

Unopinionated Noise Reduction

*a non-invasive approach to noise
reduction through image fusion.*

By Ryan Filgas

Problem.

- Most noise reduction is opinionated.
There's always a sacrifice.
- Noise reduction can't recover lost
colors or bring in detail.
- Sometimes noise reduction just isn't
good enough for a production.
- Strobes don't get to burst when
they're fighting sun at full power.
- Everything shows in print

Solution

1 Take two images

- "Correct" exposure
- Brighter exposure

3 Match Exposures

- Match the histogram of the brighter image to that of the darker.

2 Create a mask

- Copy the bright image and convert to grayscale.
- Target the highlights with black so they don't come through. Normalize.

4 Composite

Merge the images together using the mask in between them.

$$(\text{img1} * (1 - \text{alpha})) + (\text{matched_exposure} * \text{alpha})$$

Process

Input 1



Input 2



Alpha Mask



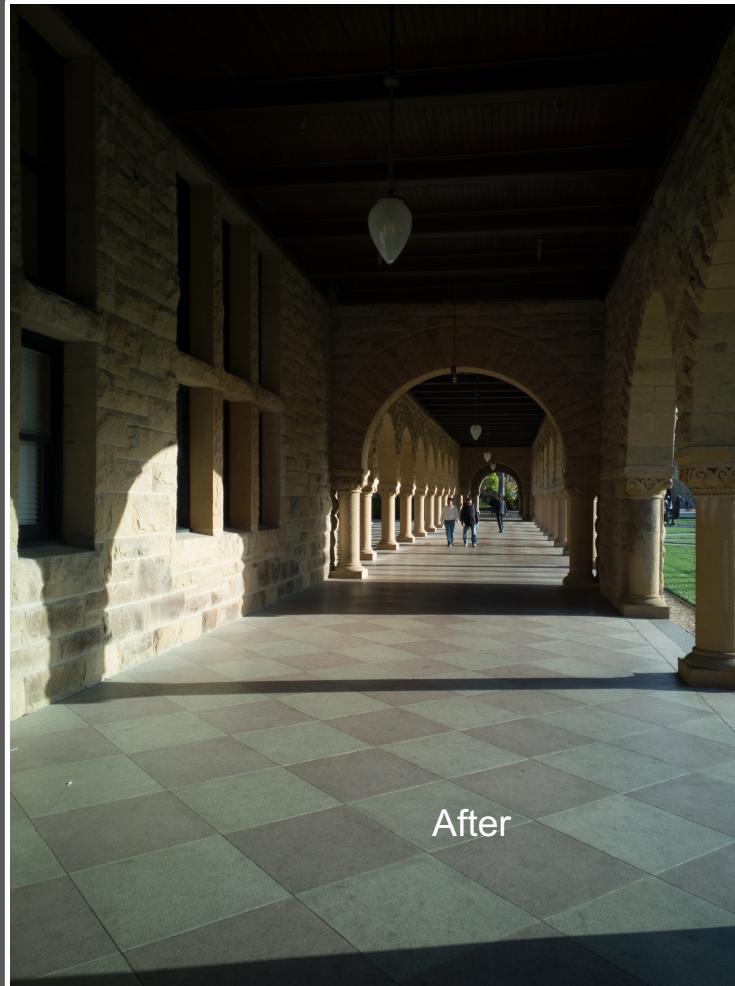
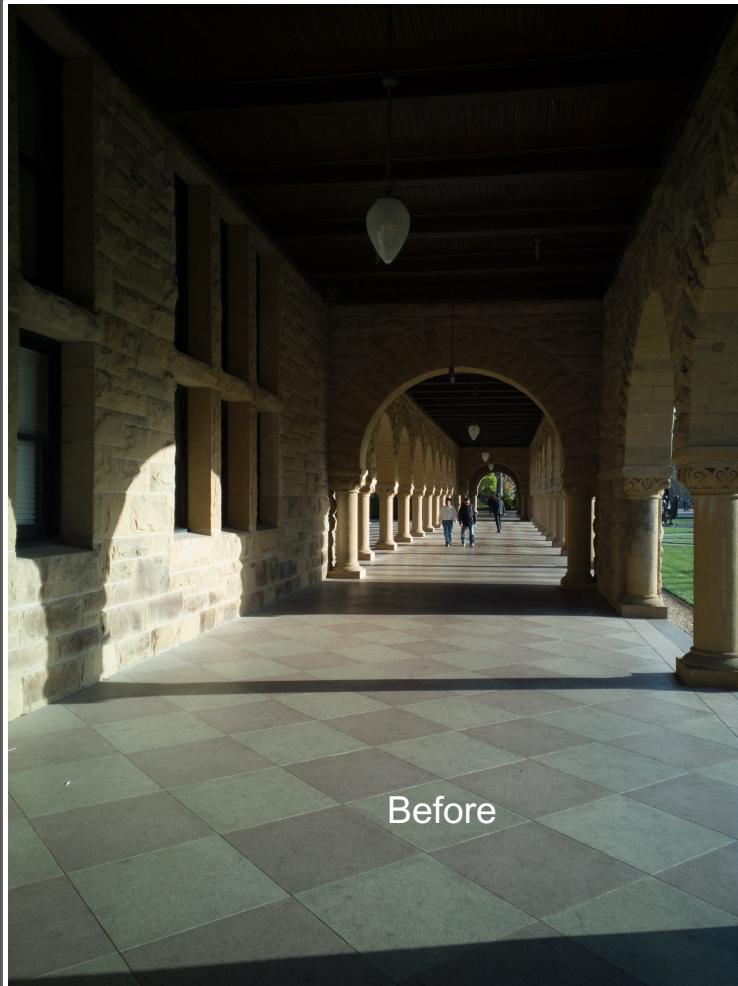
Matched

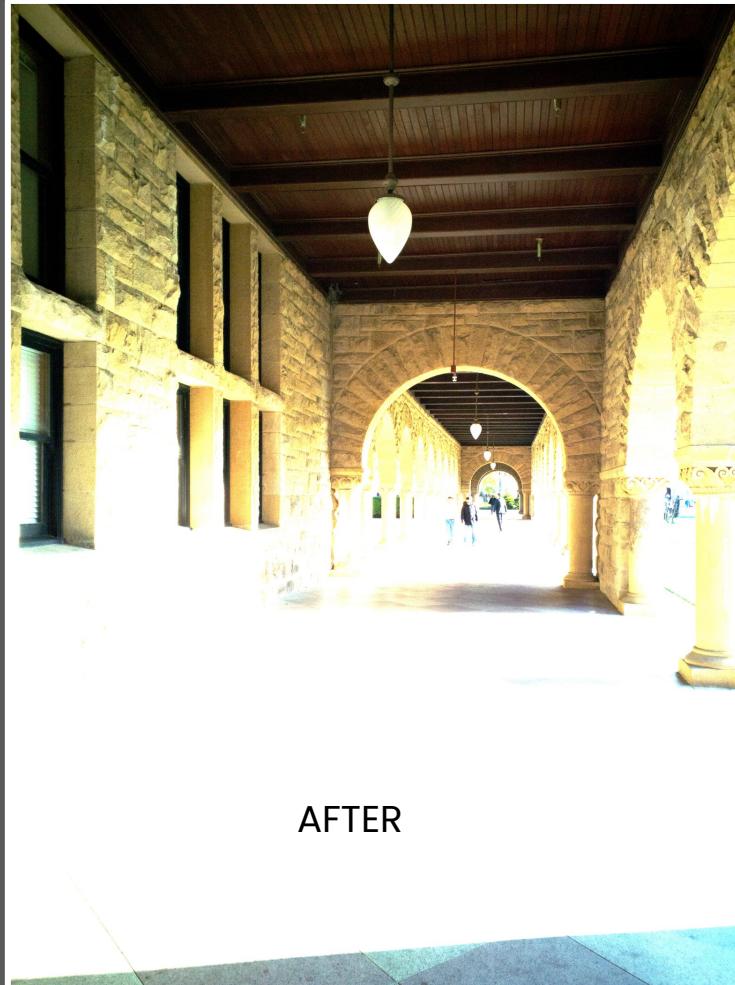
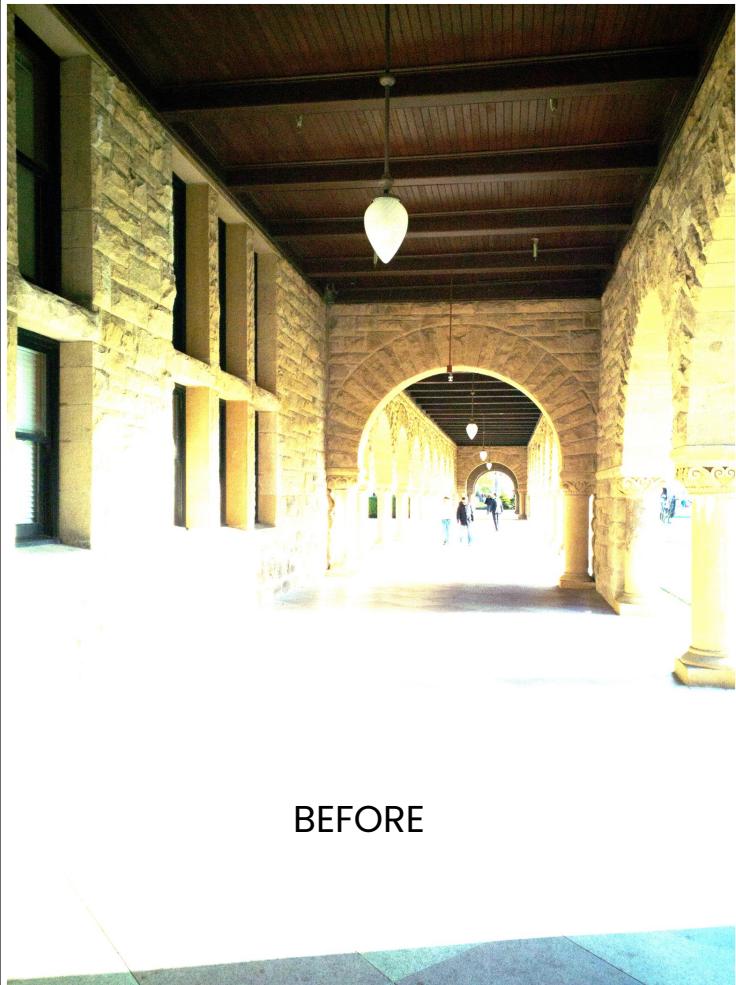


Merged

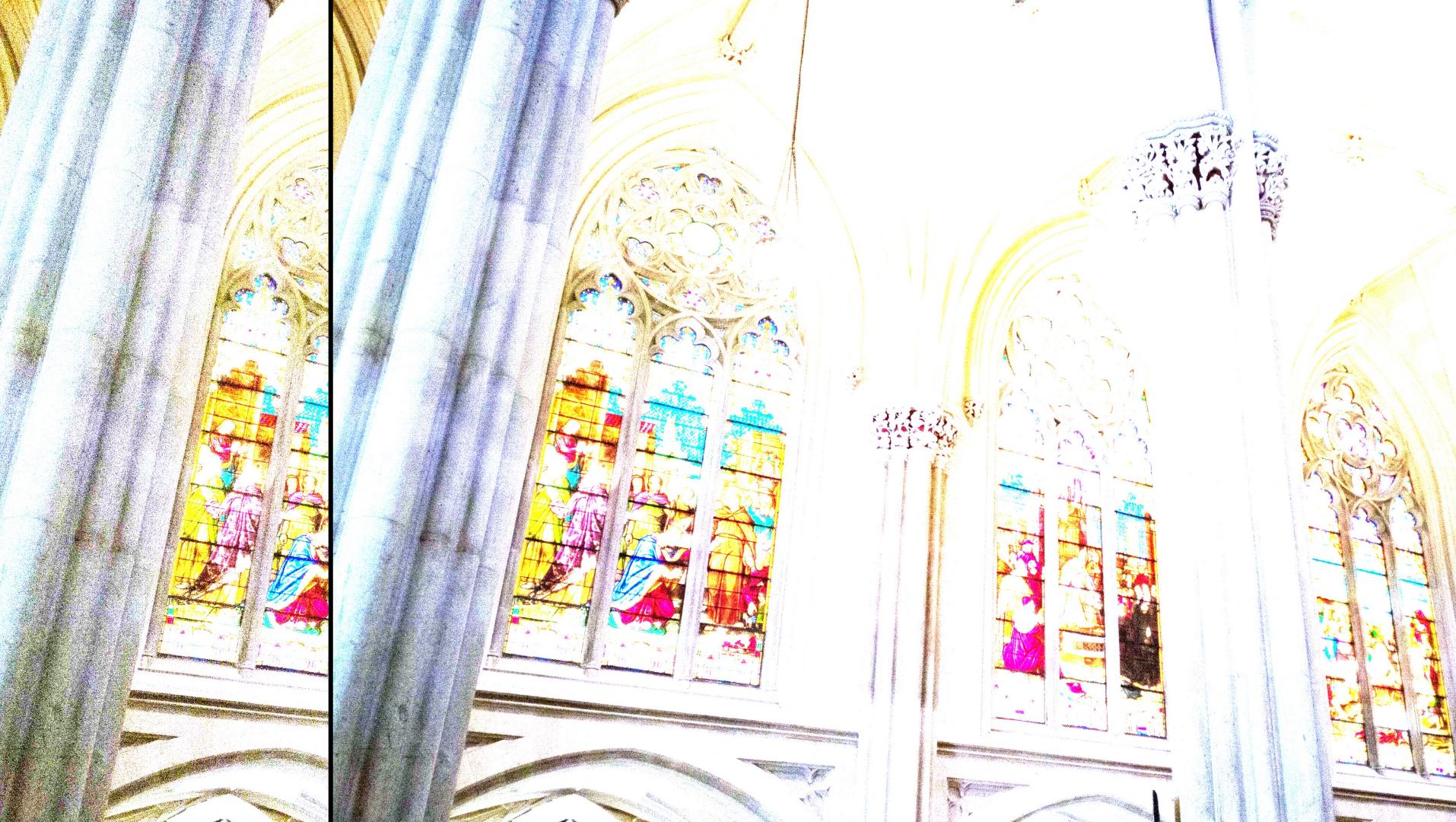


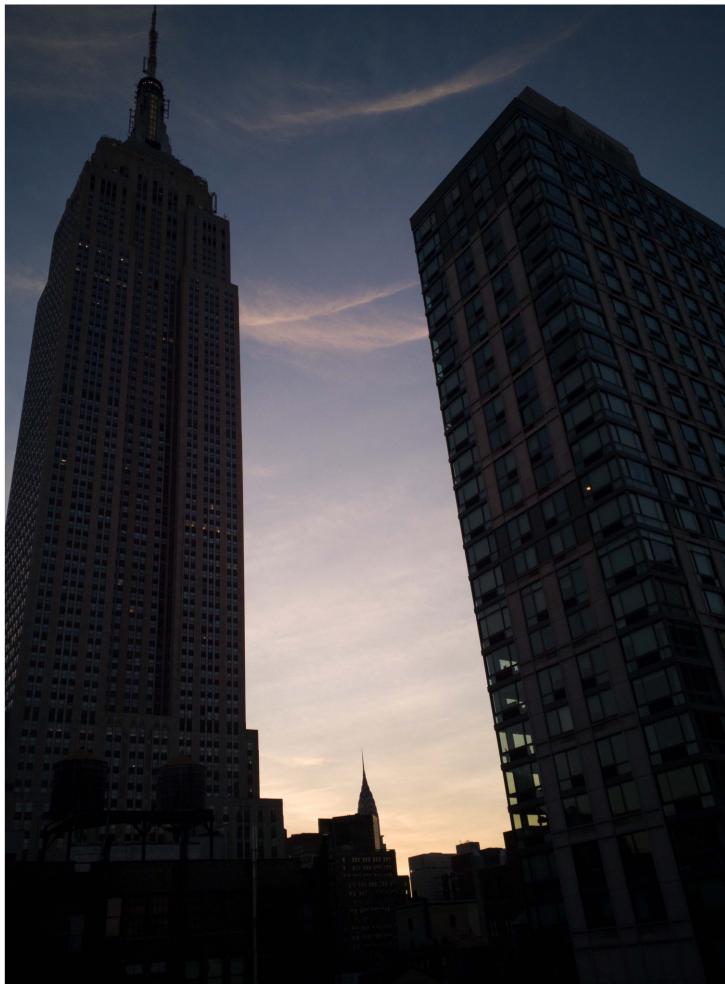
Data set from Googles HDR+ Burst Photography Dataset: @article{hasinoff2016burst, author = {Samuel W. Hasinoff and Dillon Sharlet and Ryan Geiss and Andrew Adams and Jonathan T. Barron and Florian Kainz and Jiawen Chen and Marc Levoy}, title = {Burst photography for high dynamic range and low-light imaging on mobile cameras}, journal = {ACM Transactions on Graphics (Proc. SIGGRAPH Asia)}, volume = {35}, number = {6}, year = {2016}, }















Future improvements:

- Brighter Images as exposure adjustment
- Raw equivalent files from stacked jpgs
- Raw integration and image alignment
- Interactive interface
- Efficiency. The algorithm is expensive.

Thank you.