Universität Bamberg

Einführung Digitale Denkmaltechnologien
Vorlesung
Technische Photographie

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KDWT

Hausaufgabe in der Vorbereitung für den Vortrag von Amandine Colson am 20.1.2020

- Bitte lesen Sie zum 20. Januar von Emma Payne und ICOM/ ECCO Ethik vor
  - Payne, Emma Marie (2013): Imaging Techniques in Conservation. In: Journal of Conservation and Museum Studies 10. DOI: http://dx.doi.org/10.5334/jcms.1021201, Link oder
  - Bitte bereiten Sie 3 Fragen vor, die Sie zum Artikel haben – bedenken Sie auch schon die Antworten
- Wenn Sie Gelegenheit haben – Handapparat: Janis K (2005) Restaurierungsethik. m-press, München

Inhalt der Vorlesung

1. Technische Fotografie
    1. Museumsfotografie
    2. Technische Ausstattung
    3. Massendigitalisierung
    4. Fallstudie 3DBox
2. Reflectance Transformation Imaging
3. IR/UV Fotografie > Multispektrale Dokumentation

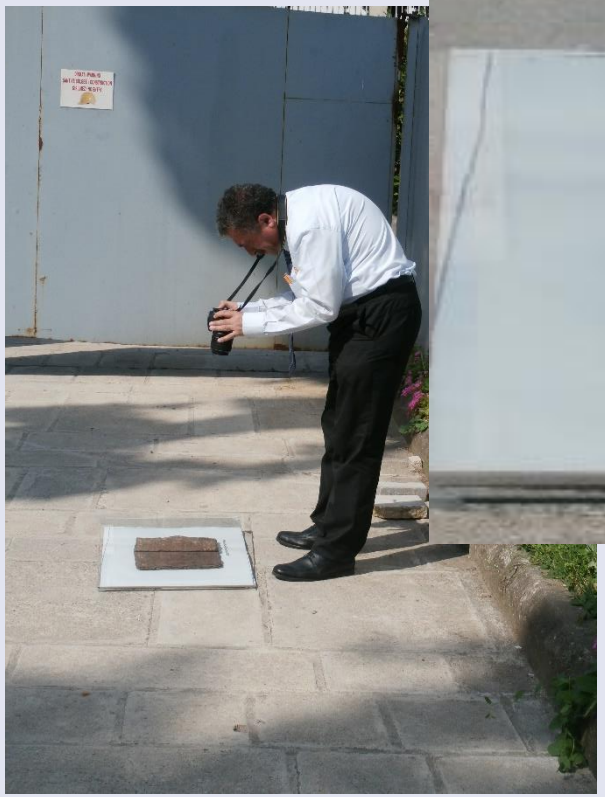
Universität Bamberg

Technische Fotografie

Institut für Archäologische Wissenschaften, Denkmalwissenschaften und Kunstgeschichte

KDWT

Fotografische Dokumentation Improvisation

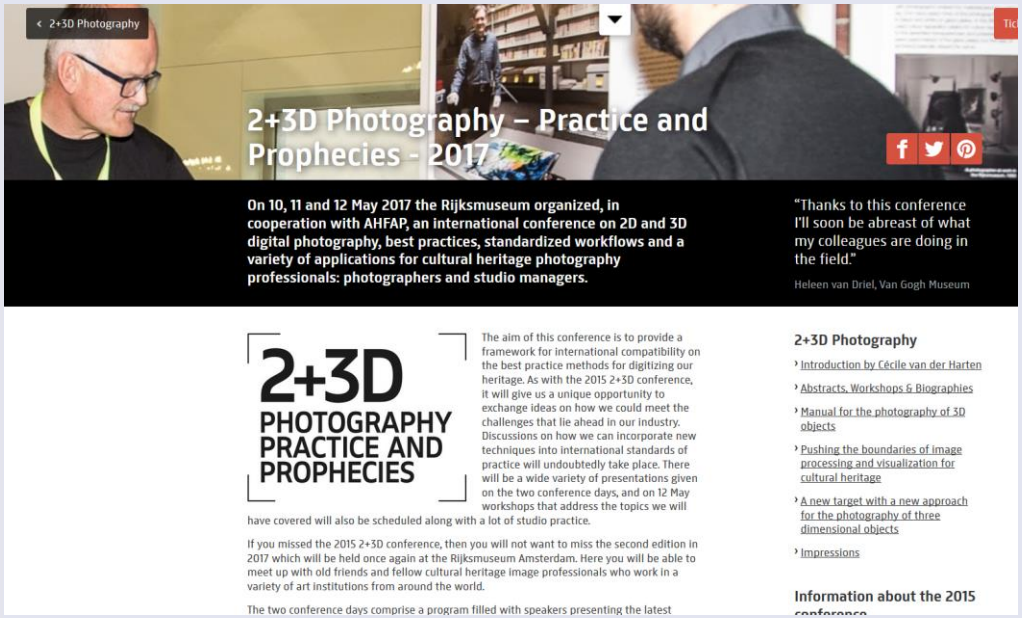


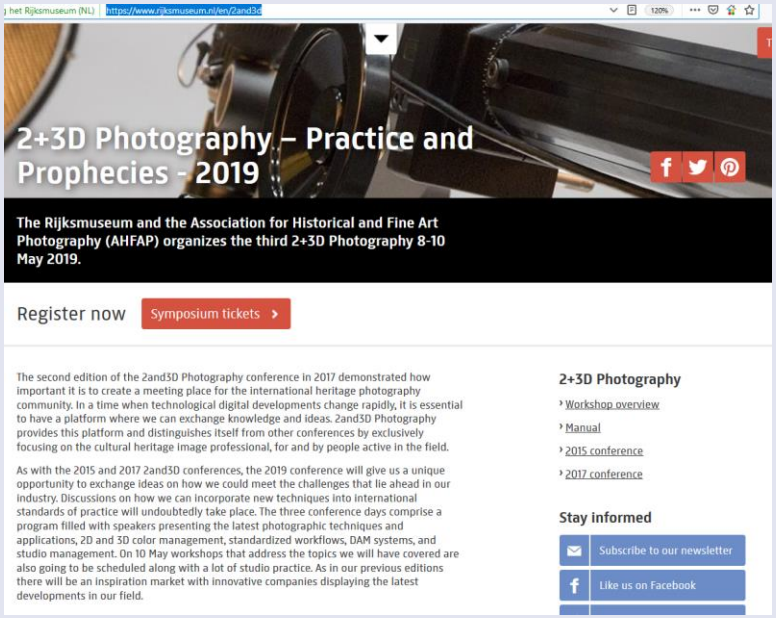
Weiterführende Literatur 2D technische Fotografie

- The Library of Congress (2006) *The Library of Congress Technical Standards for Digital Conversion Of Text and Graphic Materials*. United States: Library of Congress. http://memory.loc.gov/ammem/about/techStandards.pdf
- FADGI (Federal Agencies Digital Guidelines Initiative) (2016) *Guidelines: Technical Guidelines for Digitizing Cultural Heritage Materials* -. Available at: http://www.digitizationguidelines.gov/guidelines/digitize-technical.html (Accessed: 10 January 2018).

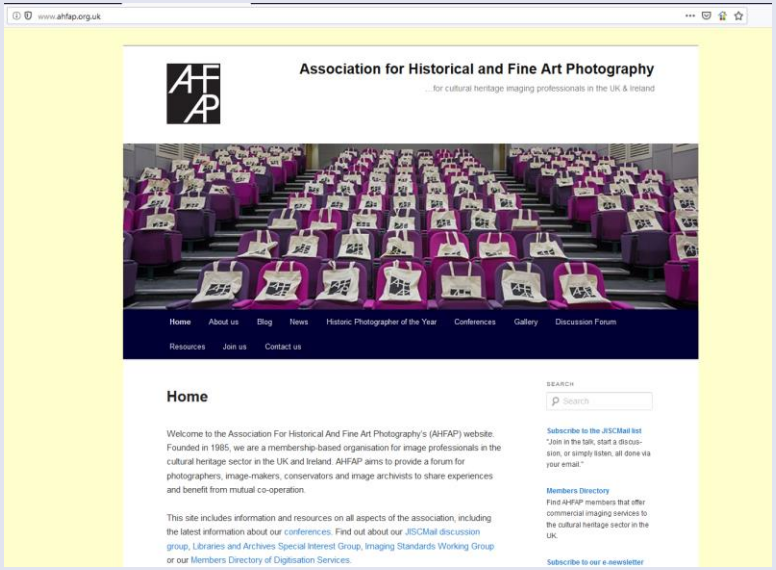
Konferenzen zum Thema

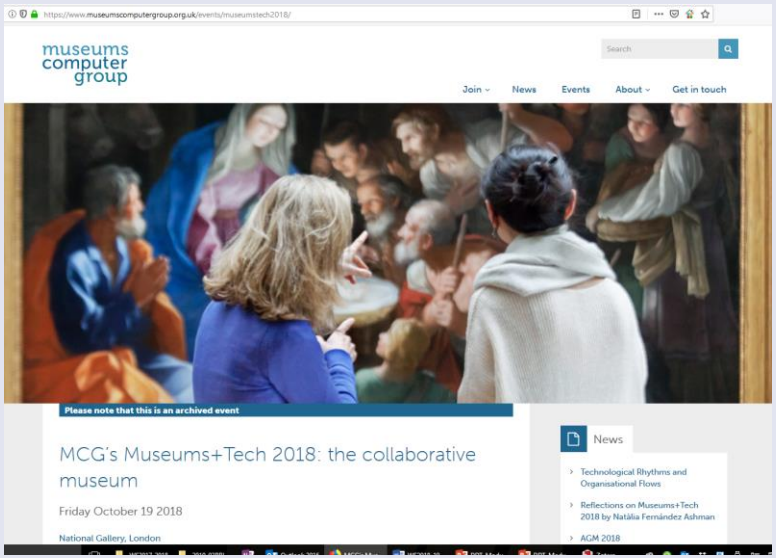
- https://www.rijksmuseum.nl/en/2and3d
- Manual for museum photography https://www.rijksmuseum.nl/nl/downloads/90bce65c-7b12-40c9-b0dd-97f48853445a/Rijksmuseum-Manual-3D-2018.pdf





Berufsverbände von Museumsfotografen





Beispiele Museum Photography

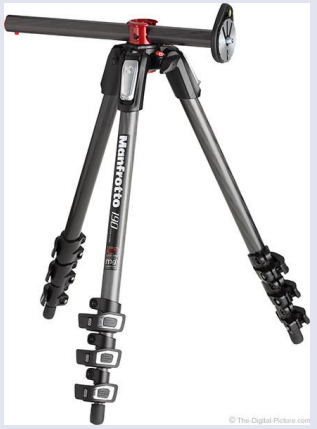
- http://www.keatswebb.com/museum.html
- https://www.rijksmuseum.nl/nl/downloads/90bce65c-7b12-40c9-b0dd-97f48853445a/Rijksmuseum-Manual-3D-2018.pdf

Wir haben Kameras und Objektive. Was brauchen wir noch?

LET'S GET SHOPPING

Dreibeine / Stative

- Low: Rollei, EUR100
- Medium: Manfrotto, EUR400
- High: Studio EUR1000



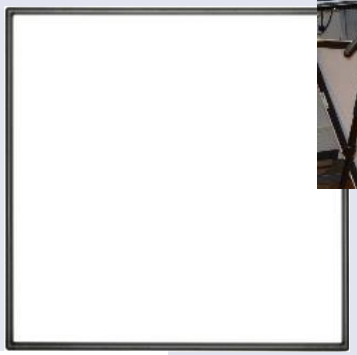
Lighting/ Beleuchtungsmittel (Continuous or flash)

- Low: Included in kit
- Moderate : Speedlight + Wireless Trigger + Hot shoe + batteries + charger
- High: professional studio lights

- Lichttemperatur etc
- https://www.shutterbug.com/content/studio-lighting-gear-continuous-strobe-and-led-too

Light tent / Lichtzelt

- Low: included in kit
- Moderate (1 x 1 x 1 m cube)
  - Aluminium frame (42x42”) , White translucent & silver reflective fabric, neatness clips
- High: professional backdrop and sides



Background & Fixture

- Low: included in kit
- Moderate: PVC background
- High: professional backdrop

Turntables – rotational photography/ Drehtische

- Low: cake stand
- Moderate: shop display stand, automated
- High: automatically triggered with camera


broncolor

Robotische Fotografie

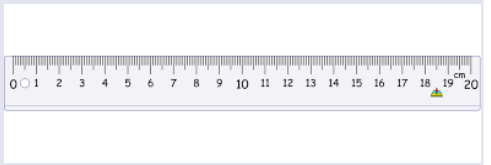
Farbkarten/ Referenzmasstab

https://www.kodak.com/motion/products/lab_and_post_production/control_tools/kodak_color_separation_guides_and_gray_scales/default.htm

- The KODAK Gray Scale is a quality-control device that helps:
  - Compare tone values of reflection copy with its reproduction
  - Find the correct exposure and processing conditions
  - Balance negatives and positives in a color reproduction process
  - Plot tone reproduction curves

Farbtafel (früher Gretag Macbeth ColorChecker , jetzt X-rite)

Scale / Referenzmasstab



Processing / Nachbearbeitung 2D

- Quality Control of resolution and colour:
  - High: Golden Thread, …
  - Medium: X-rite Passport for colour ca …
  - High: Adobe Lightroom
- Capture
  - Low: DigiCamControl (Freeware/ Opensource) http://digicamcontrol.com/cameras
  - High: PhaseOne
- Processing of photographs
  - Low: GIMP, ImageJ , Dstretch (Freeware/ Opensource) etc.
  - High: Adobe Photoshop
  - High: PhaseOne

Overview Modules

	Lighting	Light tent	Background	Turntables	Scales	Processing software	SUM
Low			£ 49.88	£ 3.00	£ 1.00	free	£ 53.88
Moderate	£ 250.00	£ 295.00	£ 39.80	£ 135.00	£ 50.00	£ 100.00	£ 869.80
High	£ 2,000.00	£ 300.00	£ 200.00	£ 1,000.00	£ 400.00	£ 900.00	£ 4,800.00

Image processing: illumination correction

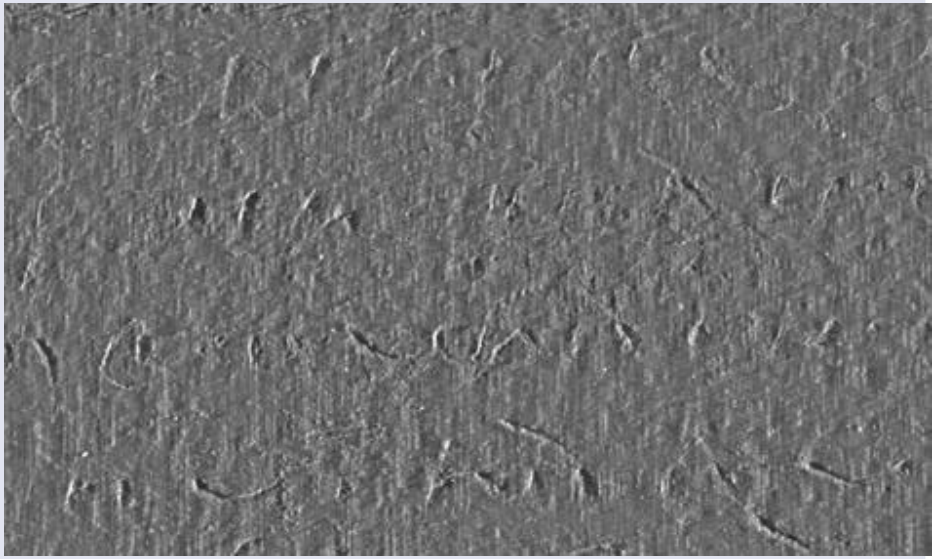
Original image

After illumination correction

Image processing: woodgrain removal -1

Original image

After woodgrain removal

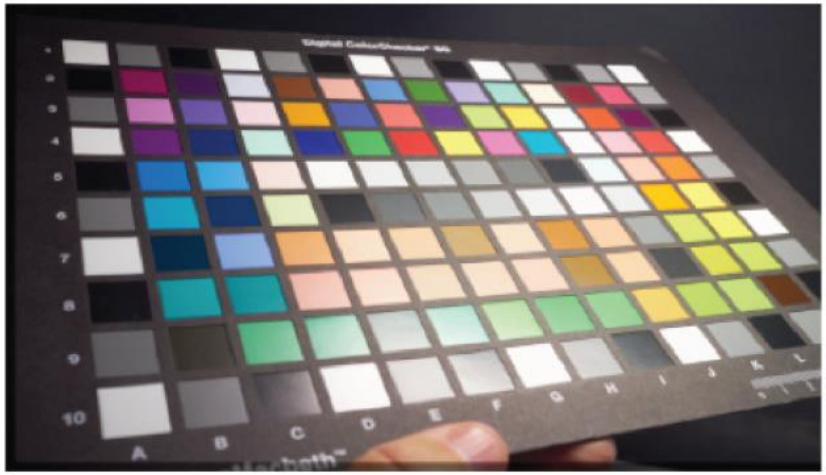


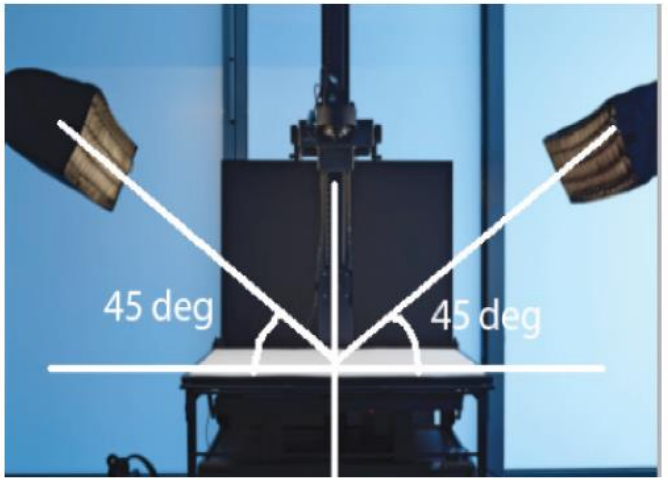
With thanks to Dr Segolene Tarte, eSAD project, OeRC

Grundlagen Fotostudio

- Grösse
- Licht oder kontrolliertes Licht
- Wände
- Farbe
- Flexibilität (Träger an Decken und Wänden, Vorhänge)
- Aufbau von technischem Gerät
- Bildschirme abschirmbar (Vorhang)
- Fahrbahre Trolley, Wägen oder Plattformen
- Konservierungsmaterial für den Aufbau

Reproduktionsstand für Dokumente





For those interested in this subject and who use Capture One there's a Colour Reproduction Guide on our CH page:

http://bit.ly/2CWm2iM

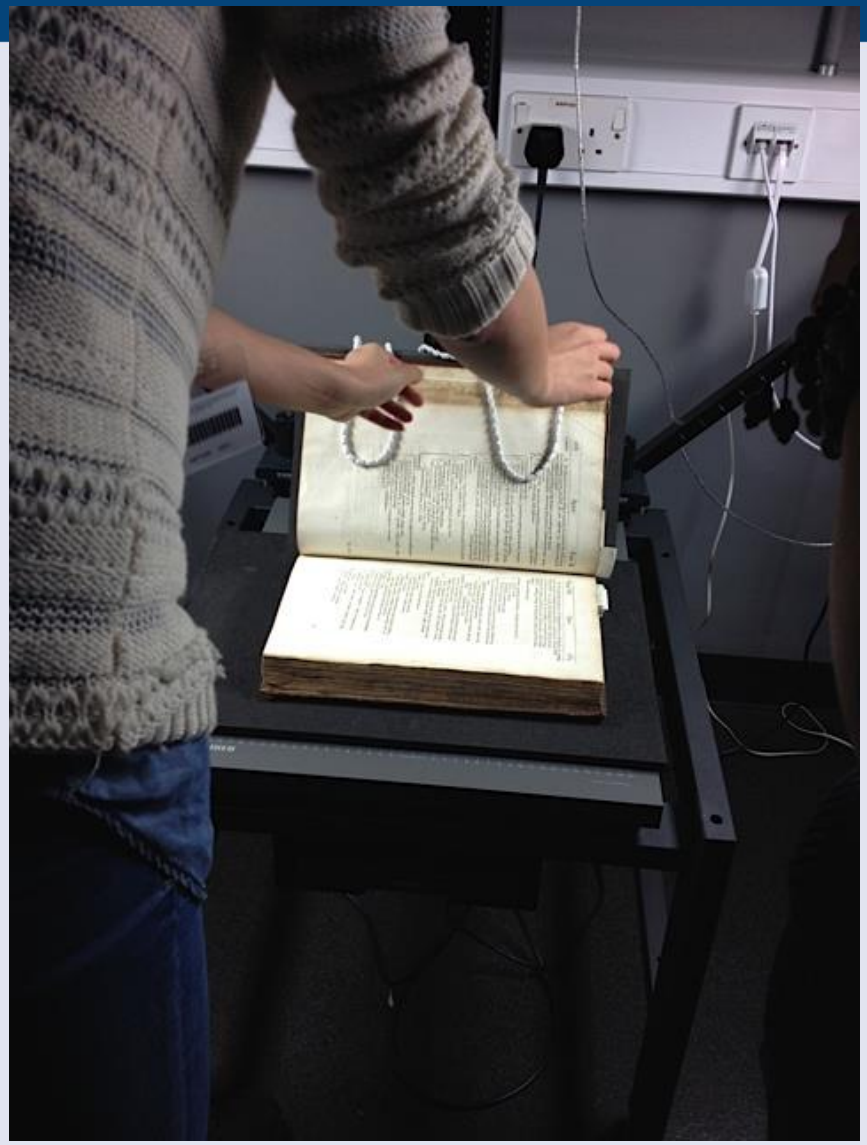
Multi-Modal Digitisation Suite

UCL MULTI-MODAL DIGITISATION SUITE

https://www.ucl.ac.uk/dh/facilities/digitisation-suite

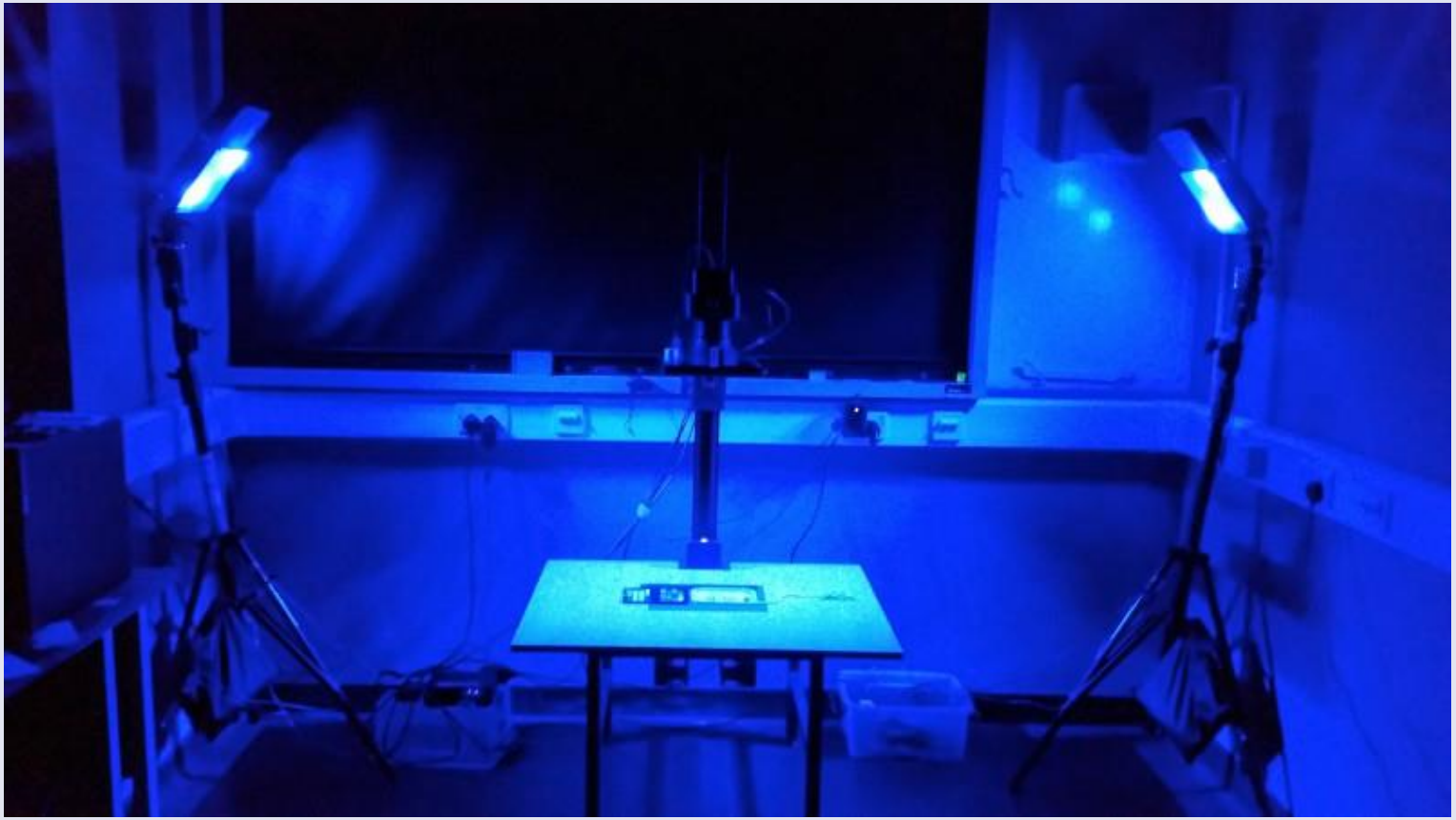
Images Melissa Terras, UCL DH

Universität Bamberg



Images Melissa Terras, UCL DH

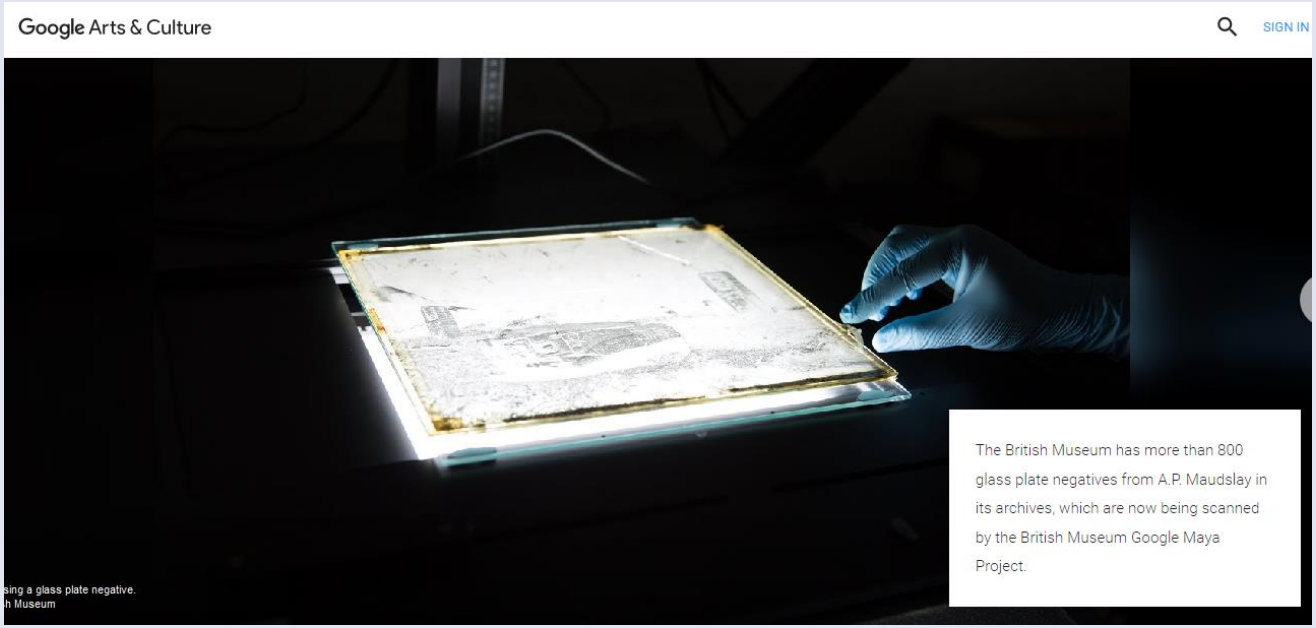
Multispectral imaging (UCL/ Kathryn Piquette)



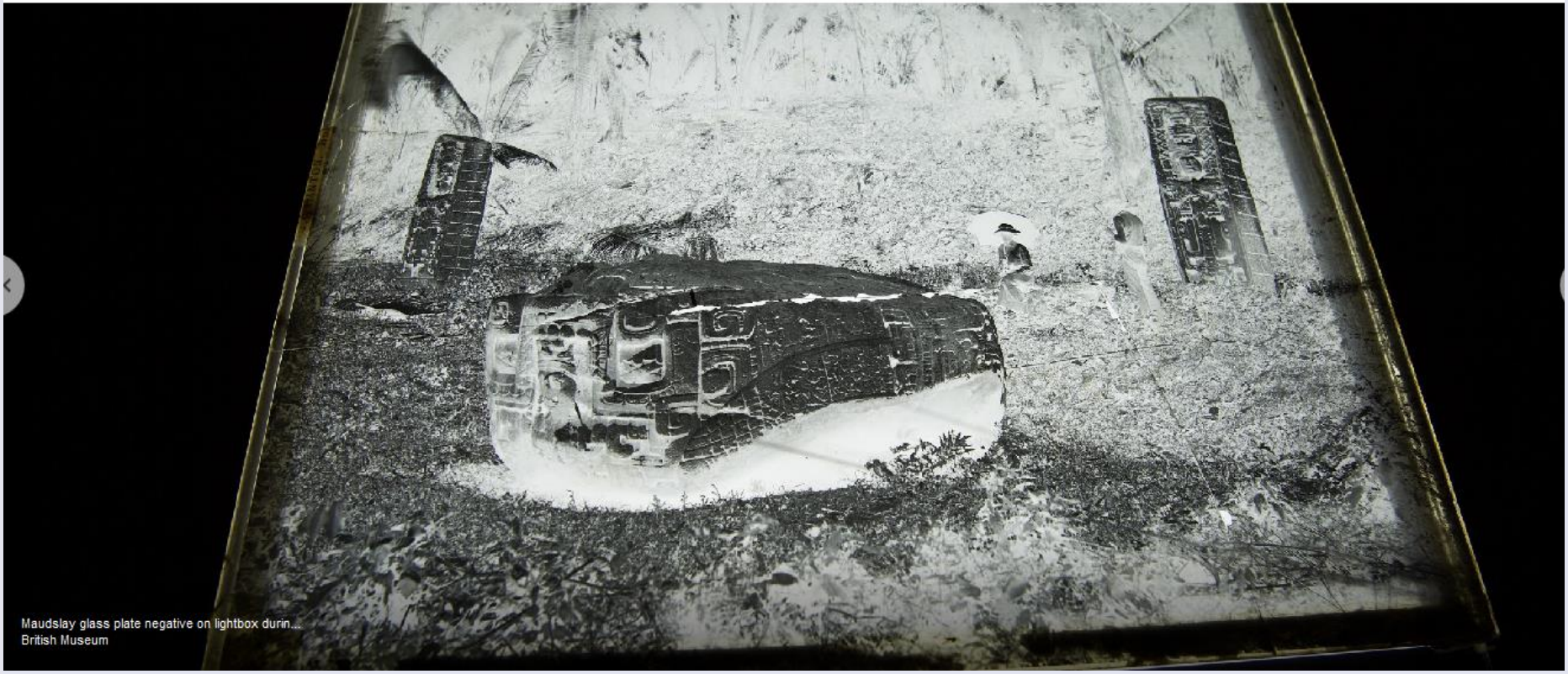
http://www.ucl.ac.uk/dh/consulting/advanced-imaging-consultants

Beispiel Google Reproduktion, Auflicht Durchlicht

- https://artsandculture.google.com/project/british-museum-s-maya (Google Maya Project with the British Museum)



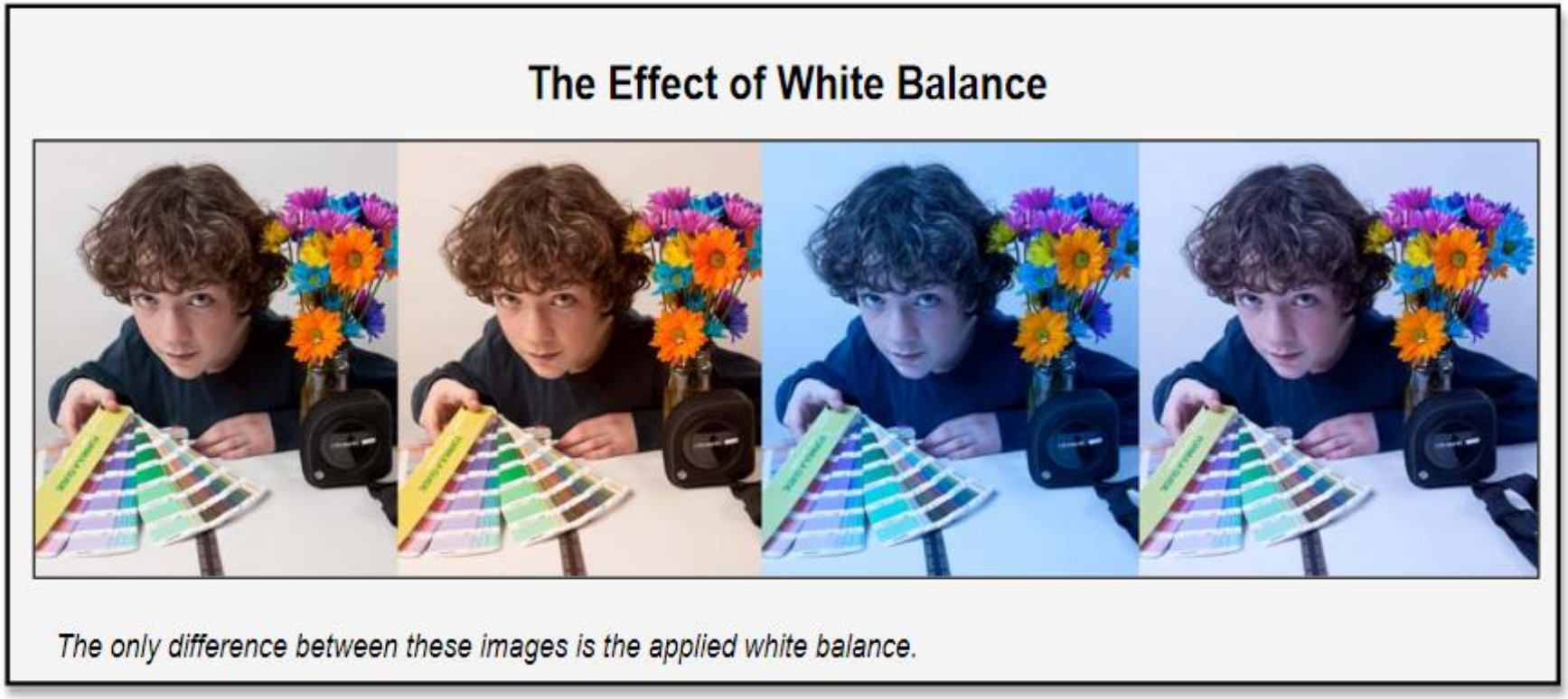
Auflicht/ Durchlicht, Glasnegativ



Objekt Setup

- Licht von 2 Seiten
  - Licht von links oben meist genutzt, Konvex und konkav wird besser „gelesen“
- Licht indirekt
  - Auf die Decke richten
  - Softbox auf dem Licht
  - Light tent
- Kontrastierender Hintergrund zur Objektfarbe
- Achtung auf Spiegelungen

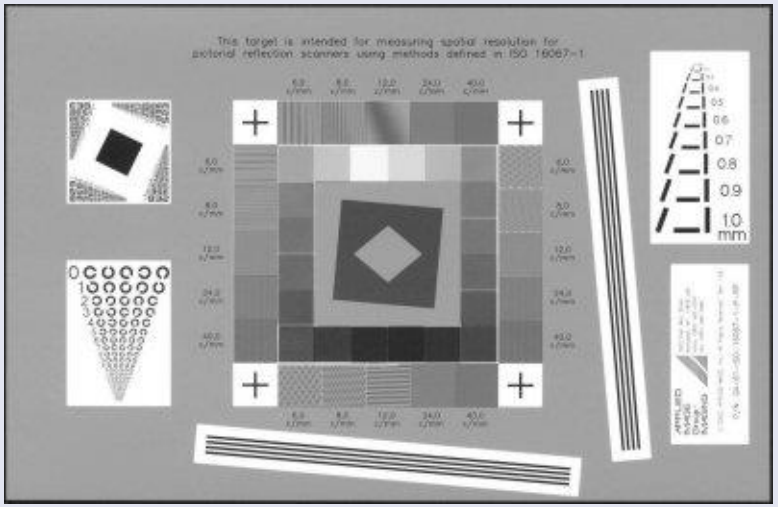
Weissableich und Farbkalibration (> Modul 4)



Farbtafel (früher Gretag Macbeth ColorChecker , jetzt X-rite) (> Modul 4)

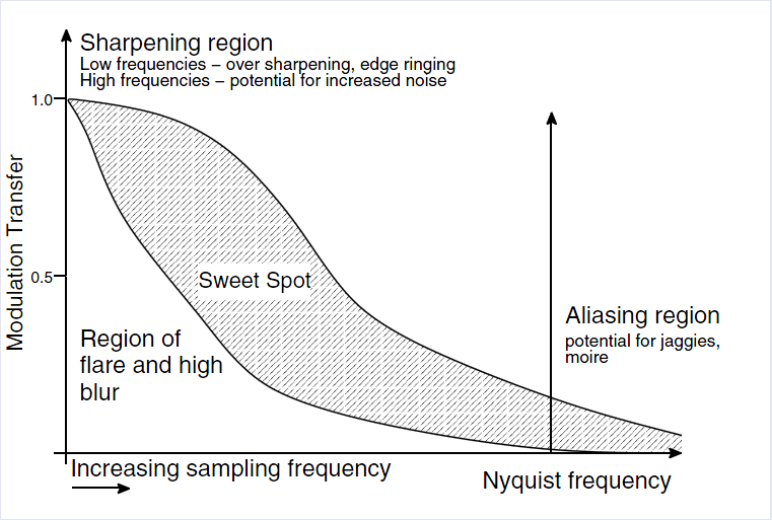
No.	Number	sRGB R	sRGB G	sRGB B	CIE L*a*b* L*	CIE L*a*b* a*	CIE L*a*b* b*	Munsell Notation Hue Value	Munsell Notation / Chroma
1.	dark skin	115	82	68	37.986	13.555	14.059	3 YR	3.7 / 3.2
2.	light skin	194	150	130	65.711	18.13	17.81	2.2 YR	6.47 / 4.1
3.	blue sky	98	122	157	49.927	-4.88	-21.925	4.3 PB	4.95 / 5.5
4.	foliage	87	108	67	43.139	-13.095	21.905	6.7 GY	4.2 / 4.1
5.	blue flower	133	128	177	55.112	8.844	-25.399	9.7 PB	5.47 / 6.7
6.	bluish green	103	189	170	70.719	-33.397	-0.199	2.5 BG	7 / 6
7.	orange	214	126	44	62.661	36.067	57.096	5 YR	6 / 11
8.	purplish blue	80	91	166	40.02	10.41	-45.964	7.5 PB	4 / 10.7
9.	moderate red	193	90	99	51.124	48.239	16.248	2.5 R	5 / 10
10.	purple	94	60	108	30.325	22.976	-21.587	5 P	3 / 7
11.	yellow green	157	188	64	72.532	-23.709	57.255	5 GY	7.1 / 9.1
12.	orange yellow	224	163	46	71.941	19.363	67.857	10 YR	7 / 10.5
13.	blue	56	61	150	28.778	14.179	-50.297	7.5 PB	2.9 / 12.7
14.	green	70	148	73	55.261	-38.342	31.37	0.25 G	5.4 / 8.65
15.	red	175	54	60	42.101	53.378	28.19	5 R	4 / 12
16.	yellow	231	199	31	81.733	4.039	79.819	5 Y	8 / 11.1
17.	magenta	187	86	149	51.935	49.986	-14.574	2.5 RP	5 / 12
18.	cyan	8	133	161	51.038	-28.631	-28.638	5 B	5 / 8
19.	white (.05*)	243	243	242	96.539	-0.425	1.186	N	9.5 /
20.	neutral 8 (.23*)	200	200	200	81.257	-0.638	-0.335	N	8 /
21.	neutral 6.5 (.44*)	160	160	160	66.766	-0.734	-0.504	N	6.5 /
22.	neutral 5 (.70*)	122	122	121	50.867	-0.153	-0.27	N	5 /
23.	neutral 3.5 (.1.05*)	85	85	85	35.656	-0.421	-1.231	N	3.5 /
24.	black (1.50*)	52	52	52	20.461	-0.079	-0.973	N	2 /

Spatial Resolution / Räumliche Auflösung Testobjekte



ISO-16067-1 Resolution test chart. Photographic test target QA-61 by Applied Image Inc.

The centre includes differently spaced black and white lines to determine the Resolving power in (L/mm), and a Slanted Edge target in the centre



Spatial Frequency response graph (SFR) by Slanted Edge analysis.

Typical graph appearance and the sweet spot. presentation image by (Burns, 2001, p. 43) by (Goesele, Fuchs, and Seidel 2003)

Stanford University Libraries' Digitization Labs

- **Film: Stanford University Libraries' Digitization Labs**
- Approach to different types of objects, digitization technologies

- More info: http://library.stanford.edu/research/digitization-services

Mass Digitization Programme at the Smithsonian Institution

Home | About | SI Digi Blog | In the News | Contact Us | 2017 Digitization Fair | Resources

Mass Digitization Program

The DPO's Mass Digitization Program supports the 19 museums and 9 research centers that make up the Smithsonian Institution in their efforts to digitize their collections as comprehensively, quickly, and cost-effectively as possible. We support our colleagues around the Smithsonian by helping to build workflows, which move objects from storage to digital capture stations efficiently; by creating sustained high speed, high quality digitization processes; by pairing up the digital surrogates we create with the collection records stored in the Smithsonian's various collection databases; and by making all this information available to you, the museum (and virtual museum) going public.

This responsibility takes us on a global hunt to find the best technologies and processes to achieve these goals; to conduct mass digitization projects to test and implement these new technologies and processes; to educate and train ourselves to understand these new approaches; and finally to integrate digitization operations into the day-to-day operations of the Smithsonian in order to give the world access to the Smithsonian's vast collections.

https://dpo.si.edu/mass-digitization-program

Mass Digitization Programme at the Smithsonian Institution

- **Film: Smithsonian Digitization Program Office Rapid Capture Digitization Process**
- **https://youtu.be/ikI2PClWMlM**
- Detailed technical information, Including Quality Control

- **Film: Unprecedented Access to Cooper Hewitt's Collection**
- https://youtu.be/MveUhuPajnw
- The digitisation process from the view of the object. Information about the program.

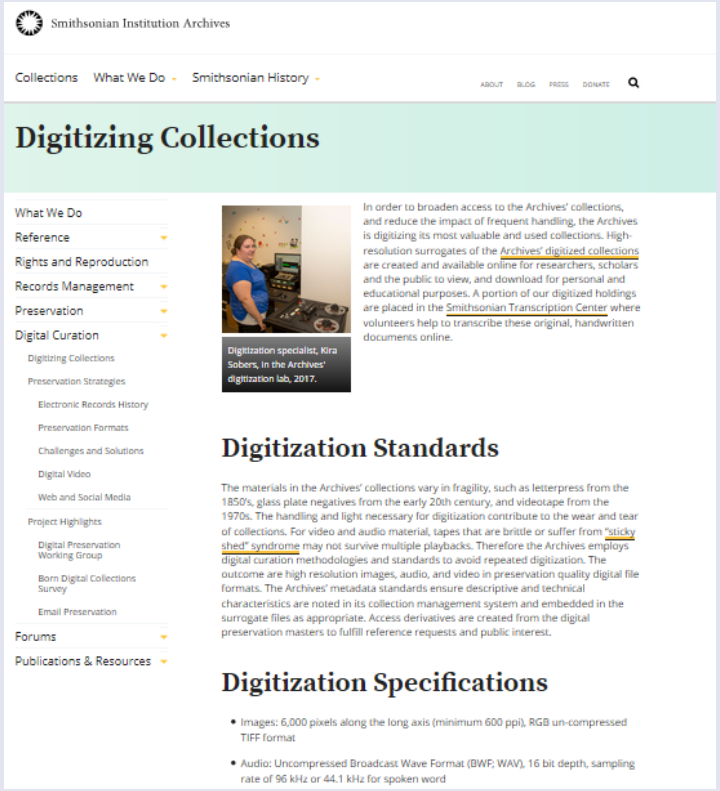
Further videos about the Smithsonian Mass Digitisation

- **Film: Smithsonian Digitization: A conveyor-belt driven imaging system**
- https://youtu.be/eMPwoHu-TV4
- Great views of the archives , extensive explanation of the reasons for digitisation, conveyor belt driven system

- **Film: Smithsonian Digitization: Impact of Digitizing Botany Collection**
- https://youtu.be/SmHG73Ph8sY
- Conveyor belt detailed views, connection to GIS database.

Smithsonian Institutions Digitizing Collections

- https://siarchives.si.edu/what-we-do/digital-curation/digitizing-collections



British Library Digitisation https://www.bl.uk/digitisation-services

- Film Digitisation Services
- https://youtu.be/DbusabvBaEM
- Technologies for different objects, description of labs and projects

Wel(l)come@3D and 3DBOX – a modular kit for photogrammetry

Dr Mona Hess, UCL CEGE
Dr John Hindmarch, UCL Information Studies
Prof Melissa Terras, UCL Information Studies
Deborah Leem, Wellcome Trust

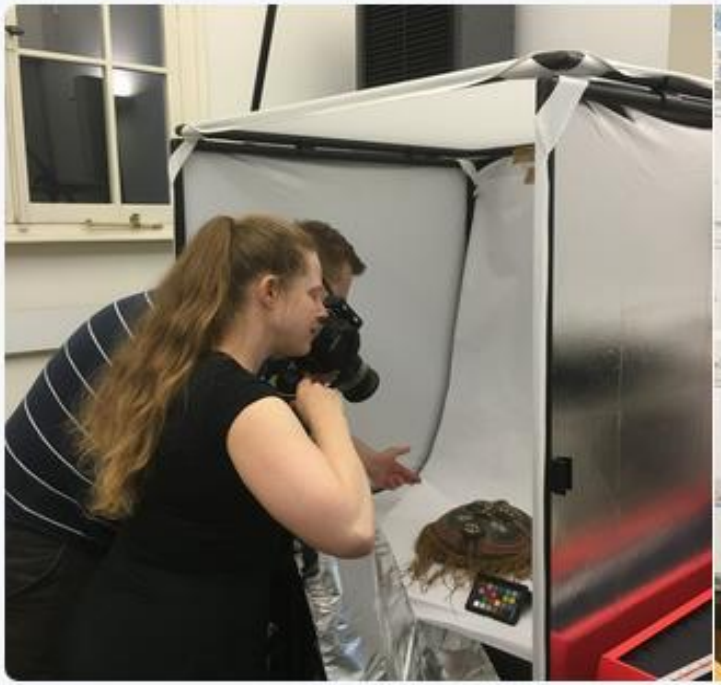
Project Wel(l)come@3D

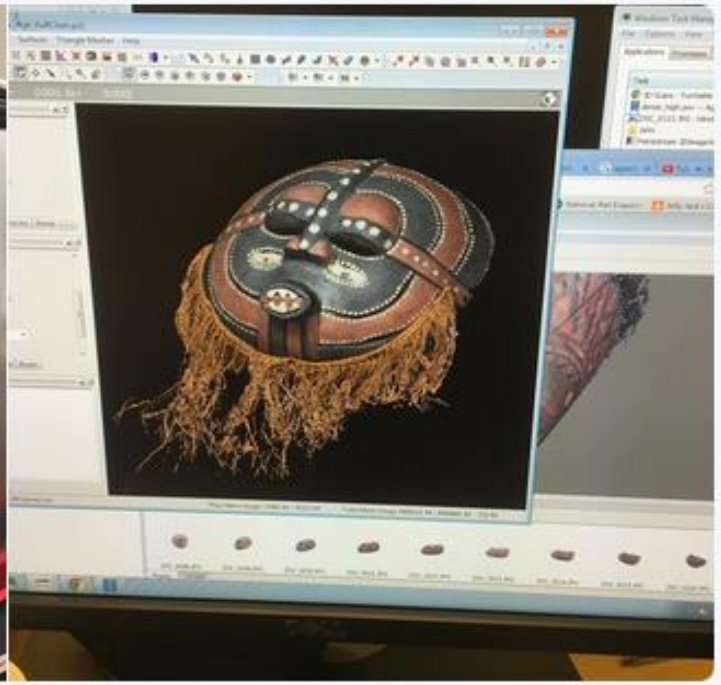
- *3DBOX* was designed as part of the project *Wel(l)come@3D.*
- Wel(l)come@3D - knowledge exchange in 3D imaging technology, 3D printing and dissemination of archival and collection objects , Knowledge Exchange Champion
- UCL Enterprise Knowledge Exchange Grant plus match funding by the partner Wellcome Trust for a collaborative project on in-house capacity building of 3D imaging in collections. “Wel(l)come@3D”. Collaboration of UCL CEGE with UCL Digital Humanities/Department of Information Studies, partnering with the Wellcome Trust

Prototype 3DBOX

melissa terras @melissaterras · Jul 4

Checking in with @mona3Dimaging on a pilot 3D scanning heritage project we have with @WellcomeLibrary.

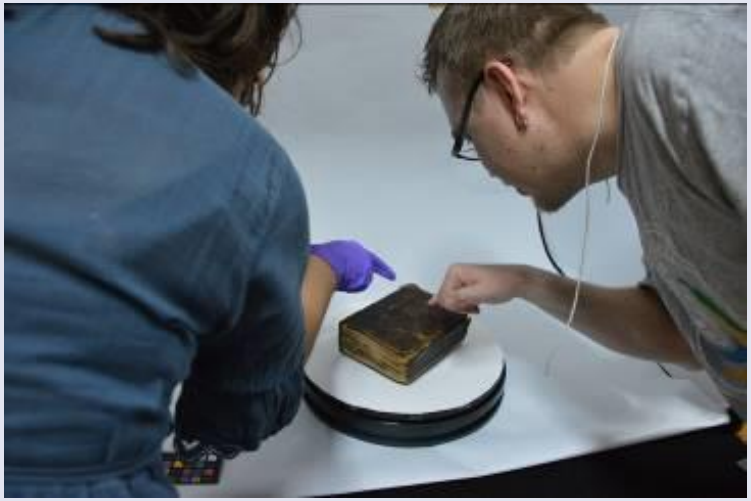




11 24

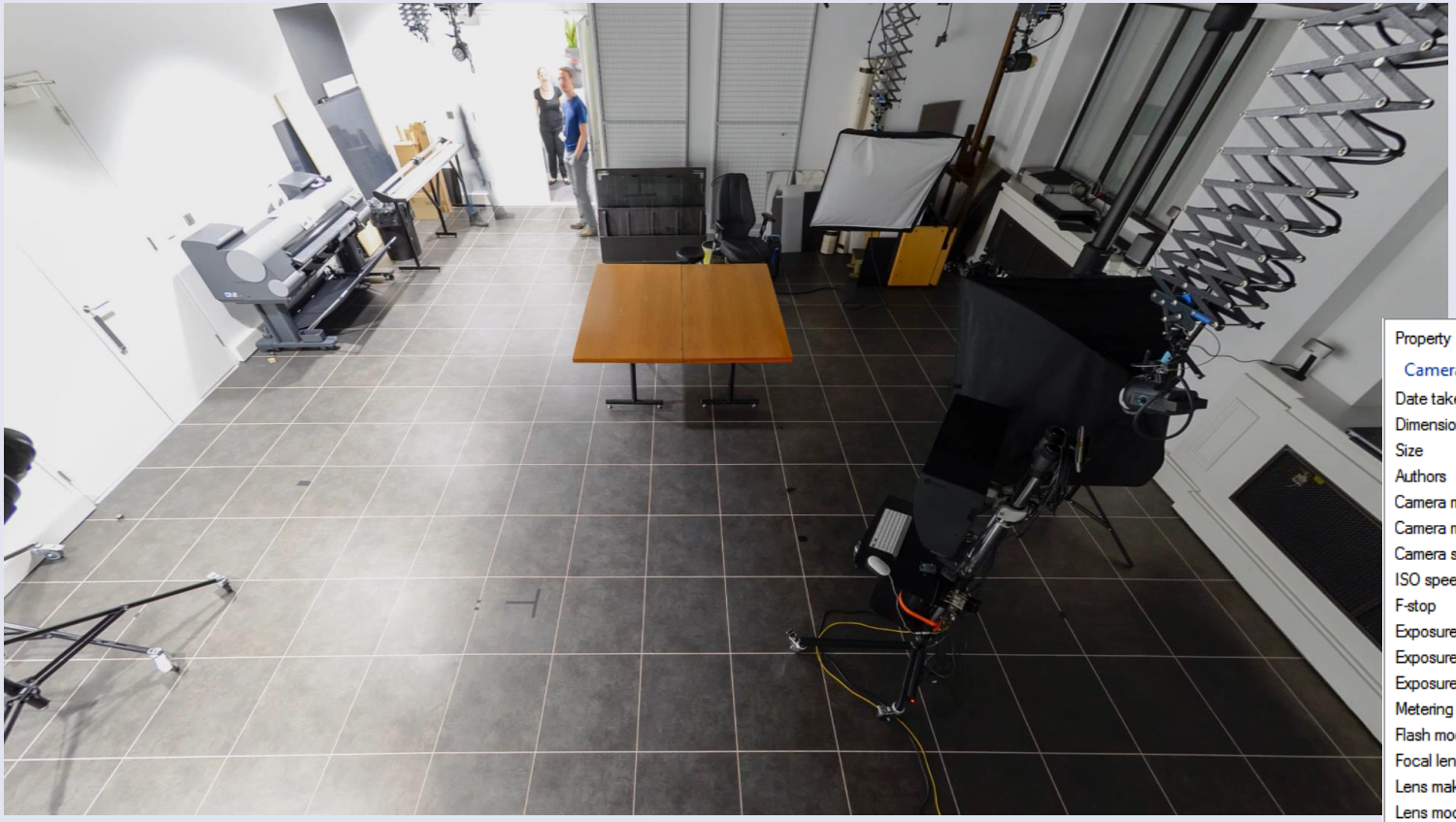
Mobile 3DBOX PhotoLab

On site



On-site imaging 3DBOX

Timelapse



Thank you to Ben Gilbert and Thomas Farnetti, Deborah Leem

Thank you to Stefania, Richard Everett, Stefania Signorello, Gillian Boal

Property	Value
Camera	
Date taken	21/07/2016 13:00
Dimensions	4256 x 2832
Size	10.5 MB
Authors	
Camera maker	NIKON CORPORATION
Camera model	NIKON D700
Camera serial number	2185091
ISO speed	ISO-200
F-stop	f/11
Exposure time	1/160 sec.
Exposure bias	0 step
Exposure program	Manual
Metering mode	Pattern
Flash mode	No flash
Focal length	60 mm
Lens maker	
Lens model	

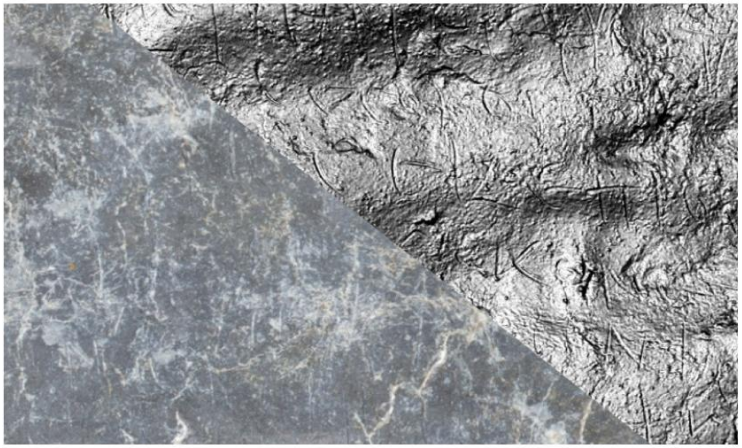

NIKON

RTI/ H-RTI / PTM
IR/ UV/ Multispektral

Weitere digitale fotografische Methoden mit Anwendungen im Bereich Denkmalpflege und Kulturgüterschutz

Reflectance Transformation Imaging

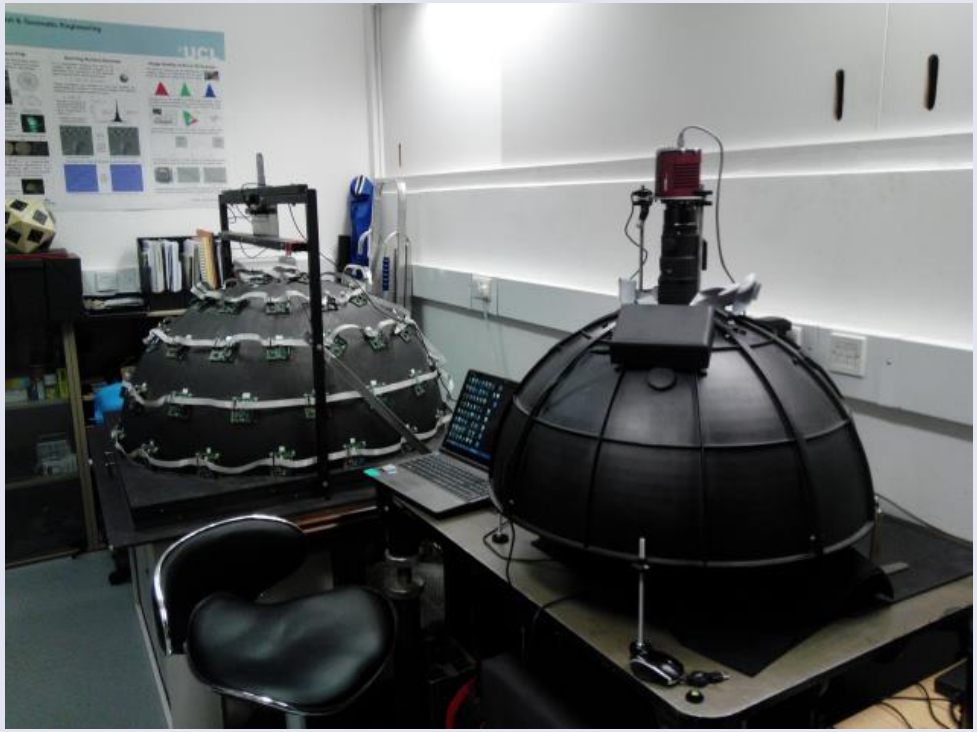
We offer both custom RTI services and training. Reflectance Transformation Imaging (RTI), also known as Polynomial Texture Mapping (PTM), is a high-resolution, non-invasive and non-destructive imaging technique for documenting fine surface details. Unlike conventional photographs, images created using the RTI capture method can be virtually relit. The direction of the light source can be moved around in real time to give 3D appearance to surface shapes for systematic inspection of fine surface details.

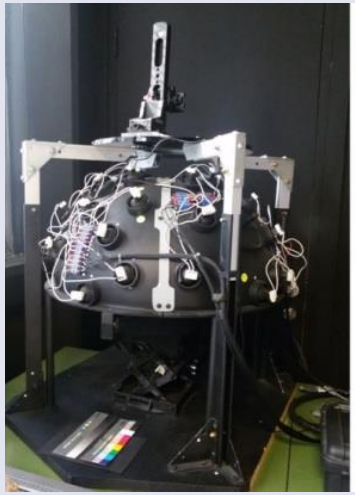


Detail of Greek-inscribed lead tablet (T37, Institut für Altertumskunde). Left: default lighting; Right: specular enhancement. Images: Kathryn E. Piquette. Courtesy University of Cologne.

What is RTI and H-RTI? PTM?

Digitale Erfassung durch PTM/RTI, H-RTI und Photometric Stereo



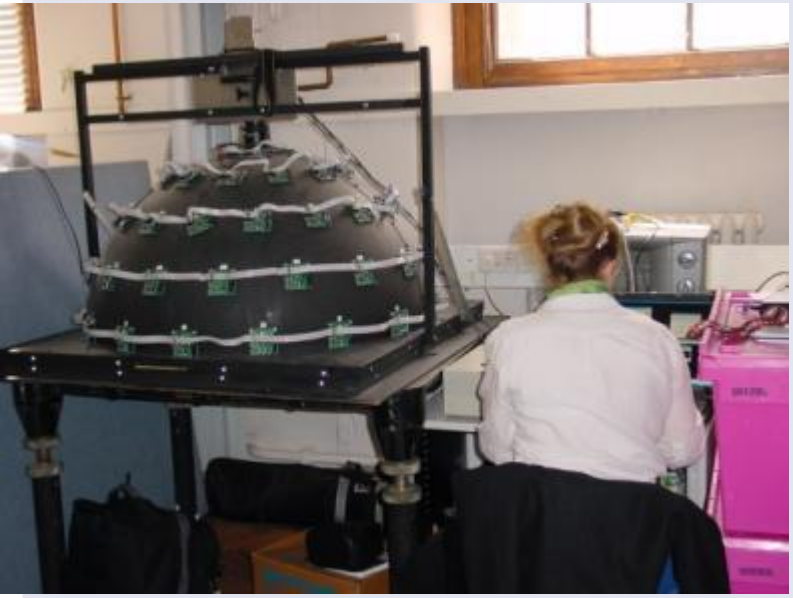


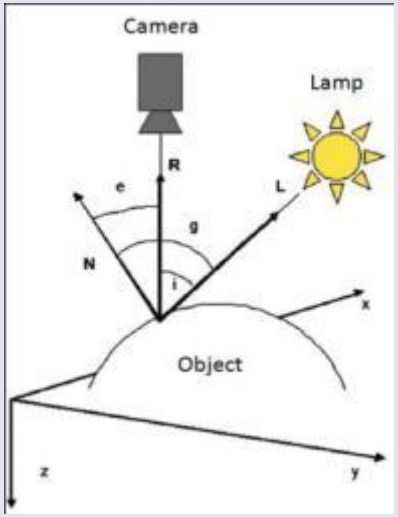
Part of the COSCH Eu-Cost project

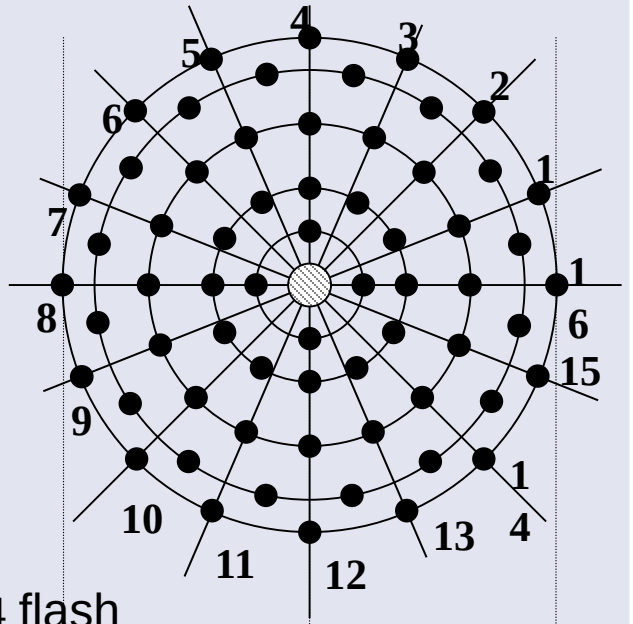
http://kathrynpiquette.blogspot.de/2012_03_01_archive.html

Polynomial Texture Mapping

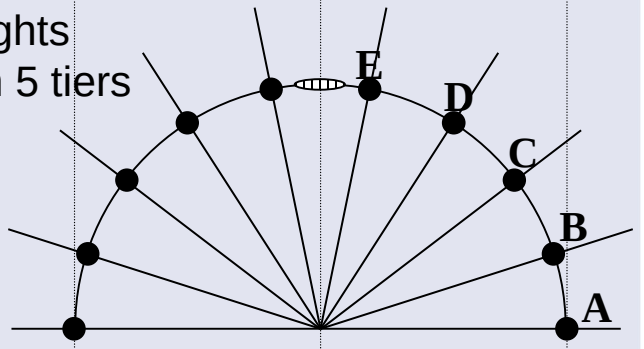
Graphics courtesy
Lindsay MacDonald





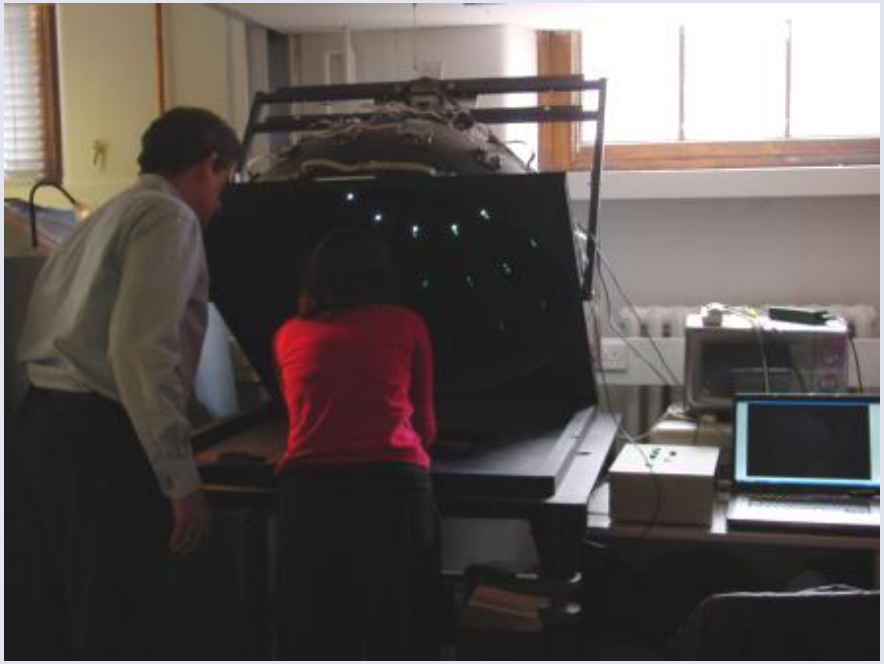


64 flash lights in 5 tiers



Flash light selection incremented per image.

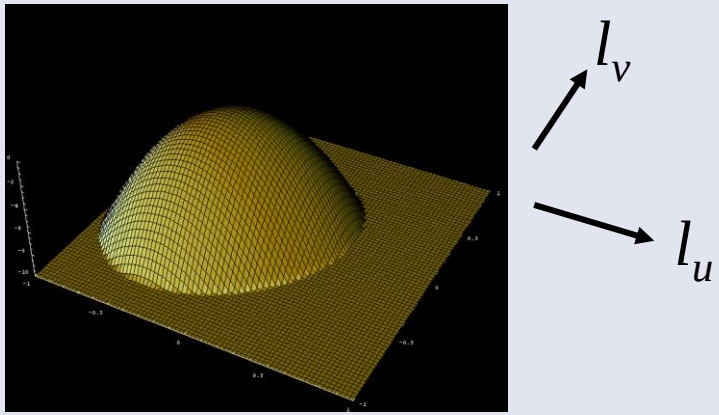
Polynomial Texture Mapping
Beispiel



Weiterführende Info: Polynomial Texture Maps

Assuming a Lambertian surface, the angular reflectance function is separable, with a constant colour per pixel modulated by an angle-dependent luminance factor:

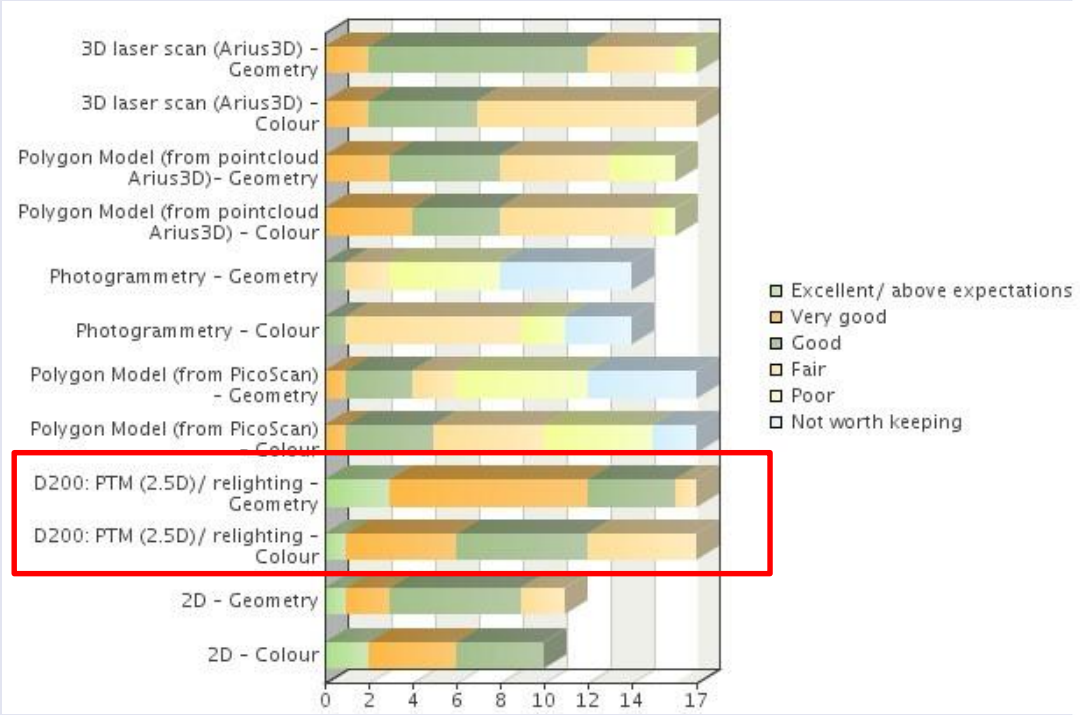
$$I = L(\Theta_i, \Phi_i, u, v)R(u, v)$$



Malzbender, T., Gelb, D. and Wolters, H. (2001) 'Polynomial Texture Maps', *Proc. SIGGRAPH*, **28**, 519-528.

Slide : Lindsay MacDonald

Beispiel Wandgemälde Fragment, Sherborne Abby



Painting Fragment of Sherborne Abbey (Cortauld Institute of Art): more information below.
Which of the images is giving the best representation of the object for use in condition reporting and to answer conservation questions?
Please consider the colour and geometry of the object. How well can the materials be recognized on the digital image?

„Site under construction..

Minidome

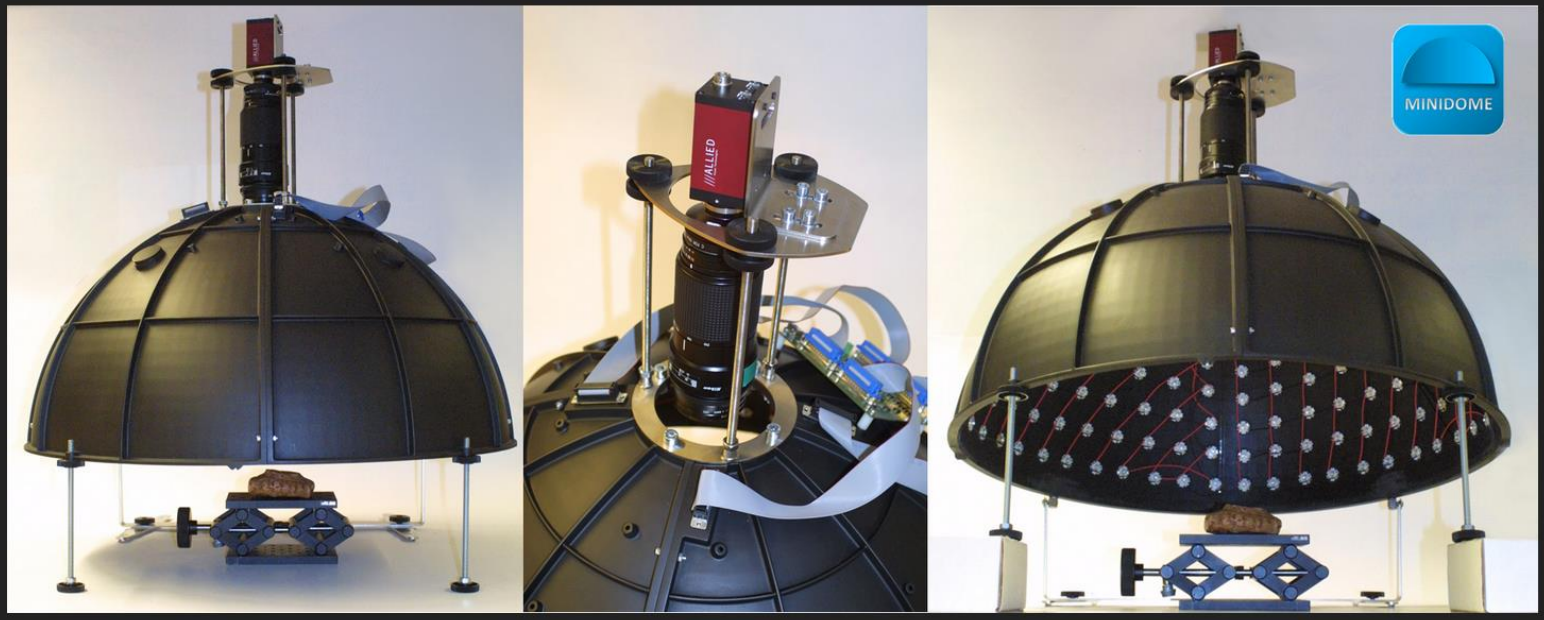
Home

Principle

The Minidome or Portable Light Dome is an automated 3D digitizing solution, developed by the computer vision group **VISICS** at KULeuven.

It consists of a small, light-weight dome of light sources and a digital camera. It can carry both SLR cameras as machine vision cameras. The approach is geared towards an easy-to-use, relatively inexpensive solution for virtually inspection of objects, where both the 2D aspect (color, intensity, or other representations through filtering and relighting) as well as the 2D+/3D aspect (by estimating the 3D surface characteristics are being considered. The **results** allow for photorealistic virtual re-lighting and non-photorealistic rendering of the objects in real-time through the use of programmable graphics hardware.

For portability, the device is built out of 4 identical parts, and is quickly deployable on-site. It allows a wide range of object sizes, with an easy calibration procedure one can switch easily between both macro as well as wide-angle digitization



The Minidome provides a flexible, cost effective alternative to the traditional scanning approach. And whereas the traditional techniques focus mainly on the 3D surface properties, a surface is not only characterized by it's 3D nature, but equally by it's color, reflectance properties, albedo, BRDF,.. The minidome is designed to deliver results on both sides, while at the same time optimizing ease of use and flexibility.

The current portable dome has a radius of 60~cm and is a discrete illumination hemisphere consisting of 260 white power LEDs positioned both on the knots and in the center of the edges. The LEDs are 5W Lambertian emitters (over a 120\degree angle), resulting in homogeneous illumination. Each LED can be individually lit and the corresponding images can be recorded by the camera mounted on top. The entire recording procedure is programmable and fully automatic.

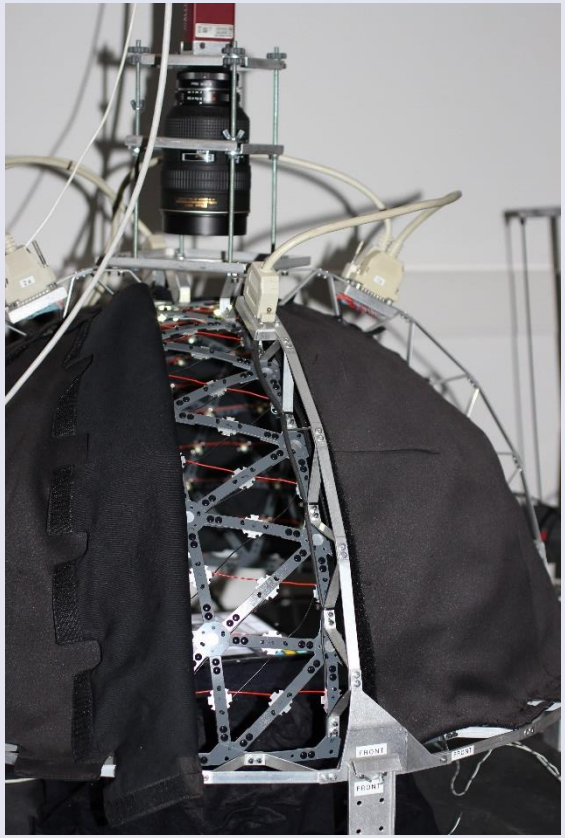
Contact: info@minidome.be

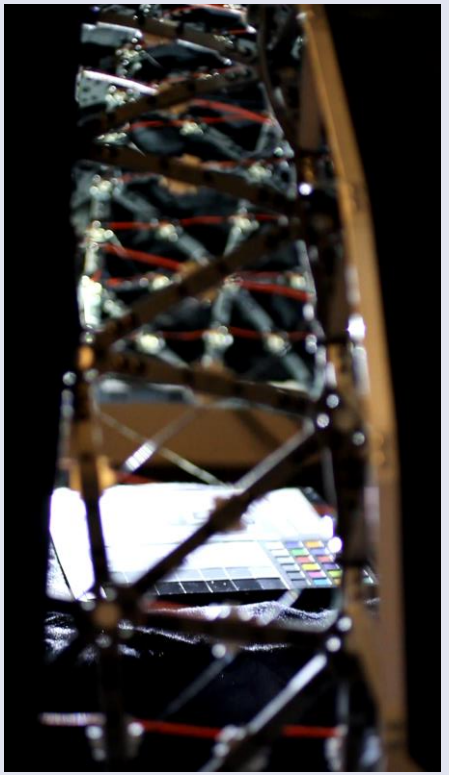
http://www.minidome.be/v01/home.php

Photometric stereo and an automatic dome – KU Leuven Minidome

- https://portablelightdome.wordpress.com/category/rich-illuminare/
- https://vimeo.com/175578404
- http://www.minidome.be/v01/home.php

Photometric stereo and an automatic dome – KU Leuven Minidome





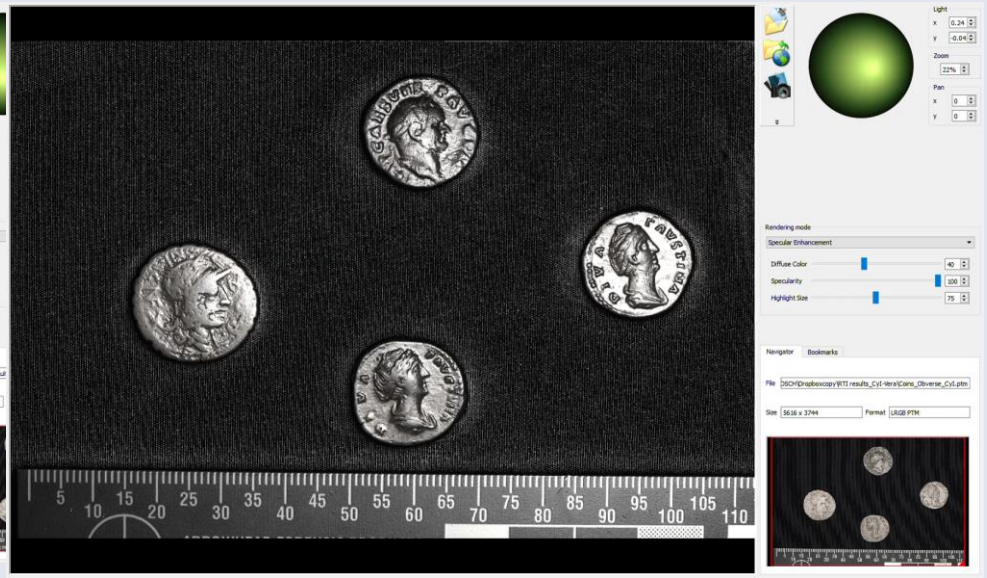
http://www.minidome.be/v01/viewer.php

PTM/ RTI in action

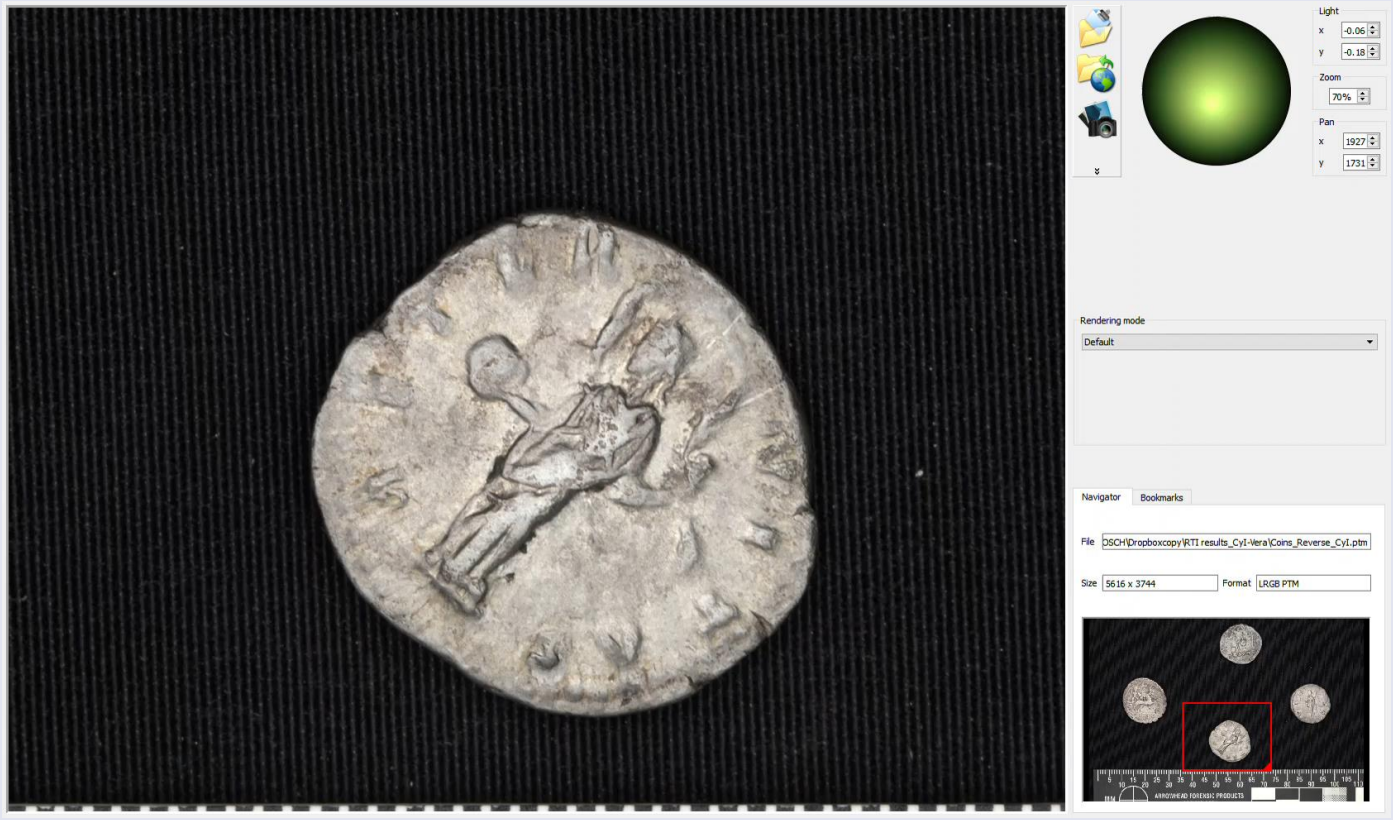
Universität Bamberg

The test objects for this study were two silver denarii (coins A and B) portraying Empress Favstina I, wife of Antoninus Pius, believed to be posthumous deification issues of 141 AD. The obverse of both coins shows the bust of the empress, facing right, with raised inscription DIVΛ FΛVSTINΛ. The portrayal on Coin A is rather more flattering to a lady who was famous for her beauty. The designs on the reverse faces are different: coin A shows Aeternitas (or perhaps Urania) holding a globe in her right hand, with palla billowing out around her head, and is inscribed ΛETER-NITΛS; coin B shows Vesta, holding the palladium in her right hand, sceptre in left, and is inscribed VES-TΛ. Each coin is approximately 17 mm in diameter and 1.5 mm thick.

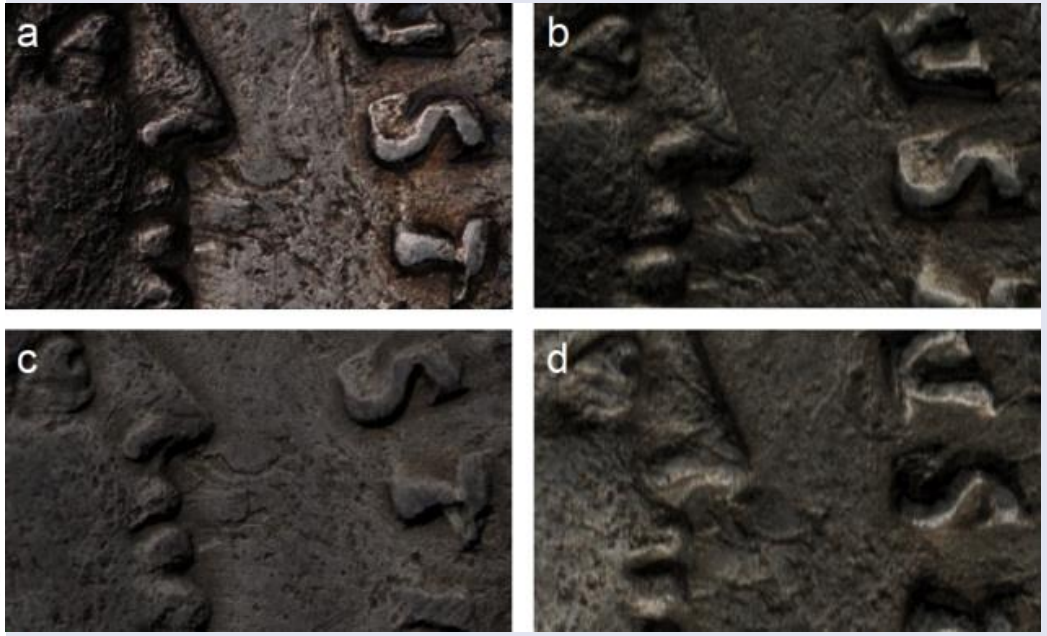
Link to Lindsay presentation



PTM/ RTI in action



RTI Kuppeln

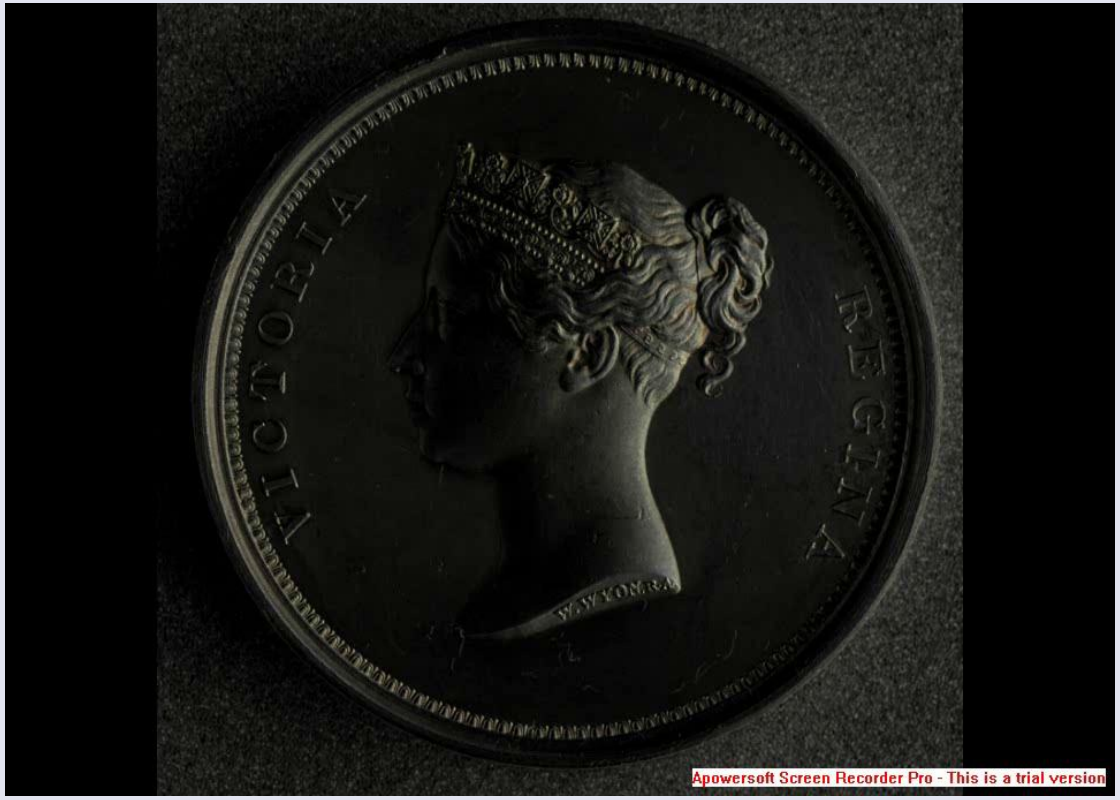


Coin B, obverse (detail). Sharpness. a) UCL dome; b) CyI dome; c) RBINS dome; d) Southampton dome.

Coin A, obverse (detail). a) RTI capture UCL dome; b) RTI capture CyI dome; c) RTI capture RBINS Minidome, albedo mode; d) RTI capture RBINS Minidome, ambient mode; e) RTI capture Southampton dome; f) Focus stacked picture.


THE BRITISH
POSTAL
MUSEUM
& ARCHIVE
Rendering mode
Specular Enhancement
Diffuse Colo 40
Specularity 70
Highlight Siz 75
Navigator
Bookmarks
File 'GeorgeVDie_1925.ptm
Size x 1761 Format B PTM

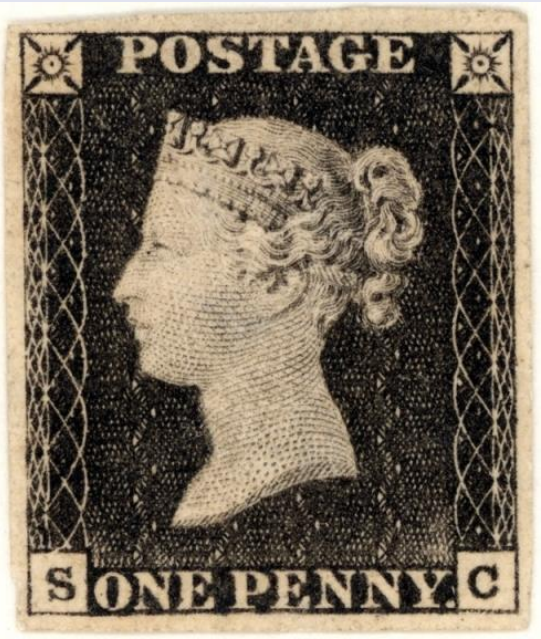
One of a kind

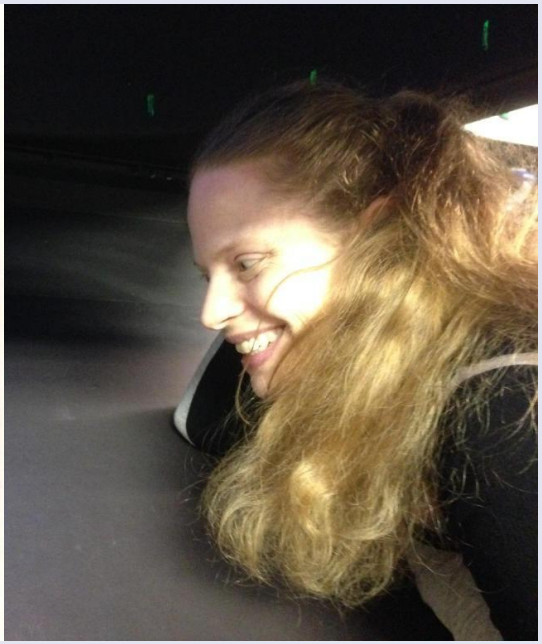


THE BRITISH POSTAL MUSEUM & ARCHIVE

BPMA, Wyon Medal, 1838

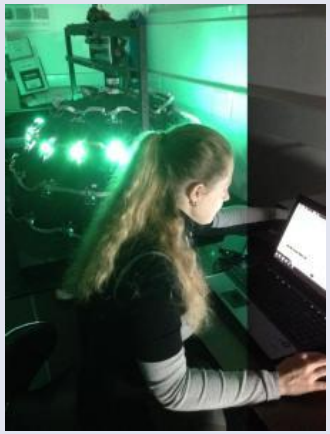
One of a kind





Old original' Penny Black Die, 1840

One of a kind



BPMA, Old original' Penny Black Die, 1840

One of a Kind


THE BRITISH
POSTAL
MUSEUM
&ARCHIVE
UCL ENGINEERING
Change the world
Mona Hess @Mona3Dimaging · May 1
In honour of 175year #PennyBlack anniversary I present detail of #RTI imaging of OldOriginal' with @postalheritage
Mona Hess

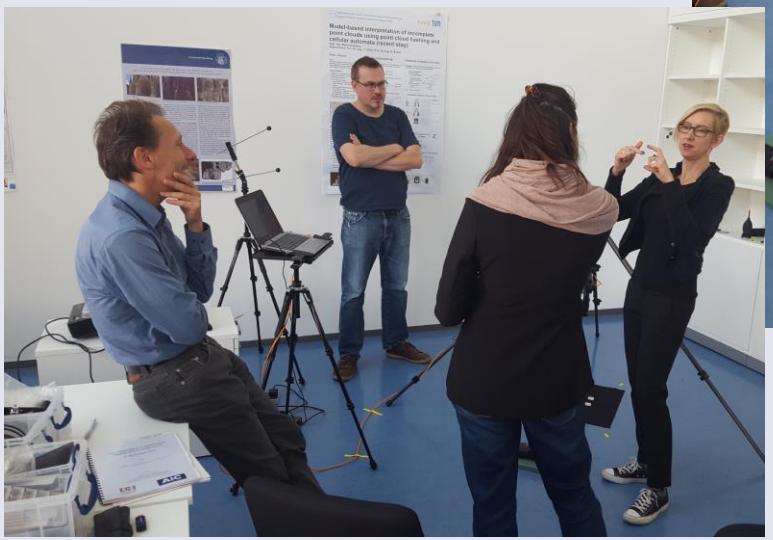
H-RTI

CulturalHeritageImaging CHI RTI Session

https://www.youtube.com/watch?v=zddxcSayxcg

Impressionen RTI Kurs Oktober 2019 mit Dr. Kathryn Piquette, KDWT

Universität Bamberg



H-RTI

- https://www.slideshare.net/dcsb/kathryn-piquette-u-of-cologne-the-herculaneum-papyri-and-greek-magical-texts-elucidating-ancient-writings-with-reflectance-transformation-imaging

Entwicklungspotenzial ?

- Farbkalibration ok, Detailtiefe sehr gut
- Messen im PTM/ RTI ?
- Stitching von Einzelbildern ?
- Reproduktion von Einzelaufnahmen
- Software Interface
- https://www.youtube.com/watch?v=G-1eWueAOzE

Weiterführende Literatur zum Thema RTI/PTM

- BASIS: Malzbender, T. et al. (2001): Polynomial Texture Maps. Online unter: http://www.hpl.hp.com/research/ptm/papers/ptm.pdf .
- Mudge, M. et al. (2006): New Reflection Transformation Imaging Methods for Rock Art and Multiple-Viewpoint Display. In: The 7th International Symposium on Virtual Reality, Archaeology and Cultural Heritage. Online unter: http://www.hpl.hp.com/personal/Tom_Malzbender/papers/CHI_VAST2006-final-.pdf .
- Piquette, K;(2016) Documenting Early Egyptian Imagery: Analysing past technologies and materialities with the aid of Reflectance Transformation Imaging (RTI).
- Piquette, Kathryn E. (2017): Illuminating the Herculaneum Papyri: Testing new imaging techniques on unrolled carbonised manuscript fragments. In: Digital Classics Online 4, S. 80–102.
- Hess M, MacDonald LW, Valach J (2018) Application of multi-modal 2D and 3D imaging and analytical techniques to document and examine coins on the example of two Roman silver denarii. Heritage Science 6:1–22 . doi: 10.1186/s40494-018-0169-2
- Weitere Quellen:
  - http://kathrynpiquette.blogspot.de/
  - http://culturalheritageimaging.org/Technologies/RTI/
  - https://portablelightdome.wordpress.com/category/rich-illuminare/

UV imaging

Romano-Egyptian cartonnage mummy mask in white light

Fitzwilliam Museum, E103a.1911

Slide by Dr Ruth Siddall, UCL

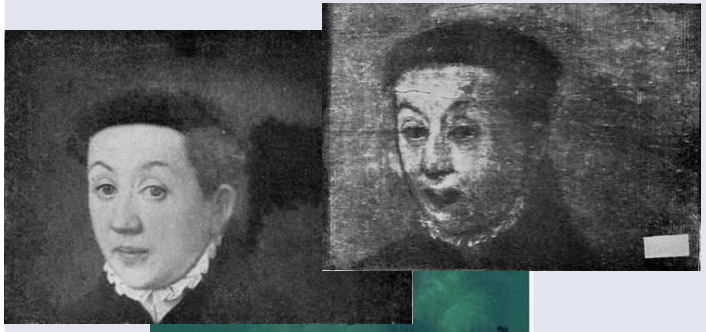
The same under UV light

Universität Bamberg

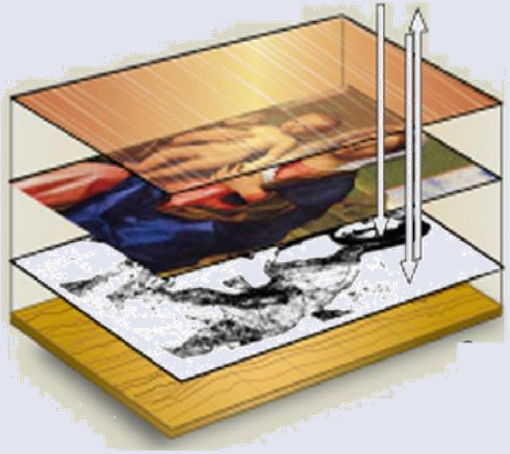
Fitzwilliam Museum, E103a.1911

Slide by Dr Ruth Siddall, UCL

Beispiel für Anwendung in der Konservierung Elektromagnetische Strahlung



UV Reflektografie



IR Reflektografie

Röntgendiagnostik

Visible induced luminescence imaging

- https://www.researchgate.net/publication/252245586_The_application_of_visible-induced_luminescence_imaging_to_the_examination_of_museum_objects
-
- Giovanni Verri, Cortauld Institute
- https://courtauld.ac.uk/people/giovanni-verri

Egyptian Blue

Synthetic - calcium copper silicate $(Ca,Cu)Si_4O_{10}$

Mineral Analogue: cuprorivaite (rare!)

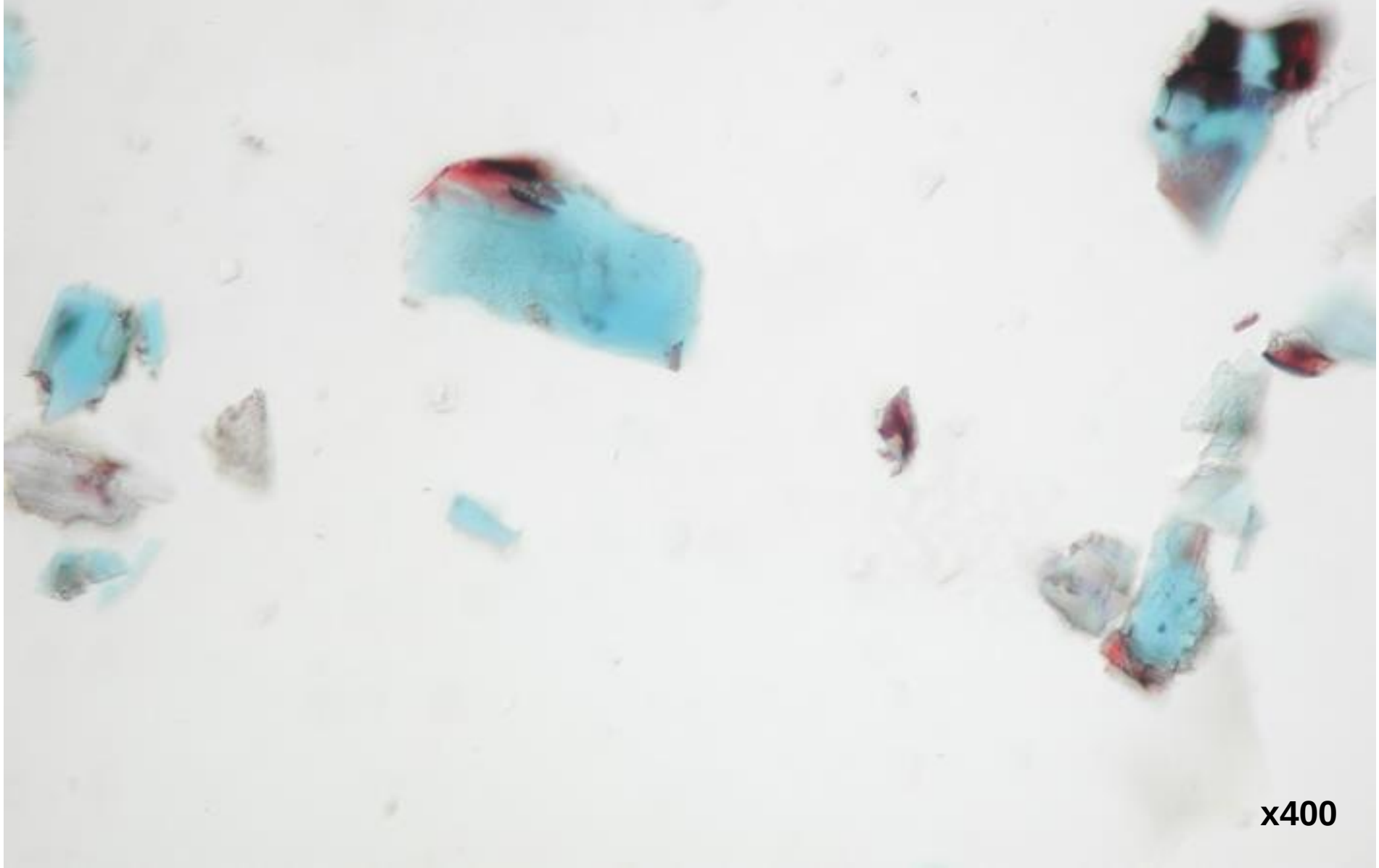
'Egyptian Blue', 'Vestorian Blue', 'Pozzuoli Blue'

- made since the early 3rd Millenium BC

- formed by heating $CaCO_3$ with copper (oxide, filings), quartz (sand, diatomite) + flux (natron, plant ash)

- @ T = 850-1000° C

Particles of Egyptian Blue with traces of the copper oxides cuprite and tenorite



x400

Egyptian Blue

YUAG 1936.45 Visible light, painted limestone relief depicting Maat. Vial of Egyptian blue pigment on the left. (photo credit: Jens Stenger)

YUAG 1936.45 Visible light-induced IR luminescence, painted limestone relief depicting Maat. Vial of Egyptian blue pigment on the left. (photo credit: Jens Stenger, Megan Salas)

https://ipch.yale.edu/news-events/ancient-pigment-new-discoveries-egyptian-blue

Multispectral imaging

— Checking potential samples for the project with Alice Stevenson (Petrie Museum-UCL) and Kathryn Piquette (UCL) at the Petrie Museum, London.

Multispectral imaging

- Low cost https://chsopensource.org/multispectral-imaging-msi/
- Filters change: MacDonald L, Giacometti A, Campagnolo A, Robson S, Weyrich T, Terras M, Gibson A (2013) Multispectral Imaging of Degraded Parchment. In: Tominaga S, Schettini R, Trémeau A (eds) Computational Color Imaging. Springer Verlag, Berlin, Heidelberg, pp 143–157, https://link.springer.com/content/pdf/10.1007%2F978-3-642-36700-7_12.pdf
-
-

Fig. 3. Copystand with four tungsten-halogen lamps for reflective imaging of samples with the Nikon D200 camera. The filter is screw-mounted into the front of the lens.

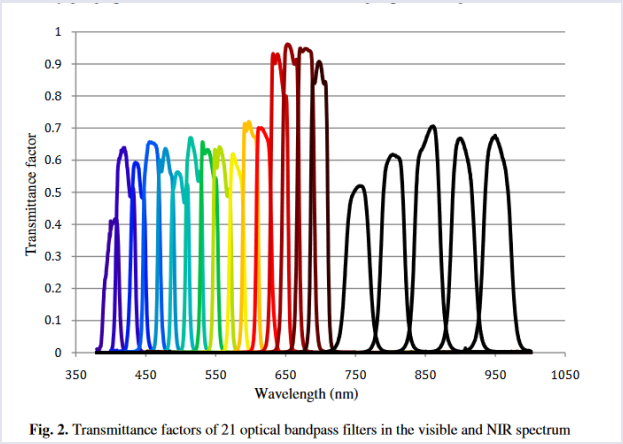
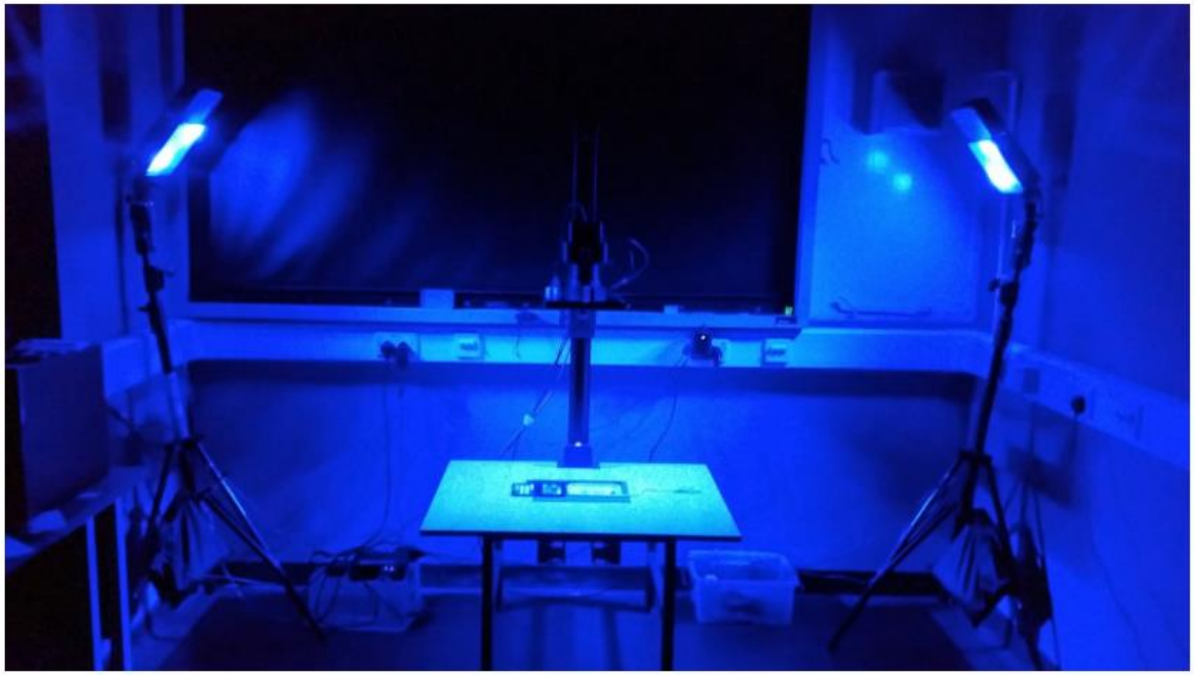


Fig. 2. Transmittance factors of 21 optical bandpass filters in the visible and NIR spectrum

Multispectral imaging

https://www.ucl.ac.uk/dh/consulting/advanced-imaging-consultants http://rbtoth.com/index.html

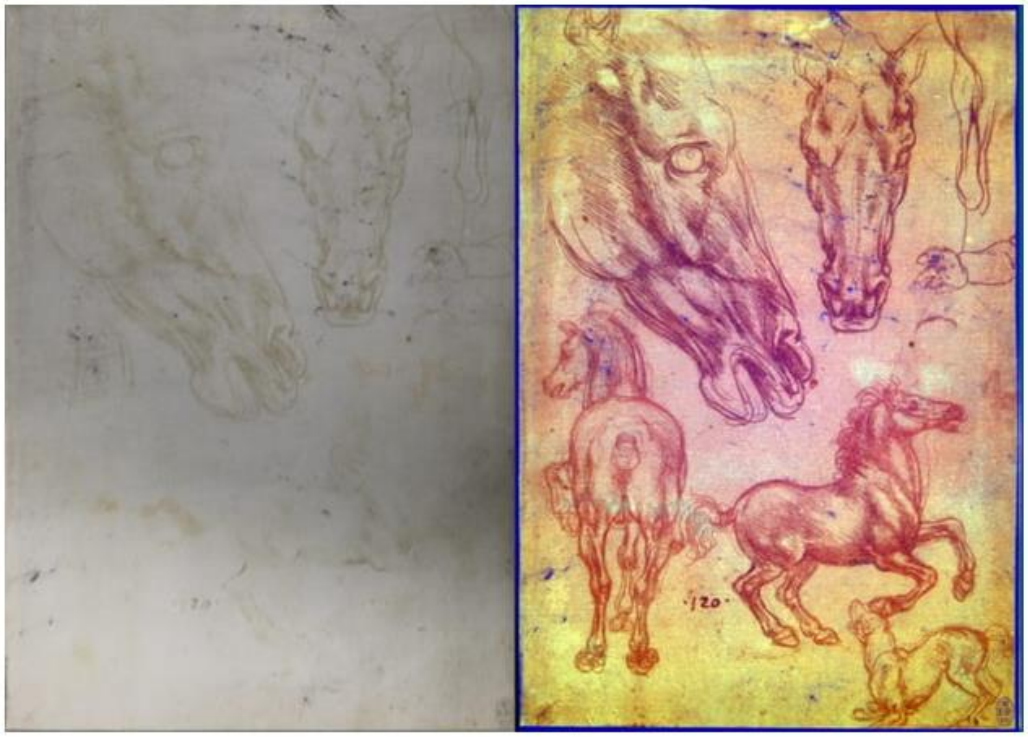


Spectral Imaging system, UCL Multi-Modal Digitisation Suite

Multispectral imaging https://www.ucl.ac.uk/dh/consulting/advanced-imaging-consultants

Manuscript detail (Latin 4, folio 1, verso). Left: RGB image; Right: Multispectral false colour image. Courtesy UCL Library Special Collections

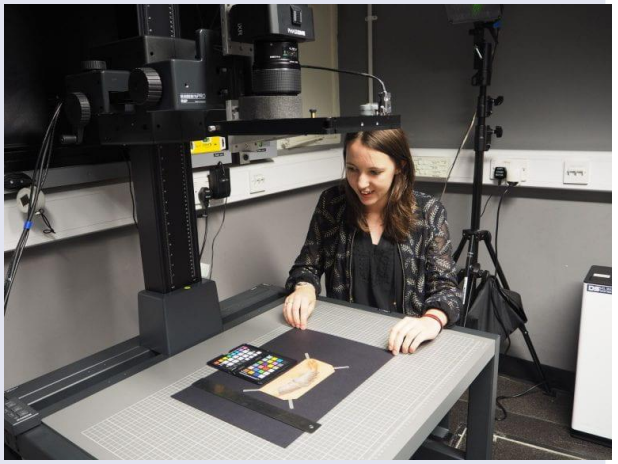
Multispectral imaging of DaVinci



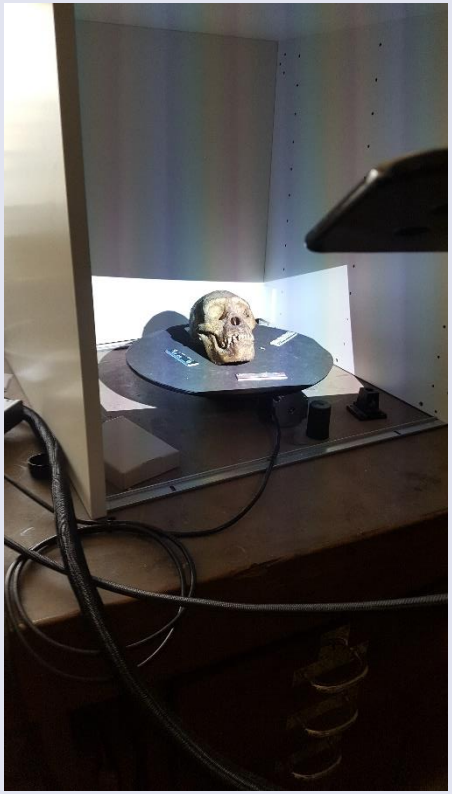
'Studies of horses and horses' heads' illuminated under visible light (left) and after multispectral imaging (right). The two horses and dog at the bottom of the page cannot be seen using the human eye alone. (Image copyright: Queen Elizabeth II, Moral rights: Cerys Jones)

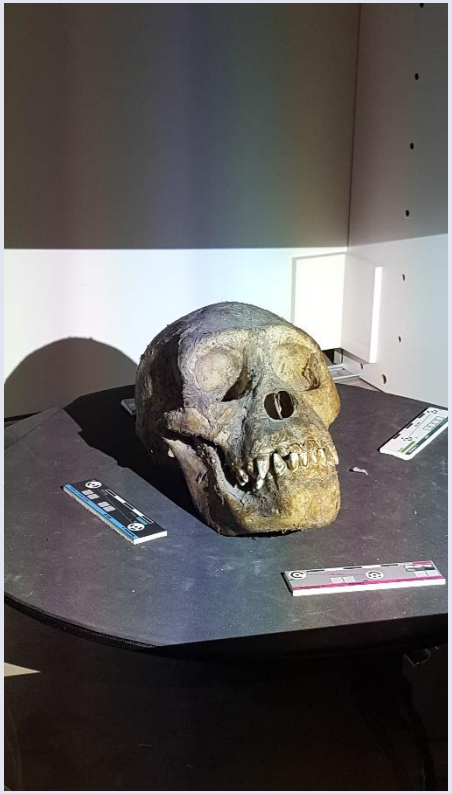
http://www.seaha-cdt.ac.uk/2019/02/cerys-jones-work-published-in-new-book-on-leonardo-da-vinci/

'Studies of horses and horses' heads' created circa 1481. https://blogs.ucl.ac.uk/researchers-in-museums/category/c-e/cerys-jones/

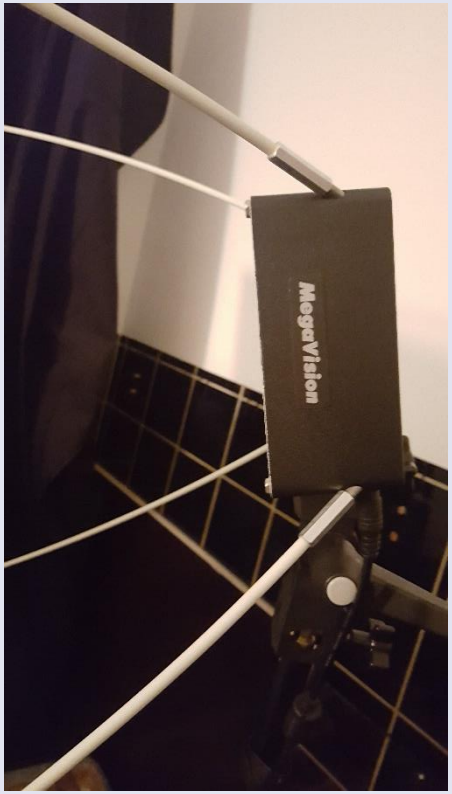


Multispectral imaging :Setup RBINS





Multispectral imaging :Setup RBINS



Multispectral imaging :Setup RBINS

Hyperspectral imaging

- https://www.ucl.ac.uk/bartlett/heritage/sites/bartlett/files/charles_willard.pdf