

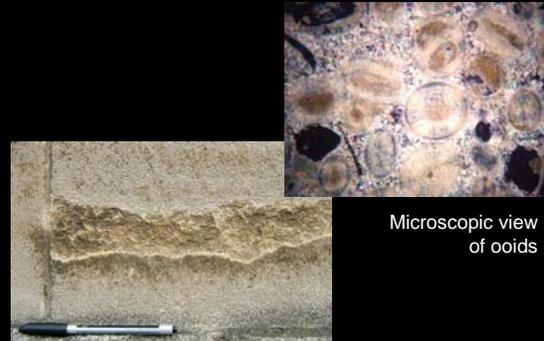
Crumbling facades



Past, present and future threats to Oxford's stonework

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Oxford limestones



Microscopic view of ooids

Limestone deterioration

- Soiling and crust formation
- Blistering and breaching of crusts
- Salt damage
- Biodeterioration



Oxford history of building in stone



St George's Tower
(Source: NMR, Henry Taunt)

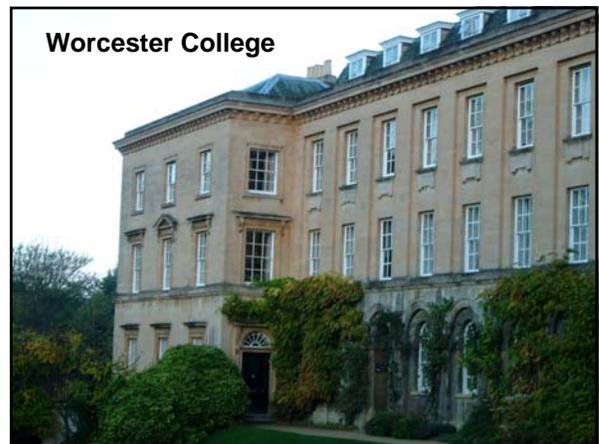


Worcester College

Oxford stone types

- Local – Wheatley and Headington
- Cotswolds – Taynton and Milton
- Bath
- Further afield in the Jurassic stone belt – Clipsham
- Foreign stones – eg Savonnières

Worcester College



History of decay of Oxford stone



Trinity College



History of management and repair

Pembroke College



Oxford stone today

- Complex and diverse 'stock at risk'
- A wide range of management styles
- Some new buildings also using stone



St Edmund Hall

Present threats 1:

Traffic, air pollution and stone decay in Oxford - the EMITS project



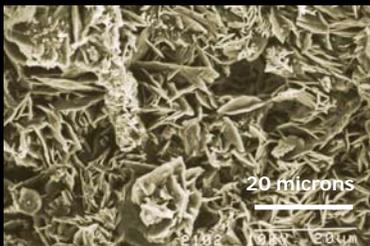
EMITS overview

- To investigate the impacts of the OTS on traffic, air pollution, health, economic vitality and building stone decay
- 5 year EU-Life funded project
- 3 years pre-OTS and 2 years after OTS (1996 – 2001)

EMITS and stone decay

- Limestone weathers naturally through dissolution in water acidified by carbon dioxide
- Under polluted air limestone weathers through sulphation in water acidified by SO_2
- Sulphation produces gypsum which forms a damaging surface crust
- Particulate air pollution also causes soiling of stone which can enhance deterioration

Well developed gypsum crust from an old limestone wall



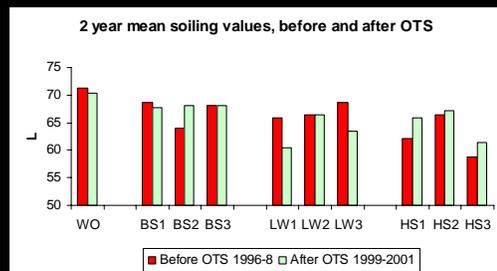
Studies of stone decay and traffic

- Used stone sensors on lighting columns
 - 15 small discs of Bath stone placed at 3 m above ground on lighting columns at 10 sites (3 along High Street; 3 along Longwall, 3 along Broad Street and 1 in a city centre garden)
- Repeat photography of old walls to investigate changes in soiling

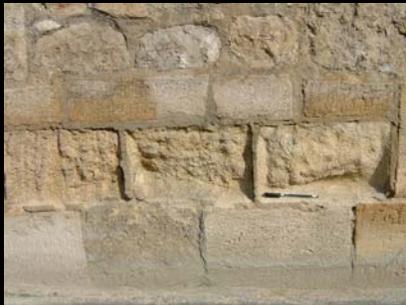
Soiling of stone after 2 years of roadside exposure on the High Street



Has OTS made things better?



**Present threats 2:
Rapid, catastrophic decay of stone**



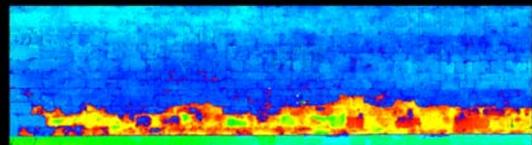
Longwall Street



New College Lane



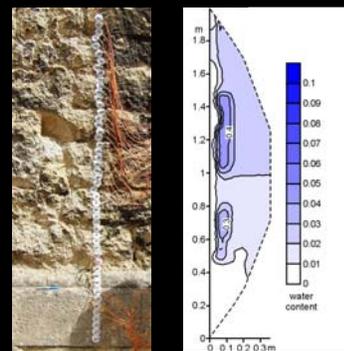
**Topographic map from Lidar of
New College Lane wall**



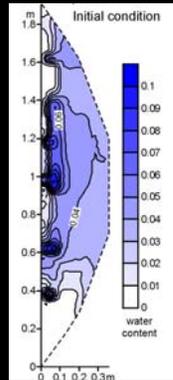
2D resistivity surveys



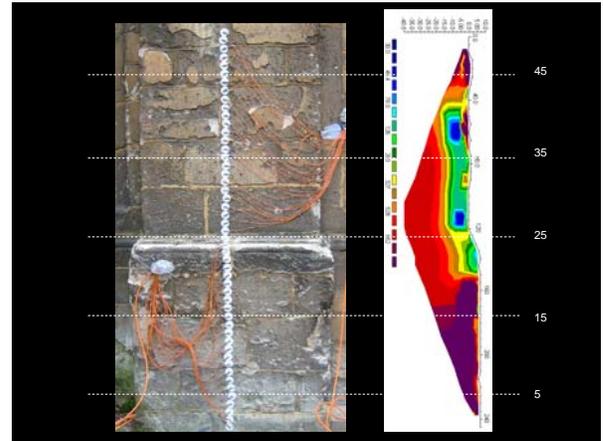
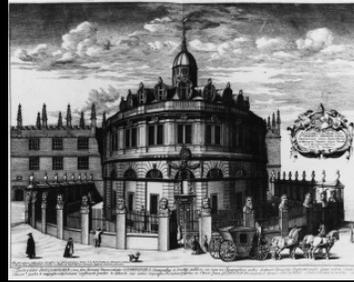
New College 1B



New College 1C

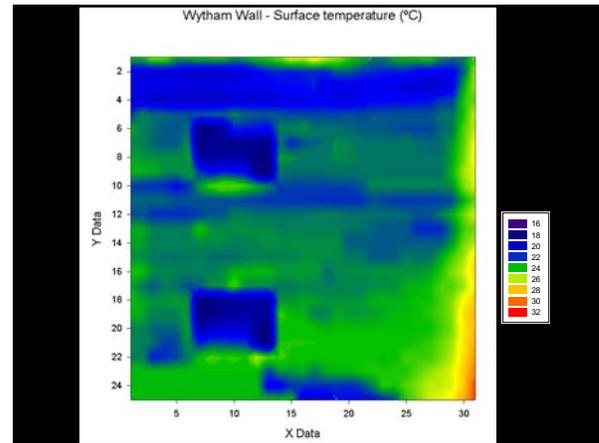
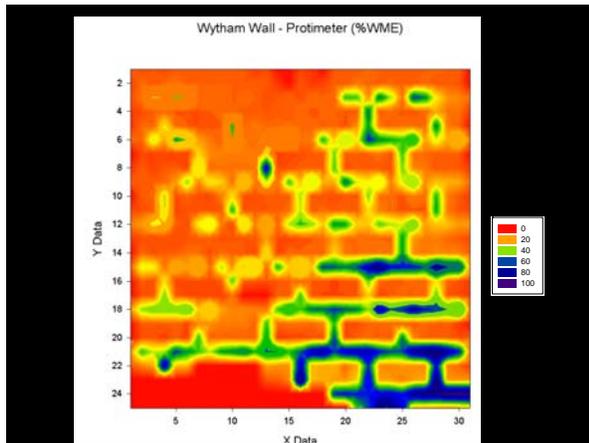


Wren Wall



Test wall at Wytham Woods





Future threats



Conclusions

- Oxford's facades illustrate many types of deterioration, and show the complexity of decay on old stonework
- Both the nature and severity of deterioration have varied over time and will continue to vary
- Climate change will influence stone decay in the future, but traffic remains a major problem