Historic Royal Palaces

Tudor tapestries environmental protection project:

when risk mapping and analysis informs innovative mitigation measures

Constantina Vlachou – Mogire ,
Ian Gibb,
Kate Frame

IAQ 2016, 3-4 March 2016

Historic Royal Palaces

Monitoring locations

Great Hall

Great Watching Chamber

Historic Royal Palaces

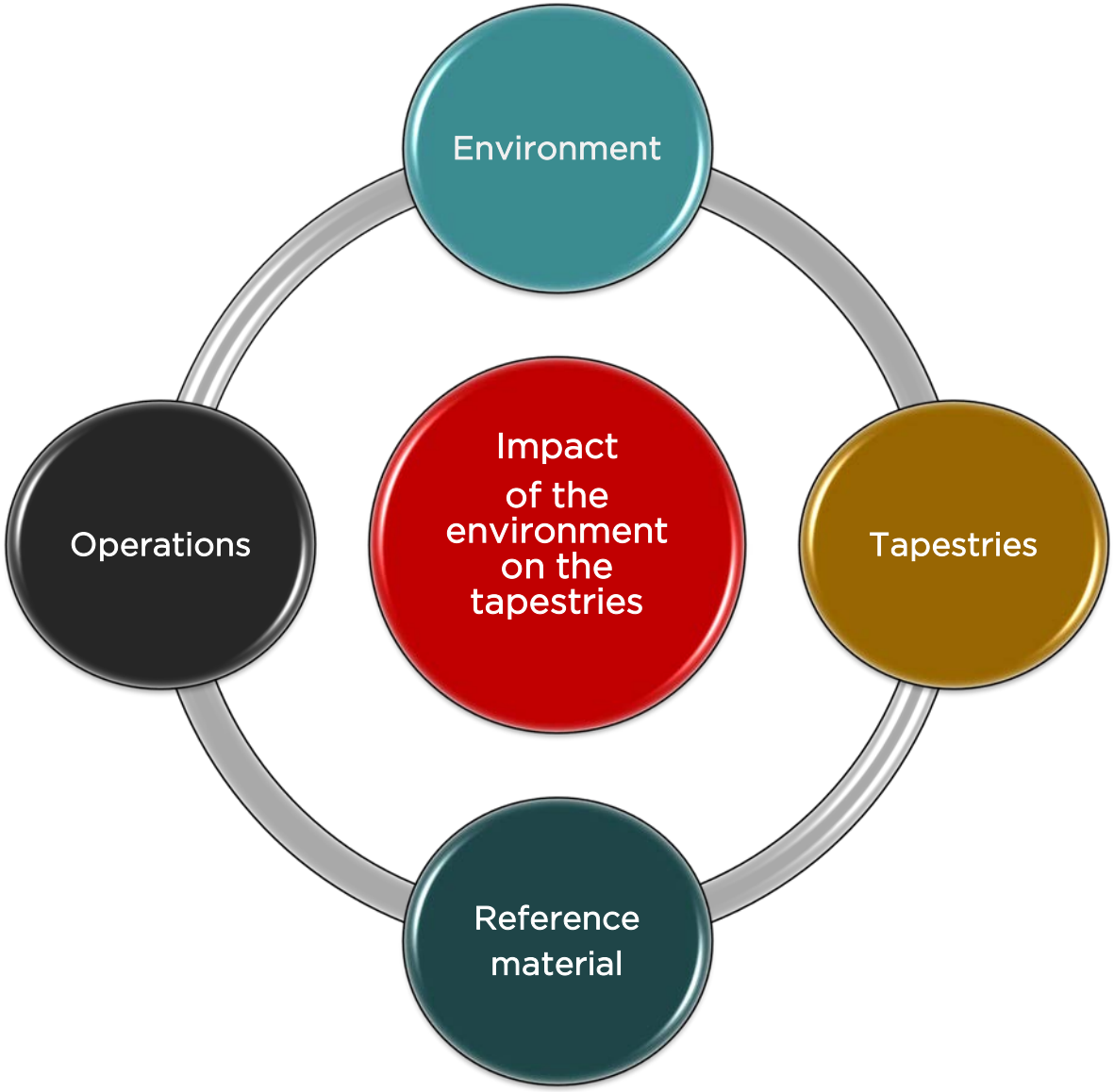
Visitor numbers

Great Hall

Great Watching Chamber

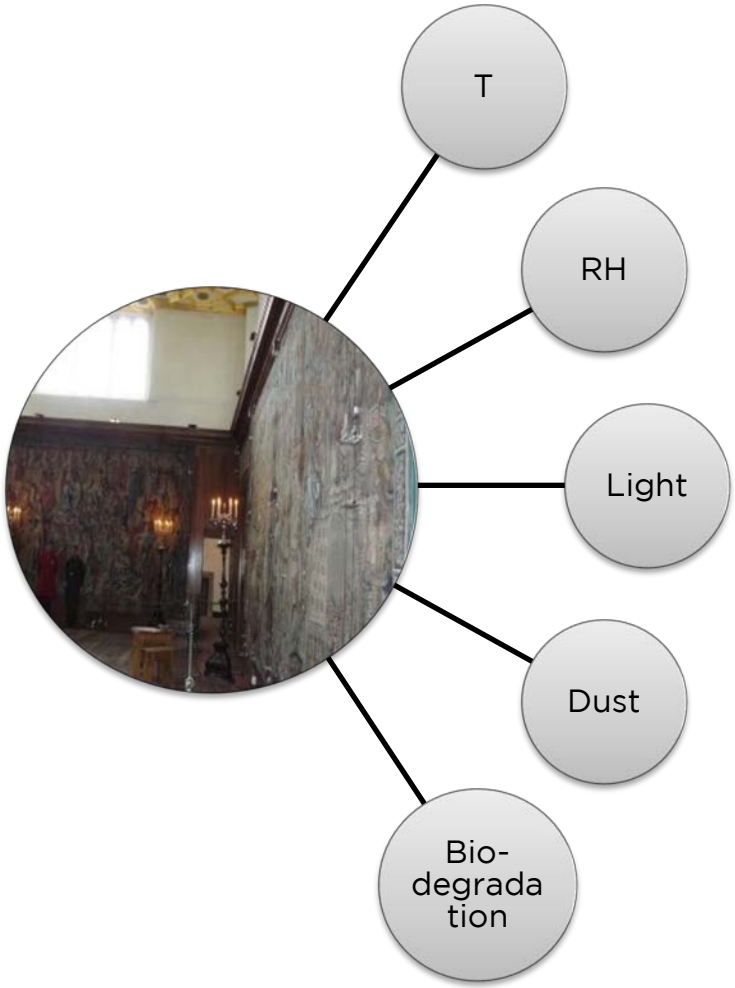
Historic Royal Palaces

Phase I



Historic Royal Palaces

Environmental risks



Historic Royal Palaces

Monitoring phase 2012 - 2015

Great Watching Chamber
March 2012 – March 2013

Great Hall
April 2013 – April 2015

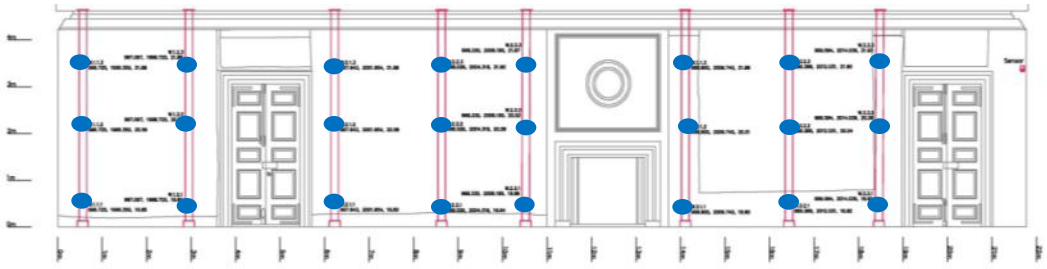
Historic Royal Palaces

Monitoring stands

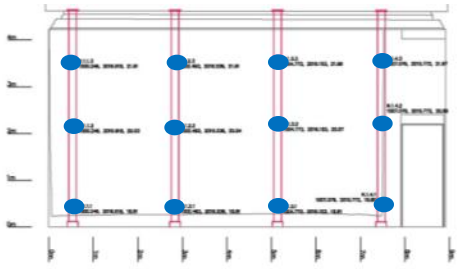
Historic Royal Palaces

Deployment of monitors: Great Watching Chamber

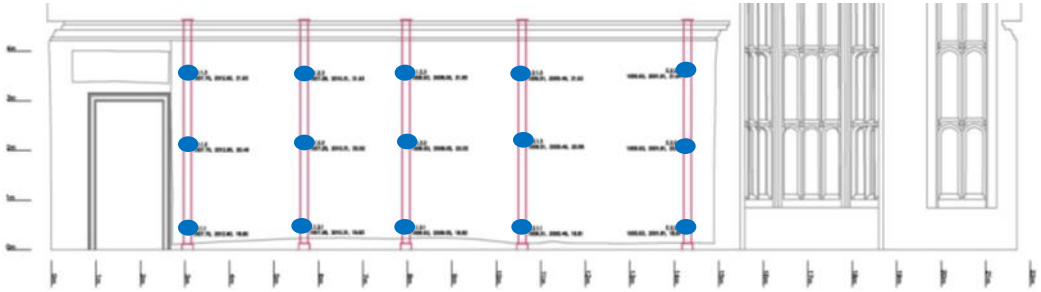
Seven tapestries: 138 sensors and 126 dust slides



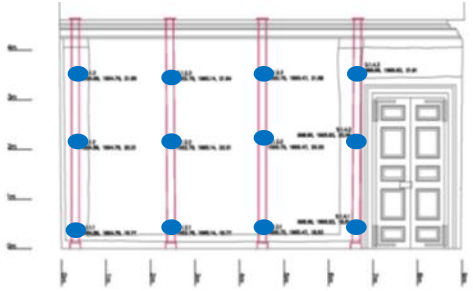
West Elevation (true bearing of face = N9°E)



North Elevation (true bearing of face = W9°S)



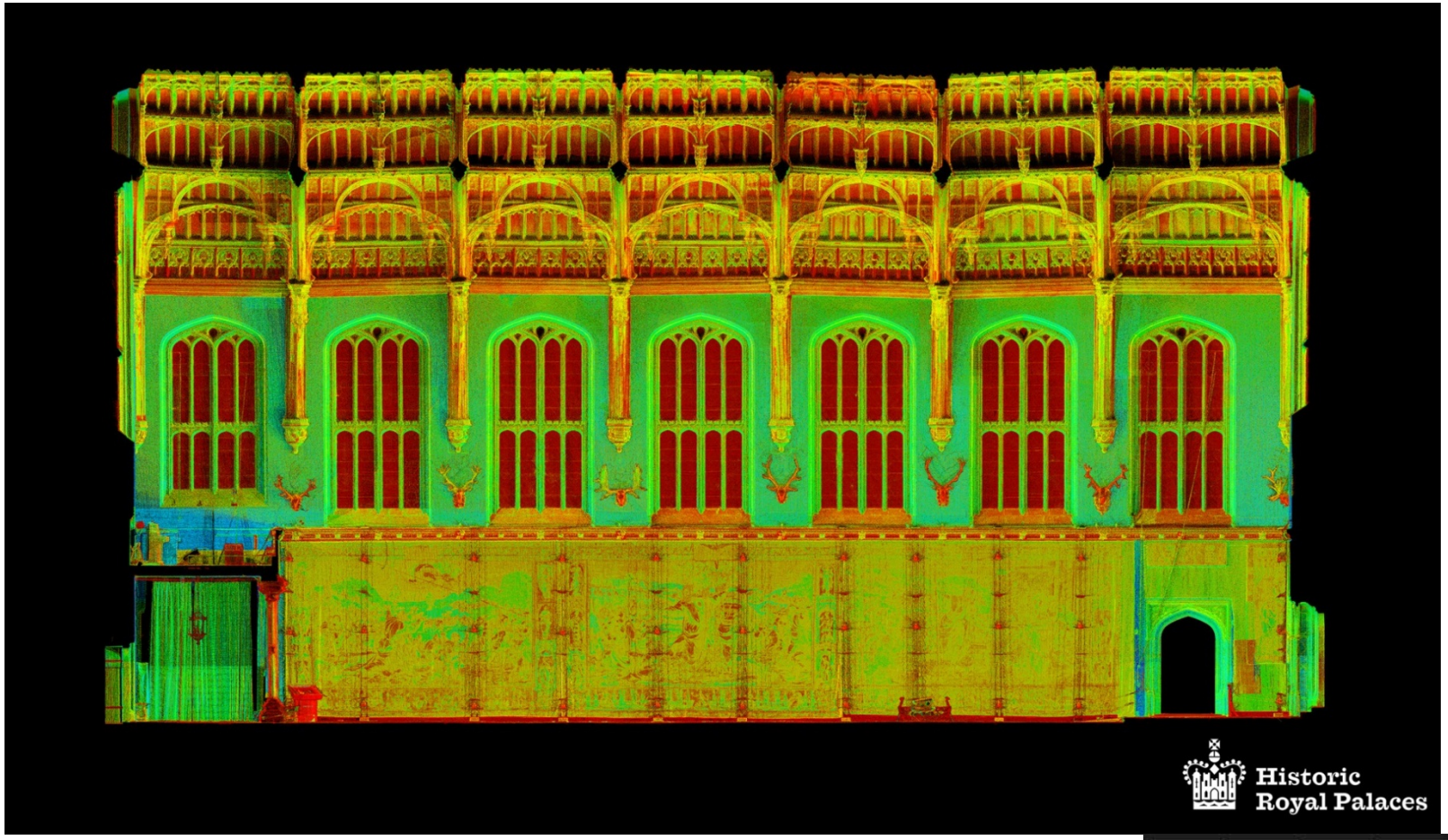
East Elevation (true bearing of face = S9°W)



South Elevation (true bearing of face = E9°N)

Historic Royal Palaces

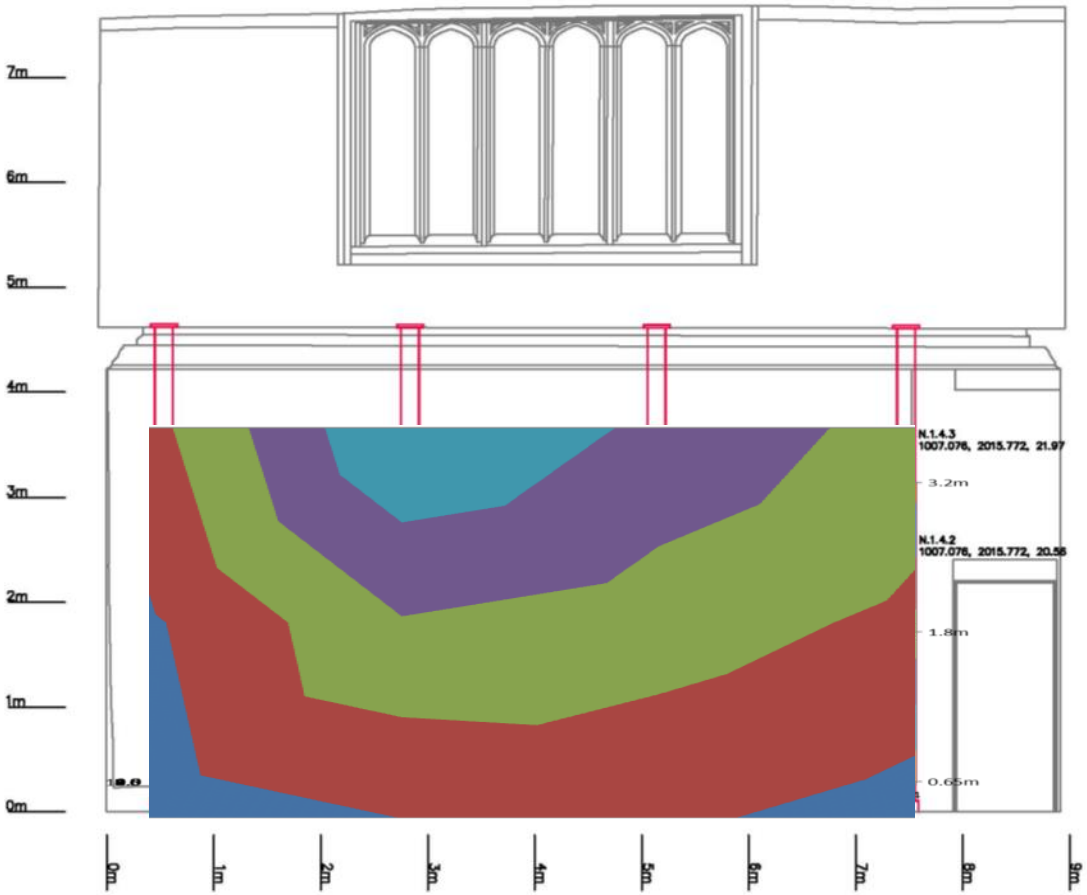
Great Hall 3D laser scanning



C D D V
Centre for Digital Documentation and Visualisation

Historic Royal Palaces

Data mapping

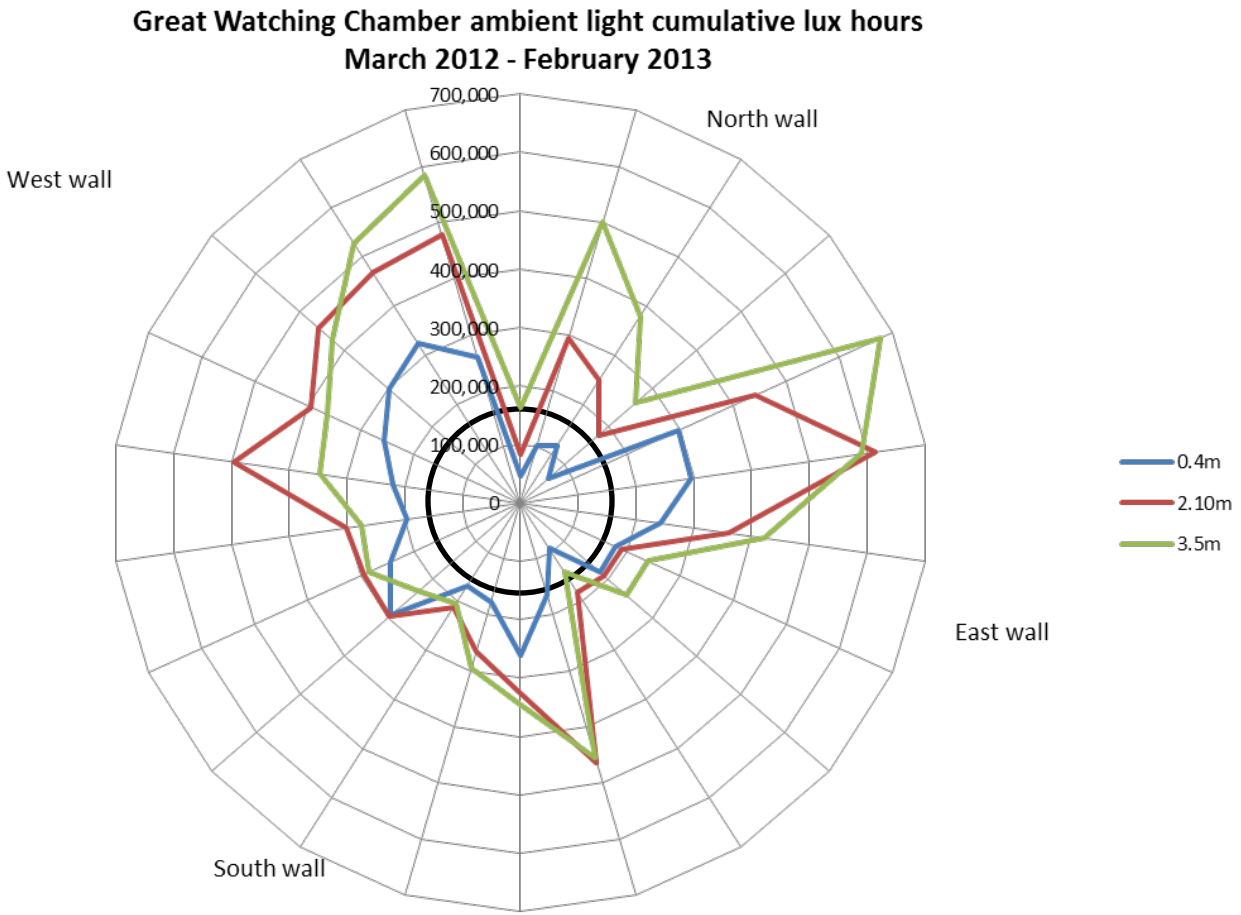


North Elevation (true bearing of face = W9°S)

Historic Royal Palaces

Results – ambient + direct light

150,000 lux.hours

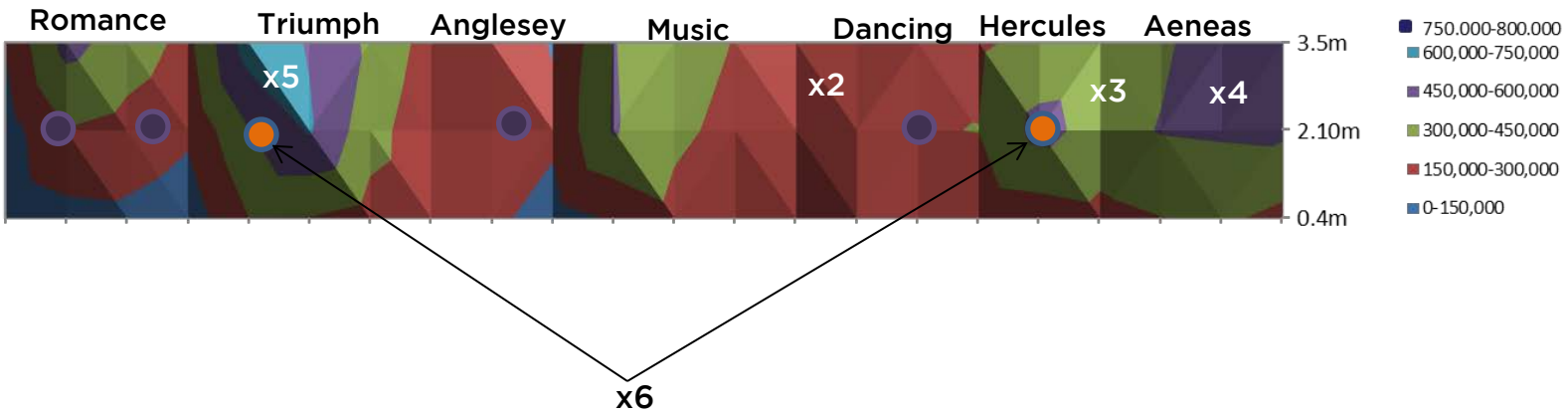


Historic Royal Palaces

Results –light (ambient + direct + artificial)

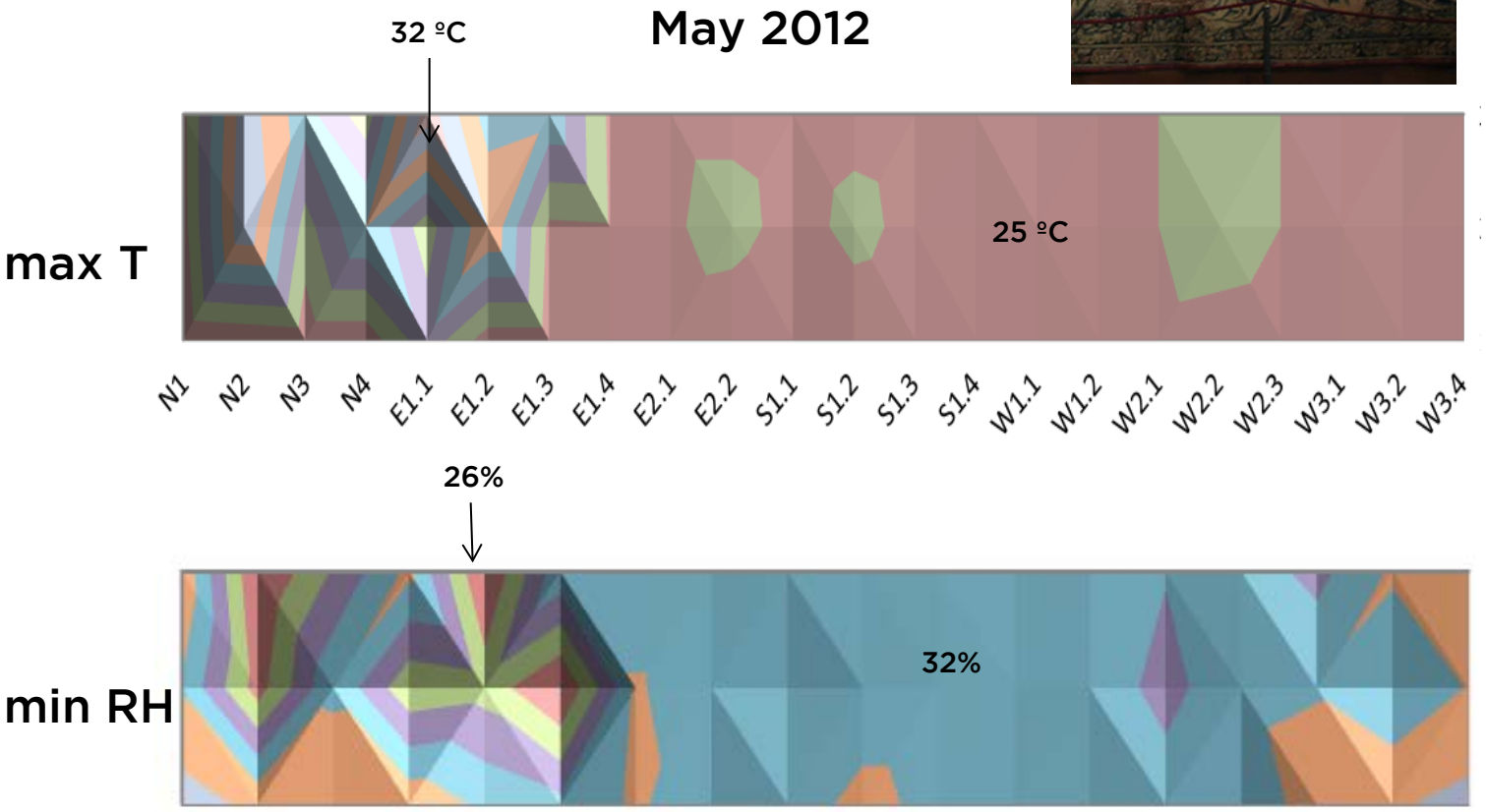
March 2012 - February 2013 (150,000 lux.hours)

North Wall East Wall South Wall West Wall



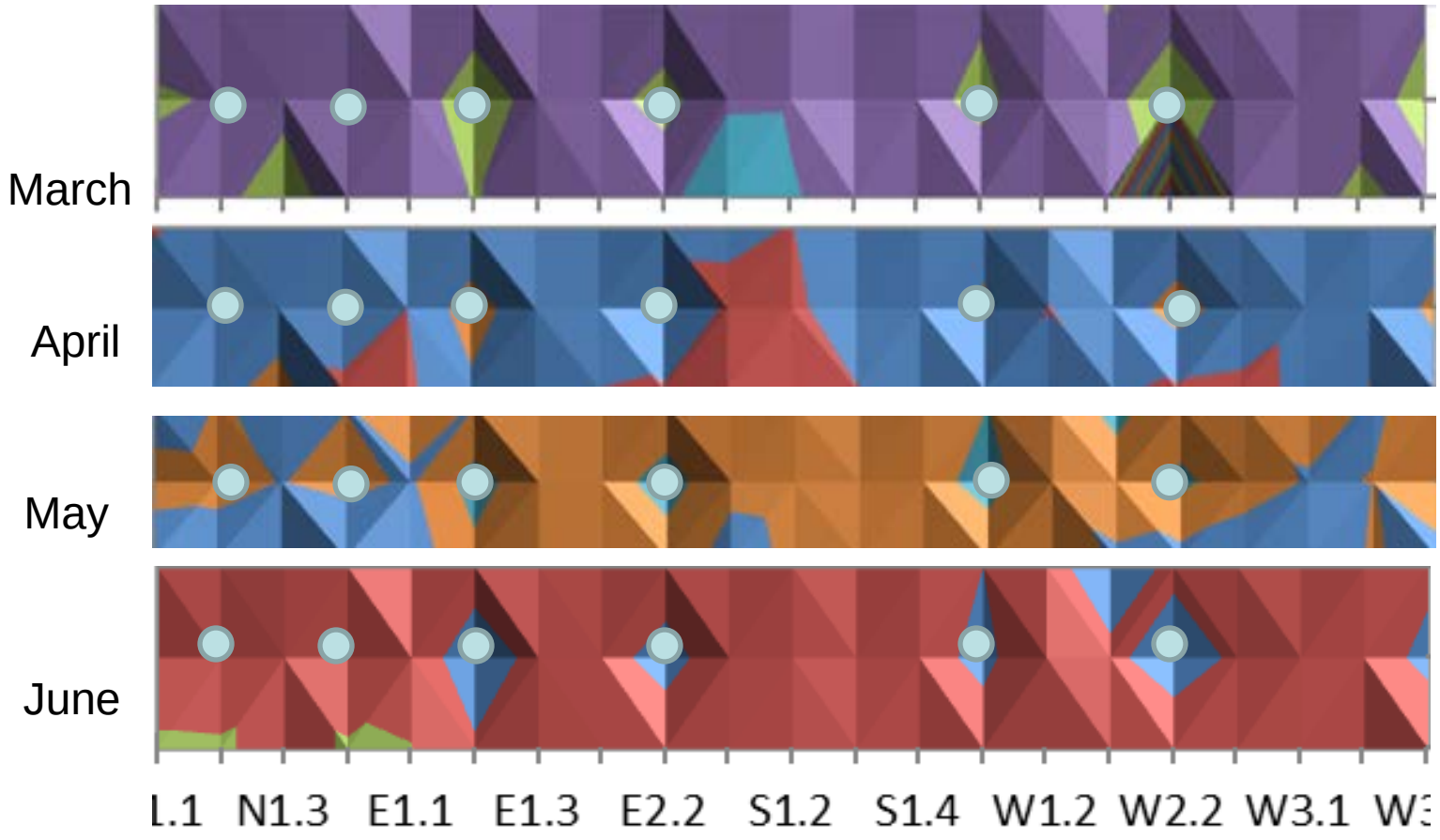
Historic Royal Palaces

Results -solar gain



Historic Royal Palaces

Results –Impact of incandescent lamps to environment (lower RH)

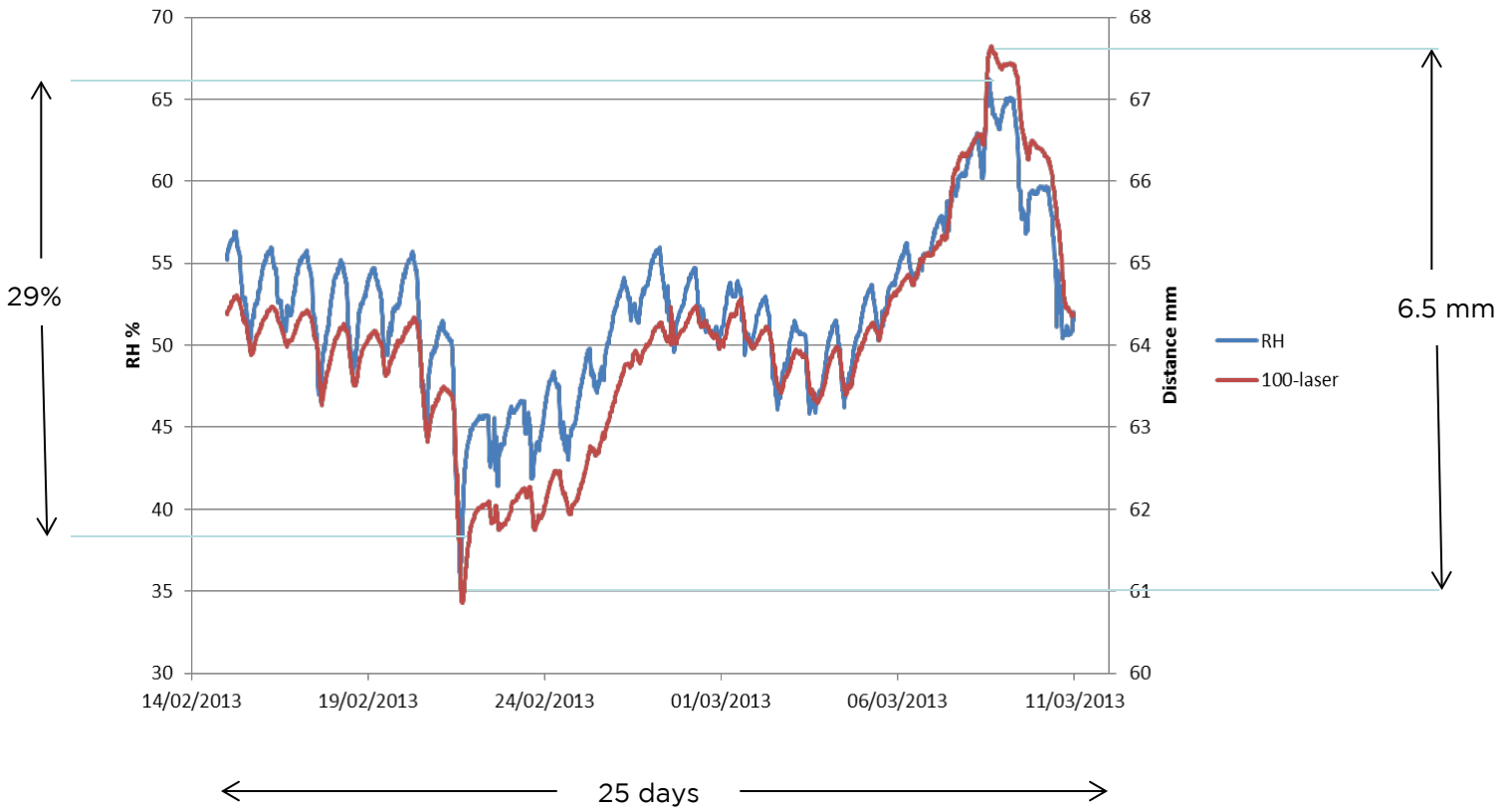


Historic Royal Palaces

Candelabras with incandescent lamps

Historic Royal Palaces

Tapestry movement in response to RH/T fluctuations



Historic Royal Palaces

EPSRC SEAHA
Centre for Doctoral Training

Strain modelling in historical tapestries

PhD research project (2015-2019)

UCL

IBM

Historic Royal Palaces

MRes Heritage Science
Centre for Sustainable Heritage

HRP Heritage Science Scholars:

1st:Lisa McCullough (2012- 14)

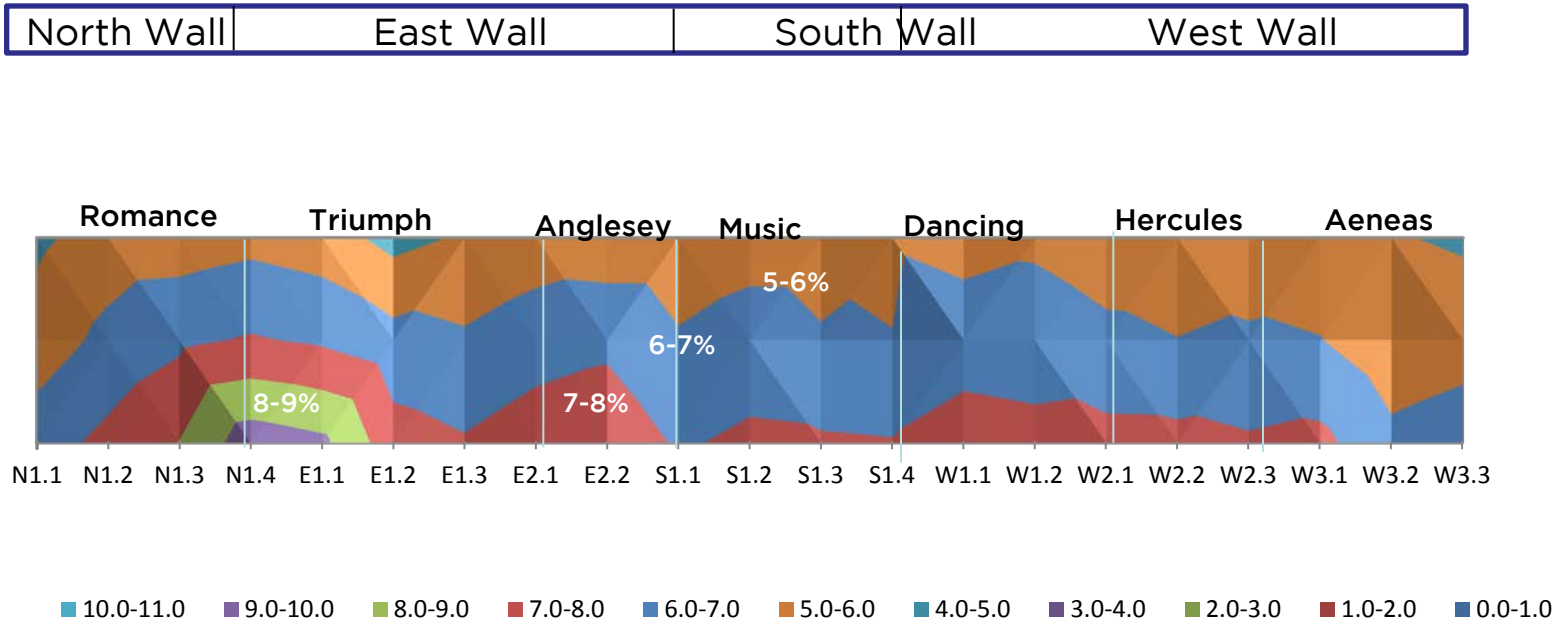
2nd: Nanette Kissi (2014-16)

Non-invasive method to measure damage on tapestries using NIR

Historic Royal Palaces

Results – dust deposition (KPI:3%)

Great Watching Chamber, March 2012 - February 2013



Historic Royal Palaces

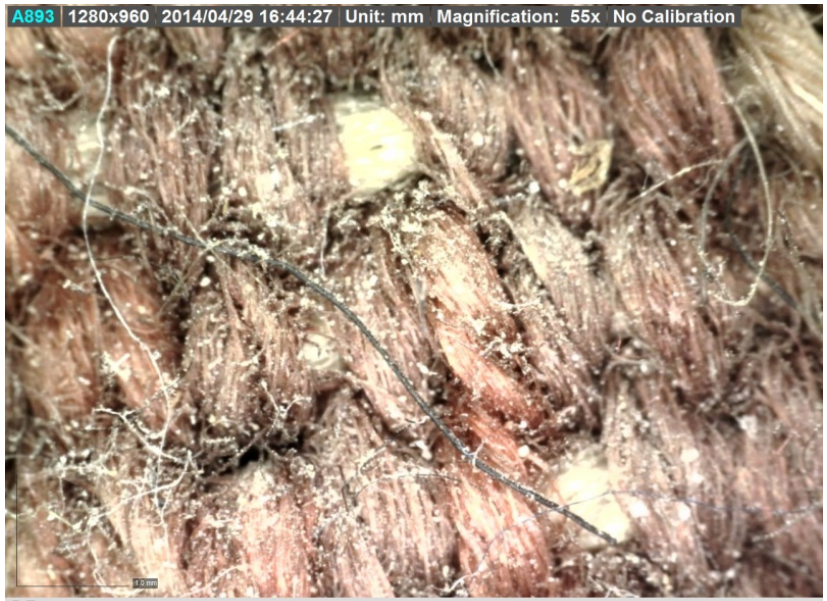
Dust deposition modeling

UCL

Dr Josep Grau – Bove

Historic Royal Palaces

Dust deposition -Wool



5.7a

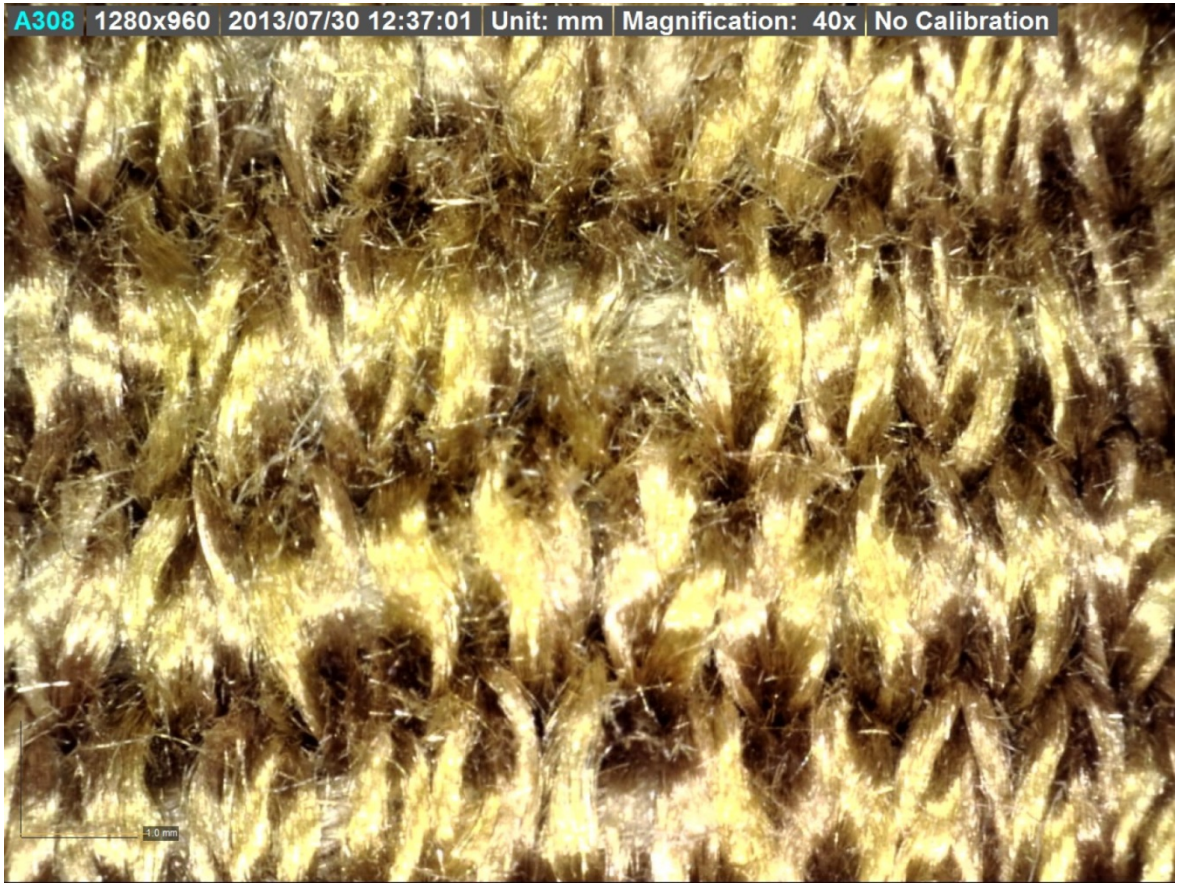
5.7a

Historic Royal Palaces

Dust deposition - Silk

Historic Royal Palaces

Silk degradation



Historic Royal Palaces

Dust deposition - Metal threads

Historic Royal Palaces

Biodegradation
summer /winter 2012

- Air
- Tapestries
- Dust

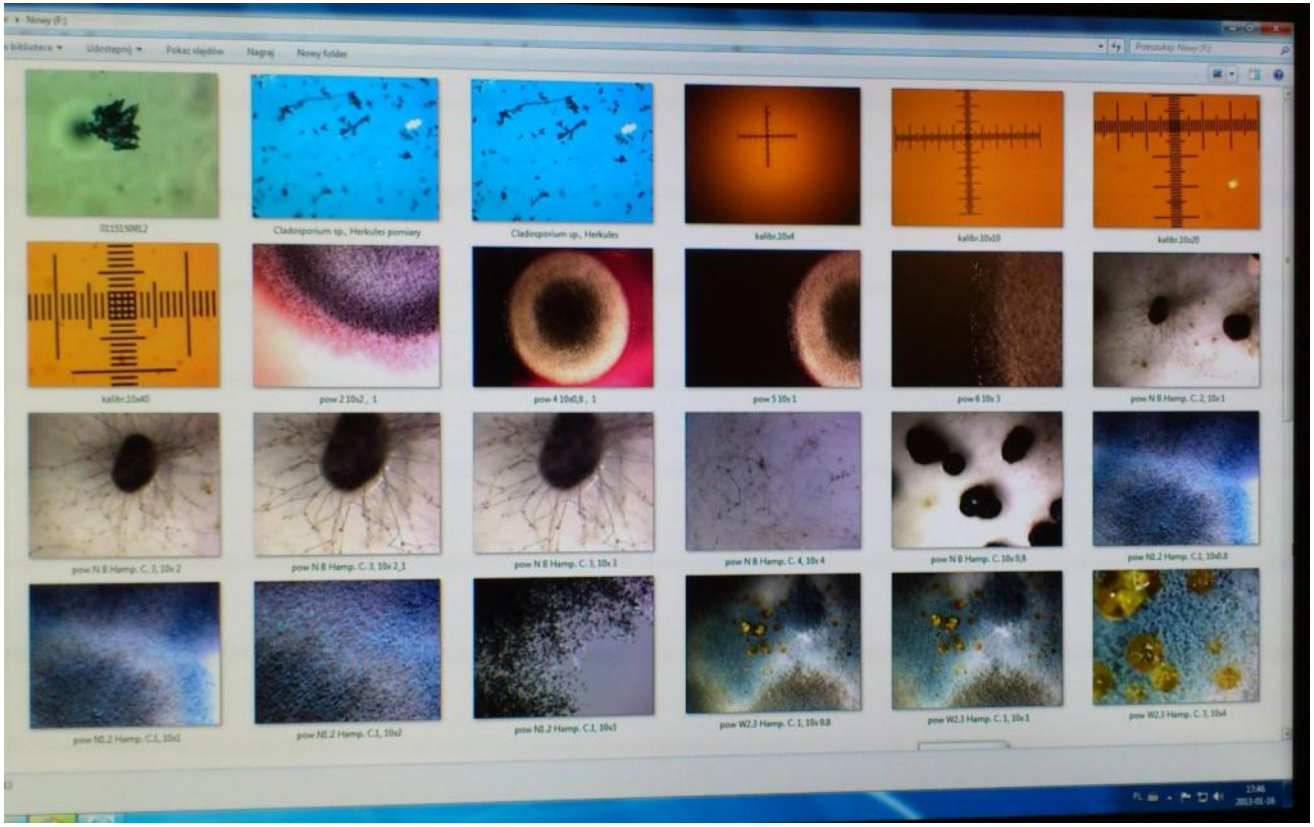
Dr Agnieszka Laudi

Historic Royal Palaces

Biodegradation

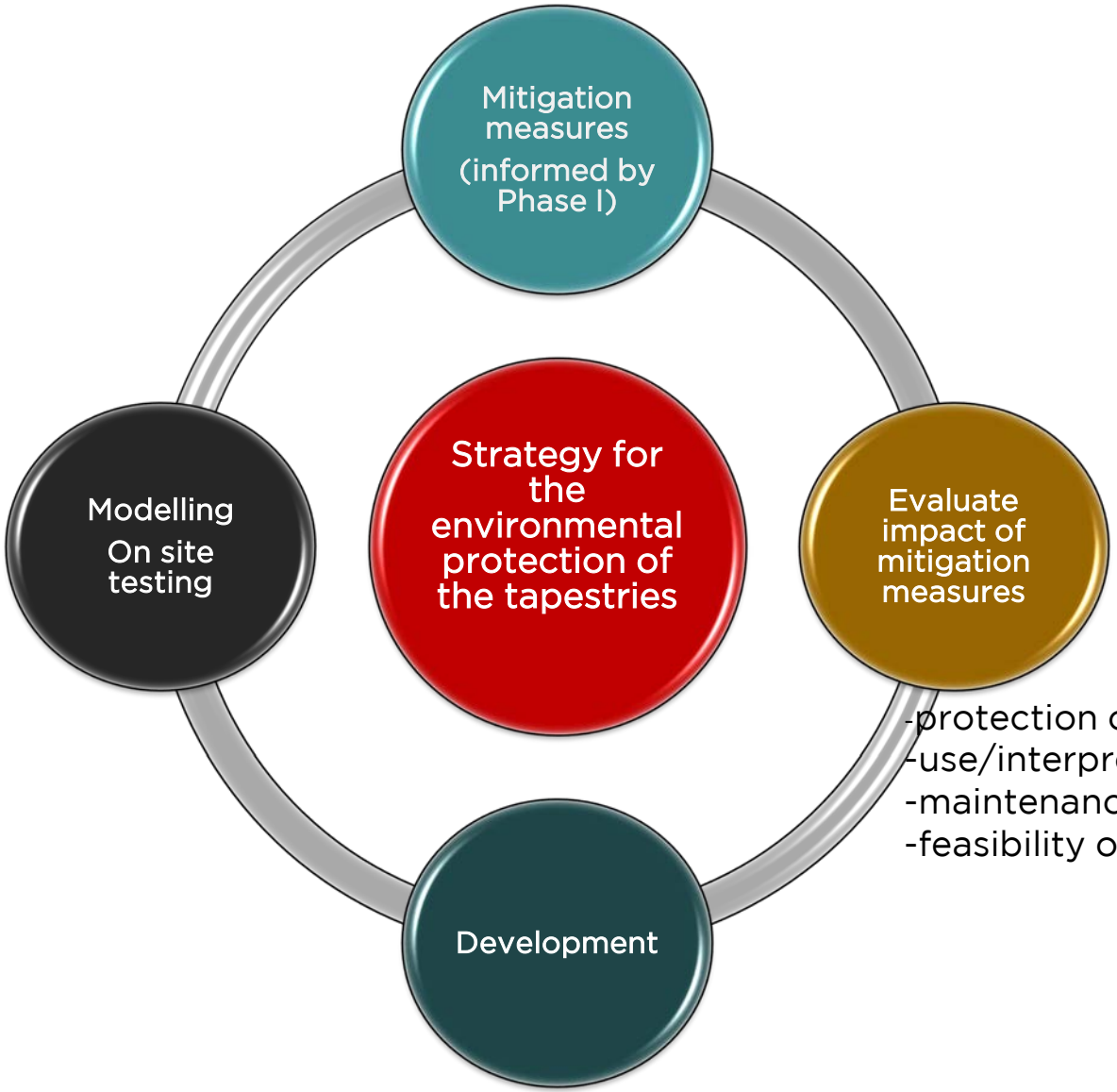
Muzeum Pałac w Wilanowie

- No real threats in indoor air contamination (air ventilation is important)
- Visitor's influence microbial air contamination.



Historic Royal Palaces

Phase II



-protection of the tapestries
-use/interpretation of the roo
-maintenance and salvage
-feasibility of design and cost

Historic Royal Palaces

Candelabras with incandescent lamps

Historic Royal Palaces

LED lamps on candelabras

50% saving on light exposure
no heat
energy efficient

Historic Royal Palaces

Great Watching Chamber
Smart Tint trial February 2015

Historic Royal Palaces

Great Watching Chamber
Smart Tint film trial February 2015

Historic Royal Palaces

Next steps

- Installation of “smart tint” films on the Great Watching Chamber windows
- Design of light protection measures in the Great Hall
- Analysis of tapestries’ microscopic examination data of particulate matter deposition