Projection Mapping in Processing: 1 Day

Evan Raskob
evan@openlabworkshops.org

Openlab Workshops

Becky Stewart
becky@codasign.com
Adam Stark
adam@codasign.com

http://learning.codasign.com

Click on Projection Mapping in Processing
http://learning.codasign.com/index.php?title=Projection_Mapping_in_Processing

Contains short tutorials and links to other supporting material like code and slides

The Software, etc.

Helpful links to software used in this workshop:

Processing
http://processing.org

SurfaceMapper (open souce, bezier surfaces, movie support)
http://www.ixagon.se/surfacemapper/

Code:
http://github.com/pixelpusher/P5ProjectionMapping

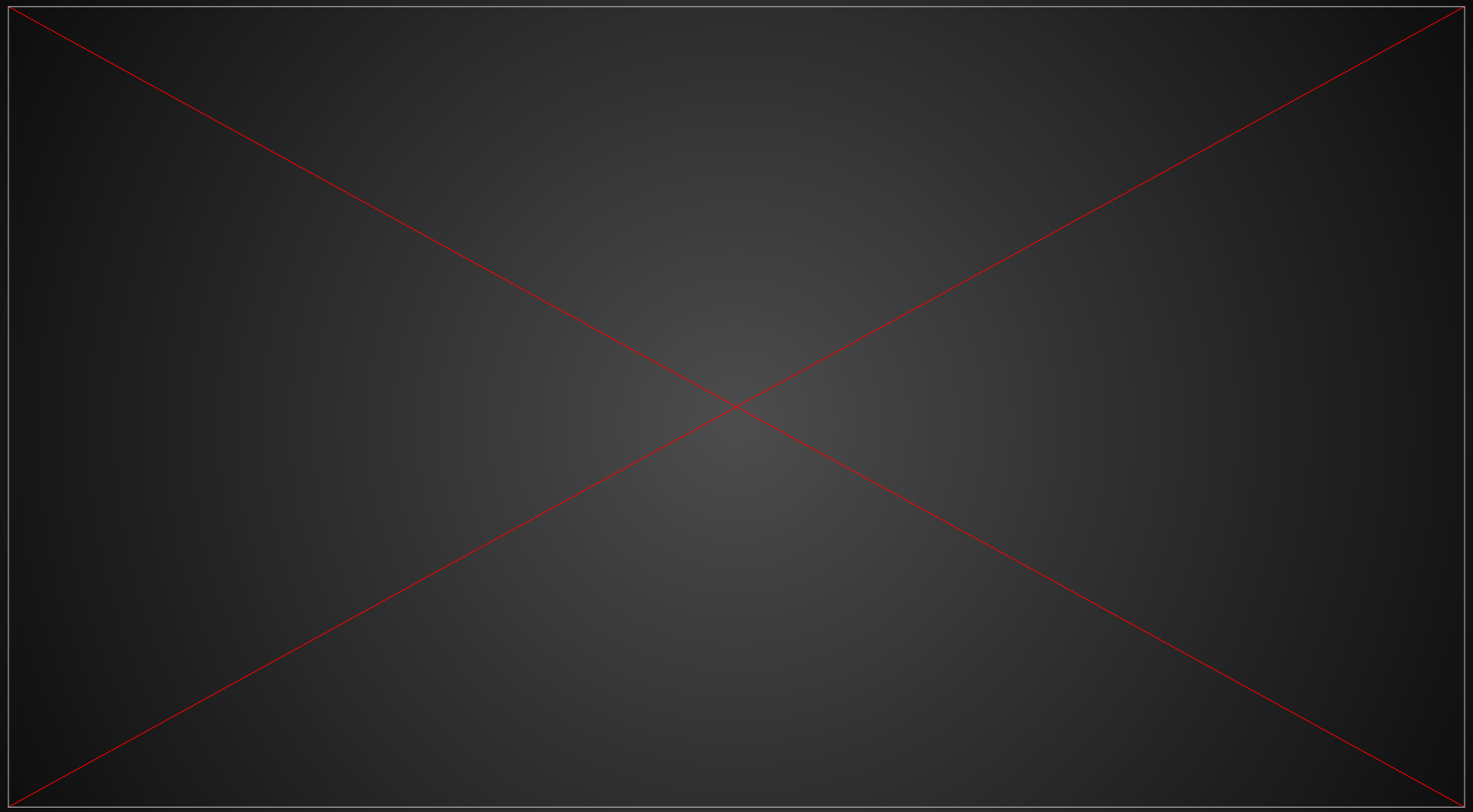
Other libraries & add-ons:

3D vs 2D? Project onto 3D models using 3D models as a guide? (requires all sorts of math). This could be done using saitoobjloader: http://code.google.com/p/saitoobjloader/

Quase-Cinema Feijoada VJ software
https://github.com/AlexandreRangel/QuaseCinemaFeijoada

Projection Mapping

in the wild...



Amon Tobin ISAM: http://vimeo.com/28840857

In the Wild:

http://www.bbc.co.uk/news/technology-18356814

Why?

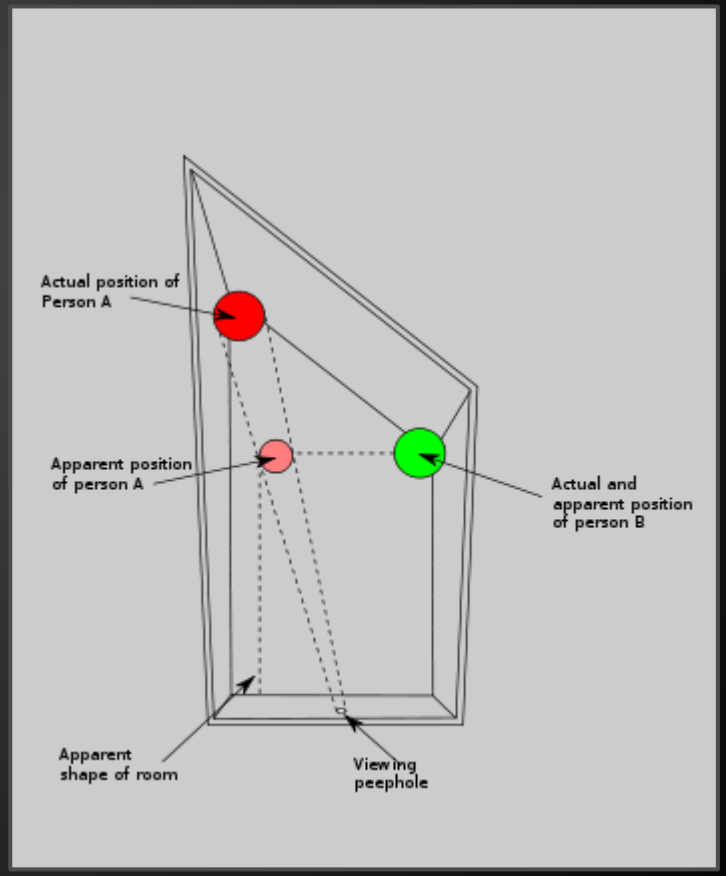
- Visual perceptions are Approximations of Reality

- Empirical evidence from our experience
- Statistical, pragmatic, learned over time

We can be fooled...

Forced Perspective

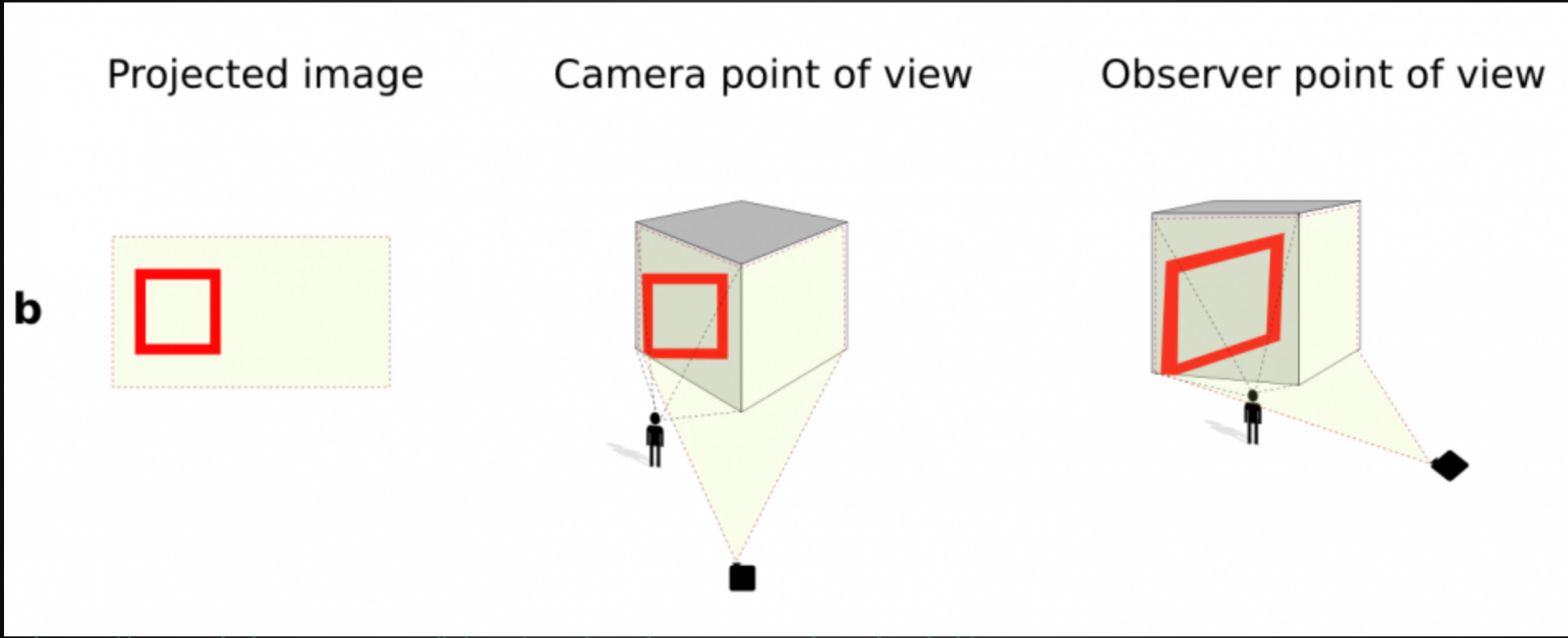
- Ames Rooms (Honi Effect)



it defies be-leaf

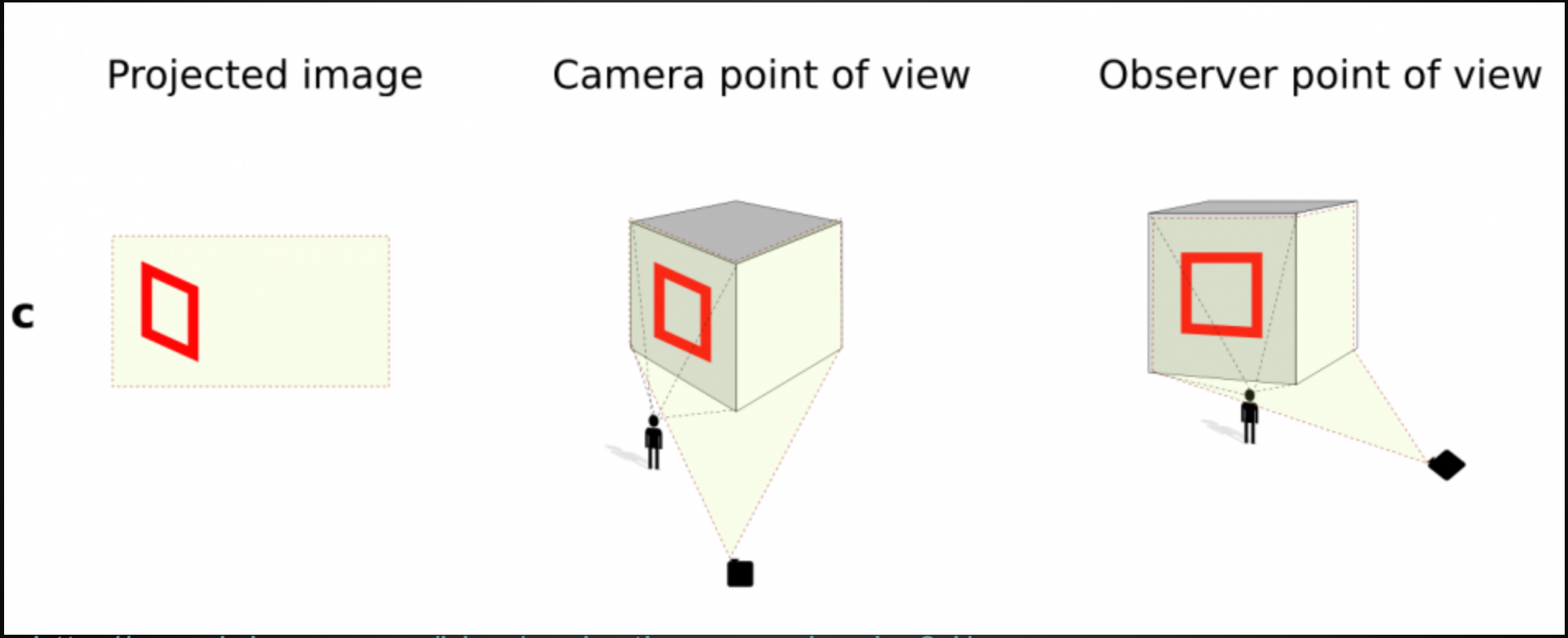
Wood you believe this moth??

Practical Perspective Problems



http://marcinignac.com/blog/projection-mapping-in-3d/

Perspective Correction



http://marcinignac.com/blog/projection-mapping-in-3d/

How do we create a mapped projection?

1. The scene(s) being projected
   - Draw shapes
   - Import and manipulate images
   - Import and manipulate videos

2. The surface(s) being projected on
   - Mathematical transformations to adjust perspective
   - We'll use code contributed by others to do this (today SurfaceMapper)

Why Use Processing?

- Free / Open Source
- Extensible - infinitely programmable
- Interactive
- Reactive / realtime / generative - things you can't do with video:
  - http://www.flickr.com/photos/davebollinger/
  - http://hemesh.wblut.com/ **(this image)**

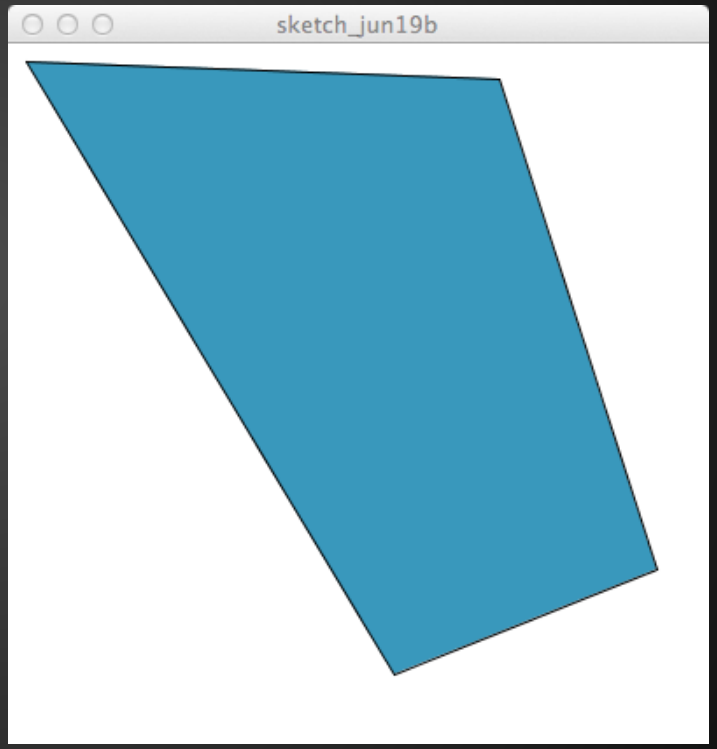
Why NOT Use Processing?

- DIY - not a finished product!
- Rely heavily on pre-rendered media like videos
- Need to create your own visual editing tools
  - 3D texture mapping will blow your mind...

Basics of Processing

Drawing Shapes

- rect, ellipse, triangle
- colors
- stroke



Instead of rect(x,y, w,h)

```
beginShape();

  vertex(10, 10);
  vertex(280, 20);
  vertex(370, 300);
  vertex(220, 360);
// any other vertices you want...

  endShape();
```

Exercise 1:
Draw a scene with shapes and colors.

Importing Images

http://learning.codasign.com/index.php?title=Displaying_Images_with_Processing

Exercise 2:
Import and manipulate an image.

Making Decisions in Code

Animating a Scene

Bouncing Ball

http://learning.codasign.com/index.php?title=Animating_a_Shape_in_Processing

Disco Ball

http://learning.codasign.com/index.php?title=Animating_a_Coloured_Shape_in_Processing

Exercise 3:
Animate a shape or image.

Movies via GSVideo

1. Install GSVideo (and GLGraphics)
2. Using GSVideo to play & control movies

LUNCH!

grab a pint or whatever floats your projector

Getting Ready to Map:

Applying Gestalt laws and neurological tricks

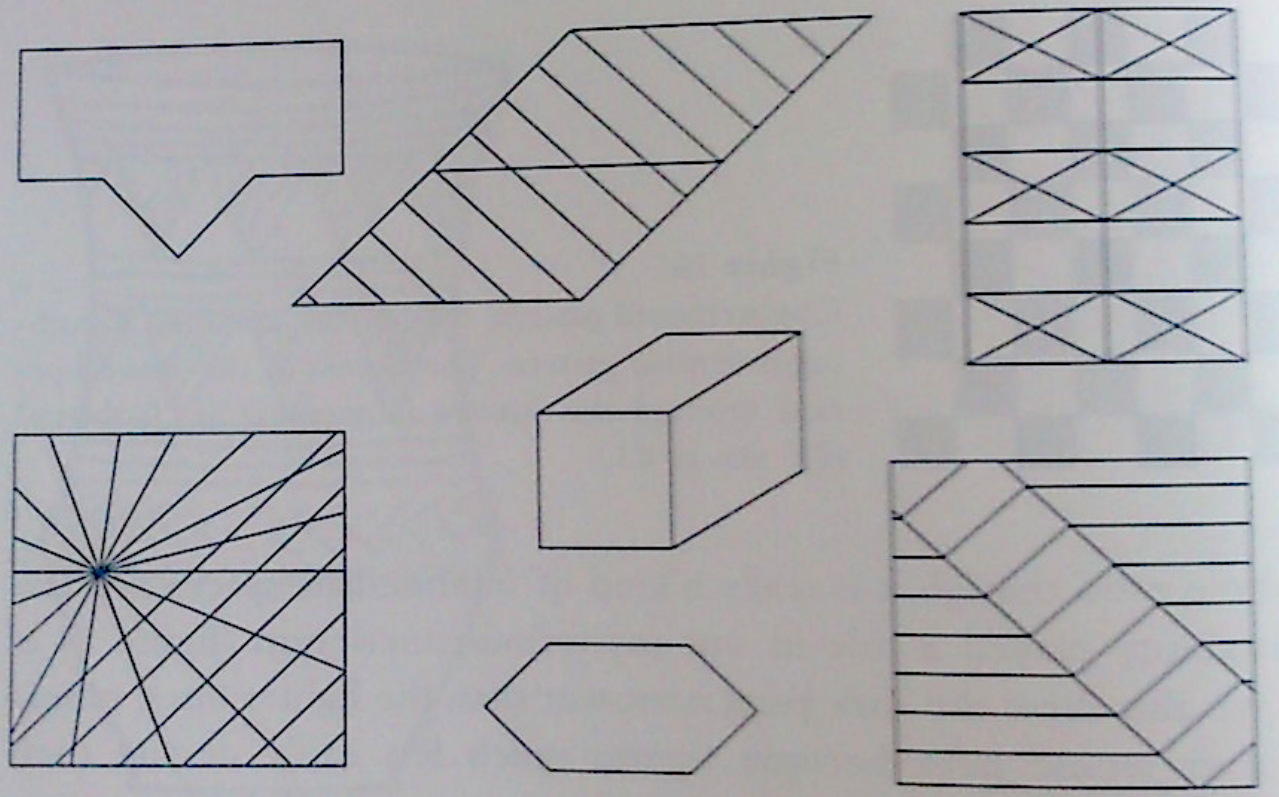


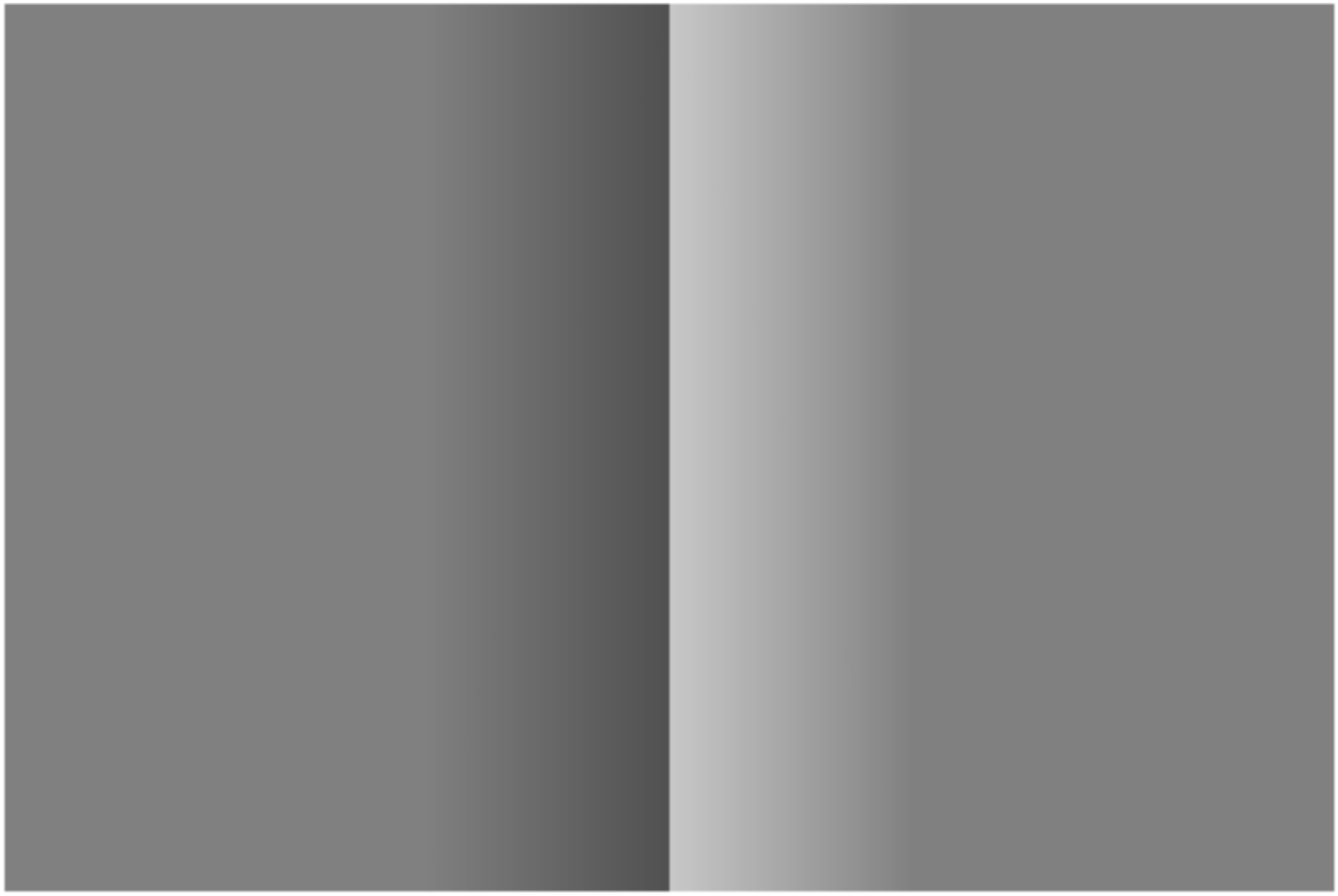
Figure 16A

Invisible shapes. The diagram contains three identical hexagons, three identical squared blocks, and three identical rectangles with a point (as above left). Where are they? How long did the search take? Who can see all of them without the help of a pencil or laboriously gathering up their parts over and over? (From K. Gottschaldt: *Über den Einfluß der Erfahrung* etc. *Psychol. Forschg.* 8, 1926.)

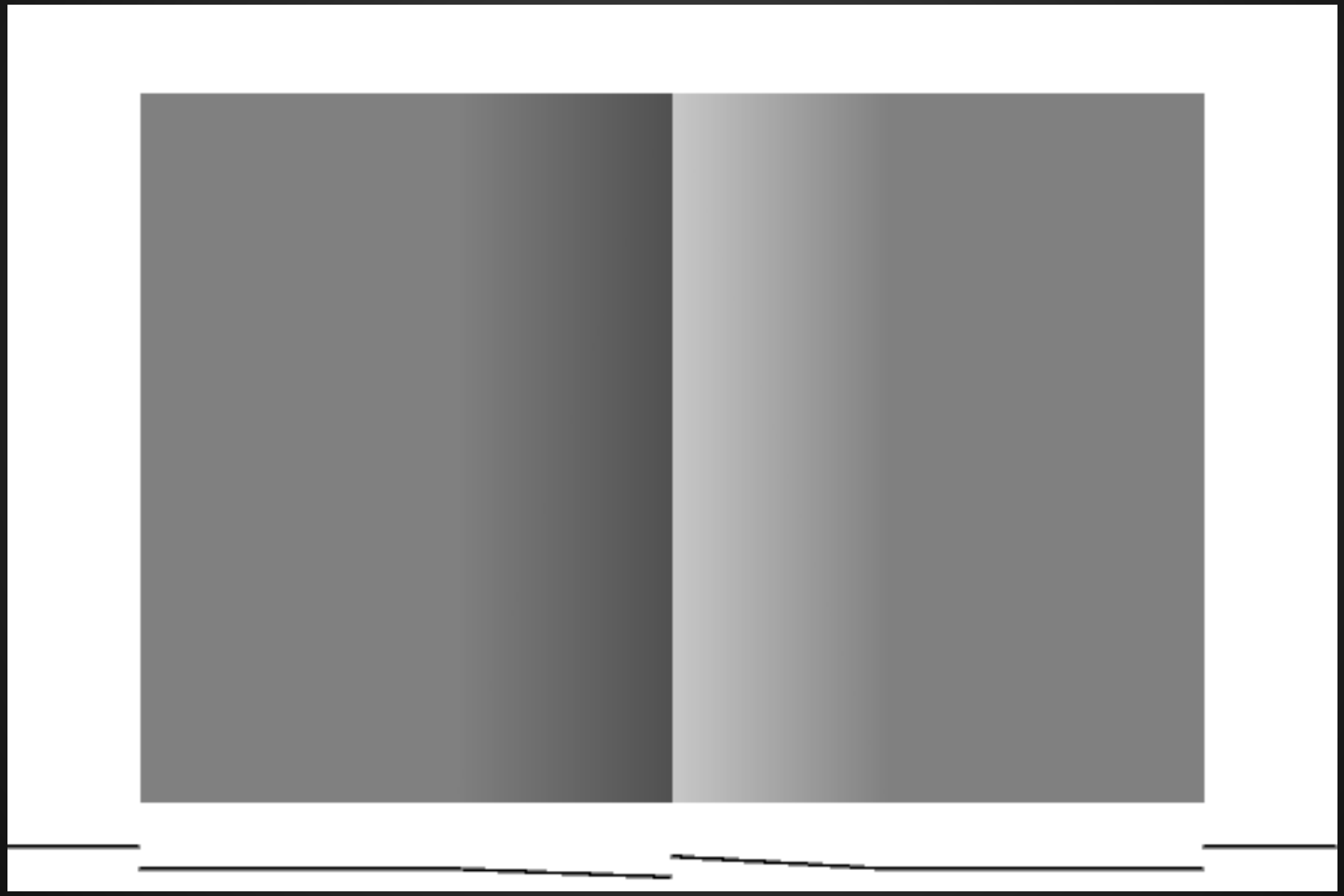
Contrast effects

- http://web.mit.edu/persci/gaz/gaz-teaching/flash/contrast-movie.swf

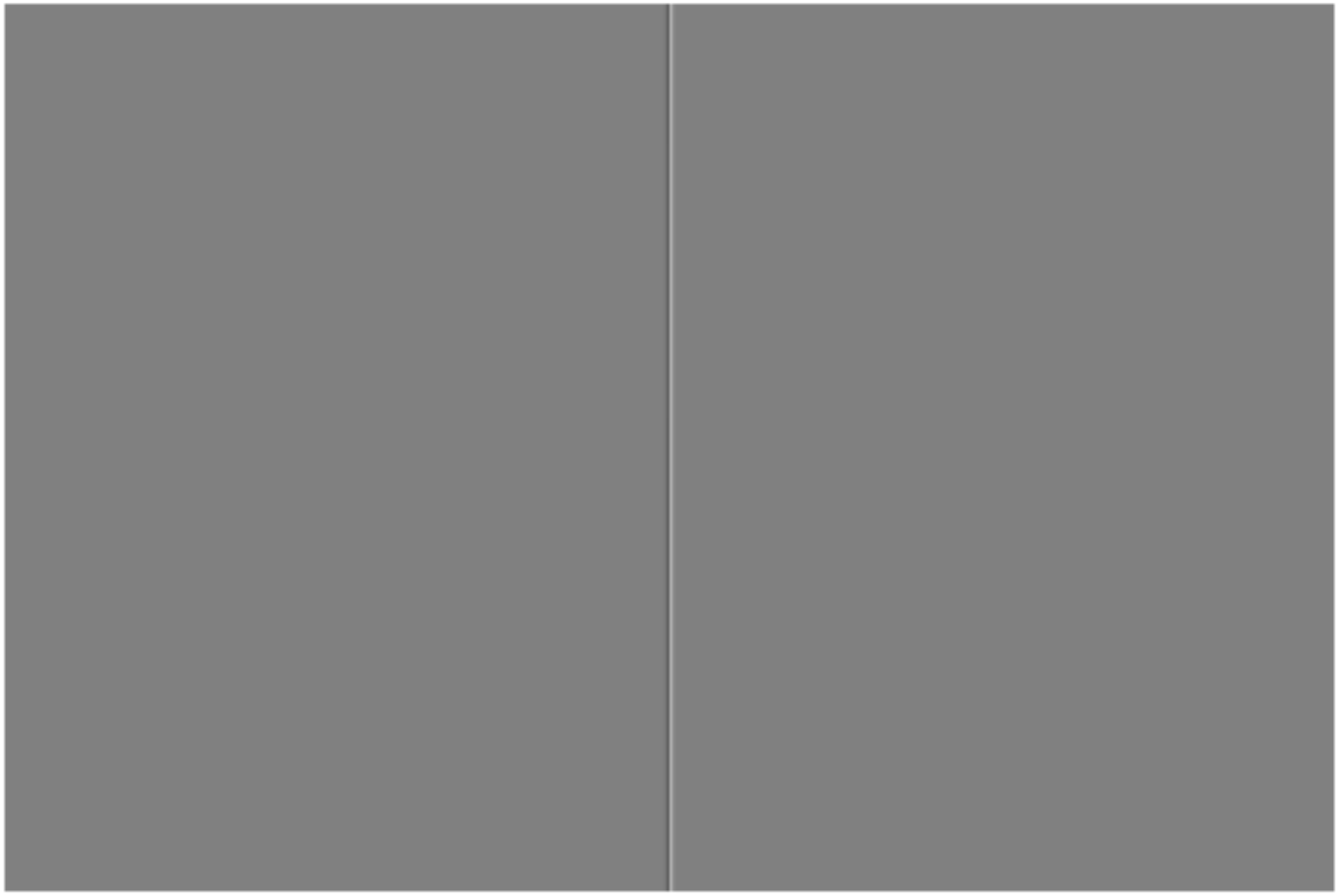
Which side is brighter?



Actual brightness, graphed:

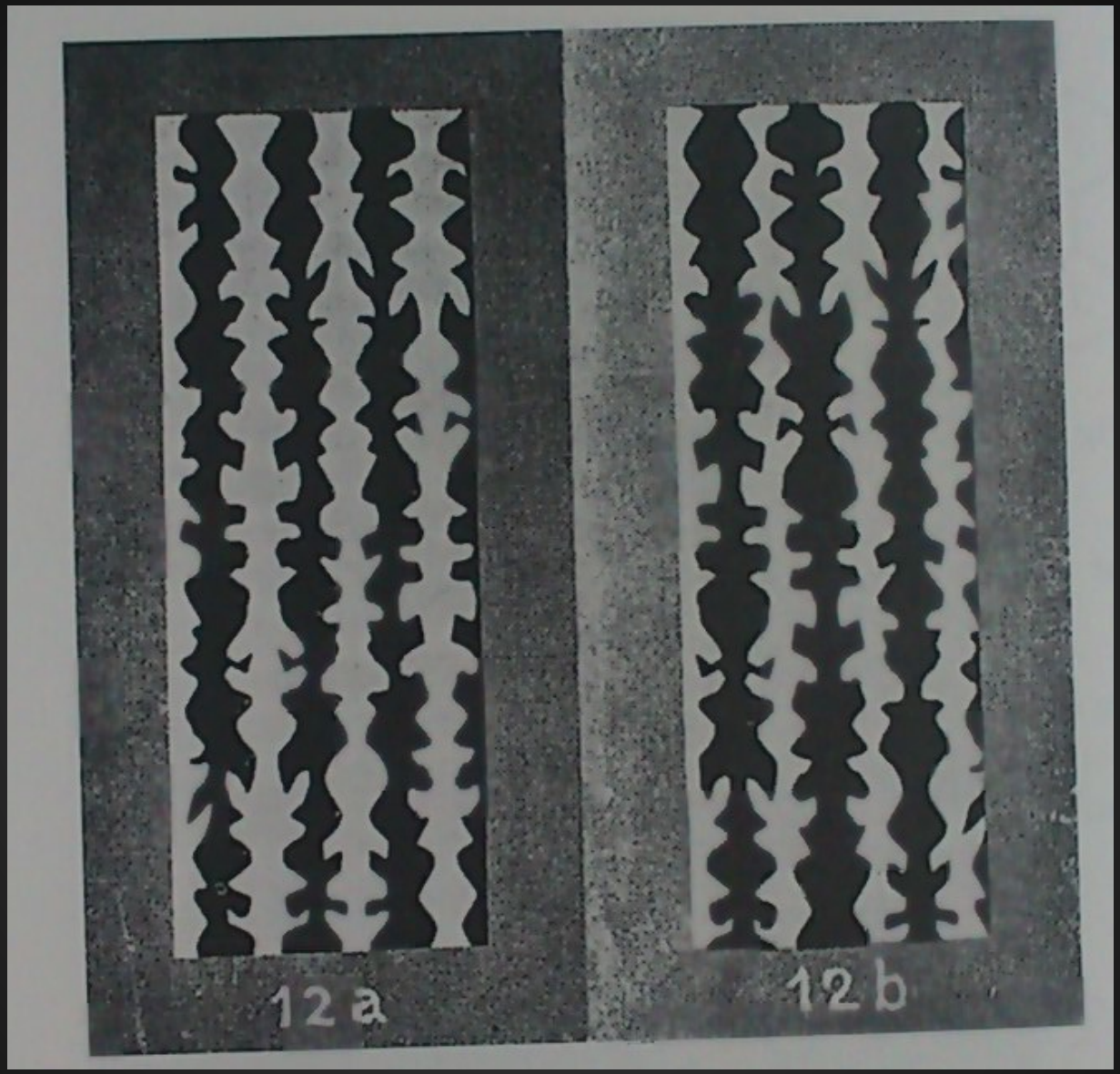


Proof!

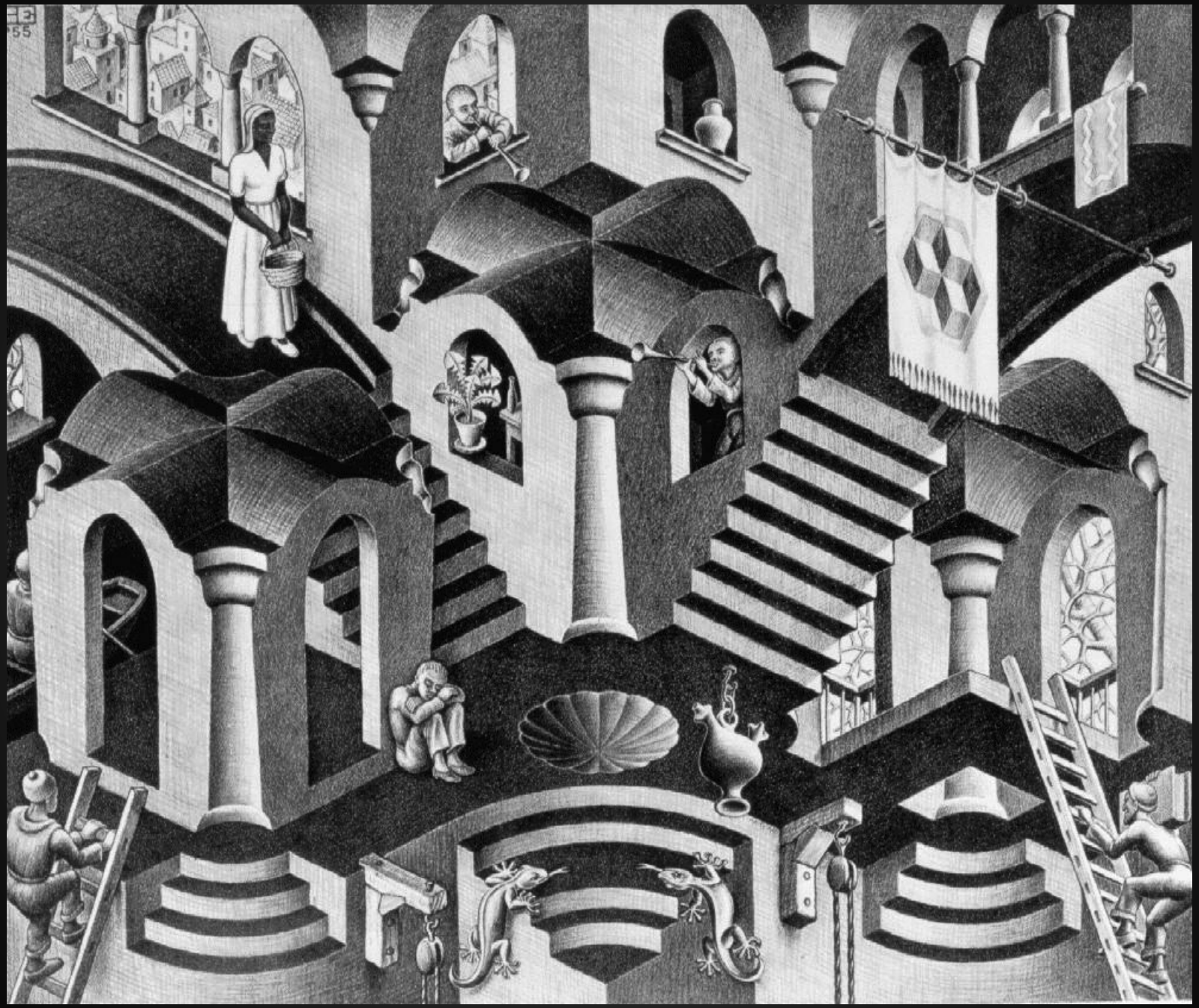


Chiaroscuro: light/dark

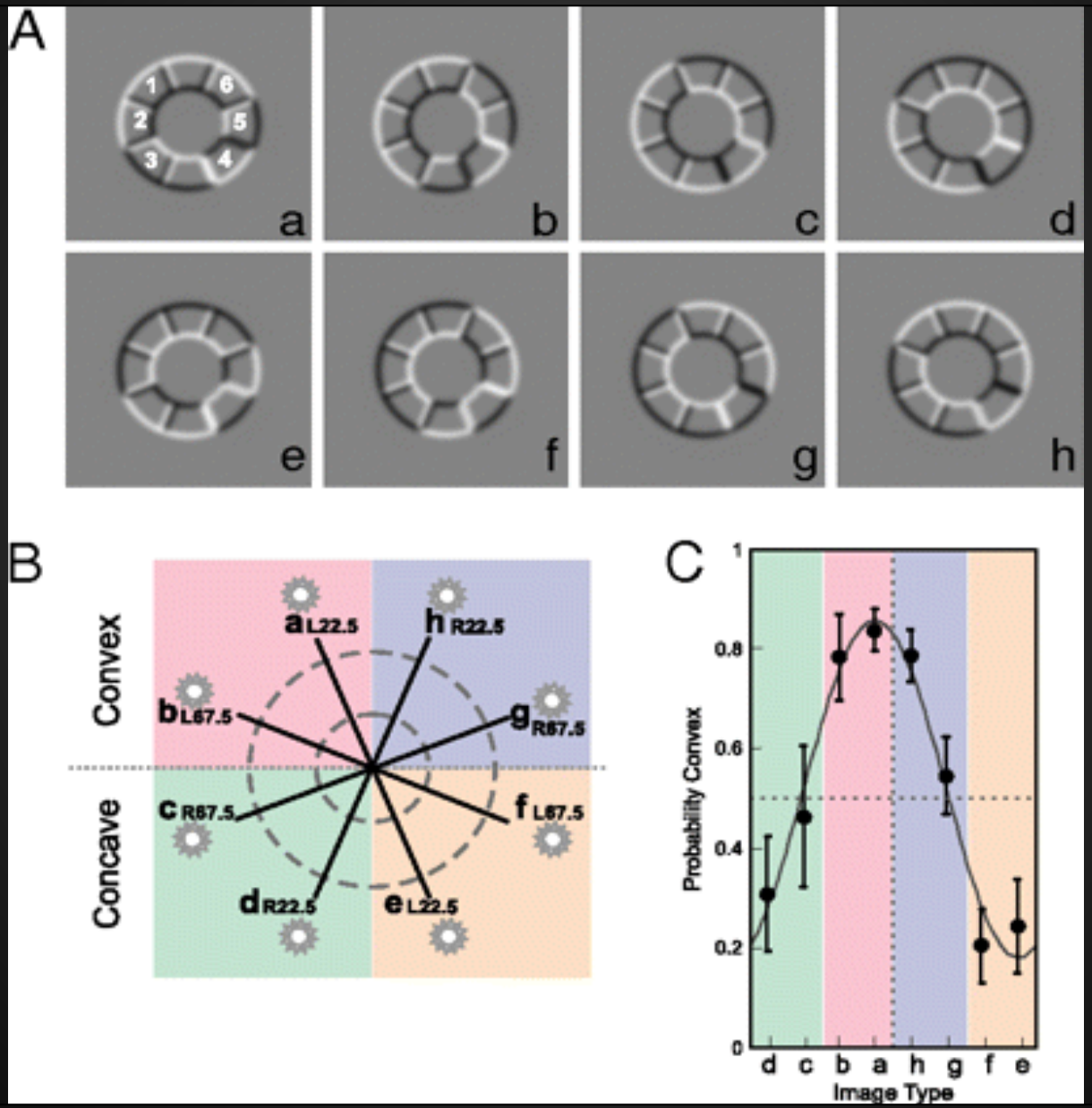
Behold: The Magic Goblet



Intermediate spaces



Lighting direction



Gestalt Laws

- Intermediate spaces
- Law of Proximity
  - Narrow and far
  - Invisible shapes
- The smooth curve:
  - Closure (of shapes)
    - Reversing patterns
  - Symmetry (balance) in form across the image

- Continuation, Unity in the whole
- Common Fate (common movements)

Now, apply it:

Using the SurfaceMapper library

Basics of SurfaceMapper

- Included examples
- Building our own sketch from scratch

SurfaceMapper Projection Mapper

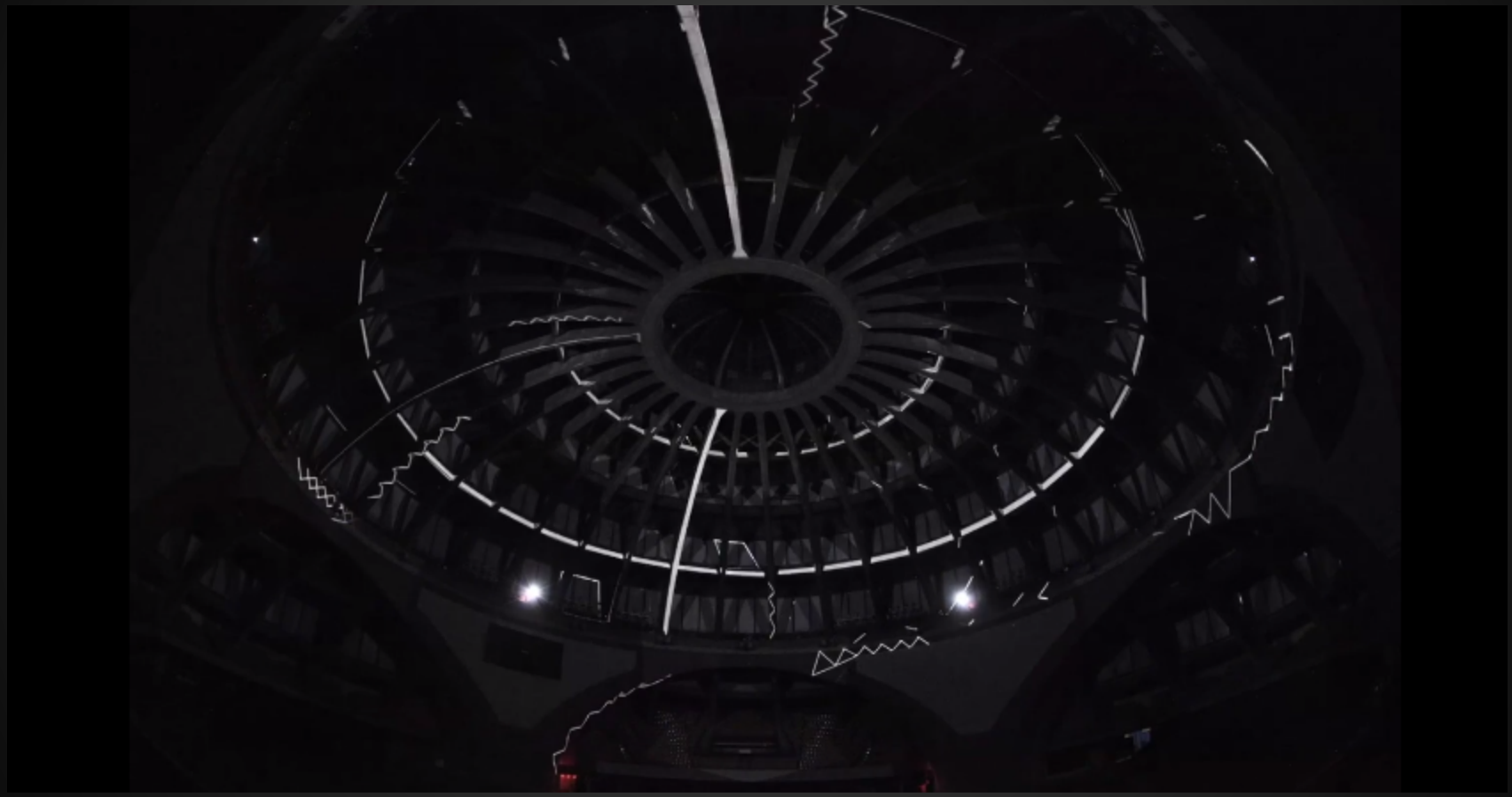
1. How to get (in github code)
2. required libs
3. overview of features
    a. change textures, load, save, visually edit shapes, show mapped view
4. How to modify for our own uses

Exercise 4:
Map an image to a shape using SurfaceMapper

Demo + Exercise 5:
Create a generative sketch and map it to a shape using SurfaceMapper

Interesting Case Studies

Omicron (AntiVJ)



http://vimeo.com/41486619

How?

- 3D model
  - Texture mapping
- Multiple projectors
- Edge-blending, masking

1. Overview - Tools (MadMapper, etc) - why use Processing?
2. Illusions - quick version
3. Show website, code repository
4. Draw stuff - shapes, colors
5. Adding and drawing images
6. Installing libraries - GSVideo, GLGraphics
    a. do video
7. LUNCH: 1 - 2pm (Brewery?)
8. Making decisions in code (if / else, mousePressed, etc)
9. time based animations?
    a. if / else and counter
    b. millis() and smooth etc.
10. Install other necessary libraries - GLGraphics, SurfaceMapper
11. Demo of libraries in action
    a. irregular shapes, etc.
    b. 4 point gradient contrast effect
12. Play with library on a live project (1 hr)
13. Break
14. Case Study - multiprojectors, edge blending, etc.
    a. AntiVJ etc
    b. Marshmellow Laser Feast
15. More supervised project work
16. Done!