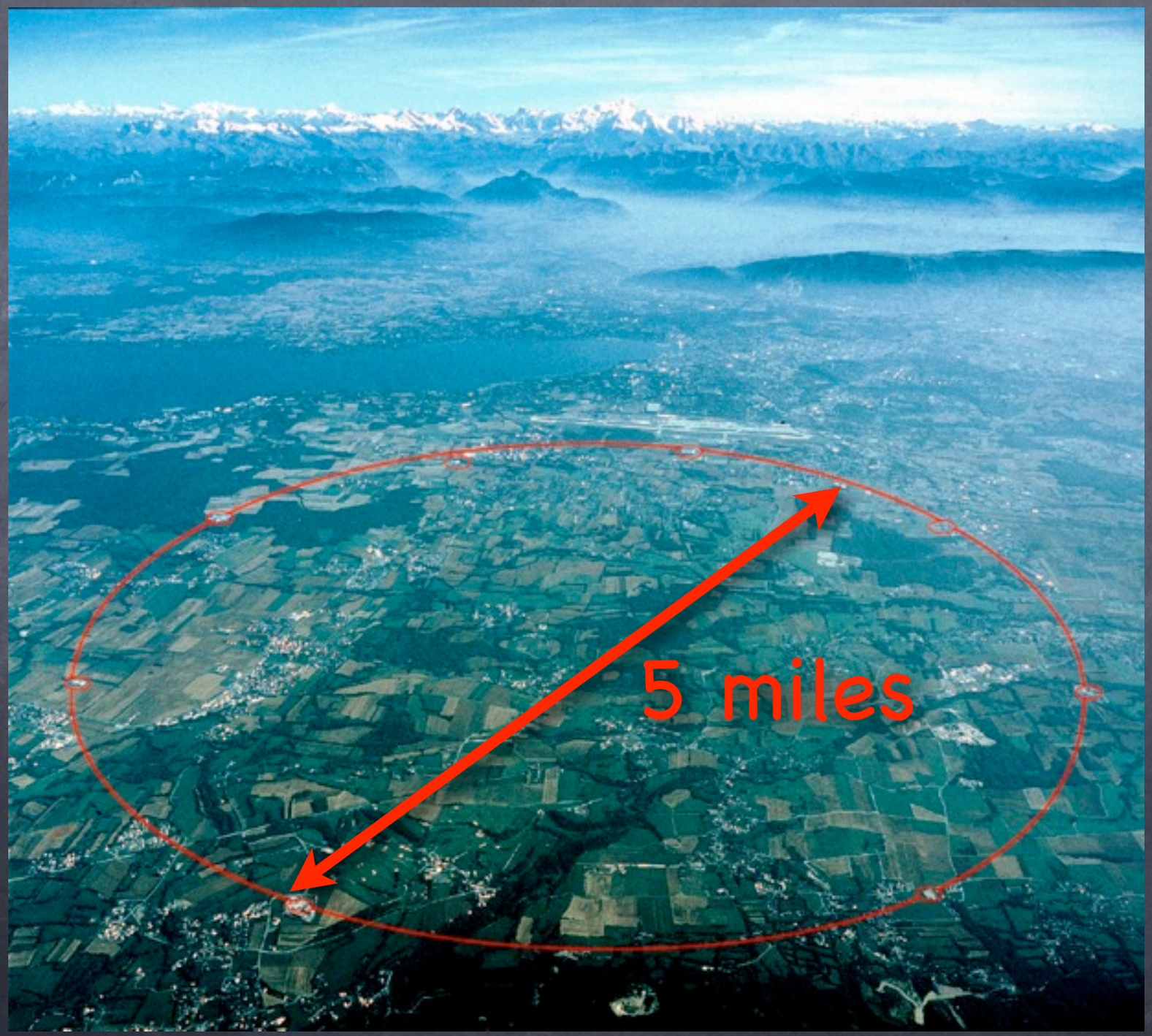
Extra Dimensions

John Terning

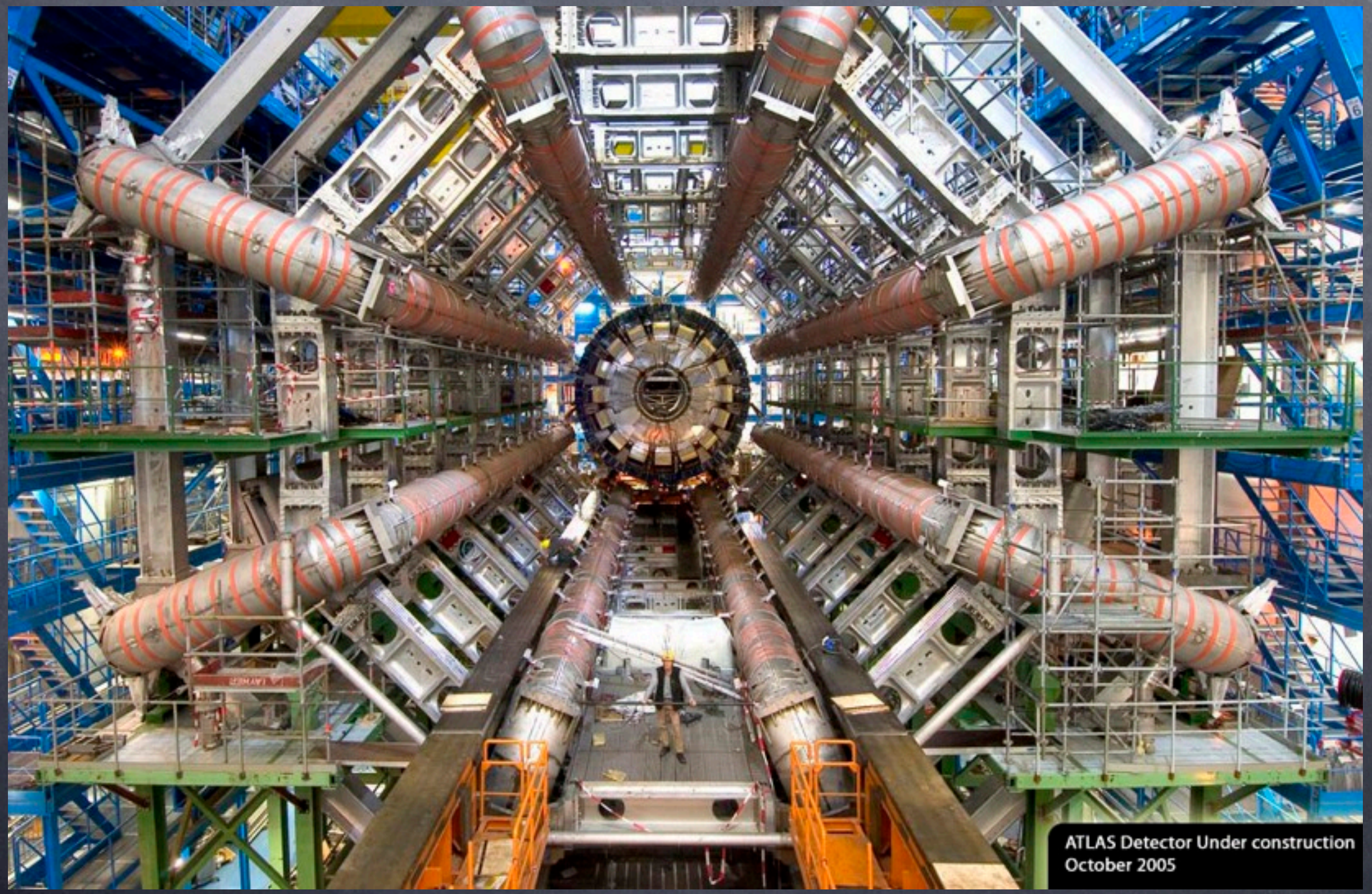
UC Davis

Large Hadron Collider

Large Hadron Collider



Atlas Detector

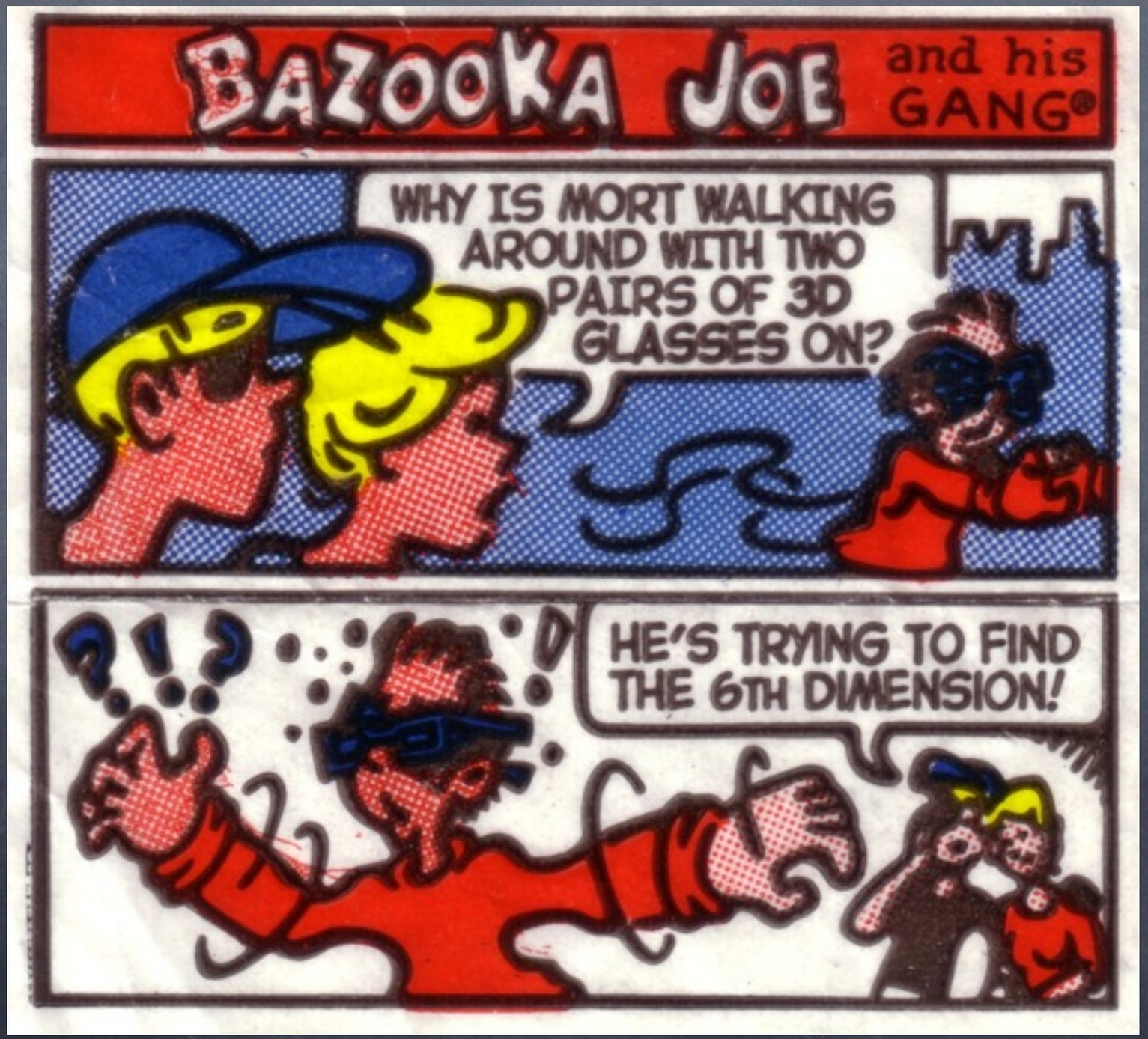


ATLAS Detector Under construction
October 2005

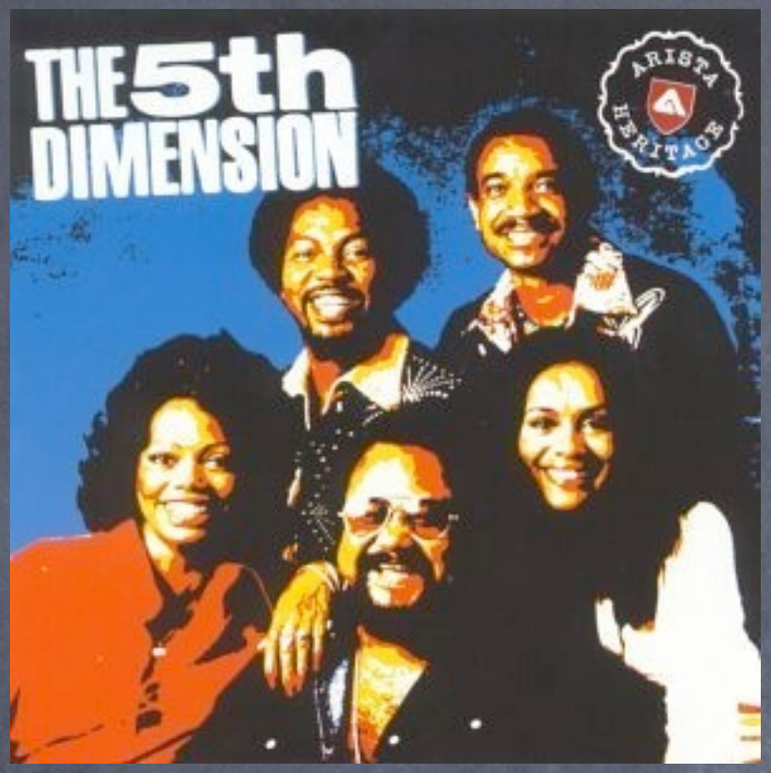
CMS Detector

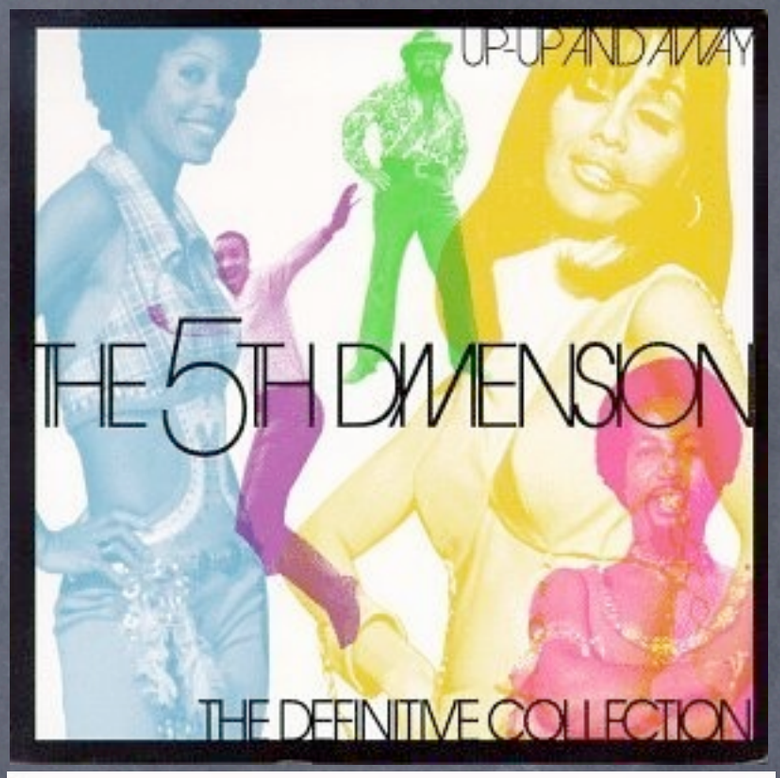
Large Hadron Collider

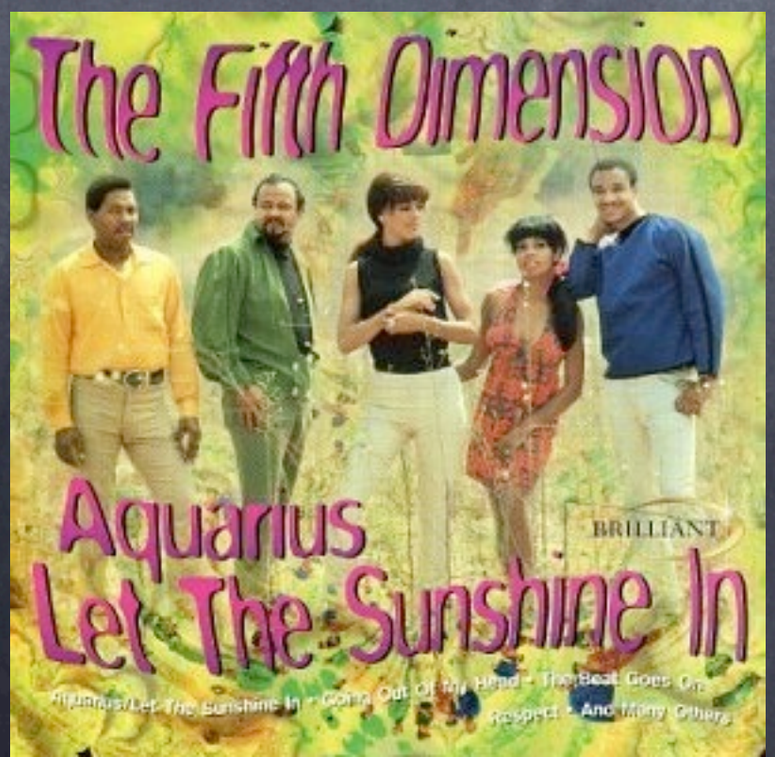
The Sixth Dimension



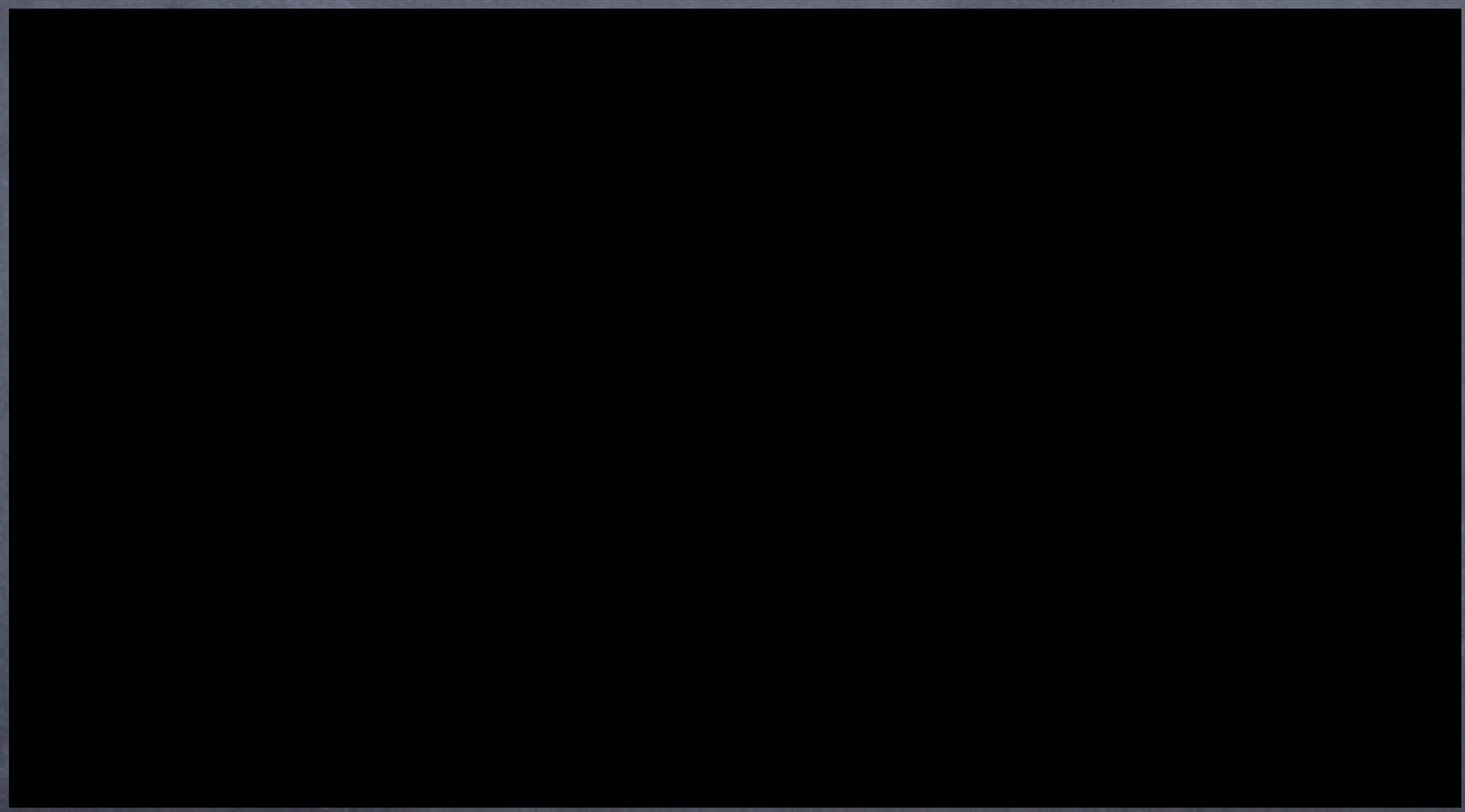
The Fifth Dimension



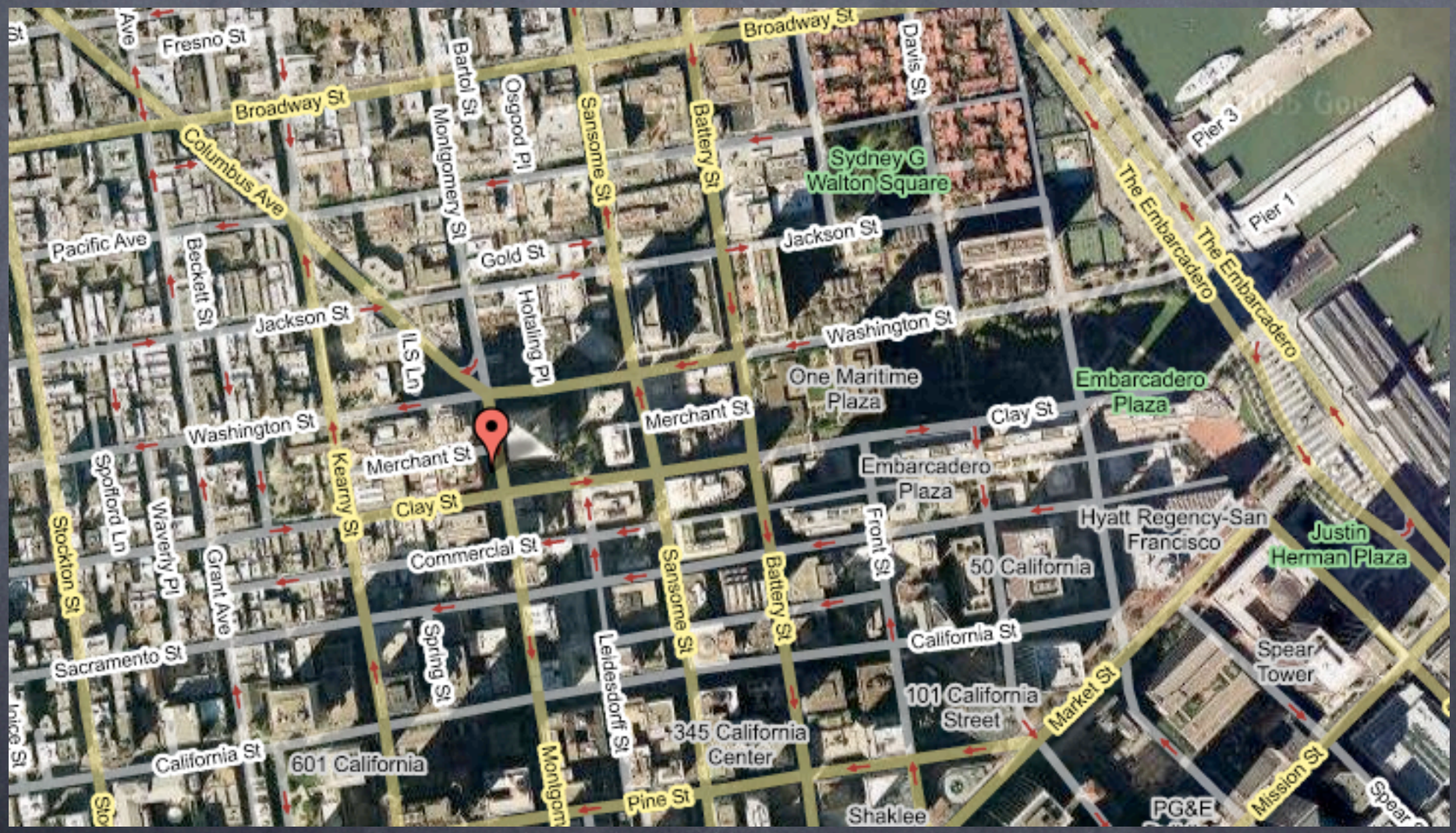




Entering Another Dimension



How Many Dimensions?



2 Dimensions: Clay and Montgomery

How Many Dimensions?

2 Dimensions: Clay and Montgomery

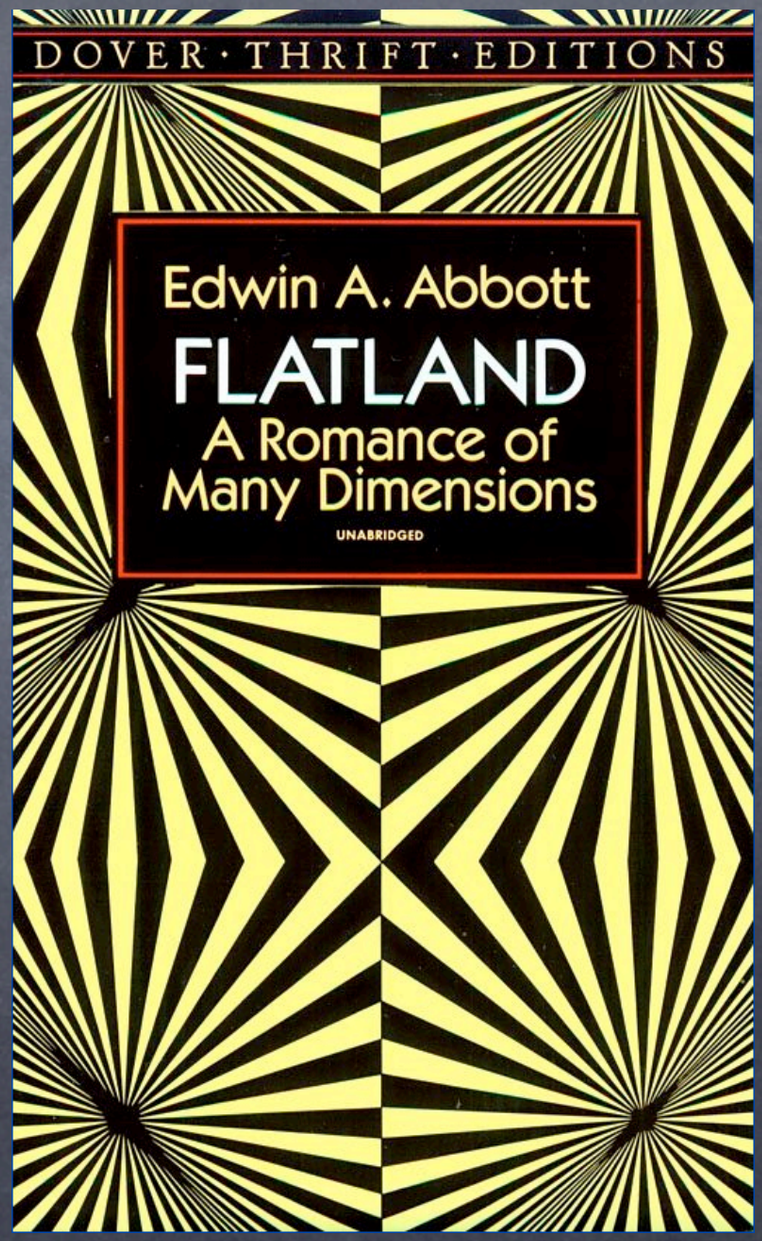
3rd Dimension: 43rd Floor

Time is the 4th Dimension

3 Dimensions: 43rd Floor, Clay and Montgomery

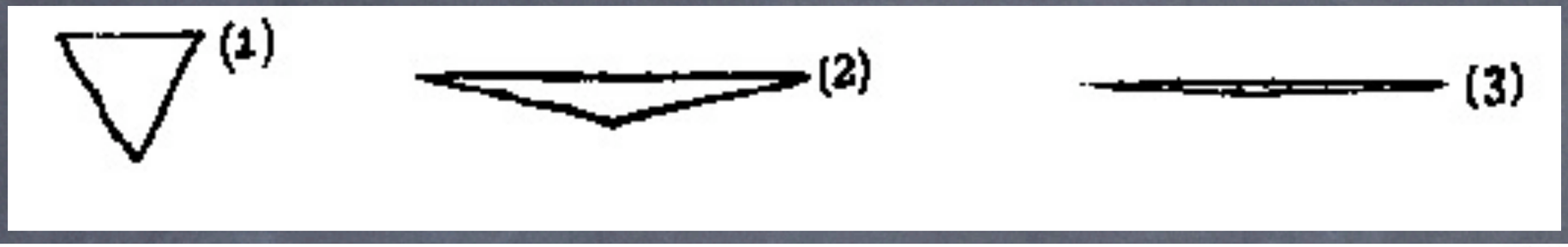
4th Dimension: 2:45 pm

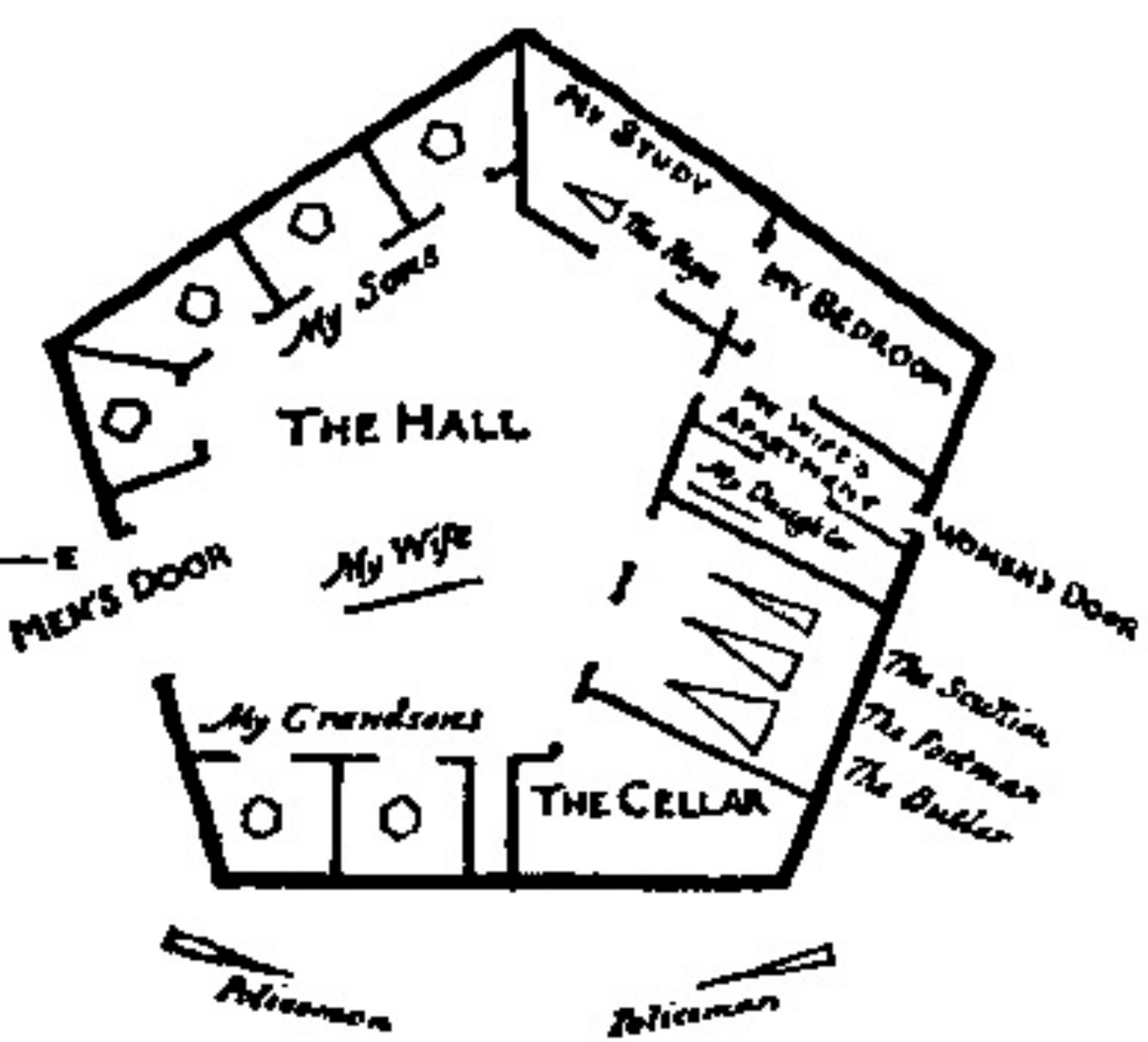
Edwin Abbott Abbott

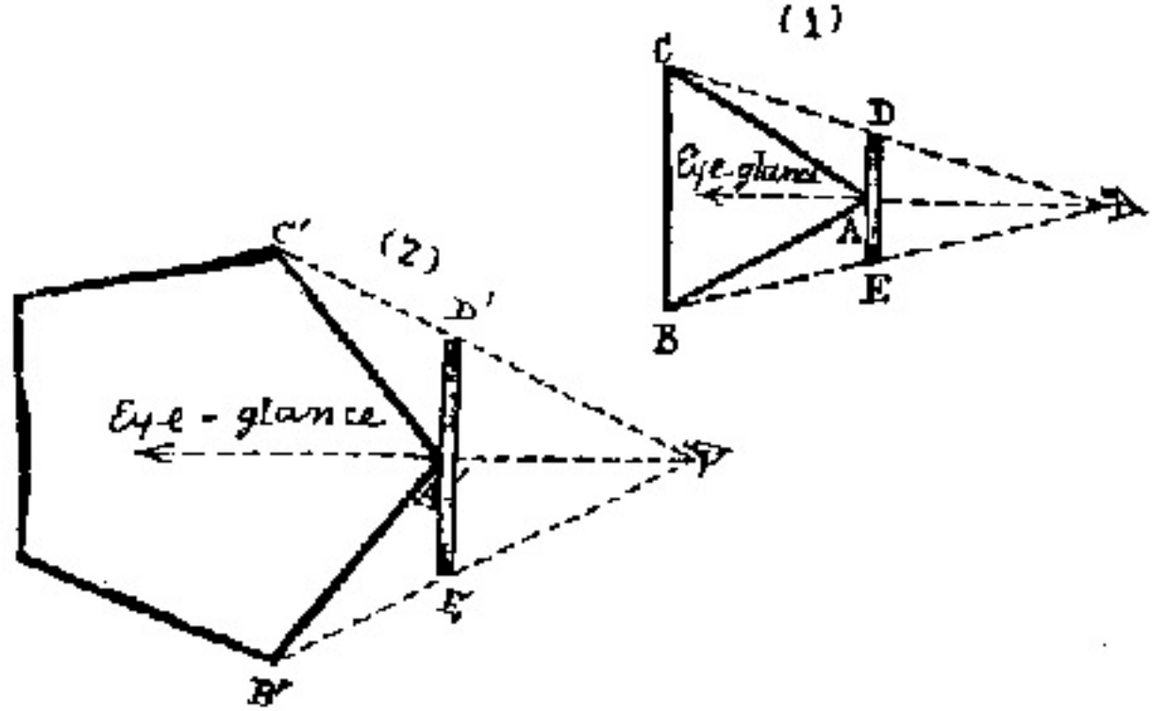


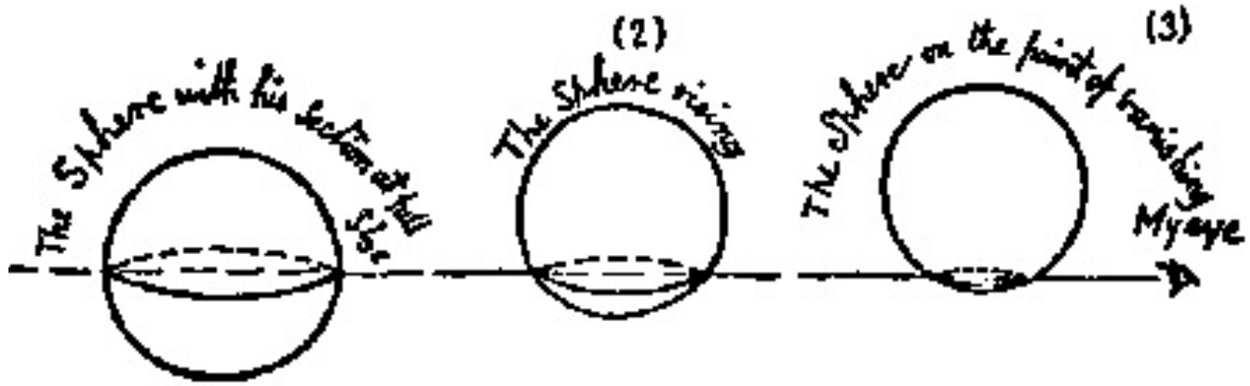
1884

Flatland


(1)
(2)
(3)


My Study
The Hall
My Sons
My Bedroom
My Wife's Apartment
My Daughter
Women's Door
Men's Door
My Wife
My Grandsons
The Cellar
The Scullion
The Footman
The Butler
Policeman
Policeman


(1)
C
D
Eye-glance
A
E
B
(2)
C'
D'
Eye - glance
A'
E'
B'


(2)
The Sphere with his section at full size
The Sphere rising
(3)
The Sphere on the point of vanishing
My eye

Lack of Perspective

Lorenzo Lotto

David Hockney

Perspective

Summary of Optical Evidence that Lorenzo Lotto Used a Lens in c.1523

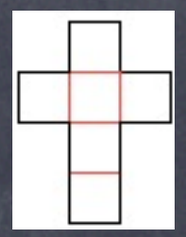
Qualitative

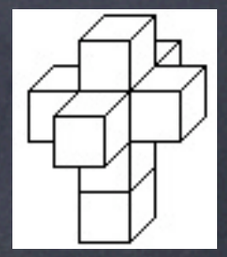
- Octagonal pattern goes out of focus
- Two vanishing points are readily apparent in the octagonal pattern
- Excellent fit of a perspective-corrected octagon to the pattern
- Change to a 2nd vanishing point in the border is apparent at same depth into scene as octagonal pattern goes out of focus

Quantitative

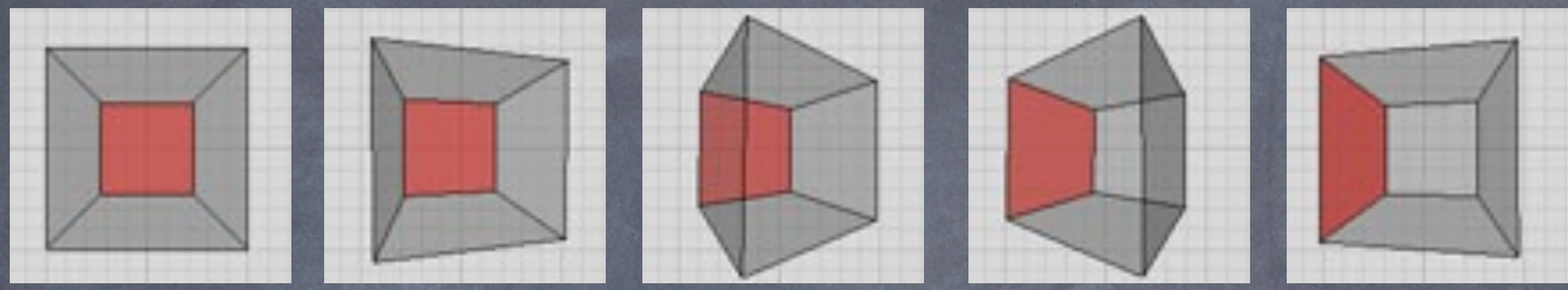
- Focal length of lens calculated as 53.8 cm (from ***magnification*** of painting)
- Diameter of lens calculated as ~2½ cm (from ***depth of field***)
- Magnification decrease of –14.3% calculated where perspective of octagon initially changes (from ***depth of field + focal length***)
- Second magnification decrease of –12.5% calculated where perspective of octagon changes (from ***depth of field + focal length***)
- Change in convergence of 3° calculated for the border pattern (from ***change in magnification upon refocusing + focal length***)

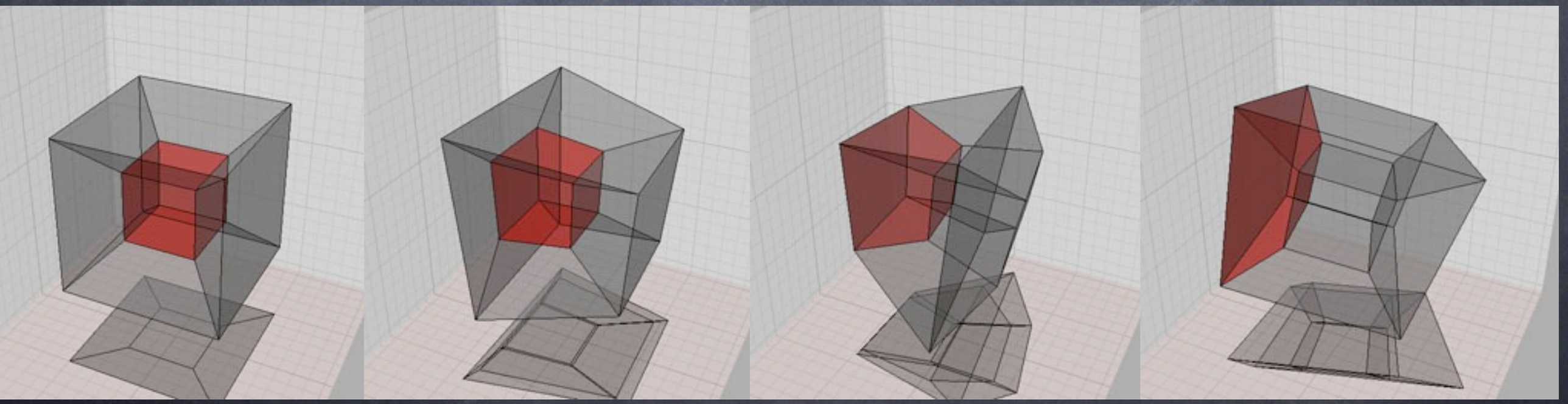
David Hockney, Charles Falco



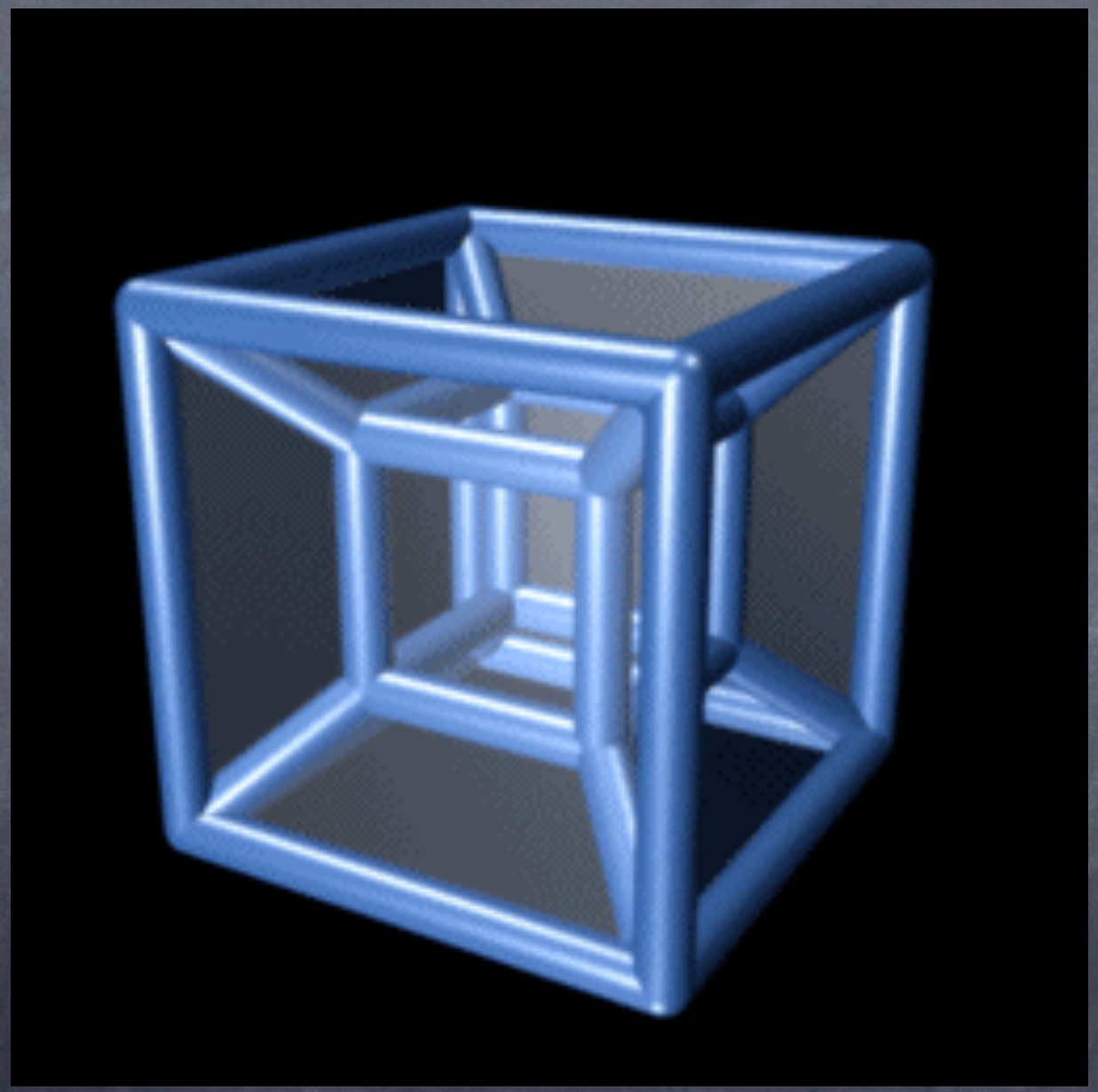


Projection of Rotation

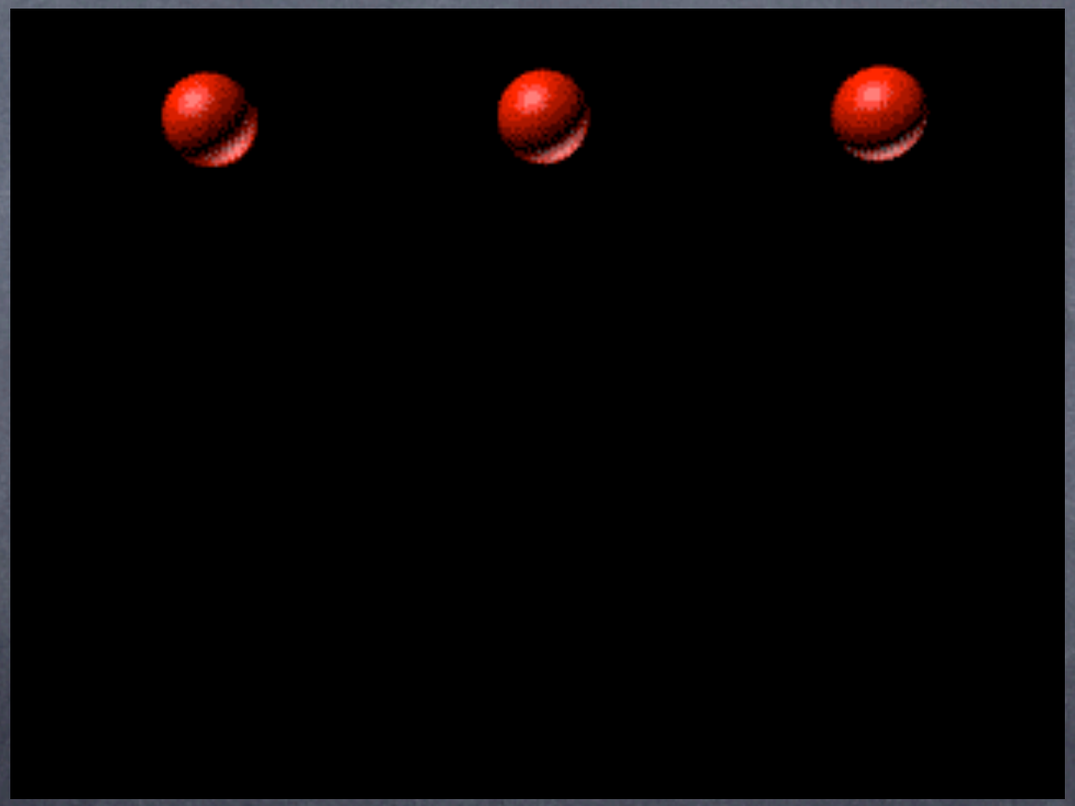


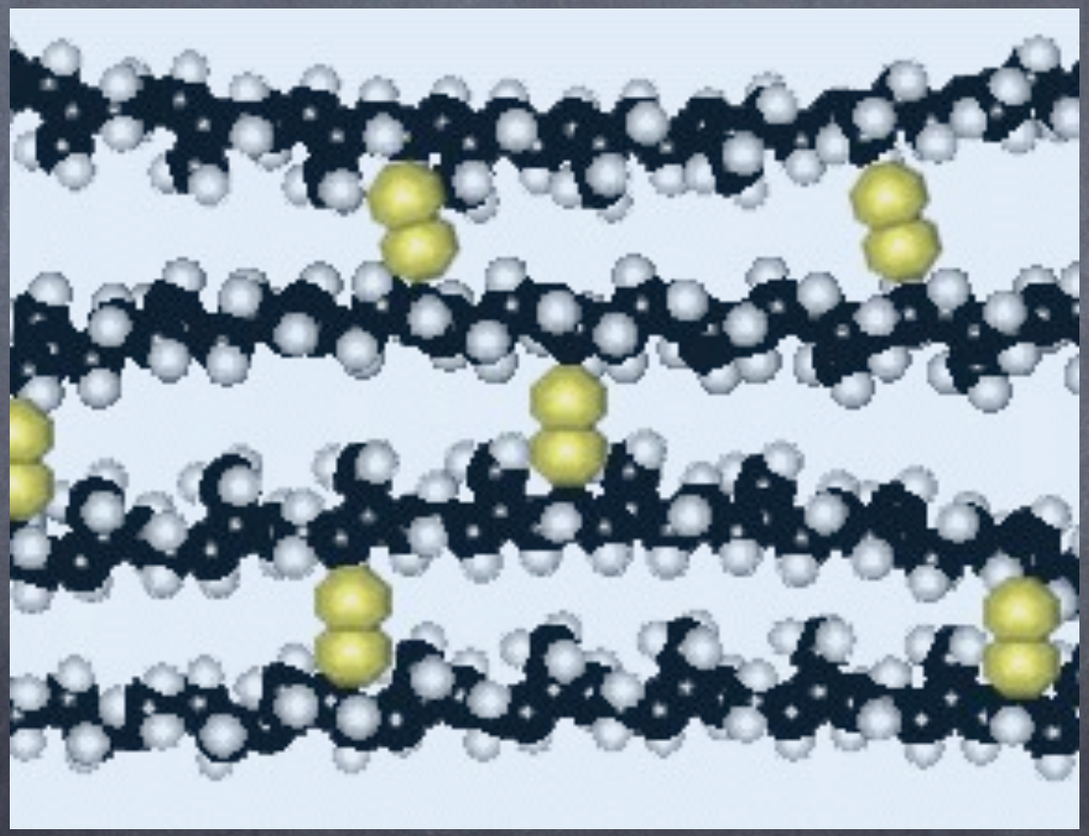


Projection of Rotation



Effective Theories



Effective Theories

Effective Theories