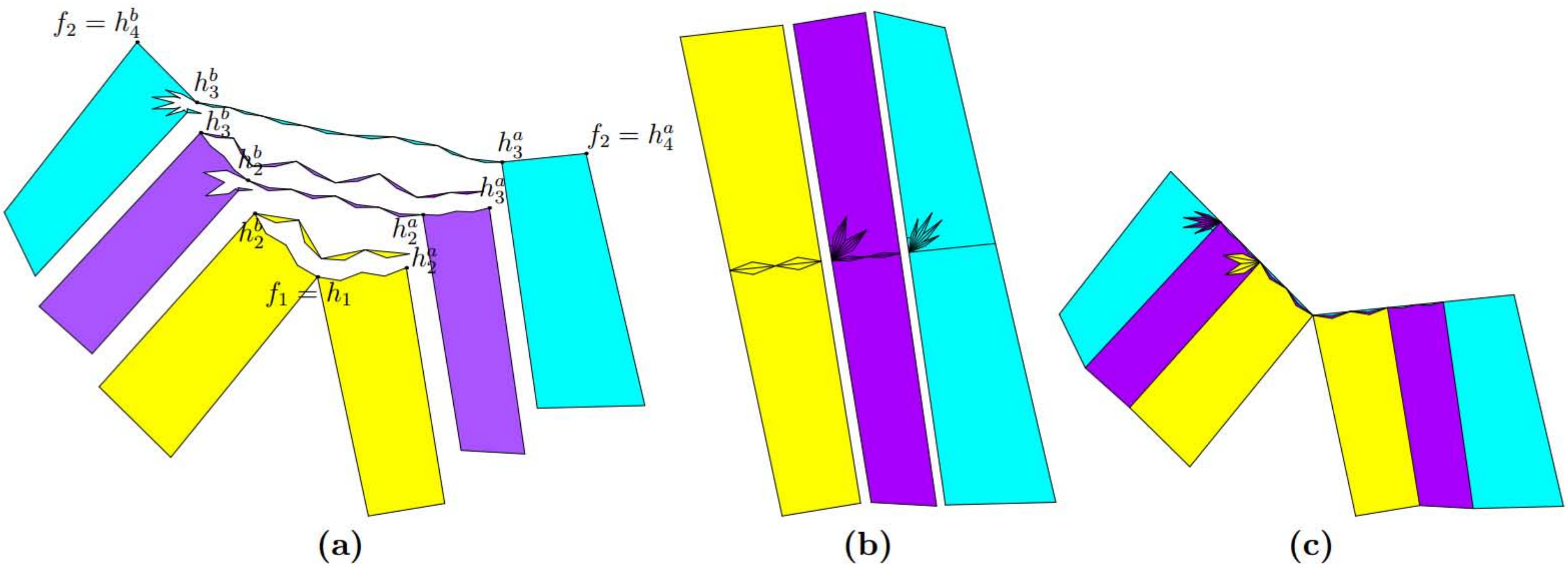


(a) **(b)** **(c)**

Figure 14: The possible cases (up to reflection) when capping the rectangle base.

Courtesy of Timothy G. Abbott, Zachary Abel, David Charlton, Erik D. Demaine, Martin L. Demaine, and Scott Duke Kominers. Used with permission.

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



Courtesy of Timothy G. Abbott, Zachary Abel, David Charlton, Erik D. Demaine, Martin L. Demaine, and Scott Duke Kominers. Used with permission.

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

Can we get a brief overview of 3D dissections?

MATHEMATICAL PROBLEMS.*

LECTURE DELIVERED BEFORE THE INTERNATIONAL CONGRESS OF MATHEMATICIANS AT PARIS IN 1900.

BY PROFESSOR DAVID HILBERT.

3. THE EQUALITY OF THE VOLUMES OF TWO TETRAHEDRA OF EQUAL BASES AND EQUAL ALTITUDES.

In two letters to Gerling, Gauss * expresses his regret that certain theorems of solid geometry depend upon the method of exhaustion, *i. e.*, in modern phraseology, upon the axiom of continuity (or upon the axiom of Archimedes). Gauss mentions in particular the theorem of Euclid, that triangular pyramids of equal altitudes are to each other as their bases. Now the analogous problem in the plane has been solved.† Gerling also succeeded in proving the equality of volume of symmetrical polyhedra by dividing them into congruent parts. Nevertheless, it seems to me probable that a general proof of this kind for the theorem of Euclid just mentioned is impossible, and it should be our task to give a rigorous proof of its impossibility. This would be obtained, as soon as we succeeded in *specifying two tetrahedra of equal bases and equal altitudes which can in no way be split up into congruent tetrahedra, and which cannot be combined with congruent tetrahedra to form two polyhedra which themselves could be split up into congruent tetrahedra.*‡

[Hilbert 1900]