21st century science harnessed to help preserve historic buildings

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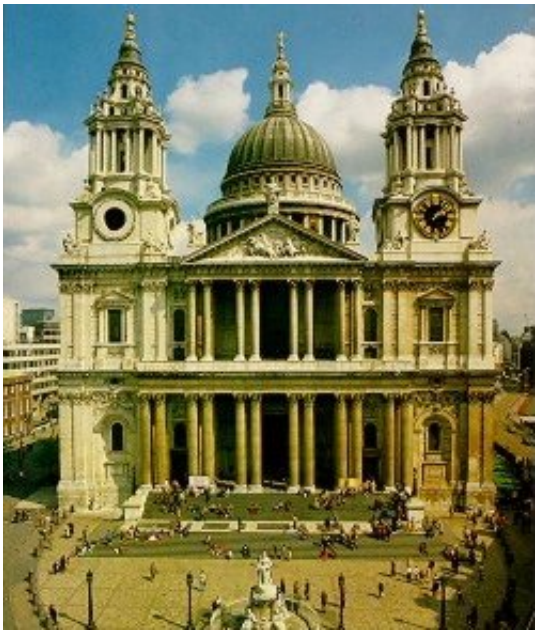

Famous British landmarks such as St Paul's Cathedral stand to benefit from world-leading research aiming to aid the conservation of limestone buildings. A key element in the project is the development of highly sensitive, innovative fibre-optic sensors able to provide data about the physical and chemical processes at work in limestone blocks used in buildings.

The initiative is being undertaken by a team combining state-of-the-art

expertise in Geomorphology, Physics and Civil Engineering from Queen's University Belfast, City University in London and Oxford University. Funded by the Engineering and Physical Sciences Research Council (EPSRC), work is due to begin at the start of January 2006.

Limestone decay caused by pollution, weather and other factors can be disfiguring and expensive to rectify, and – if left untreated – may eventually lead to a building's collapse. By radically improving understanding of how and why limestone decays, the new research will make it easier to develop better ways of tackling the problem.

Limestone is the main construction material used in many of the UK's most historic buildings, including St Paul's, Lincoln and Wells Cathedrals and many Oxbridge colleges. Although basic knowledge exists about the general causes of limestone decay, it is not known why decay takes place in unpredictable fits and starts or why it accelerates in some parts of a building but not in others.

Understanding what lies behind these processes is vital not only to enable action to be taken before decay spirals out of control, but also to ensure that conservation decisions do not lead to premature and unnecessary replacement of limestone blocks – and avoidable expense.

In the new project, optical sensors will be developed that can monitor how limestone blocks are affected by traffic pollution, road salt, temperature, humidity and wetness, detecting subtle changes in the blocks due to changing moisture levels and salt movement, for instance. The sensors will be installed in a boundary wall at Worcester College, Oxford, and other limestone structures. Information will be fed from the sensors, via fibre-optic cable, to a data logger and analysed to assess how decay correlates with the limestone's precise physical, chemical and mineralogical characteristics and with different environmental factors.

Dr Heather Viles of Oxford University is one of the Principal Investigators leading the project. She says: "This is really the first time that electronic and other engineering expertise has been applied to the problem of rapid limestone decay. As well as informing anti-decay strategies, our research will generate knowledge about types of limestone best suited to particular environmental conditions, and so will benefit renovation and new-build projects."

Source: Engineering and Physical Sciences Research Council