Origami: Art, Science, Math

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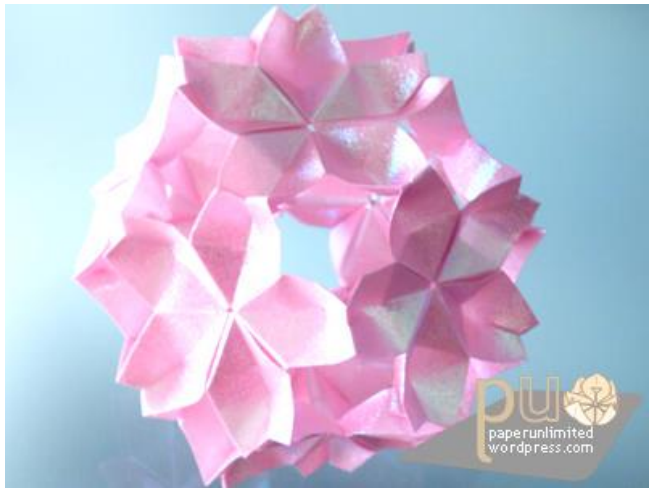
herngyi.com

Origami Art

John McKeever

Shuki Kato



Toshikazu Kawasaki

Eric Joisel

OSME Conferences

SCIENCE
MATHEMATICS
EDUCATION
ORIGAMI

4OSME

4th international conference
8-10 September 2006
Caltech•Pasadena•CA

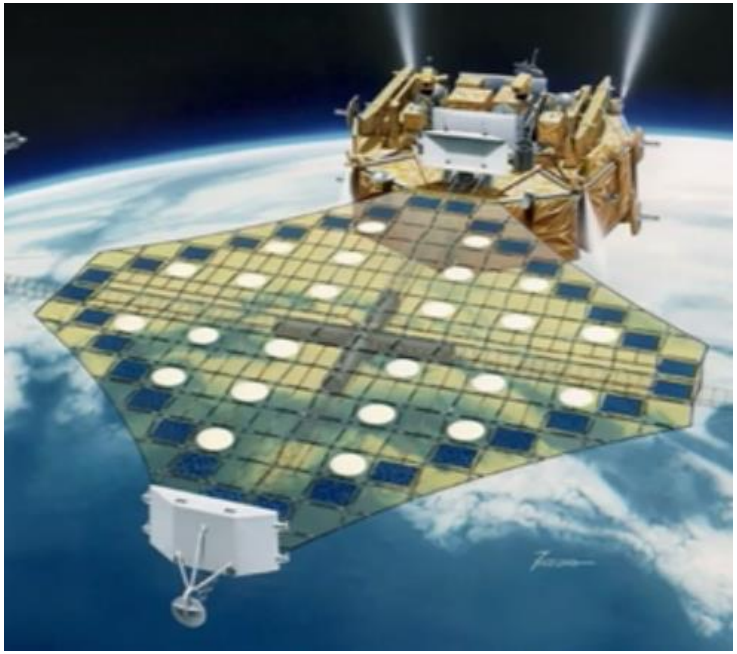
Origami Science & Technology

Large sheet ↔ Small size

Solar Array

- "Miura Map Fold"
- Koryo Miura, 1995

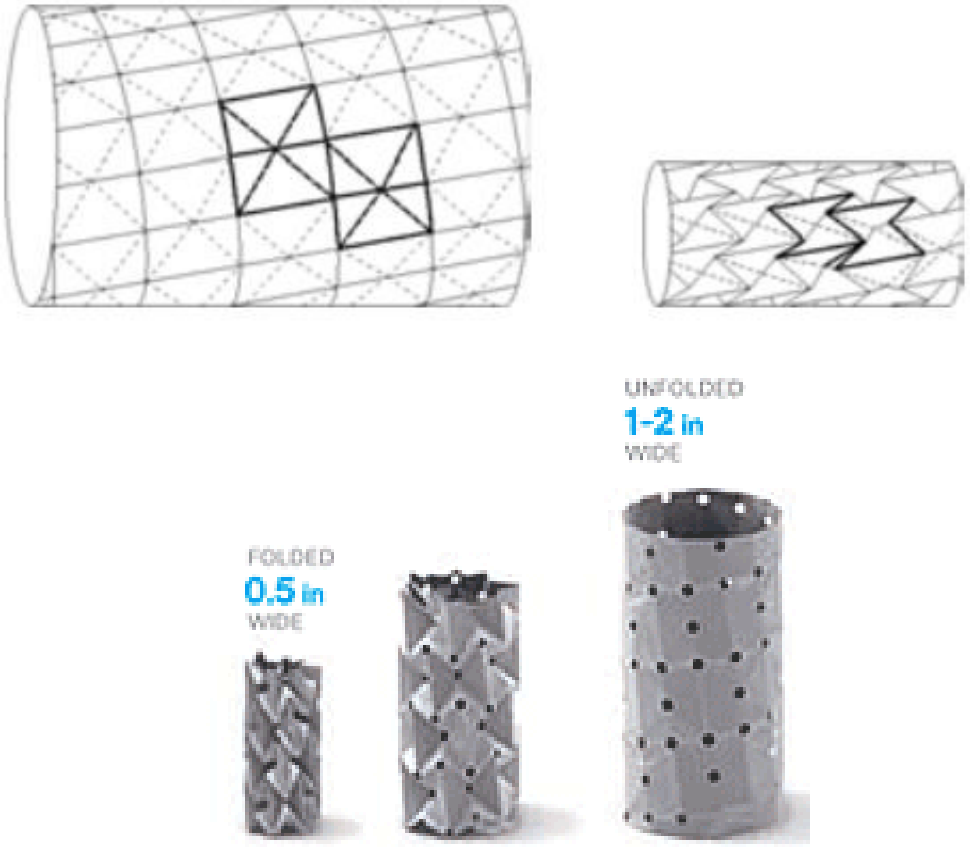
Miura-ori by MetaNest



Robert J. Lang, "The Math and Magic of Origami", TEDTalk

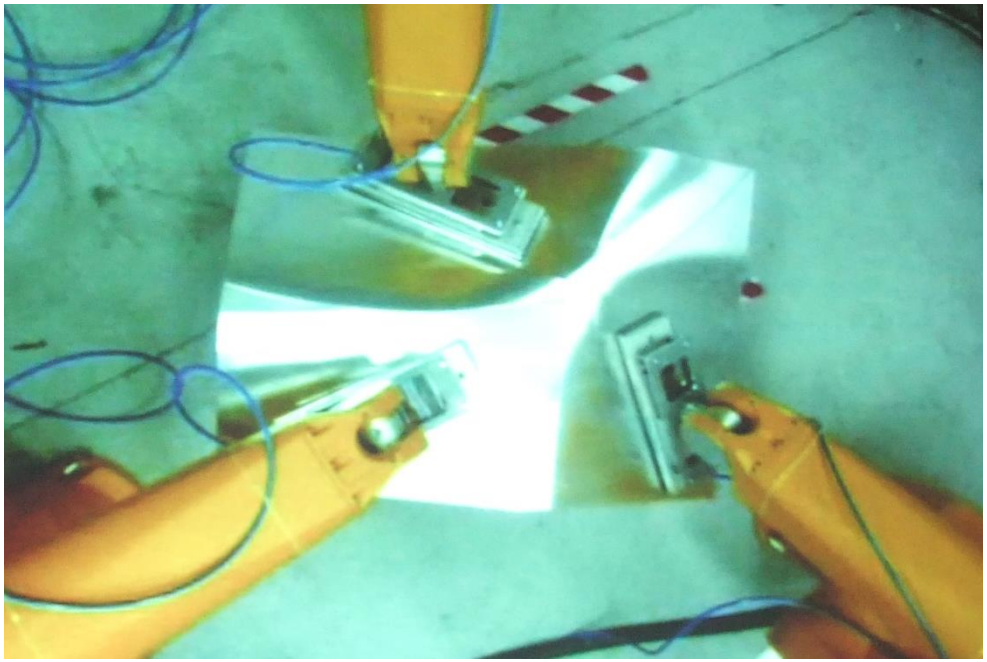
Origami Stent Graft

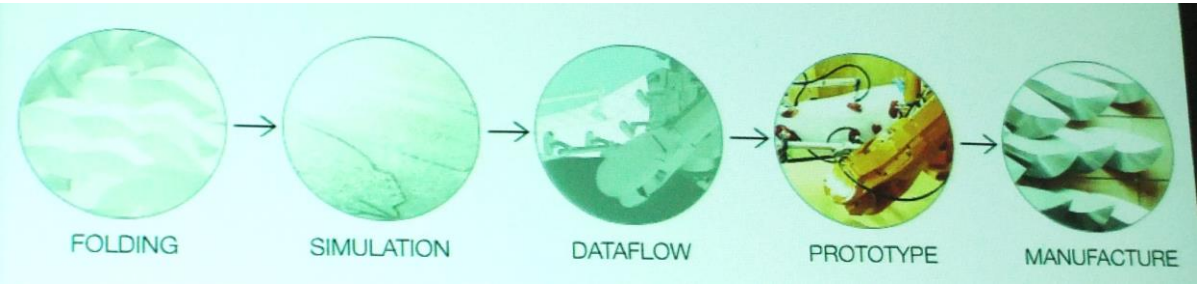
- Kaori Kuribayashi, Zhong You (2006)
- Waterbomb bases



"Fold Everything", National Geographic Magazine

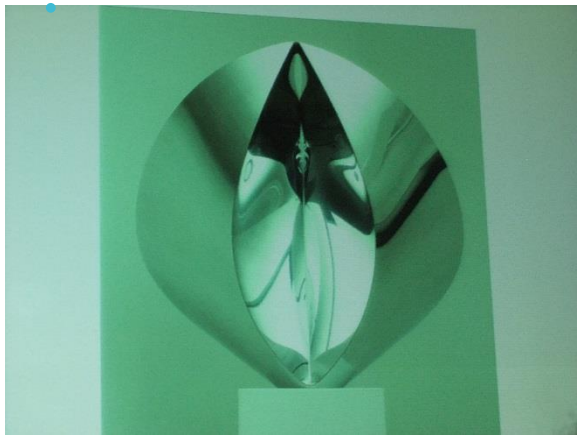
Robotic Folding

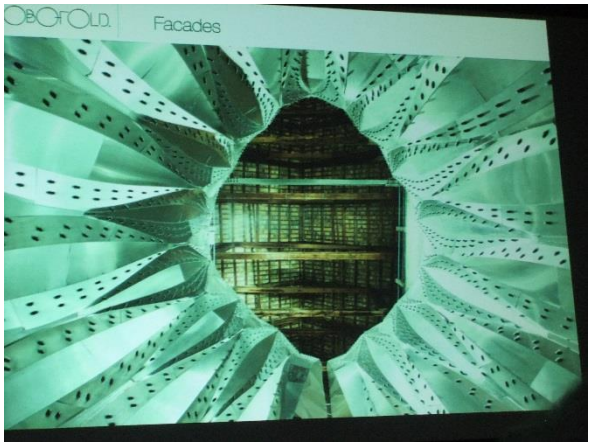
- Gregory Epps (6OSME)
- 

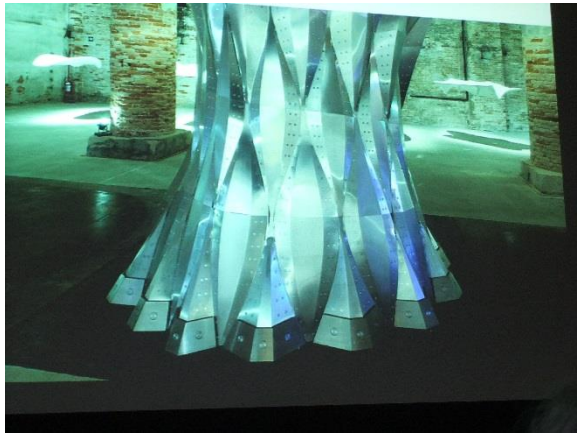


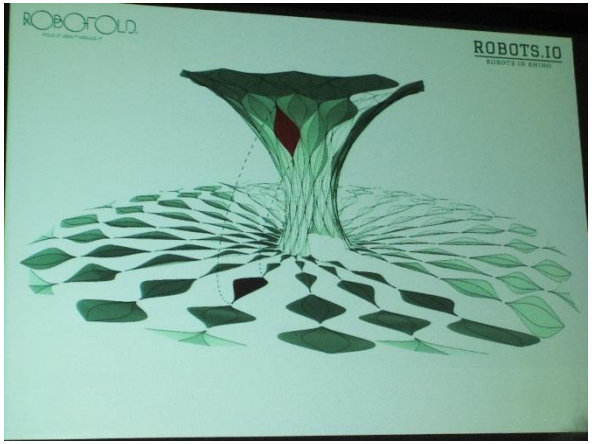
Robotic Folding

- Gregory Epps (6OSME)







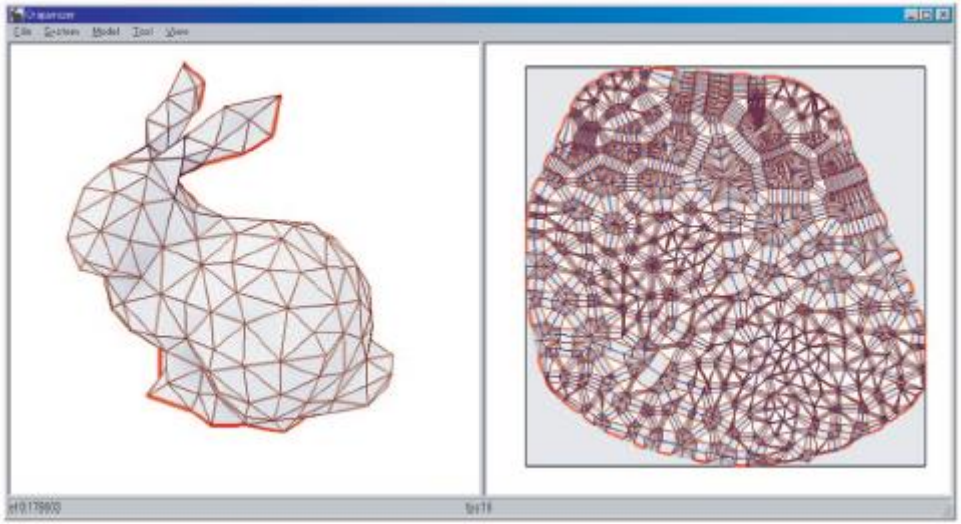


Origami Design Software

Automatic origami design

Origamizer

- Tomohiro Tachi (2010)



Tomohiro Tachi, "Origamizing Polyhedral Surface", IEEE Trans. Visual. Com. Graphics (2010)

Origamizer

- Chop surface into polygons
- Spread polygons out on flat paper
- Close the gaps by folding them shut

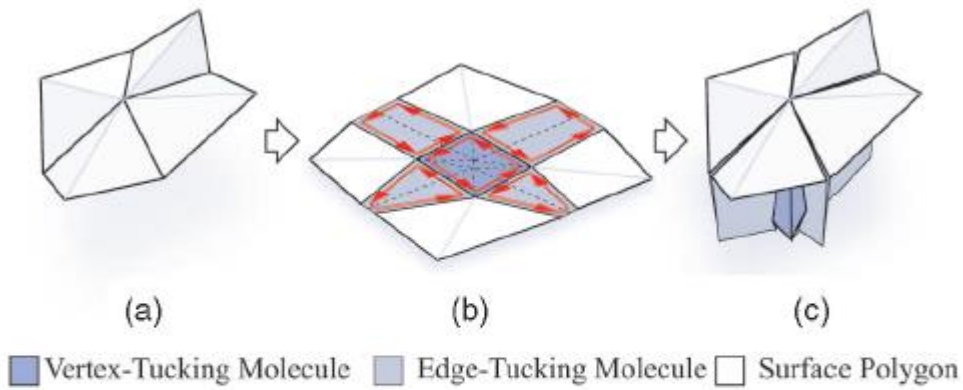


Fig. 4. (a) Polyhedral surface S. (b) Tessellation derived from S, constructed by inserting tucking molecules between mapped surface polygons. (c) Gap is tuck-folded to be completely hidden behind the surface, thereby the surface polygons are "glued" together again.

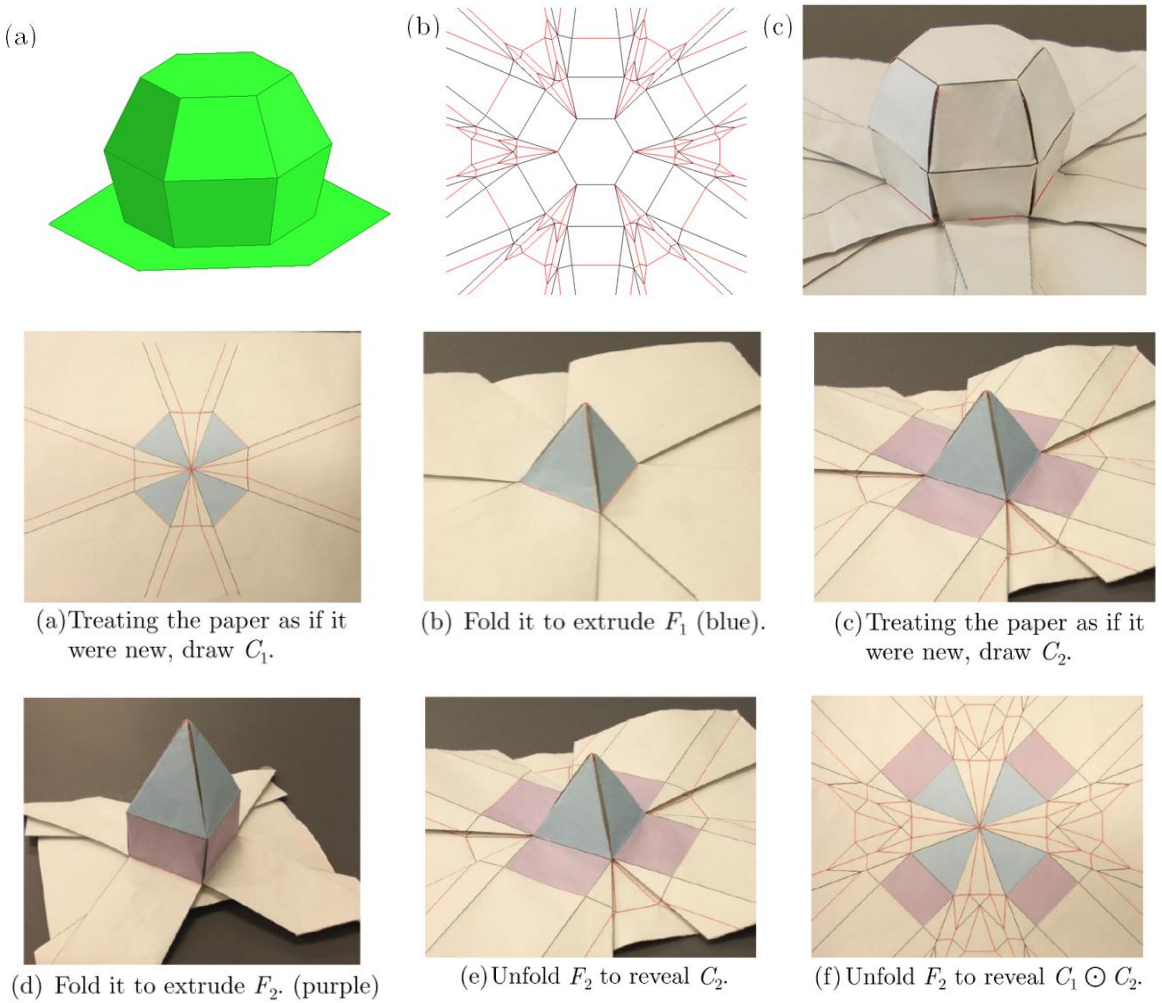
Tomohiro Tachi, "Origamizing Polyhedral Surface", IEEE Trans. Visual. Com. Graphics (2010)

Random

- (6OSME)
- Randomly fold paper
- Generate many random folds
- Spot nice folds

Grafting Towers

- Herng Yi Cheng (6OSME)



(a) Treating the paper as if it were new, draw C_1.

(b) Fold it to extrude F_1 (blue).

(c) Treating the paper as if it were new, draw C_2.

(d) Fold it to extrude F_2. (purple)

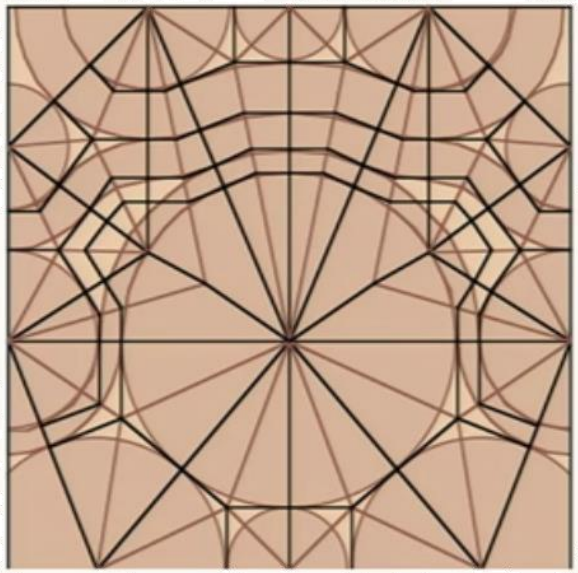
(e) Unfold F_2 to reveal C_2.

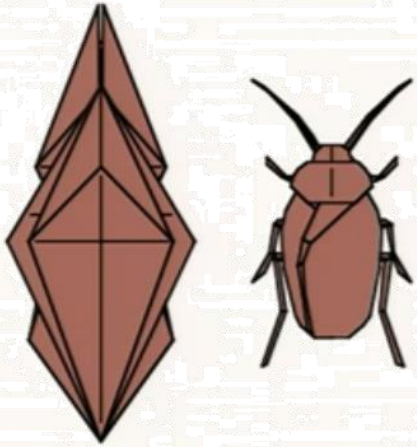
(f) Unfold F_2 to reveal $C_1 \odot C_2$.

TreeMaker

- Circle Packing

- Pack circles, which represent all the body parts.
- Fill in with molecular crease patterns.
- Fold!





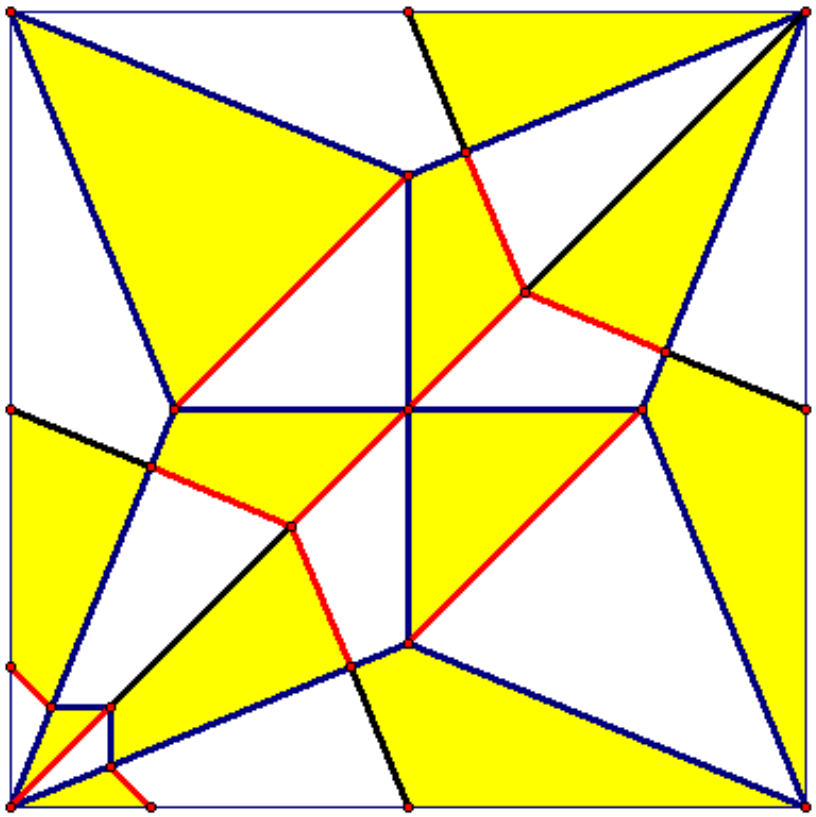
Robert J. Lang, "The Math and Magic of Origami", TEDTalk

Origami Math

The fundamental laws of folding

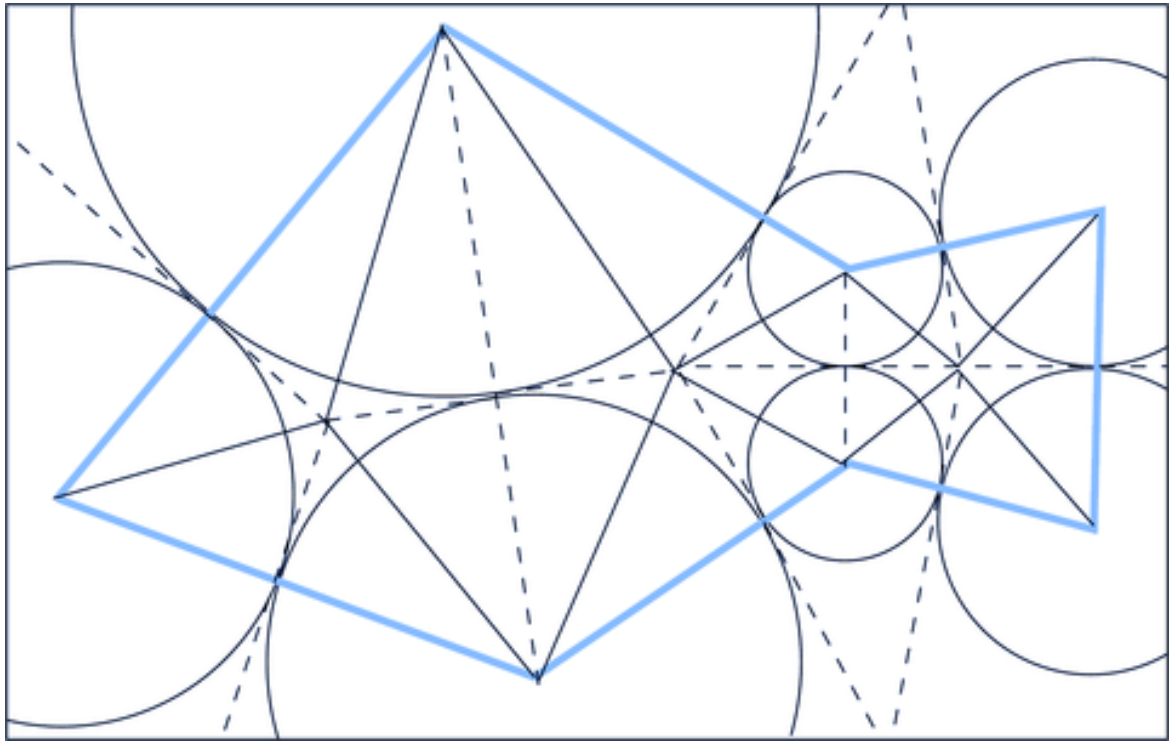
Flat Folding

- Alternating colors
- Mountains and valleys differ by 2



Fold and Cut

- Erik Demaine, Martin Demaine, Anna Lubiw
- Marshall Bern, Erik Demaine, David Eppstein, Barry Hayes

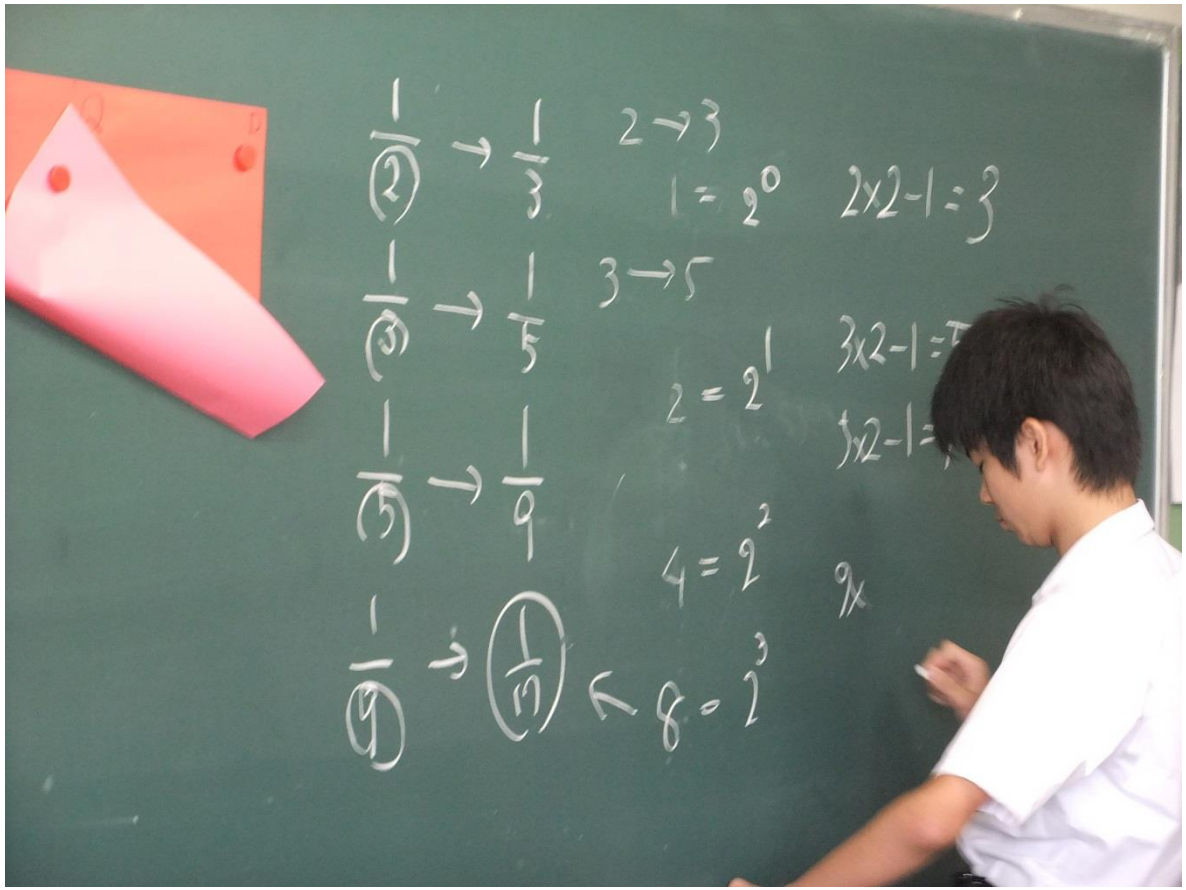


Math Class

- Haga's theorem and similar triangles

Math Class

- Number patterns

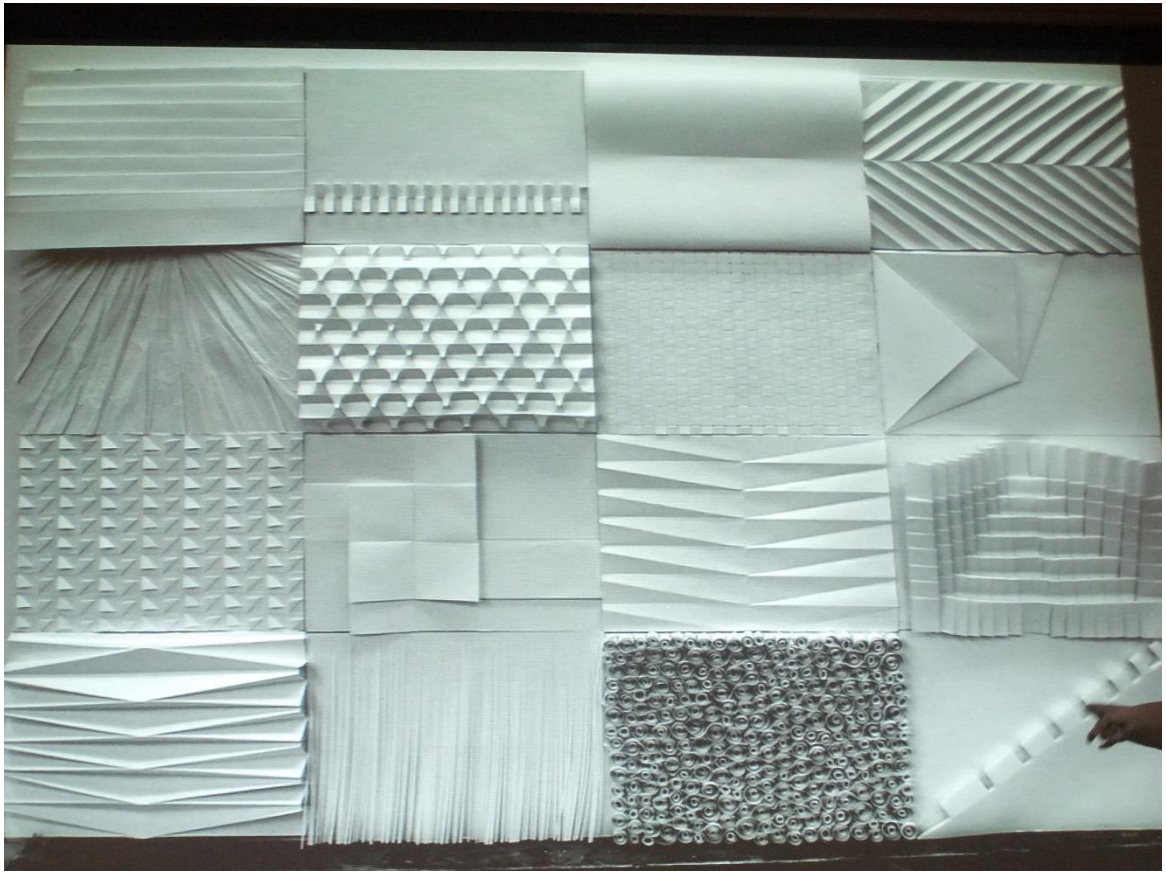


At the Edge

To origami and beyond

Folding in Design

- Lecture by Paul Jackson (6OSME)

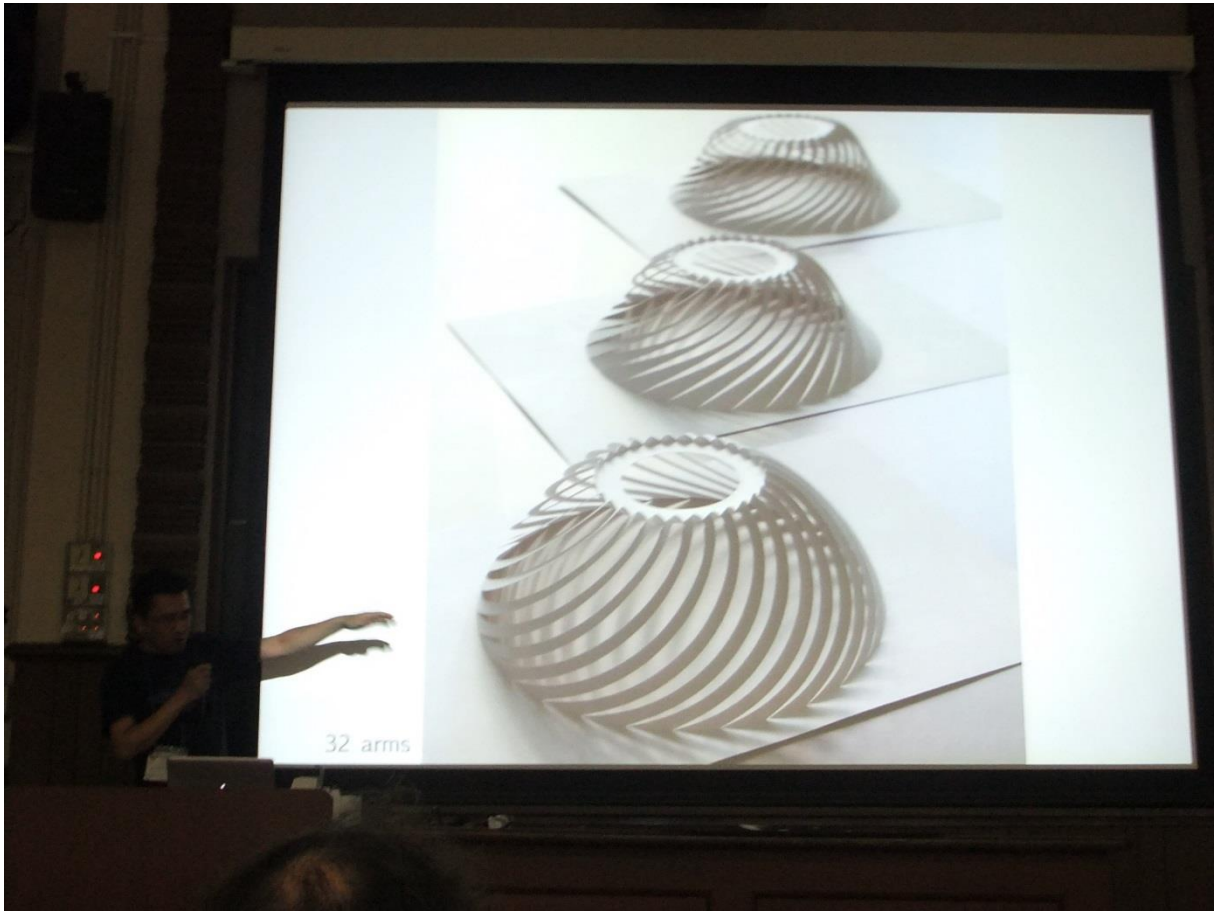


Folding in Design

- Lecture by Paul Jackson (6OSME)

Cut 3D sculptures

- Yoshinobu Miyamoto (6OSME)



Cut 3D Sculptures

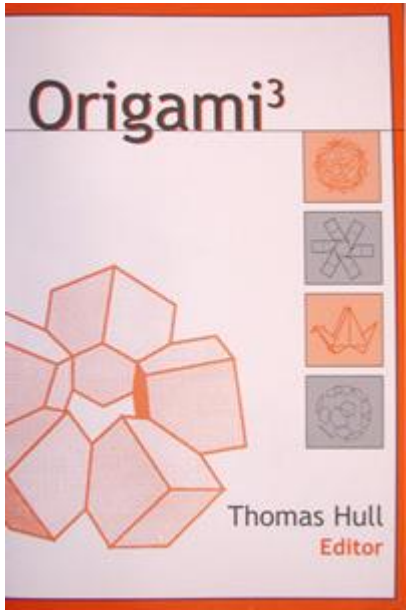
- Yoshinobu Miyamoto (6OSME)

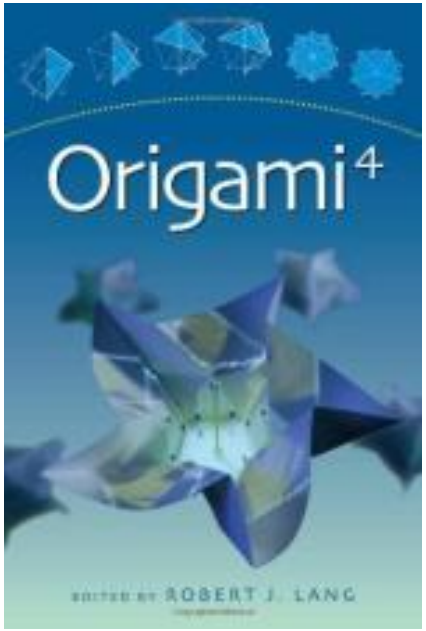
Further Resources

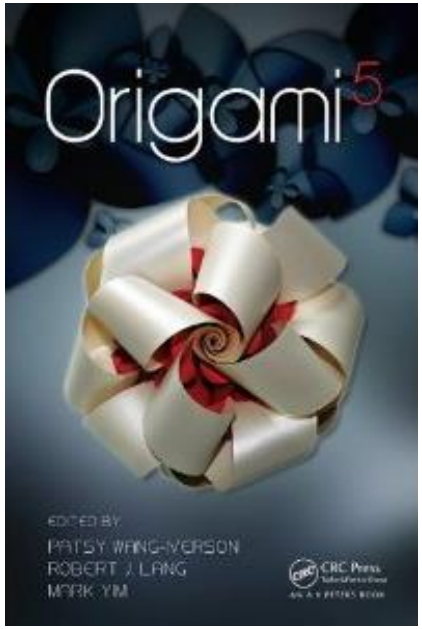
Books and videos

Books

- OSME proceedings

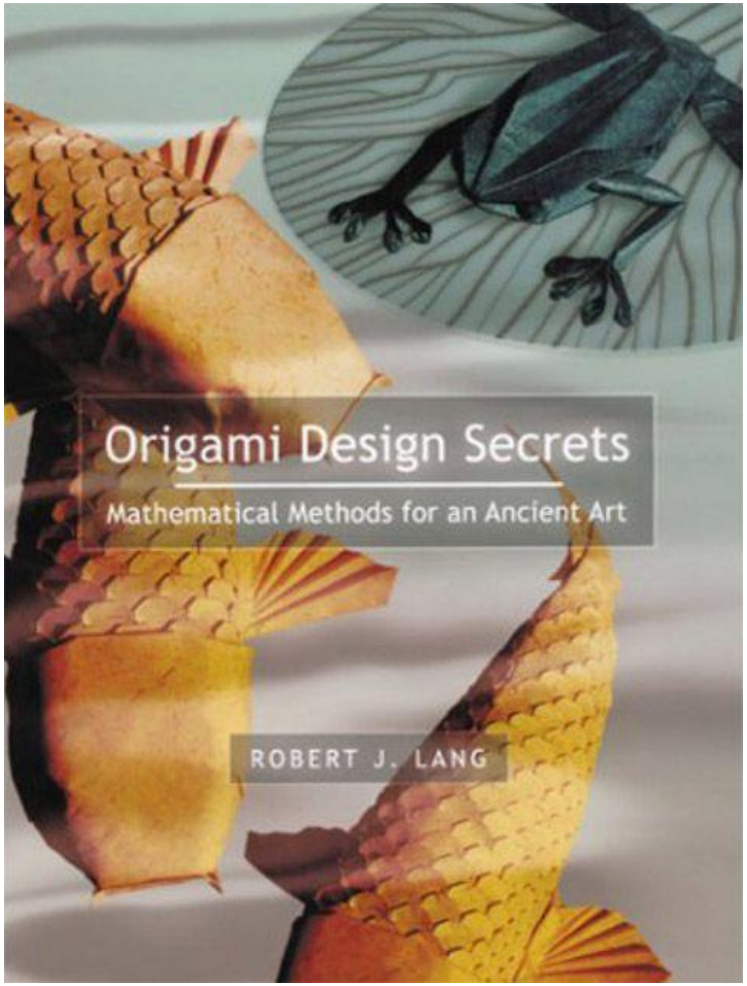






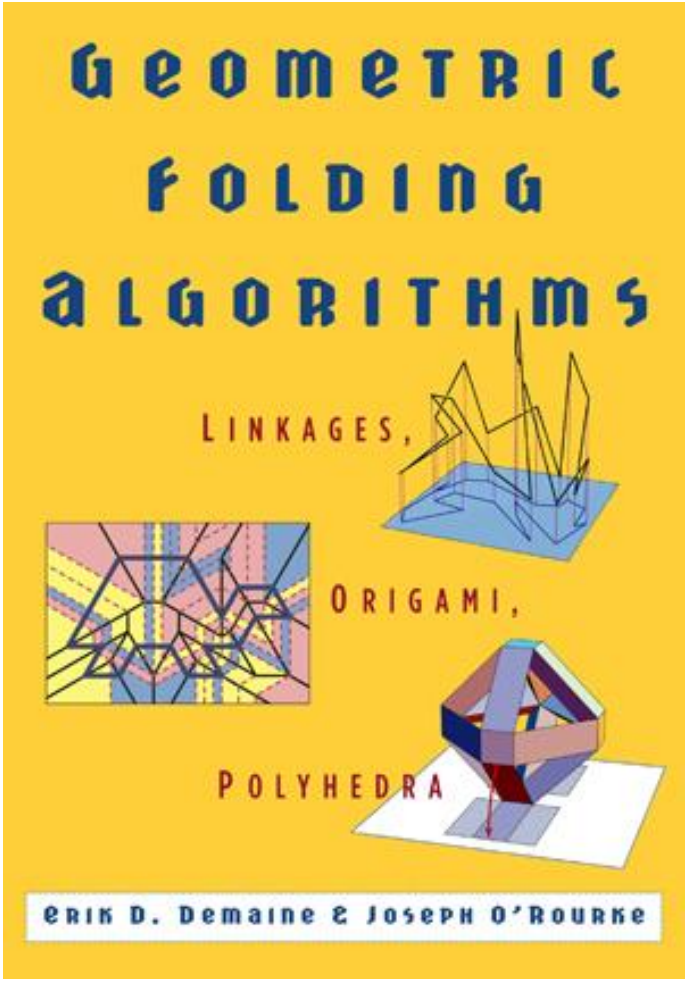
Books

- Origami design techniques and theory



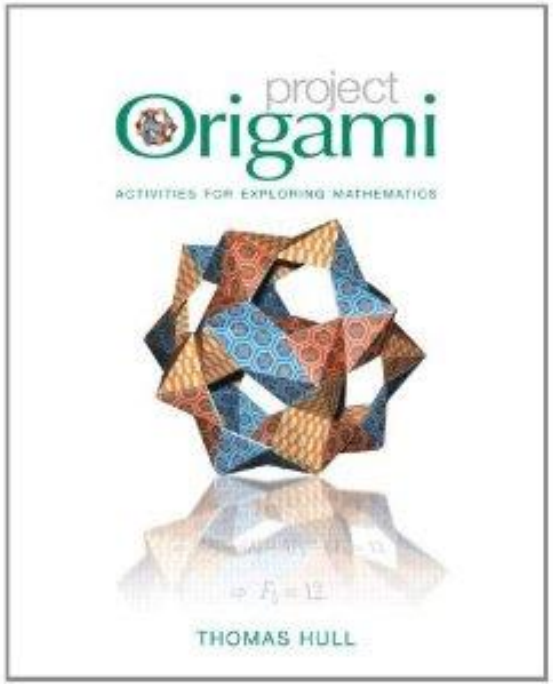
Books

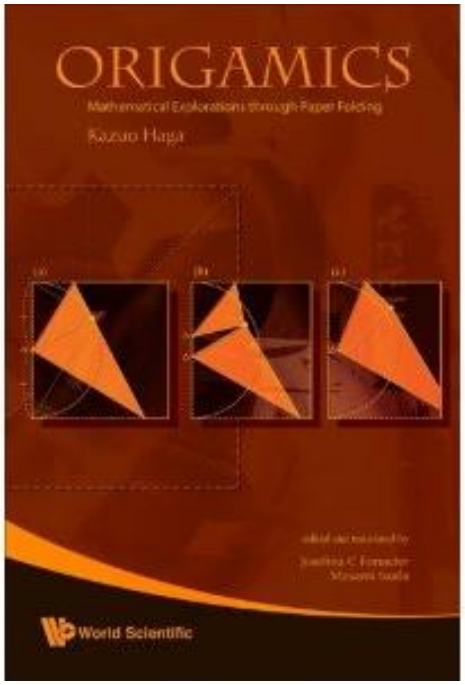
- Mathematics and computer science

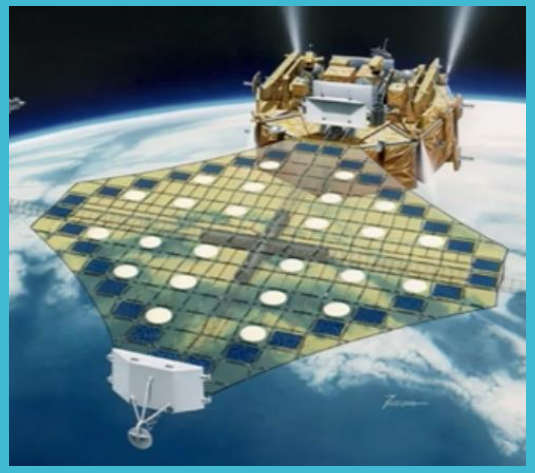


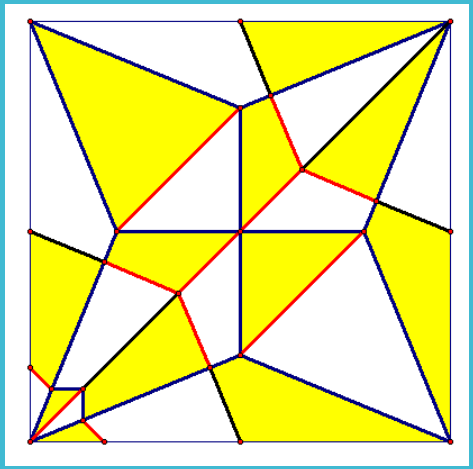
Books

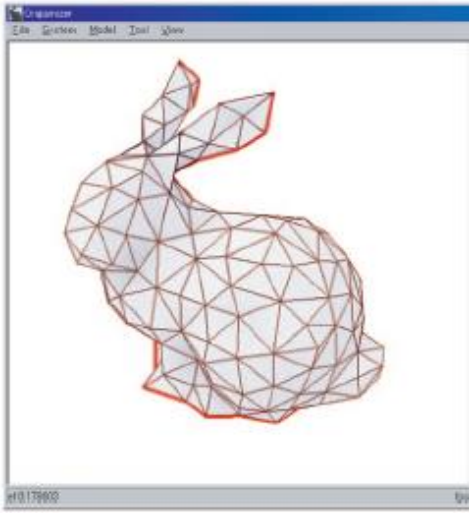
- For educators!











Art + Science + Math

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