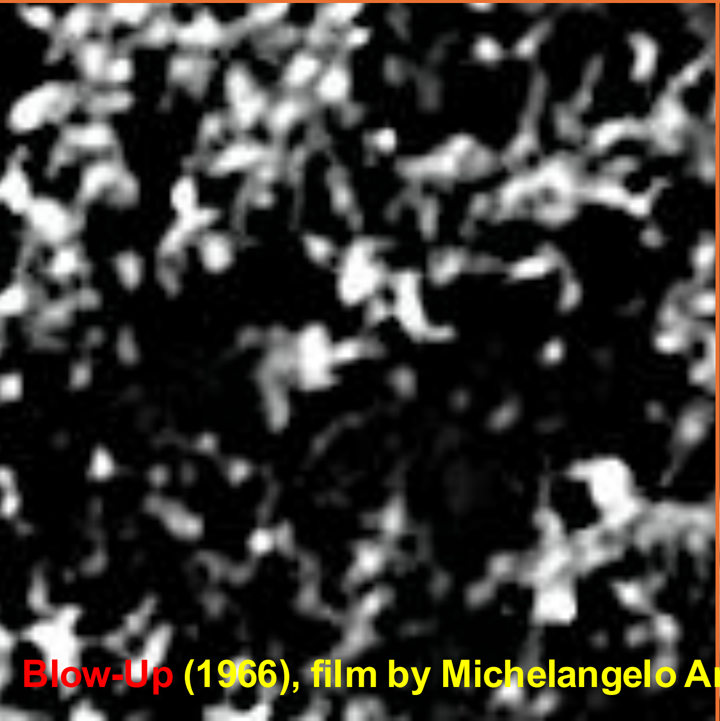
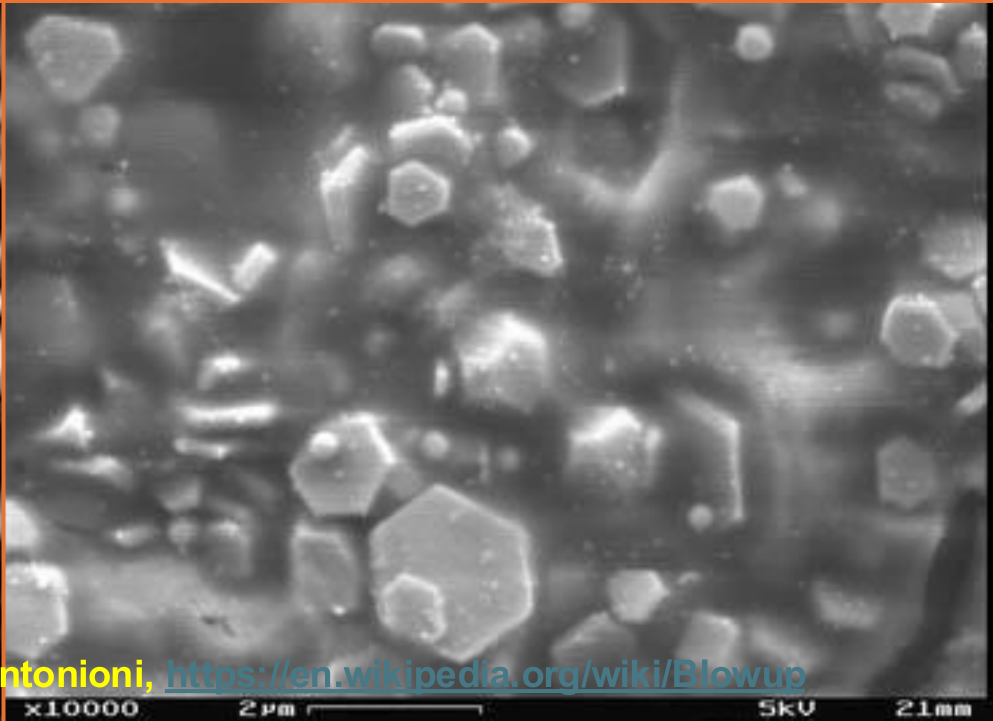
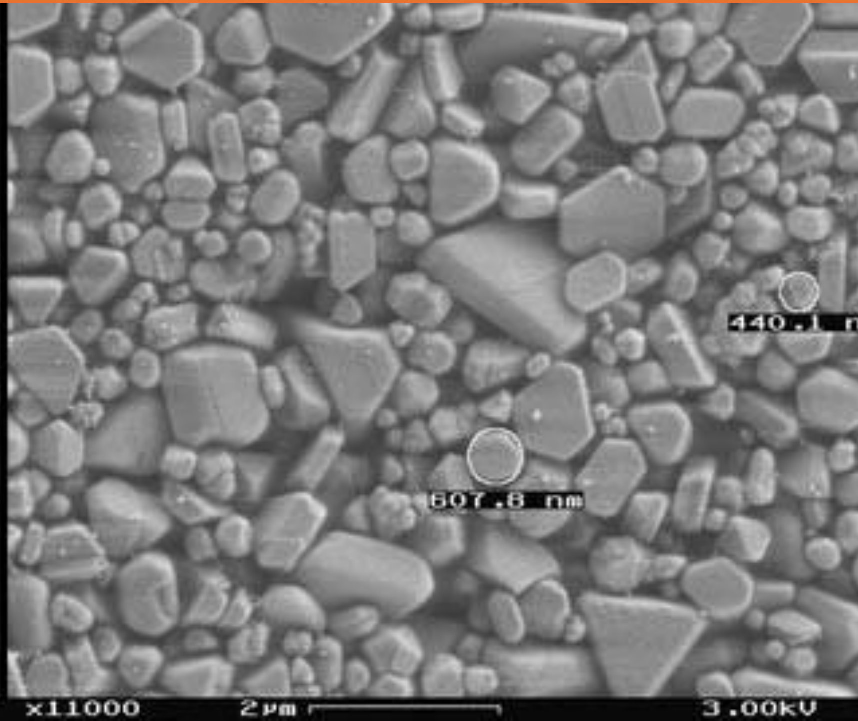




Blow-Up (1966), film by Michelangelo Antonioni, https://en.wikipedia.org/wiki/Blowup

Kodak Analog Films: Pan-X, ISO 32 Plus-X, ISO 125 TRI-X ISO 400

First View of Earth from Moon, Lunar orbiter, NASA (October 1, 1966)

https://www.nasa.gov/feature/50-years-ago-the-lunar-orbiter-program

First View of Earth from Moon, Lunar orbiter, NASA (Oct 1, 1966) data processed with better soft.

https://www.nasa.gov/feature/50-years-ago-the-lunar-orbiter-program

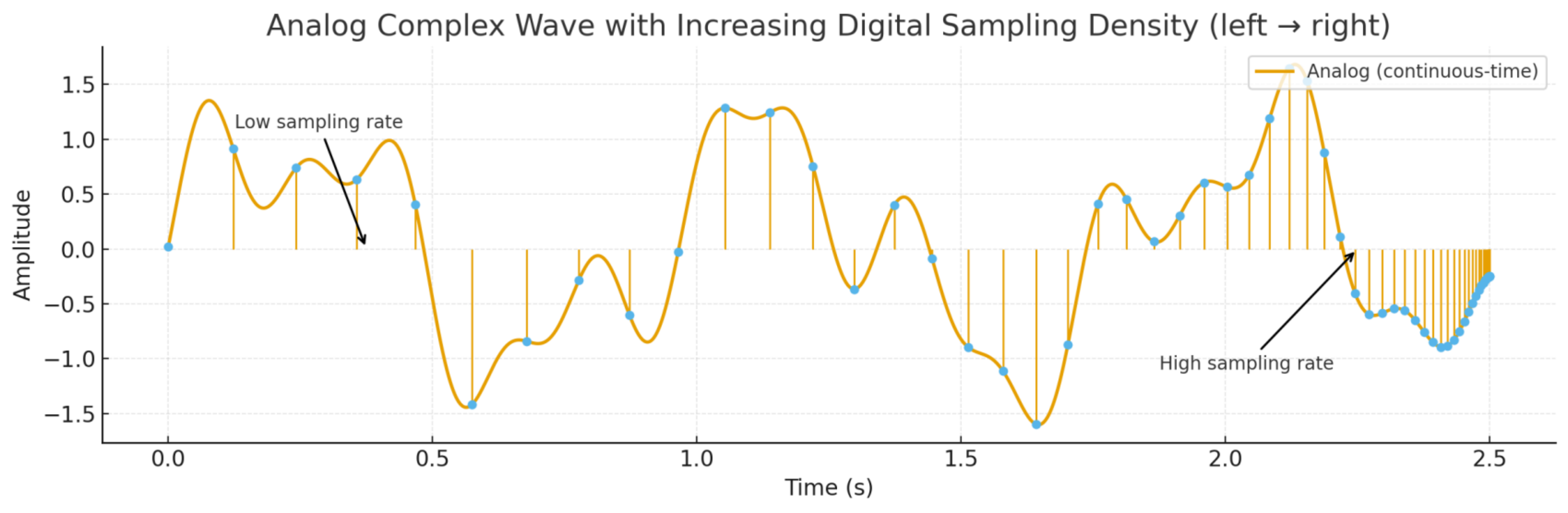
First View of Earth from Moon, Lunar orbiter, NASA (Oct 1, 1966) updated with more recent software

https://pds-imaging.jpl.nasa.gov/volumes/loirp.html

From Analog to Digital: From Chemical to Numeric Operations

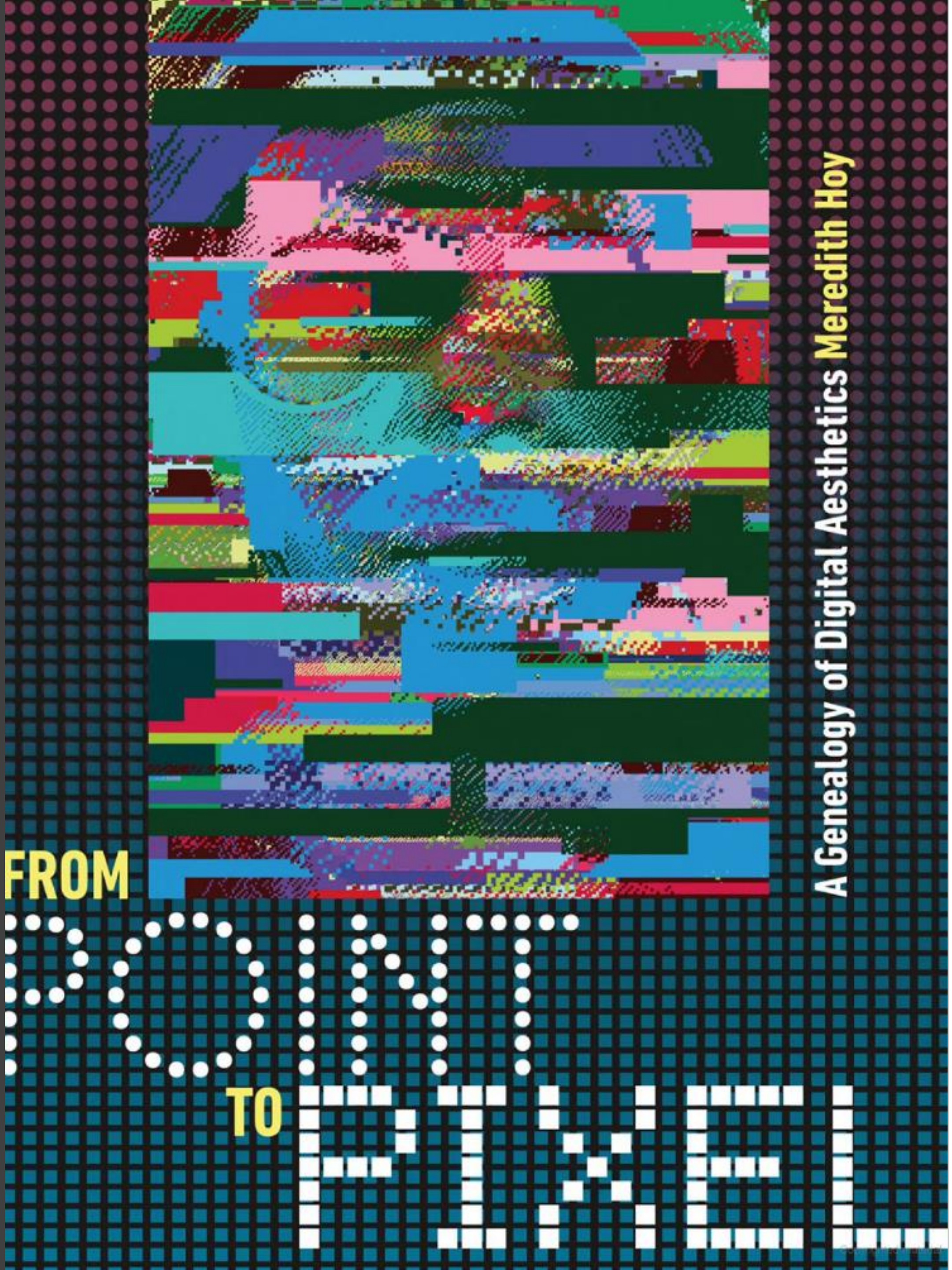
- Analog photographs are created through light exposure of light-sensitive chemicals coated on film followed by chemical development

- Digital images are sampled light information captured electronically with sensors which are then processed numerically

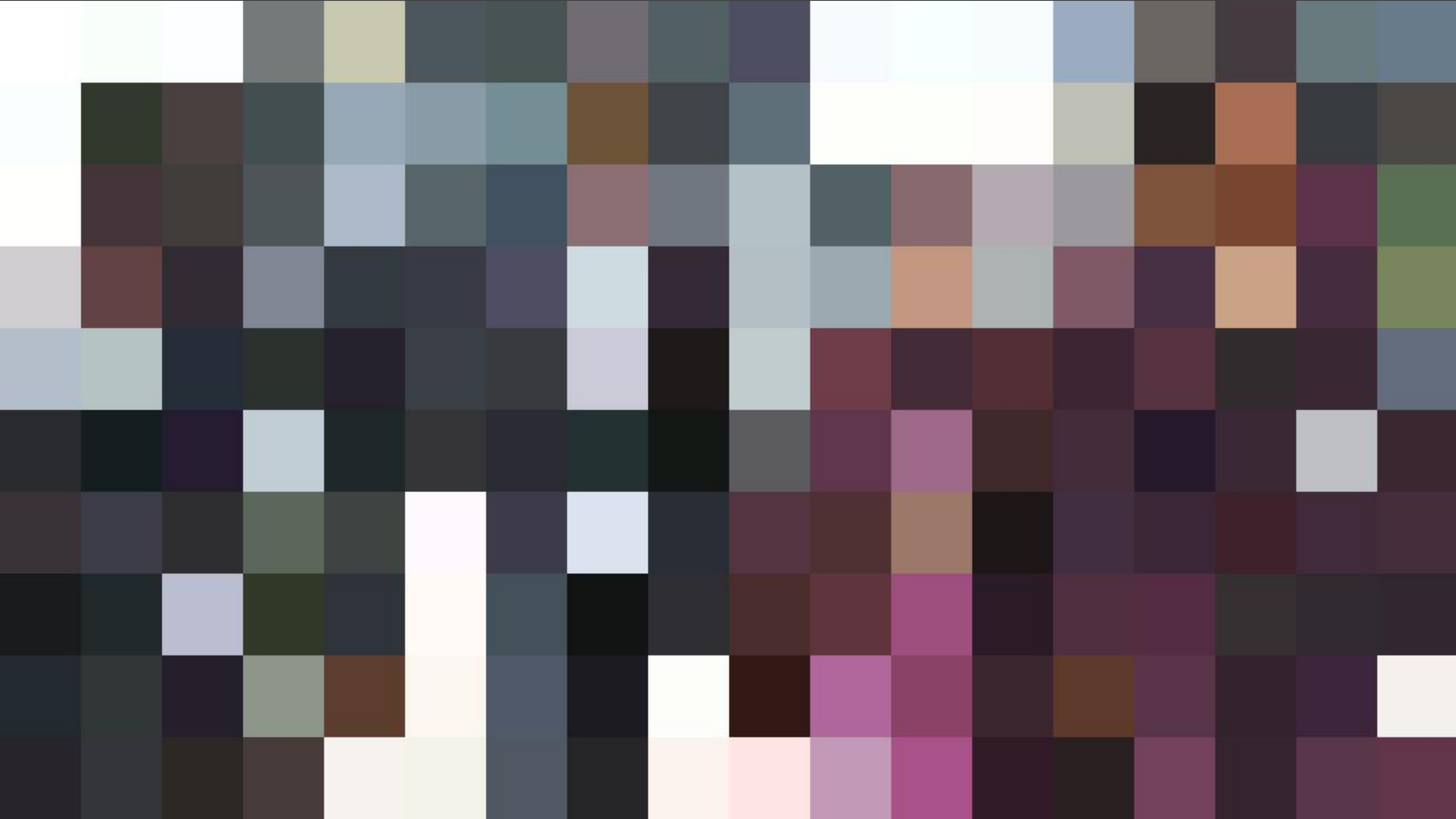


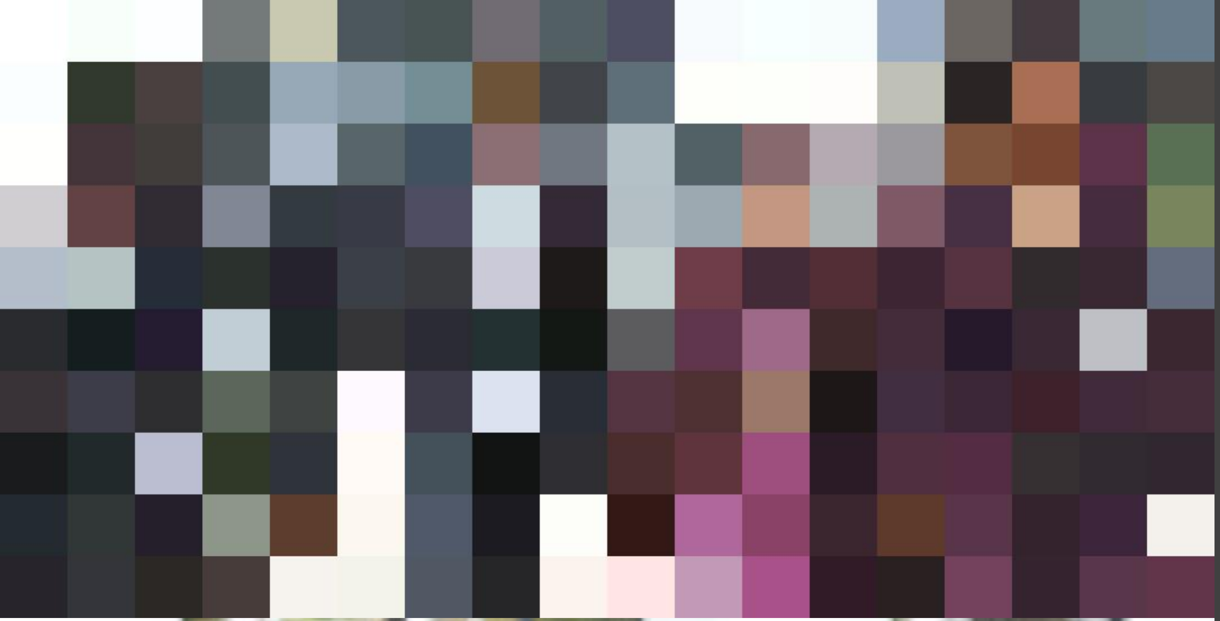
“ la Grande Jatte”, Georges Seurat (1884)

https://www.britannica.com/art/pointillism


FROM
POINT
TO
PIXEL
A Genealogy of Digital Aesthetics
Meredith Hoy

Contents



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000000e0: 29 00 32 30 32 35 3a 30 39 3a 31 34 20 31 35 3a
000000f0: 34 31 3a 35 35 00 00 00 00 04 90 00 00 07 00 00
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00000160: 00 00 02 01 00 04 00 00 00 01 00 00 01 82 02 02
00000170: 00 04 00 00 00 01 00 00 02 ce 00 00 00 00 00 00
00000180: 00 48 00 00 00 01 00 00 00 48 00 00 00 01 ff d8
00000190: ff ed 00 0c 41 64 6f 62 65 5f 43 4d 00 01 ff ee
000001a0: 00 0e 41 64 6f 62 65 00 64 80 00 00 00 01 ff db
000001b0: 00 84 00 0c 08 08 08 09 08 0c 09 09 0c 11 0b 0a
000001c0: 0b 11 15 0f 0c 0c 0f 15 18 13 13 15 13 13 18 11
000001d0: 0c 0c 0c 0c 0c 0c 11 0c 0c 0c 0c 0c 0c 0c 0c 0c
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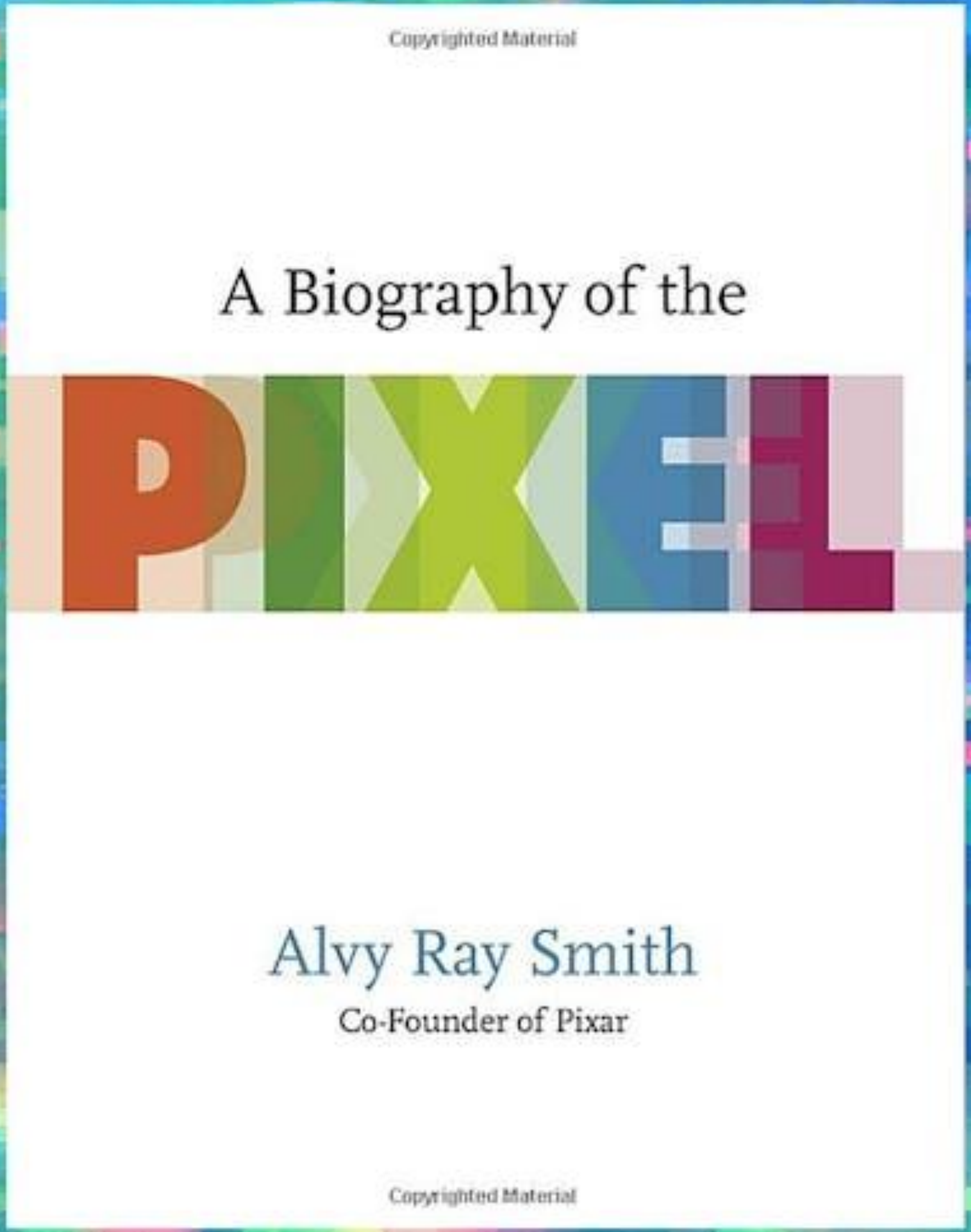
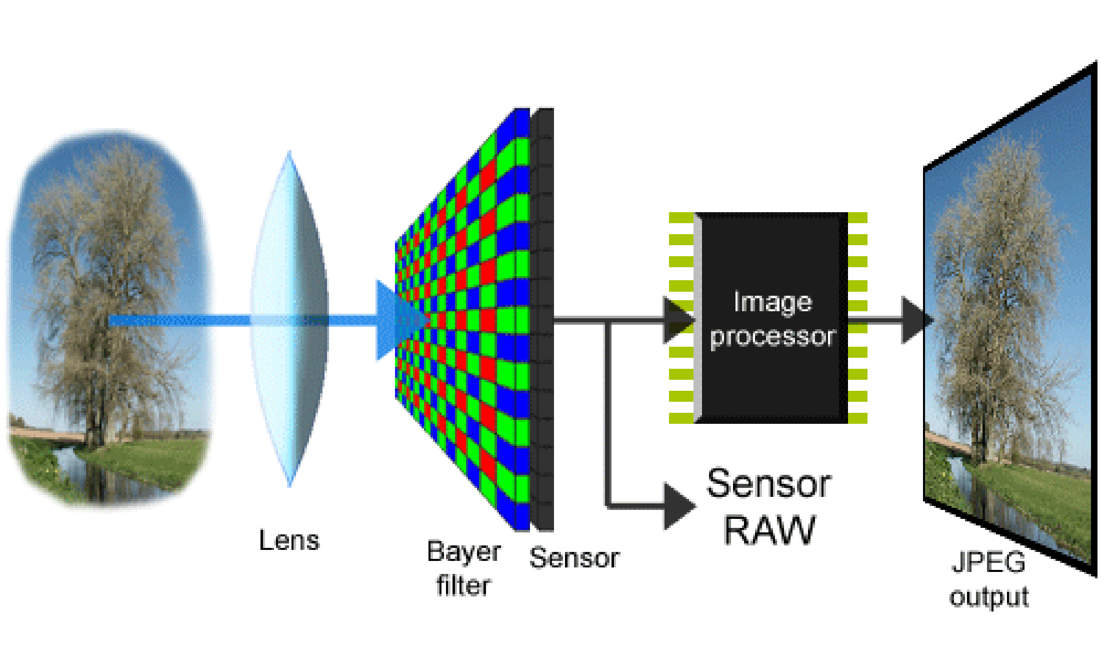
000001f0: 0c 0c 0c 01 0d 0b 0b 0d 0e 0d 10 0e 0e 10 14 0e
```


Digital Image is made up of pixels, organized as a multi-dimensional data structure: horizonal, vertical, RGB, alpha (transparency), Bitdepth (2 bit, 8 bit, 16 bit, 32 bit)



The PIXEL is a sample at a discreet point, at a specific sampling rate, the higher the rate the closer to a continuous signal

The Digital image as Signal



- Light captured by sensors in the camera is converted into digital form through sampling and quantization
- Quantization is the process of mapping a continuous range of values into a finite set of discrete values.
- A signal is a mathematical function and conveys some information. It can be processed mathematically through algorithms (*An algorithm is a repeatable sequence of instructions, active until it reaches a pre-defined limit*)

- *Pixel* ***Horizontal*** location: **2560**
- Pixel ***Vertical*** location: **1920**
- **Each pixel has R,G,B values between 0 to 255**
- **Dimensions: X,Y,R,G,B,alpha**
- **Total bytes: 1,678,364 (1.7MB)**

Multi-dimensional Data Structure – Allows for additional data to be inserted wherever there is extra space

“Bitwalls”, Christian Moeller (2011)

https://segd.org/san-jose-international-airport-art-technology-program | Christian Moeller website

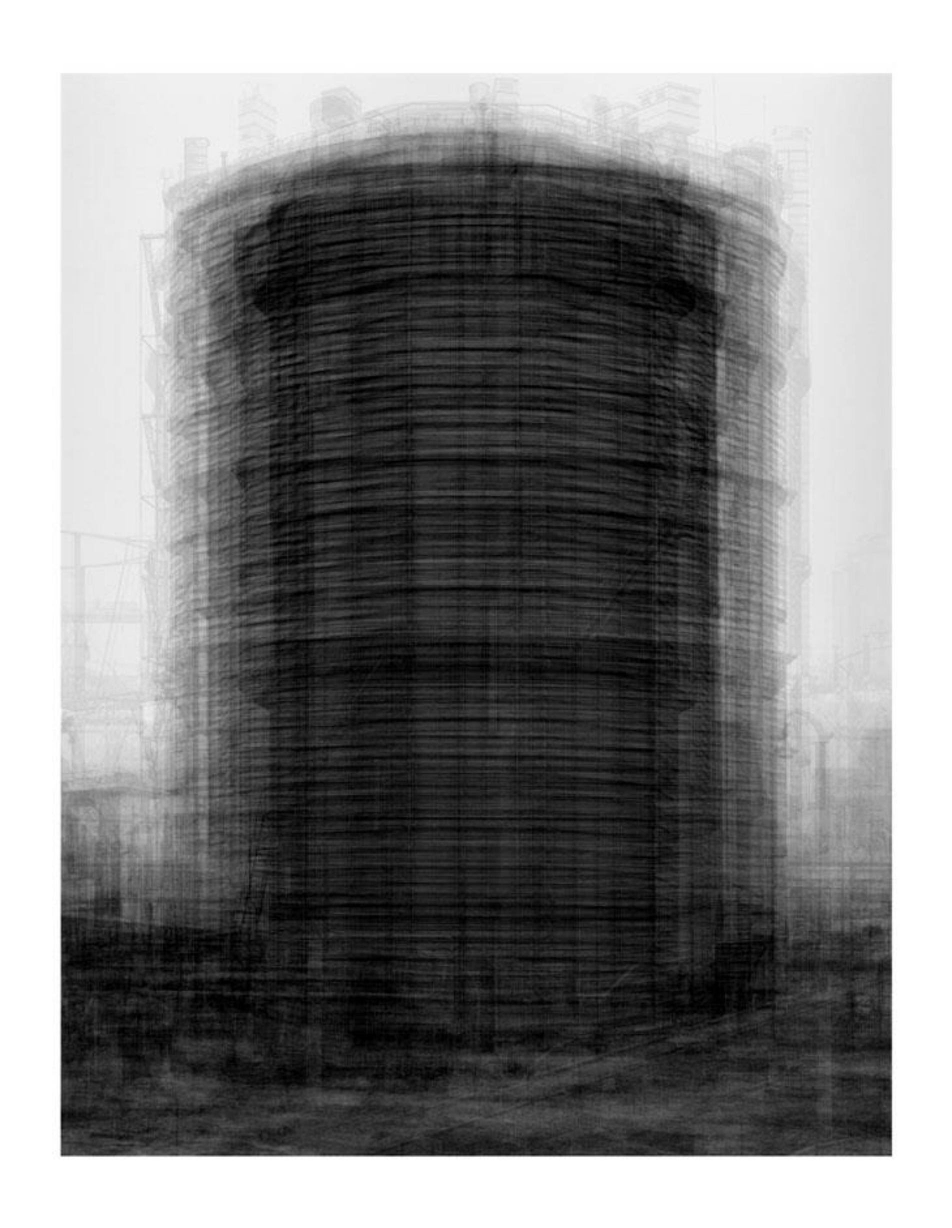
“Netropolis | Berlin”, Michael Najjar (2003-2006)

https://www.michaelnajjar.com/artworks/netropolis#9

“Rembrandt”, “Velasquez”, Jason Salavon (2009/2010)

http://www.salavon.com/work/Portrait/

Idris Khan (2017)



https://thenewartgallerywalsall.org.uk/exhibition/idris-khan/

Multiple Image Layering

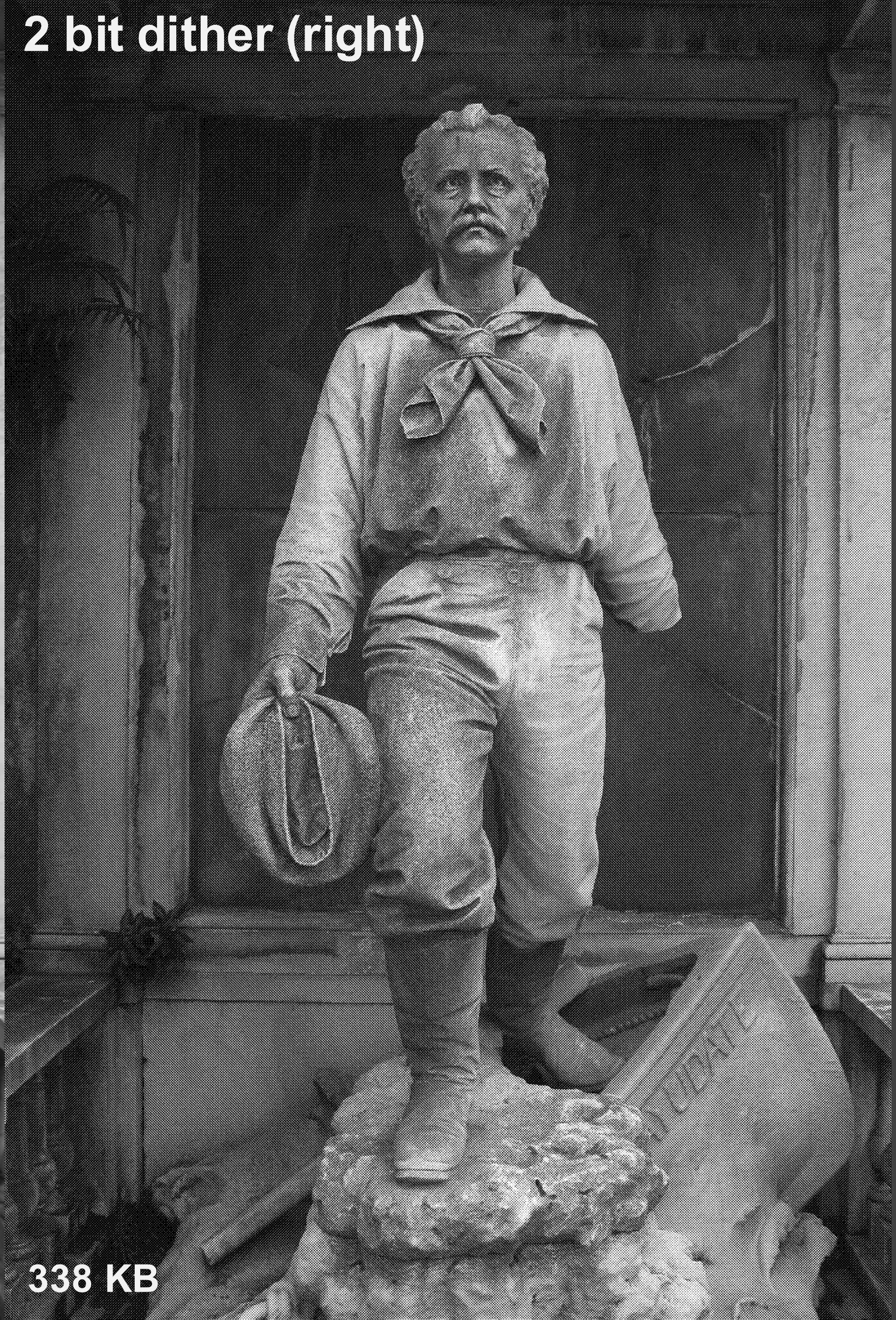
https://www.davidzwirner.com/artists/james-welling/survey

Sampling at different resolutions – DPI resolution (Dots per inch)

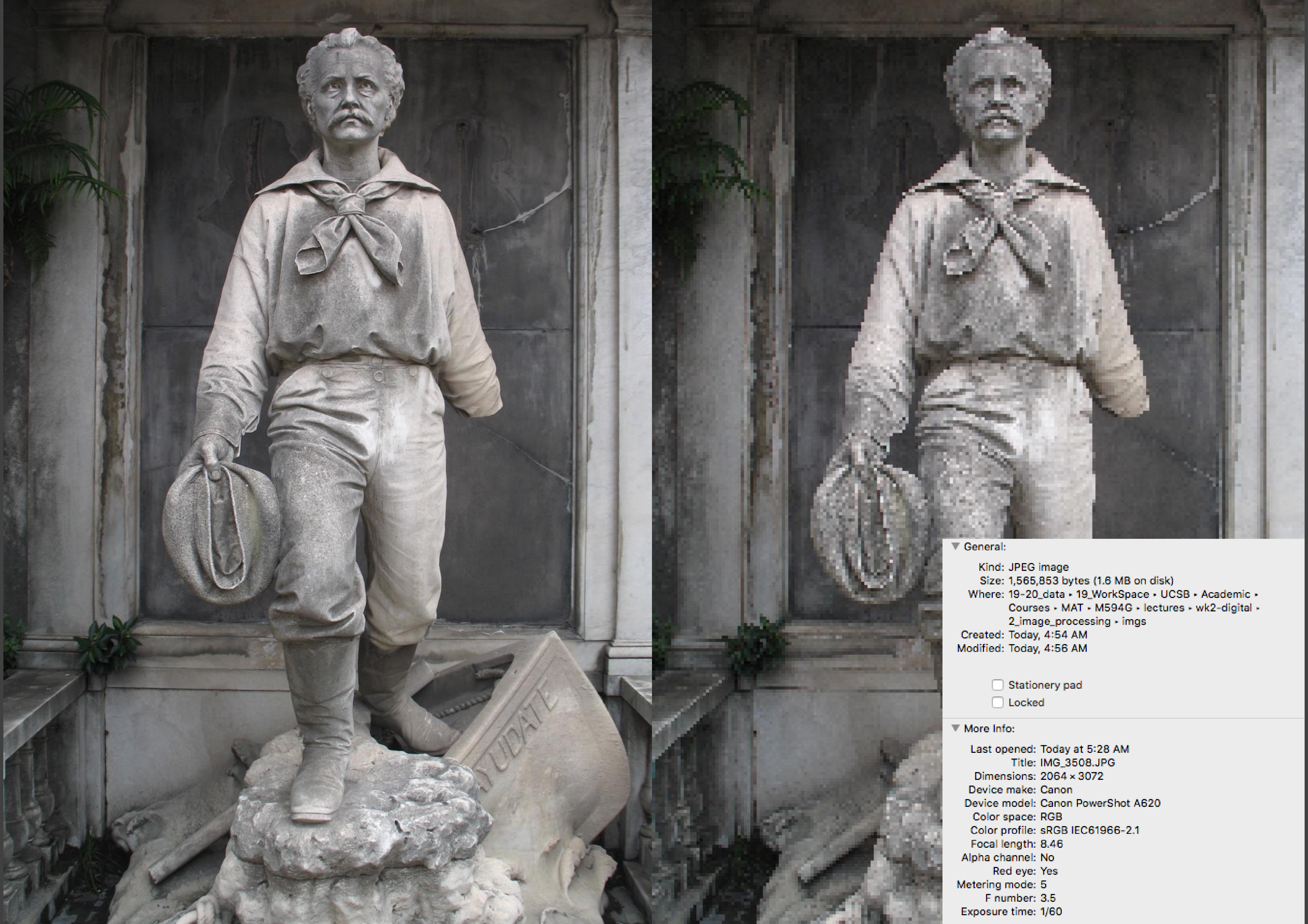
1.6 MB (100 dpi)

950 KB (10 dpi)


Standard grey scale (256 values)
1.2 MB


2 bit dither (right)
338 KB

EXIF Data (*Digital cameras embed into the image how it was created*)

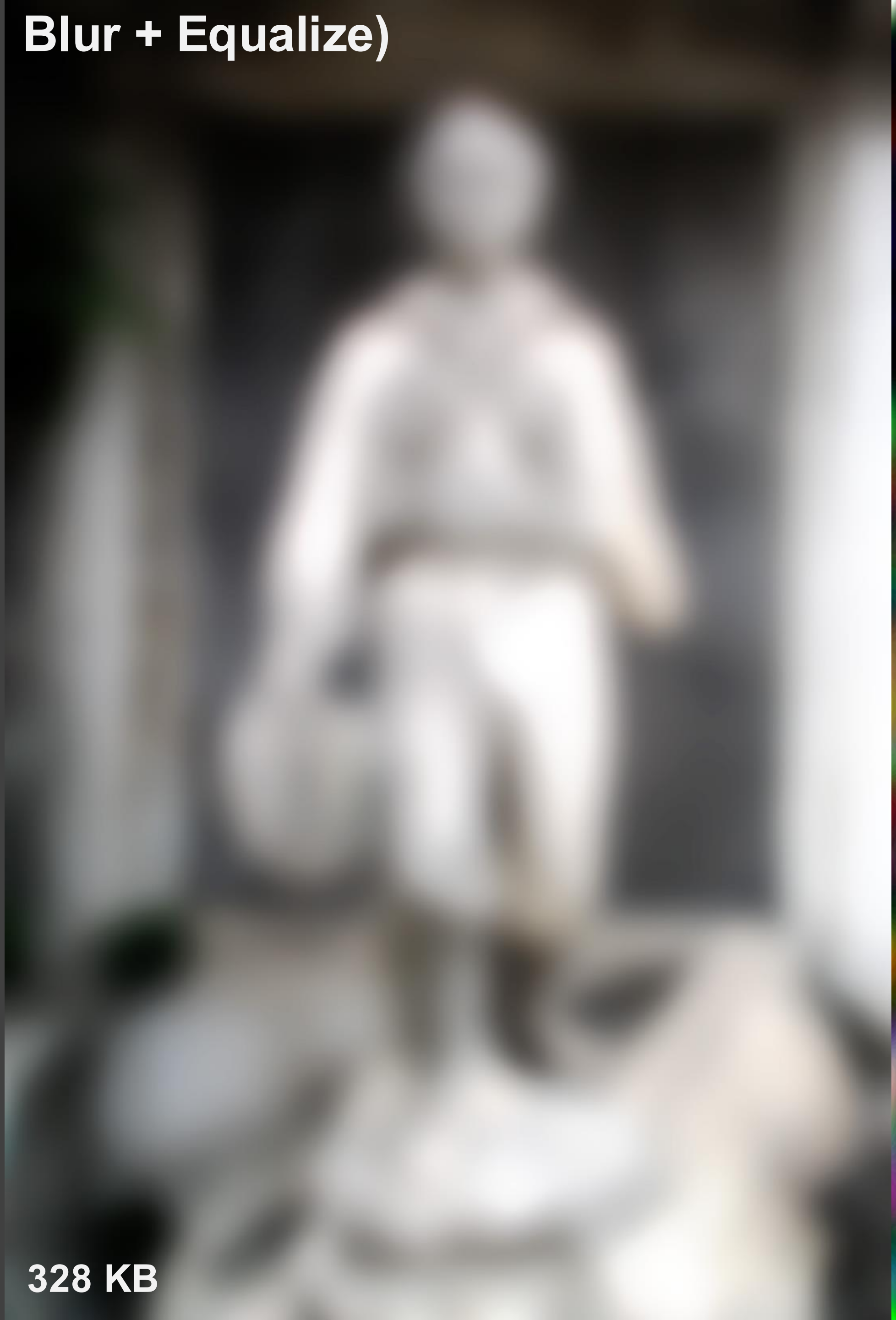



Sharpen
[1,1,1]
[1,9,1]
[1,1,1]
1.6 MB

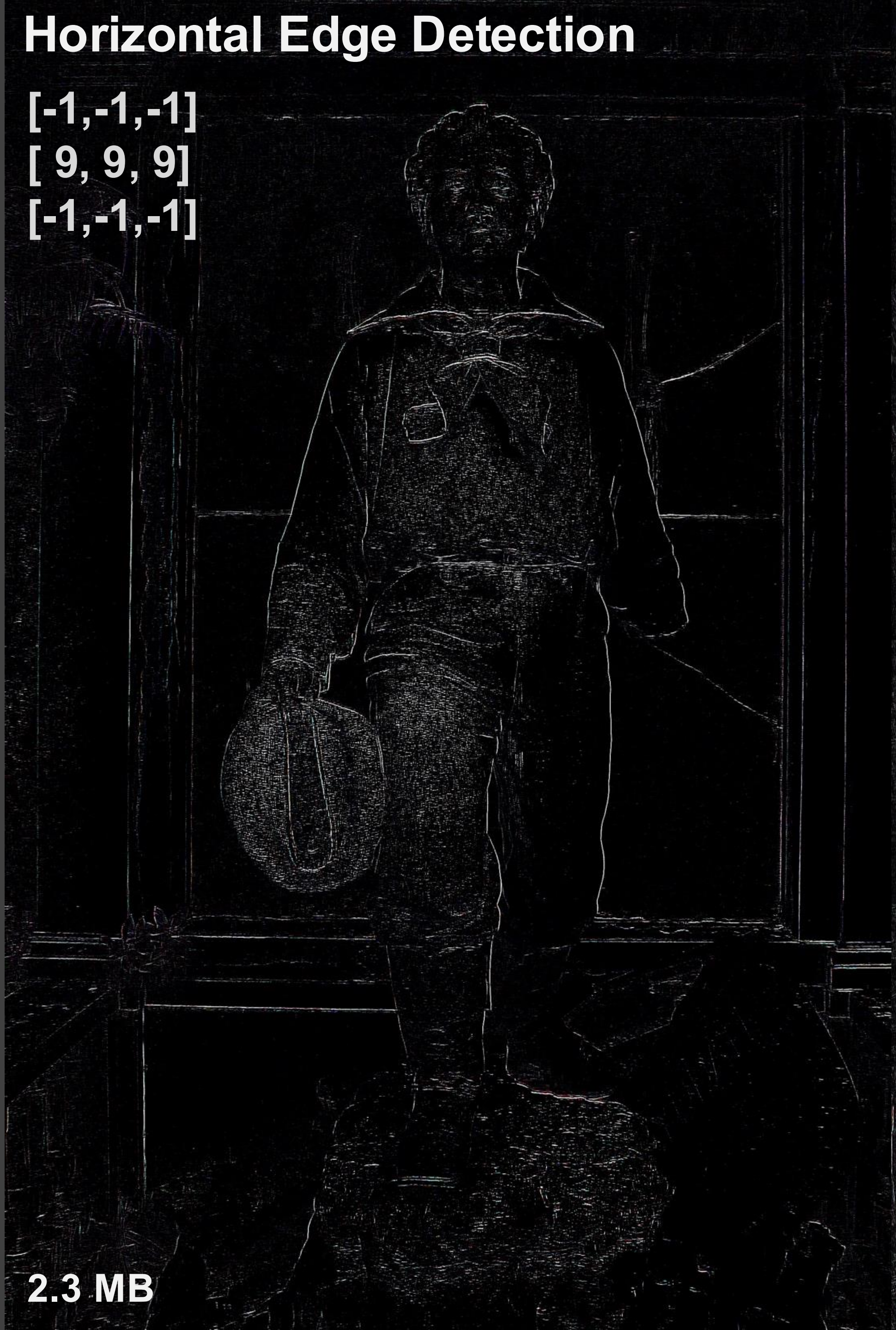

Maximum Saturation
4.9 MB

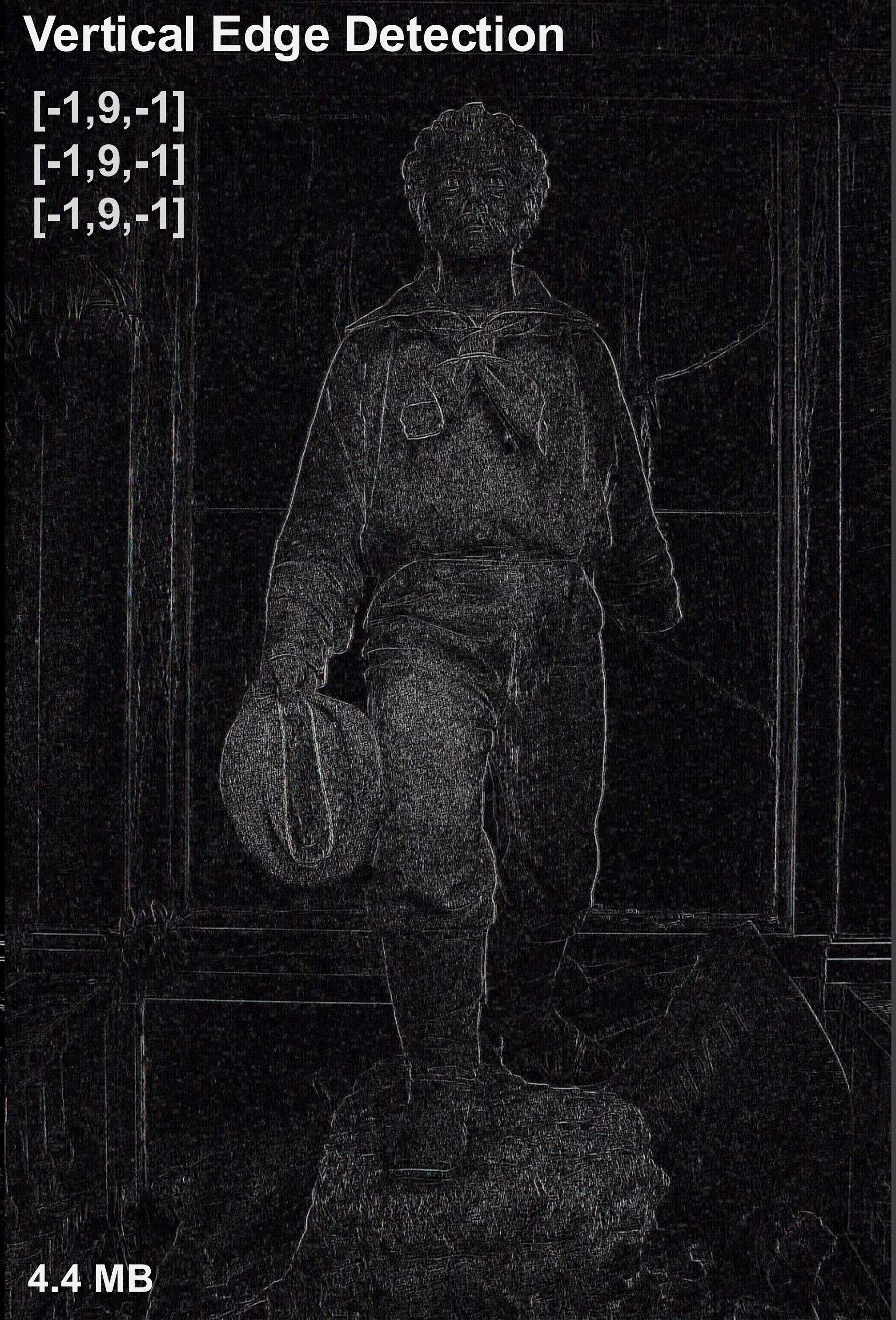

Blur (remove information)
[1,1,1]
[1,1,1]
[1,1,1]
326 KB


Blur + Noise (add information)
4.6 MB


Blur + Equalize)
328 KB


Blur + Noise + Equalize (results in banding)
700 KB (https://en.wikipedia.org/wiki/Colour_banding)

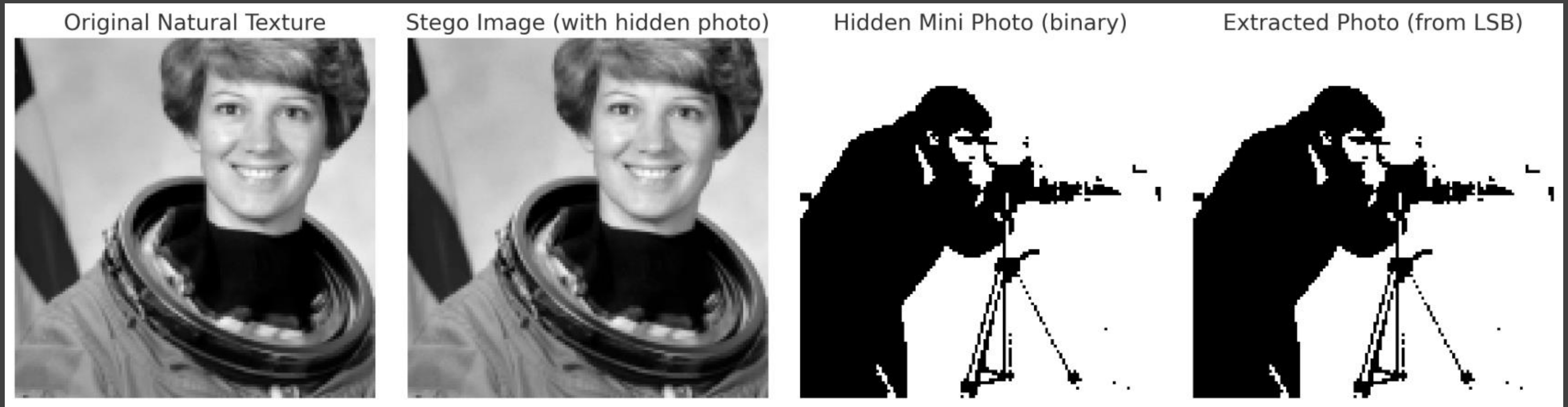

Horizontal Edge Detection
[-1,-1,-1]
[9, 9, 9]
[-1,-1,-1]
2.3 MB


Vertical Edge Detection
[-1,9,-1]
[-1,9,-1]
[-1,9,-1]
4.4 MB

Steganography is the practice of concealing information. It involves hiding data within an ordinary, non-secret file or message to prevent detection. The hidden information is being extracted at the receiving end.

When images are compressed, extra digital space can be used to encode data that is kep hidden

- Null Byte



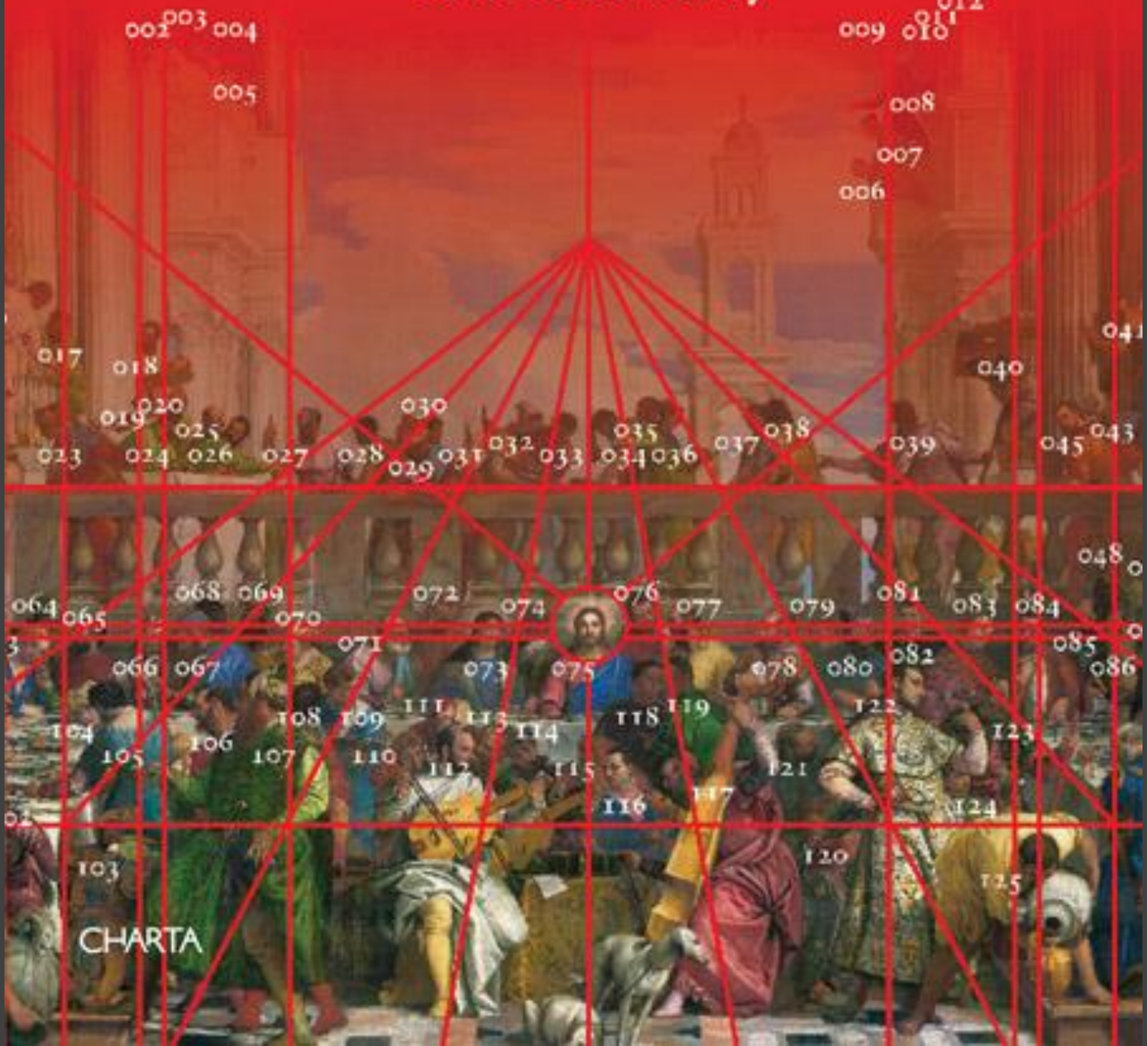
- Here's the **photo-in-photo steganography demo**:
- **Original Natural Texture** – cropped astronaut photo (grayscale).
- **Stego Image** – looks almost the same but hides another photo in its least significant bits.
- **Hidden Mini Photo** – the classic "camera man" image (converted to binary).
- **Extracted Photo** – recovered from the LSB plane of the stego image.

Veronese

The Wedding at Cana
Las Bodas de Caná

A Vision by
Una visión de

Peter Greenaway

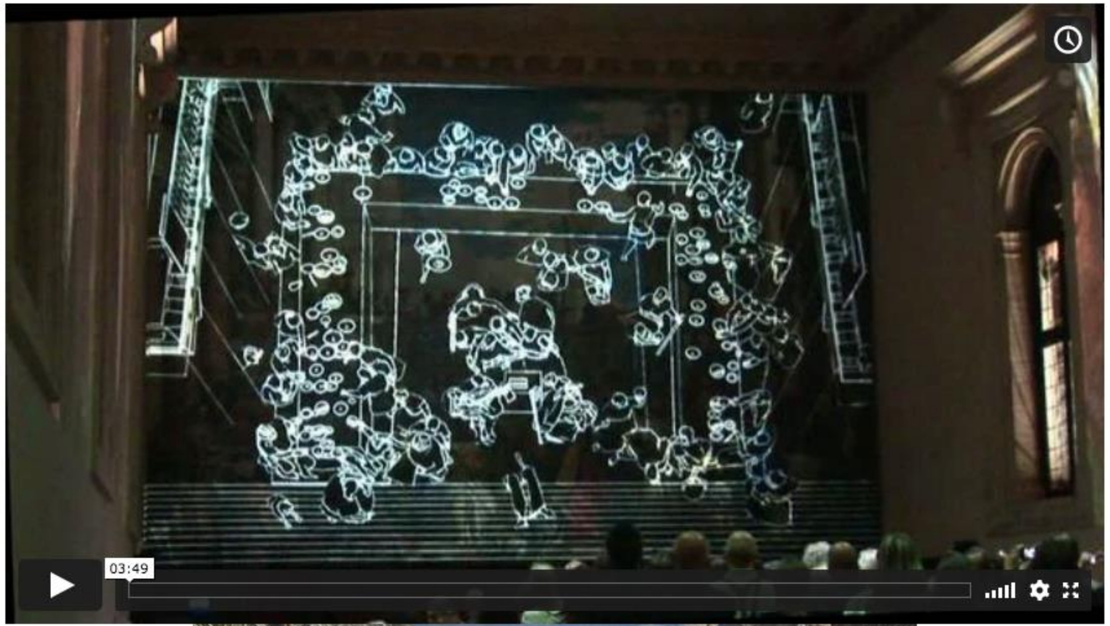


CHARTA

PETER GREENAWAY ON VERONESE´S WEDDING AT CANA

SHARE

San Giorgio Maggiore, Venice



The second of Peter Greenaway's live projects onto a facsimile that was produced by Factum Arte. The performance took place in the original location of the great painting by Veronese: the refectory of San Giorgio Maggiore in Venice. Click here to know more about the process and production of the Wedding at Cana facsimile.

JPEG Compression: Image information is discarded to achieve smaller file size

- In information technology, **lossy compression** or **irreversible compression** is the class of data encoding methods that uses inexact approximations and partial data discarding to represent the content. These techniques are used to reduce data size for storing, handling, and transmitting content.

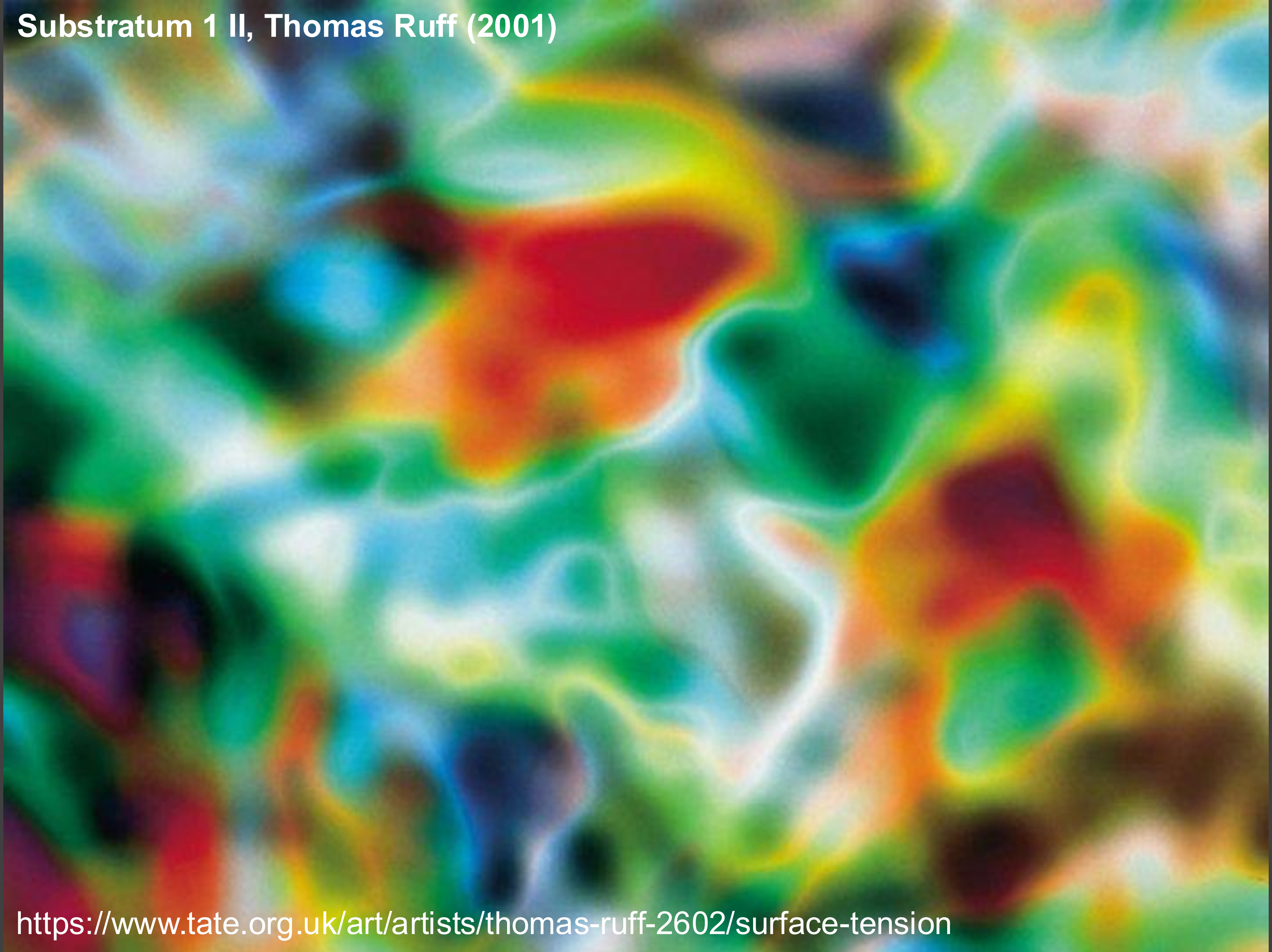
- This is opposed to lossless data compression (reversible data compression) which does not degrade the data. The amount of data reduction possible using lossy compression is much higher than through lossless techniques.

- Lossy compression is most commonly used to compress multimedia data (audio, video, and images), especially in applications such as streaming media and internet telephony. By contrast, lossless compression is typically required for text and data files, such as bank records and text articles.

Highly Compressed JPEG results in patterns where similar data are situated “jpeg ny02”, Thomas Ruff (2004)

https://artblart.com/tag/thomas-ruff-jpeg-ny02/

Substratum 1 II, Thomas Ruff (2001)

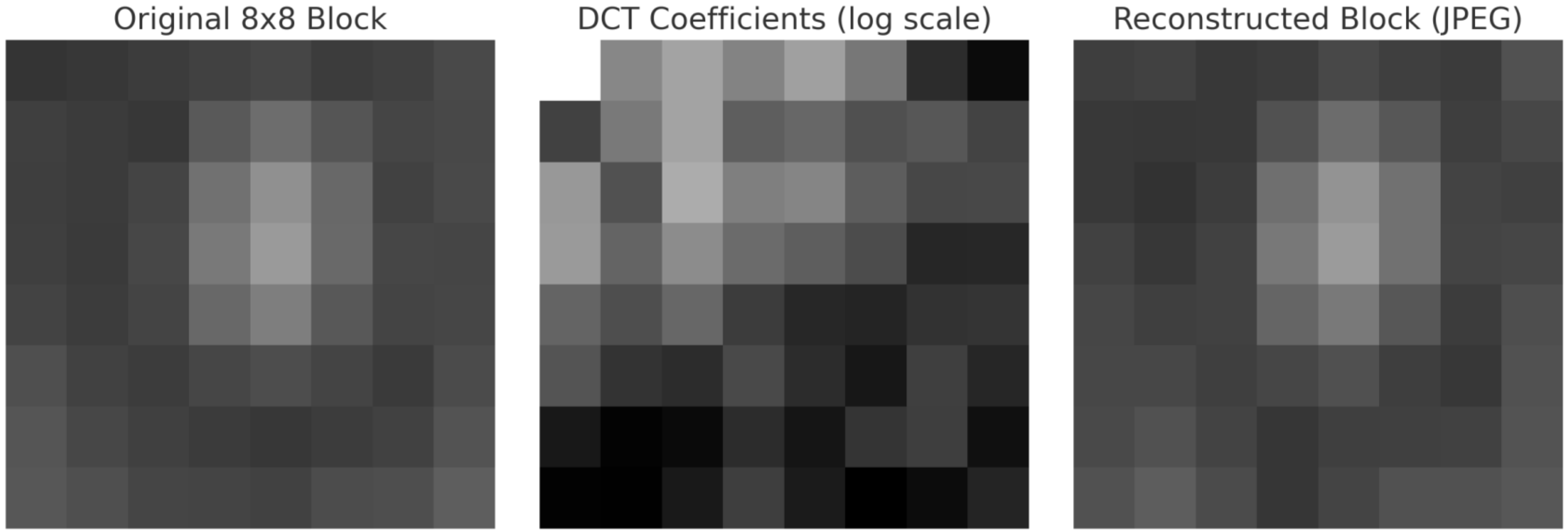


https://www.tate.org.uk/art/artists/thomas-ruff-2602/surface-tension

Substratum (Manipulation of Manga images) Thomas Ruff (2001)

https://www.castellodirivoli.org/en/mostra/thomas-ruff/ douglas_dct_works_vm2017.pdf

- The **Discrete Cosine Transform (DCT)** is a mathematical technique used to convert a signal or image from the **spatial (or time) domain** into the **frequency domain**. It is widely used in data compression (e.g., JPEG for images, MP3 for audio) because it concentrates most of the signal's important information in a few low-frequency components.
- **JPEG** uses **DCT as one step** in its workflow but adds several other stages to achieve actual compression.



Stan Douglas *DCT works*

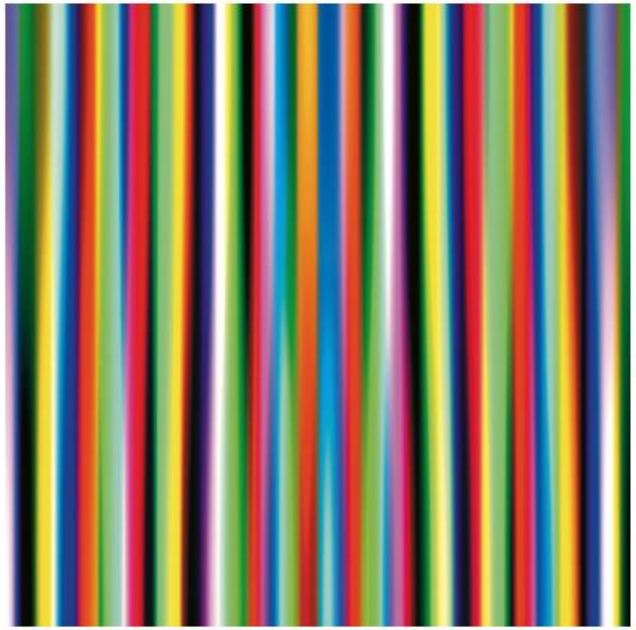


Image: Stan Douglas, *09_JNNJ*, 2016
Lacquered UV ink on gessoed panel
150 x 150 x 5 cm, 59 1/8 x 59 1/8 x 2 in

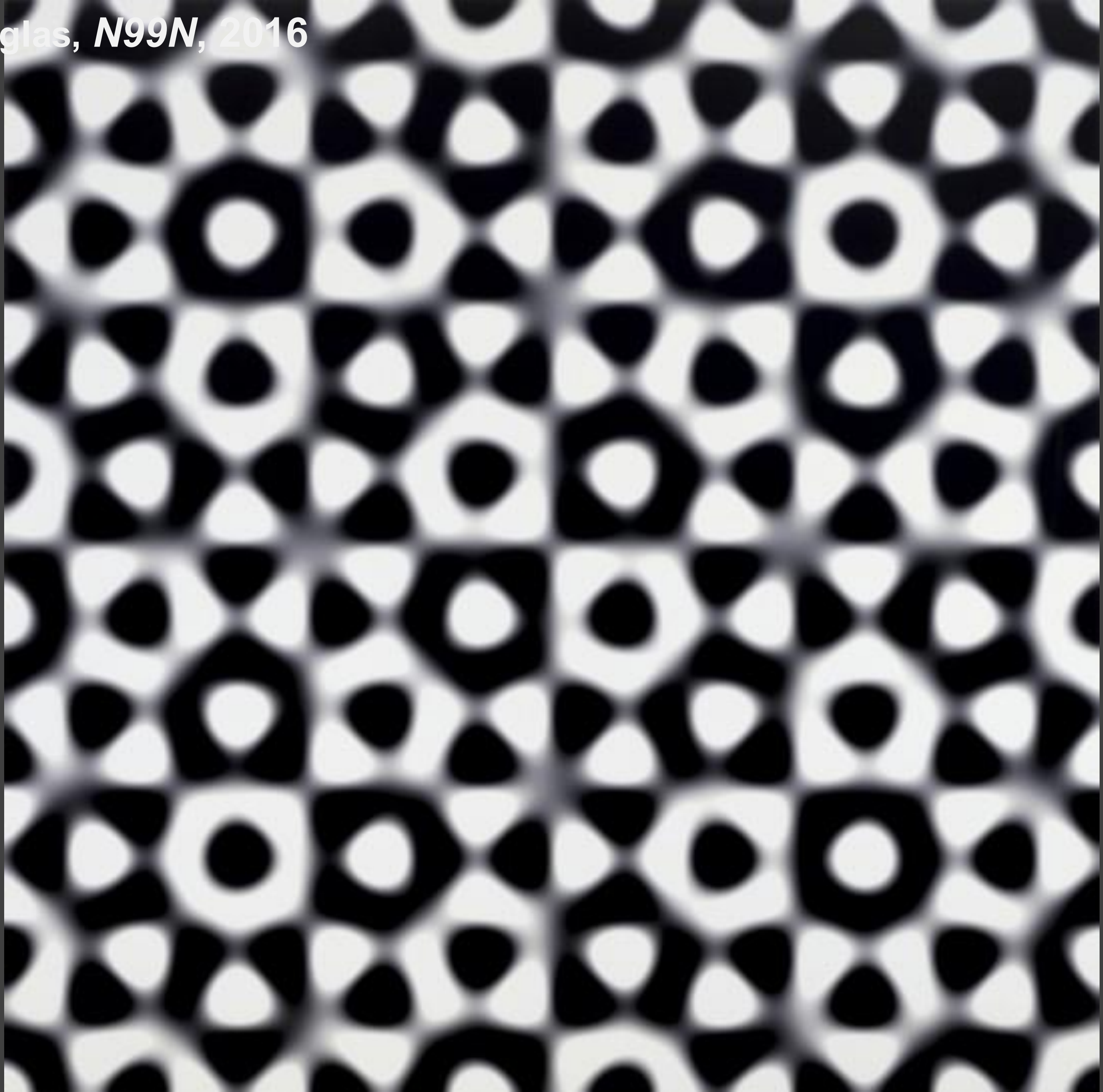
Two examples of Stan Douglas' new *DCT works* are on display.

The *DCT works* can be seen as a development of Douglas' *Corrupt Files* series from 2013, in which he examined the coding mistakes that can occur within a digital camera's memory card and the abstract, visual results that ensue.

DCT refers to a 'discrete cosine transform', a series of data points that specify how JPEG image files, among others, are compressed. Using DCTs, Douglas is able literally to 'write' images, determining their frequencies, amplitudes and colour values. Speaking about the work, Douglas explains: 'The original idea was to make a digital version of a photogram, a camera-less photograph created using the process of fixing an image without the optical apparatus of collecting an image. In the case of photography, a photogram is traditionally made using paper, light and chemicals. With digital photography, chemicals have been replaced by code. I figured that since we're turning images into code, you should be able to reverse the process and create a code to make an image.'

https://www.victoria-miro.com/usr/library/documents/main/stan-douglas_dct_works_vm2017.pdf

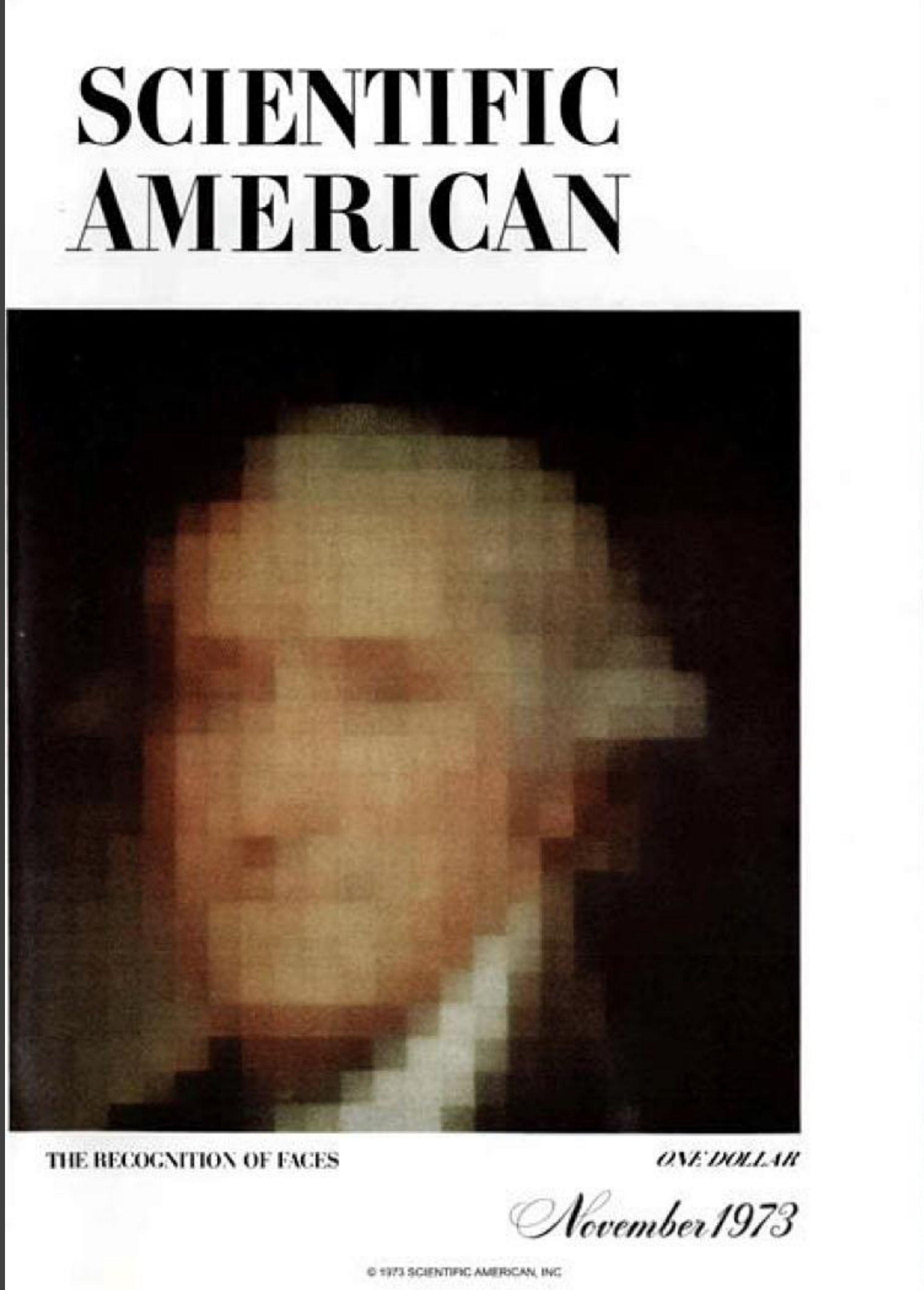
Stan Douglas, *N99N*, 2016

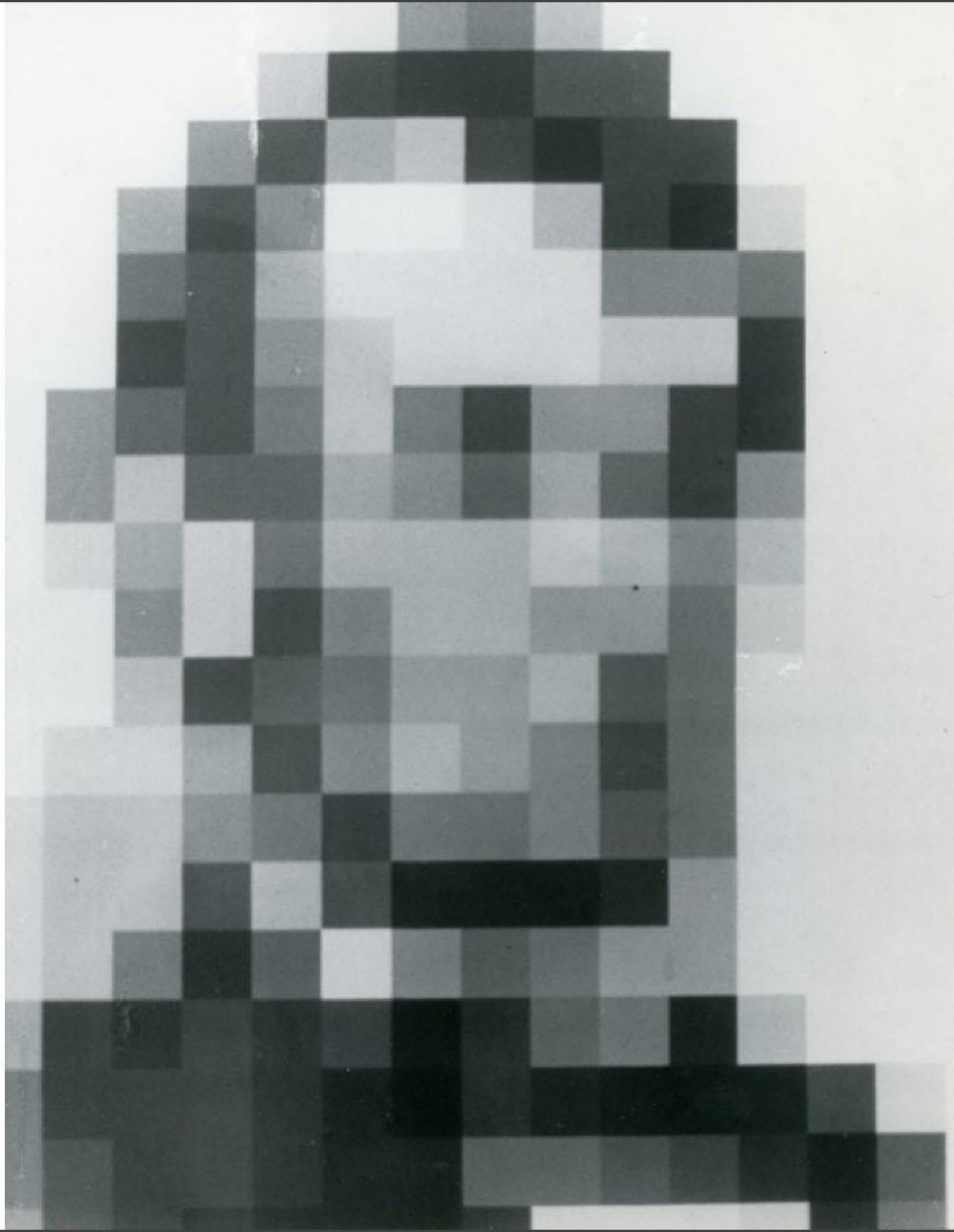


“DCT series”, Stan Douglas (2016)

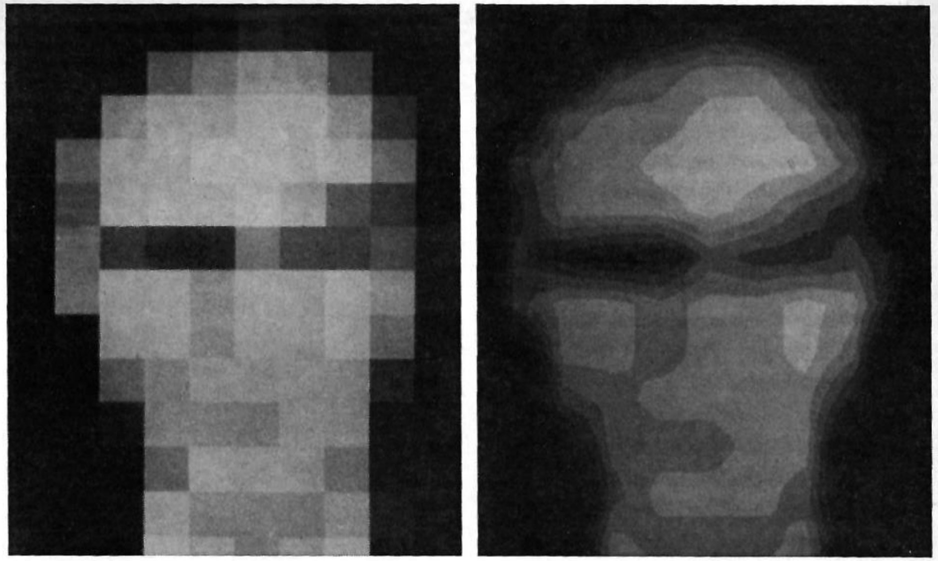
https://www.victoria-miro.com/usr/library/documents/main/stan-douglas_dct_works_vm2017.pdf

Leon Harmon

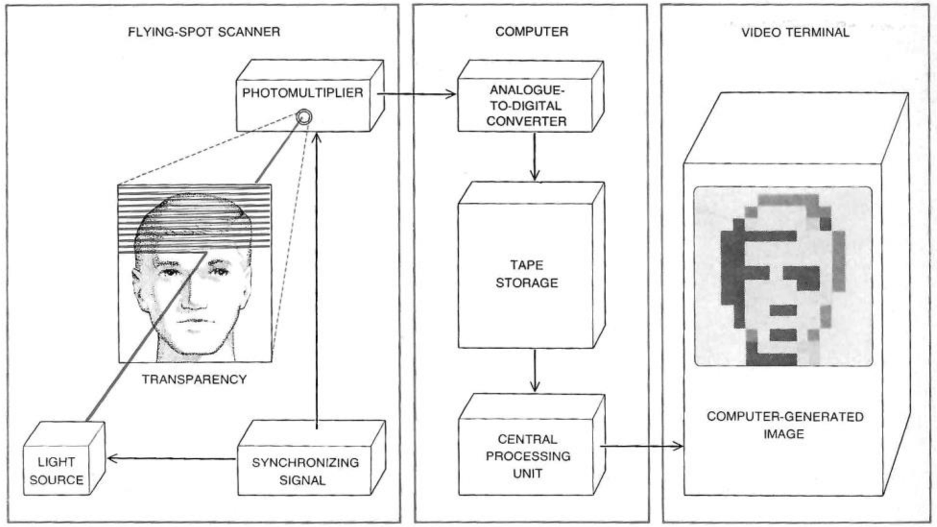




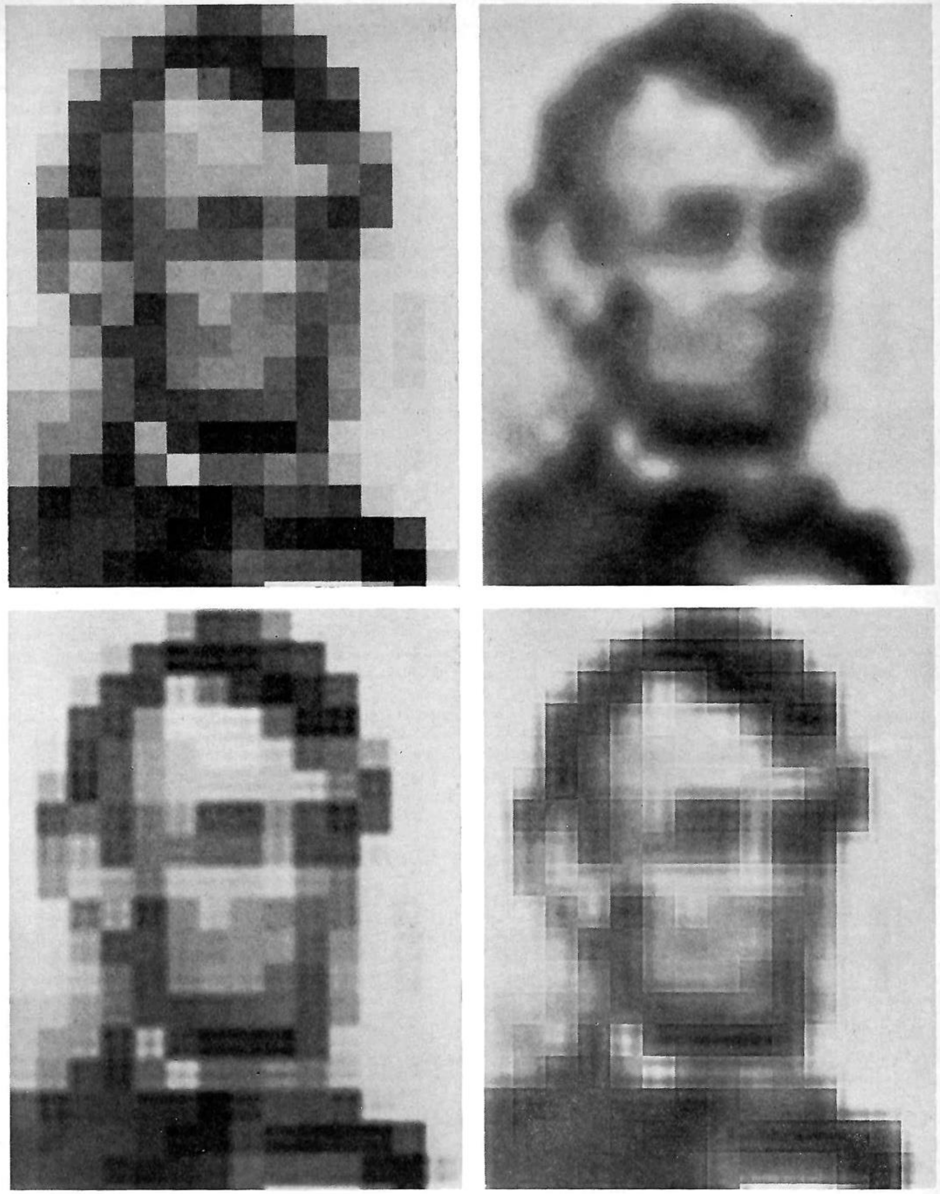
moma.org/collection/works/166022?sov_referrer=artist&artist_id=42856&page=1



REDUCED-INFORMATION-CONTENT PORTRAITS were generated by a computer. The picture at left is a block portrait; it is an array of 16×16 squares, each one of which can assume any one of 16 levels of gray. Not all the 256 squares are required to represent the face. The contoured representation at right was produced by filtering the block portrait to remove high frequencies.



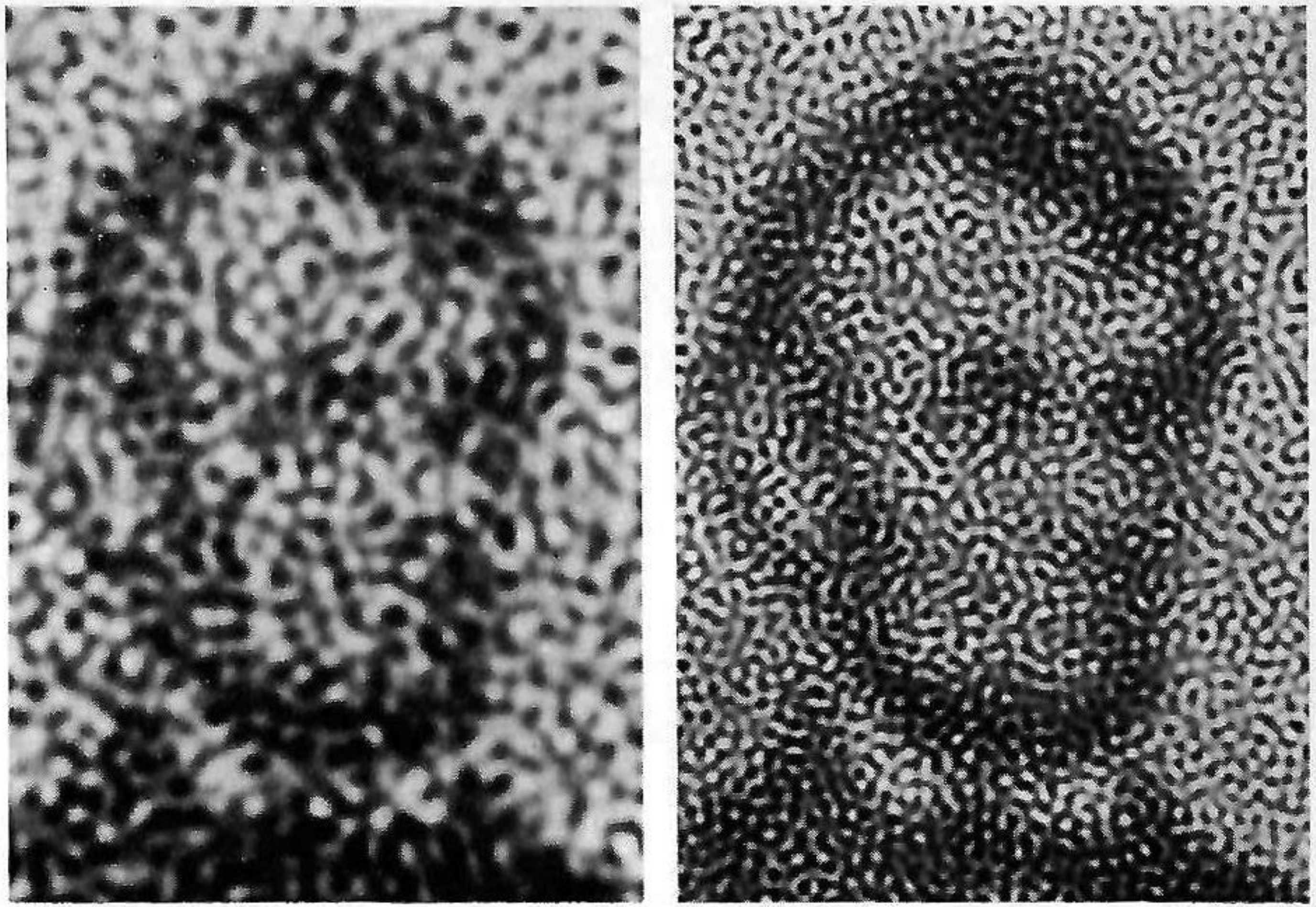
SYSTEM FOR MAKING BLOCK PORTRAITS uses a flying-spot scanner, a device similar to a television camera. The image, usually in the form of a 35-millimeter photographic transparency, is scanned in a raster pattern of 1,024 lines. In the analogue-to-digital converter each line is sampled at 1,024 points and the brightness of each point is assigned one of 1,024 values. Using this information stored on magnetic tape, the central processing unit divides the image into $n \times n$ squares and averages the brightness values of all the points within each square. The number of permissible brightness values is then reduced to eight or 16. The resulting image is displayed on a video terminal (a television screen) and photographed. The computer can also be made to operate a facsimile printer, which produces a finished picture directly. Most of the portraits used in these experiments were made by the latter process.



SELECTIVE FREQUENCY FILTERING influences the ease with which block portraits are recognized. The original block portrait of Abraham Lincoln is at top left. It consists of the photographic "signal," whose highest spatial frequency is 10 cycles per picture height, and noise frequencies extending above 10 cycles. As was anticipated, filtering out all spatial frequencies above 10 cycles (*top right*) greatly enhances recognition. Selective removal of only part of the noise spectrum, however, reveals which frequencies most effectively mask the image. At bottom left all frequencies above 40 cycles have been removed; even though the sharp edges of the squares are eliminated, perception is improved only slightly. When the two-octave band from 10 to 40 cycles is removed (*bottom right*), the face is more readily recognized. The phenomenon apparently responsible for this effect is critical-band masking.

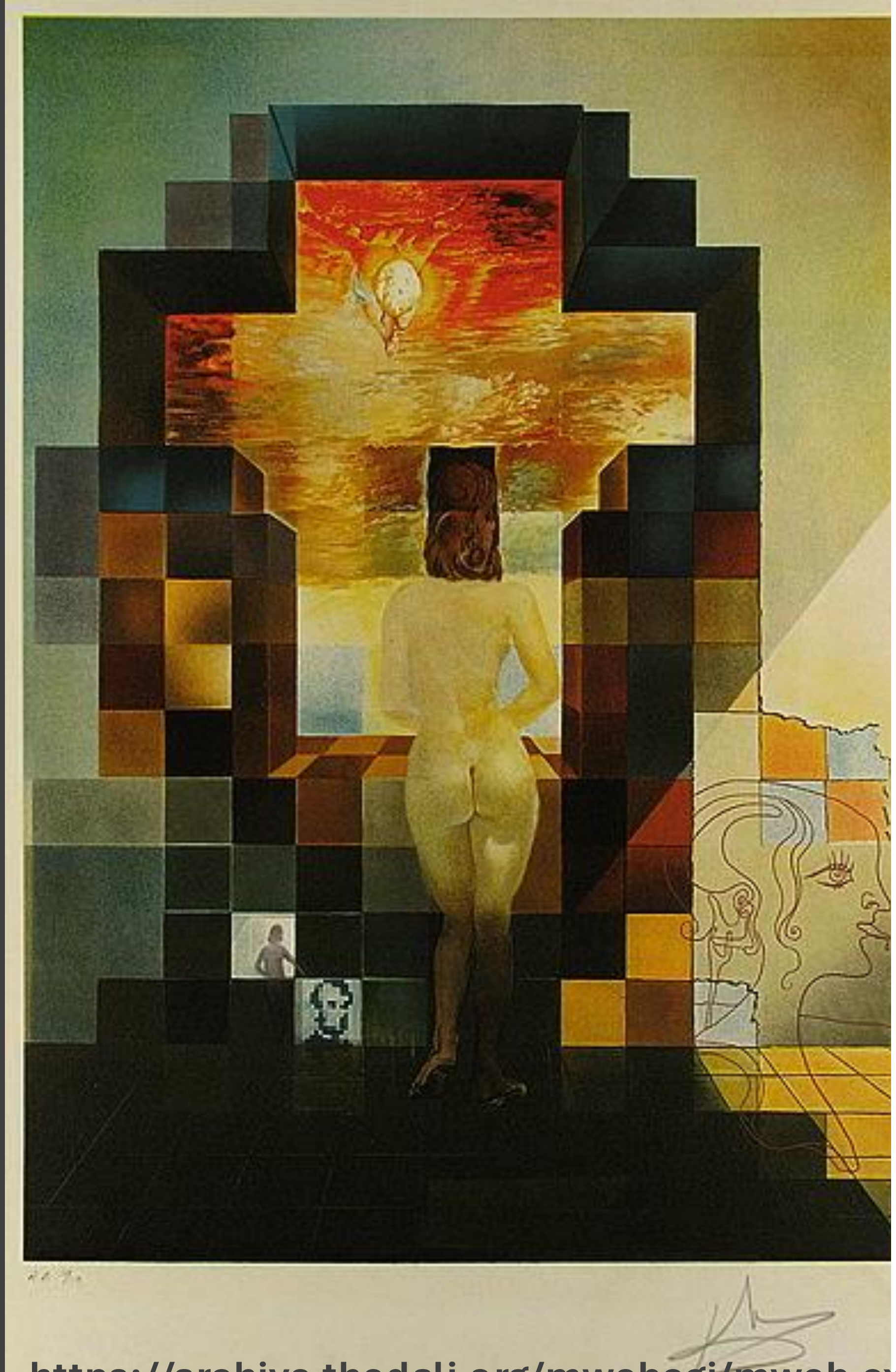
https://psychology.wikia.org/wiki/Leon_Harmon

Leon Harmon, Bell Labs (American Scientific, 1973)



RANDOMLY DISTRIBUTED NOISE of uniform amplitude is added to smoothly blurred portraits of Lincoln. When the noise is in the band adjacent to the signal frequencies (*left*), it obscures the picture more effectively than when it is at least two octaves removed from the picture frequencies (*right*), confirming that critical-band masking is the most important mechanism limiting the recognition of degraded or blurred images such as block portraits.

How much information is required for recognition and what information is the most important



https://archive.thedali.org/mwebcgi/mweb.exe?request=record;id=152;type=101

"Missing", Nancy Burson (1985)

https://www.washingtonpost.com/archive/lifestyle/1985/05/24/using-technology-to-age-missing-kids/c55c51e5-6df3-4fcf-baac-d695d81d38e8/

POPULAR MECHANICS

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Nowhere to Hide: Algorithms Are Learning to ID Pixelated Faces

The new tech can identify faces or numbers even if they've been blurred out.

// BY AVERY THOMPSON SEP 13, 2016

Images

https://www.popularmechanics.com/technology/security/a22829/machine-learning-blurred-faces/

ESSAYS & REVIEWS

Invisible Images (Your Pictures Are Looking at You)

By TREVOR PAGLEN DECEMBER 8, 2016

An audio version of this essay is available to subscribers, provided by curio.io.

"Winona"
Eigenface (Colorized),
Labelled Faces in the Wild Dataset
2016

I.

OUR eyes are fleshy things, and for most of human history our visual culture has also been made of fleshy things. The history of images is a history of pigments and dyes, oils, acrylics, silver nitrate and gelatin–materials that one could use to paint a cave, a church, or a canvas. One could use them to make a photograph, or to print pictures on the pages of a magazine. The advent of screen-based media in the latter half of the 20th century wasn't so different: cathode ray tubes and liquid crystal displays emitted light at frequencies our eyes perceive as color, and densities we perceive as shape.

The overwhelming majority of images are now made by machines for other machines, with humans rarely in the loop…

Prof. Farid Hani, Digital forensics, UC Berkeley

In a world flooded with fake images, manipulated videos, and AI-generated voices, how do we know what's real anymore? A leading voice in AI research and digital forensics, Hany works to authenticate digital media and expose the fakes.

In this episode, Hakeem and Hany dive into how we got here. How does AI really work? How are deepfakes detected? And what does the future hold for truth in the digital age? Plus, Hakeem puts Hany to the test: can he tell the difference between real and AI-generated headlines? And can Hakeem tell a deepfake version of Hany from the real thing?

Hany Farid is a Professor at the UC Berkeley School of Information. In addition to teaching at UC Berkeley, Hany is Chief Science Officer at GetReal Security, a company that focuses on the authentication of digital media. His research focuses on digital forensics, forensic science, misinformation, image analysis, and human perception.

https://farid.berkeley.edu/ | https://www.youtube.com/watch?v=nG2_GhNdTek (start 1:49 -)