RGB COLOUR PRINTING AND HALFTONING FOR THE REPRODUCTION OF STRUCTURAL COLOUR IMAGES

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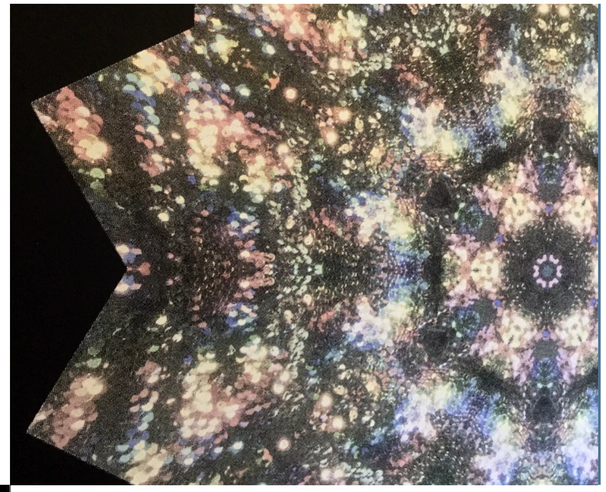
https://cfpr.uwe.ac.uk

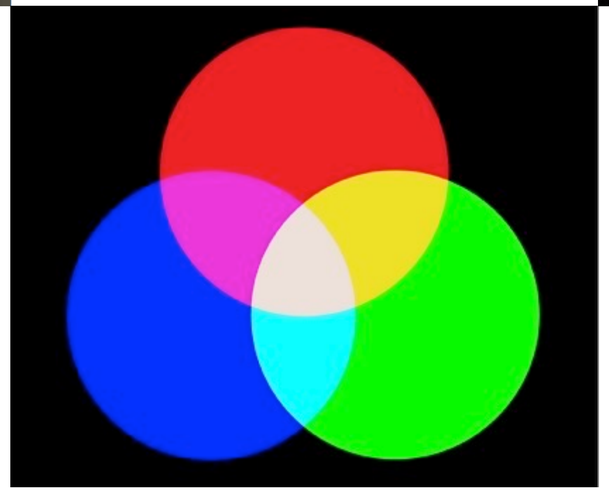
C F P R

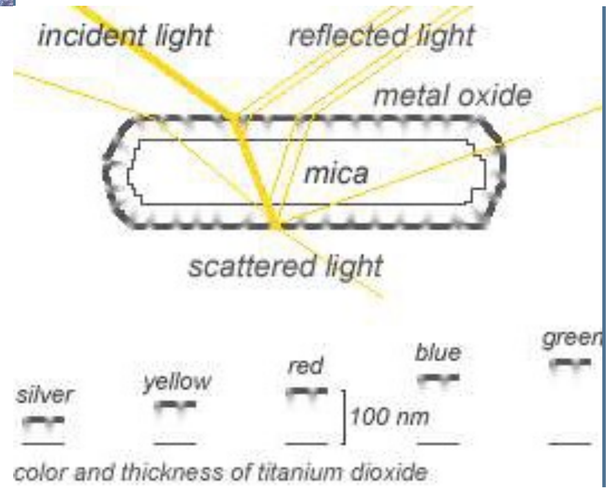
C R E A T I V I T Y A N D I N N O V A T I O N

RGB COLOUR PIGMENT PRINTING

Pigment colour printing on black paper, mimicking the mixing of coloured light, that affords the potential to reproduce structural colour, such as beetles, shells and feathers.







Merck Spectraval™

G A M U T

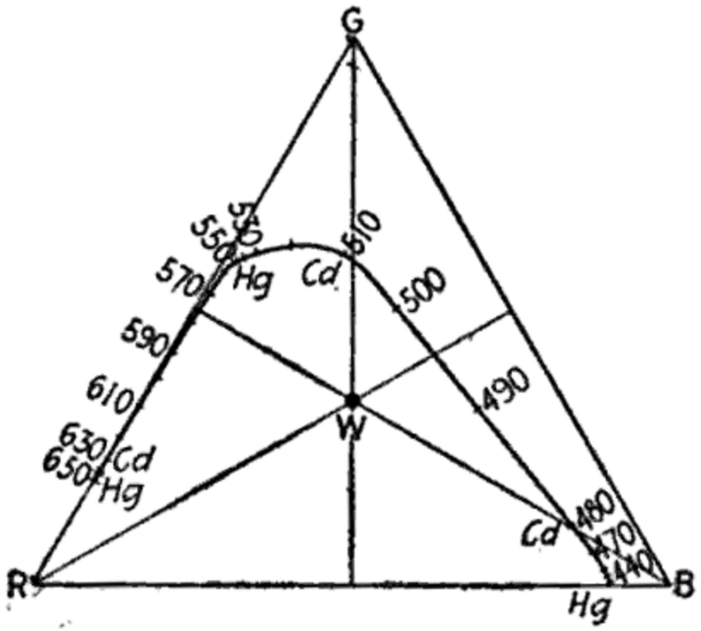
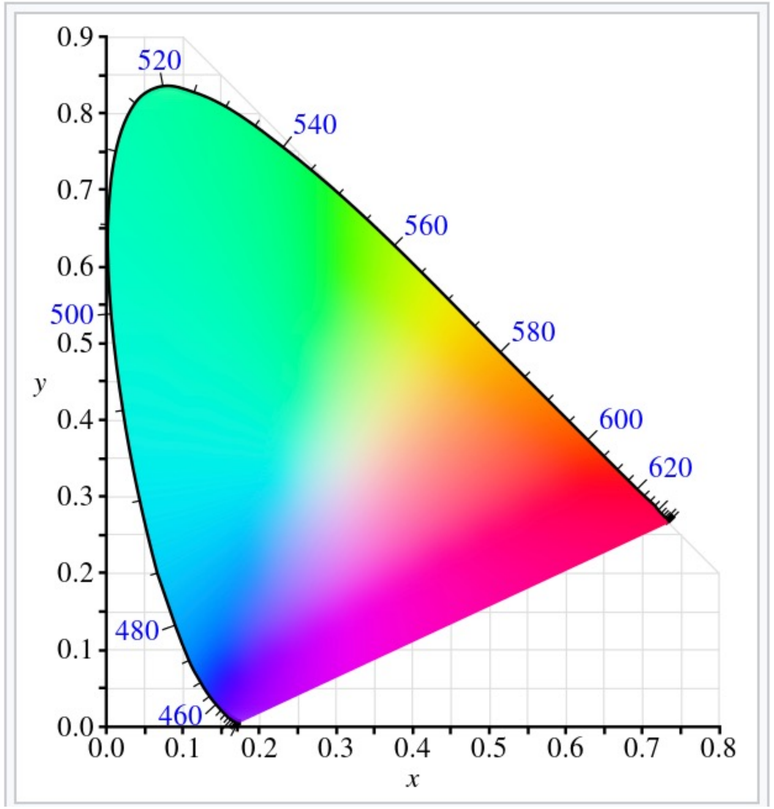
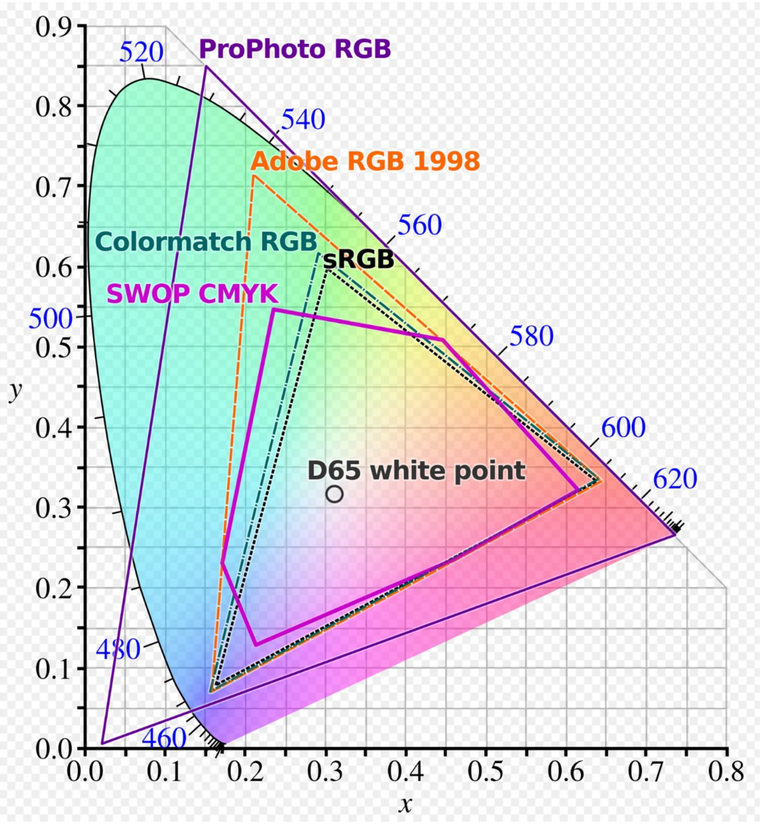
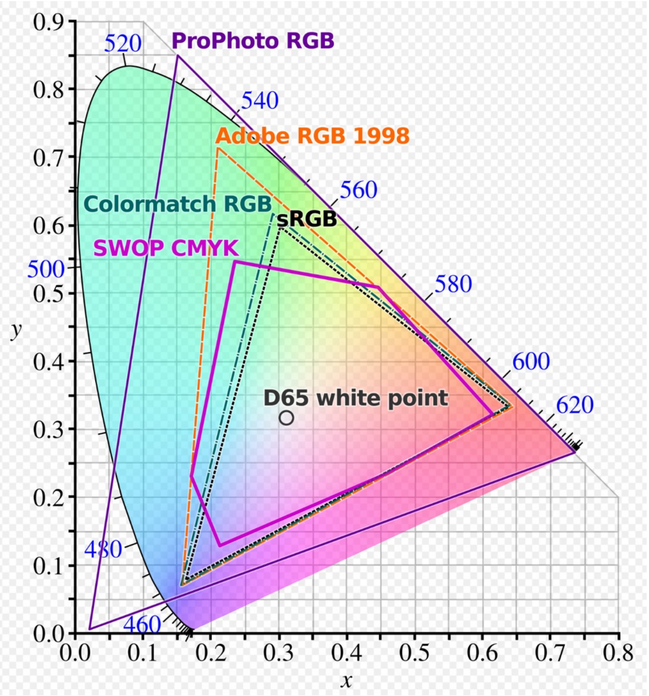


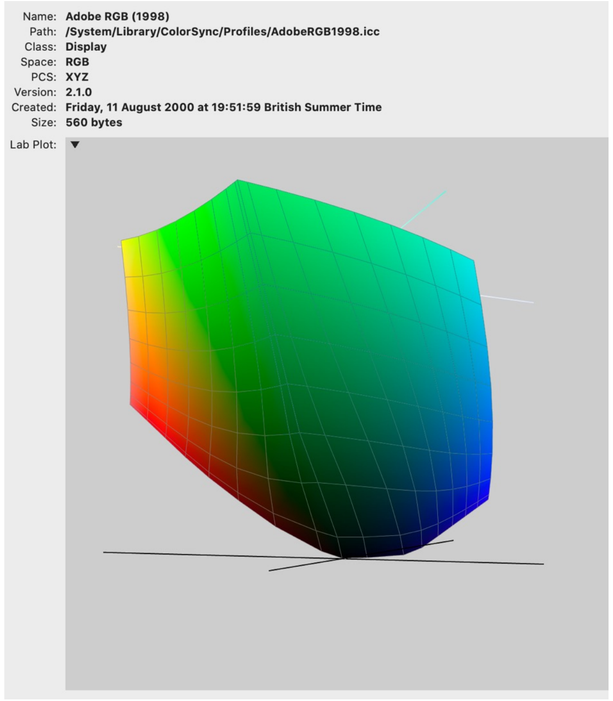
Fig. 31.—The Maxwell color-triangle.





G A M U T


ProPhoto RGB
Adobe RGB 1998
Colormatch RGB
sRGB
SWOP CMYK
D65 white point
520
540
560
580
600
620
500
480
460
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
y
x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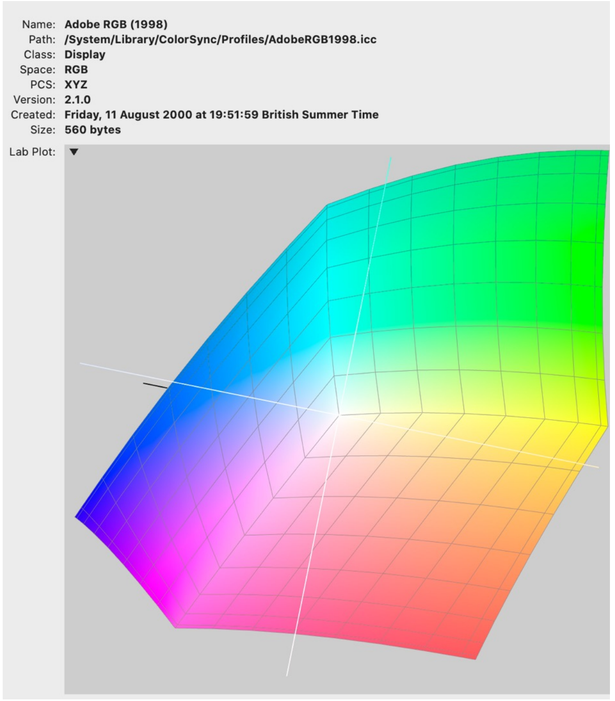
Space: RGB
PCS: XYZ
Version: 2.1.0
Created: Friday, 11 August 2000 at 19:51:59 British Summer Time
Size: 560 bytes
Lab Plot: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Space: RGB
PCS: XYZ
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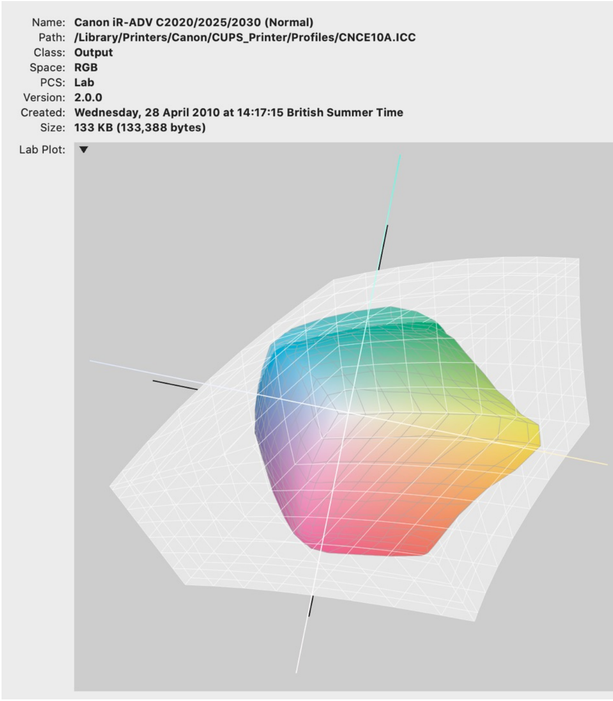
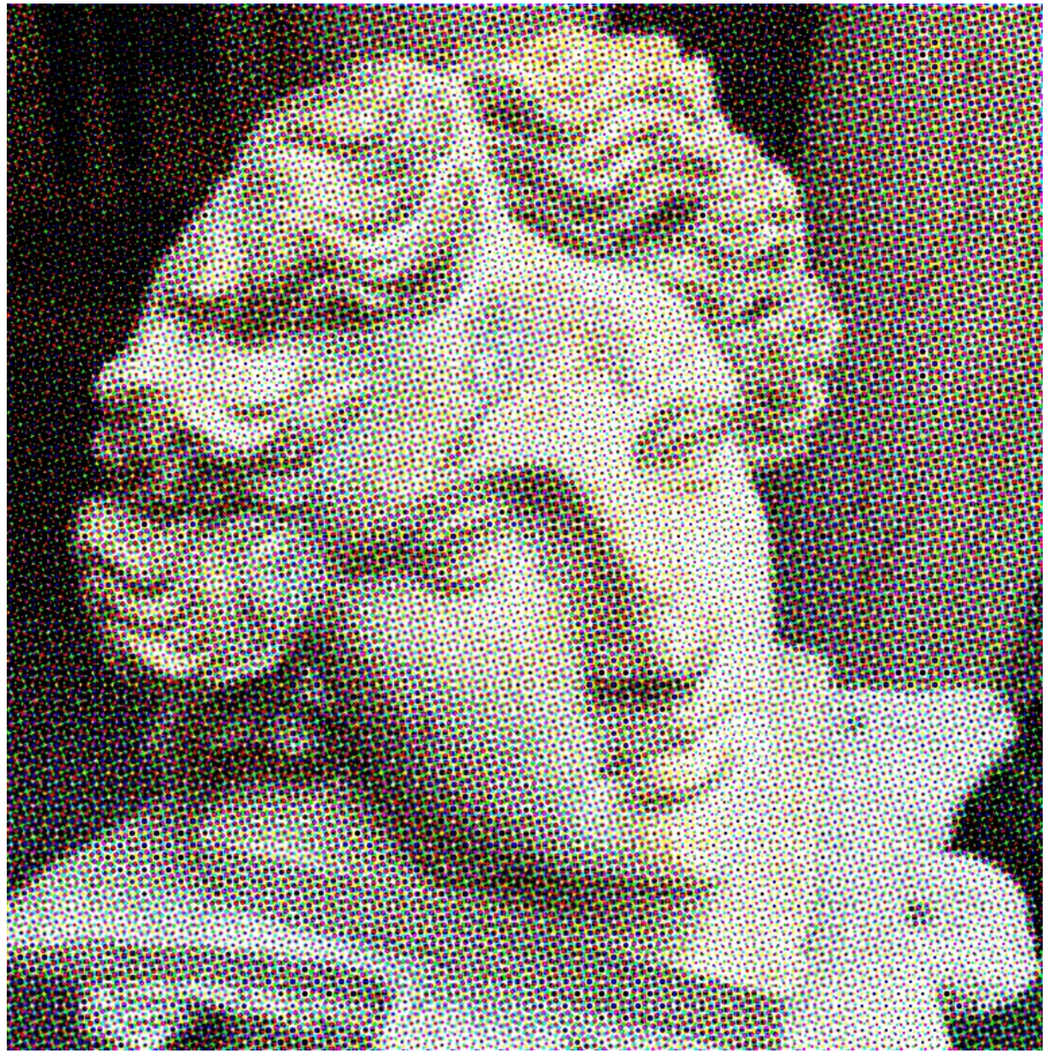
Size: 560 bytes
Lab Plot:

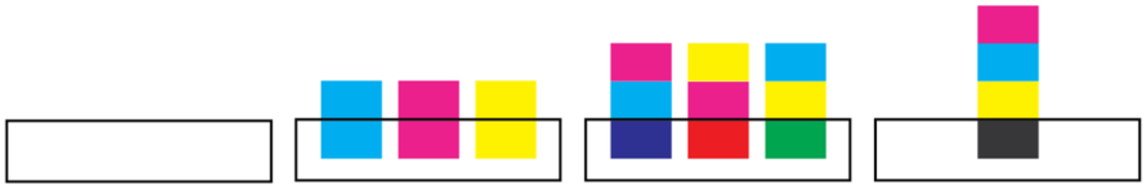

Name: Canon iR-ADV C2020/2025/2030 (Normal)
Path: /Library/Printers/Canon/CUPS_Printer/Profiles/CNCE10A.ICC
Class: Output
Space: RGB
PCS: Lab
Version: 2.0.0
Created: Wednesday, 28 April 2010 at 14:17:15 British Summer Time
Size: 133 KB (133,388 bytes)
Lab Plot:

H A L F T O N I N G

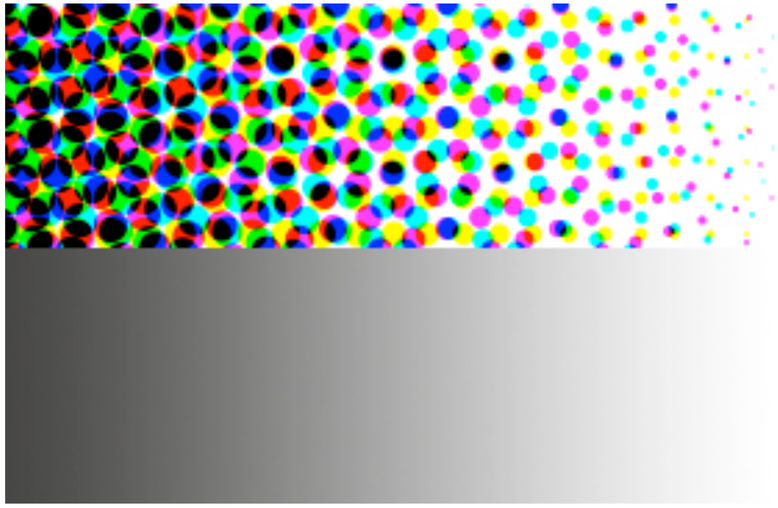


2D PRINTING

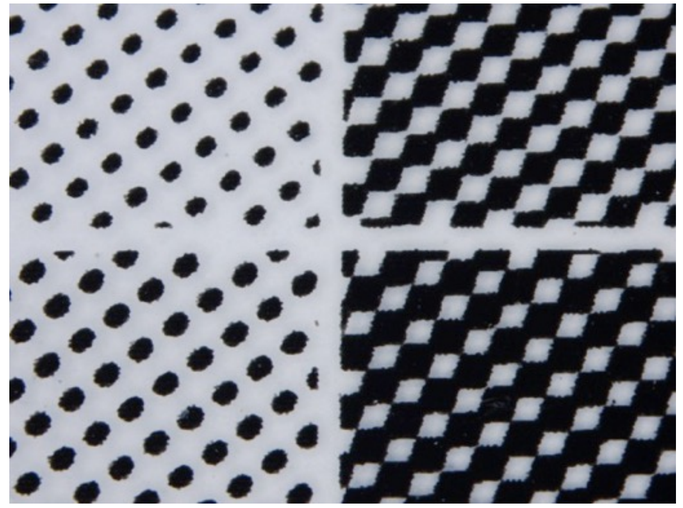
COLOUR HALFTONING



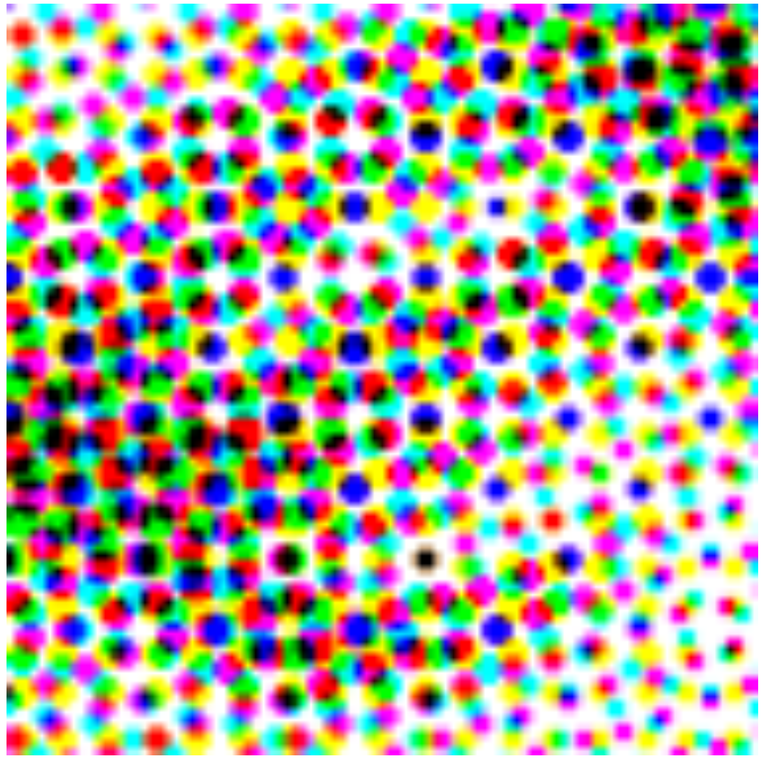
Hans Neugebauer’s eight primary colours. The primary colours are (from left to right) white (of the paper); cyan, magenta and yellow; blue, red and green; black. (Illustration adapted from Viggiano 1995)

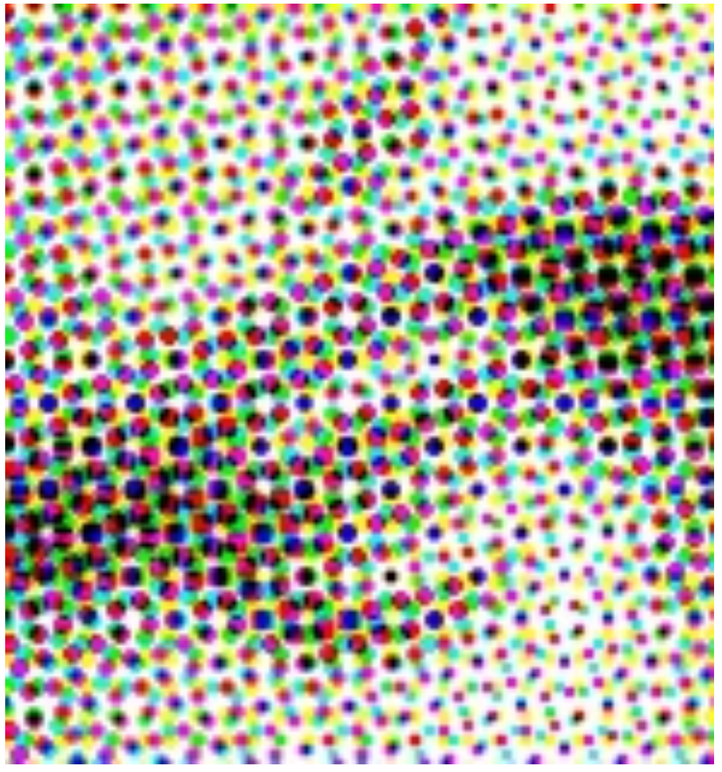


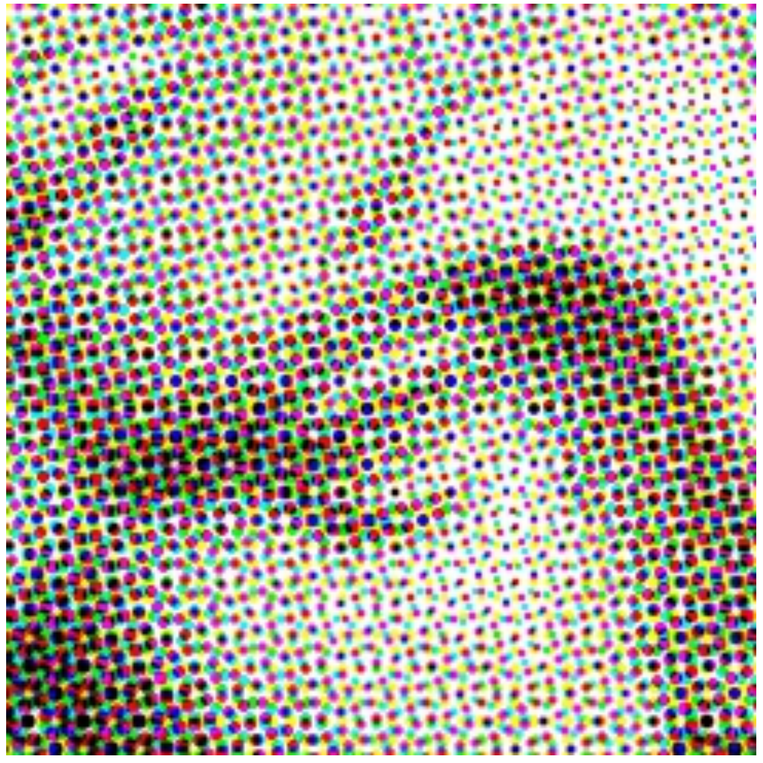
A graded grey is shown and through a simulation of printing of three process colours: cyan, yellow and magenta, onto a white paper shows the overlapping of halftone cells (top left) where equal proportions of cyan, magenta and yellow will optically mix to appear as a grey.



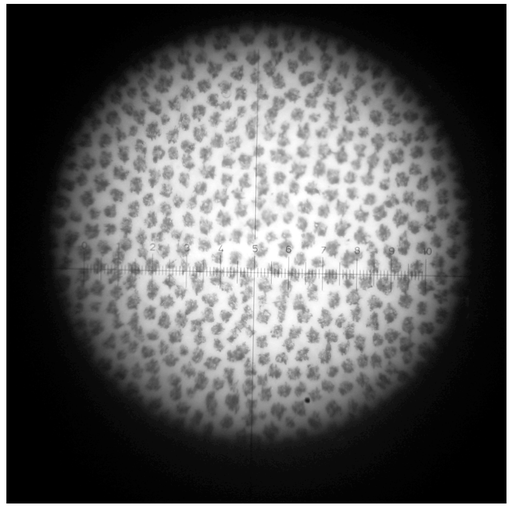
Halftone cells increasing
in percentage from light to dark
Angle of halftone or AM screen indicated above at 45°



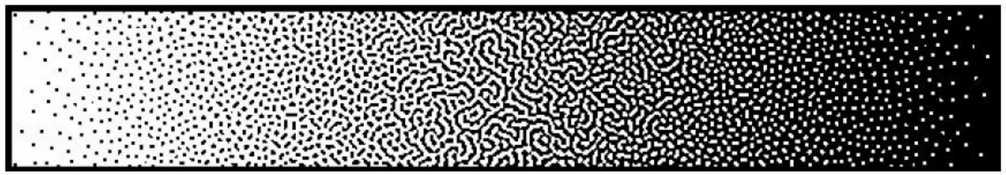


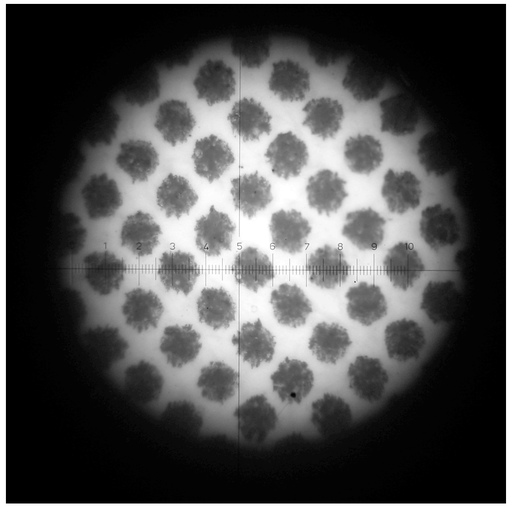


COLOUR HALFTONING



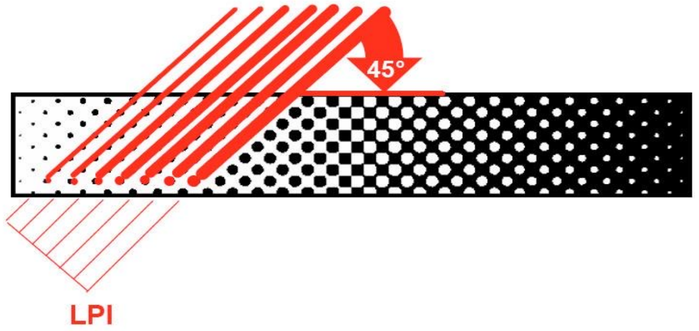
Stochastic FM screening, tightly spaced microdots
Inkjet
Randomly placed for optimal image reproduction
Many colours
Alleviates moiré



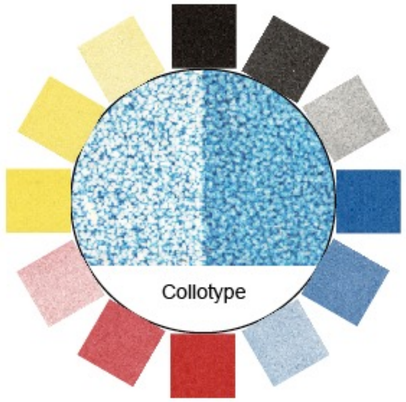


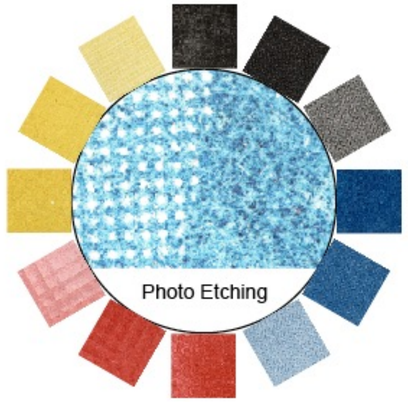
Traditional AM screening
Litho, offset, gravure
Fixed angles
4 colours
Moiré

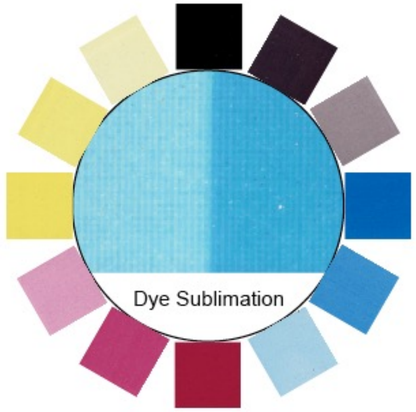
Process Colour	Angle#1	Angle#2	Angle#3
Cyan	75°	75°	45°
Magenta	45°	15°	75°
Yellow	0°	0°	0°
Black	15°	45°	15°

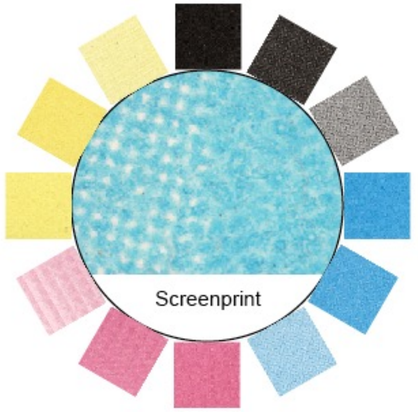


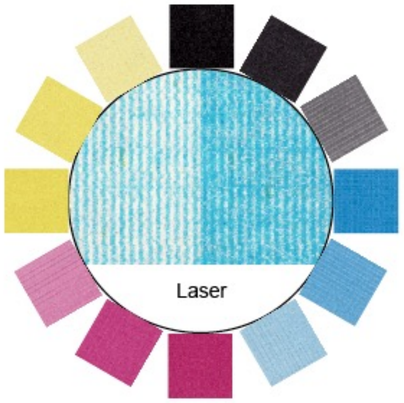
C O L O U R H A L F T O N I N G

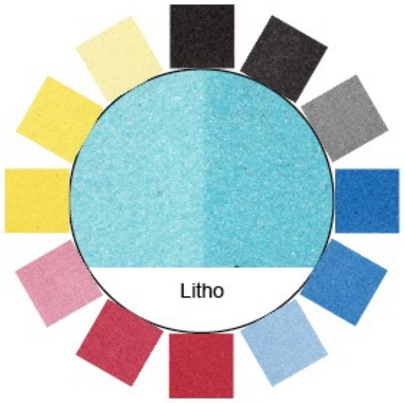


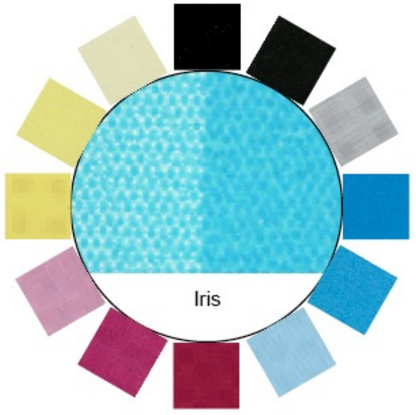


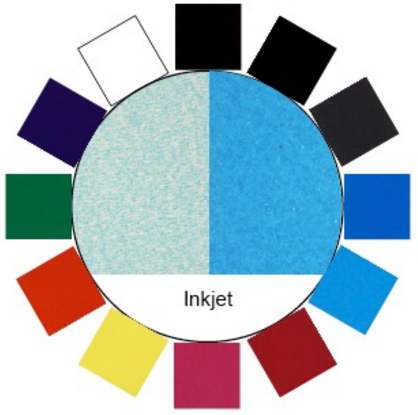












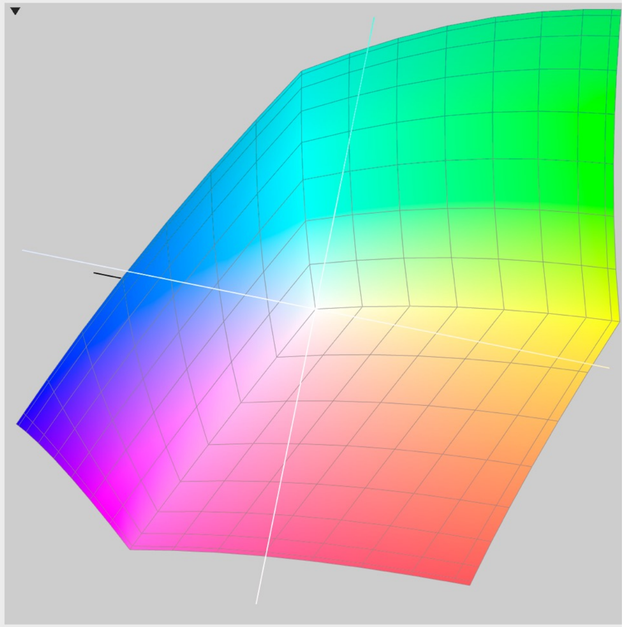
Examples of primary process colours printed at different percentages using a range of print processes. The inkjet sample shows full primary colours printed at 100% and demonstrates the extended process primary colours now used in digital printing. The white patch indicates a gloss, which is used as an enhancer to increase the surface gloss on photographic papers

RGB COLOUR GAMUT PROBLEM

G A M U T

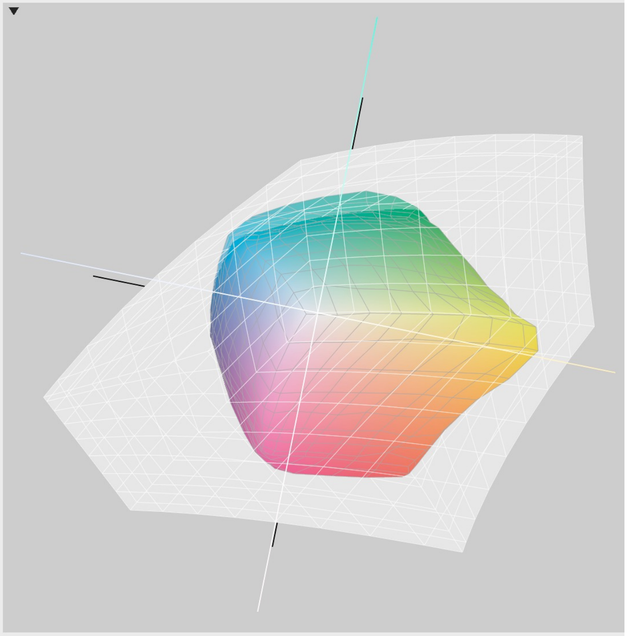
Name: **Adobe RGB (1998)**
Path: **/System/Library/ColorSync/Profiles/AdobeRGB1998.icc**
Class: **Display**
Space: **RGB**
PCS: **XYZ**
Version: **2.1.0**
Created: **Friday, 11 August 2000 at 19:51:59 British Summer Time**
Size: **560 bytes**

Lab Plot:



Name: **Canon iR-ADV C2020/2025/2030 (Normal)**
Path: **/Library/Printers/Canon/CUPS_Printer/Profiles/CNCE10A.ICC**
Class: **Output**
Space: **RGB**
PCS: **Lab**
Version: **2.0.0**
Created: **Wednesday, 28 April 2010 at 14:17:15 British Summer Time**
Size: **133 KB (133,388 bytes)**

Lab Plot:



Name: **Chart 400 Patches_17-11-22.icc**
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Class: **Output**
Space: **RGB**
PCS: **Lab**
Version: **4.3.0**
Created: **Thursday, 17 November 2022 at 17:09:26 Greenwich Mean Time**
Size: **1.9 MB (1,918,232 bytes)**

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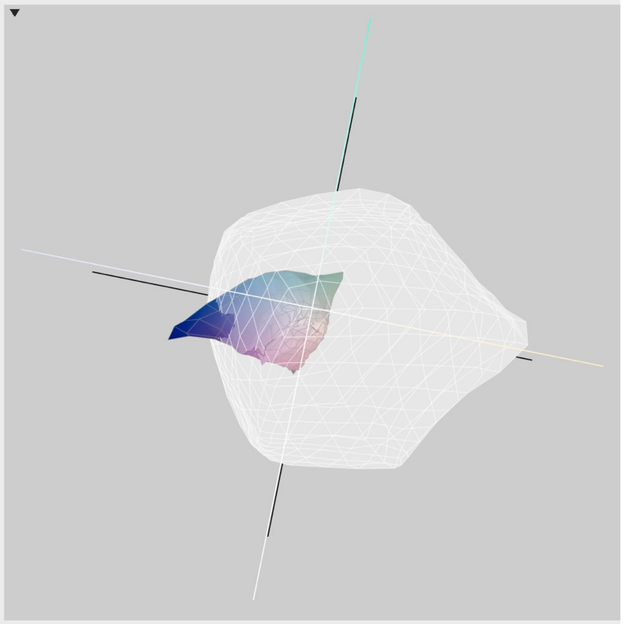
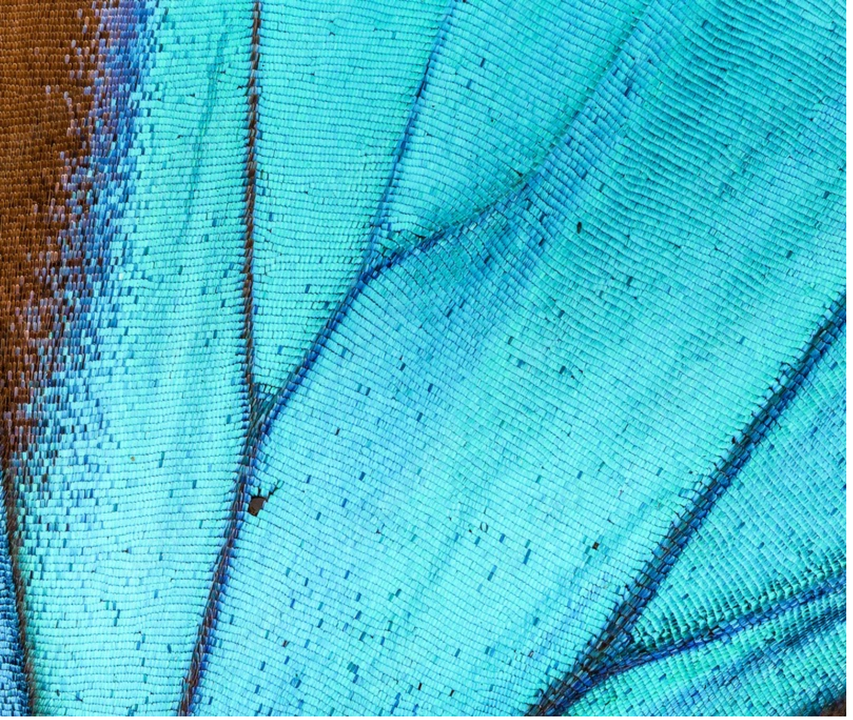
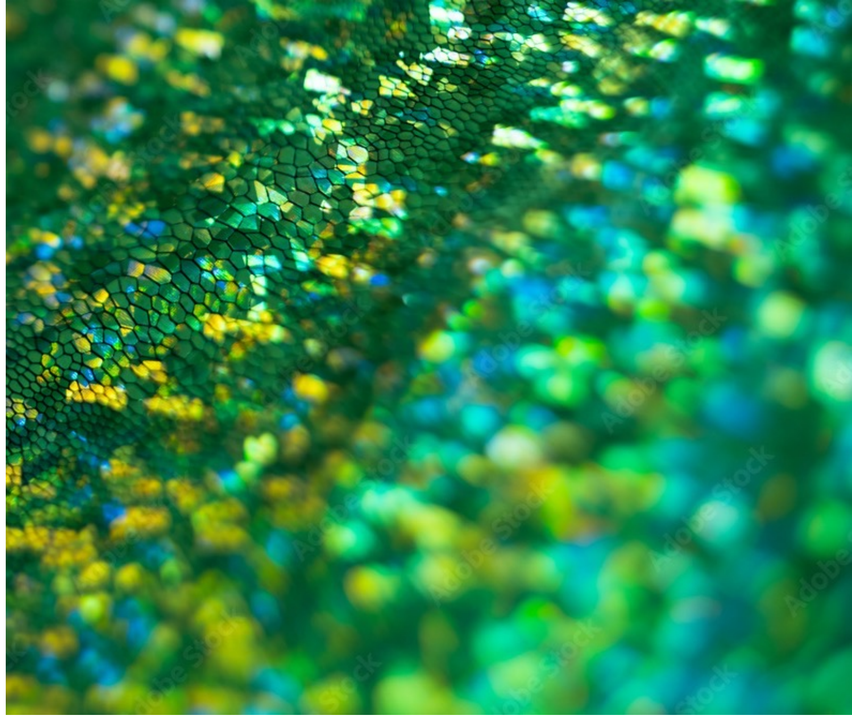
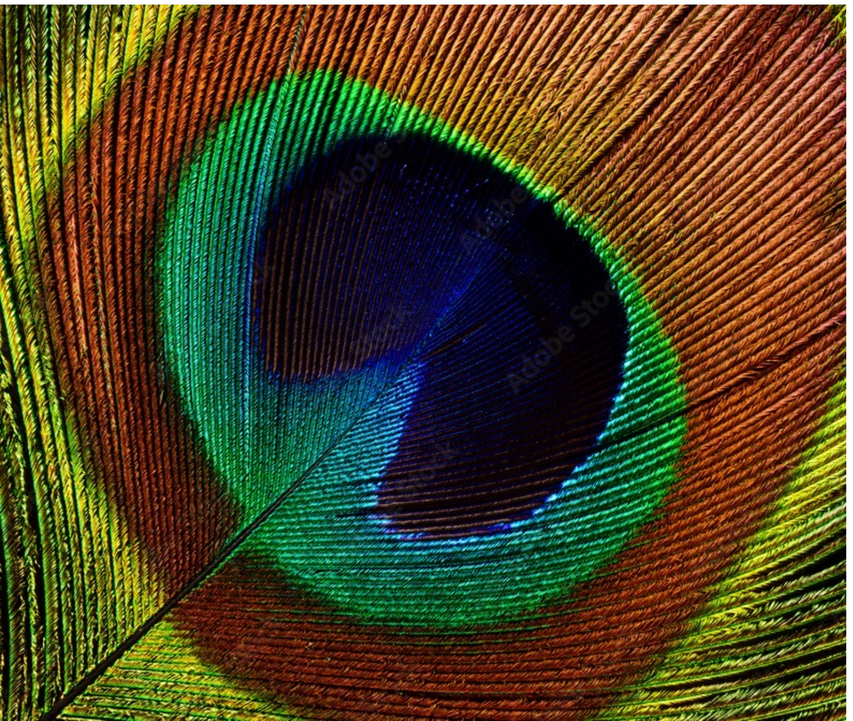


RGB PRINTING



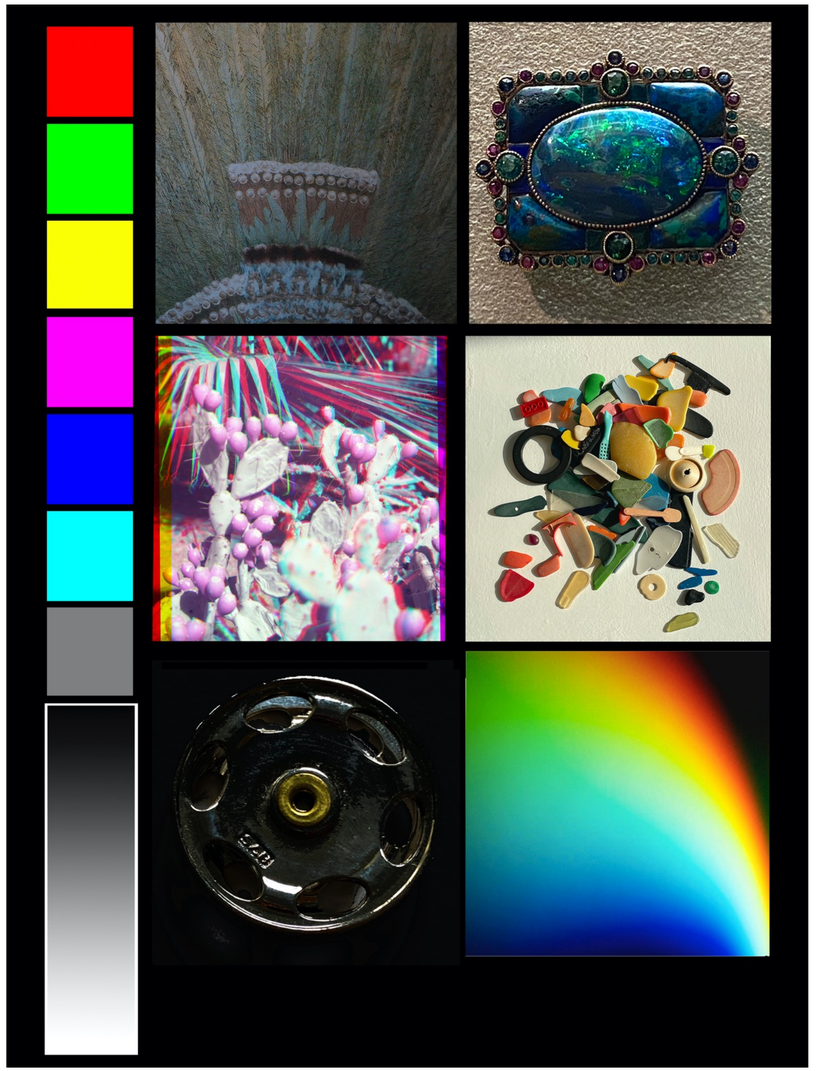




Adobe Stock | #479265095

PROCESS AND OUTPUT

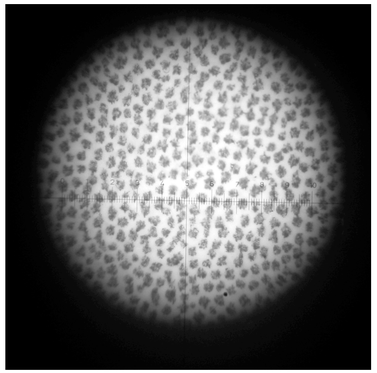
RGB Colour patches	Images (centre)	Images (right)
Red 255 Green 255 Yellow R255; G255 Magenta R255; B255 Blue 255 Cyan B255; G255	Mexican headress made of feathers	Opal piece of jewellery
Grey R126; G126; B126	RGB photograph generated by RGB filters	Plastic items collected from the beach
Grey scale 0 – 255	Metal disk	Colour spectrum

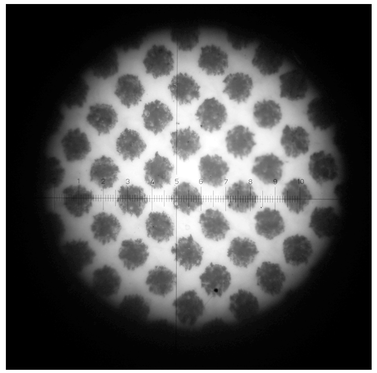


Images by Abigail Trujillo Vazquez, Susanne Klein, Harrie Fuller and Carinna Parraman

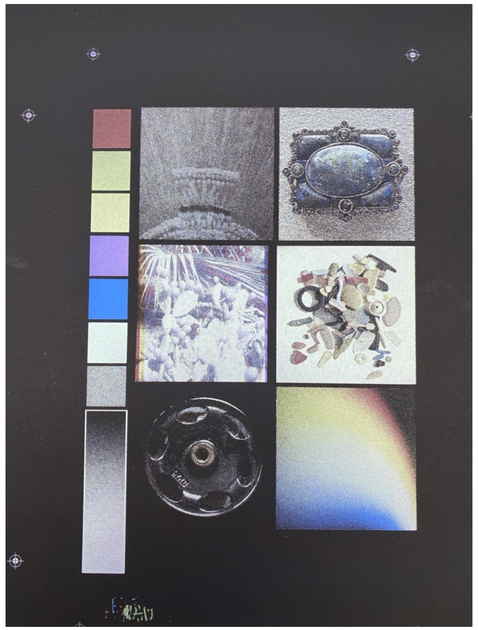
PROCESS AND OUTPUT

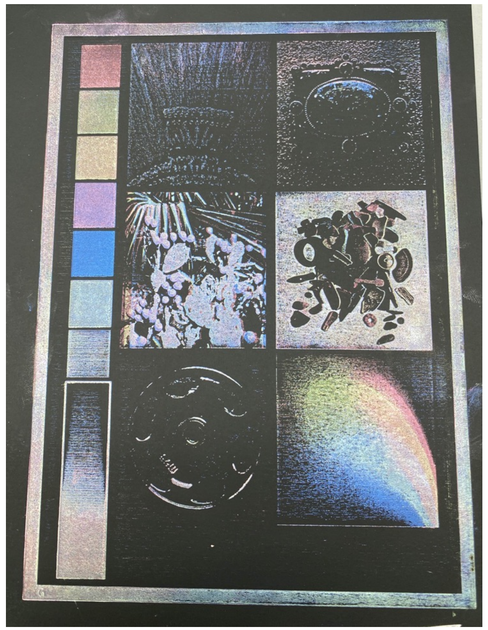
RGB image
split into RGB
channels

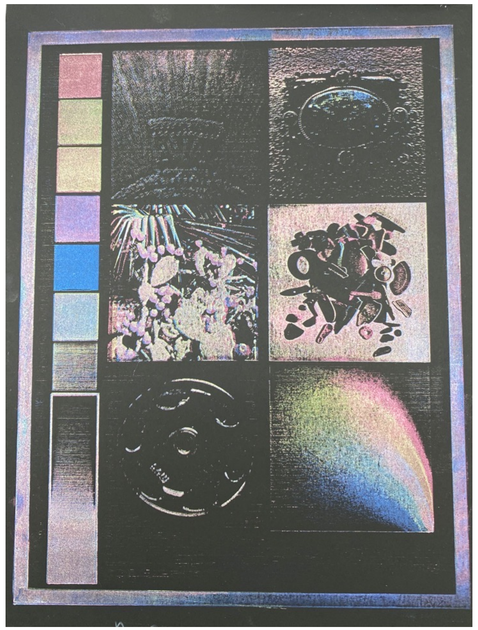




RGB Black means no ink.
White is 100% reg, green and blue







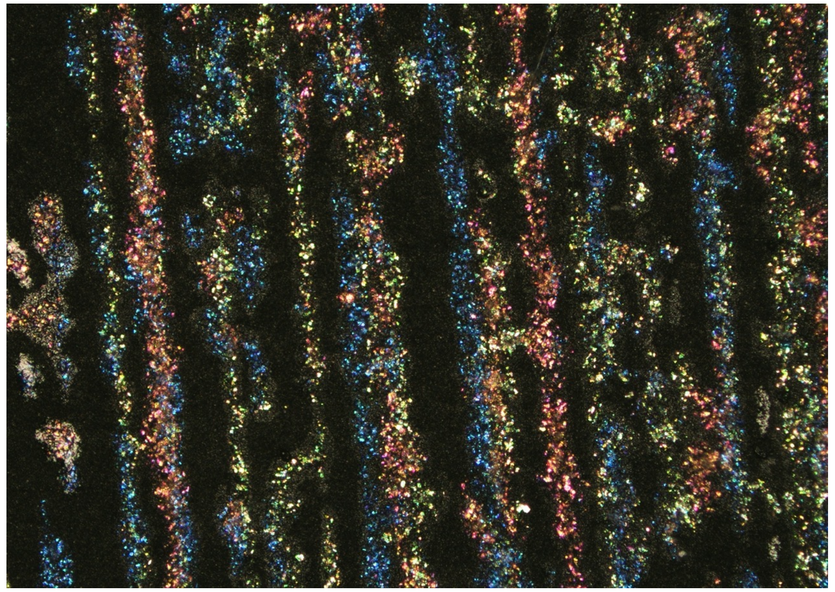
PAPER

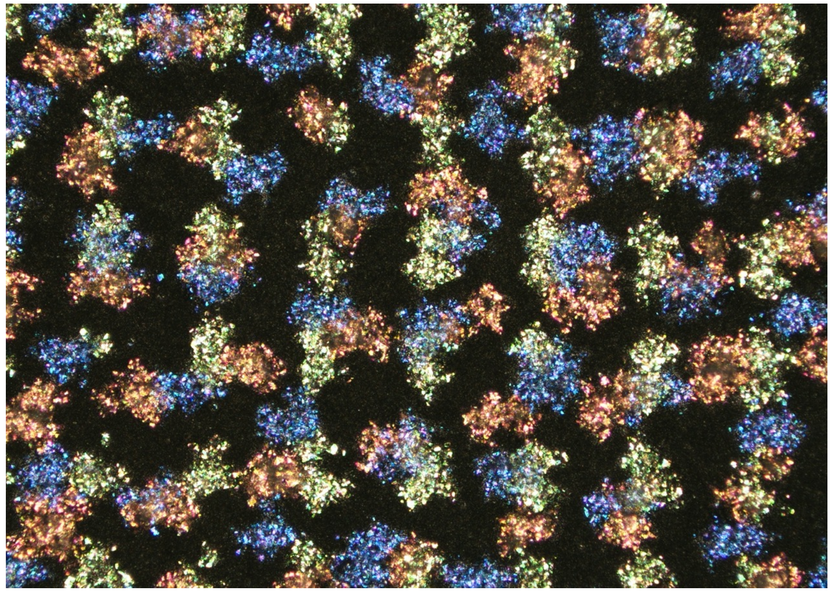
Paper/Supplier	Type	Colour	Measurement		
			L*	A*	B*
John Purcell Paper (www.johnpurcell.net)					
Somerset	Velvet	Black	21.59	0.30	0.35
Velin Arches		Noir	22.18	0.53	-0.93
Magnani	Revere	Black	23.35	0.03	-1.43
G.F Smith (www.gfsmith.com)					
Colorplan	Smooth	Ebony	21.26	0.19	-1.28
Gmund	Urban	Architect Black	22.59	2.27	-2.35
Gmund	Action	Go to Hell Black	23.04	1.96	-1.79
Neenah	Plike	Black	23.58	-0.16	-0.87
Peregrina	Majestic	Anthracite	23.97	-0.31	-3.19
Mohawk	Strathmore Grandee	Black	24.32	0.05	-2.45
Accent	Fresco	Black	28.07	0.23	0.38
Slater Harrison (www.slater-harrison.co.uk)					
Slater Harrison	CenturaPearl	Black	10.78	-015	-1.14
Arboreta Papers (http://arboretapapers.co.uk)					
Arboreta	Sugar Paper	Black	22.53	0.24	-0.61

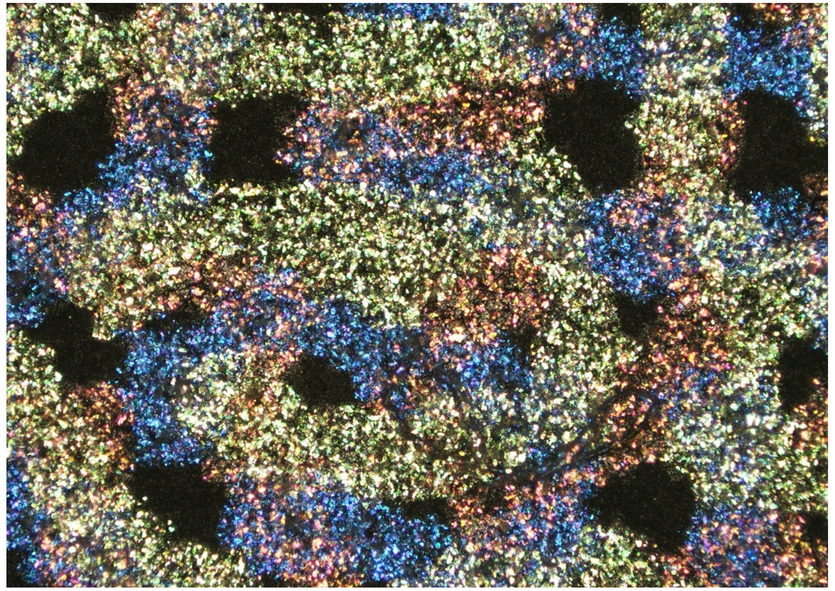
RGB HALFTONING

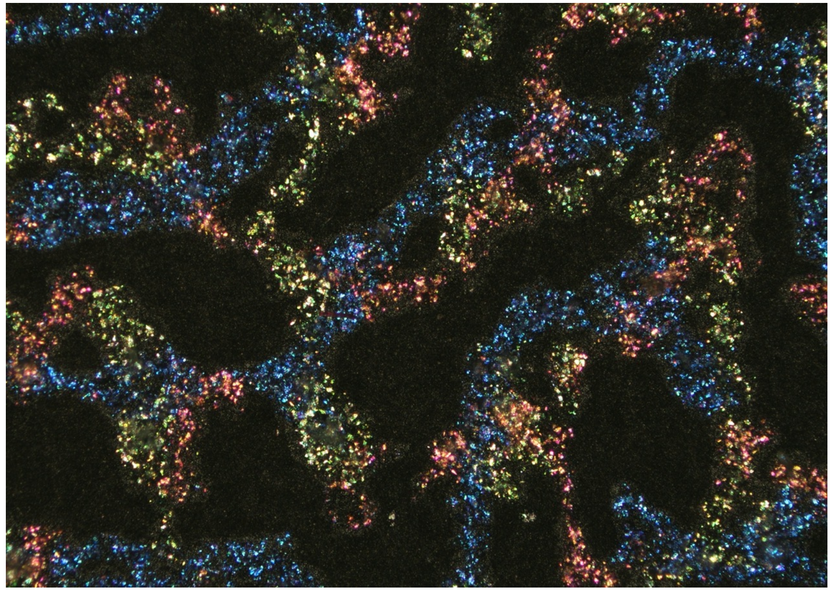
5X Magnification

- Woodbury Gravure (TL)
- Halftone screenprint (TR)
- Stochastic screenprint (BL)
- Stochastic relief (BR)

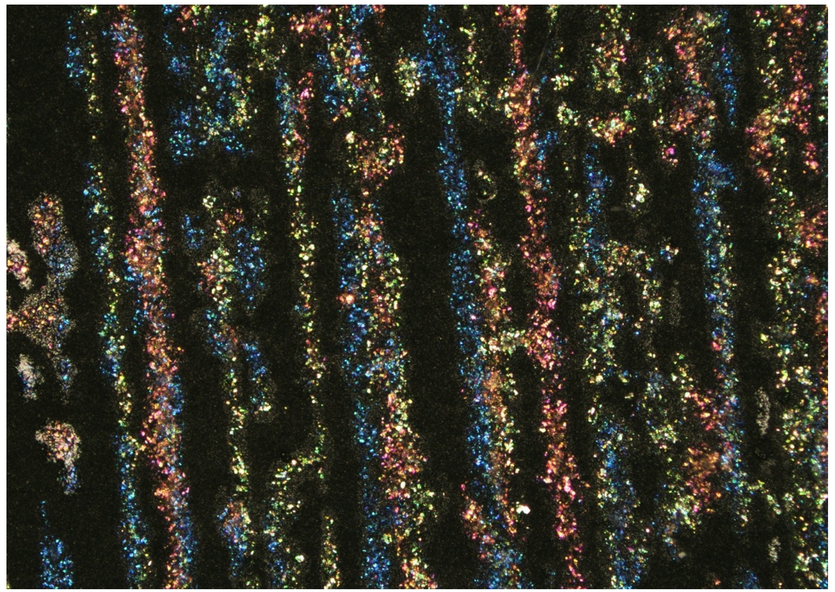








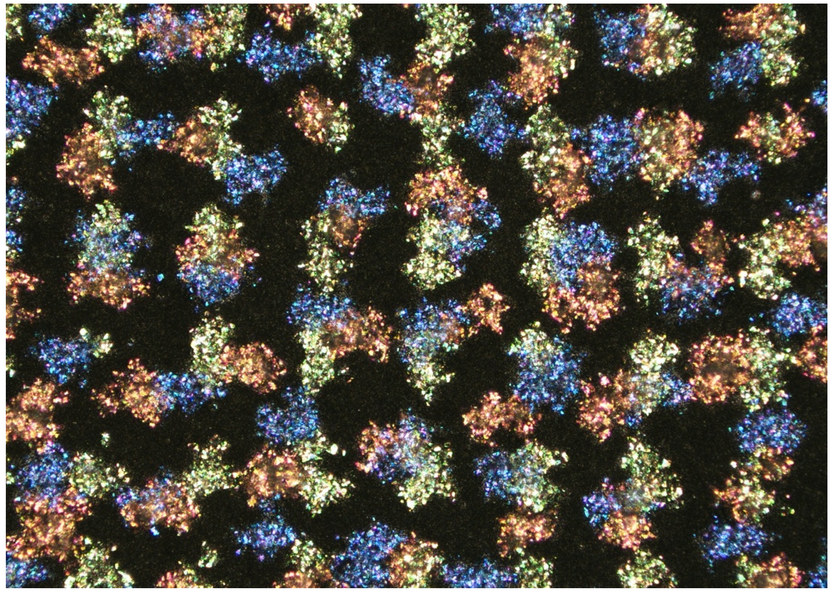
W O O D B U R Y G R A V U R E



Lazer
P 100
V 100 (cut twice) or V50 x 1

600 LPI
600 DPI

H A L F T O N E S C R E E N P R I N T

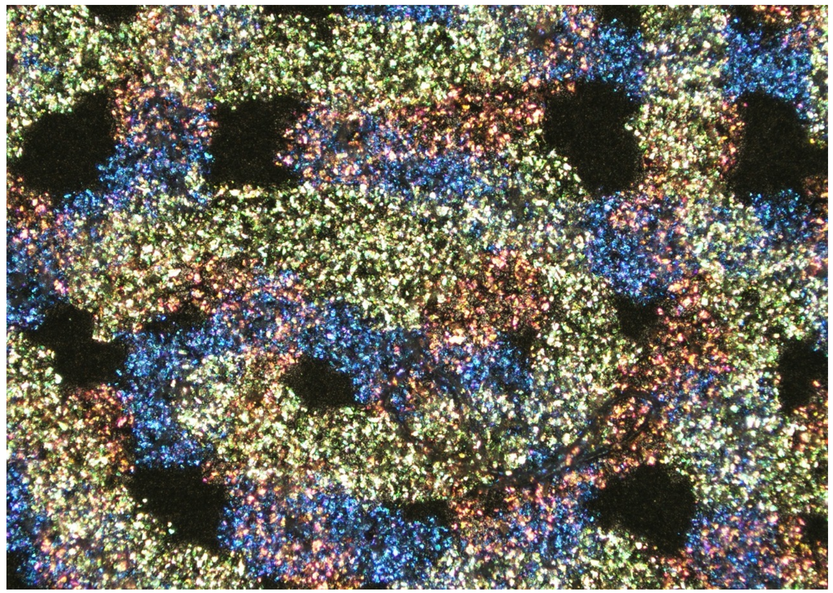


DPI = in 300 out 300
LPI = 75
Angles = R 75, B 15, G 0

S T O C H A S T I C S C R E E N P R I N T

https://stochaster.org/stochaster.html

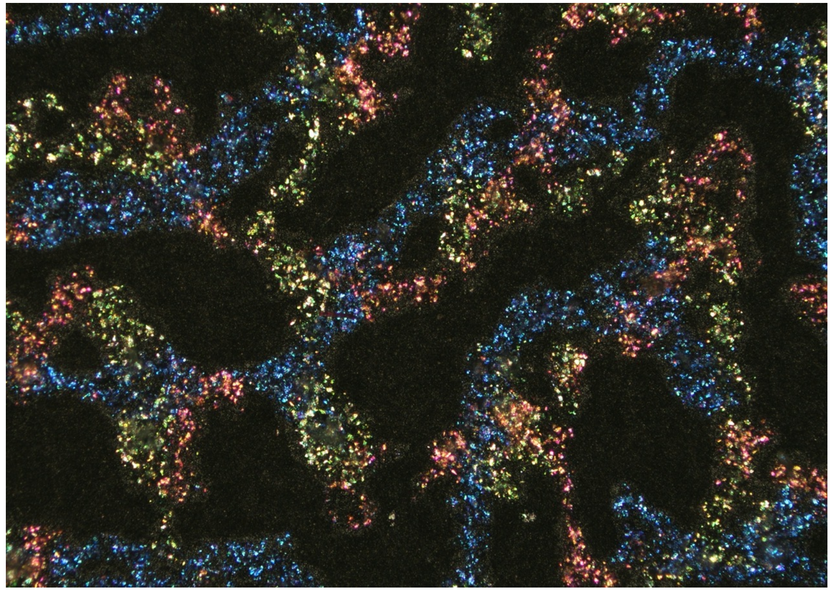
DPI = in 300 out 300
LPI = 50
Angles = R 15, B 45, G 75
Pattern shape = Turing



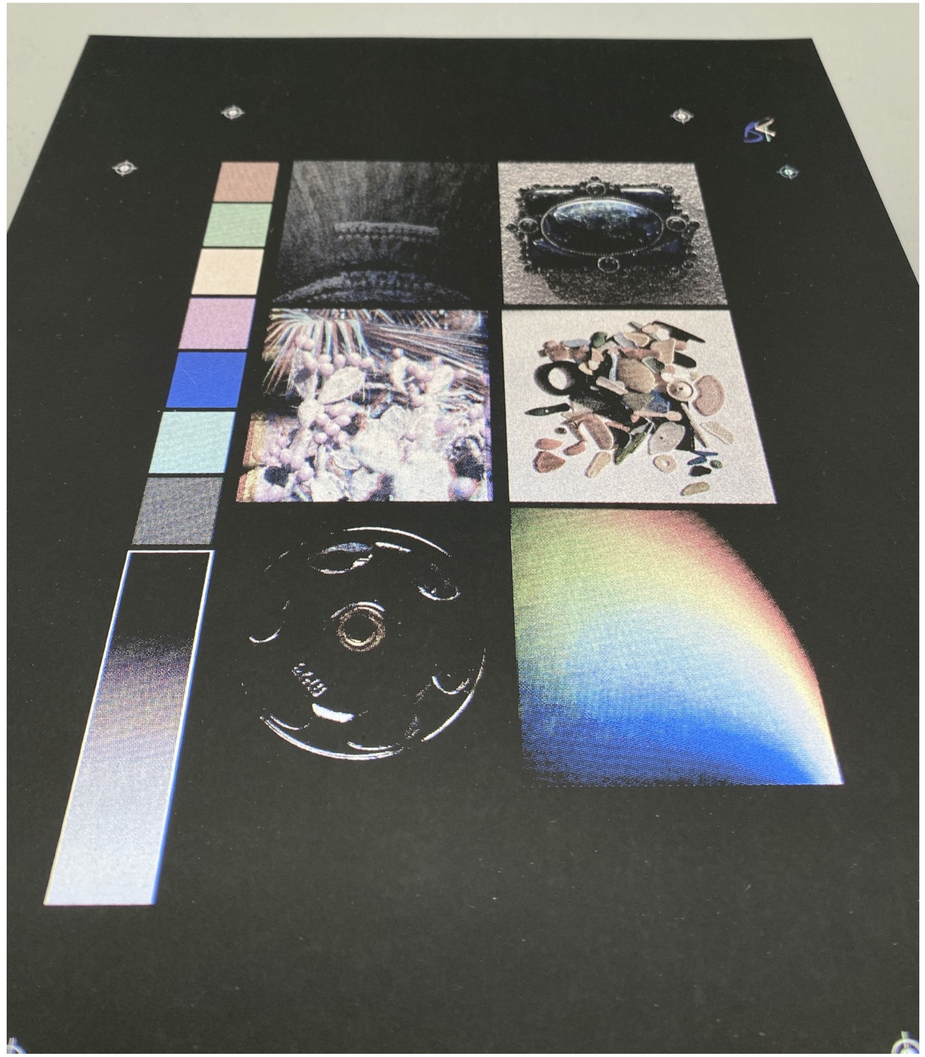
S T O C H A S T I C
R E L I E F

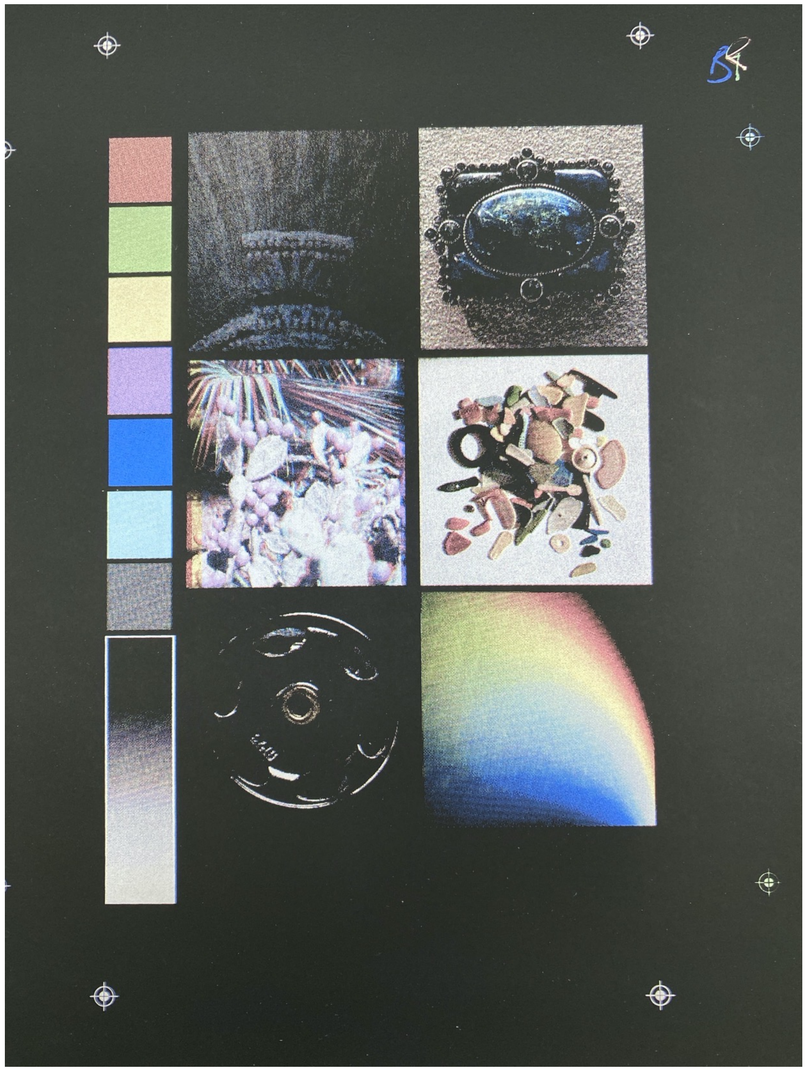
Lazer
P 100
V50

600 LPI
600 DPI

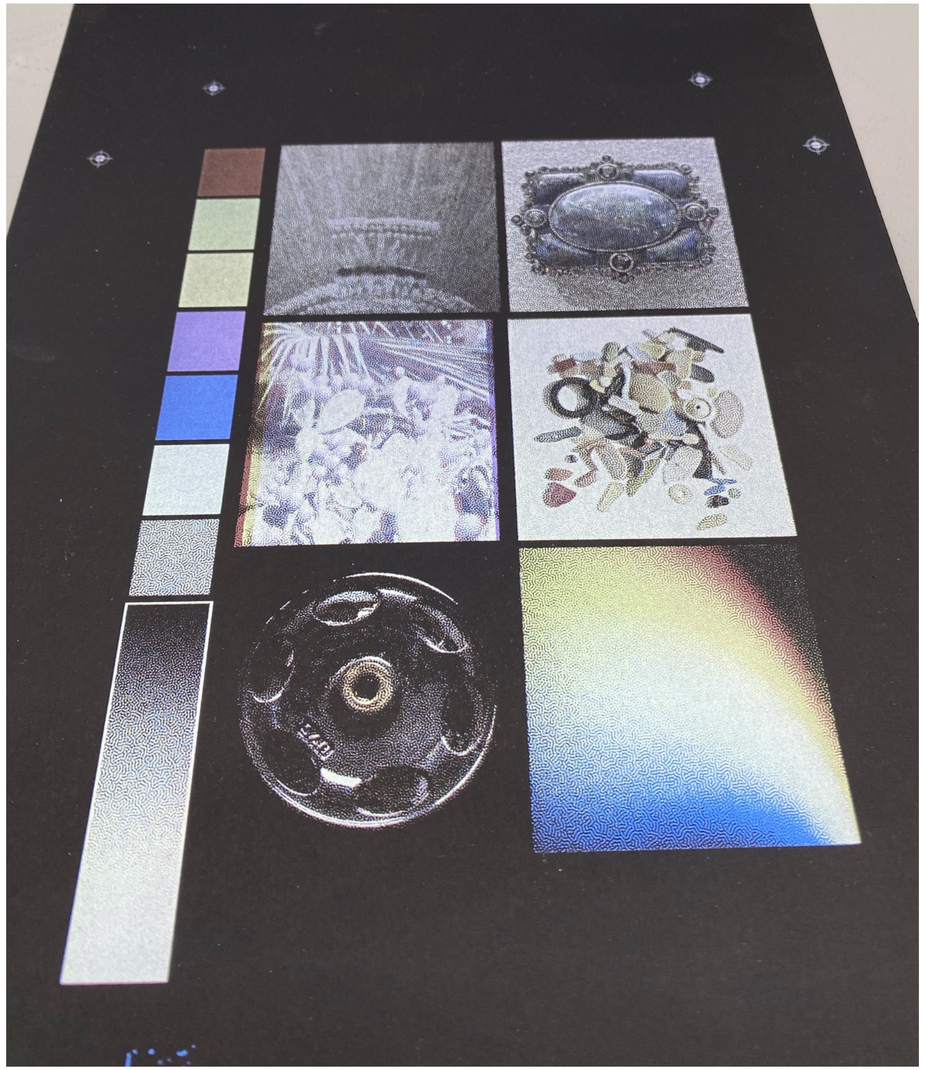


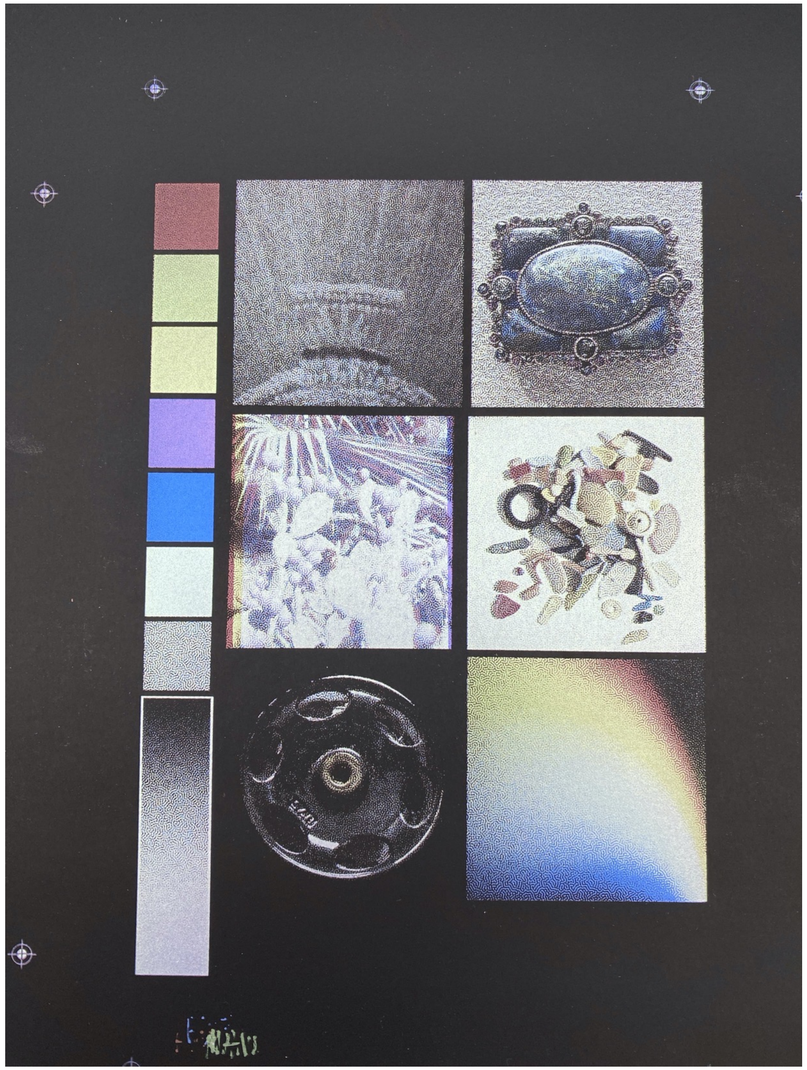
S C R E E N P R I N T



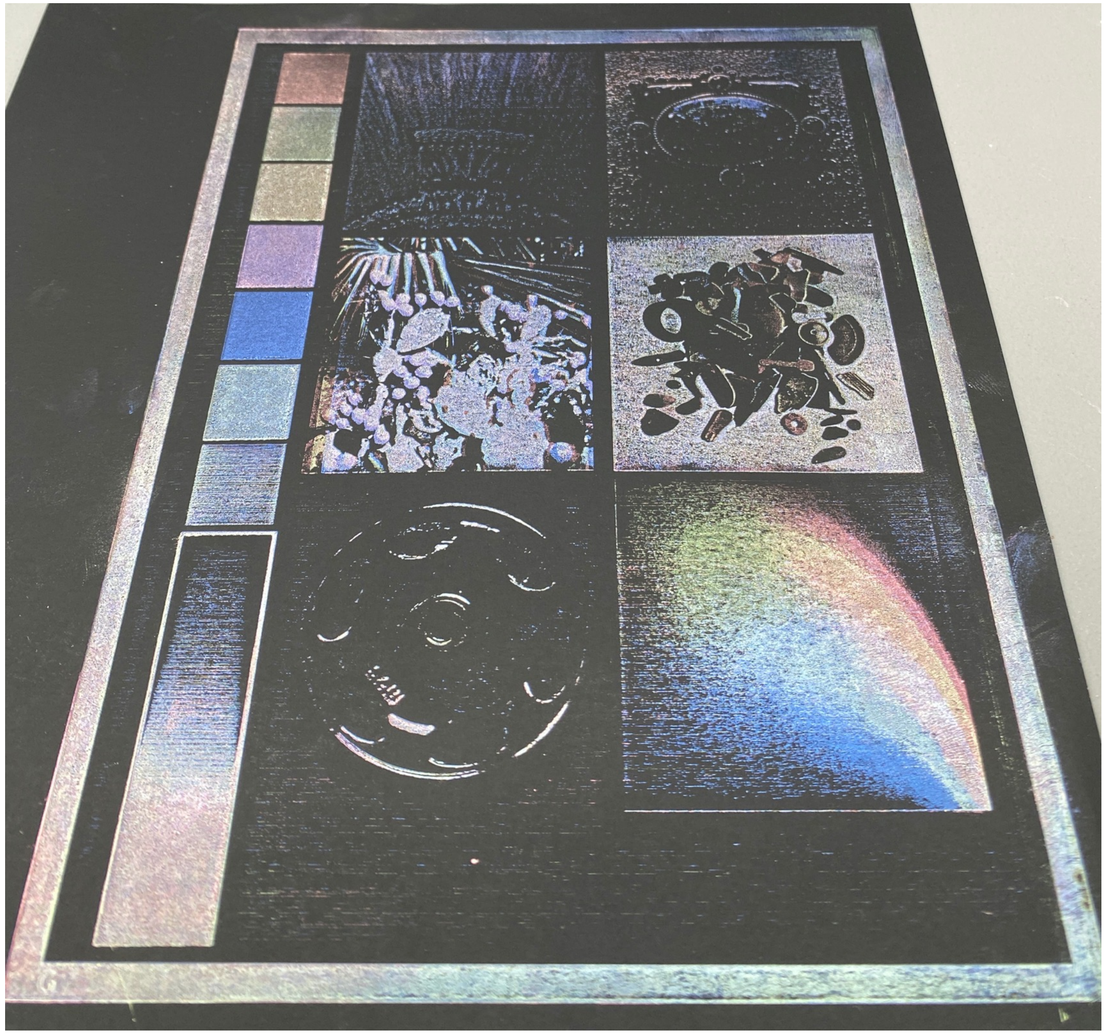


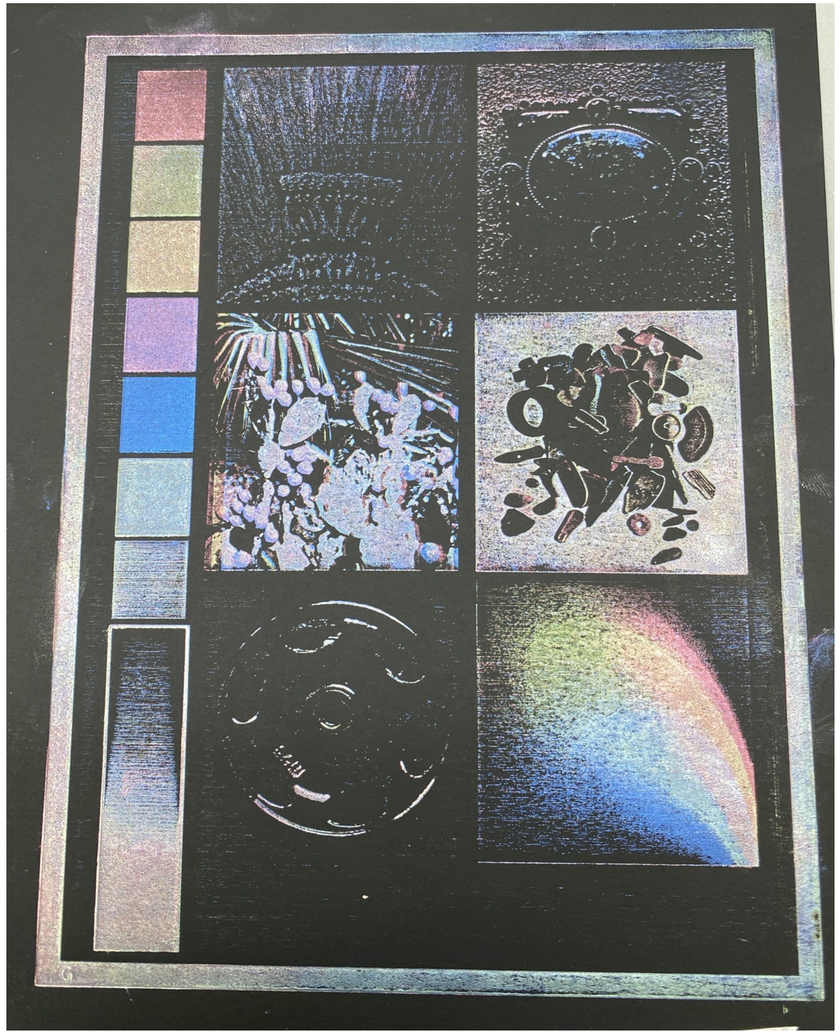
STOCHASTIC SCREENPRINT



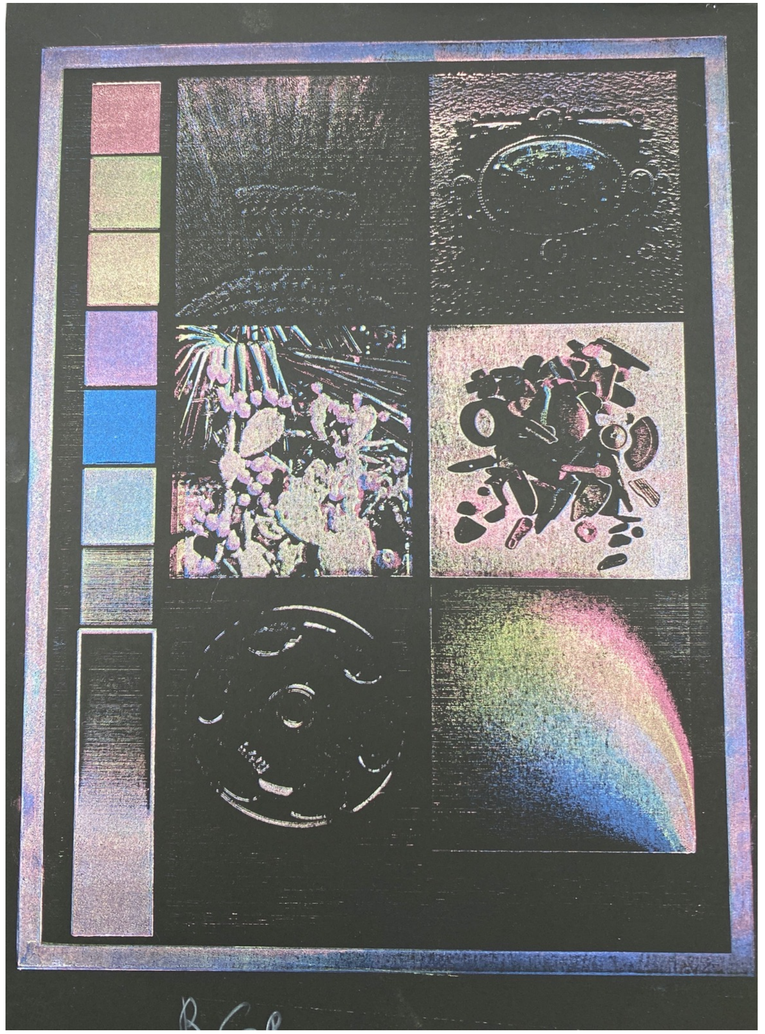


WOODBURY GRAVURE



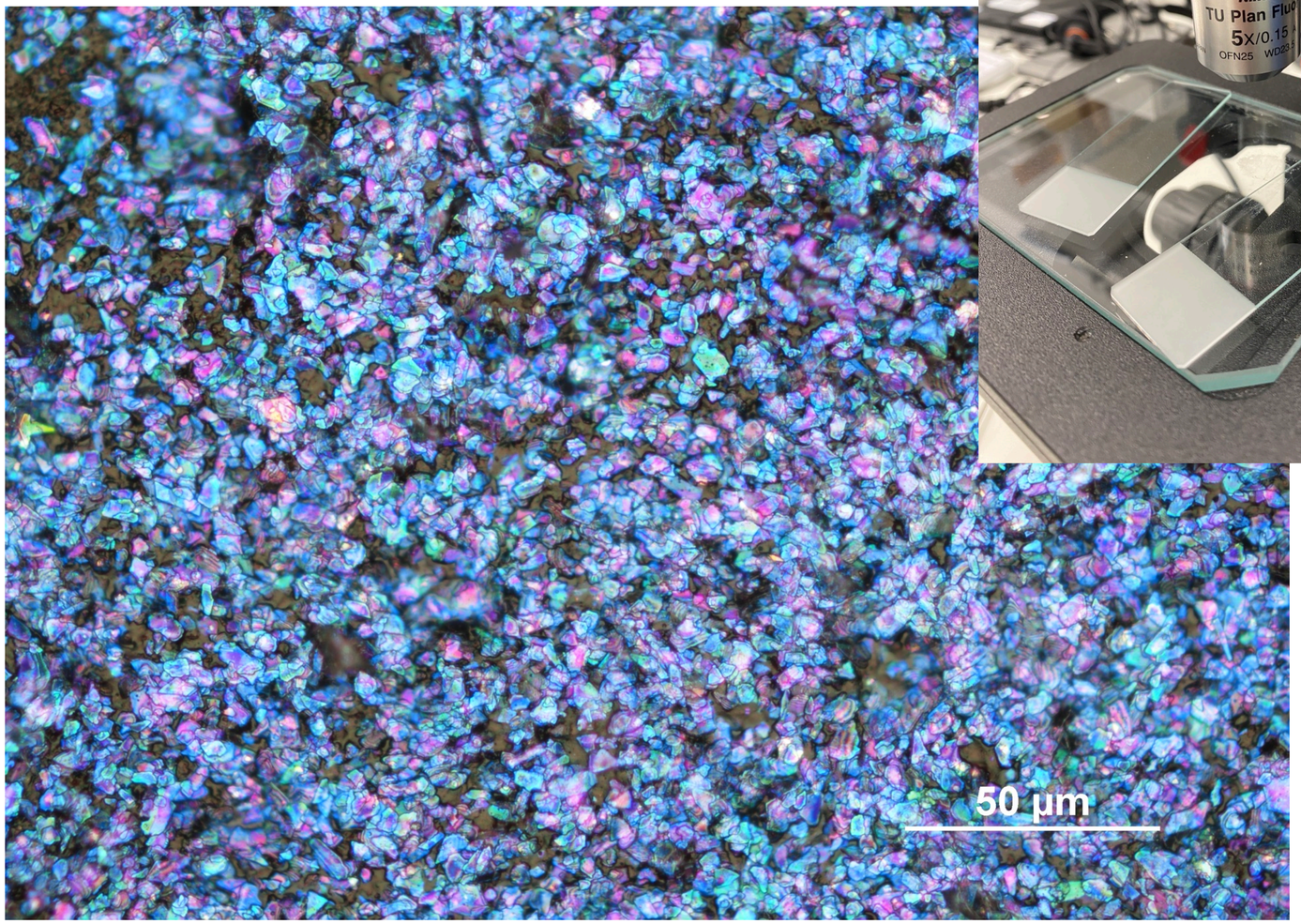


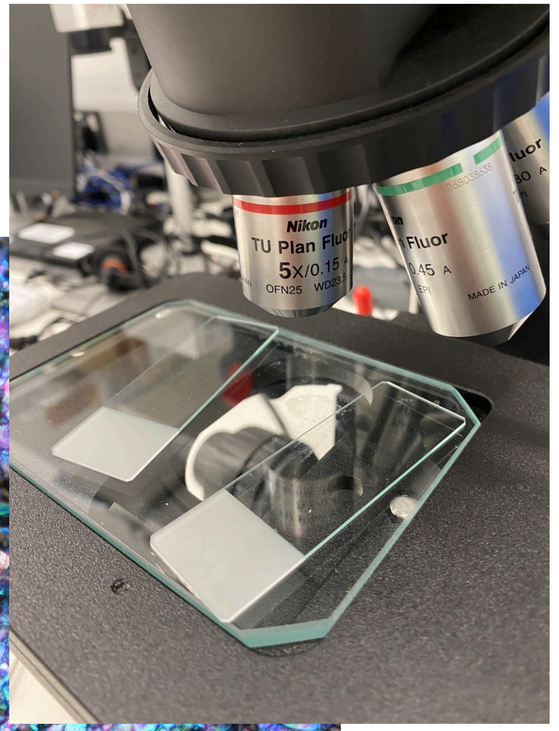
STOCHASTIC RELIEF



MICRO-PHOTOGRAPHS

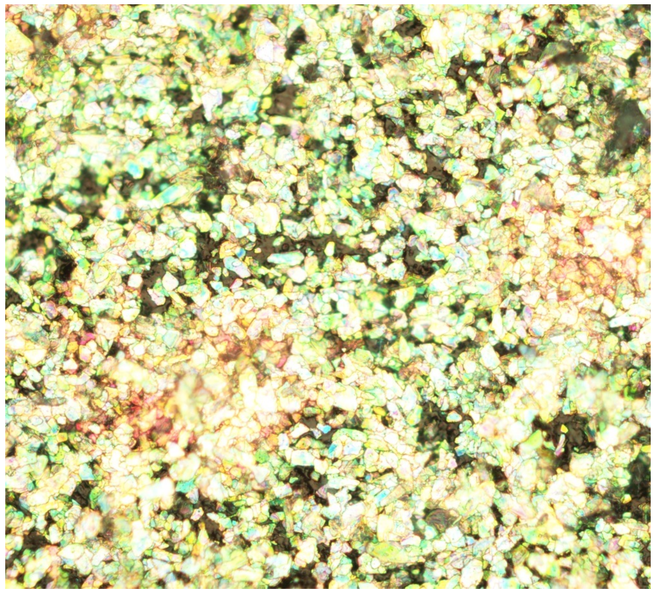
- Nikon Eclipse LV150N
- Digital Sight Camera
- NIS Elements software
- Nikon Optics 20x /0.45 and 5x /0.15





20X Magnification

S C R E E N P R I N T



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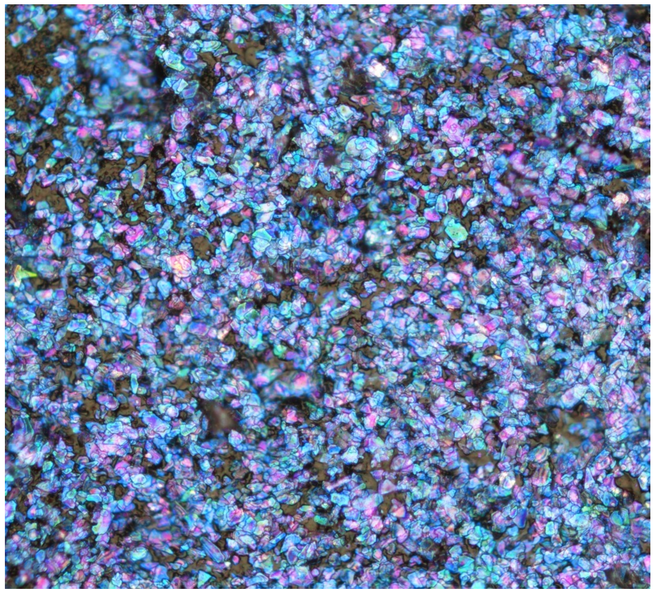

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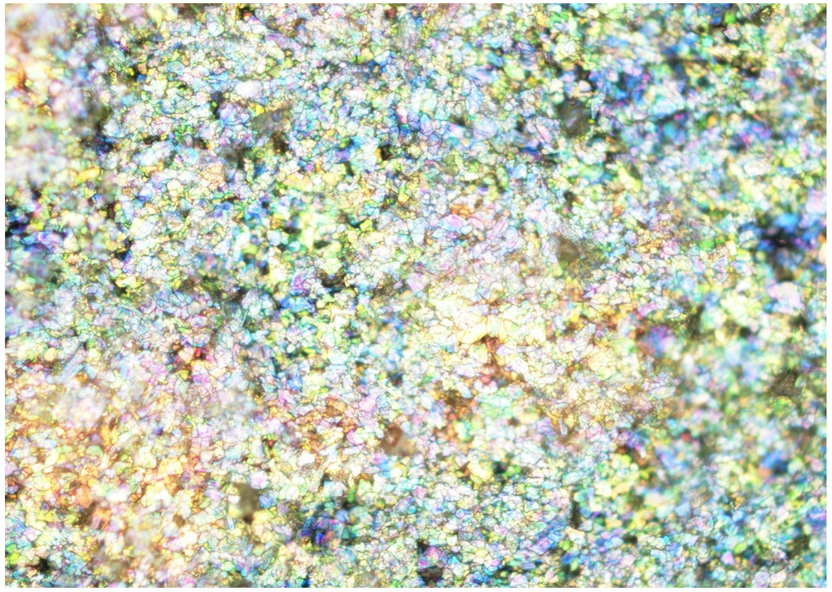
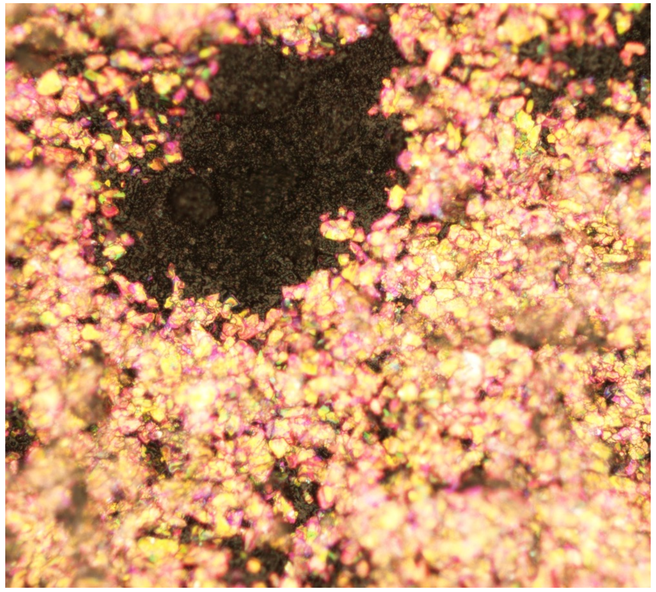
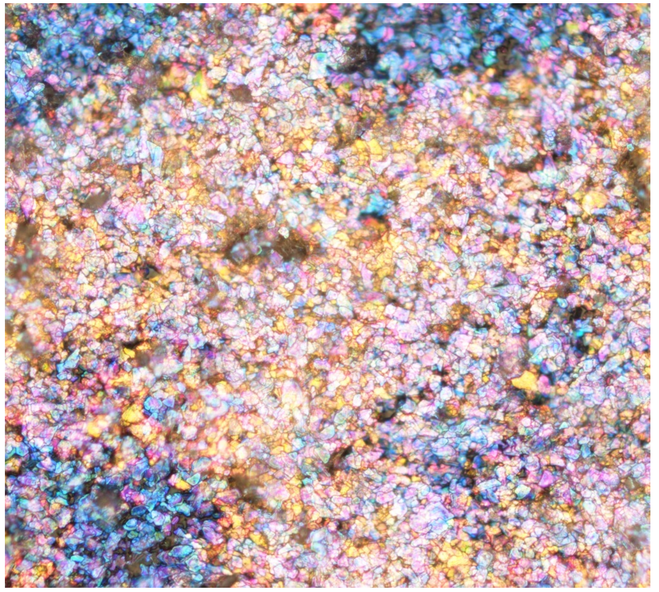


White R+G+B

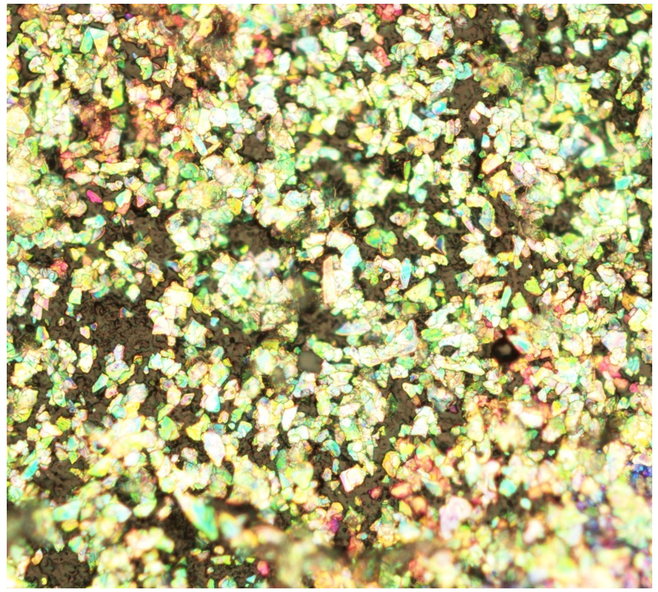


Red



Magenta R+B

STOCHASTIC SCREENPRINT



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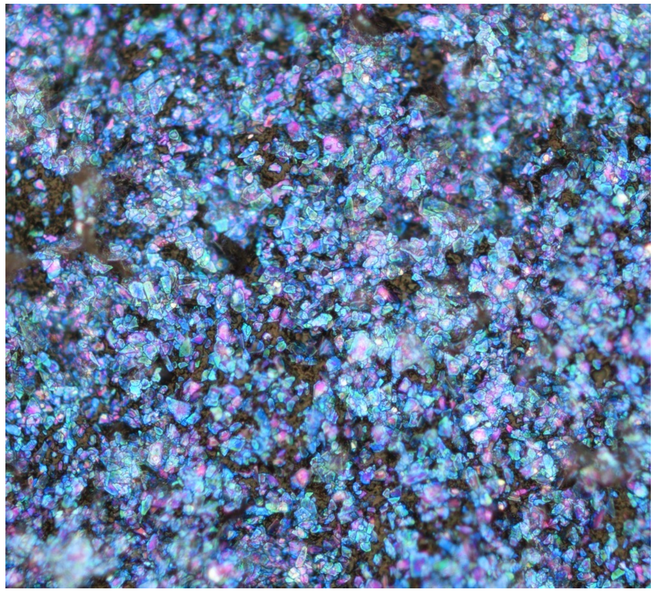

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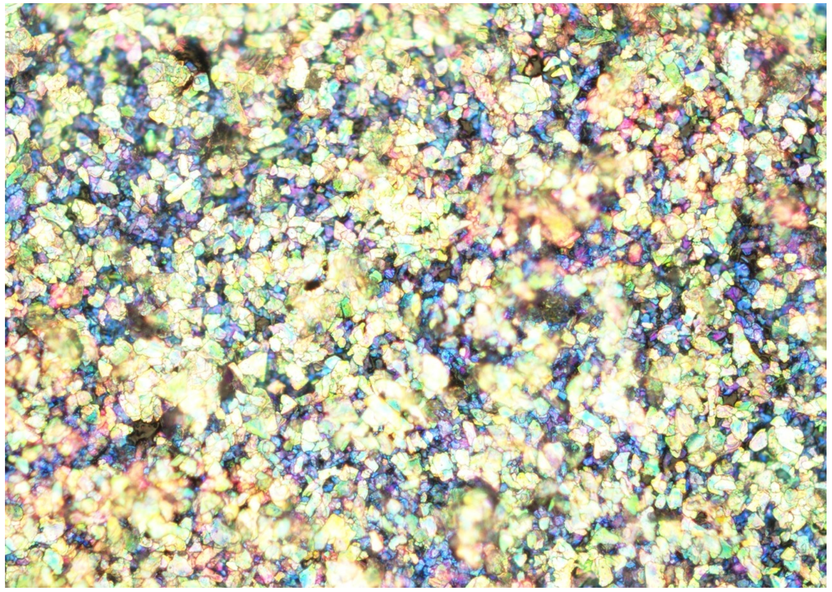
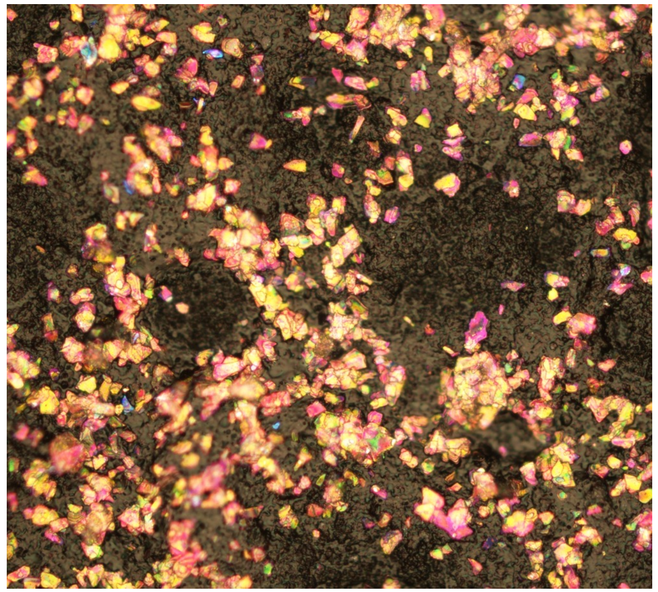
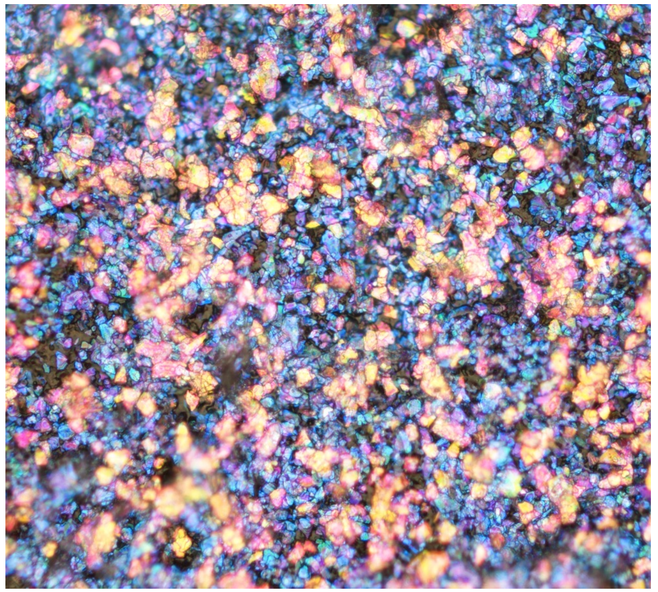


White R+G+B

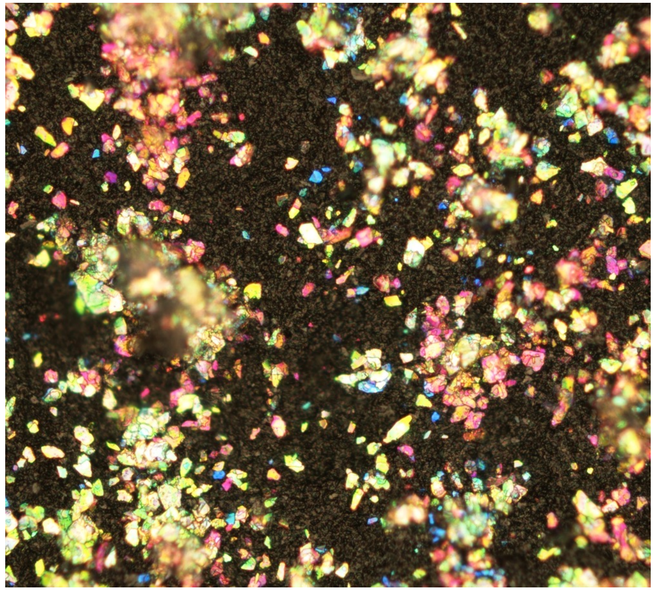


Red



Magenta R+B

W O O D B U R Y
G R A V U R E



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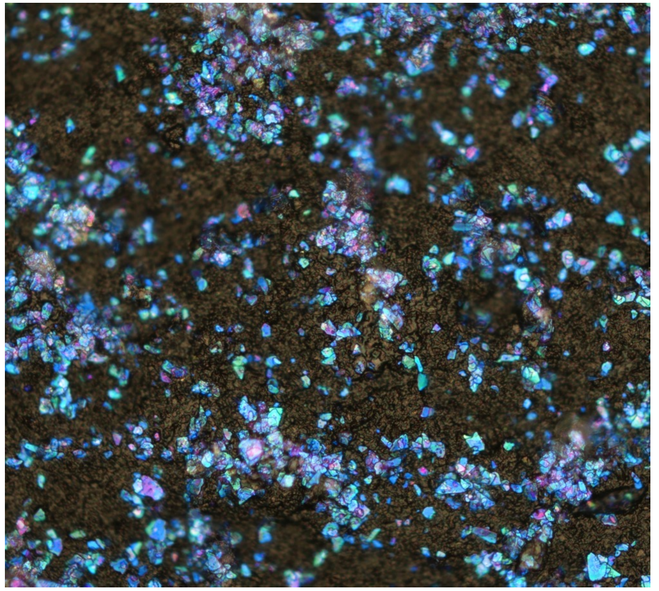

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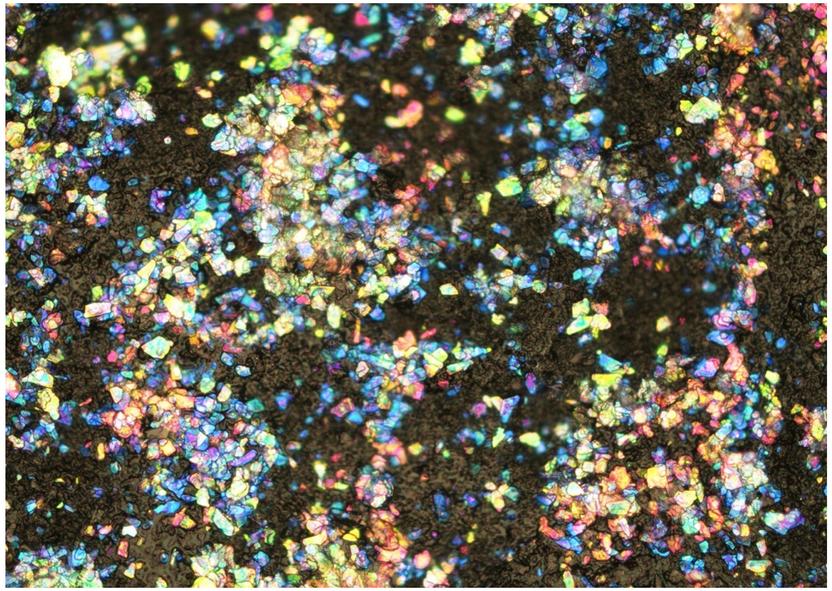
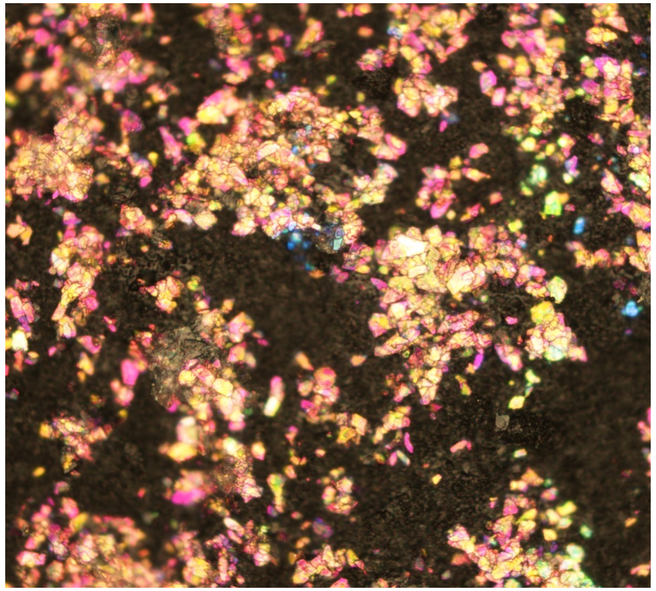


White R+G+B



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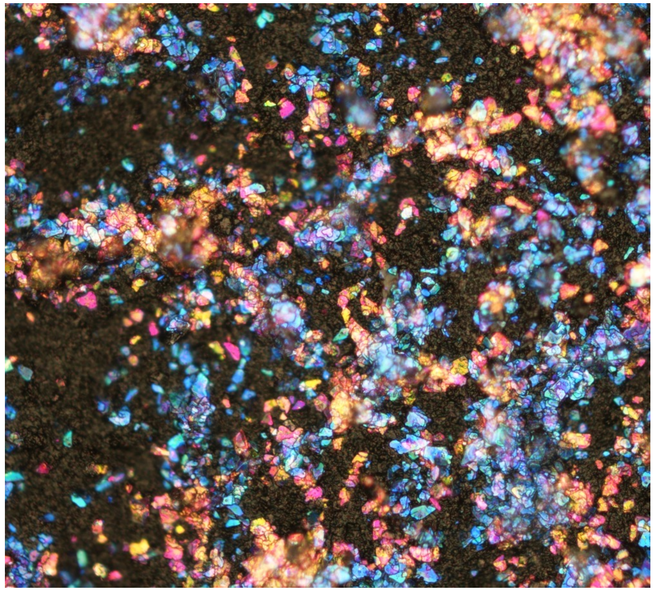
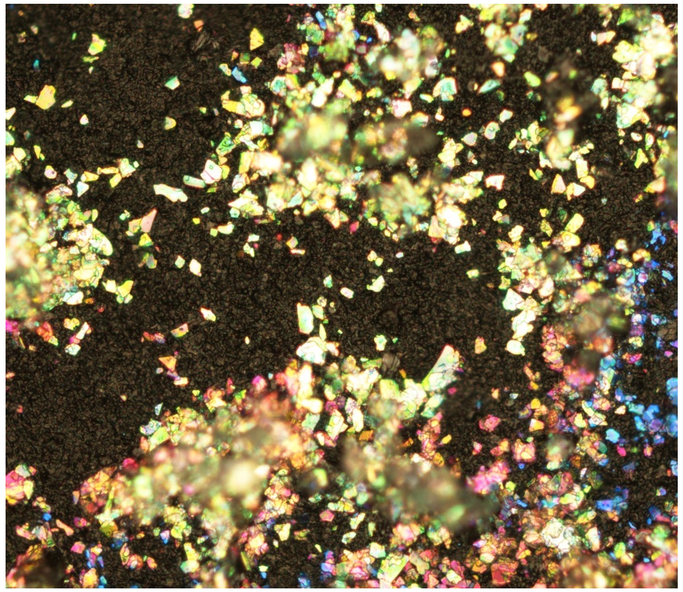


Magenta R+B

STOCHASTIC RELIEF



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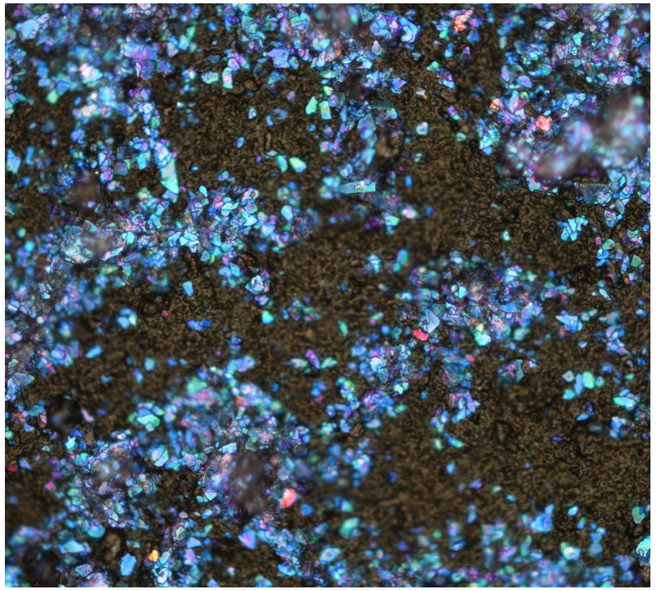

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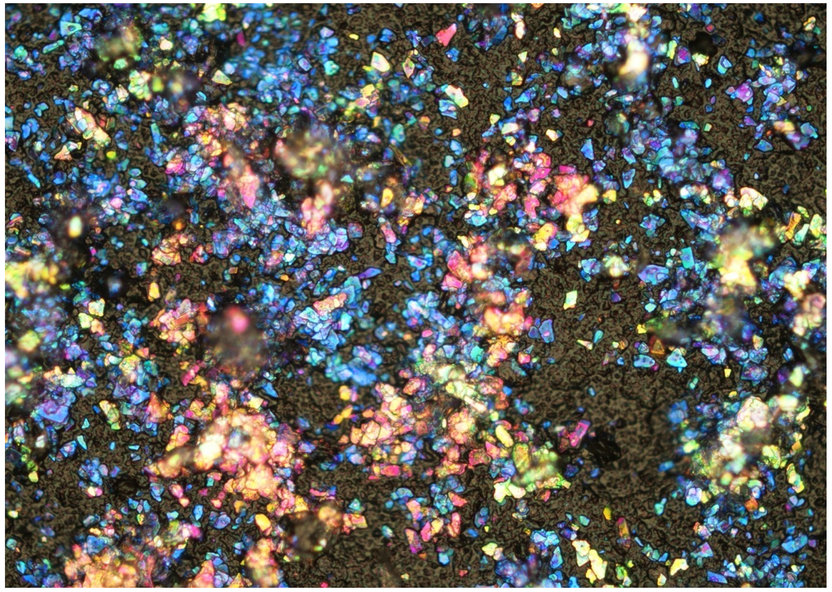
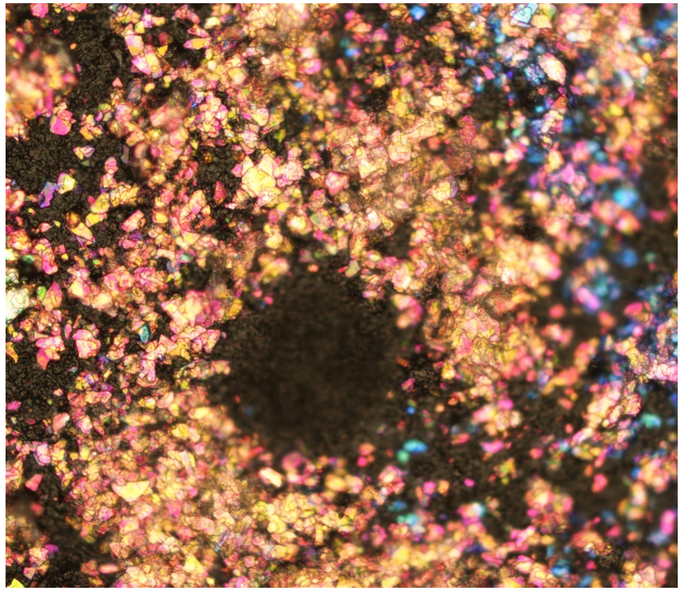


White R+G+B



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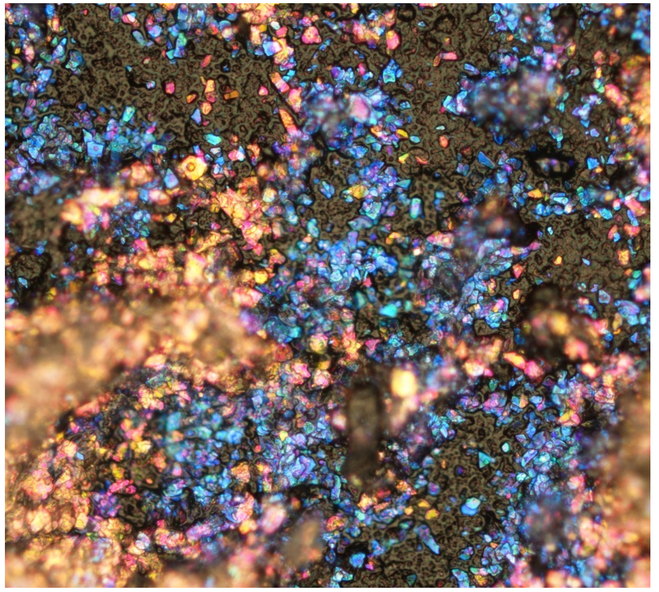
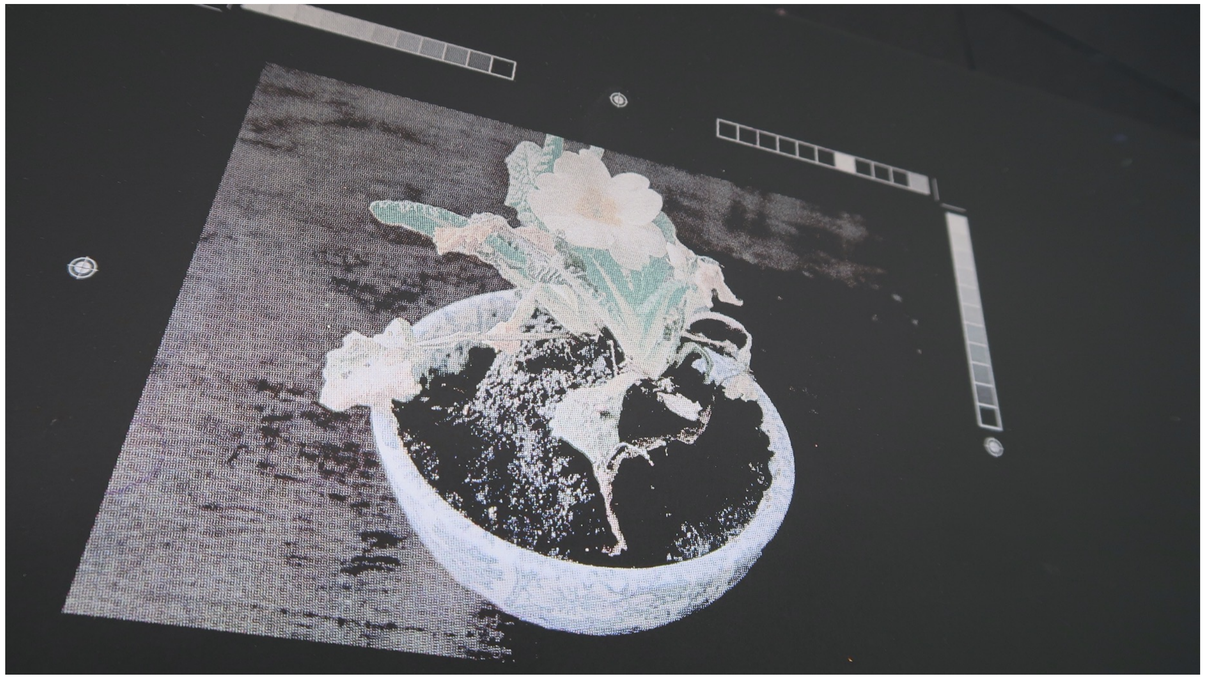
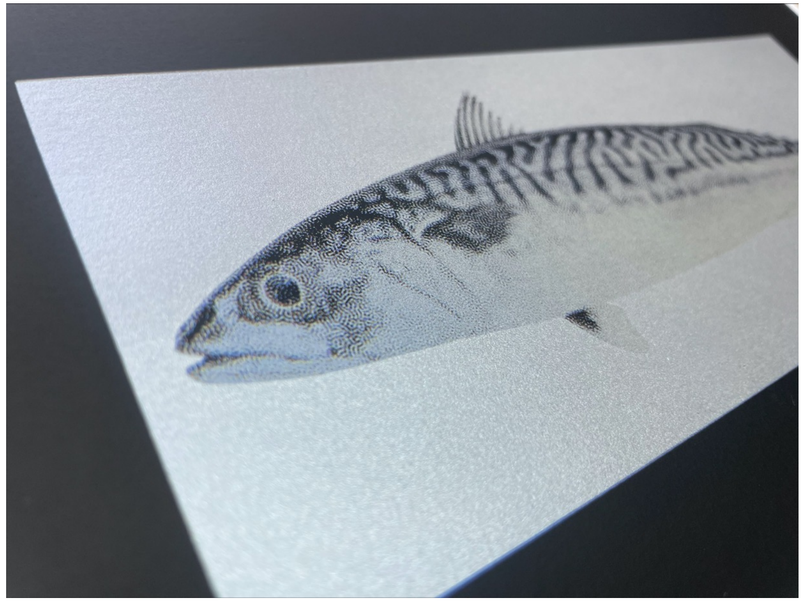
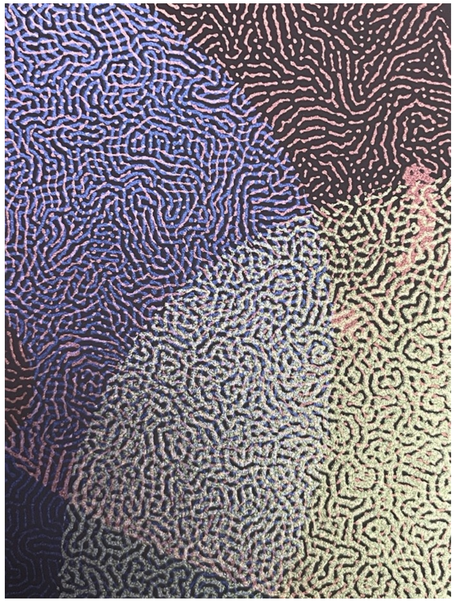
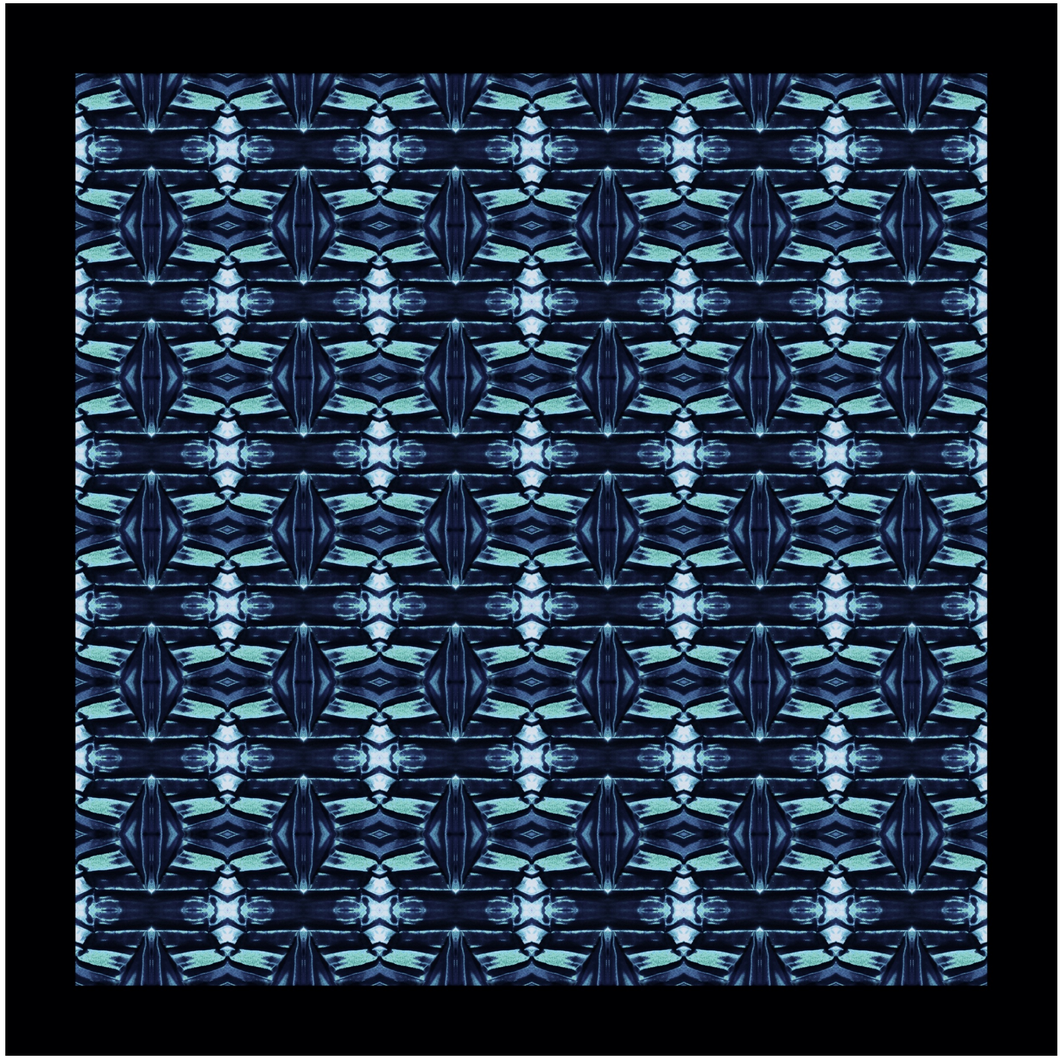


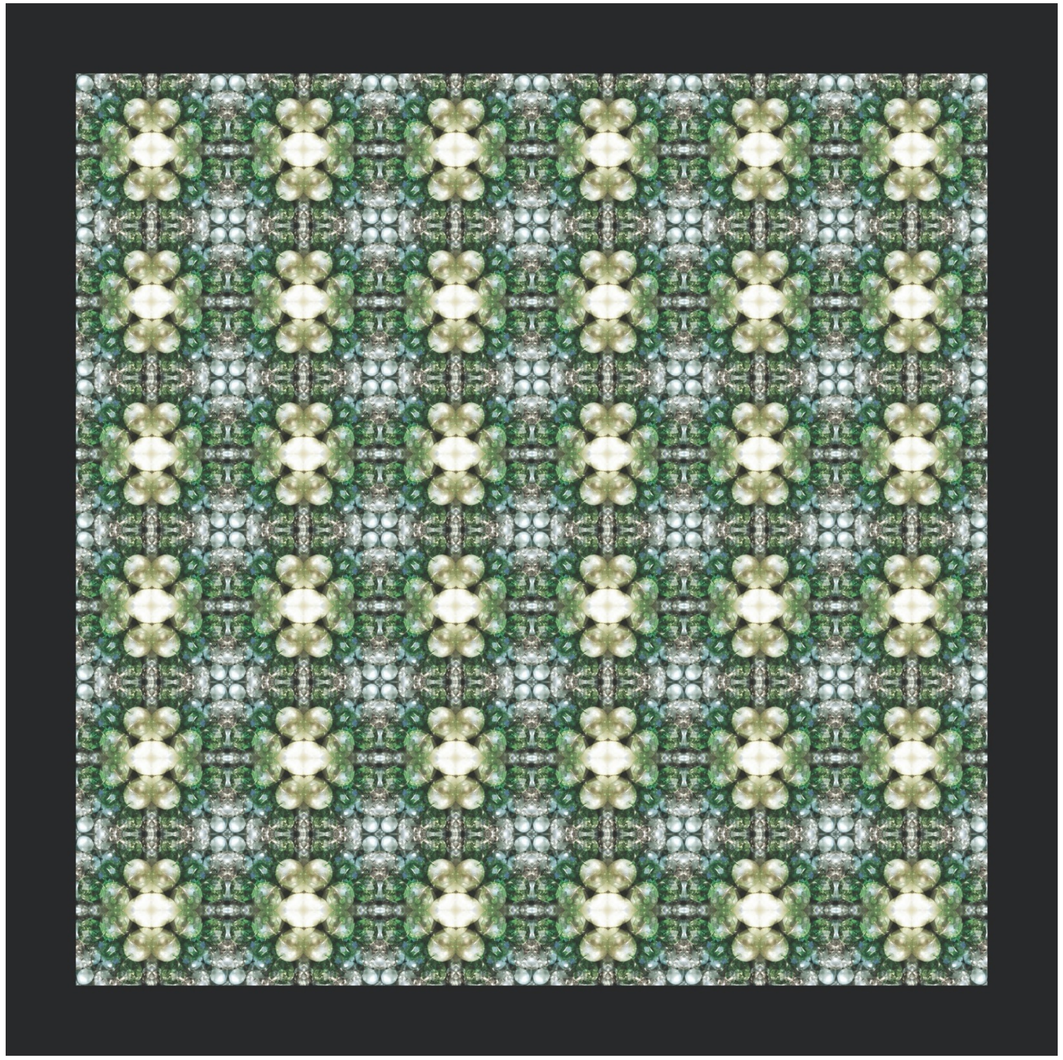
Magenta R+B

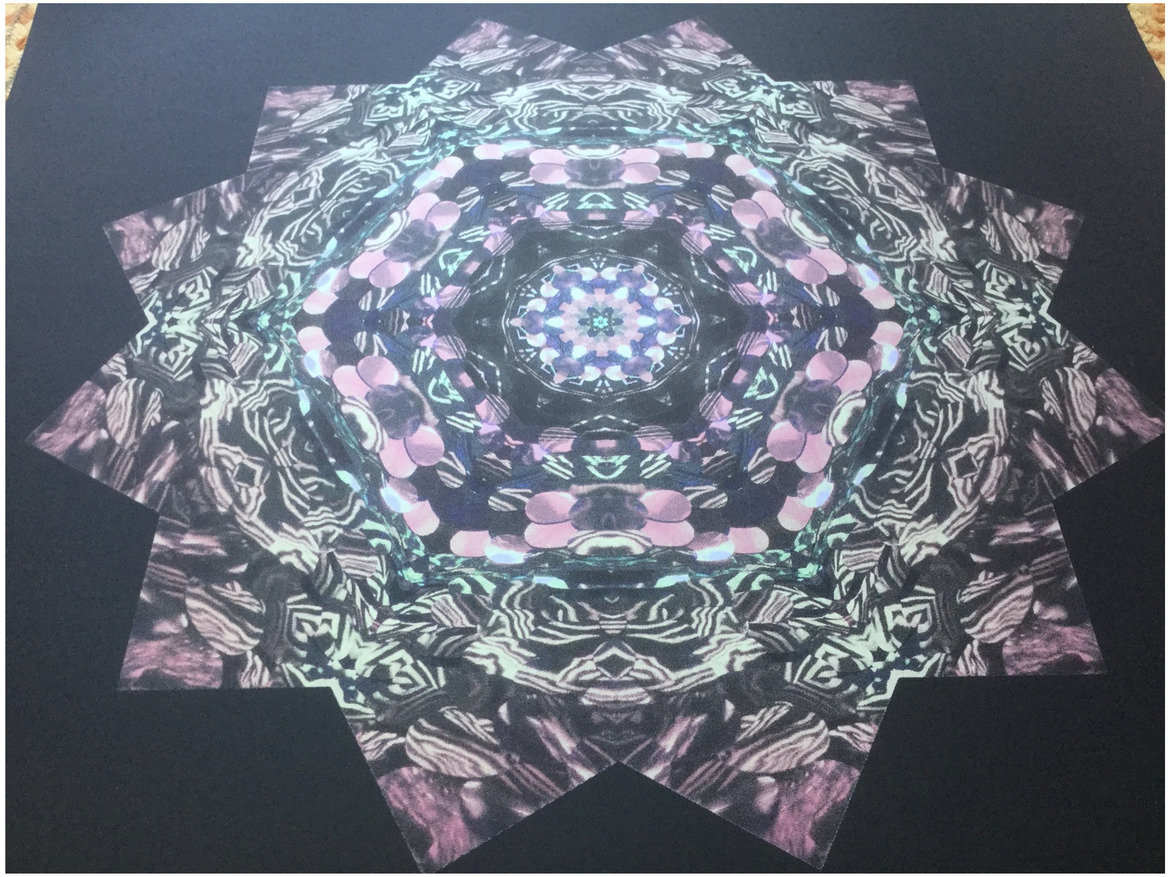












CONTACT US

@CFPR RESEARCH

THANK YOU

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