

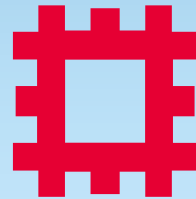


English Heritage

Preventive Conservation in Historic Libraries and Archaeological Archives

David Thickett

Collections Conservation Team



ENGLISH HERITAGE



English Heritage

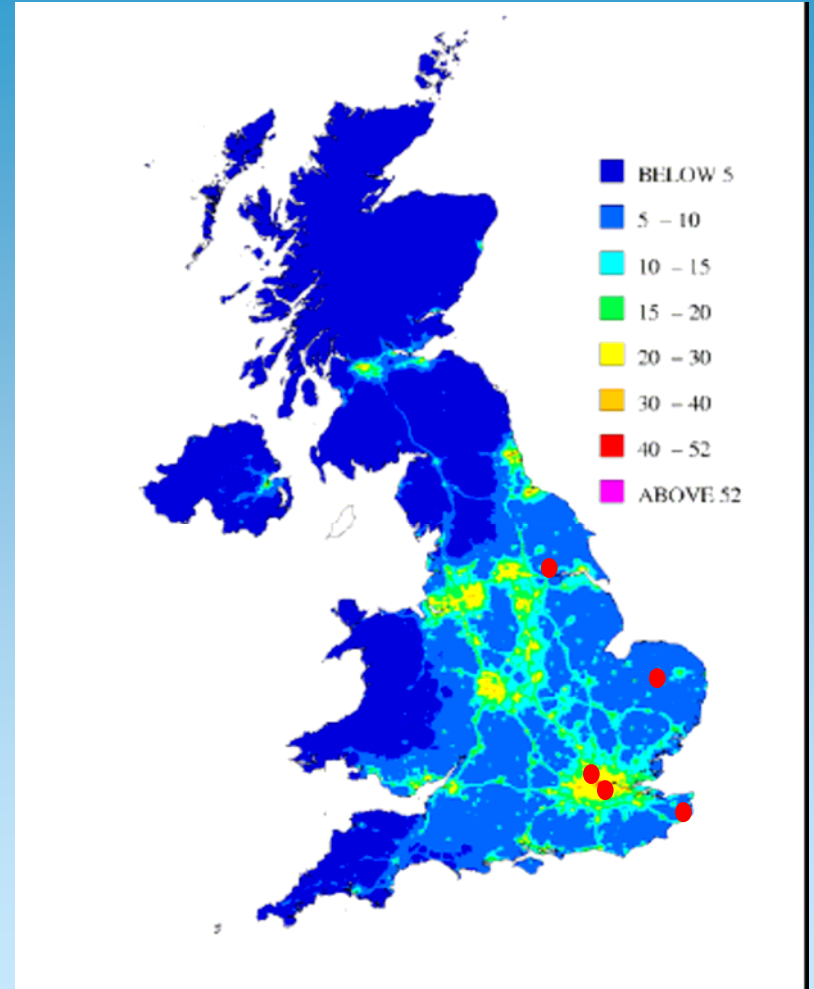
Historic Libraries







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English Heritage

Dover





English Heritage

Atcham





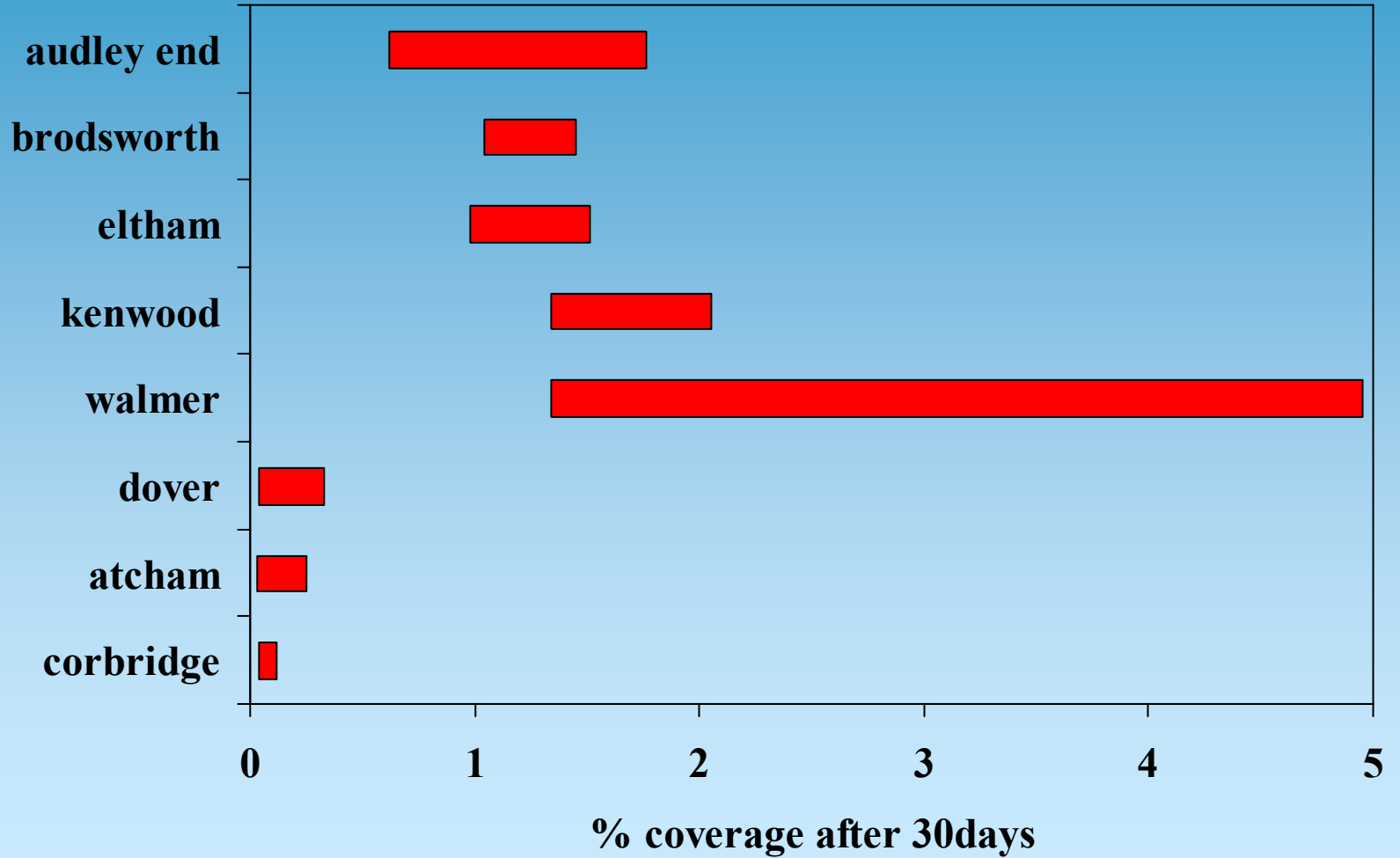
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Corbridge Roman Town





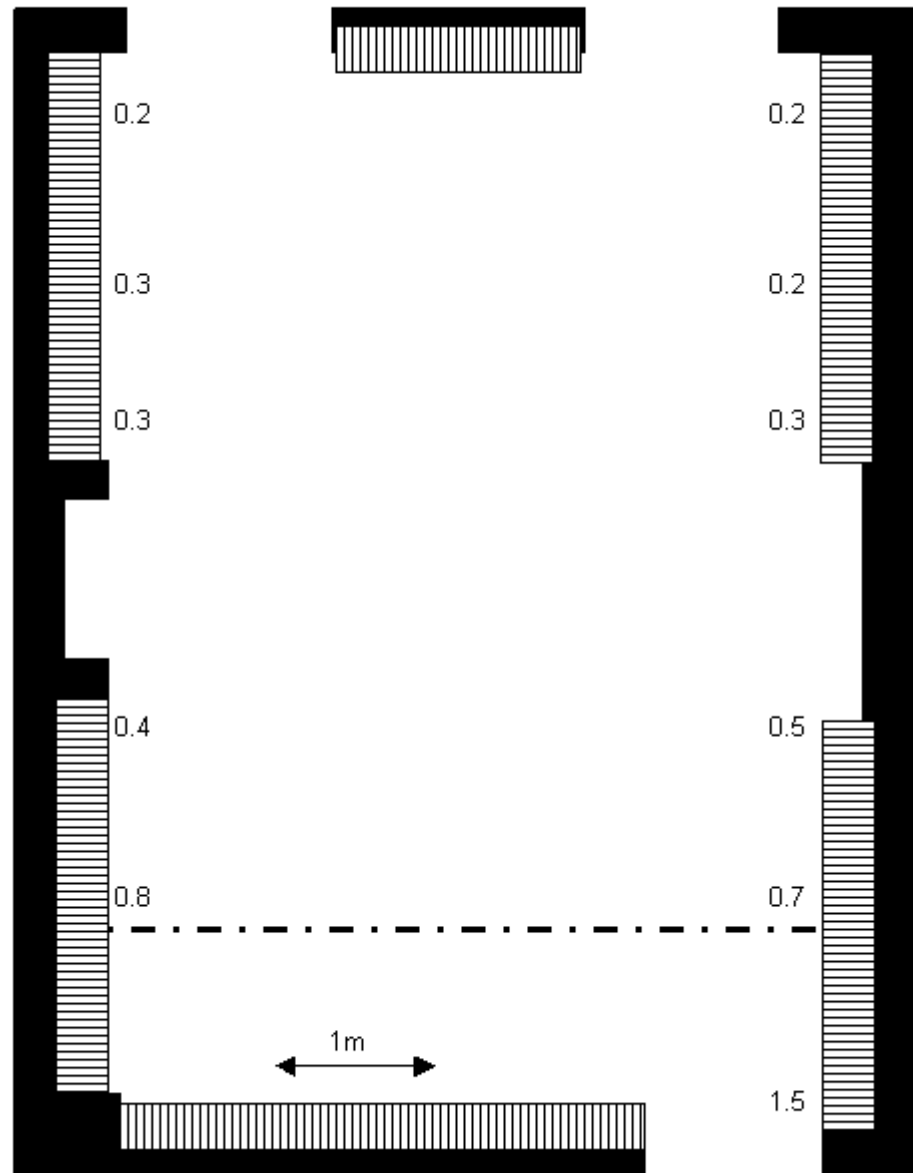
Overall Dust Deposition Rates





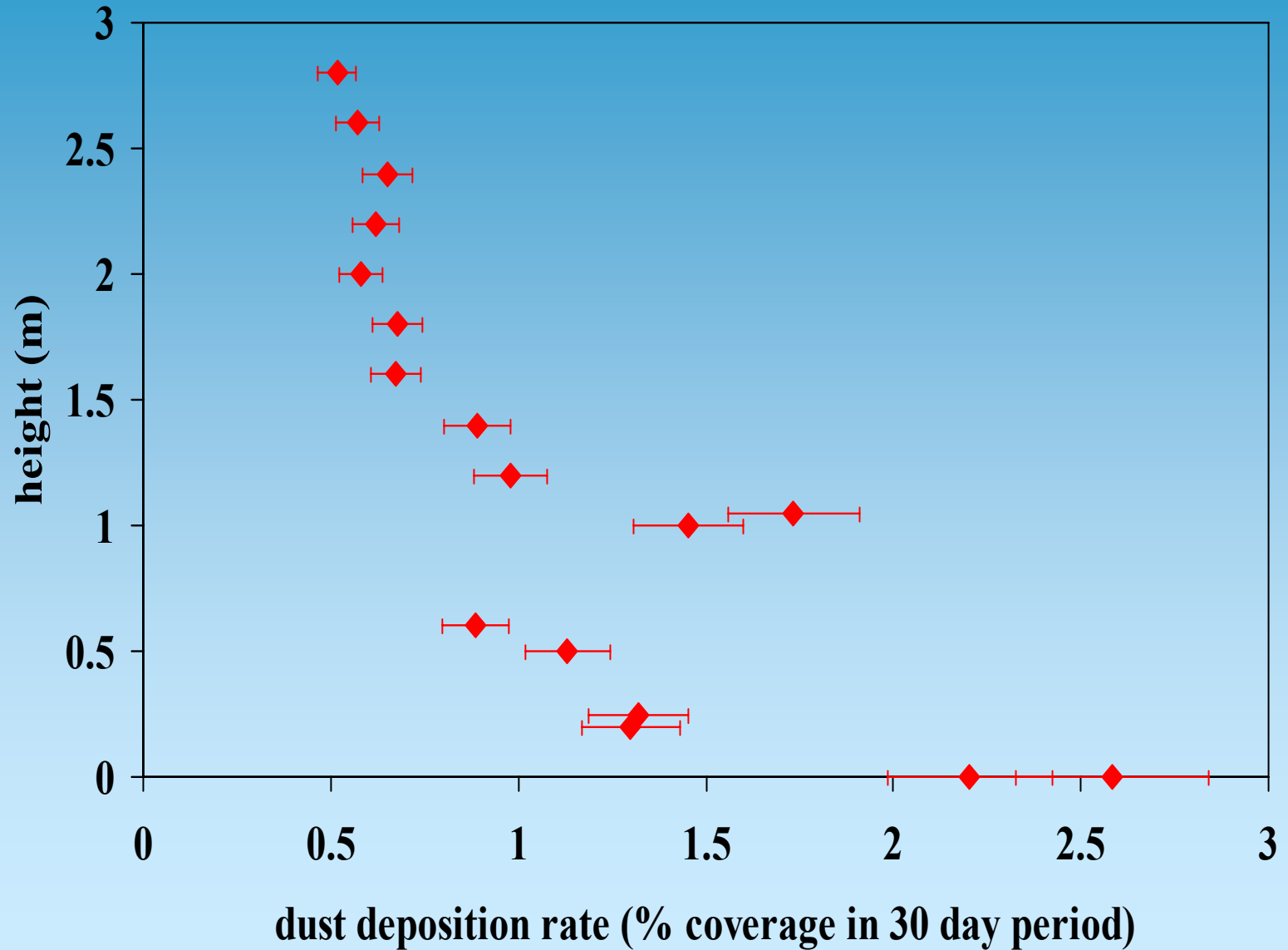
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Proximity to Visitors



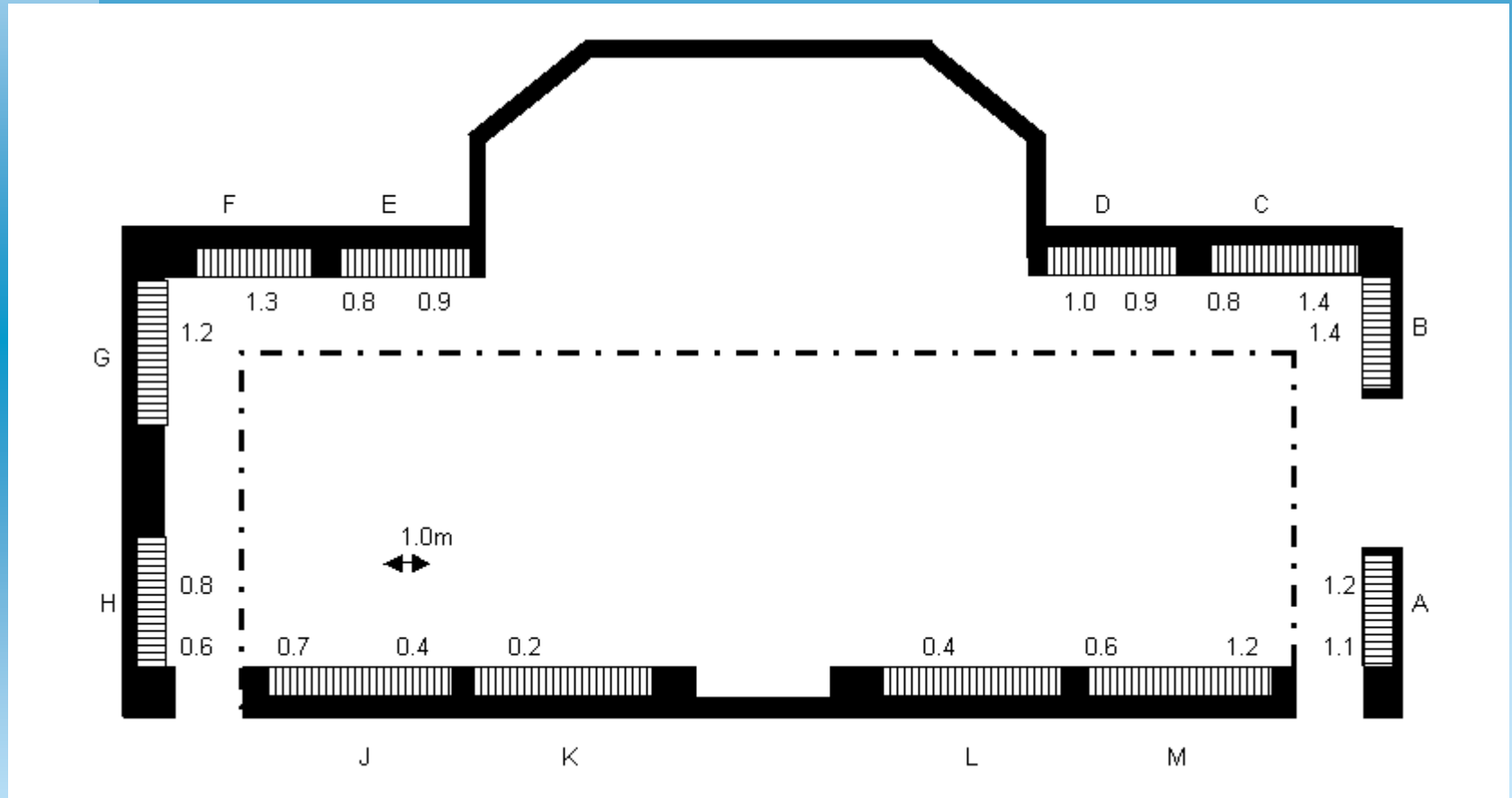


Effect of Height



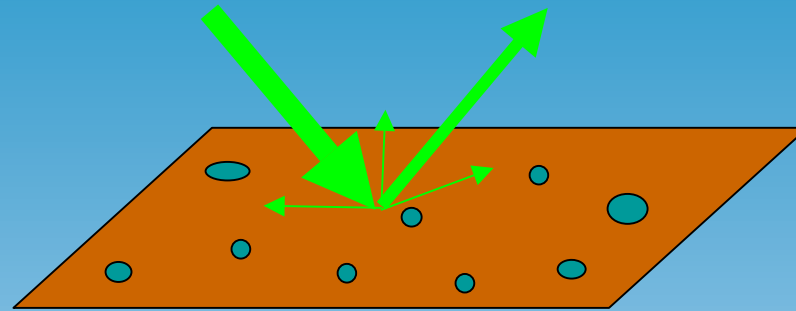


Visitor Route Tortuosity





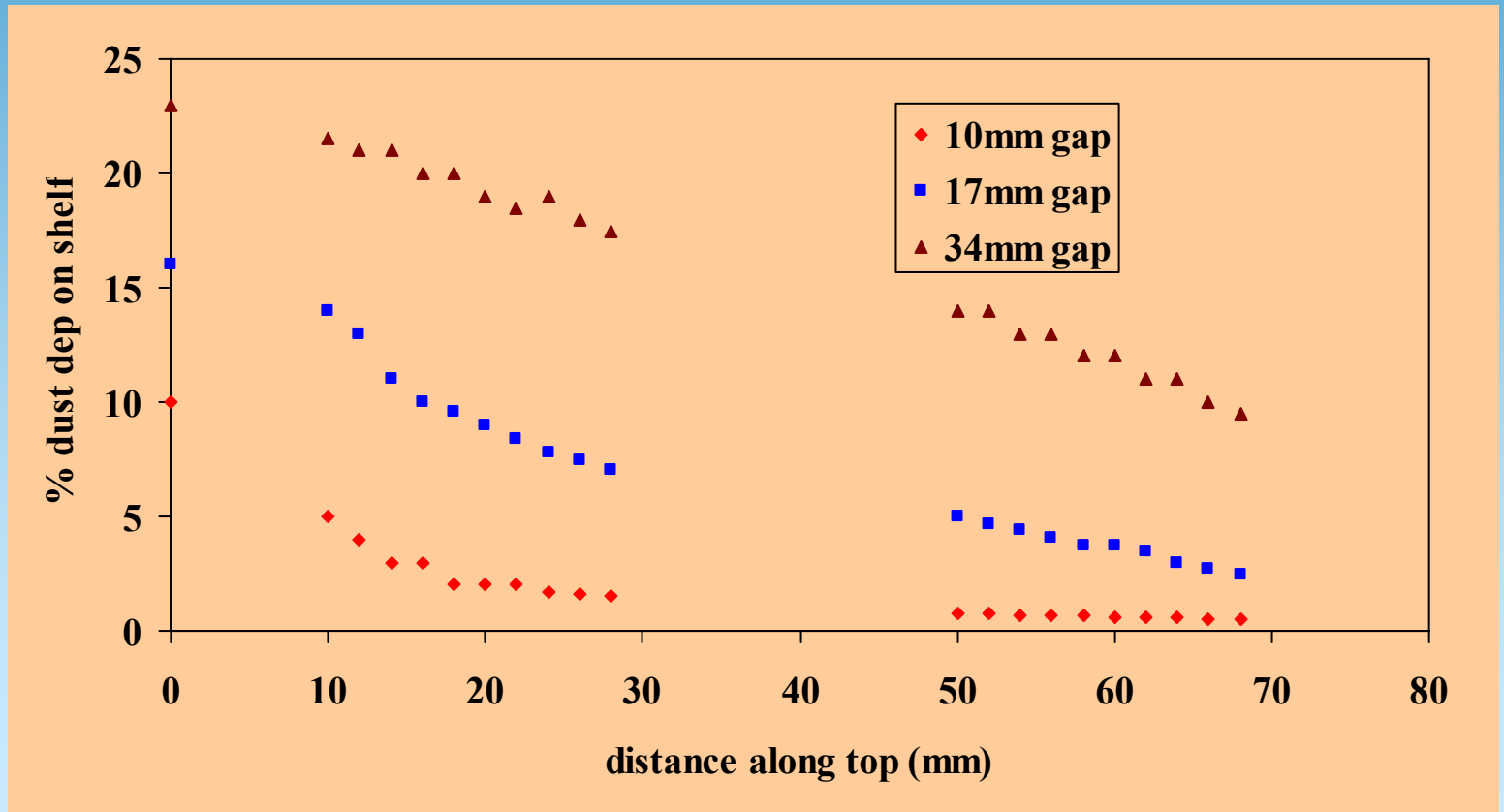
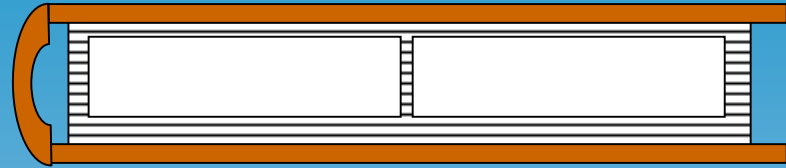
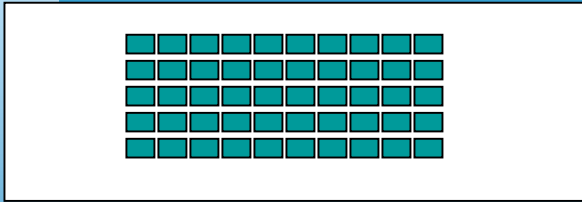
Long Term Deposition Rates



	Case A	Case B	Case C	Case D	Case E	Case F	Case G	Case H	Case J	Case K	Case L	Case M
1		11.1	6.8	14.2	12.1		14.9		18.6	12.5	2.5	
2		13.7	11.2	12.2	16.6		1		15.5	8.3	8.2	
3		22.9	11.6	17.1	16.4		16.3	9.7	14.1	13.8	8.4	
4		30.4	14.1	8.6	18.2		7.5		10.4	17.9	10.8	
5		17.7	9.3	13.8	9.8		44.6		15.8	17.3	7.1	
6		21.2	15.3	15.5	8.3		15.3		14.1	11.4	17.5	
7		15.4	12.2	16.8	4.7		21.2				7.2	
8		34.4		11.8	33.9	9.6			25.1	38.7	11.2	
9	21.6	9.1	15.3	21.7	14.8	5.7		21.4		17.3	14.1	
10		23	16.2	13.9	18.7	17.3		13.6	5.7	9.3	7.9	
11						11.4		18.5				
12						10.3						

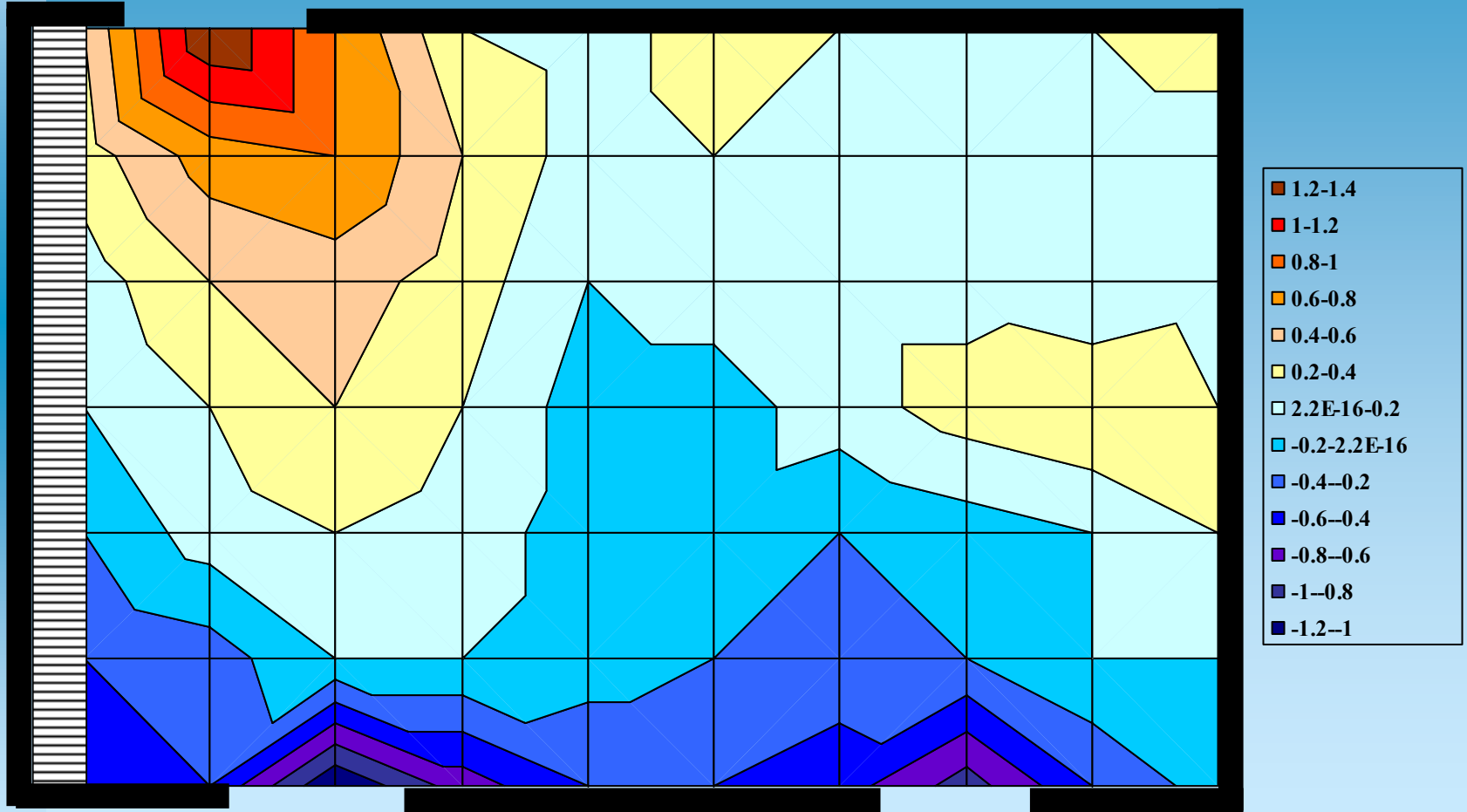


Tops of Books



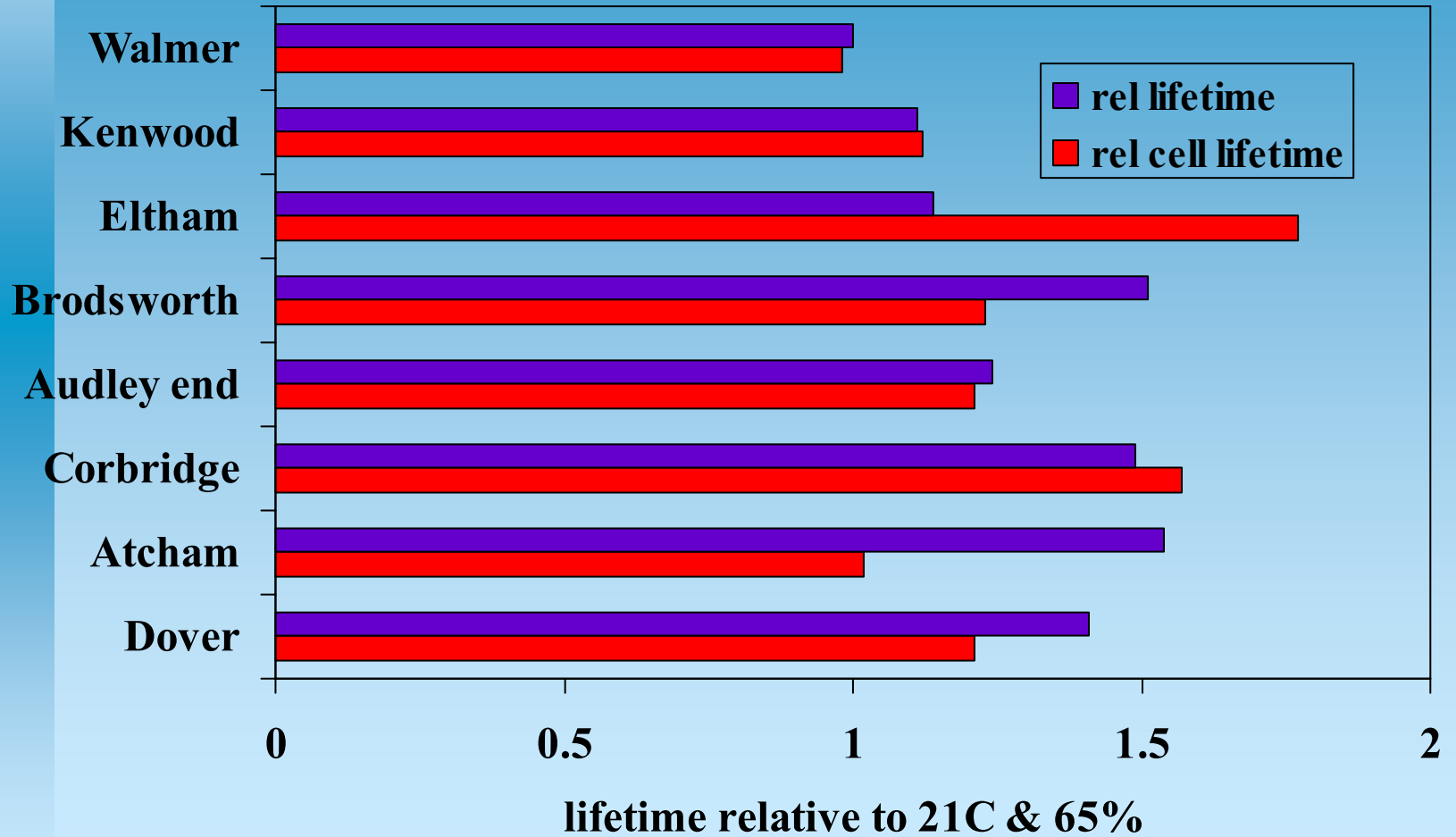


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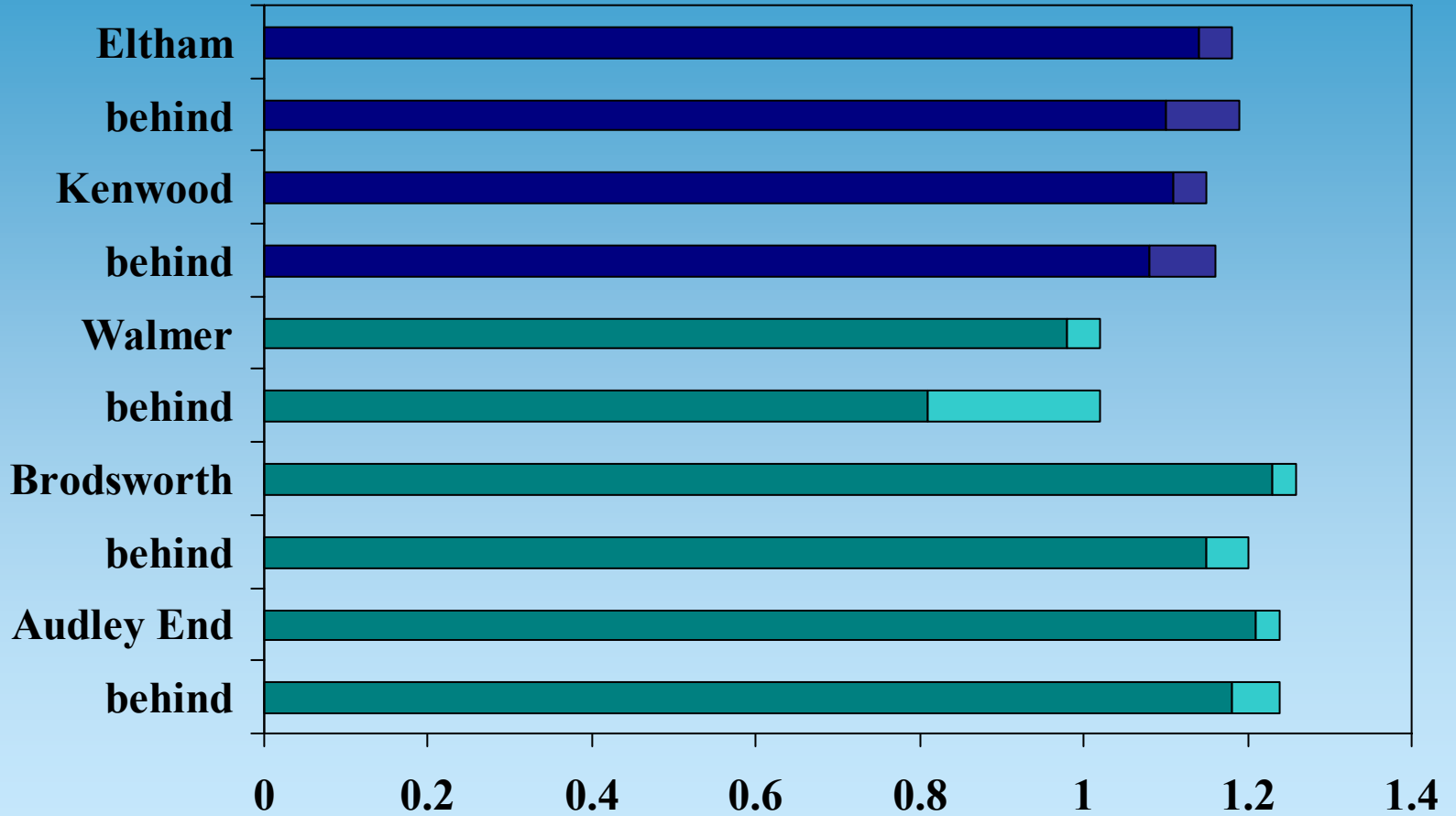
Chemical Lifetimes





Inside Bookshelves

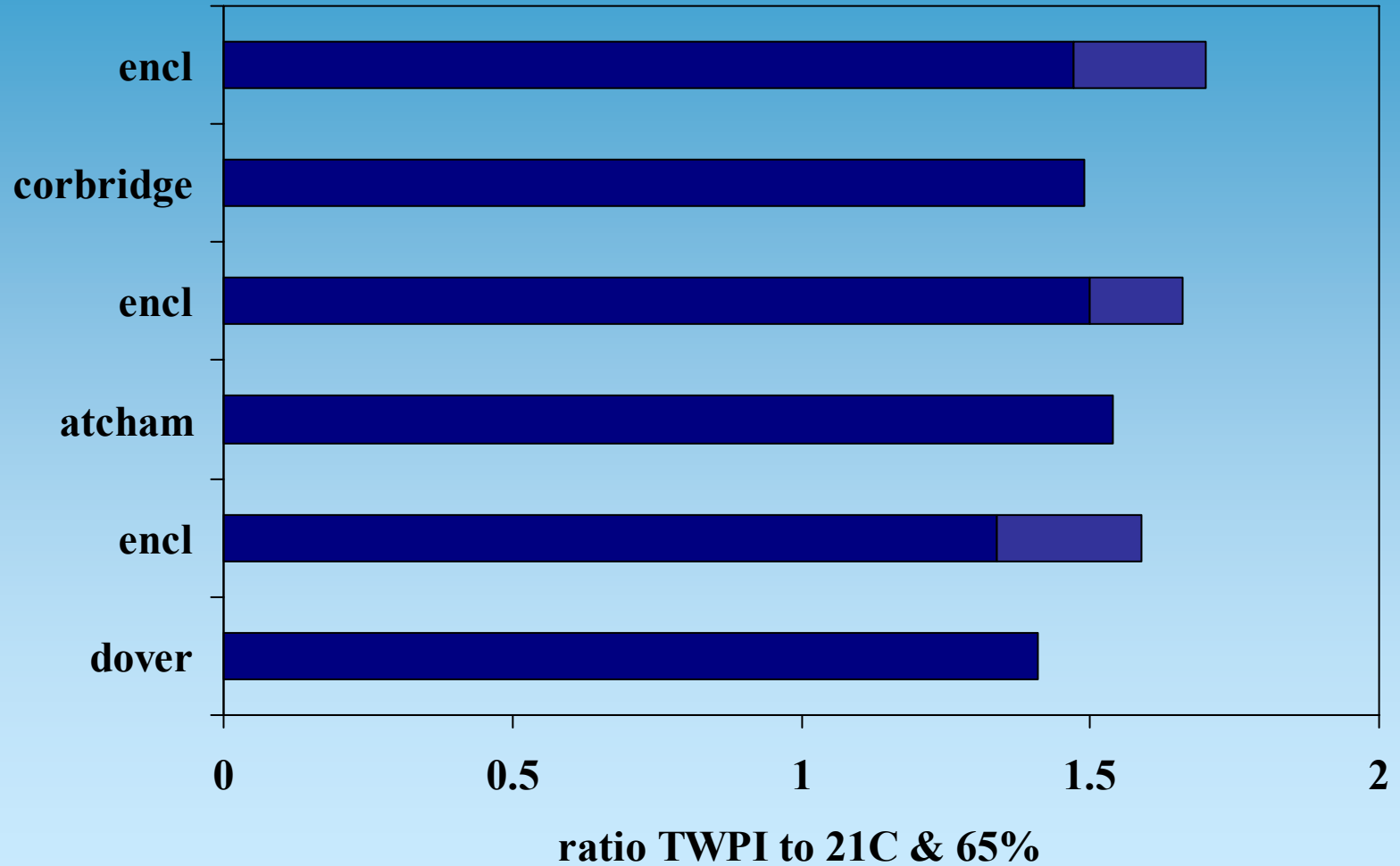
ratio TWPI to 21C & 65%



ratio cellulose lifetime to 21C & 65%

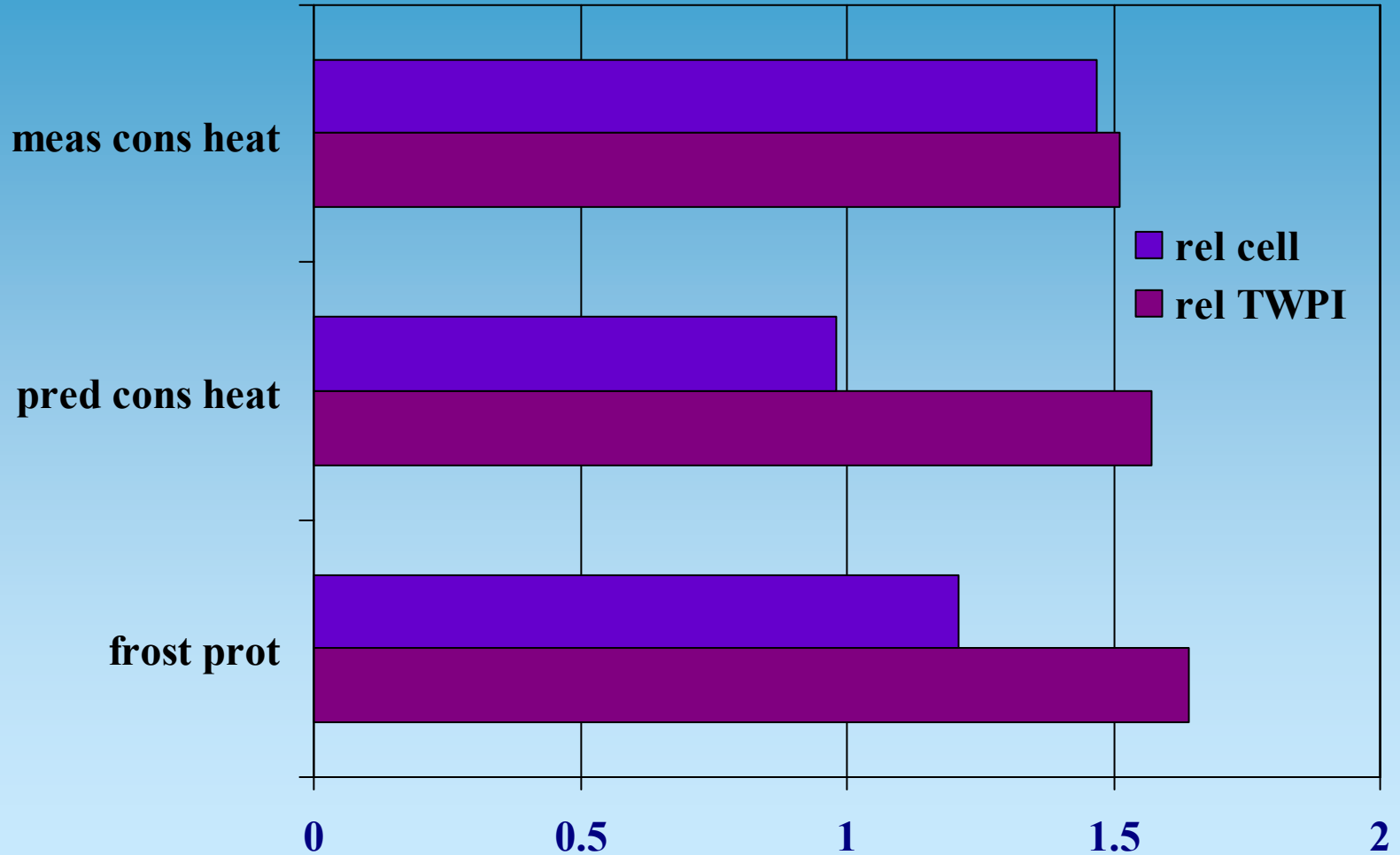


Effects Storage Enclosures





Hygrostatic Heating 50-65%



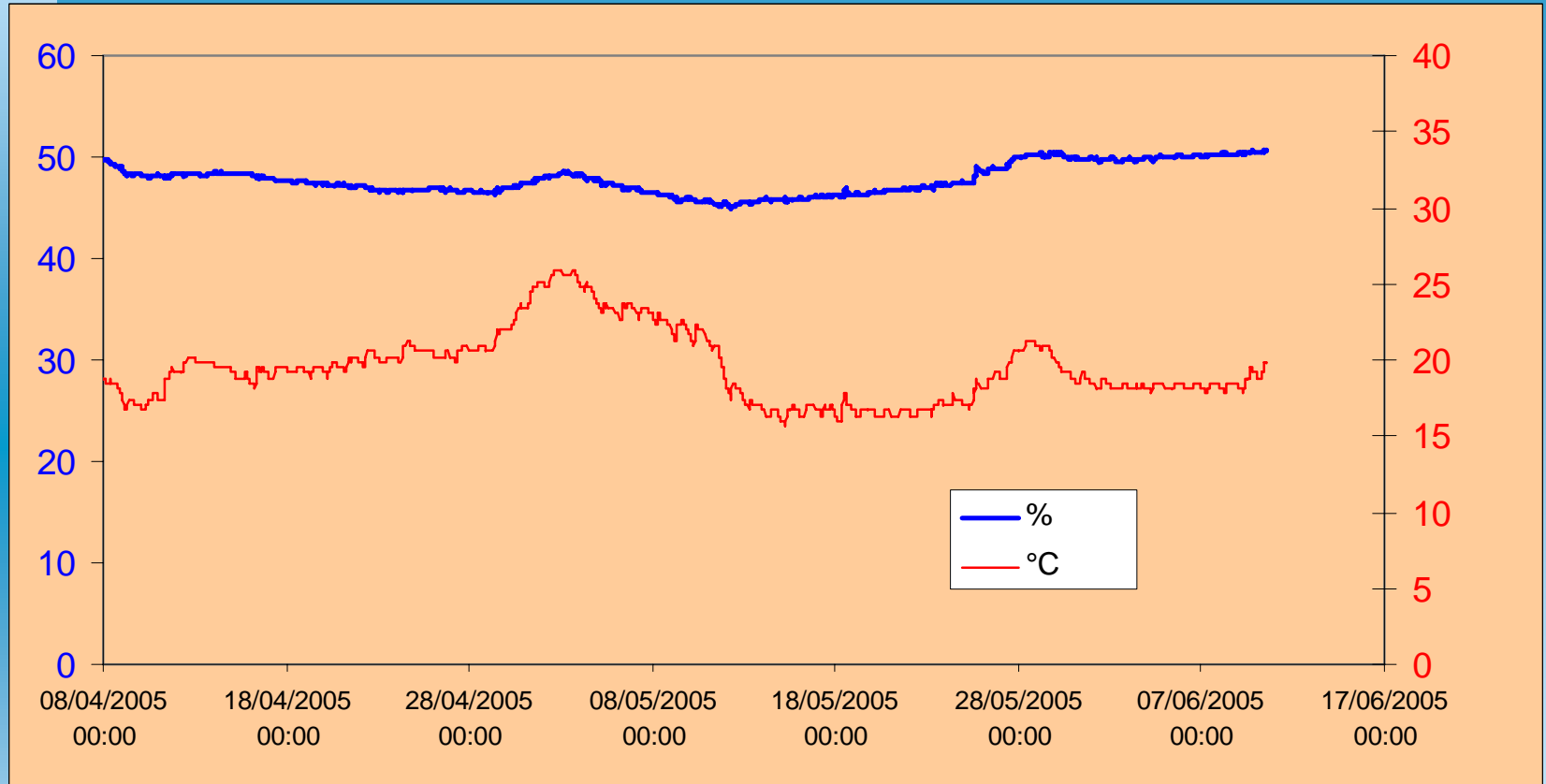


Drying Methods

- Heating
 - ◆ thermostatic
- ‘Conservation’ heating
 - ◆ Automatic systems – Rotronic Hygroclip controllers from Meaco
 - ◆ Manually adjusted systems
- Dehumidifiers
- Mixed



Manual Control



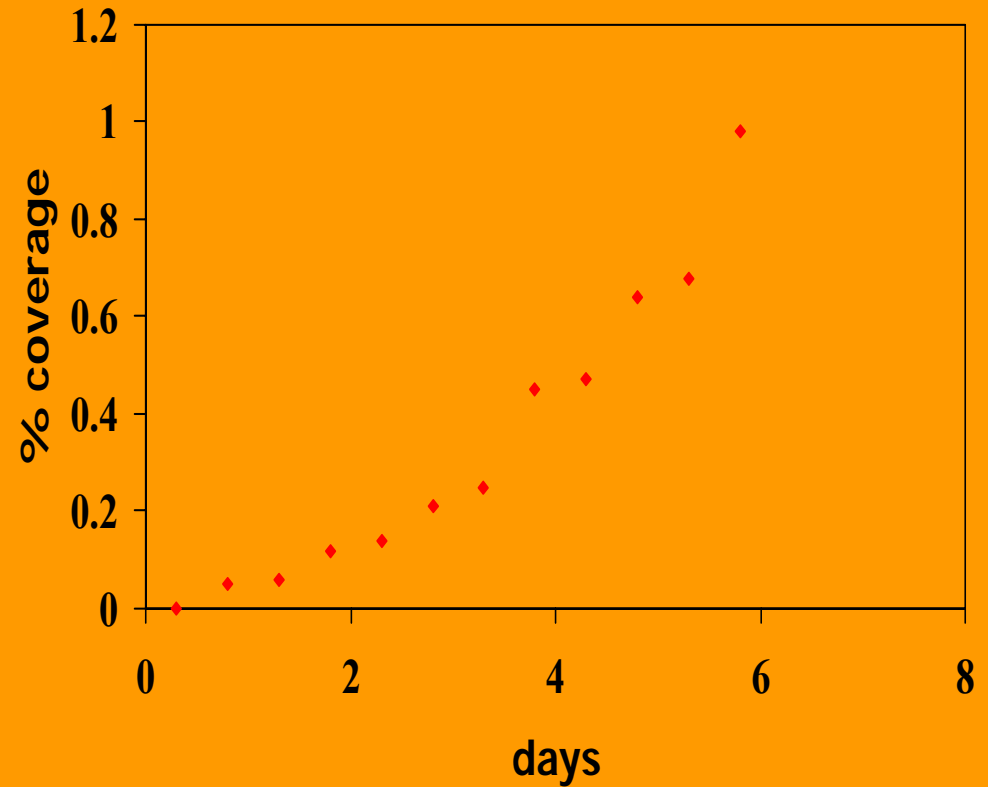
Volume 150m²

AER 4-7day⁻¹



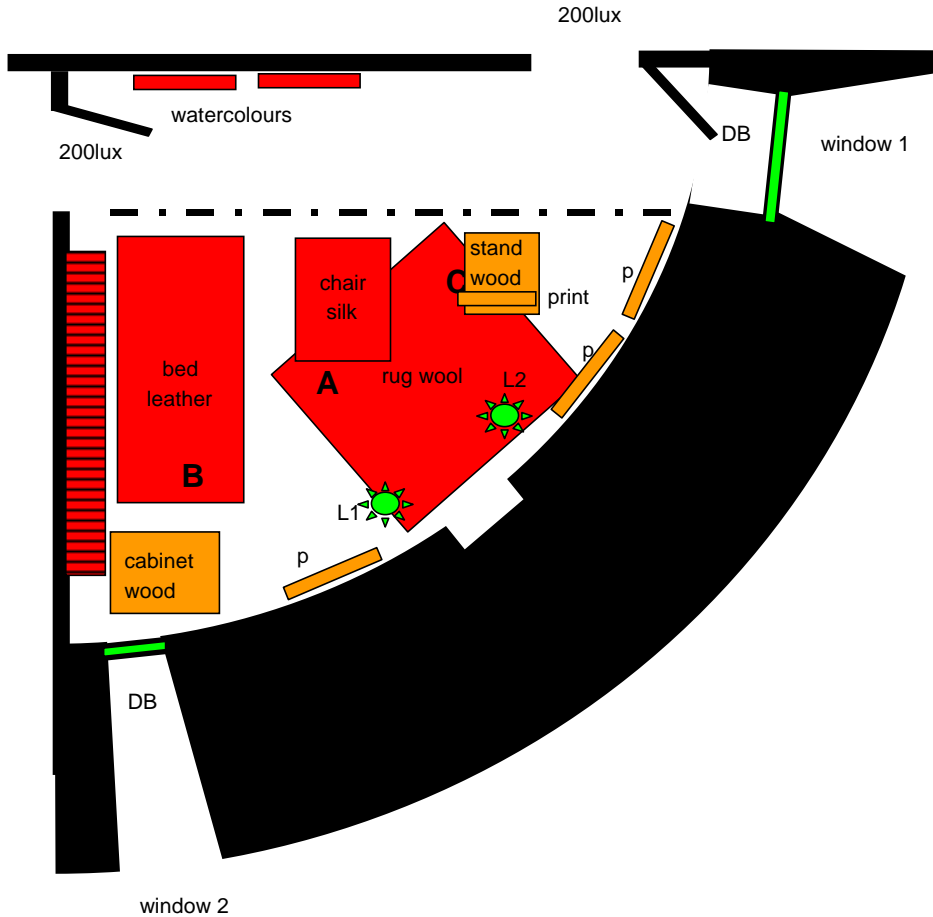
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Effect Salt Efflorescence





Light Plan



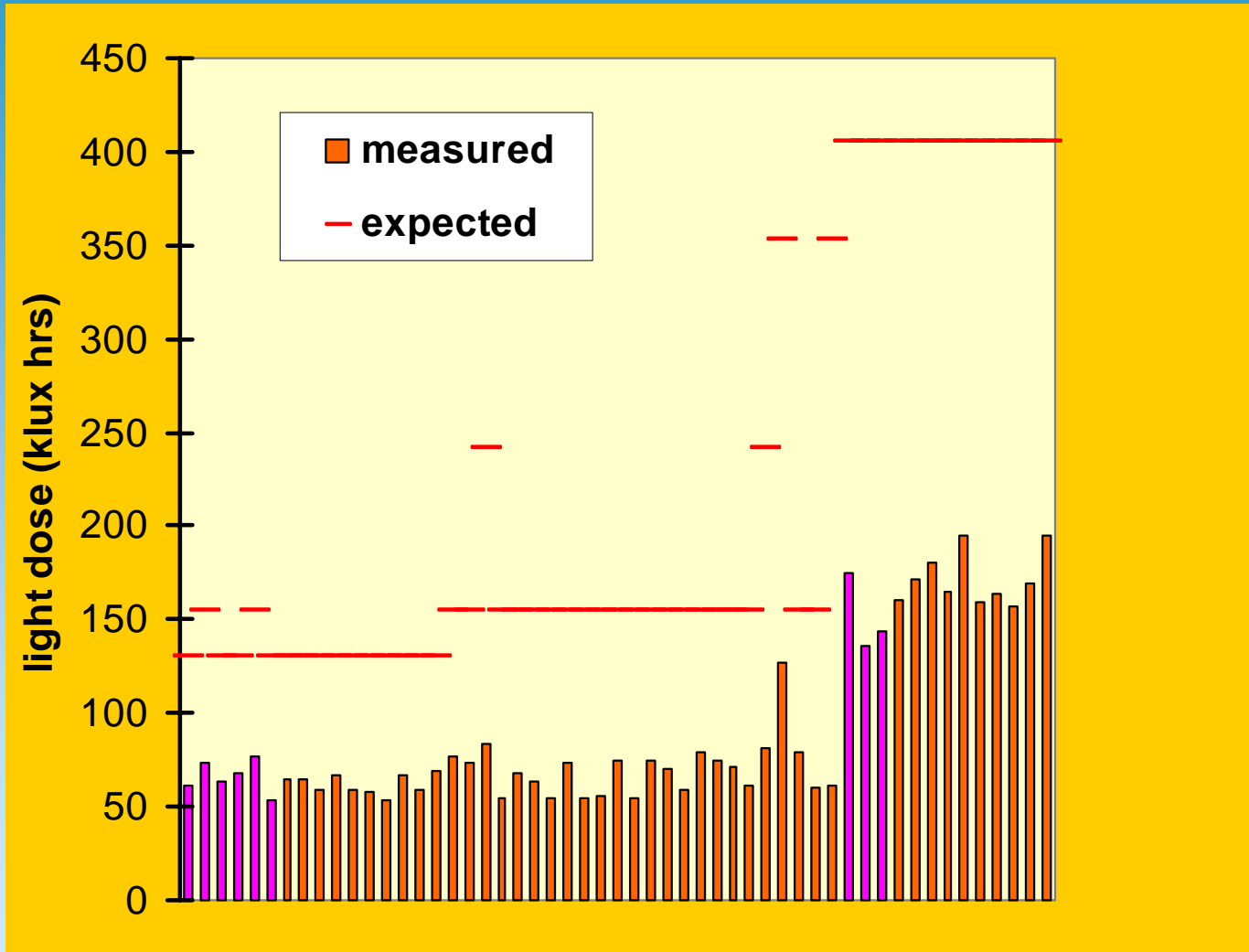
- p oil painting on canvas
- DB double blinds
- L1 40W incandescent bulb, 24microwatts/lumen
- L2 40W incandescent bulb, 24microwatts/lumen

Position	Blinds			Shutters		
	Up	Midway	Down	Lights	Closed	Lights
A						
B						
C						
D						

Room: Duke of Wellington's Room	Date: 20/02/2002			
Contents to be considered:				
Chintz armchair Silk bedcovers Bed (leather and canvas) Wallpaper (replica) Carpet (replica) Curtains (replica) Prints Books Wooden tables Wooden chair Wooden book stand				
Light Sources:				
Two windows, two electric lights on fireplace, incandescent				
UV control measures:				
UV film on both windows, 1995				
Light control measures:				
Dark coloured Holland blinds and curtains on both windows, electric lighting				
Light control:				
	Open Hours	Closed Hours	Closed Season	Functions
Proposed:	Eastern blind ¾ closed Southern blind fully closed	Blinds and curtains fully closed	Blinds and curtains fully closed	N/A
Desired lux level at recommended monitoring points when open to the public:				
Maximum of 50 lux on armchair and bed.				

Monitoring Points

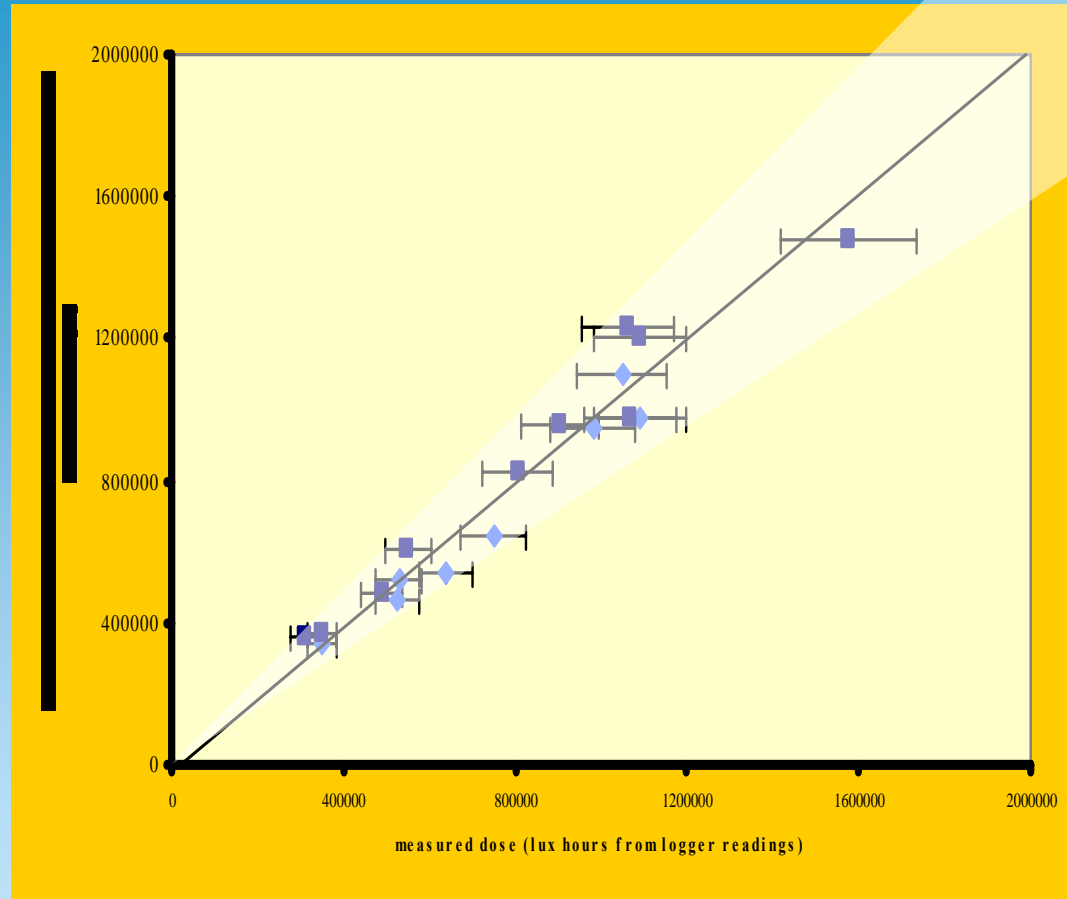
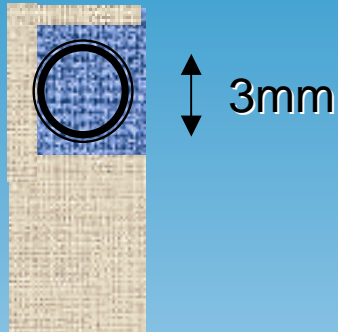
- A - Vertically at top of the armchair back
- B - Horizontally on edge of silk bedcover, on corner nearest to chair
- C - Vertically in middle of print on bookstand





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Blue Wool 1 'Errors'



■ Hanwell Luxbug

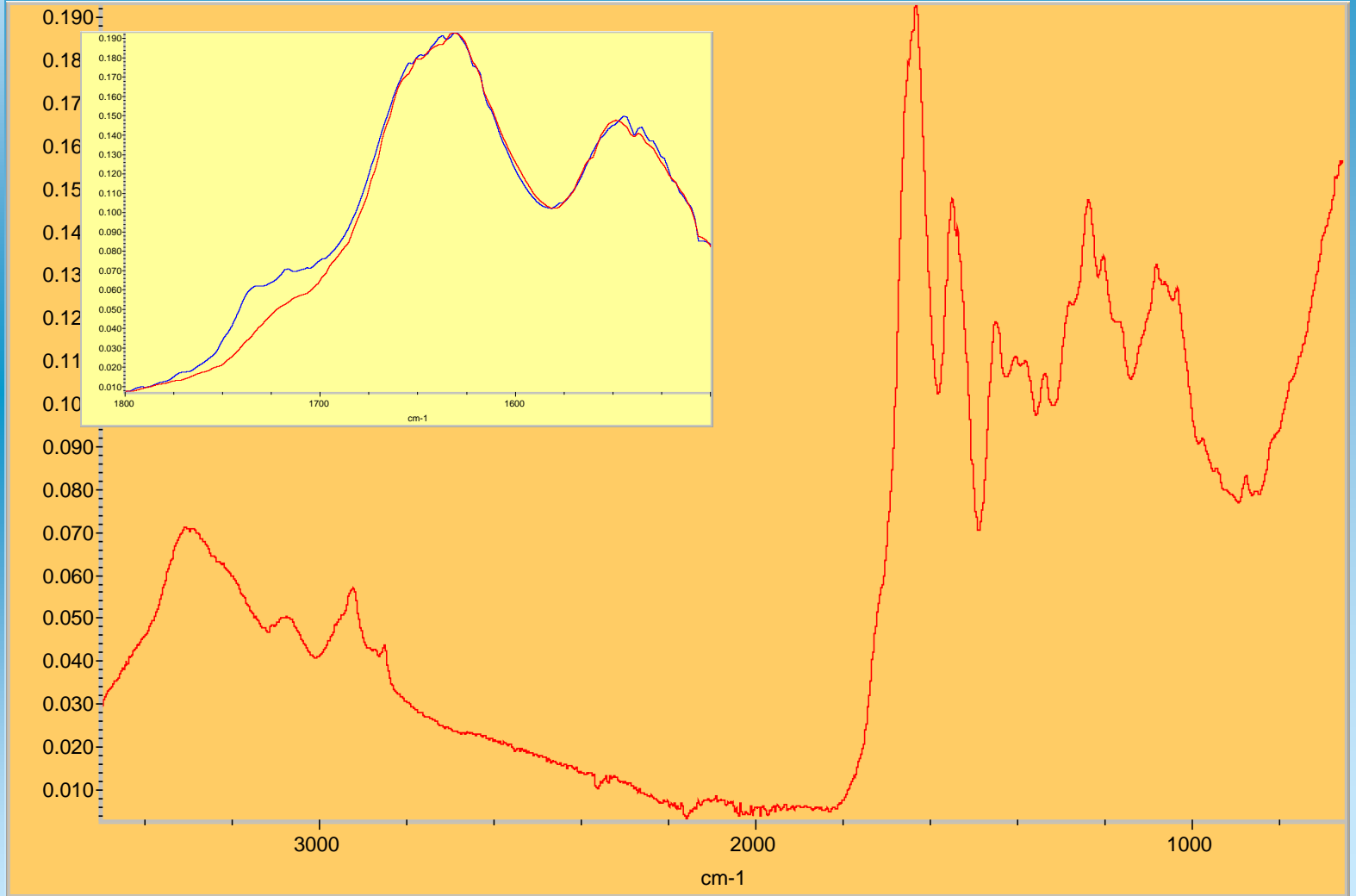
- ◆ Normal, every 5,15,30 or 60min
- ◆ Average, every 30sec, recorded in 60 min intervals

■ Meaco radio

- ◆ Every 5 minutes
- ◆ Max reading stored to computer for log interval (30 mins)



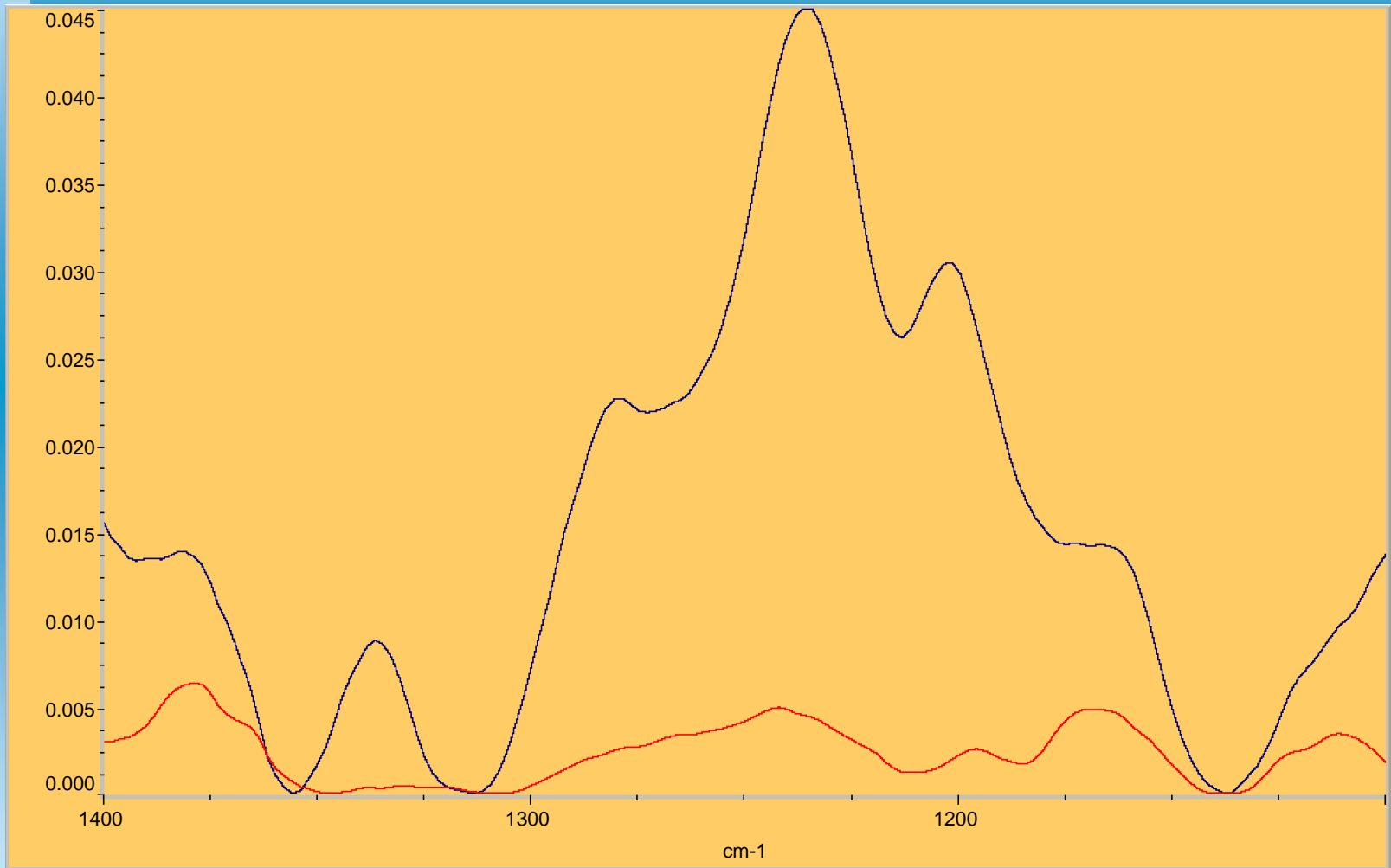
FTIR diamond ATR





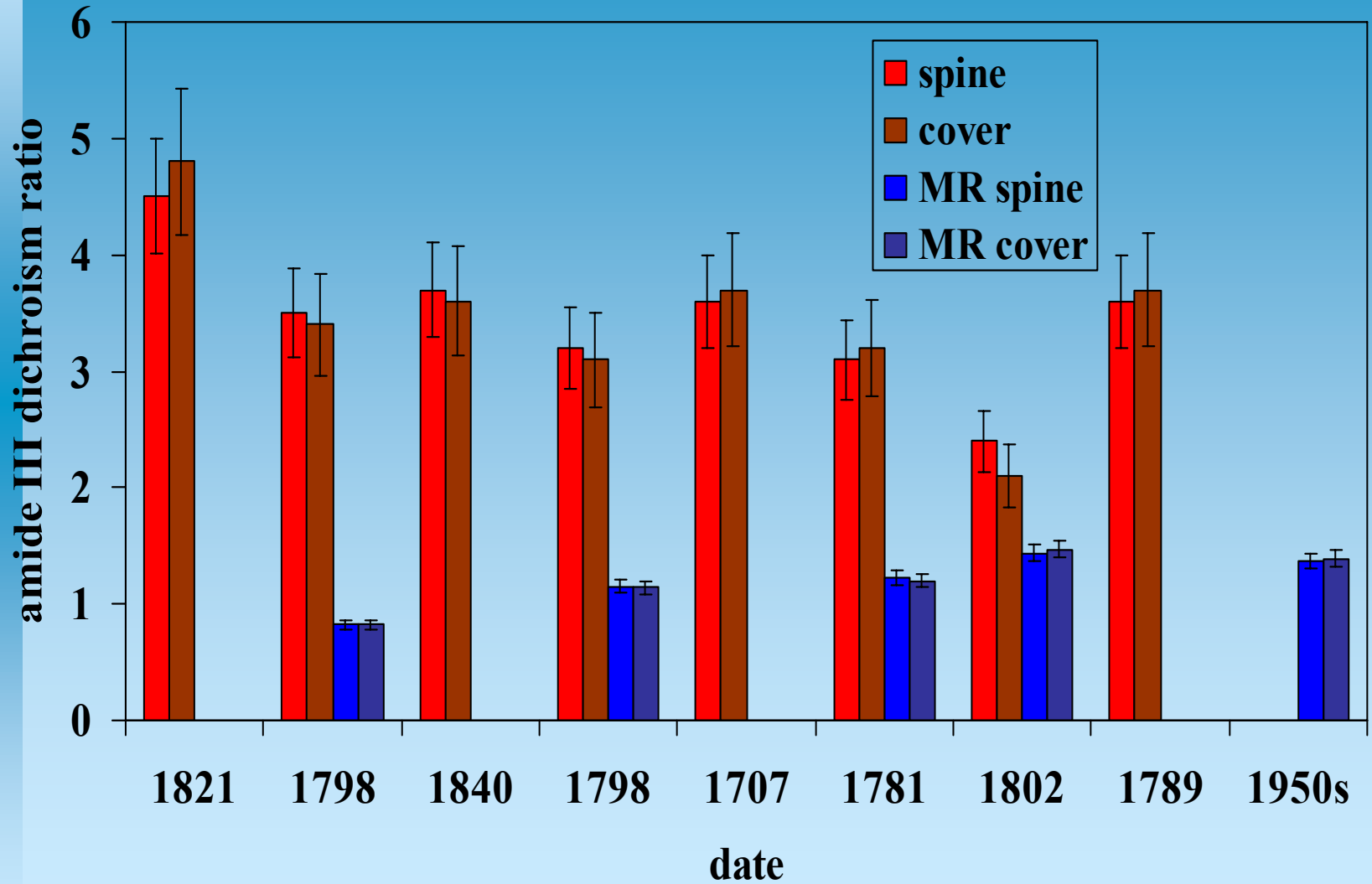
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Dichroism Amide III





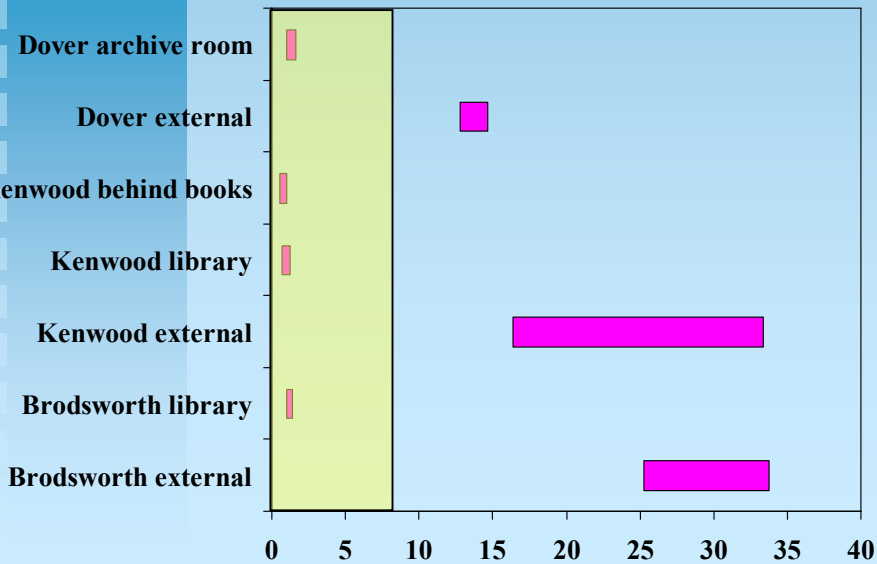
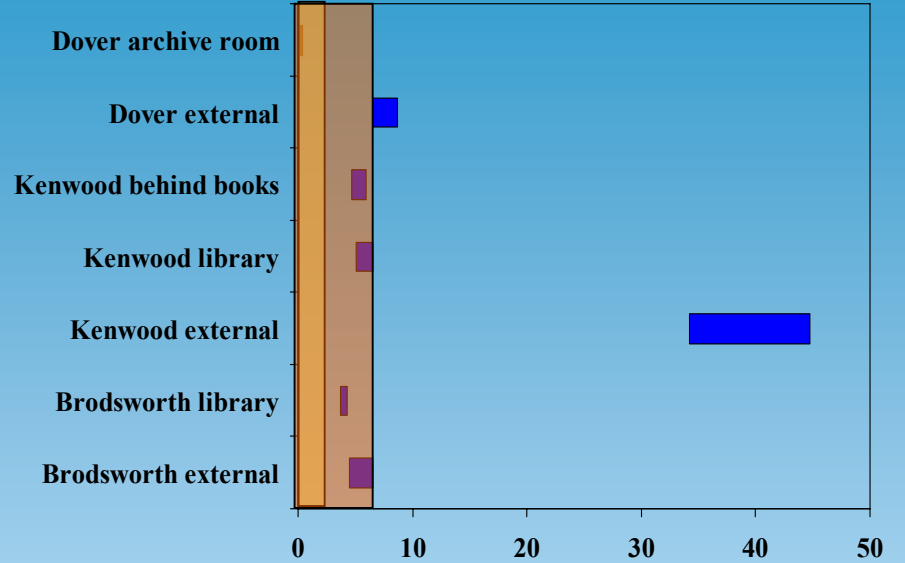
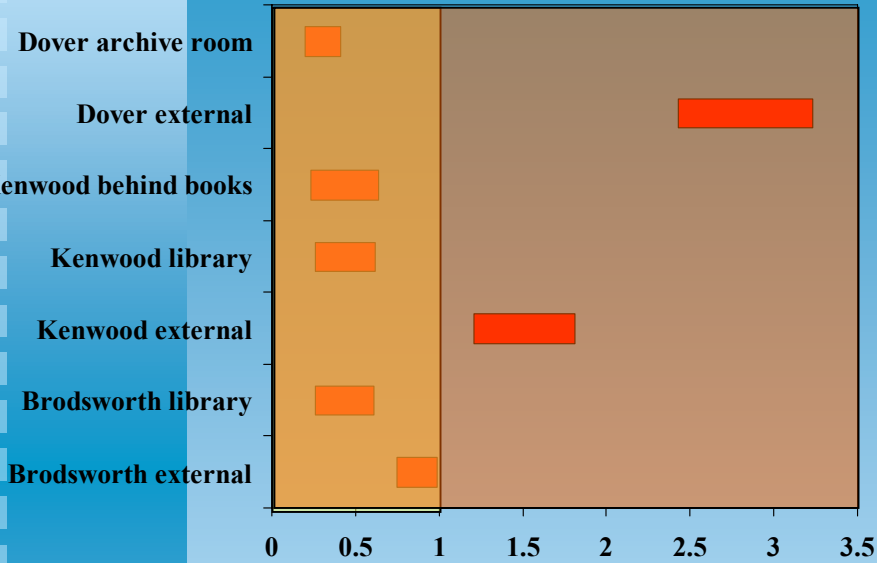
Effect of Light on Leather





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Pollutants



Sulfur dioxide

Nitrogen dioxide

Ozone

Rag paper

Wood pulp paper



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Impact Pollution Model - Naturally ventilated buildings version 1.2

Input your environmental conditions:

Pollutant SO2 NO2 O3 Outdoor ppb (if known)

Indoor temp 16 deg C

Relative humidity 43 %

Air changes 2.4 hr day

Estimate air changes from temperature and windspeed

Outdoor temp 10 deg C

Wind speed 9.0 m/s

Input your building parameters:

Internal volume m3

wall mat 1 area (m2)

wall mat 2 area (m2)

floor area (m2)

ceiling area (m2)

surface 1 area (m2)

surface 2 area (m2)

surface 3 area (m2)

Model outputs:

2ppb

Estimated indoor concentration in ppb

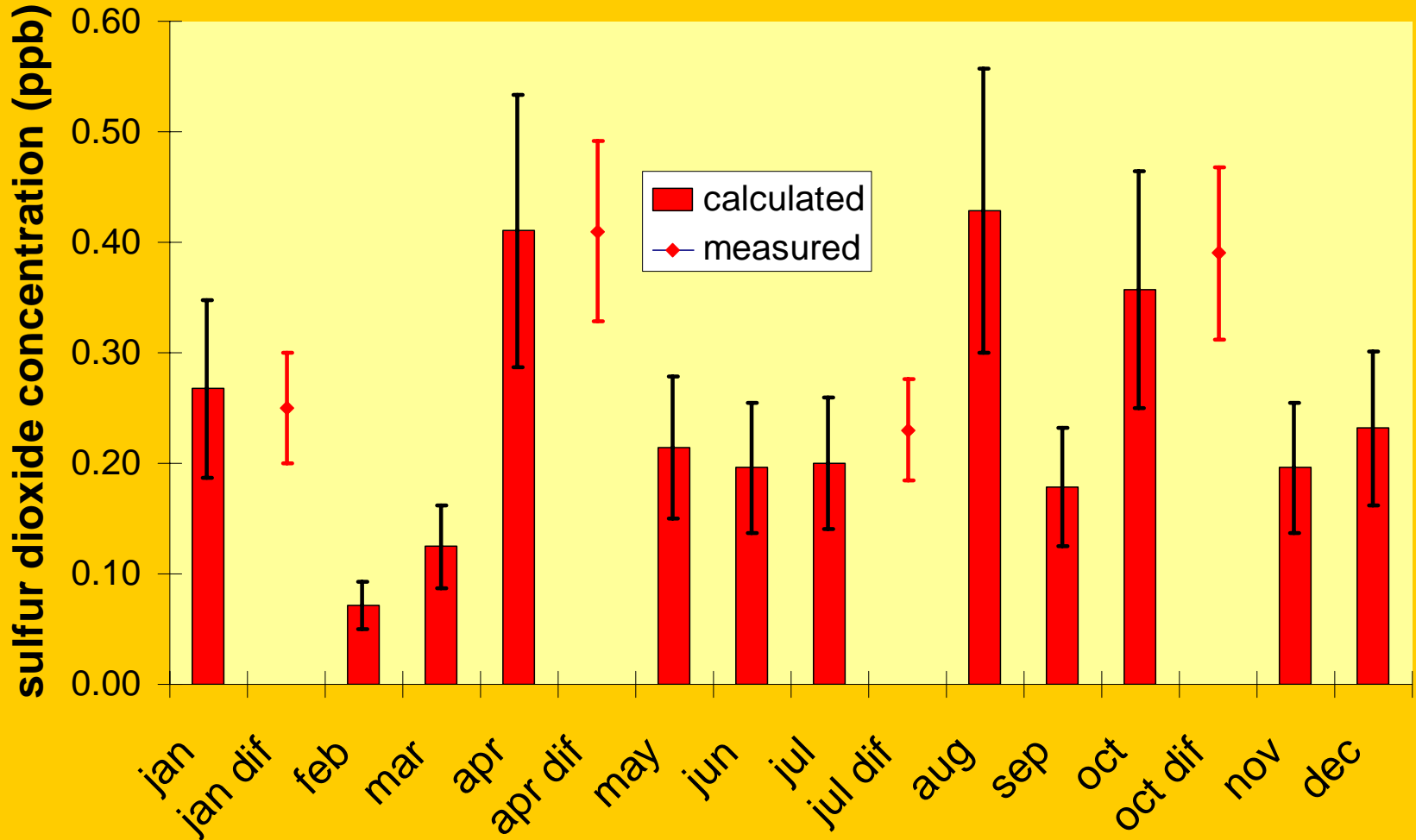
Pollutant deposition to materials (area weighted)

material	vd (cm/s)	flux (µg-s ⁻¹)
plaster	0.015	0.027
synthetic carpet	0.017	0.013

Pollutant concentration as a function of air change rate

Java Applet Window

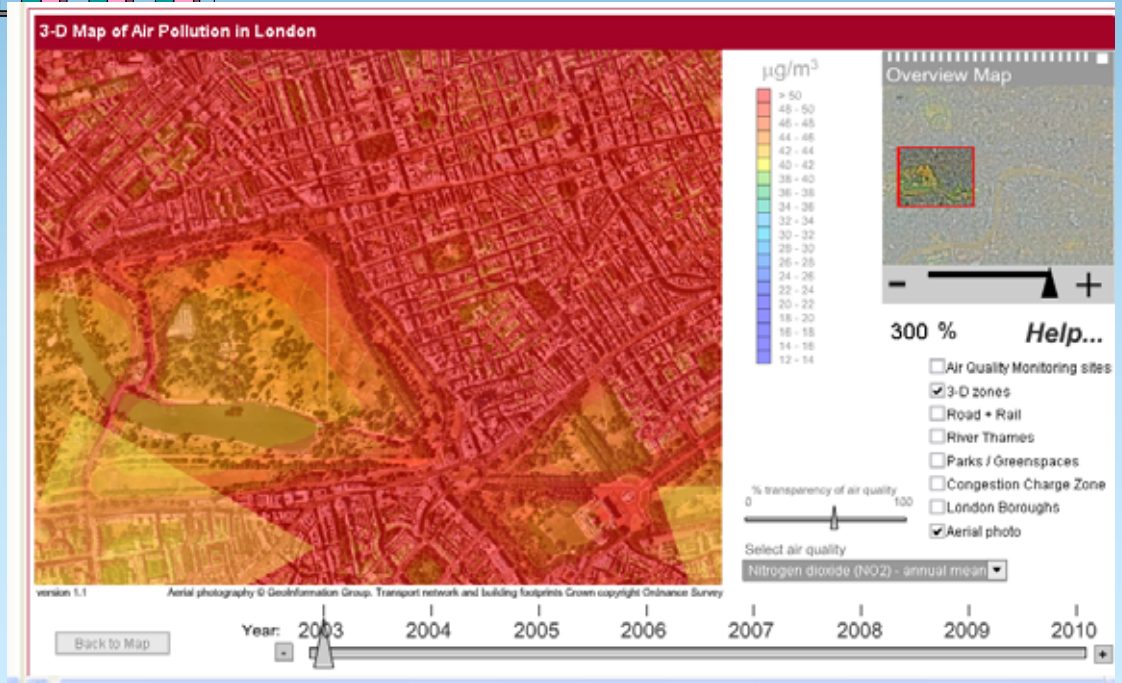
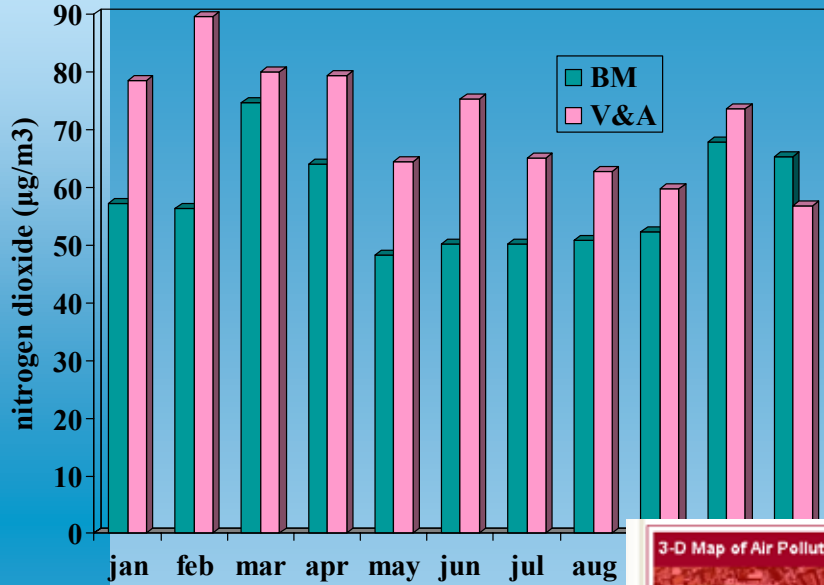
$$\frac{\text{Indoor}}{\text{Outdoor}} = \frac{\text{AER}}{v_{dep} (\text{surface} / \text{volume}) + \text{AER}}$$





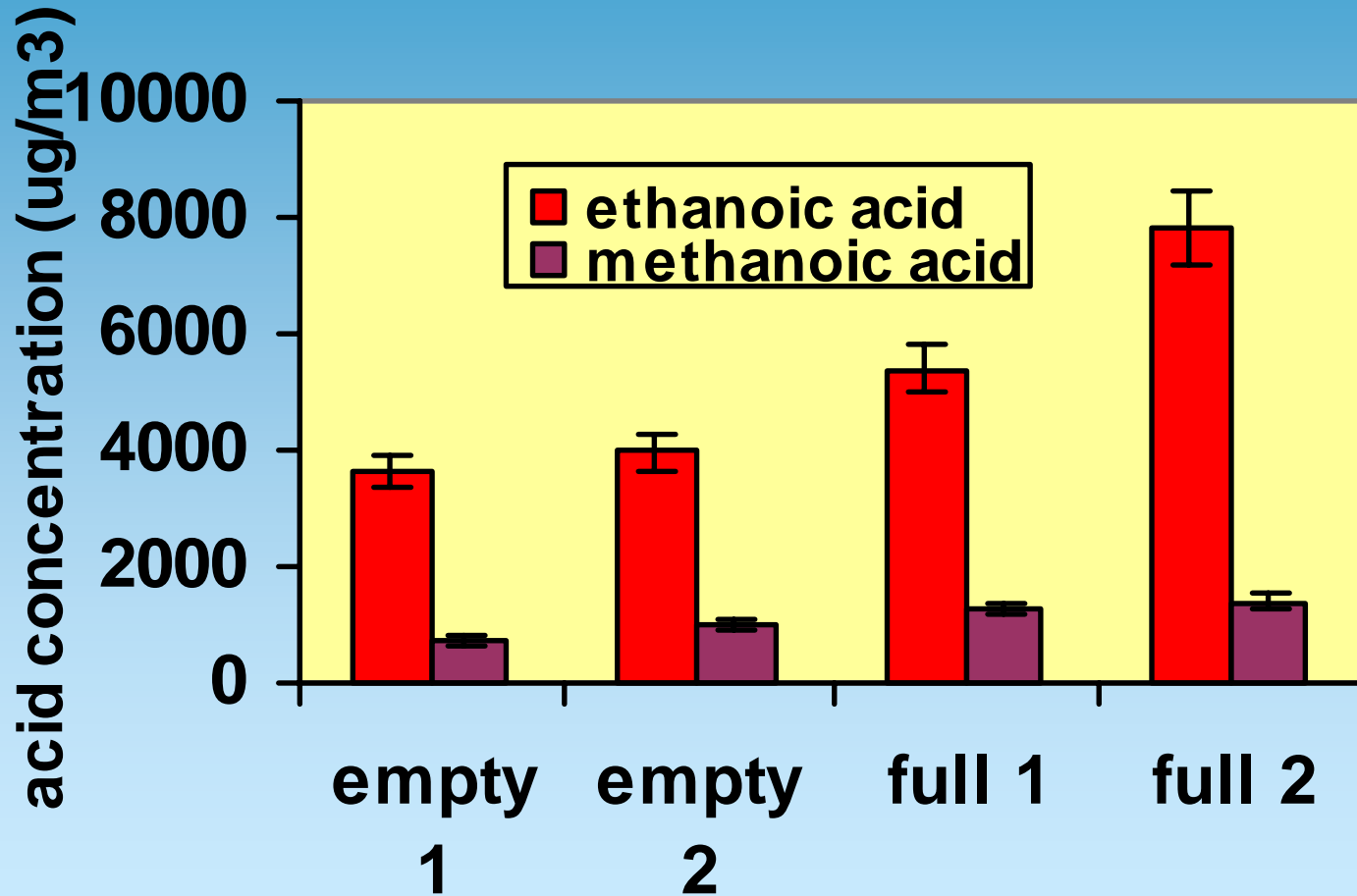
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Data issues





Internal Pollutants





Conclusions

- Chemical deterioration rates low
- Light doses less than expected, libraries & other
- No apparent light damage on leather bindings
- **Pollutant levels can be high**
- Dust follows similar deposition patterns as observed previously
- Two types of behaviour through gaps on top of books



Acknowledgements

- Seok-Joo Rhee
- Sarah Lambarth
- Tate Gallery
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