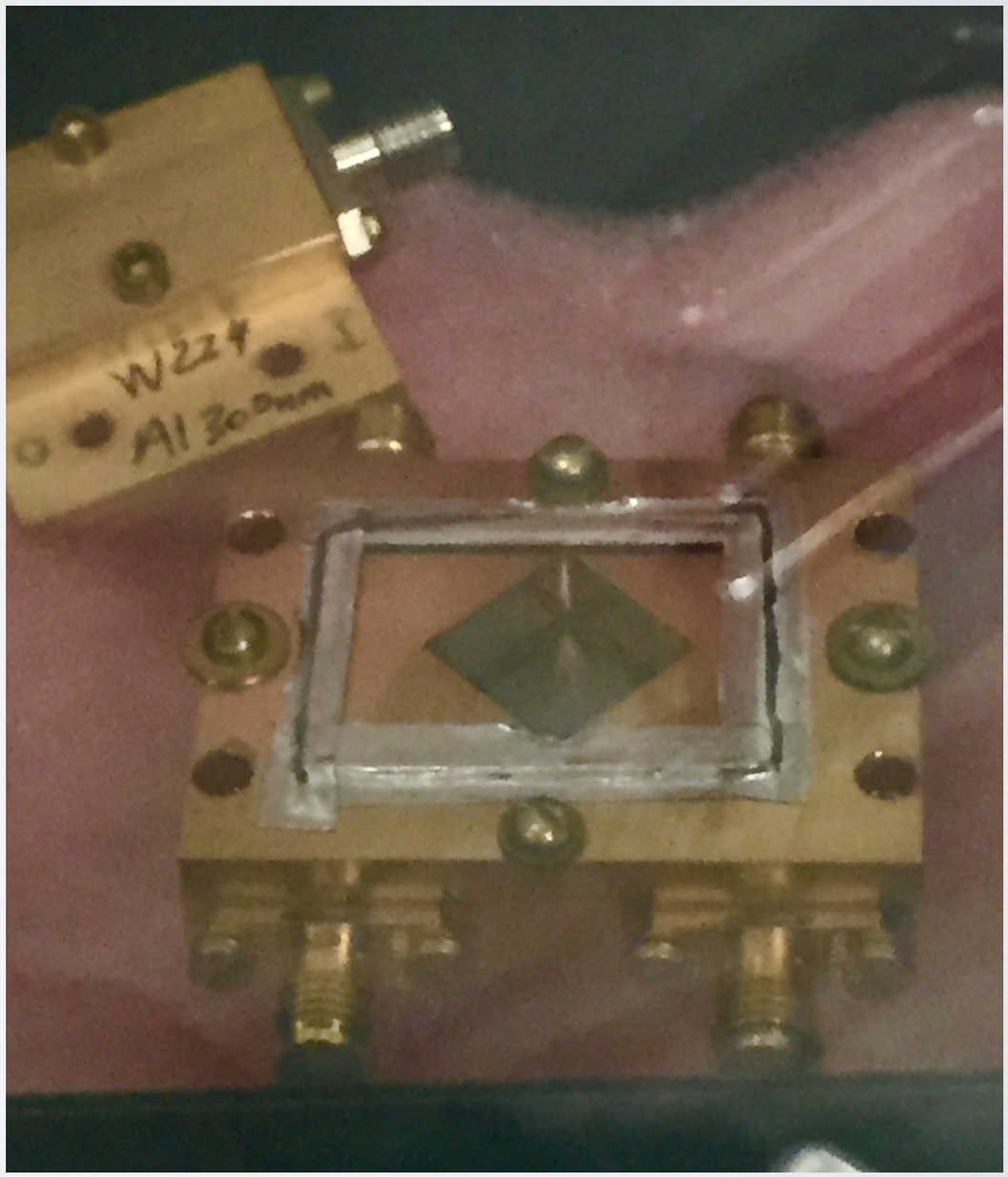
MKIDS PICTURES

in COLOR

WHAT IS AN MKID AGAIN?

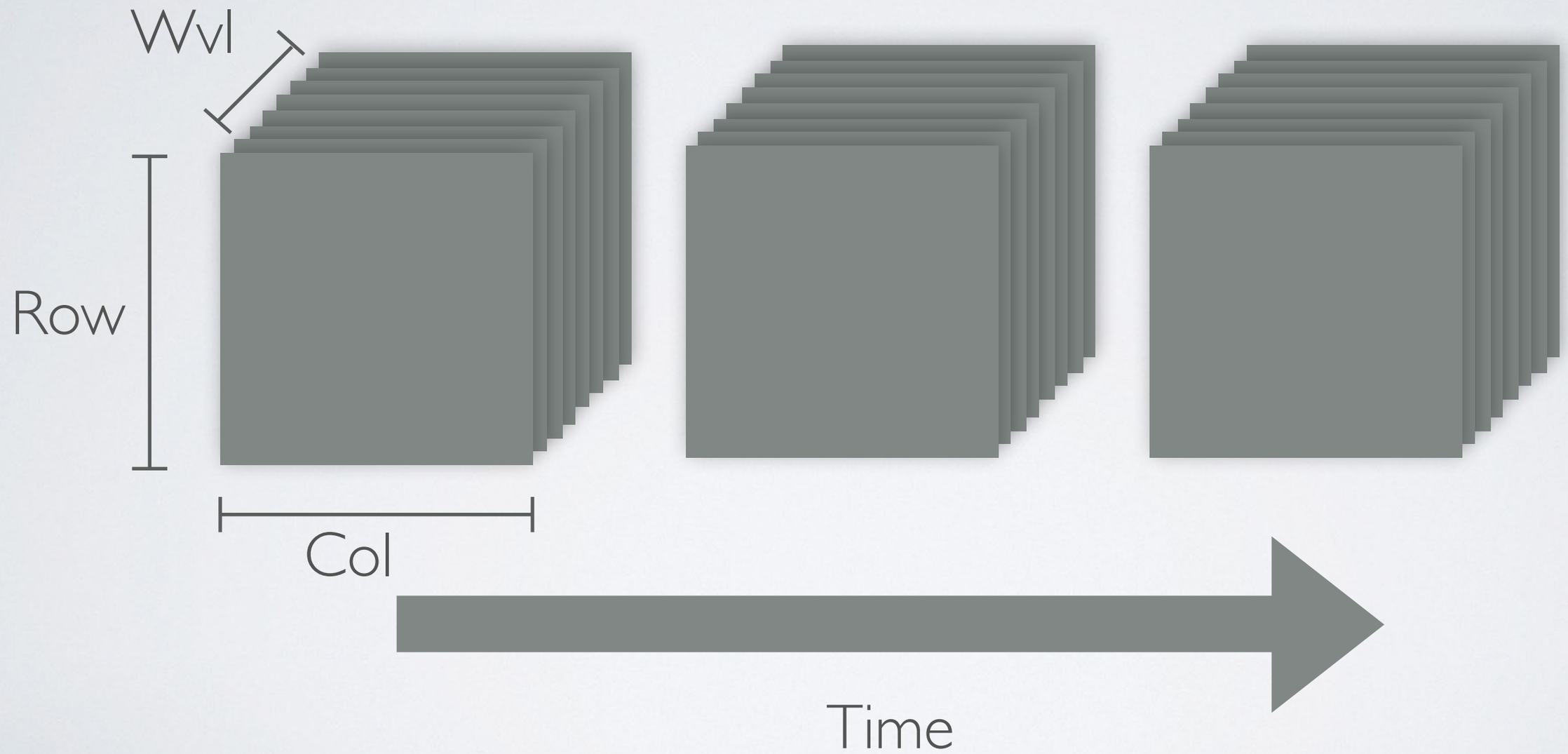
- Microwave Kinetic Inductance Detector
- Uses an LC (Inductor-Capacitor) circuit to detect photons
- Superconducting inductors have resonance frequencies
- Photon event poisons the superconductivity



WHAT IS AN MKID AGAIN?

- Doesn't just count Photons
- Unlike CCDs
- Keeps track of each photon

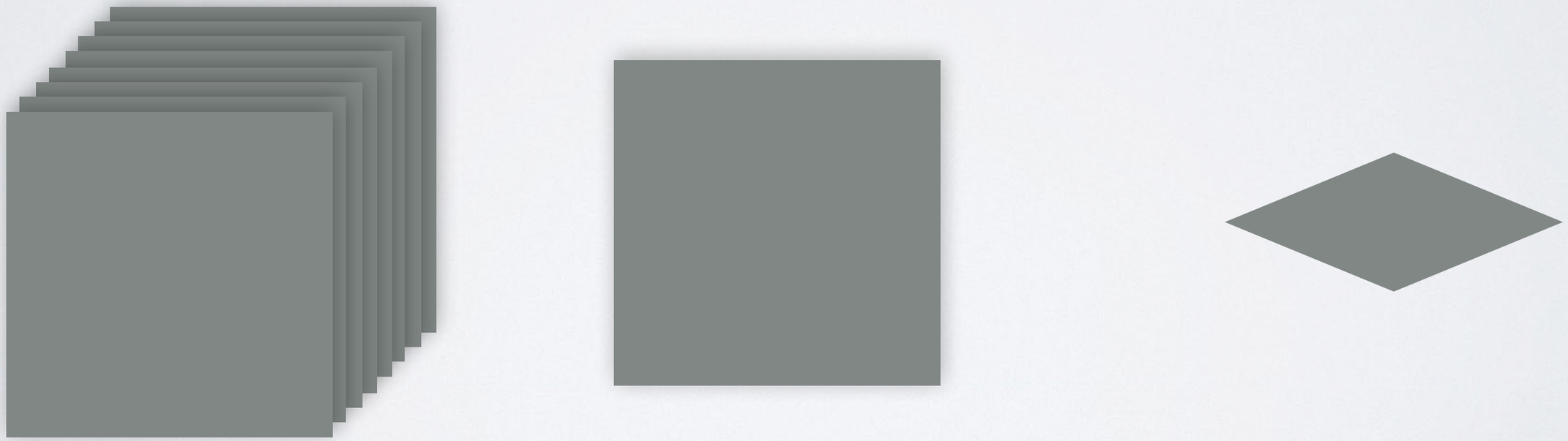
SPECTRAL CUBE



Easy for computers, hard for humans:

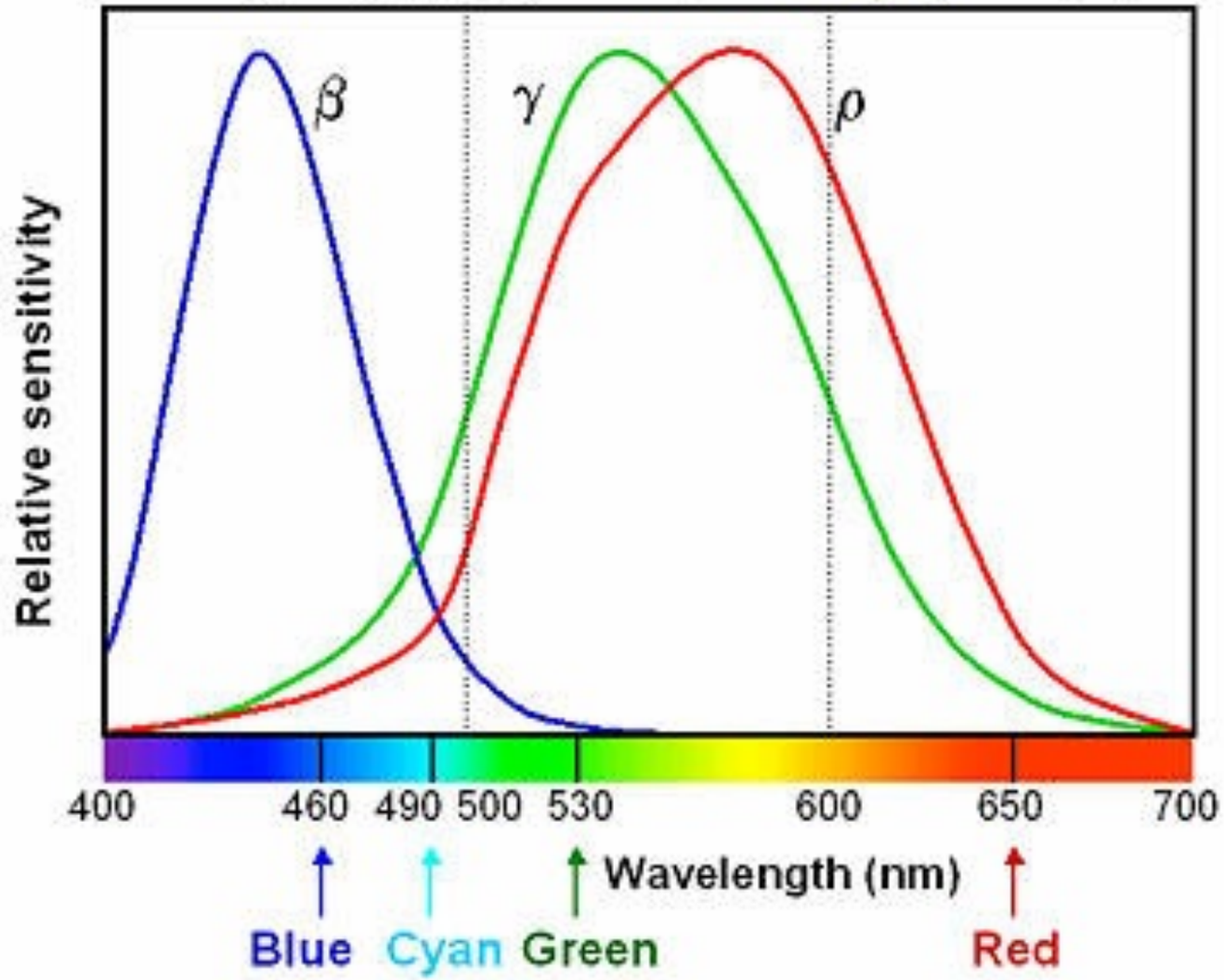
```
array([[[53, 62, 85, 31…],
        [71, 12, 24, 42…],
       [[13, 53, 76, 93…],
        [11, 41, 62, 54…],
```

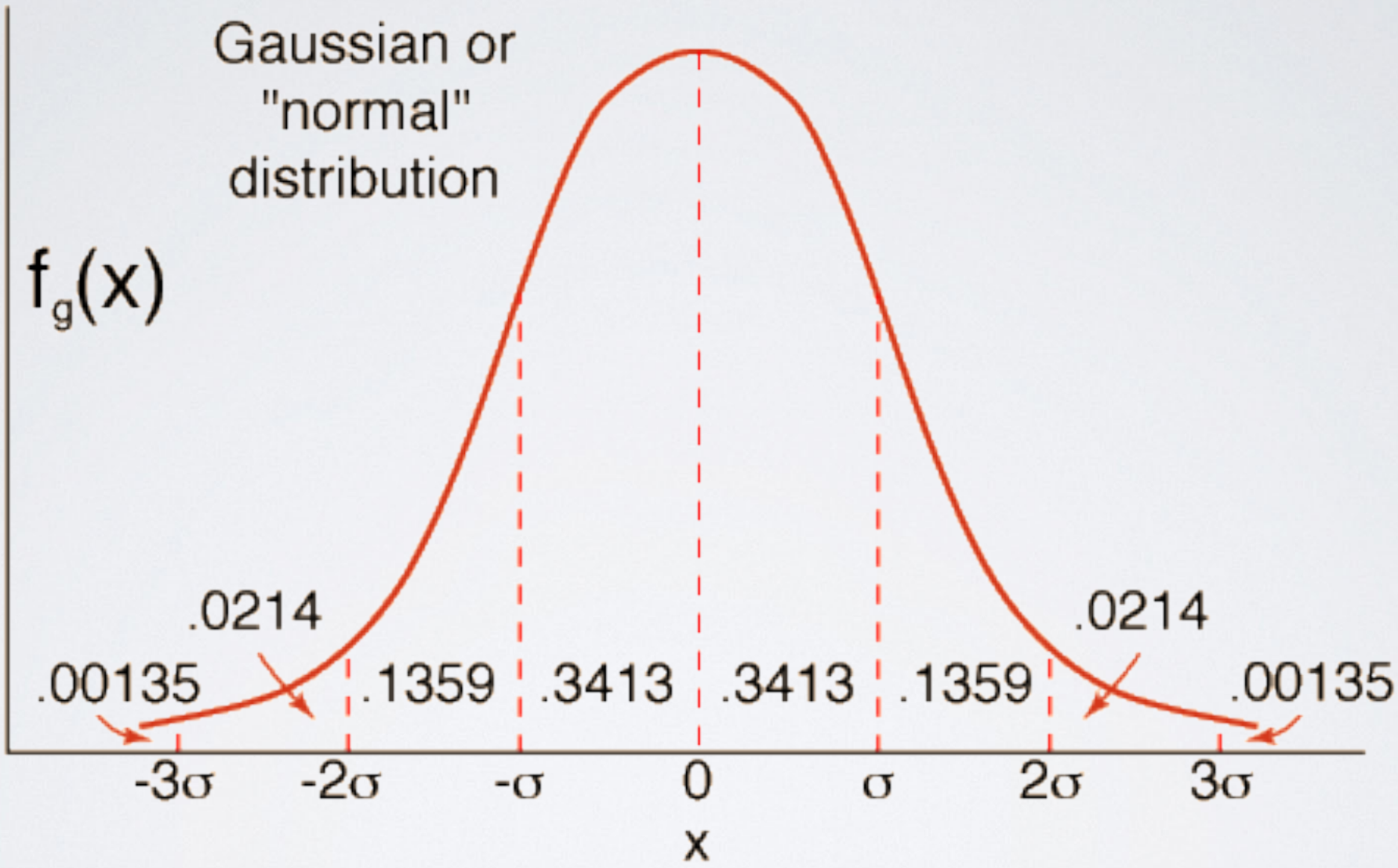
Numpy arrays can be split and integrated...

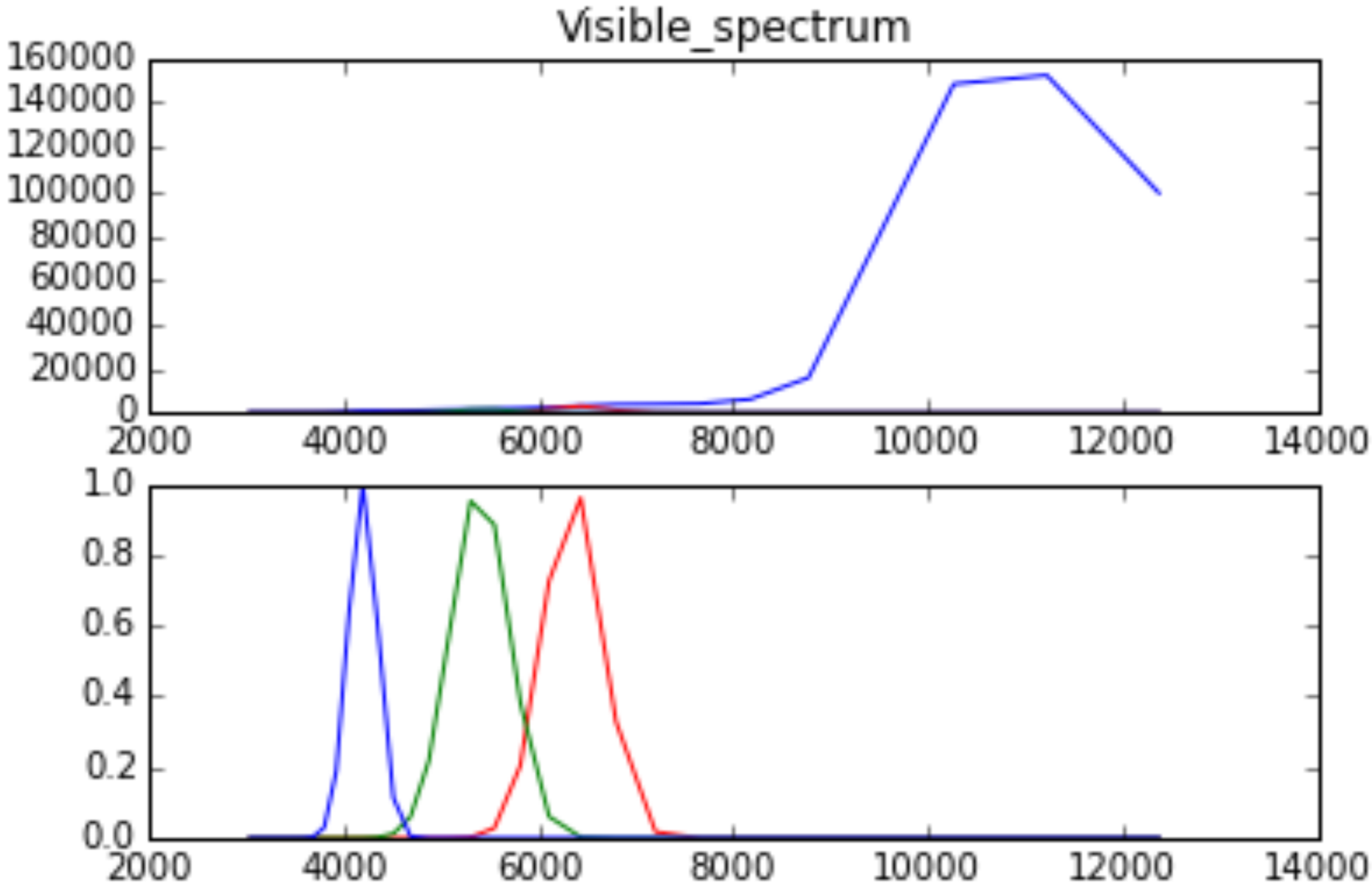


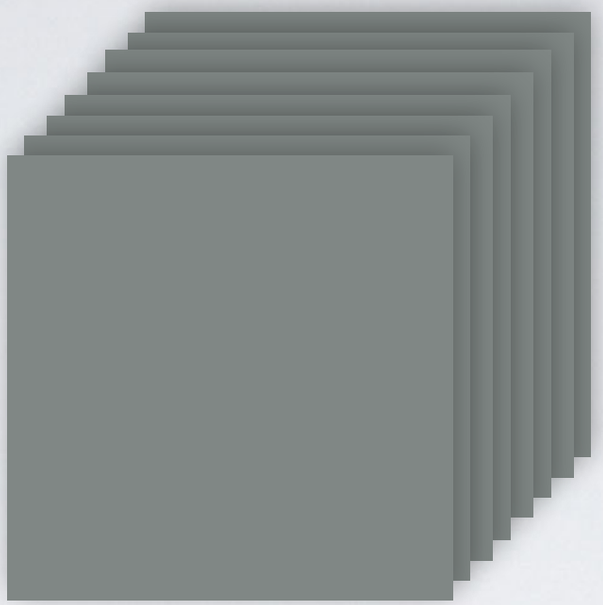
Human spectral sensitivity to color

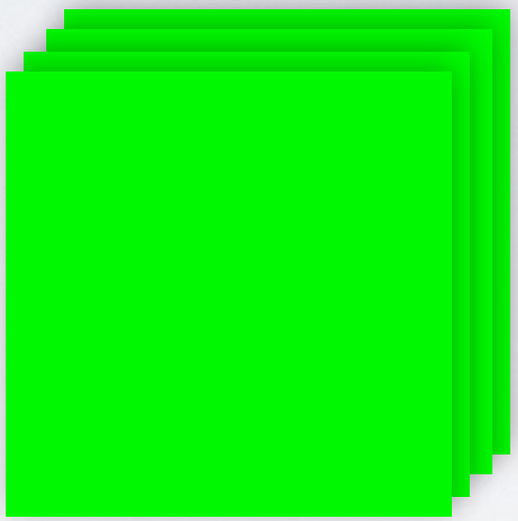
Three cone types (ρ, γ, β) correspond *roughly* to R, G, B.

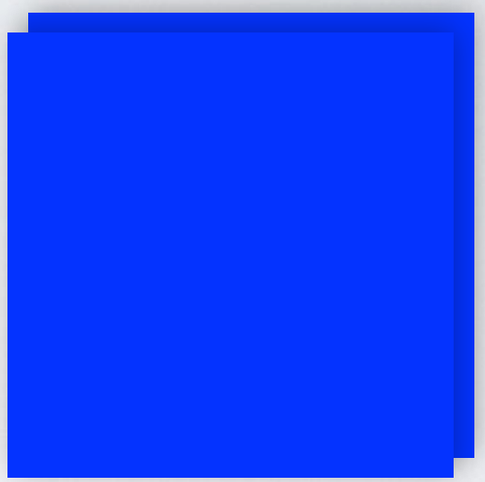


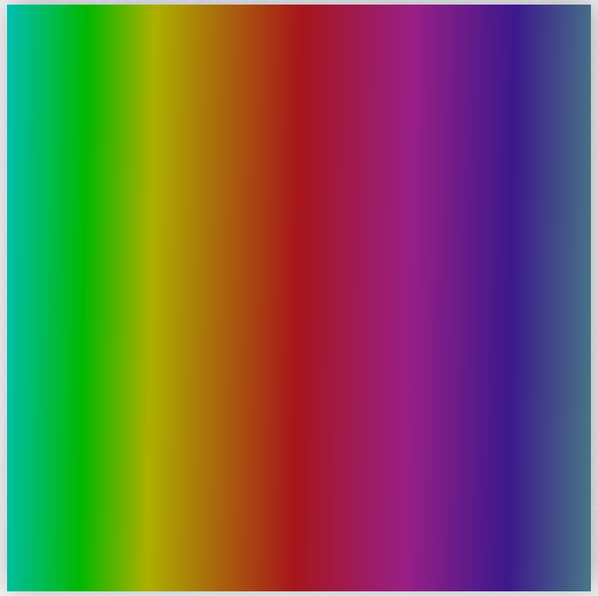

Gaussian or
"normal"
distribution
$f_g(x)$
.0214
.00135
.1359
.3413
.3413
.1359
.0214
.00135
-3σ
-2σ
-σ
0
σ
2σ
3σ
x

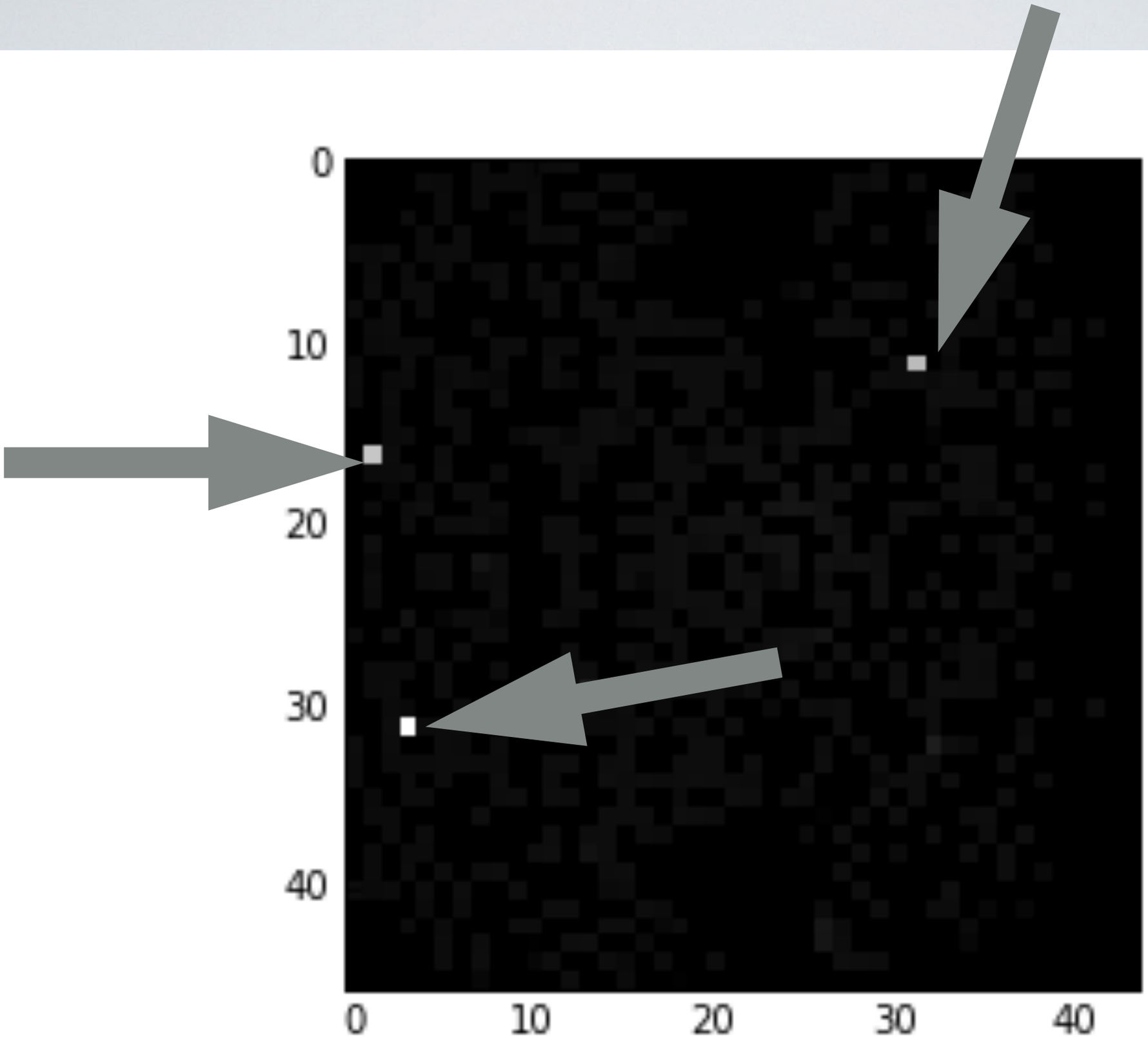

Visible_spectrum
160000
140000
120000
100000
80000
60000
40000
20000
0
2000
4000
6000
8000
10000
12000
14000
1.0
0.8
0.6
0.4
0.2
0.0
2000
4000
6000
8000
10000
12000
14000

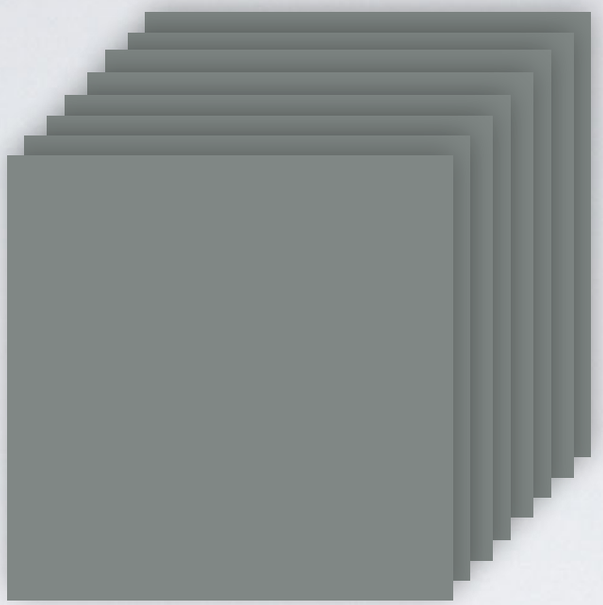


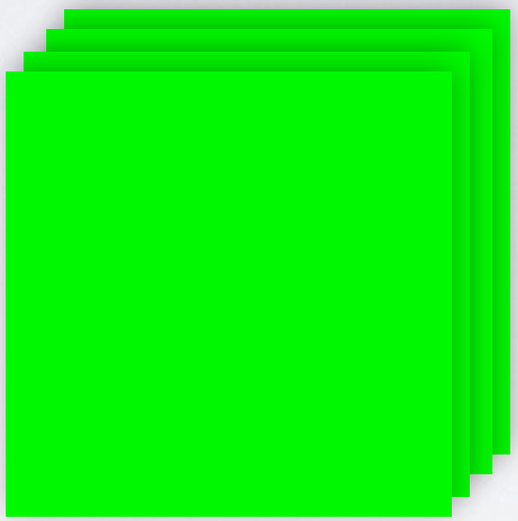


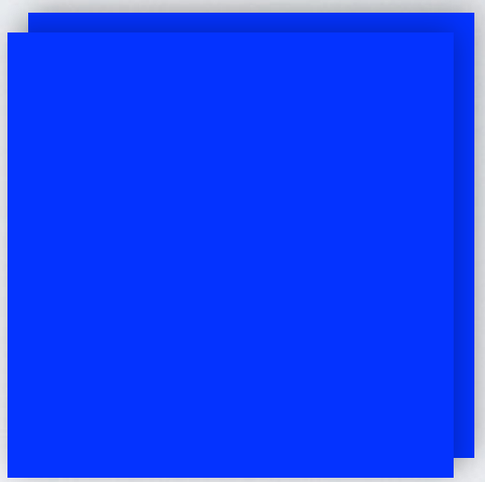


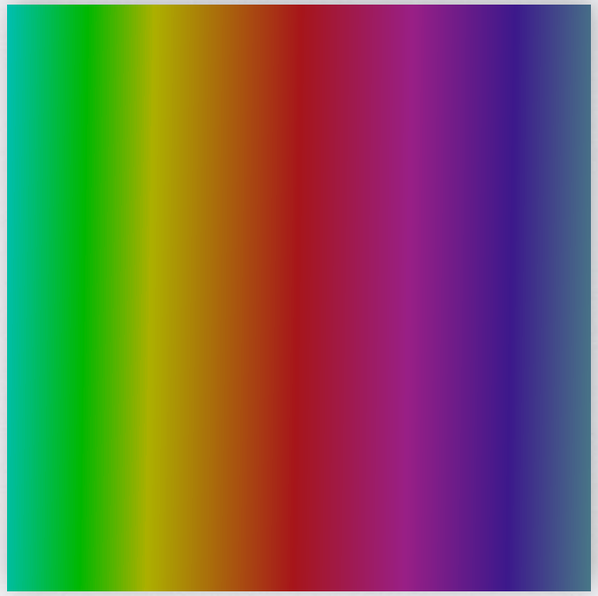



0
10
20
30
40
0
10
20
30
40

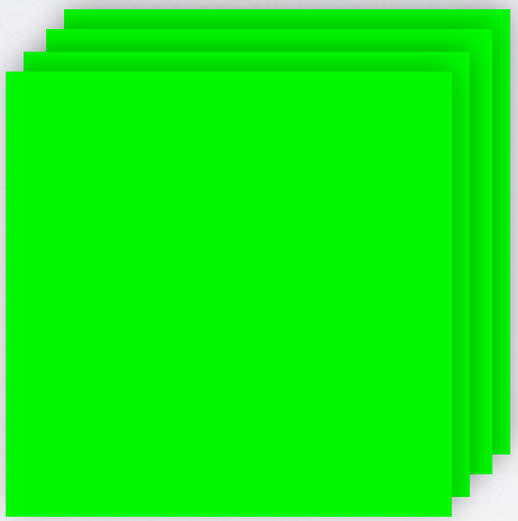


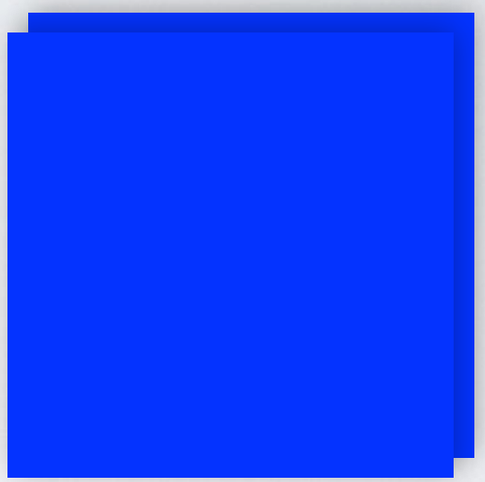


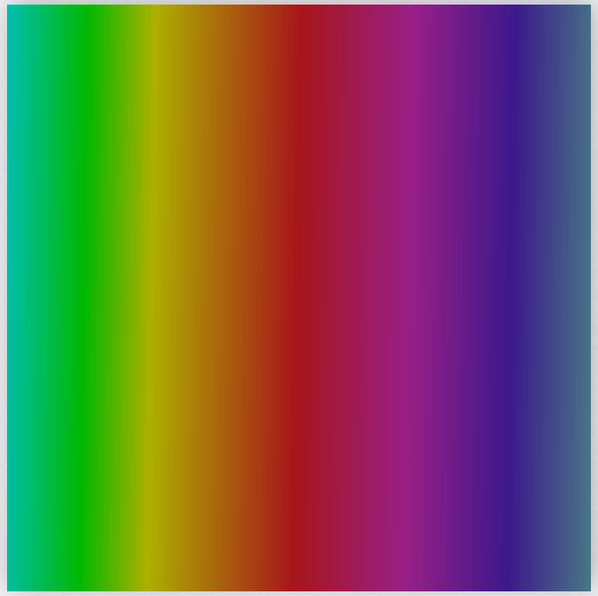


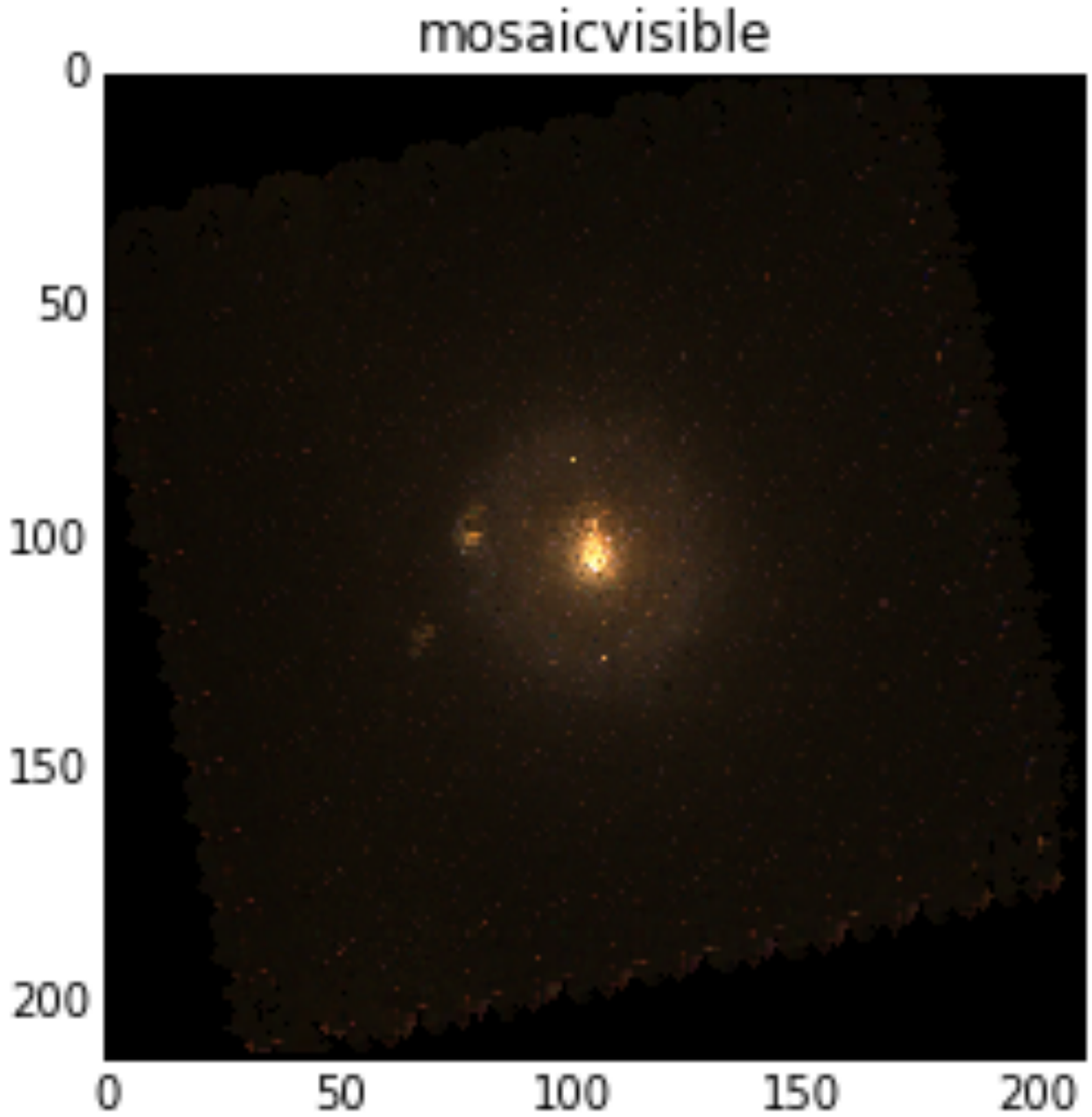


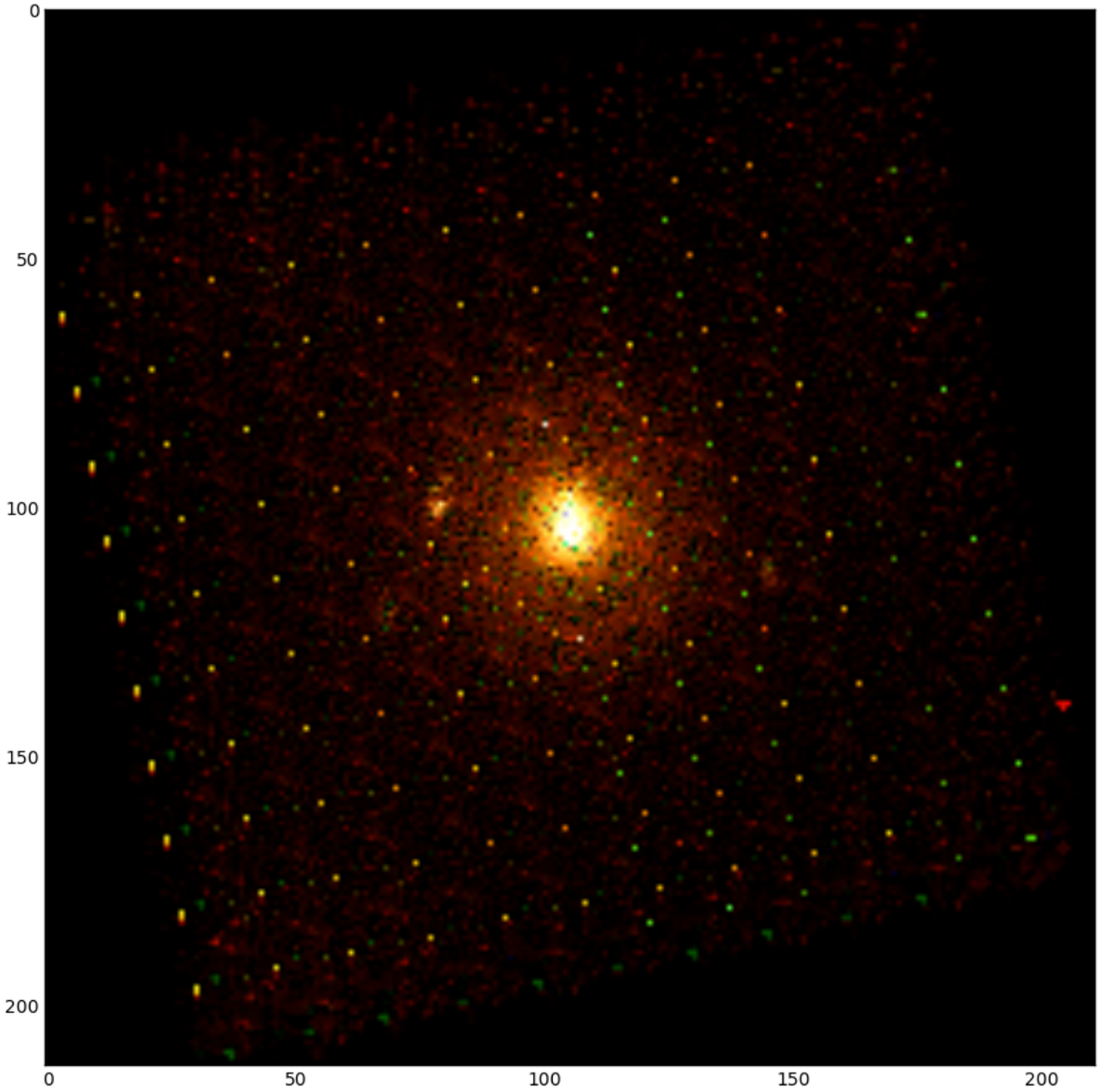
Clip the array to get rid of hot pixels...

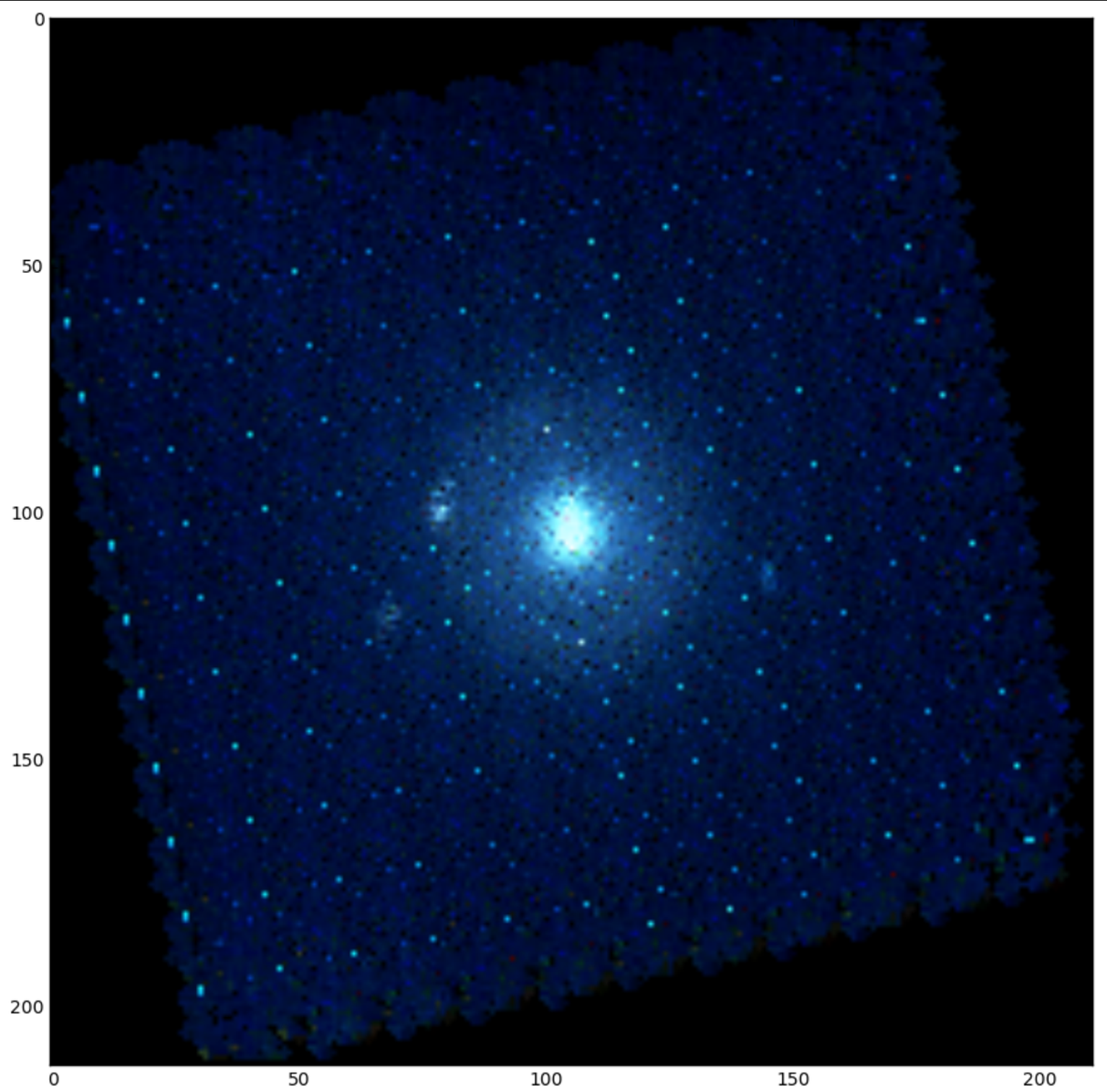


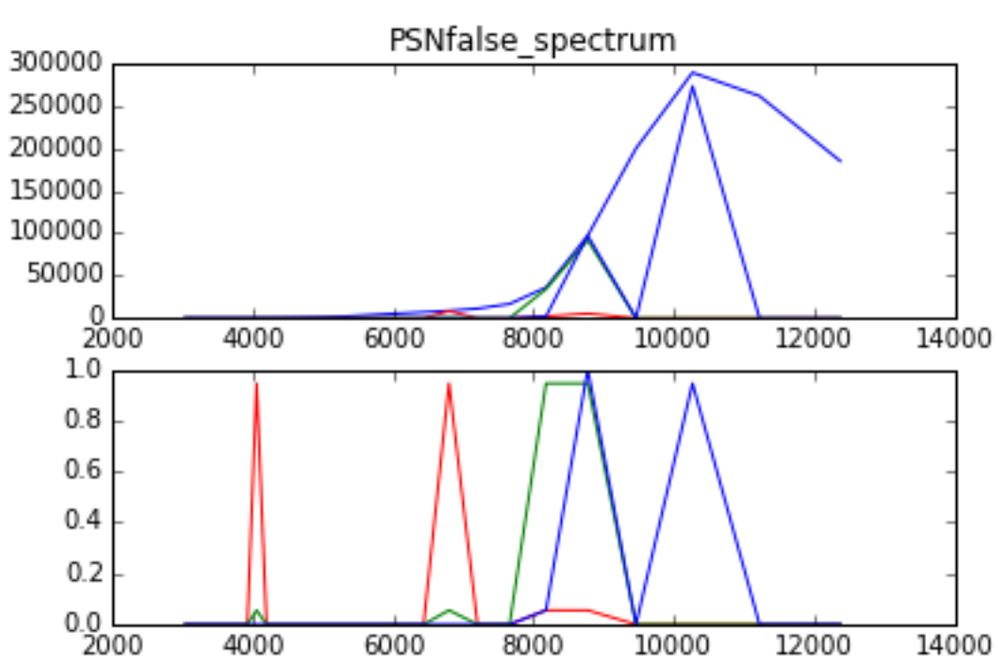





mosaicvisible
0
50
100
150
200
0
50
100
150
200


0
50
100
150
200
0
50
100
150
200


0
50
100
150
200
0
50
100
150
200


PSNfalse_spectrum
300000
250000
200000
150000
100000
50000
0
2000
4000
6000
8000
10000
12000
14000
1.0
0.8
0.6
0.4
0.2
0.0
2000
4000
6000
8000
10000
12000
14000

FUTURE

- mo' pixels, mo' pictures!
- Spectral resolution
- Signal-to-noise
- Improved Speed

ACKNOWLEDGEMENTS

- Fermilab for being awesome
- Dr. Chris Stoughton for giving me something productive do do over the summer
- George Dzuricsko for making sure we all fill out our timecards each week
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- Jake for designing the world's most intricate coffee can
- Sonja for being the most levelheaded intern
- Tim for advocating for vim
- Natalie for being the world's rising agar.io champion