



# Storage & Conservation of Geological Collections

Kathryn Royce & Dr. Christian Baars





- Conditions effect collections
  - result of weather, visitor interactions, HVAC, etc.
- Breakdown of in-room AC unit
  - recirculation without fresh air
- Drawers emit  $>1,700\mu\text{g}/\text{m}^3$  of carboxylic acids
  - corroded pipes => leaks
  - effect minerals?

# Mineral Collections Store

National Museum Wales – Cardiff, Wales



# Minerals, Stones, Fossils ≠ Stable Objects



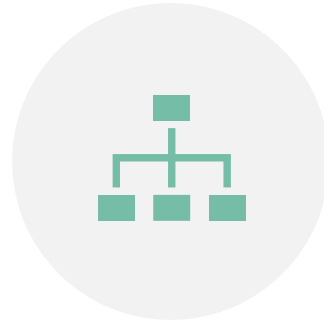
## Diversity

MANY different species  
Different compositions



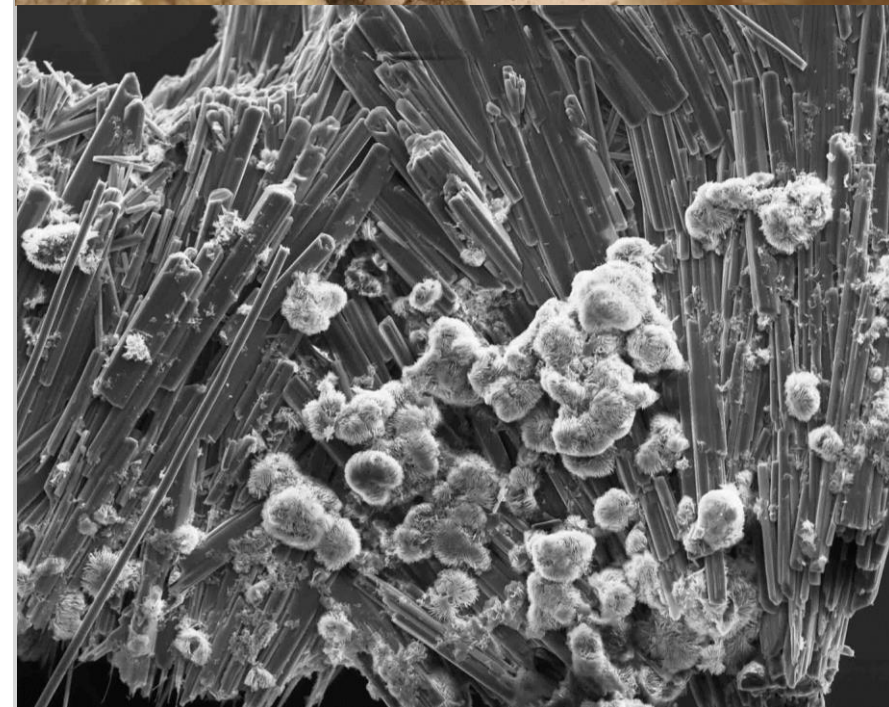
## Variable Conditions

Relative Humidity  
Oxygen presence  
Light



## Pseudomorphs

Chemical alteration  
No change visibly  
apparent





# Effects of Inappropriate Conditions

## High RH

- deliquescence
- efflorescence
- swelling
- chemical change

## Low RH

- dehydration
- shrinkage

## Light

- colour change
- loss of fluorescence

## Pollutants

- corrosion / tarnish
- acidic precipitates

## Poor Handling / Storage

- breaks
- crumbling
- crack formation



# The Research Agenda



## Defining Damage

What are we to look for?  
Can it be measured?



## Efficacy of Treatments

Are they appropriate?  
Are there any new techniques & methods that can be adopted?



## Condition Assessments

Automating condition assessments via AI?  
Combining risk assessments with condition surveys



## Current Standards

Do they fulfill specimen & collection needs?  
Are defined conditions actually suitable and achievable?



# Defining Damage

*unacceptable degradation of value-defining aspects caused by agents of deterioration*

damage = magnitude (*quant.*) + perception (*qual.*)



## Species-specific

- Decay mechanisms & products
- Cracking
- Loss of reflectance
- Colour changes

## Environmental Conditions

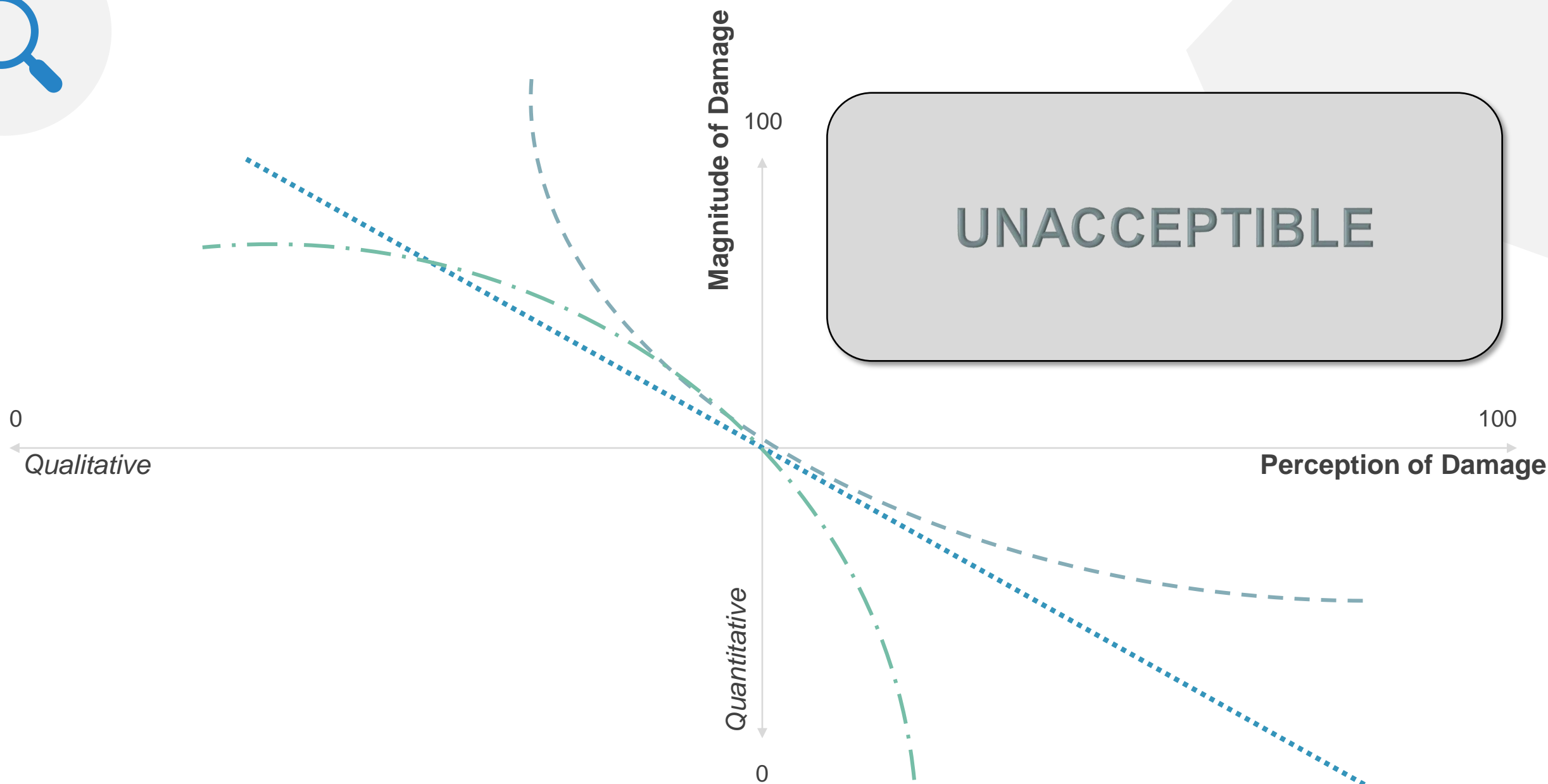
- Light
- Humidity
- Temperature
- Microclimates
- Pollutants

## Conservation Treatments

- Cleaning methods
- Handling
- Materials used







Plot of Total Damage



# Assessments



## Available Resources?

- Money
- Equipment
- Time
- Personnel



## Consistency

- Periodic
- Objective
- Repeatable



## Simplicity

- Speed up process
- Apply to entire collection







# Ideal Guidelines & Standards



## Legible

- concise language & values
- comprehensible to all



## Applicable

- available methods & treatments
- practical conditions



## Comprehensive

- appropriate coverage of species & their decay
- acknowledges widespread practices & materials

	Ambient Temperature	Ambient Relative Humidity	Microclimates (2) (Where needed)
Records:			
Documents on paper	13 - 18° (3)	55 - 65% (3)	Not applicable
B & W prints	15 - 20° (4)	30 - 50% (4)	
B&W negatives:			
Cellulose ester base	<20°C (5)	15 - 40% (5)	Prevention of

Specimens	Ambient Temperature (2)	Ambient Relative Humidity
General Guidance:	16-22°C	45-55%
Sensitive minerals and other materials (3):	depends on mineral or material	
Pyrites and Marcasite and fossils containing these minerals (4)	16-22°C	20-30%
Sub-fossil bone (5), tusks, teeth: fossils with shale or clay matrix (6)	16-22°C	not below 40%

(master & copies): Cellulose ester base	<20°C (5)	15 - 40% (5)	condensation on cooled materials important
Polyethylene tetraphthalate base	<20°C (5)	30 - 40% (5)	
Colour slides/negatives	2°C or below (4)(2)	25 - 30% (4) (2)	Higher than necessary RH accelerates deterioration
Colour prints	2°C or below (4)(2)	30 - 50% (4)(2)	ditto



## Summary

Specimens not always stable  
*some susceptible to common  
museum conditions*

- Extensive research needed to develop appropriate care
  - define damage, both quantitatively & qualitatively
  - combine both aspects into encompassing measure
  - evaluate environments, treatment methods & materials
- Refine forms of assessment
- Update standards & guidelines







# Thank you

Tom Cotterell - Senior Mineral  
Curator, NMC

Jana Horak - Head of Mineralogy  
& Petrology, NMC

Heather Viles - Research supervisor,  
University of Oxford

BSRIA Ltd.

OR3D

National Conservation Service

Pilgrim Trust