"What I hear I forget,
What I see I remember,
What I touch I understand." -Confucius

Lecture 2003

Stewart Dickson

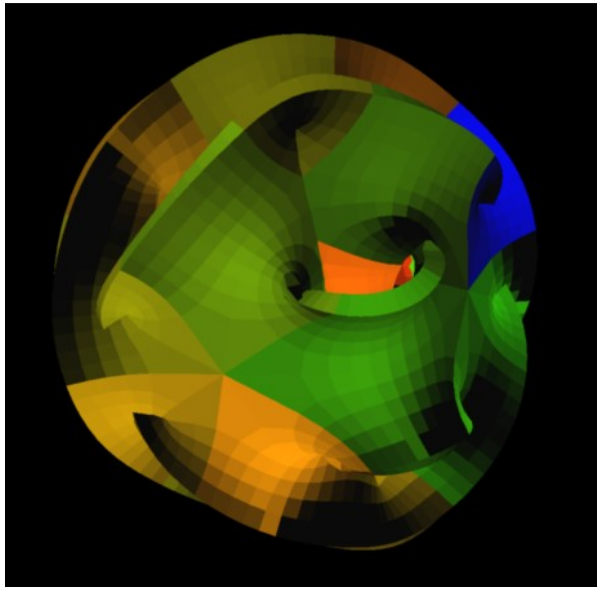
dicksonsp@ornl.gov

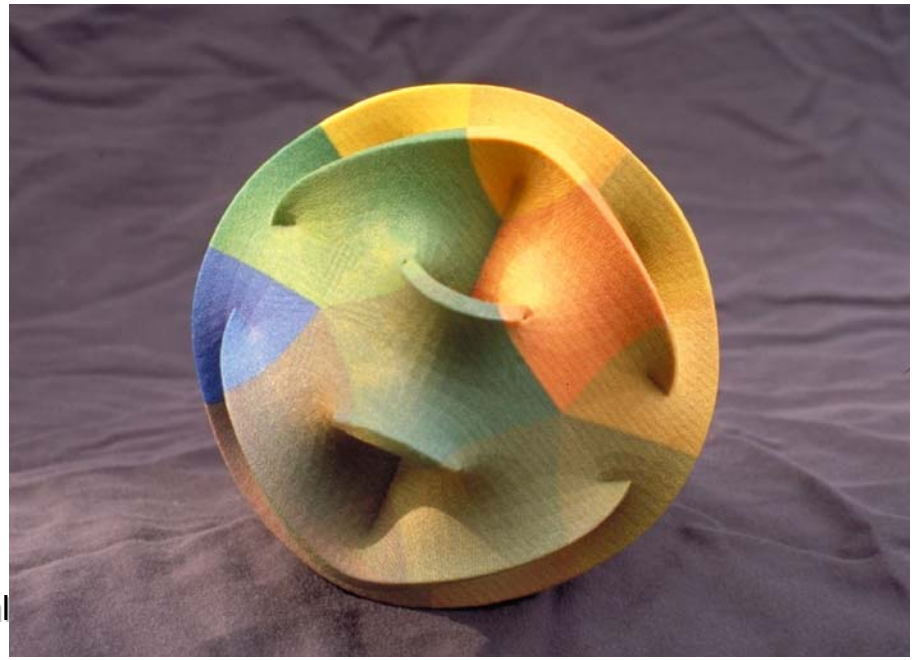
http://www.csm.ornl.gov/~dickson

Research sponsored by Computer Science and Mathematics Division of Oak Ridge National Laboratory, managed by UT-Battelle, LLC for the U.S. DOE under Contract No. DE-AC05-00OR22725.

Calabi-Yau Manifold (with Andrew Hanson)

```
u1[a_,b_] := .5 (E(a + I*b) + E(- a - I*b))
u2[a_,b_] := .5 (E(a + I*b) - E(- a - I*b))

z1k[a_,b_,n_,k_] := E(k*2*Pi*I/n)*u1[a,b](2.0/n)
z2k[a_,b_,n_,k_] := E(k*2*Pi*I/n)*u2[a,b](2.0/n)

{x, y, z} -> { Re[z1k[a,b,n,k1]],
Re[z2k[a,b,n,k2]],
Cos[alpha]*Im[z1k[a,b,n,k1]] + Sin[alpha]*Im[z2k[a,b,n,k2]]}

a: (-1.0,1.0); b:(0, Pi/2);
k2: (0, n - 1)
k1: (0, n - 1)
```



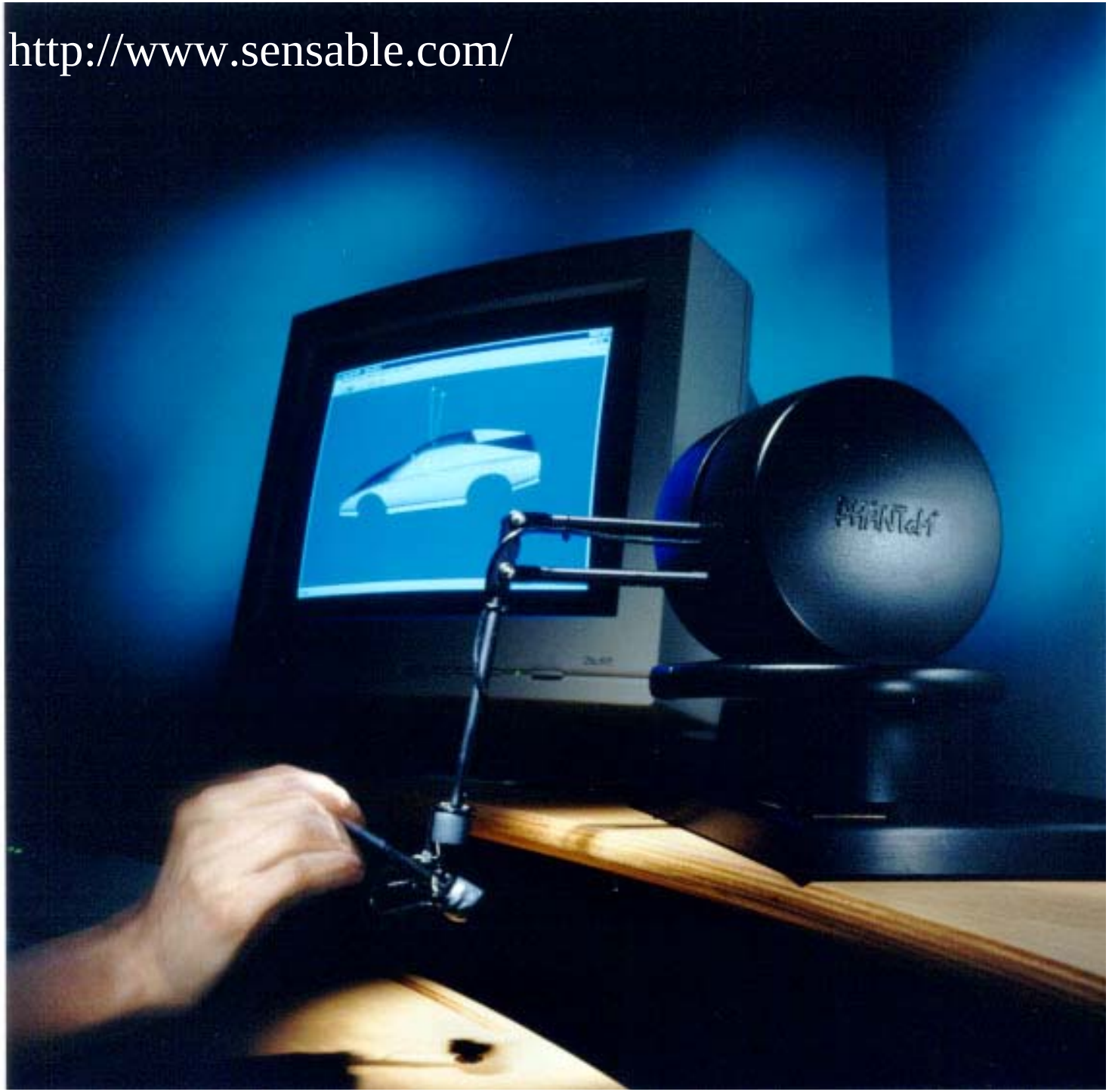


Tactile Mathematics is An Immediate Experience

http://emsh.calarts.edu/~mathart/Zoetrope2/Zoetrope2_prop.html

http://www.virtouch.com/

http://www.sensable.com/



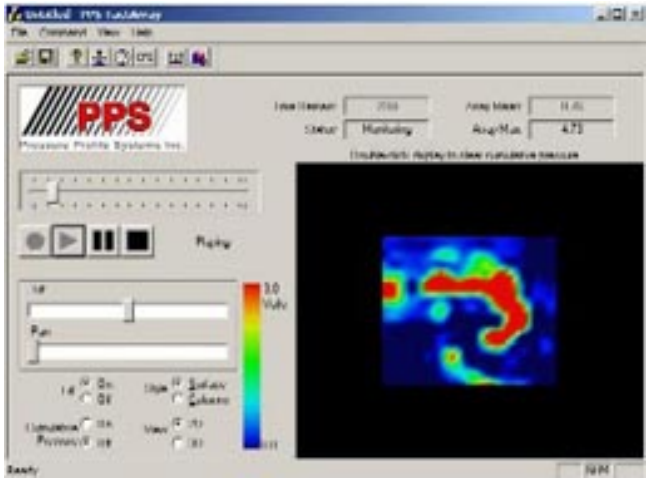
http://www.virtouch.com/

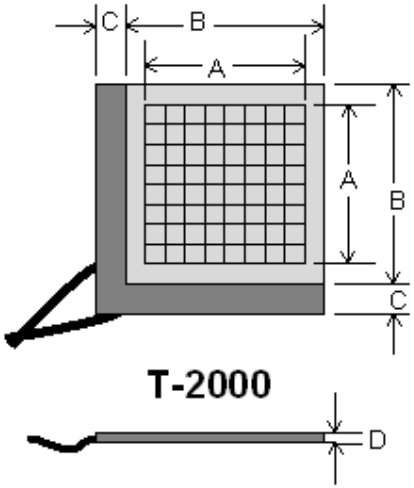
http://www.nist.gov/public_affairs/gallery/visual_display.htm

TactArray Conformable Tactile Array Sensors

Spatial Resolution 2, 2.5, or 3.8 mm
Pressure Resolution 0.01 psi., FSR , 3, 12, or 30 psi.

Electronics Enclosure = 300 mm x 240 mm x 50 mm
Cable Length = 1 m





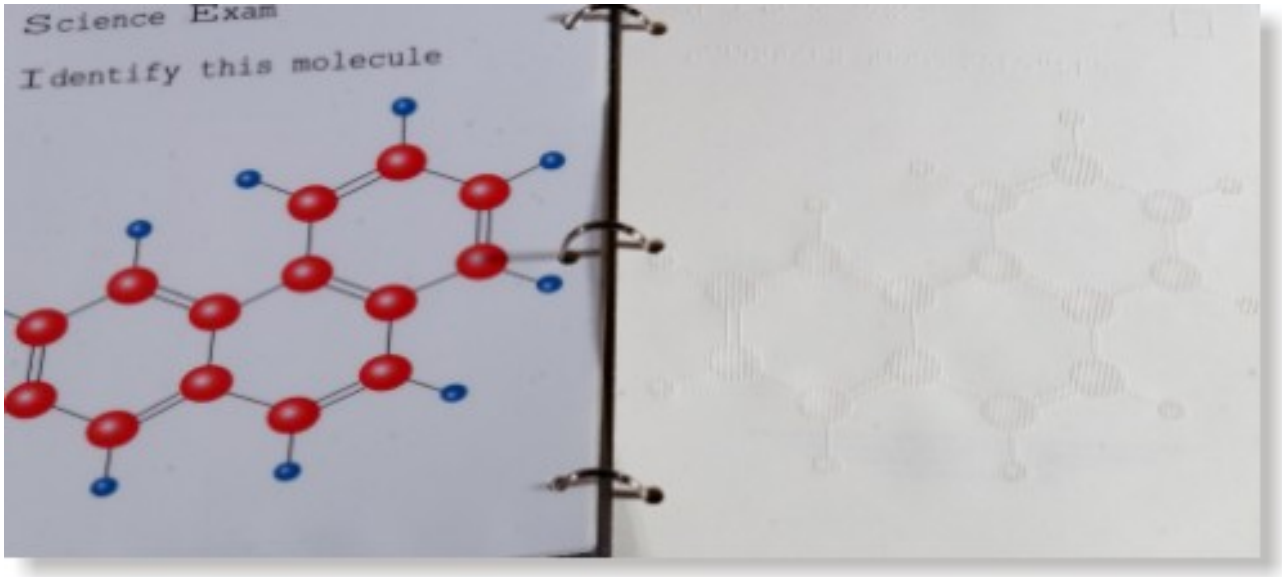
A = (#Rows/Columns) x (Spatial Resolution)
B = (#Rows/Columns + 2) x (Spatial Resolution)
C = 3-6 mm, depending on array size
D = 1 mm

http://www.pressure-profile.com/products/tactarray.html

http://viewplustech.com

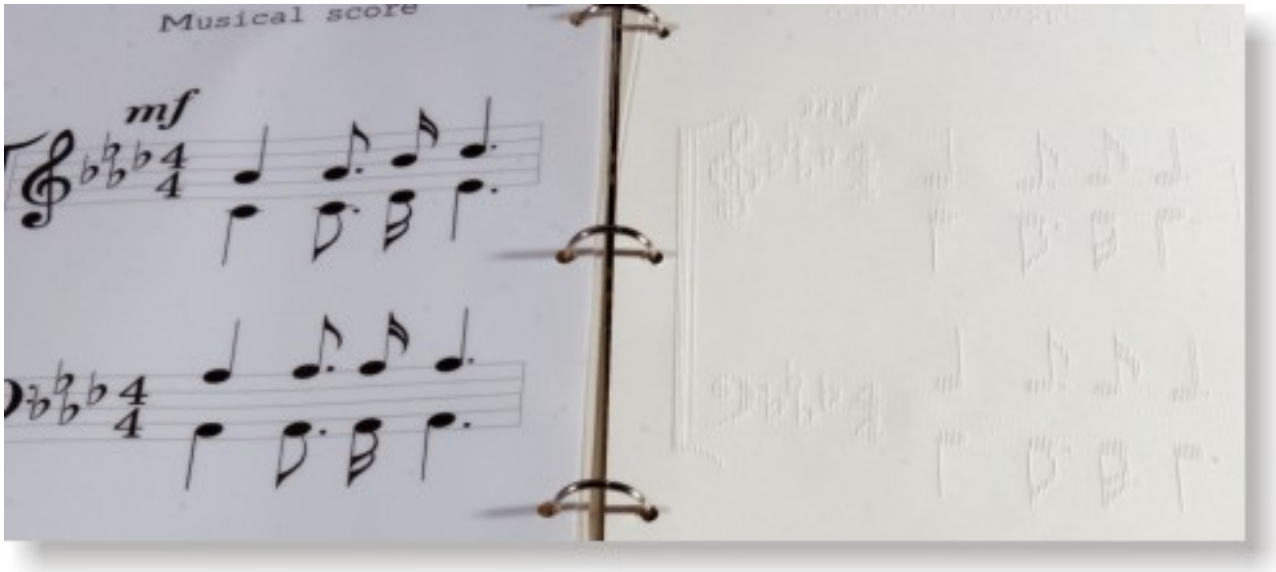
Nude in a Red Armchair" by Pablo Picasso, 1932.
Original image provided by the Tate Museum.

http://viewplustech.com



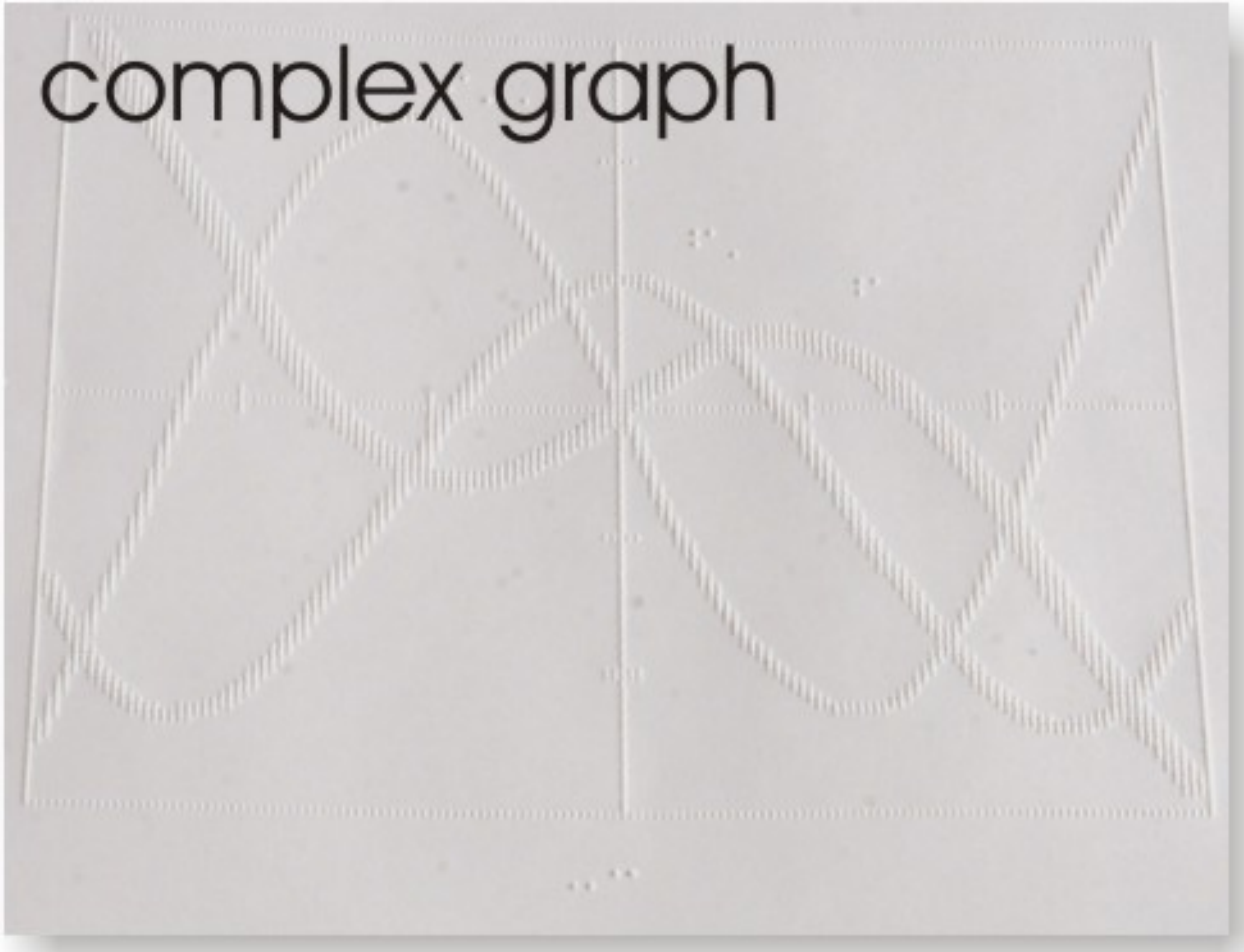
Molecular diagram

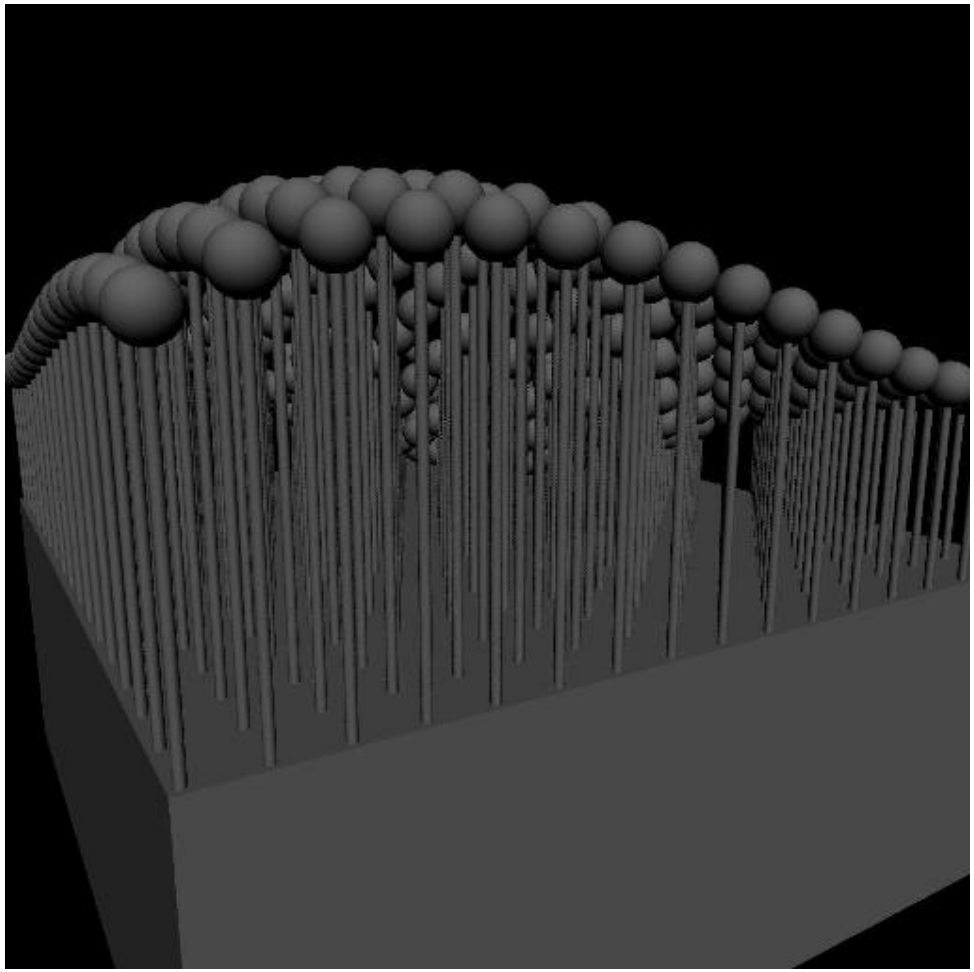
http://viewplustech.com



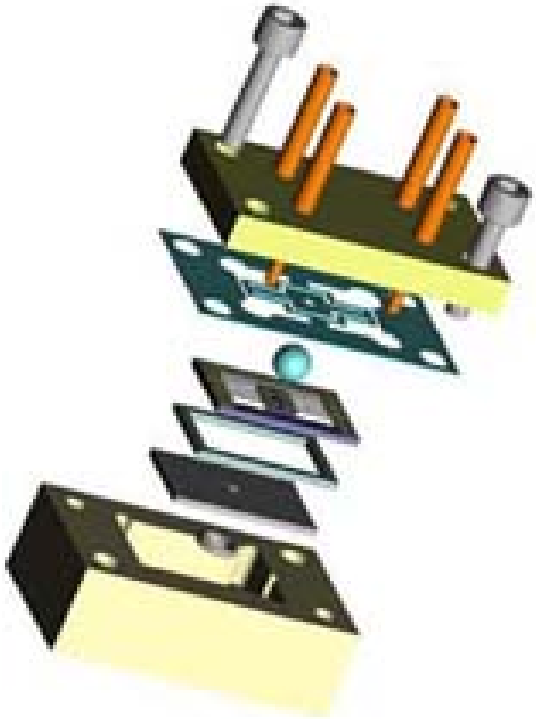
Sheet music made tactile on Tiger for example

http://viewplustech.com/

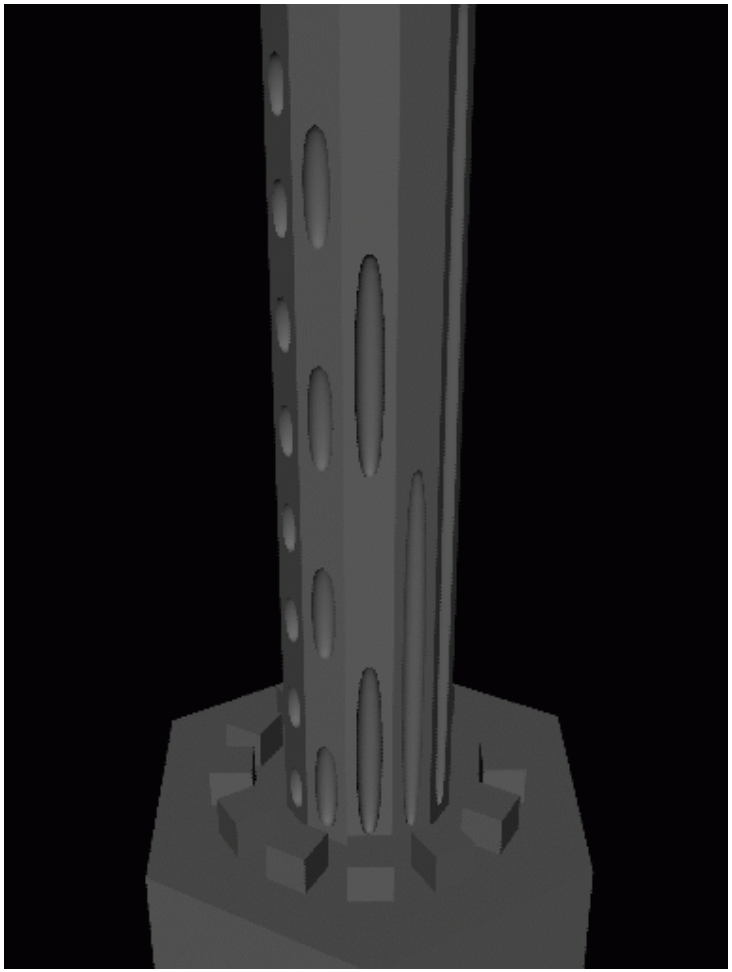




http://emsh.calarts.edu/~mathart/IS99_Talk/IS99_Contents.html

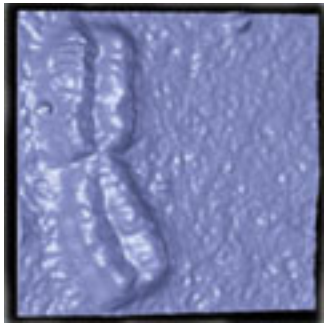


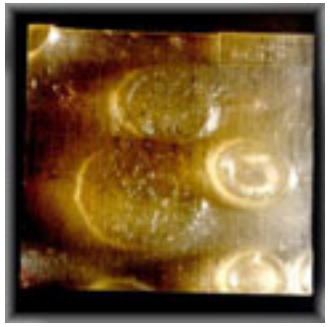
http://www.sma-mems.com/

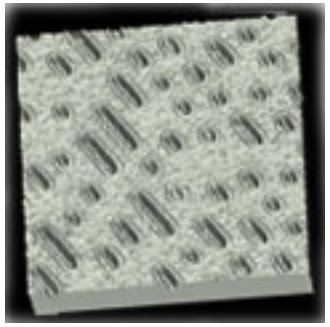


http://emsh.calarts.edu/~mathart/IS99_Talk/IS99_Contents.html

Tactile Microscopy



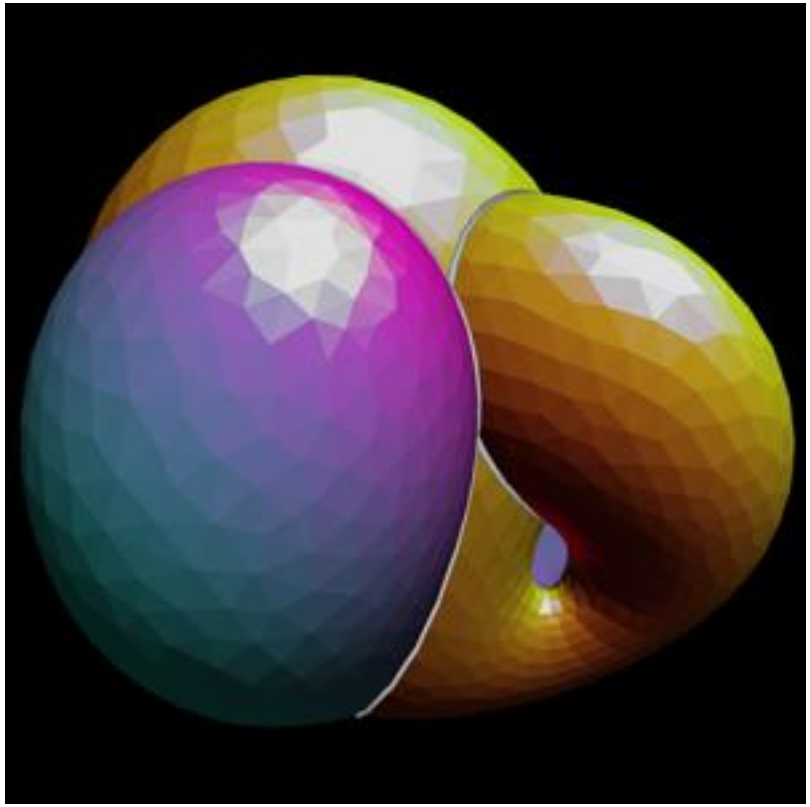




http://prism.asu.edu/projects/tactile.html

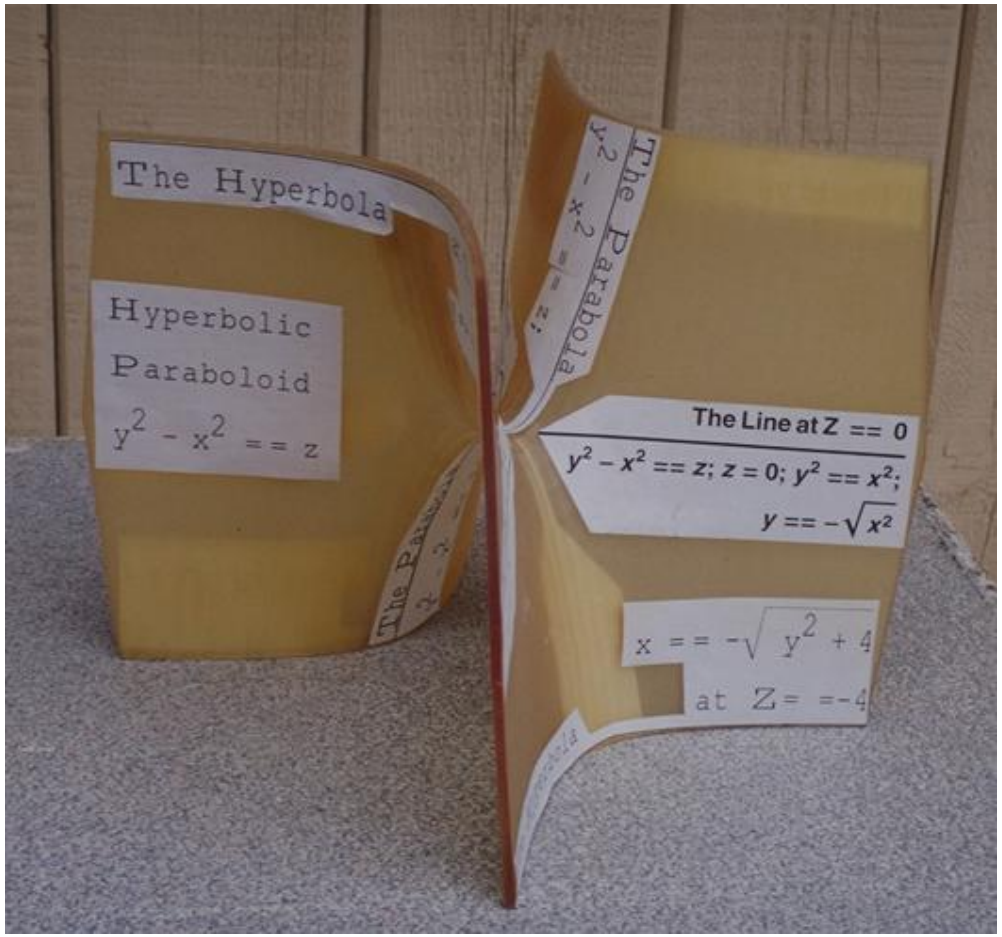
http://web.njit.edu/~skawinsk/

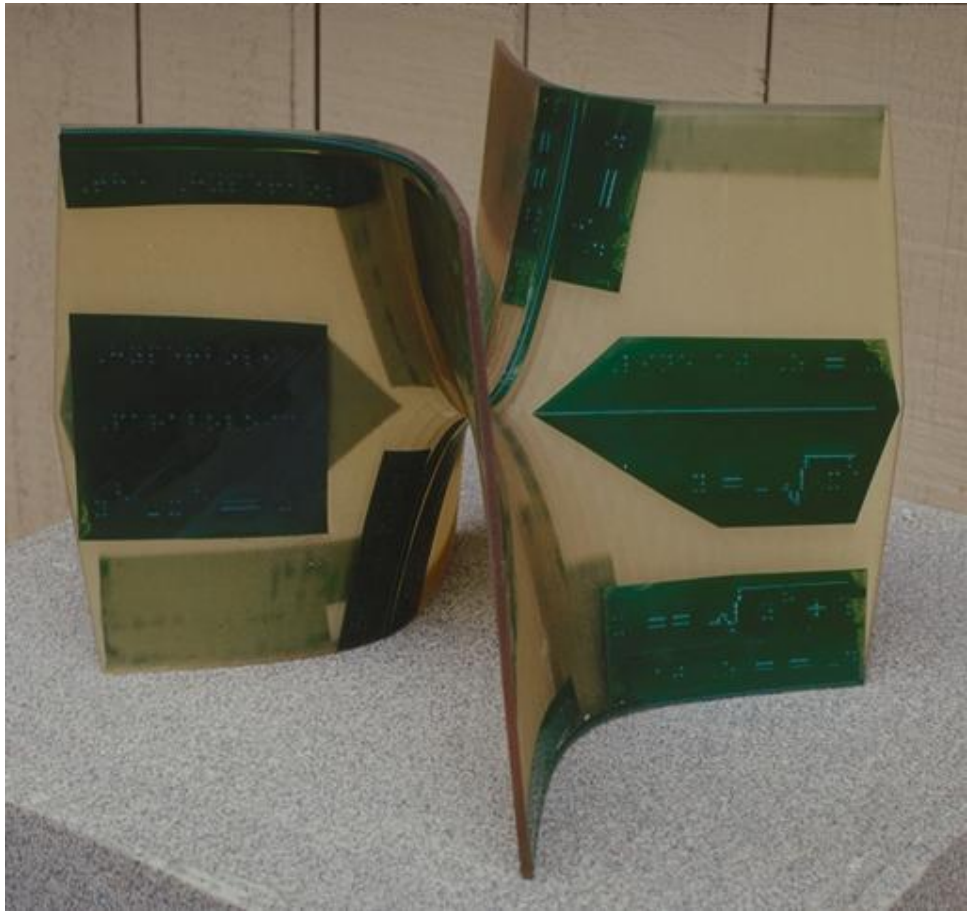
http://web.njit.edu/~skawinsk/



http://new.math.uiuc.edu/optiverse/

QuickTime™ and a Photo decompressor are needed to see this picture.


The Hyperbola
Hyperbolic
Paraboloid
y2 - x2 == z
The Line at Z == 0
y2 − x2 == z; z = 0; y2 == x2;
y == −√x2
x == −√ y2 + 4
at Z= =-4

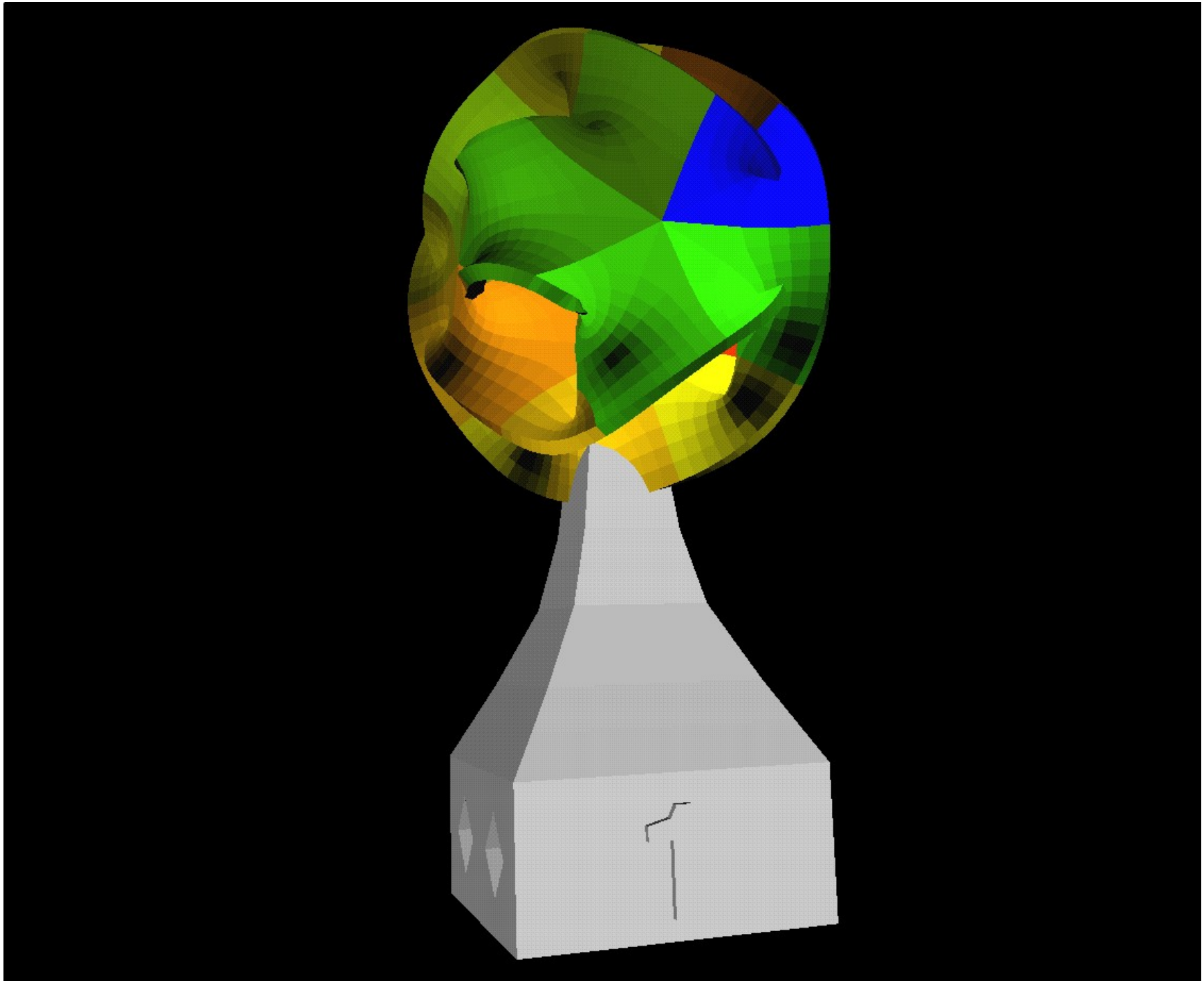


Calabi-Yau Manifold/Fermat Surface

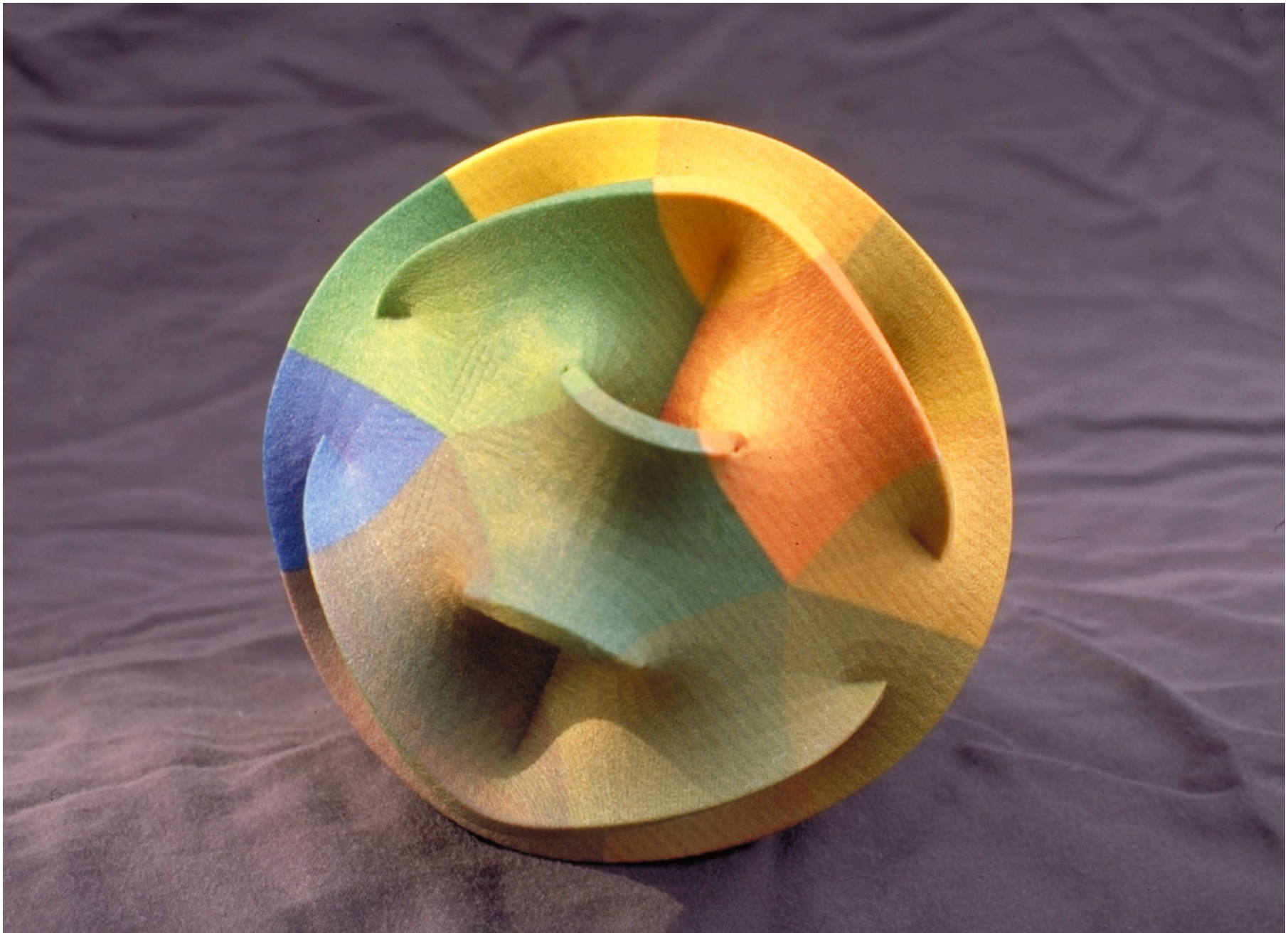
As a Superquadric Surface

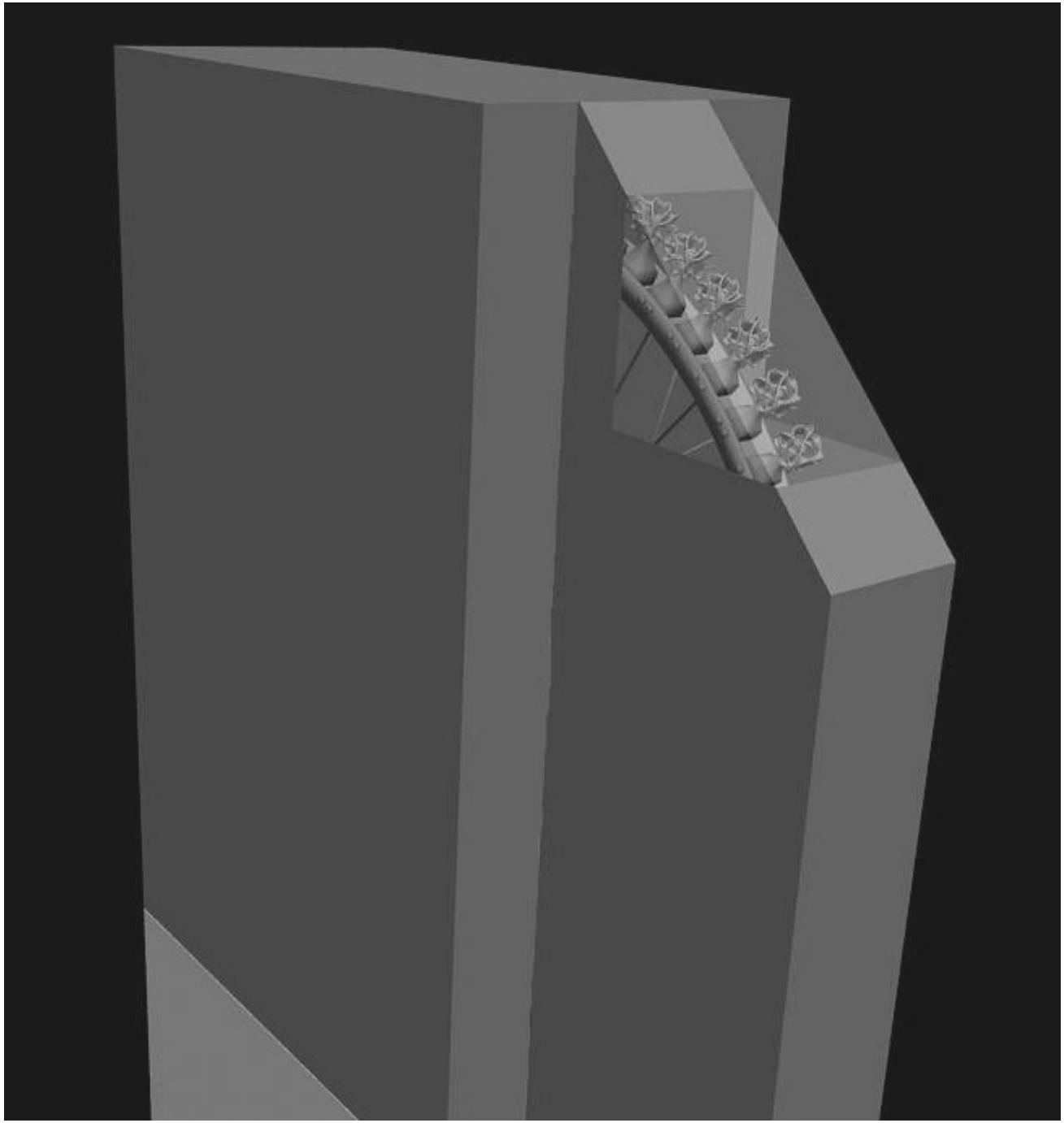
Parameterized in CP4

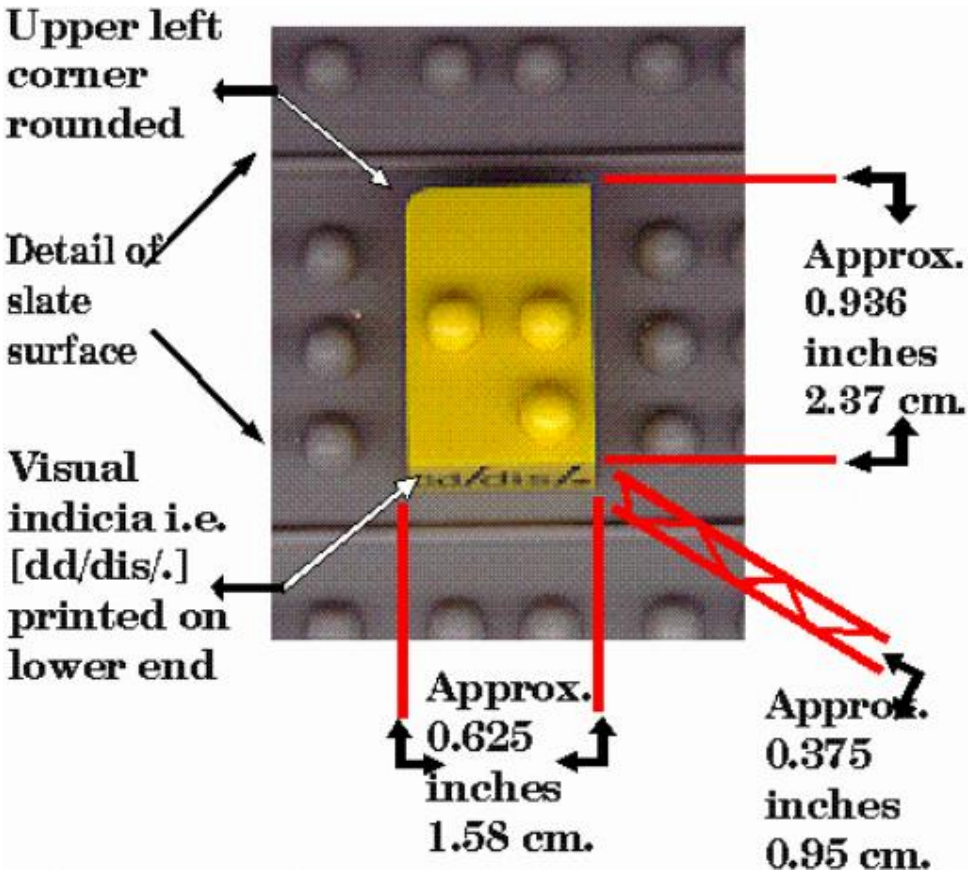
```
u1[a_,b_] := .5 (E(a + I*b) + E(- a - I*b))
u2[a_,b_] := .5 (E(a + I*b) - E(- a - I*b))

z1k[a_,b_,n_,k_] := E(k*2*Pi*I/n)*u1[a,b](2.0/n)
z2k[a_,b_,n_,k_] := E(k*2*Pi*I/n)*u2[a,b](2.0/n)

{x, y, z} -> { Re[z1k[a,b,n,k1]],
Re[z2k[a,b,n,k2]],
Cos[alpha]*Im[z1k[a,b,n,k1]] + Sin[alpha]*Im[z2k[a,b,n,k2]]}

a: (-1.0,1.0); b:(0, Pi/2);
k2: (0, n - 1)
k1: (0, n - 1)
```



QuickTime™ and a Apple Motion JPEG Format A decompressor are needed to see this picture.

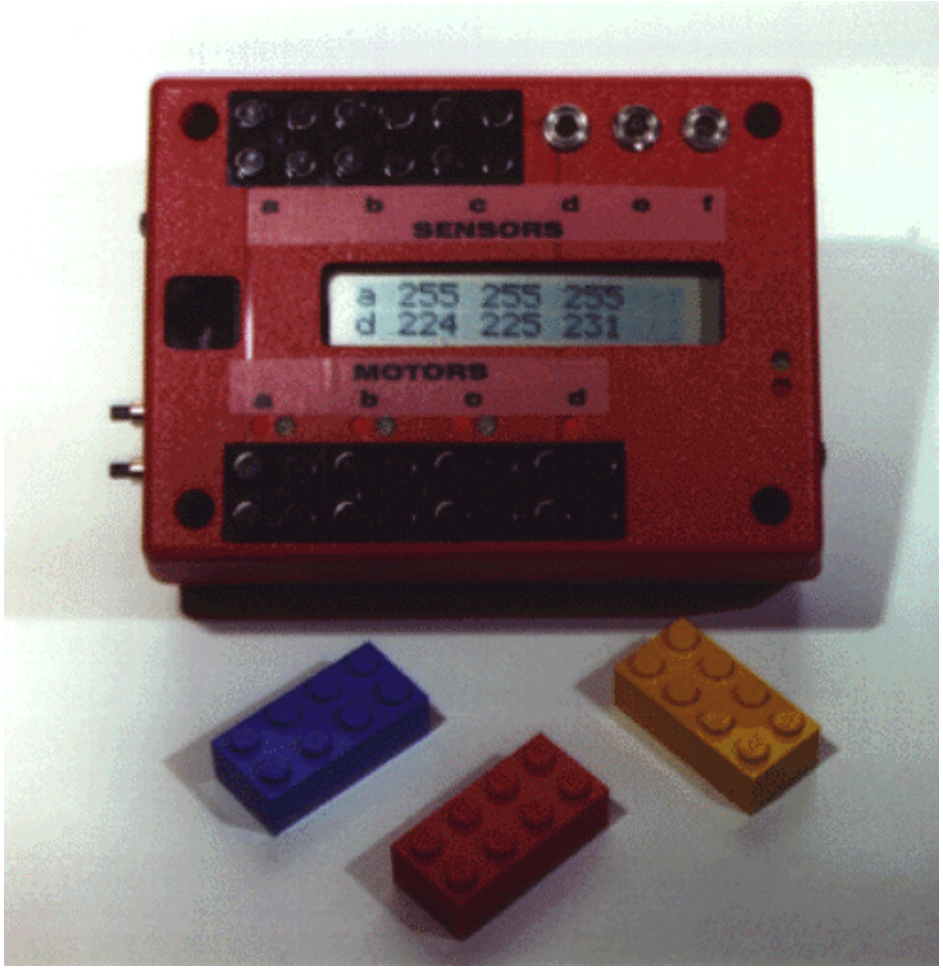




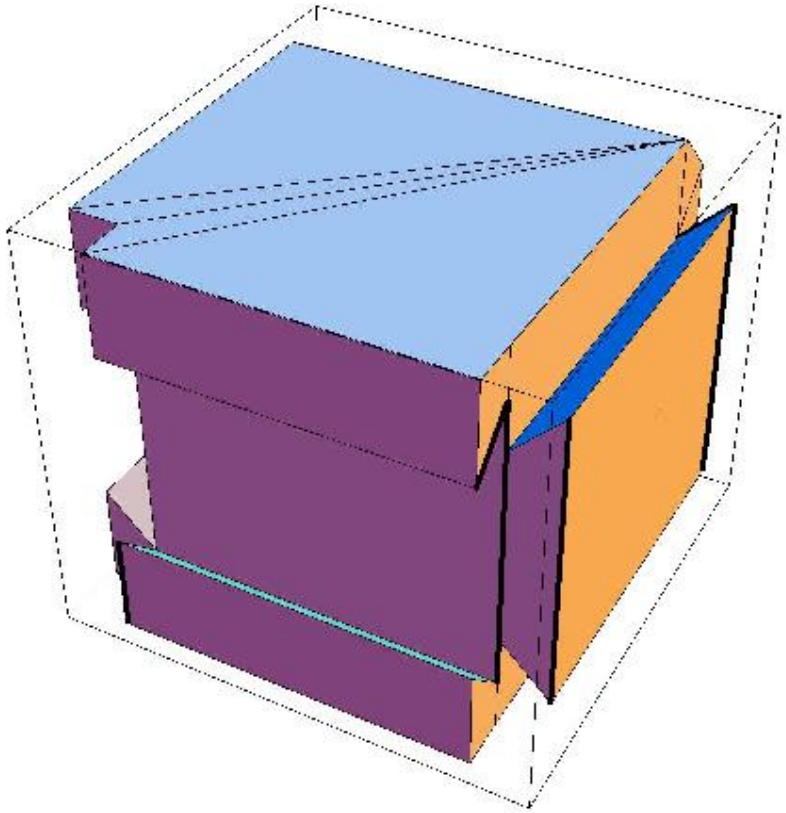


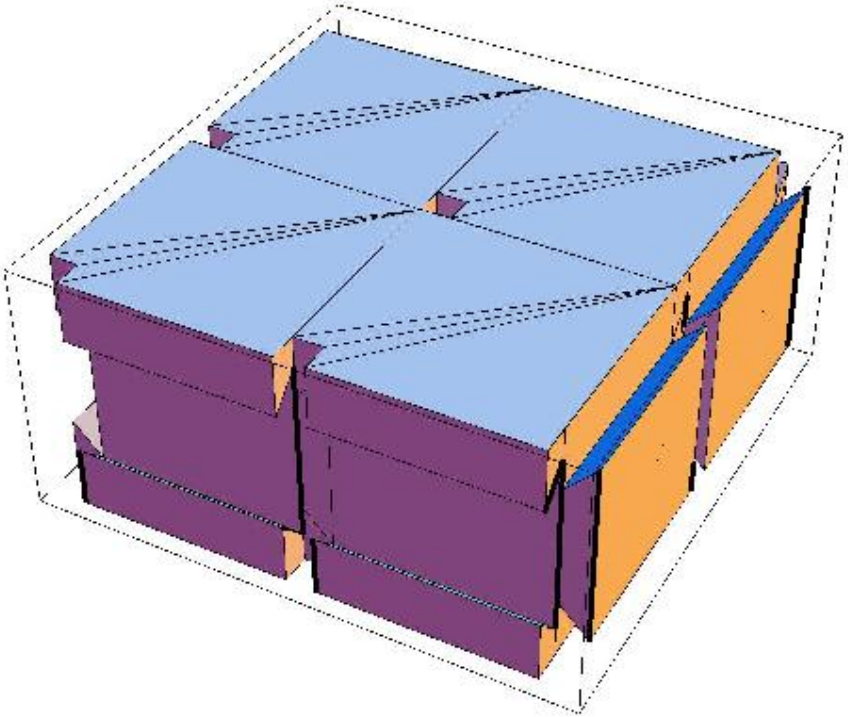
http://www.tack-tiles.com/

http://llk.media.mit.edu/projects/cricket/



http://www.lego.com/dacta/products/productsbyproductline.asp





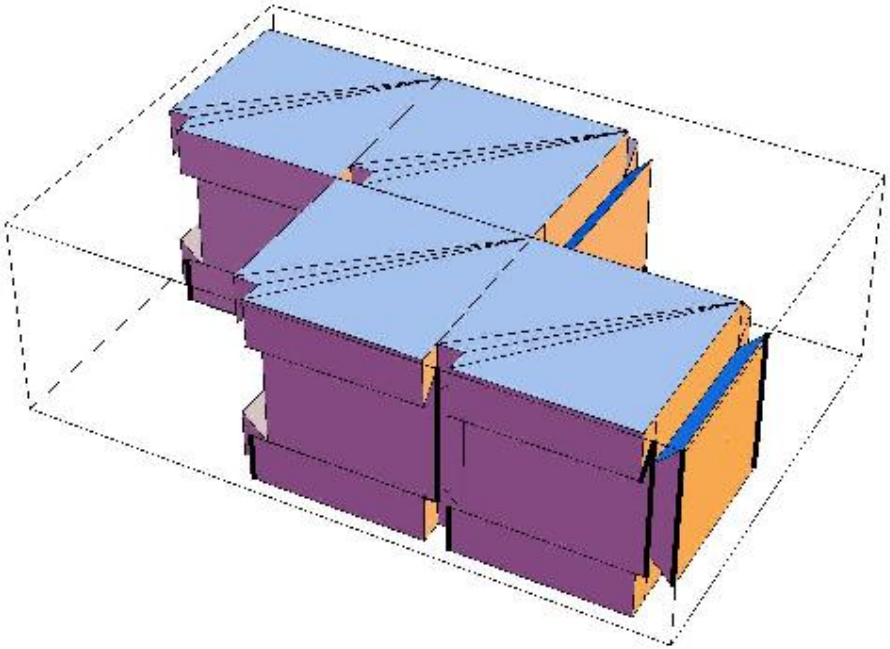
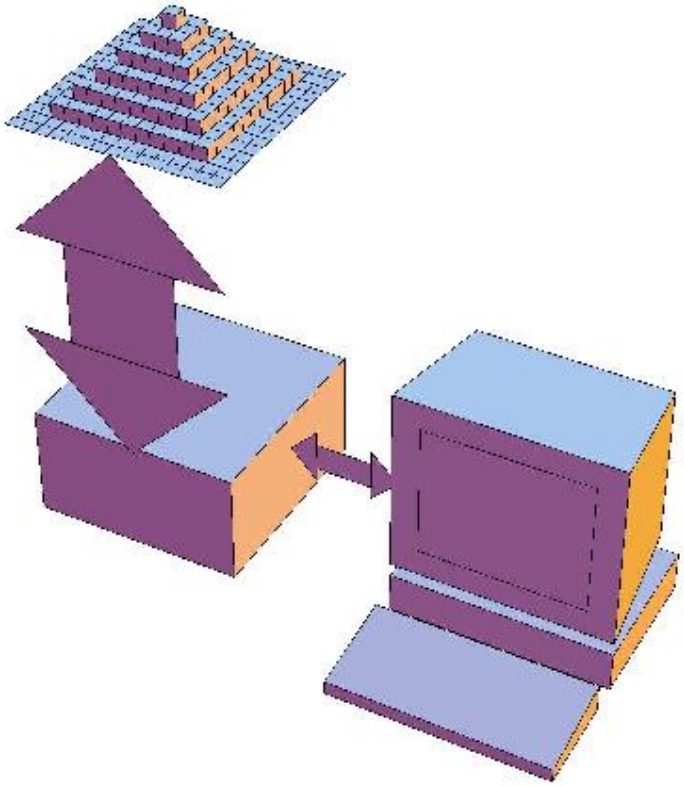


Figure 1



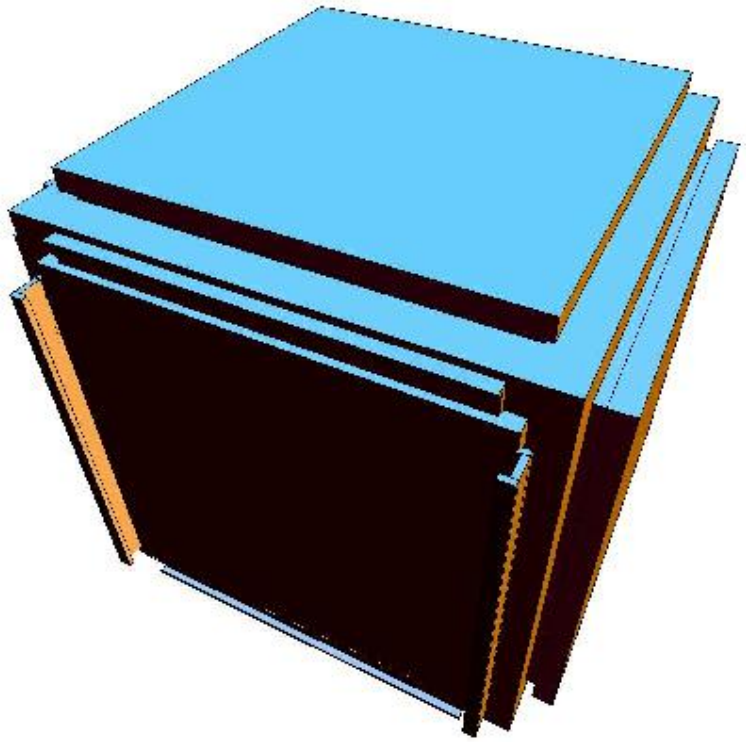
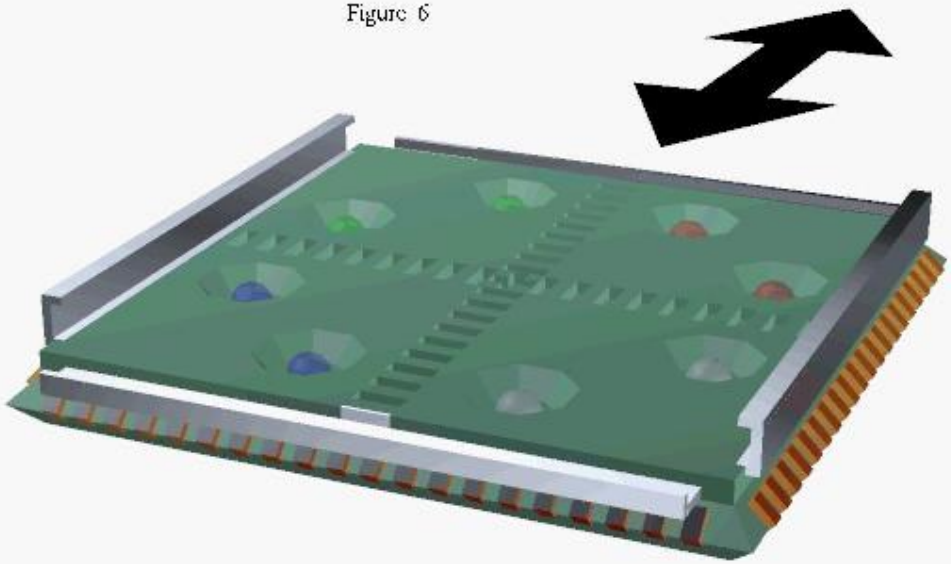


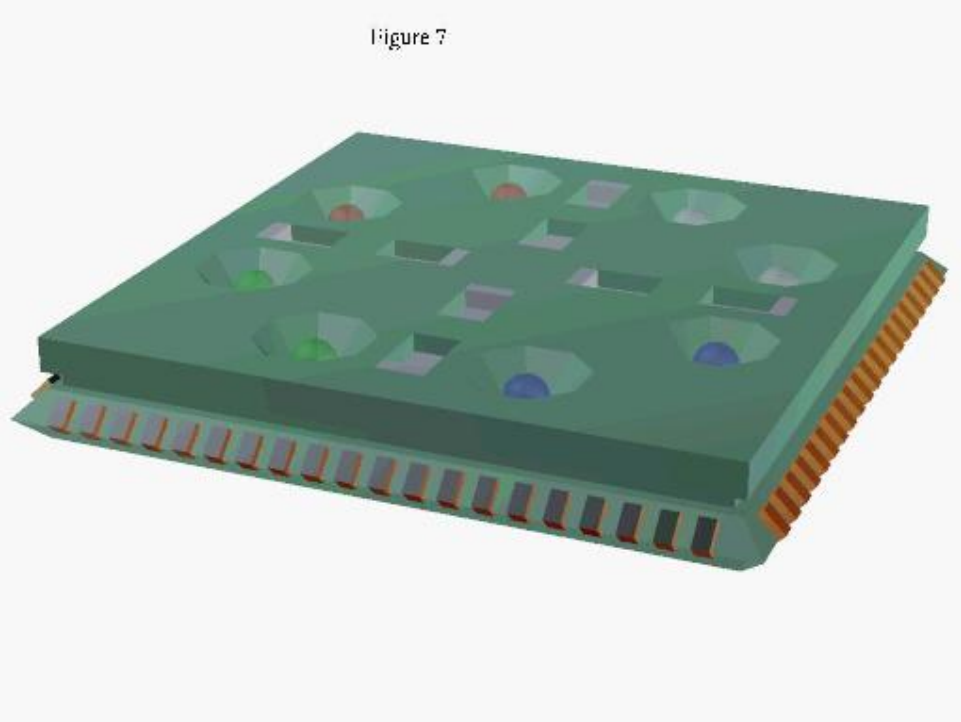
Figure 6



Cubic Face Module with Movable Latches

http://emsh.calarts.edu/~mathart/Cell_Auto/CellAutoSculpt_prop_Contents.html

Figure 7



http://emsh.calarts.edu/~mathart/Cell_Auto/CellAutoSculpt_prop_Contents.html

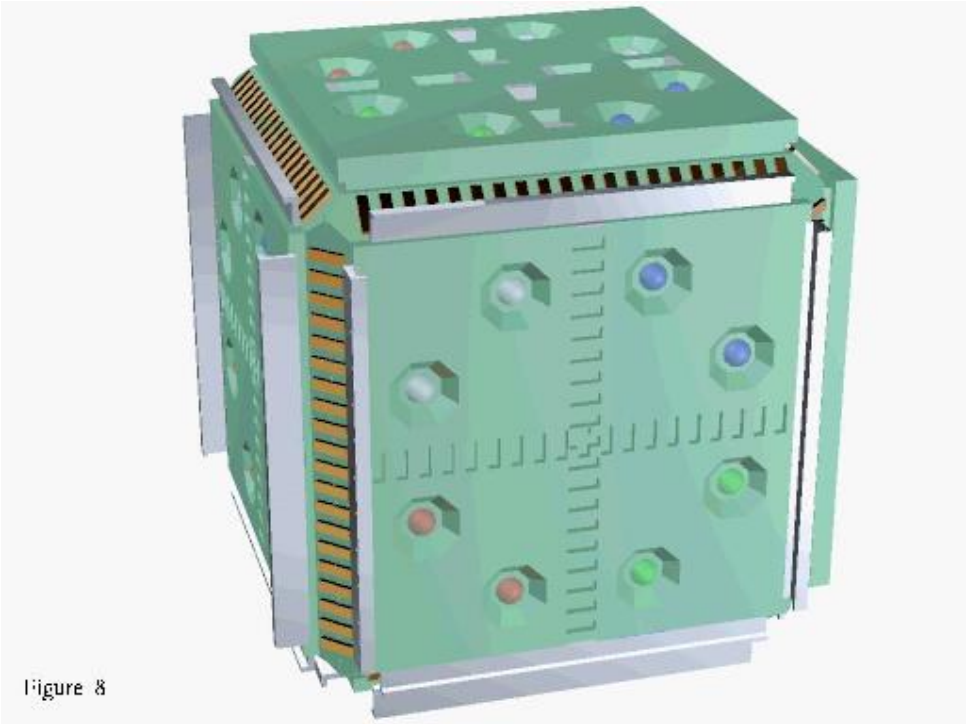
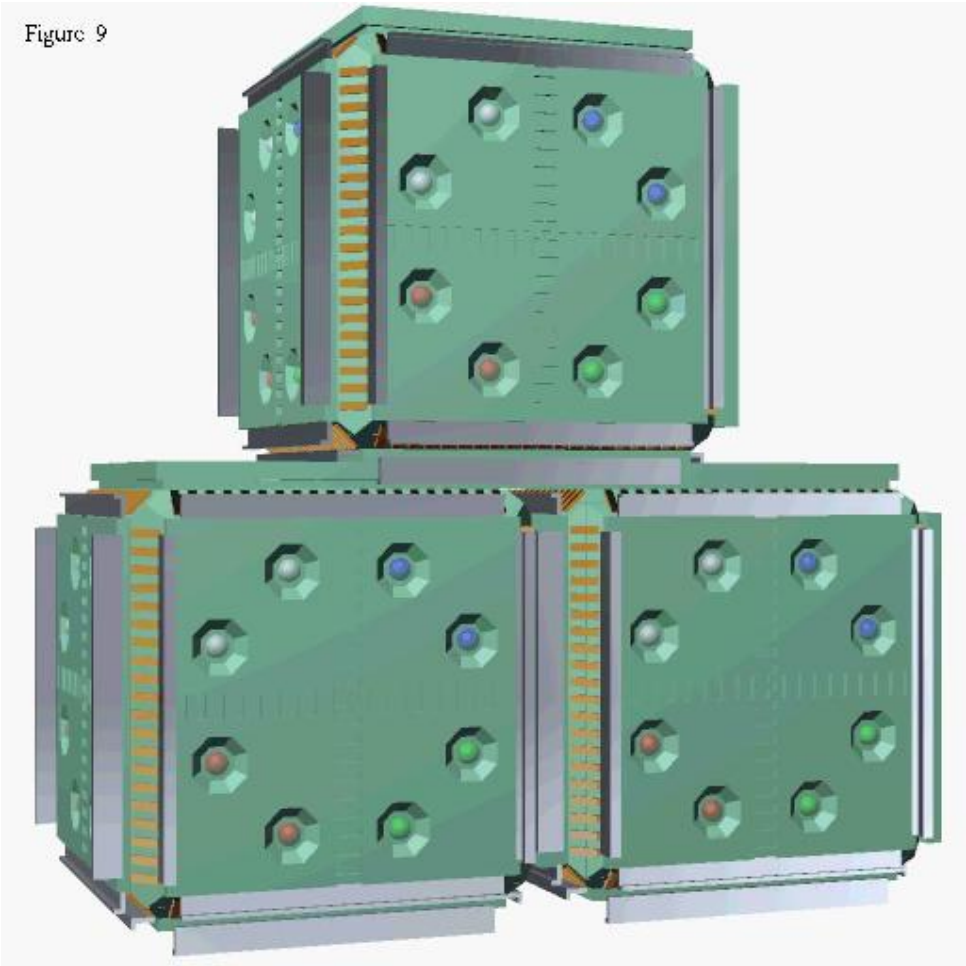
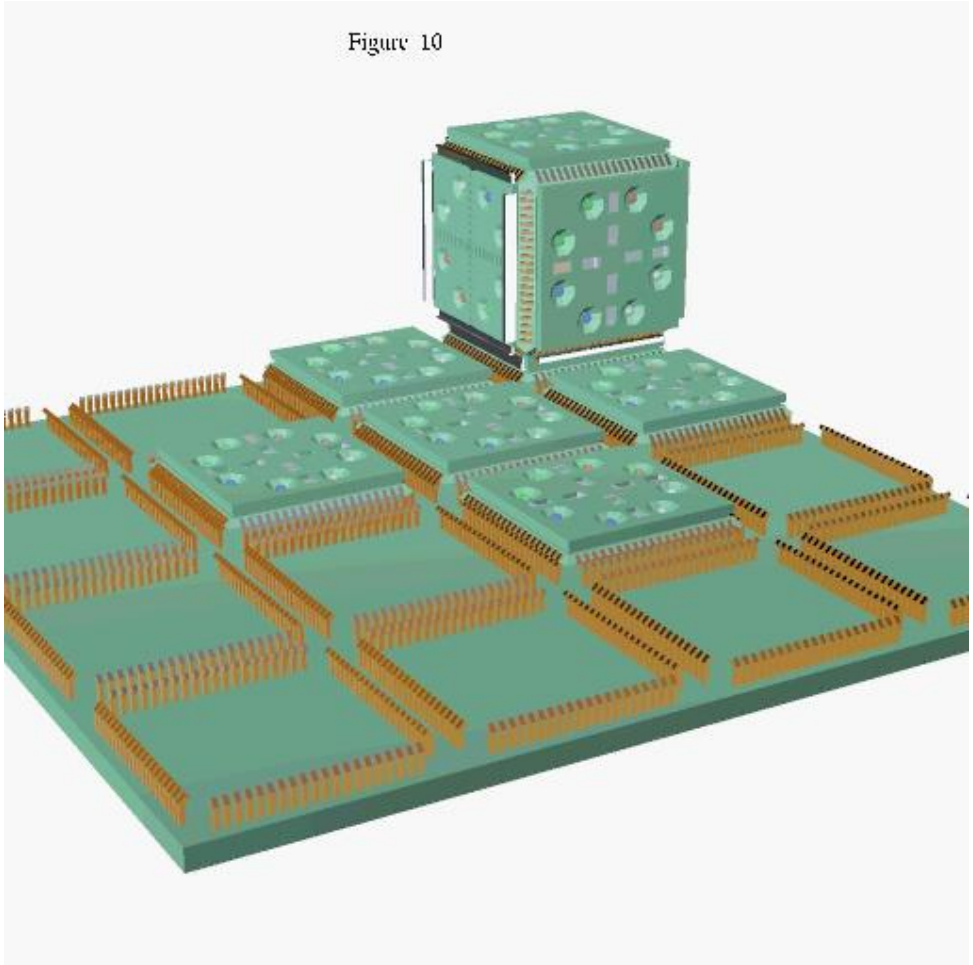


Figure 8

http://emsh.calarts.edu/~mathart/Cell_Auto/CellAutoSculpt_prop_Contents.html



http://emsh.calarts.edu/~mathart/Cell_Auto/CellAutoSculpt_prop_Contents.html



http://emsh.calarts.edu/~mathart/Cell_Auto/CellAutoSculpt_prop_Contents.html

Stewart Dickson
http://us.imdb.com/Name?Stewart+Dickson
http://emsh.calarts.edu/~mathart
http://www.cs.utk.edu/~dickson
http://www.csm.ornl.gov/~dickson
DicksonSP@ornl.gov
Mathart@emsh.calarts.edu