



Einführung Digitale Denkmaltechnologien Vorlesung Technische Photographie

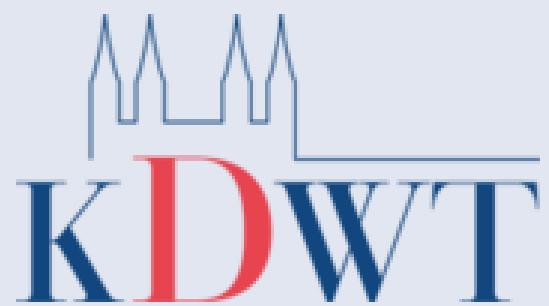
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Twitter: @Mona3DImaging



Institut für Archäologische
Wissenschaften,
Denkmalwissenschaften
und Kunstgeschichte



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

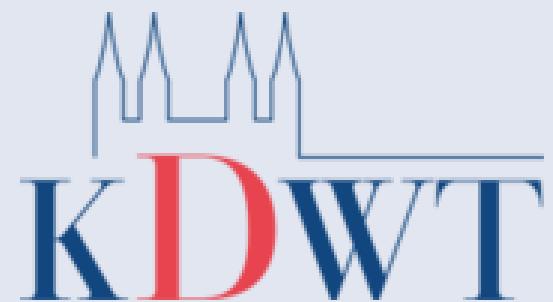
1. Technische Fotografie
 1. Museumsfotografie
 2. Technische Ausstattung
 3. Massendigitalisierung
 4. Fallstudie 3DBox
2. Reflectance Transformation Imaging
3. IR/UV Fotografie > Multispektrale Dokumentation



Technische Fotografie



Institut für Archäologische
Wissenschaften,
Denkmalwissenschaften
und Kunstgeschichte



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>



2+3D Photography – Practice and Prophecies - 2017

On 10, 11 and 12 May 2017 the Rijksmuseum organized, in cooperation with AHFAP, an international conference on 2D and 3D digital photography, best practices, standardized workflows and a variety of applications for cultural heritage photography professionals: photographers and studio managers.

"Thanks to this conference I'll soon be abreast of what my colleagues are doing in the field."

Heleen van Driel, Van Gogh Museum



2+3D PHOTOGRAPHY PRACTICE AND PROPHECIES

The aim of this conference is to provide a framework for international compatibility on the best practice methods for digitizing our heritage. As with the 2015 2+3D conference, it will give us a unique opportunity to exchange ideas on how we could meet the challenges that lie ahead in our industry. Discussions on how we can incorporate new techniques into international standards of practice will undoubtedly take place. There will be a wide variety of presentations given on the two conference days, and on 12 May workshops that address the topics we will have covered will also be scheduled along with a lot of studio practice.

If you missed the 2015 2+3D conference, then you will not want to miss the second edition in 2017 which will be held once again at the Rijksmuseum Amsterdam. Here you will be able to meet up with old friends and fellow cultural heritage image professionals who work in a variety of art institutions from around the world.

The two conference days comprise a program filled with speakers presenting the latest

2+3D Photography

- > [Introduction by Cécile van der Harten](#)
- > [Abstracts, Workshops & Biographies](#)
- > [Manual for the photography of 3D objects](#)
- > [Pushing the boundaries of image processing and visualization for cultural heritage](#)
- > [A new target with a new approach for the photography of three dimensional objects](#)
- > [Impressions](#)

Information about the 2015 Conference



2+3D Photography – Practice and Prophecies - 2019

The Rijksmuseum and the Association for Historical and Fine Art Photography (AHFAP) organizes the third 2+3D Photography 8-10 May 2019.

Register now **Symposium tickets**

The second edition of the 2and3D Photography conference in 2017 demonstrated how important it is to create a meeting place for the international heritage photography community. In a time when technological digital developments change rapidly, it is essential to have a platform where we can exchange knowledge and ideas. 2and3D Photography provides this platform and distinguishes itself from other conferences by exclusively focusing on the cultural heritage image professional, for and by people active in the field.

As with the 2015 and 2017 2and3D conferences, the 2019 conference will give us a unique opportunity to exchange ideas on how we could meet the challenges that lie ahead in our industry. Discussions on how we can incorporate new techniques into international standards of practice will undoubtedly take place. The three conference days comprise a program filled with speakers presenting the latest photographic techniques and applications, 2D and 3D color management, standardized workflows, DAM systems, and studio management. On 10 May workshops that address the topics we will have covered are also going to be scheduled along with a lot of studio practice. As in our previous editions there will be an inspiration market with innovative companies displaying the latest developments in our field.

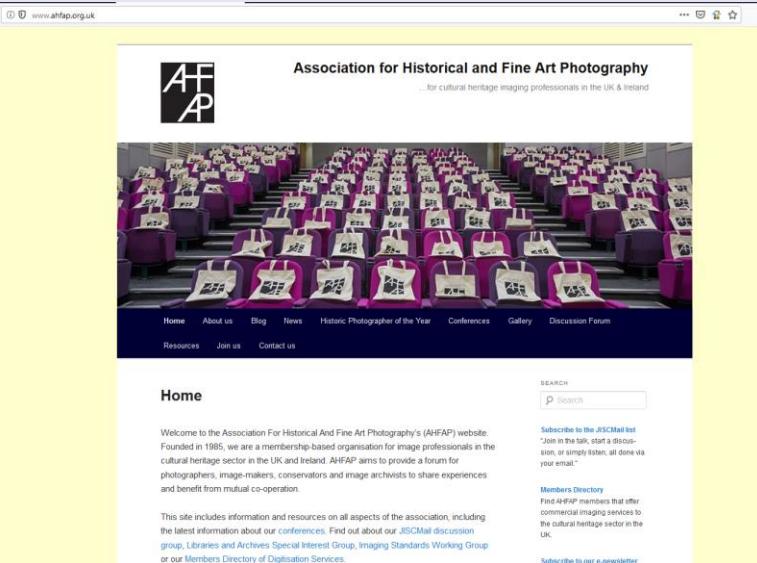
2+3D Photography

- > [Workshop overview](#)
- > [Manual](#)
- > [2015 conference](#)
- > [2017 conference](#)

Stay informed

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Berufsverbände von Museumsfotografen



Association for Historical and Fine Art Photography
for cultural heritage imaging professionals in the UK & Ireland

Home About us Blog News Historic Photographer of the Year Conferences Gallery Discussion Forum

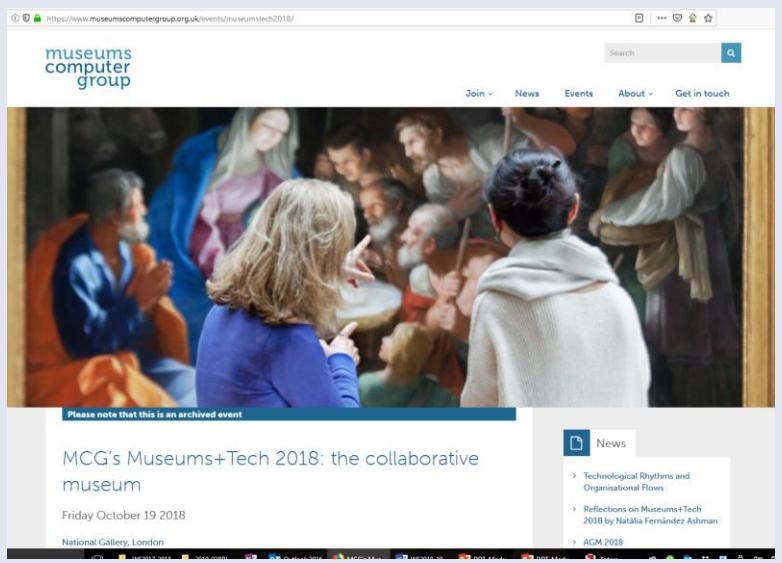
Resources Join us Contact us

SEARCH Search

Subscribe to the JSCMail list
"Join in the talk, start a discussion, or simply listen all done via your email."

Members Directory
Find AHFAP members that offer commercial imaging services to the cultural heritage sector in the UK.

Subscribe to our e-newsletter



museums computer group

Join News Events About Get in touch

Please note that this is an archived event

MCG's Museums+Tech 2018: the collaborative museum

Friday October 19 2018

National Gallery, London

News

- > Technological Rhythms and Organisational Flows
- > Reflections on Museums+Tech 2018 by Natalia Fernández Ashman
- > AGM 2018

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>

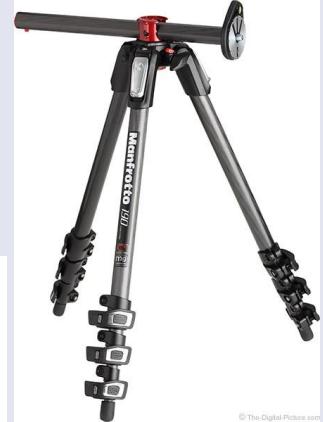


Wir haben Kameras und Objektive. Was brauchen wir noch?

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>



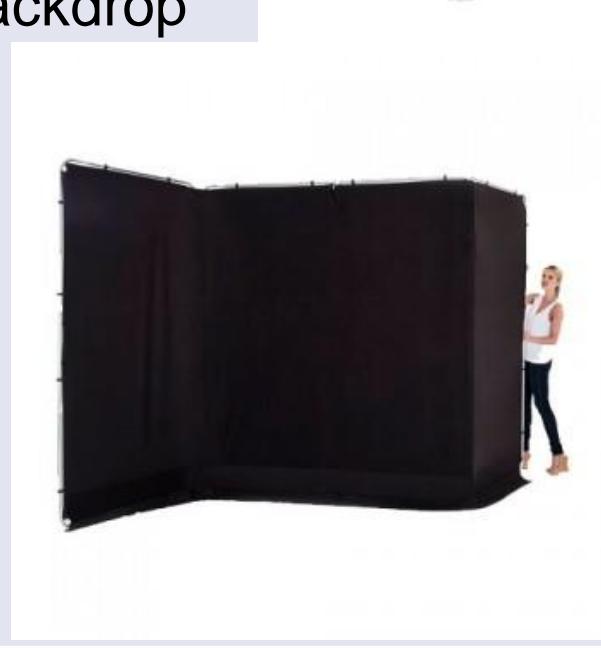
Light tent / Lichtzelt

- Low: included in kit
- Moderate ($1 \times 1 \times 1$ 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





Robotische Fotografie



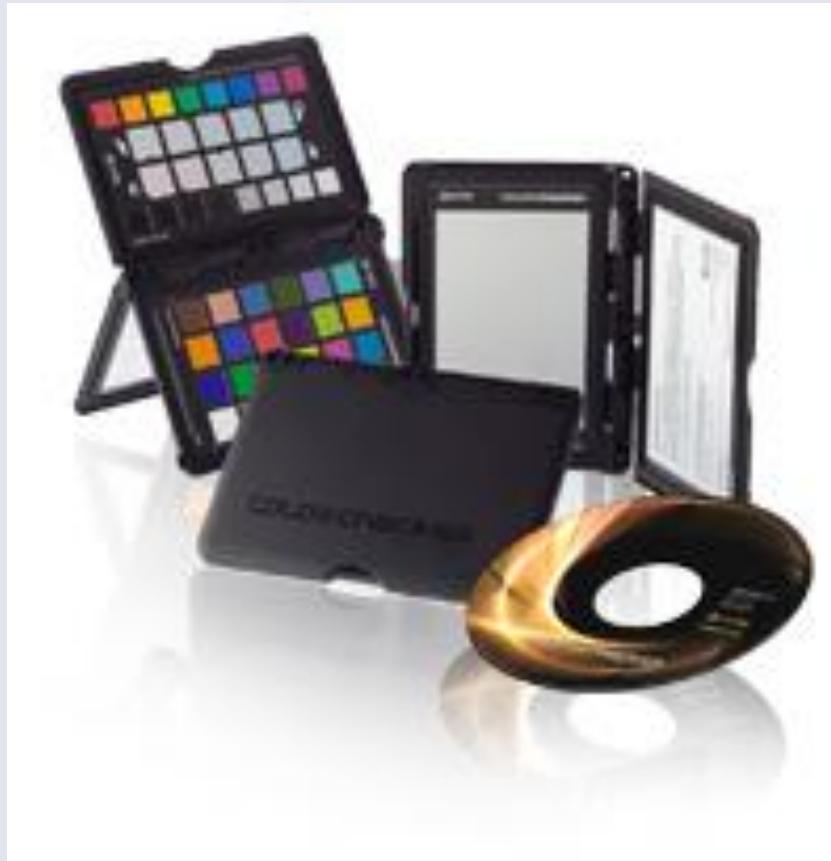
Farbkarten/ Referenzmasstab



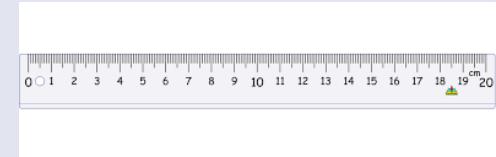
- The KODAK Gray Scale is a quality-control device that helps:
 - Compare tone values of reflection copy with its reproduction
 - Find the correct exposure and processing conditions
 - Balance negatives and positives in a color reproduction process
 - Plot tone reproduction curves

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

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

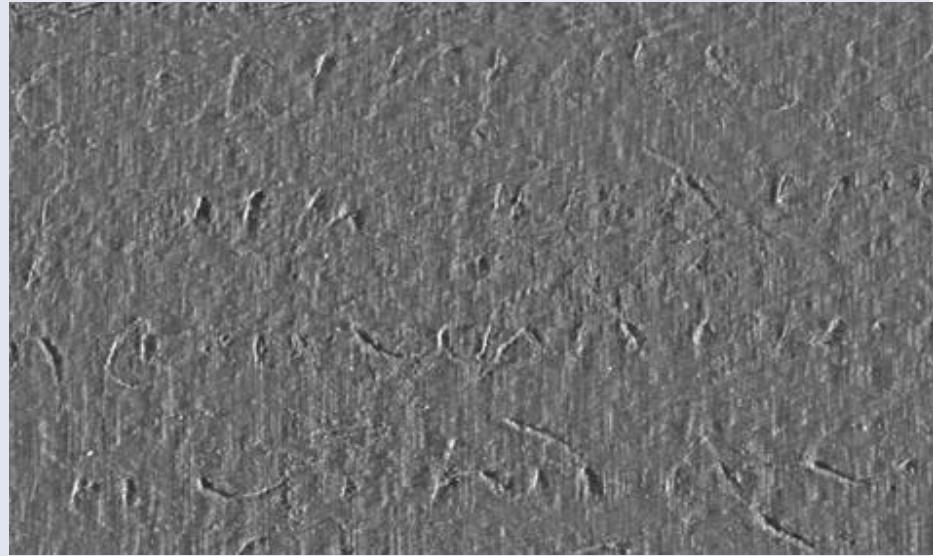


Image processing: woodgrain removal -1

Original image



After woodgrain removal

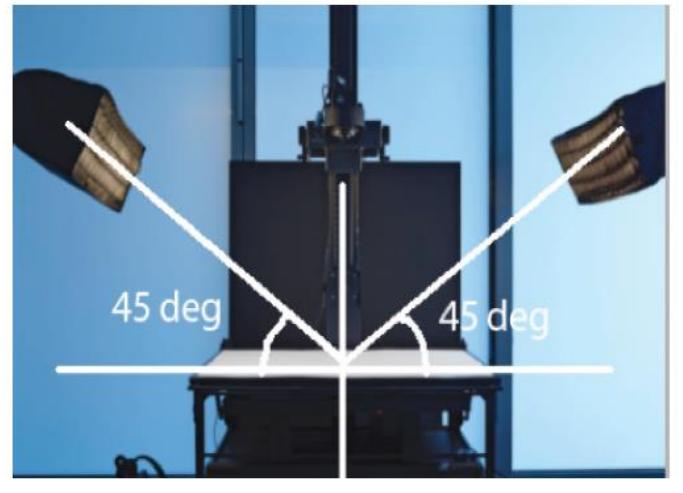
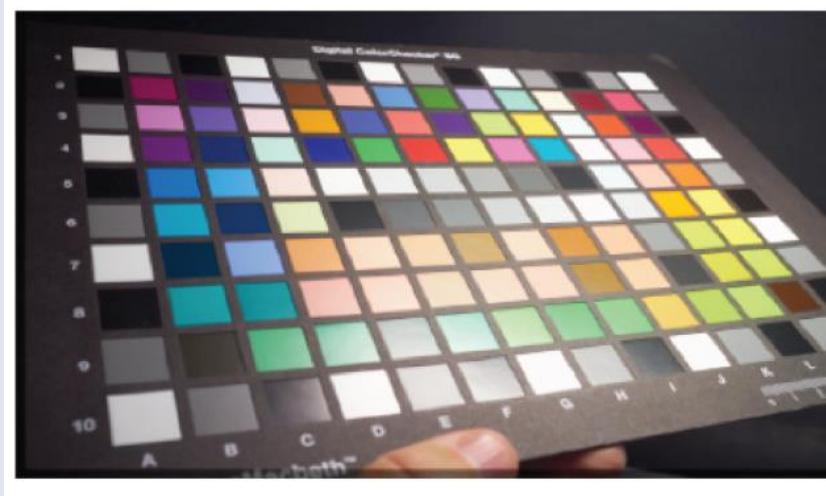


With thanks to Dr Segolene Tarte, eSAD project, OeRC

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





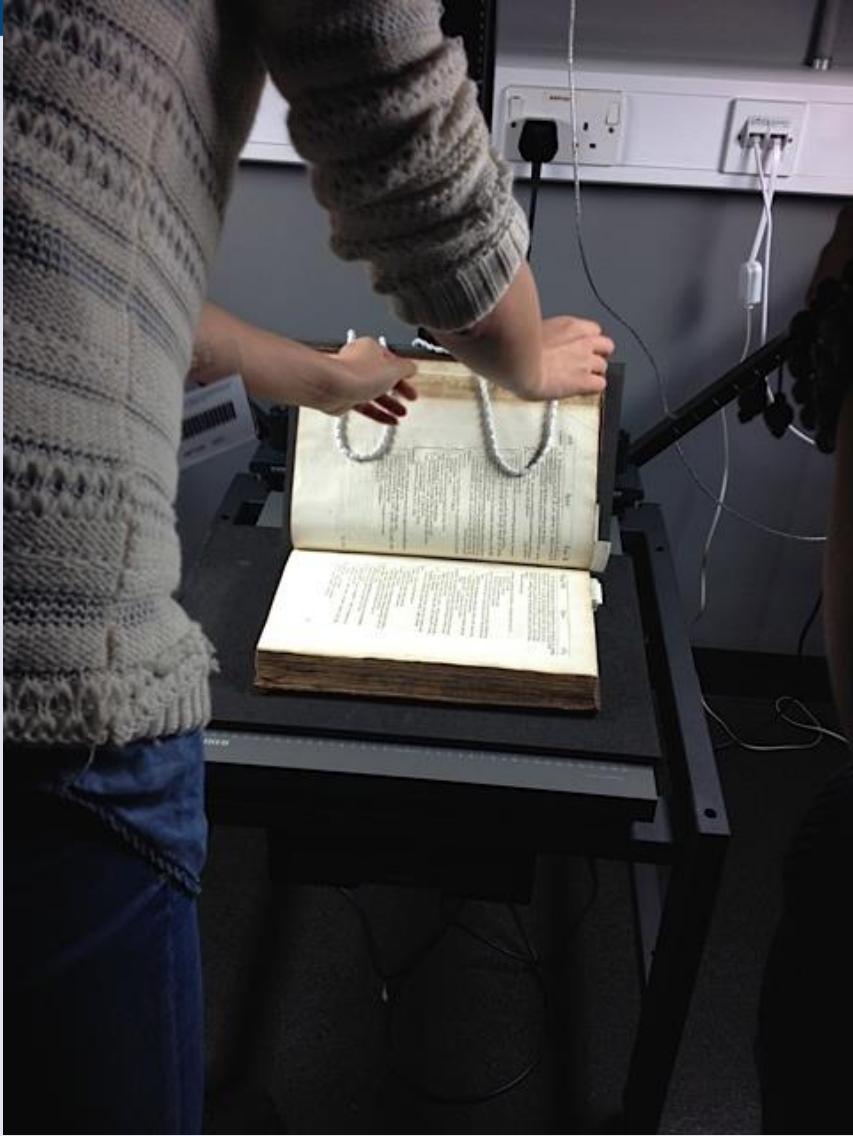
For those interested in this subject and who use Capture One there's a Colour Reproduction Guide on our CH page:

<http://bit.ly/2CWm2iM>

Multi-Modal Digitisation Suite

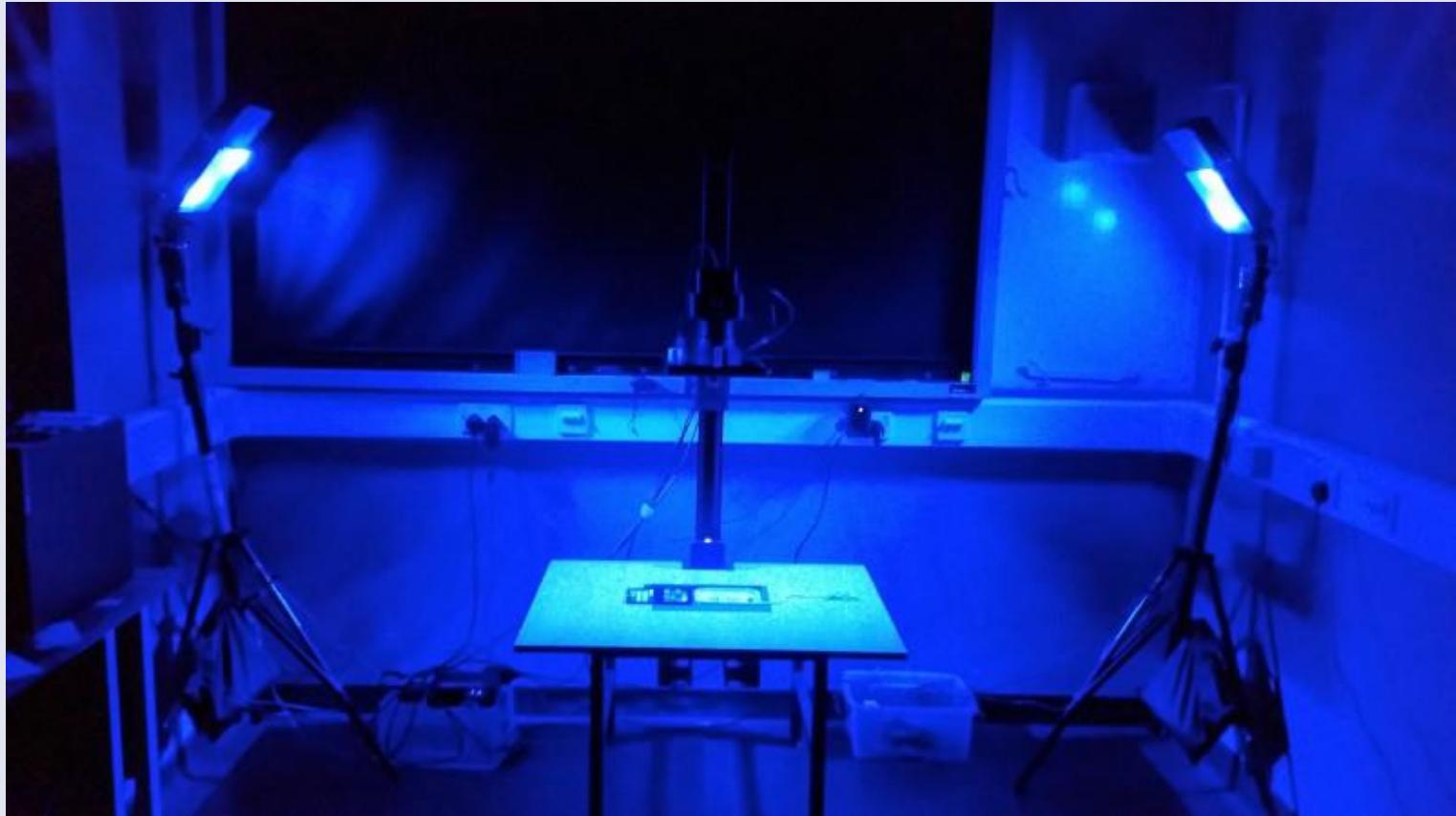


[https://www.
ucl.ac.uk/dh/
facilities/digit
isation-suite](https://www.ucl.ac.uk/dh/facilities/digitalisation-suite)





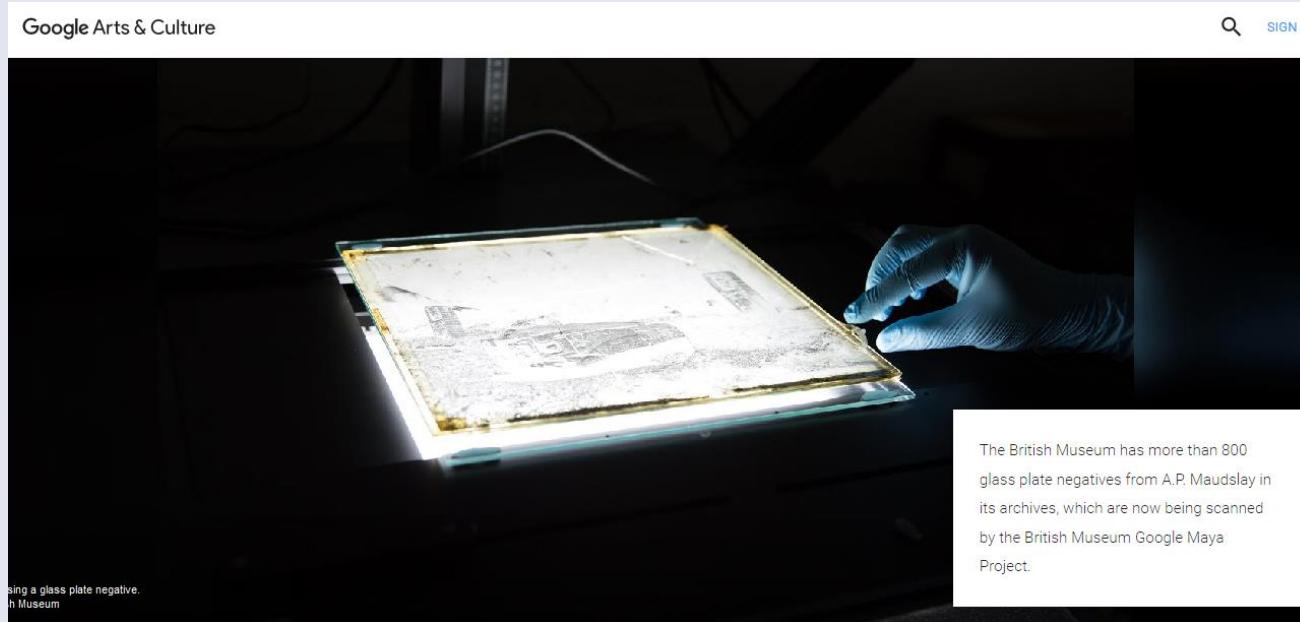
Multispectral imaging (UCL/ Kathryn Piquette)



<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)

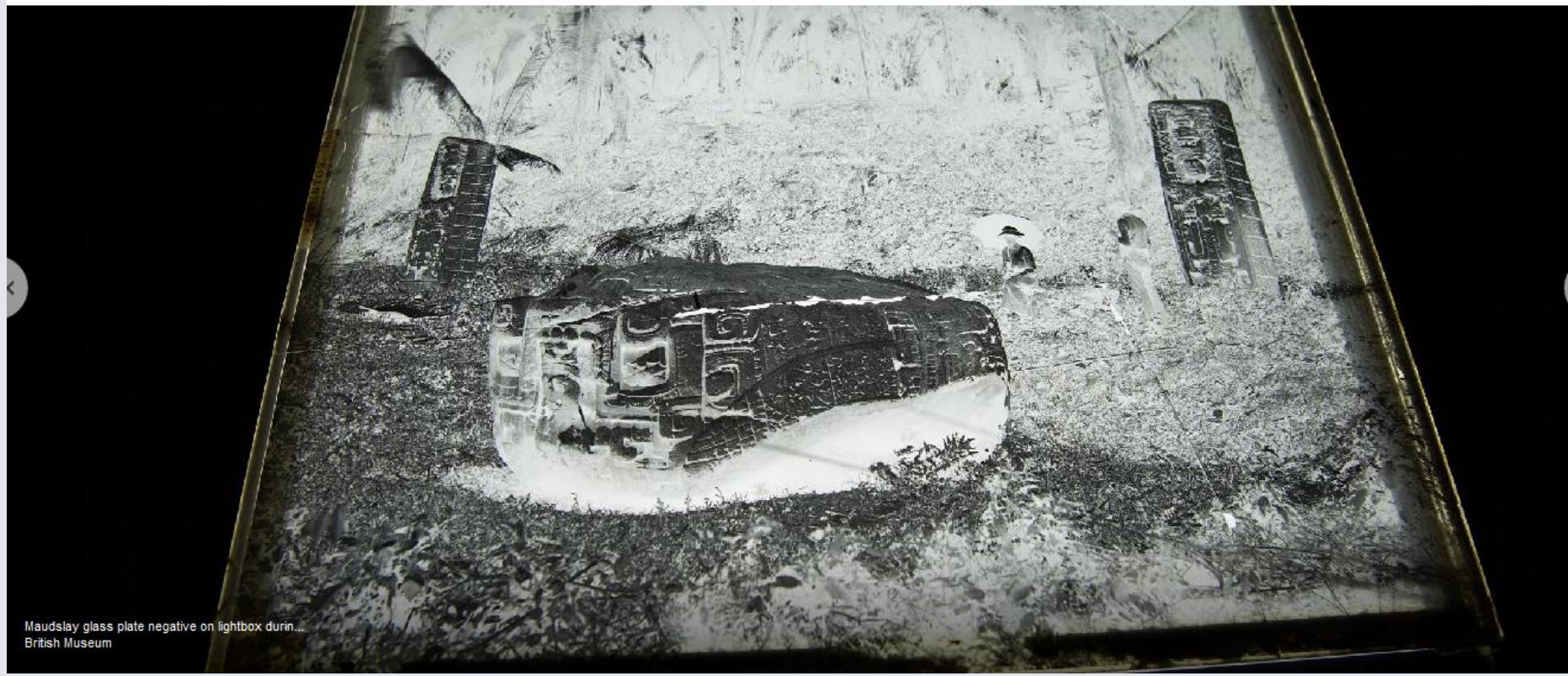


Auflicht/ Durchlicht, Glasnegativ

← Google Arts & Culture



SIGN IN



Maudslay glass plate negative on lightbox during...
British Museum

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)

The Effect of White Balance



The only difference between these images is the applied white balance.

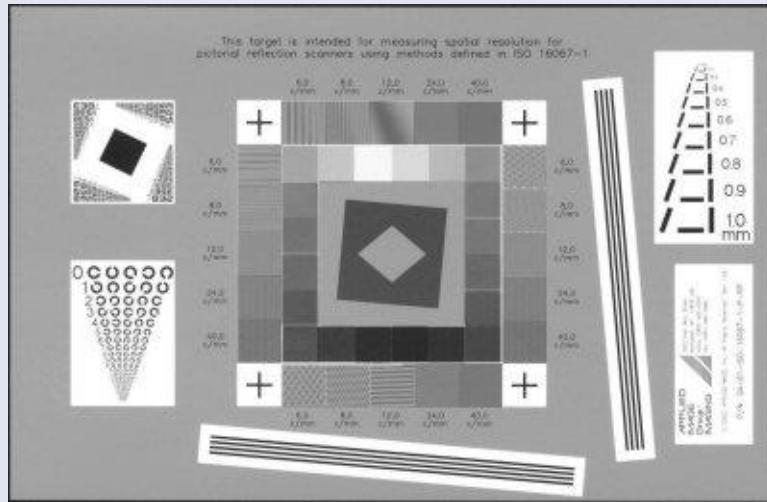
Farbtafel (früher Gretag Macbeth ColorChecker , jetzt X-rite) (> Modul 4)

No.	Number	sRGB			CIE L*a*b*			Munsell Notation Hue Value / Chroma	
		R	G	B	L*	a*	b*		
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 /



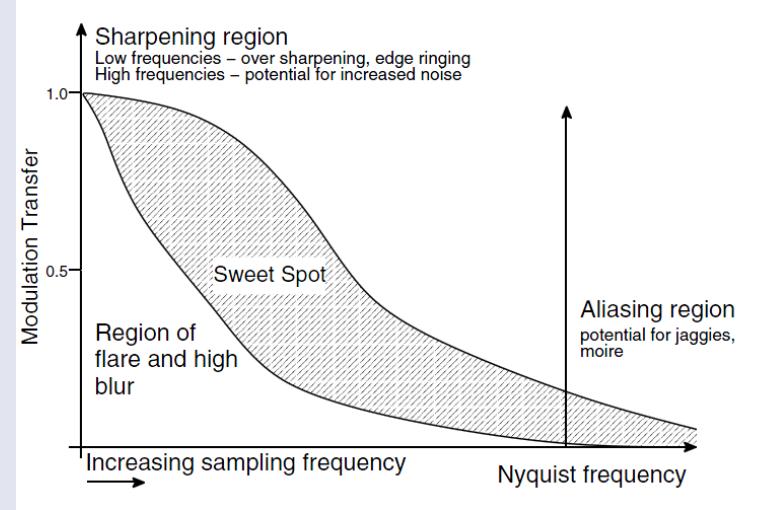
Spatial Resolution / Räumliche Auflösung

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/ikI2PCIWMIM>
- 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>

 Smithsonian Institution Archives

Collections What We Do Smithsonian History ABOUT BLOG PRESS DONATE 

Digitizing Collections

What We Do

- Reference
- Rights and Reproduction
- Records Management
- Preservation
- Digital Curation**

 - Digitizing Collections
 - Preservation Strategies
 - Electronic Records History
 - Preservation Formats
 - Challenges and Solutions
 - Digital Video
 - Web and Social Media

- Project Highlights

 - Digital Preservation Working Group
 - Born Digital Collections Survey
 - Email Preservation

- Forums
- Publications & Resources



Digitalization specialist, Kira Sober, in the Archives' digitization lab, 2017.

In order to broaden access to the Archives' collections, and reduce the impact of frequent handling, the Archives is digitizing its most valuable and used collections. High-resolution surrogates of the Archives' digitized collections are created and available online for researchers, scholars and the public to view, and download for personal and educational purposes. A portion of our digitized holdings are placed in the Smithsonian Transcription Center where volunteers help to transcribe these original, handwritten documents online.

Digitization Standards

The materials in the Archives' collections vary in fragility, such as letterpress from the 1850's, glass plate negatives from the early 20th century, and videotape from the 1970s. The handling and light necessary for digitization contribute to the wear and tear of collections. For video and audio material, tapes that are brittle or suffer from "sticky shed" syndrome may not survive multiple playbacks. Therefore the Archives employs digital curation methodologies and standards to avoid repeated digitization. The outcome are high resolution images, audio, and video in preservation quality digital file formats. The Archives' metadata standards ensure descriptive and technical characteristics are noted in its collection management system and embedded in the surrogate files as appropriate. Access derivatives are created from the digital preservation masters to fulfill reference requests and public interest.

Digitization Specifications

- Images: 6,000 pixels along the long axis (minimum 600 ppi), RGB un-compressed TIFF format
- Audio: Uncompressed Broadcast Wave Format (BWF, WAV), 16 bit depth, sampling rate of 96 kHz or 44.1 kHz for spoken word

British Library Digitisation

<https://www.bl.uk/digitisation-services>

- Film Digitisation Services
- [https://youtu.be/Dbusabv
BaEM](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





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
<u>Camera</u>	
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	



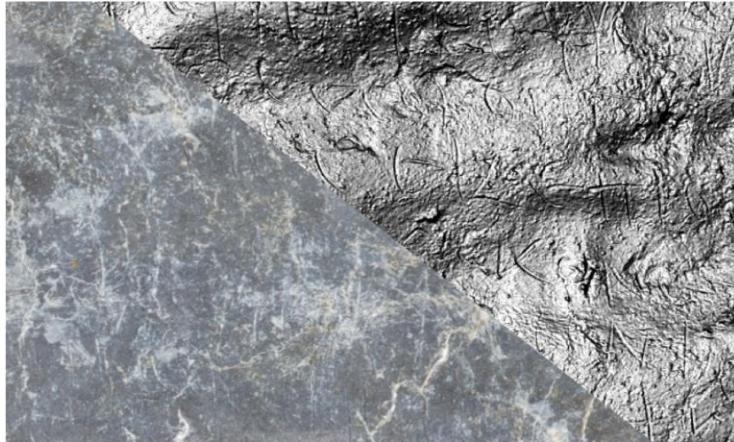


RTI/ H-RTI / PTM IR/ UV/ Multispektral

Weitere digitale fotografische Methoden mit
Anwendungen im Bereich Denkmalpflege und
Kulturgüterschutz

Reflectance Transformation Imaging

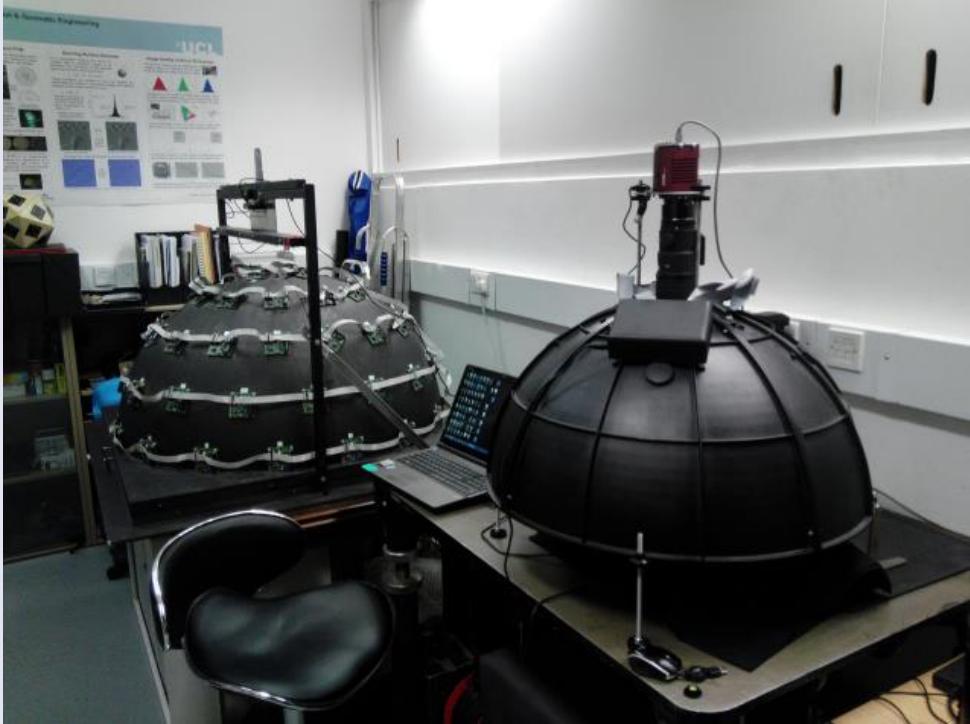
We offer both custom RTI services and [training](#). Reflectance Transformation Imaging (RTI), also known as Polynomial Texture Mapping (PTM), is a high-resolution, non-invasive and non-destructive imaging technique for documenting fine surface details. Unlike conventional photographs, images created 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.

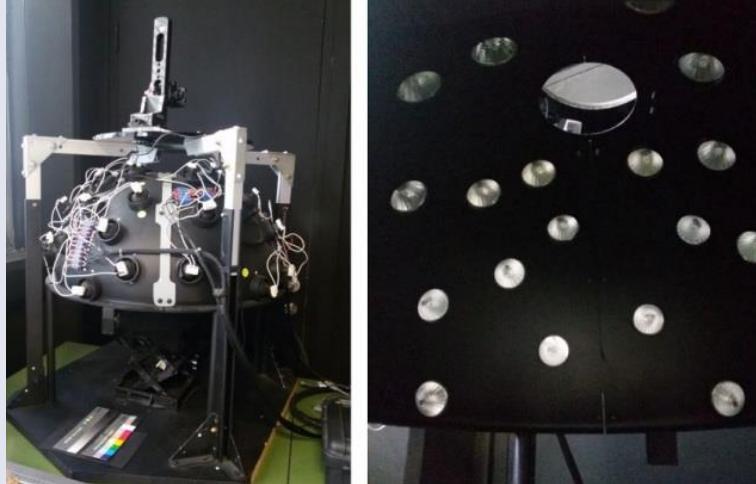
What is RTI and H-RTI? PTM?

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



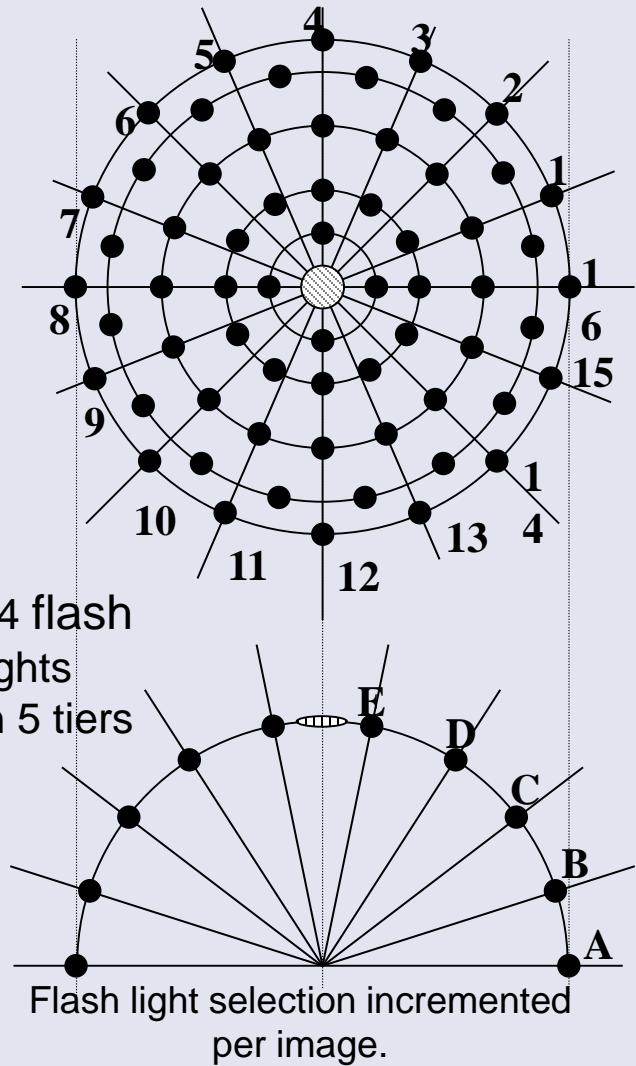
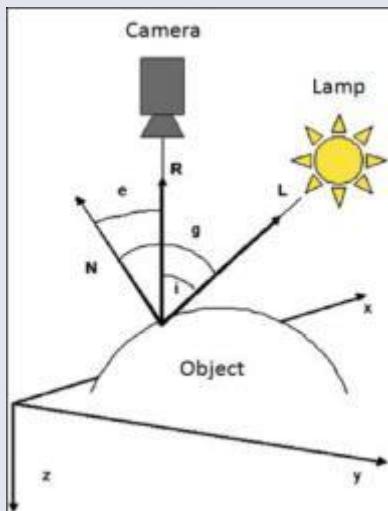
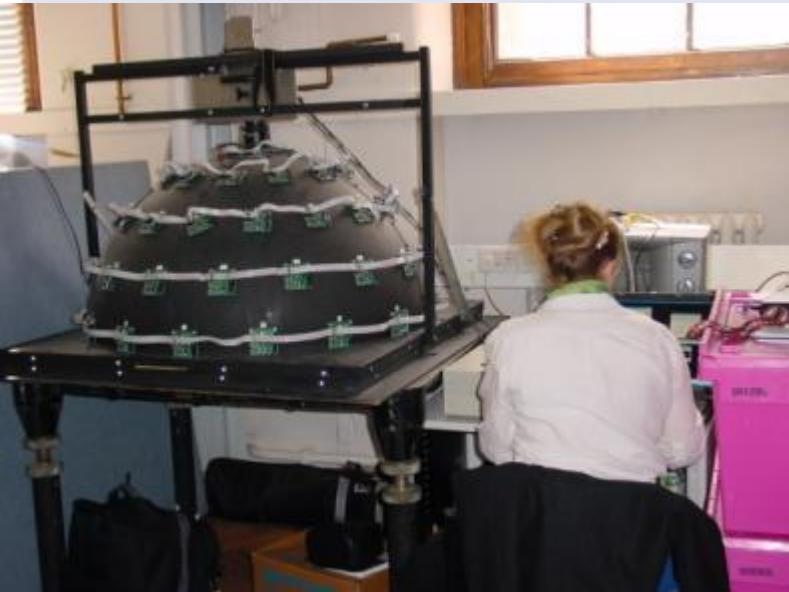
Part of the COSCH Eu-Cost project

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

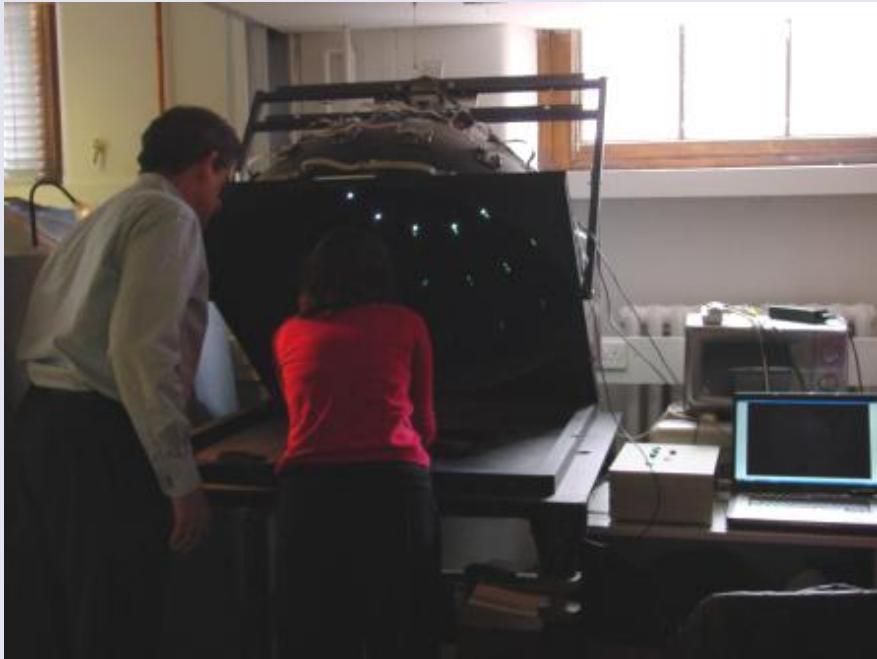


Polynomial Texture Mapping

Graphics courtesy
Lindsay MacDonald



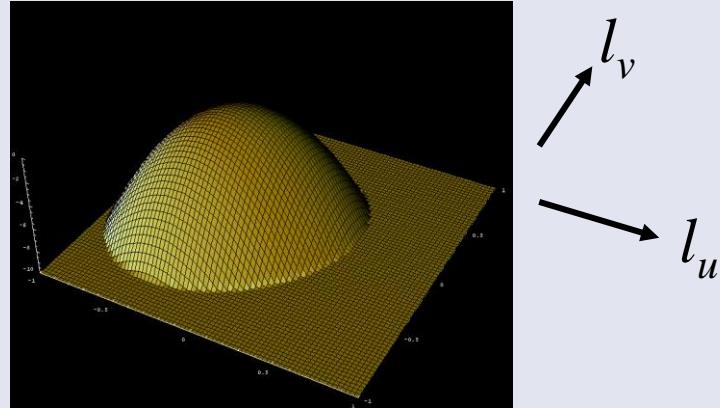
Polynomial Texture Mapping Beispiel



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

Question 7

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?

Levels

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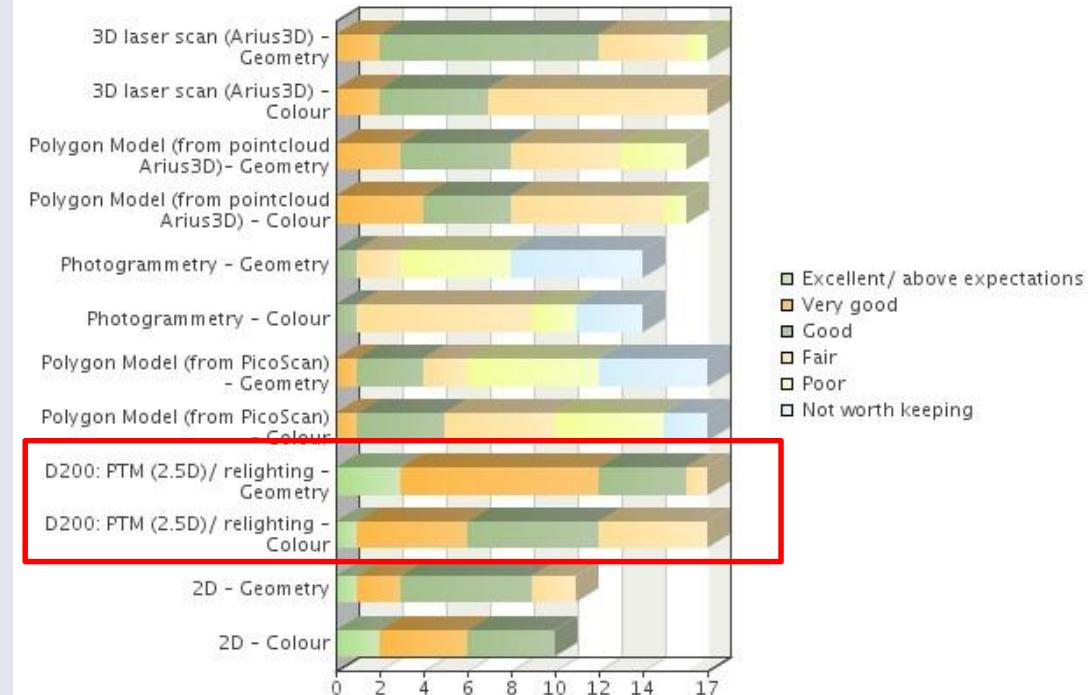
Beispiel Wandgemälde Fragment, Sherborne Abby



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?

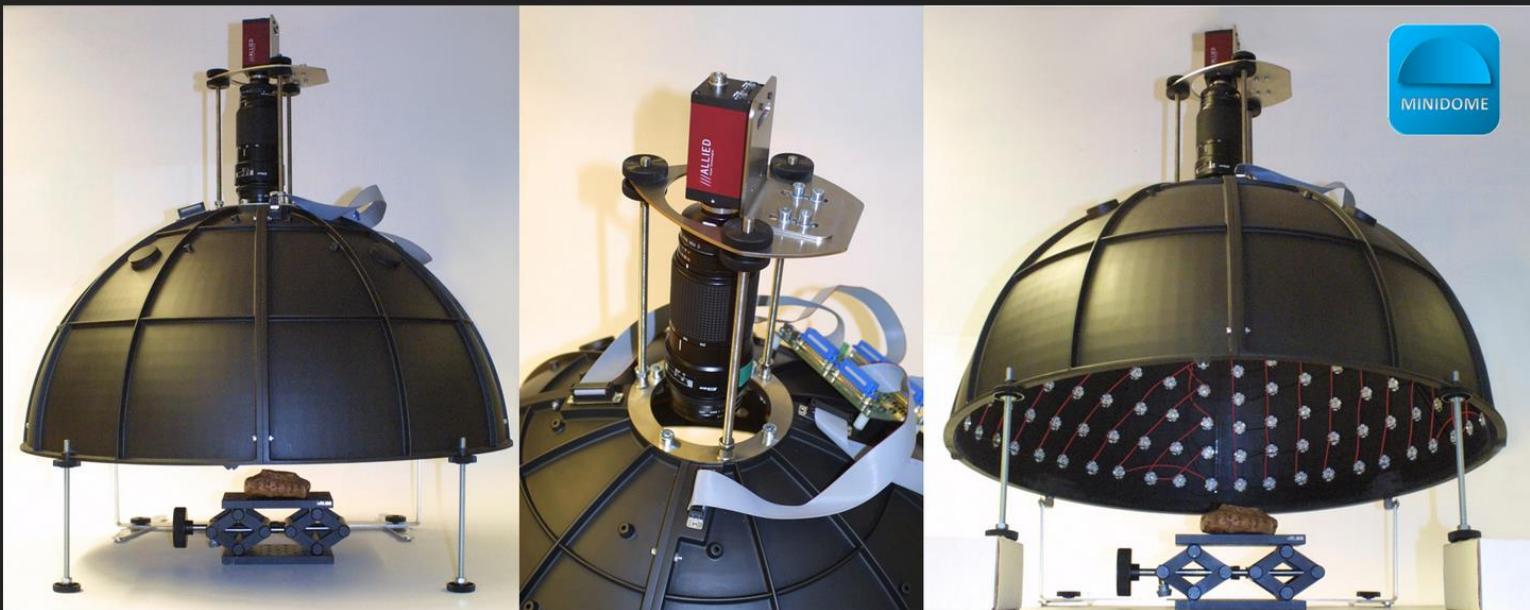


Principle

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.

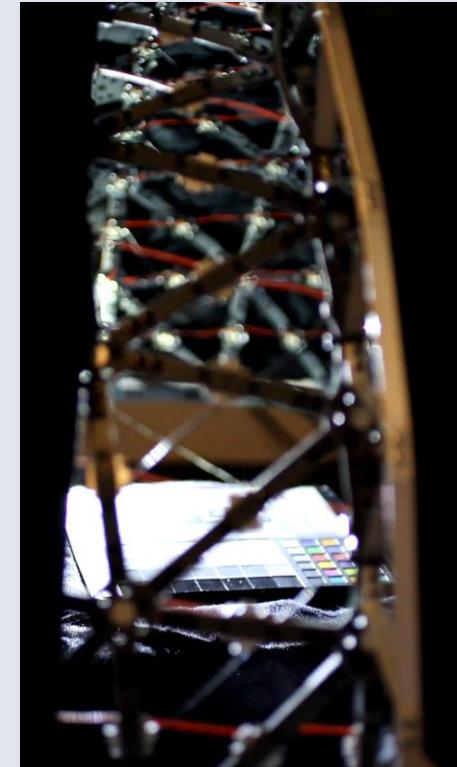
Contact: info@minidome.be

<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>

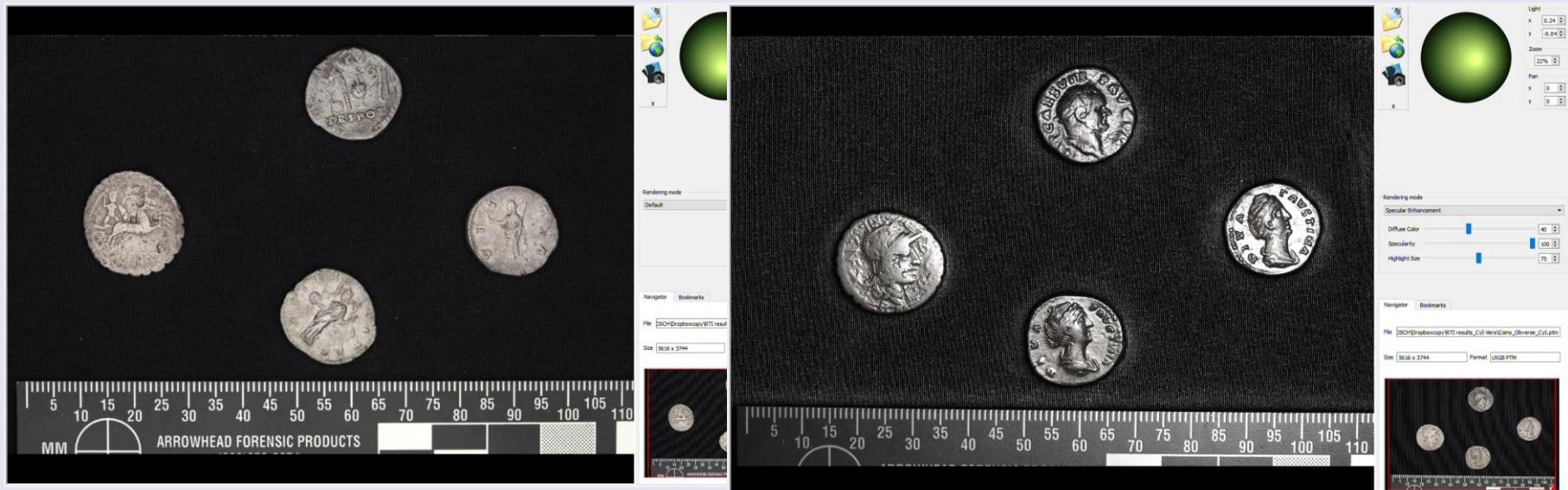
PTM/ RTI in action

Universität Bamberg



The test objects for this study were two silver denarii (coins A and B) portraying Empress Faustina 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 DIVA FAUSTINA. 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 AETER-NITAS; coin B shows Vesta, holding the palladium in her right hand, sceptre in left, and is inscribed VES-TA. Each coin is approximately 17 mm in diameter and 1.5 mm thick.

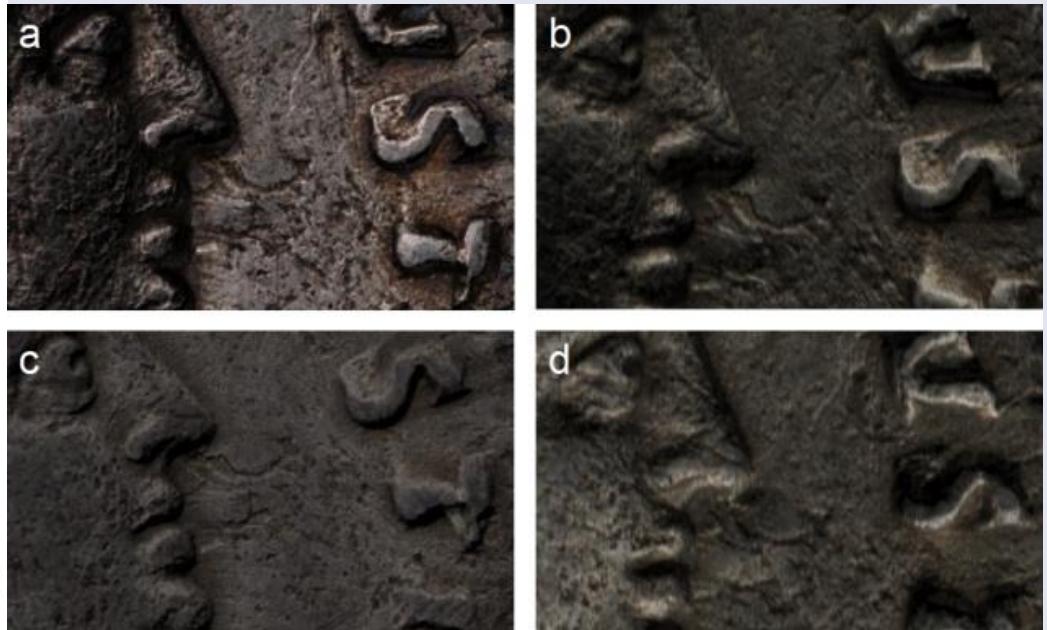
[Link to Lindsay presentation](#)



PTM/ RTI in action



RTI Kuppeln



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

Coin A, obverse (detail). a) RTI capture UCL dome; b) RTI capture Cyl 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 Colr 40

Specularity 70

Highlight Siz 75

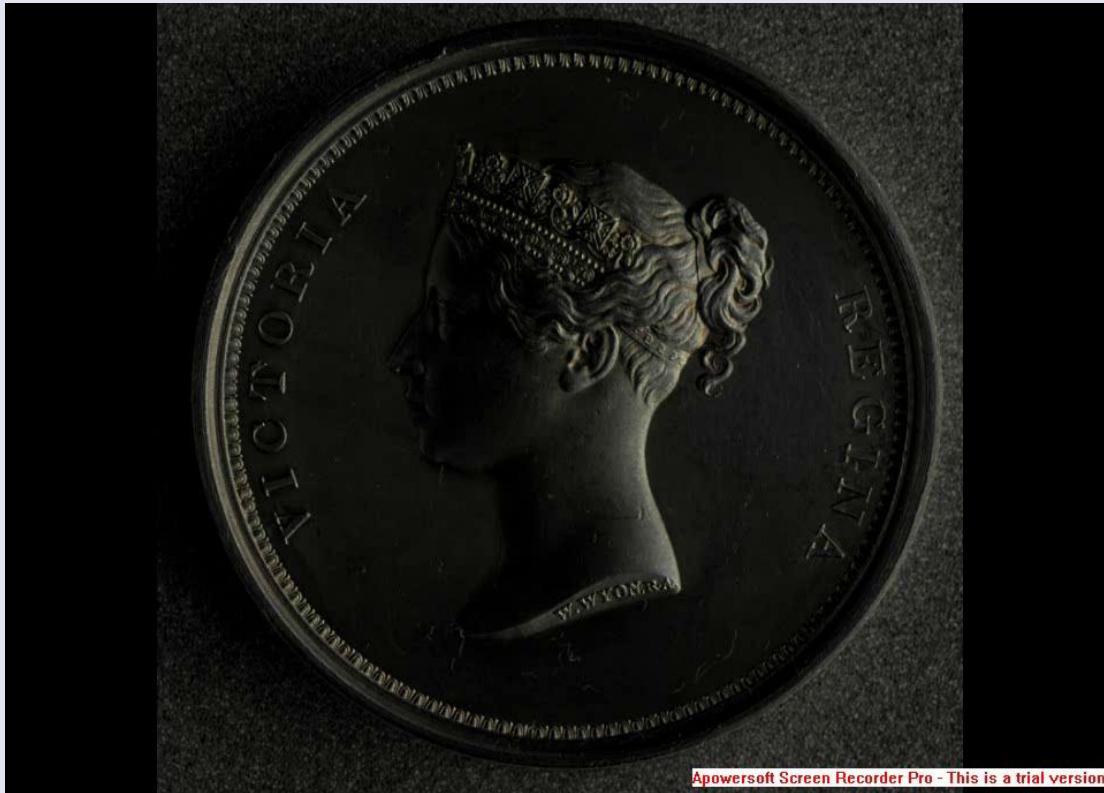
Navigator Bookmarks

File GeorgeVDie_1925.ptm

Size x 1761 Format B PTM



One of a kind



THE BRITISH
POSTAL
MUSEUM
& ARCHIVE



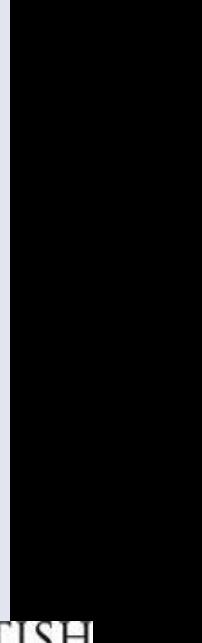
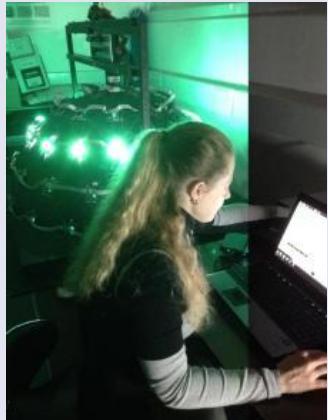
BPMA, Wyon Medal, 1838

One of a kind



Old original' Penny Black Die, 1840

One of a kind



Apowersoft Screen Recorder Pro - This is a trial version



BPMA, Old original' Penny Black Die, 1840

One of a Kind

Universität Bamberg



The image shows a high-resolution, multi-angle reconstruction (RTI) of the first postage stamp ever issued, known as the Penny Black. The stamp features a profile of Queen Victoria in black ink on a light background. The RTI visualization reveals intricate details of the ink texture and the paper's surface, including fibers and small imperfections. In the bottom left corner of the image frame, there is promotional text for 'THE BRITISH POSTAL MUSEUM & ARCHIVE' and 'UCL ENGINEERING Change the world'. Below this image is a tweet from user @Mona3Dimaging.

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=zddxcSayxcq>



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>

Entwicklungs potenzial ?

- 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](https://doi.org/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

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Fitzwilliam Museum, E103a.1911

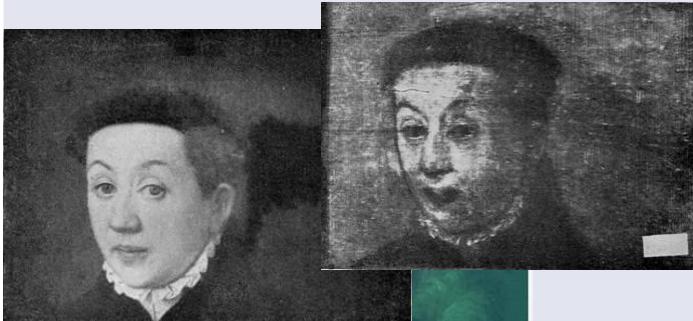
The same under UV light

Universität Bamberg

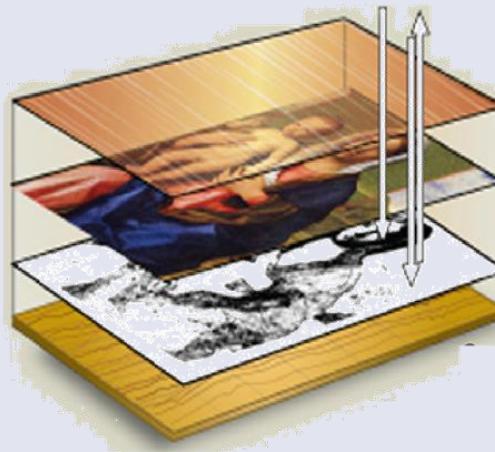


Fitzwilliam Museum, E103a.1911

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](https://www.researchgate.net/publication/252245586)
-
- Giovanni Verri, Courtauld Institute
- <https://courtauld.ac.uk/people/giovanni-verri>

Egyptian Blue

Synthetic - calcium copper silicate $(\text{Ca,Cu})\text{Si}_4\text{O}_{10}$

Mineral Analogue: cuprorivaite (rare!)

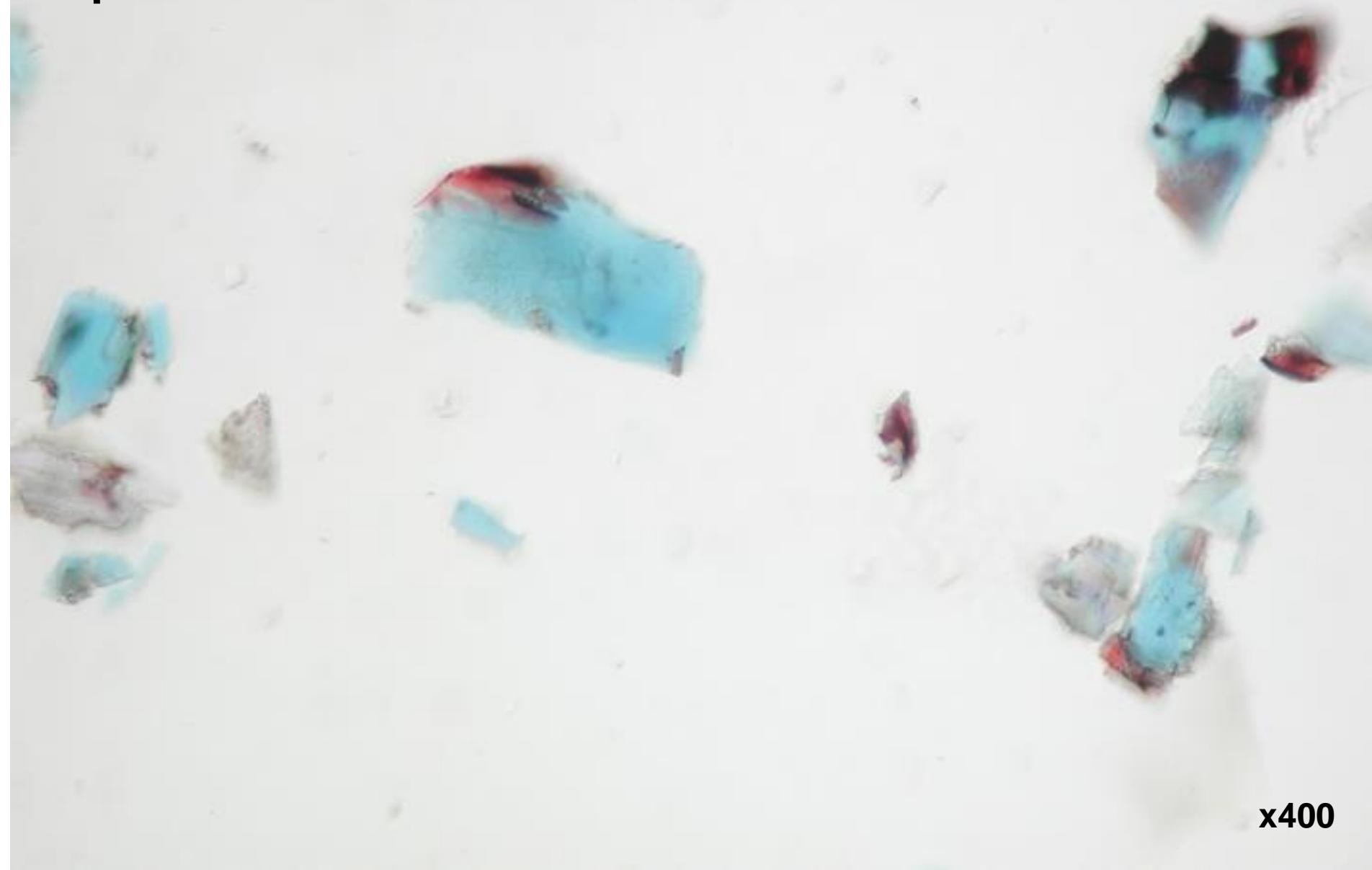
'Egyptian Blue', 'Vestorian Blue', 'Pozzuoli Blue'

- made since the early 3rd Millenium BC
- formed by heating CaCO_3 with copper (oxide, filings), quartz (sand, diatomite) + flux (natron, plant ash)
- @ $T = 850\text{-}1000^\circ \text{ C}$





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, Tréneau 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.

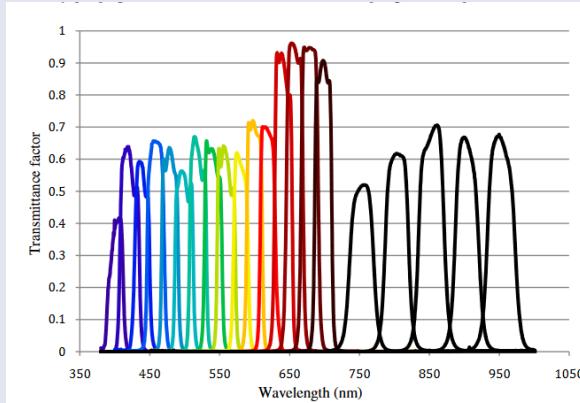
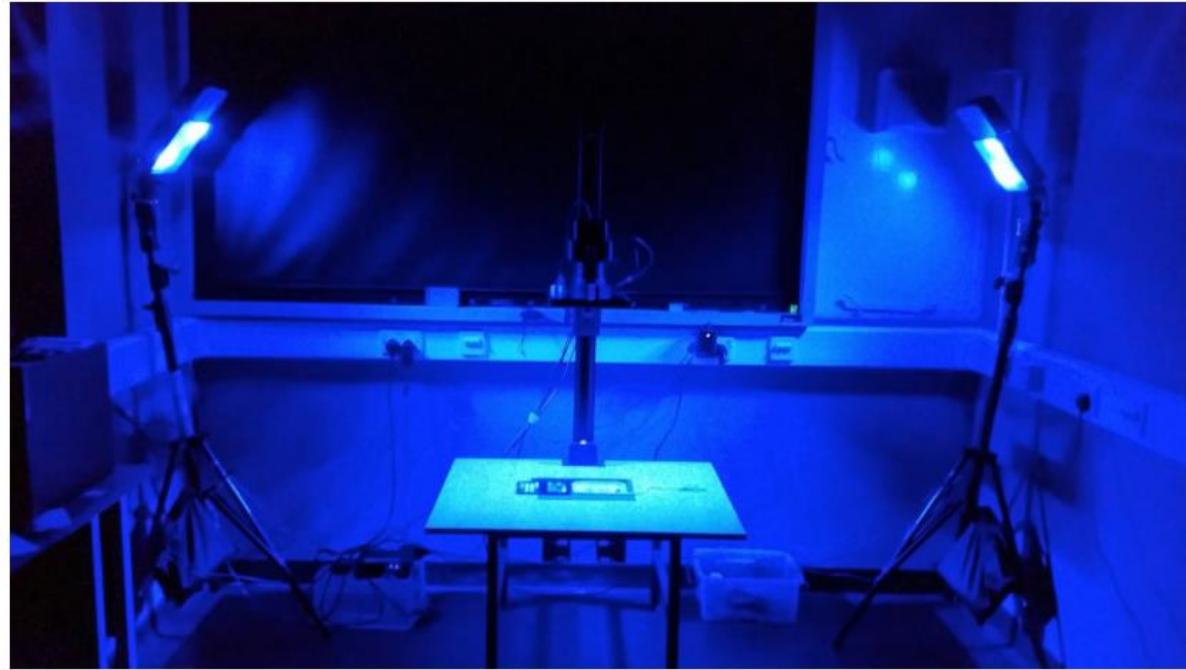


Fig. 2. Transmittance factors of 21 optical bandpass filters in the visible and NIR spectrum

Multispectral imaging

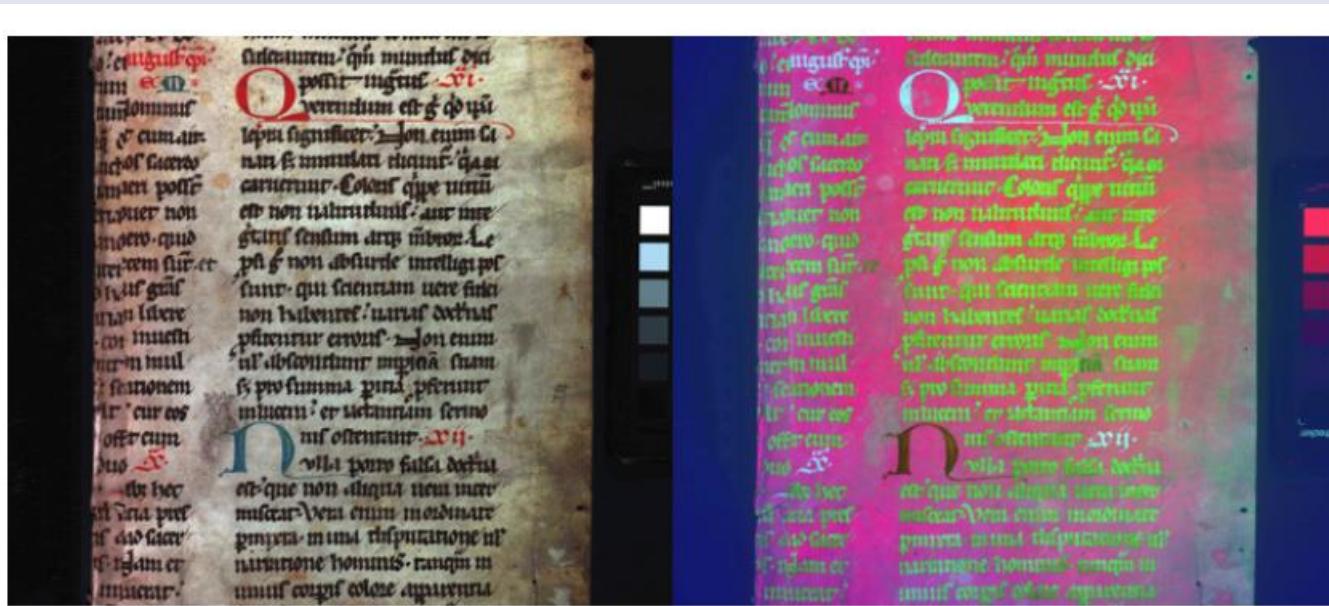
<https://www.ucl.ac.uk/dh/consulting/advanced-imaging-consultants> <http://rbtoth.com/index.html>



Spectral Imaging system, UCL Multi-Modal Digitisation Suite

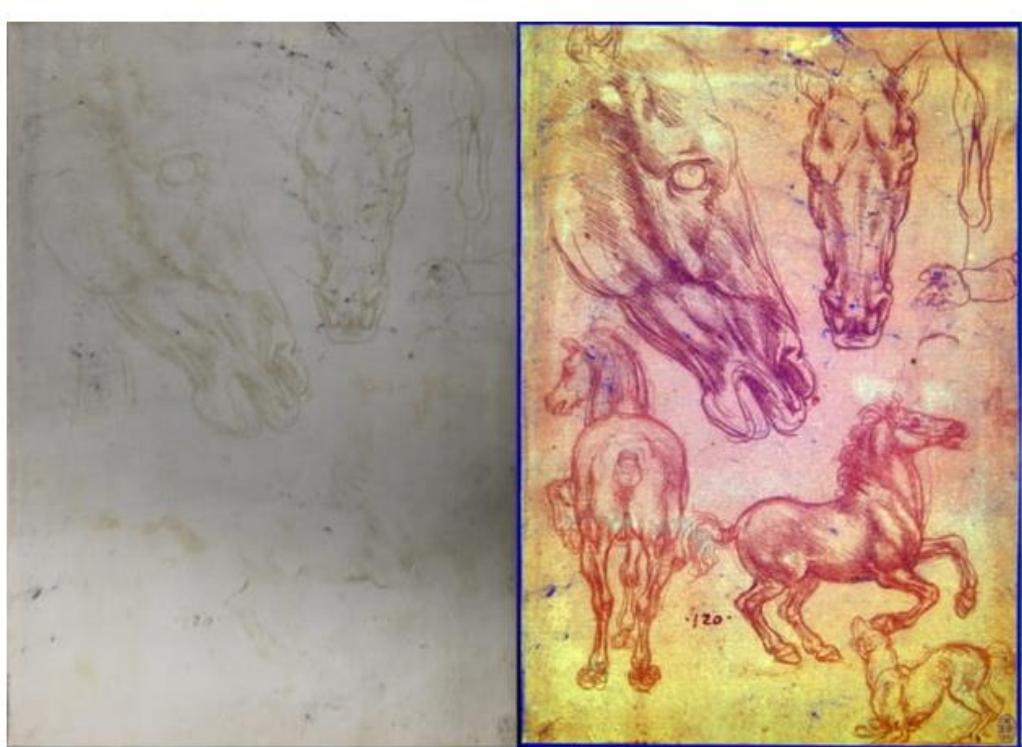
Multispectral imaging

<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

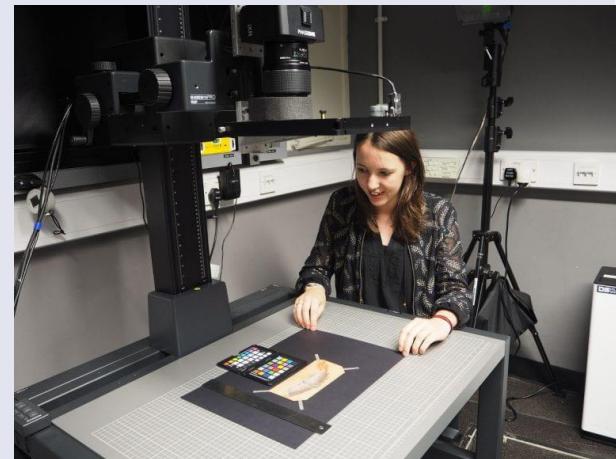
Multispectral imaging of DaVinci



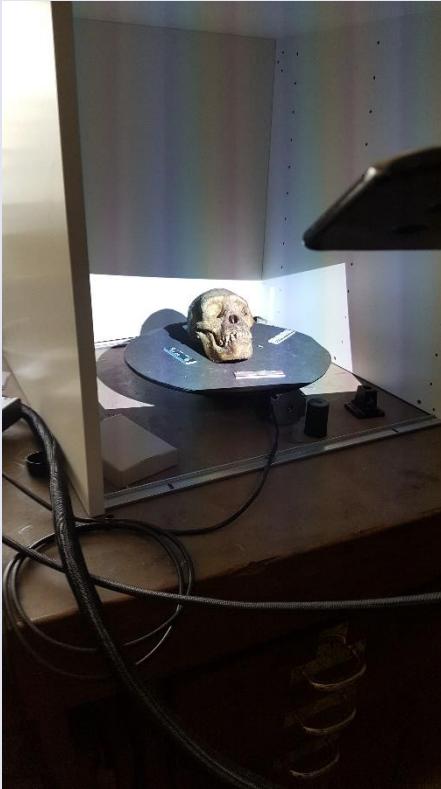
'Studies of horses and horses' heads' illuminated under visible light (left) and after multispectral imaging (right). The two horses and dog at the bottom of the page cannot be seen using the human eye alone.
(Image copyright: Queen Elizabeth II, Moral rights: Cerys Jones)

<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