

Scissor, Paper, Rock – a study of the Old Library at Trinity College, Dublin.

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Extended Abstract.

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This presentation focuses on investigations into dust and VOC levels in the Old Library at Trinity College, Dublin, which forms part of a multi-faceted study of the building, the collections, and the environment.

The Library at Trinity College (now termed the Old Library) was built between 1712 and 1732. It retains its original function as a library and a research space but also houses office space, an exhibition space and a retail area. In the past fifteen years, visitor numbers have increased to over 500,000 per annum, and their impact and that of the modern urban environment are being assessed through the study of the indoor environment. The internal design of the building has over the decades undergone significant changes due to the need for extra storage and to provide access to visitors, which may have resulted in the loss of a protective environmental buffer for the collection. In a balance to this, external events such as the end of coal burning by Dublin Town Gas in 1968 and the Air Pollution Act, 1987, could have resulted in improvements in the internal air quality.

Since 2004 a significant amount of environmental monitoring has been undertaken under the leadership of the Preservation & Conservation Department, and a summary of some of this data is presented here. Monitoring of environmental parameters is vital in order to establish a baseline which can then be compared with available standards and with studies of other archives. The results will feed into the development of the preservation plan for the building and the collection. Continuous monitoring in the future will allow comparison with baseline conditions as further modifications to the building occur and with future climate change.

The data from the environmental monitoring will be stored within LibViz a 3-D interactive model of the building which has been designed in a parallel project. The model acts as a numerical and graphical database, allowing correlation of a wide range of parameters, including temperature, relative humidity, visitor numbers, dust accumulation, VOC's, SO₂, NO₂ and weather conditions in a spatial context and over time.

Dust

In the first study existing macroscopic dust in the Old Library was characterised in terms of its component types by mass. The microscopic dust was investigated with x-ray diffraction and x-ray fluorescence. A visual "rough and dirty" estimation of dust levels in the Long Room according a 3-point scale (slight, moderate and severe) was conducted in 2007 to record levels and look for a pattern in distribution, and dust from different spaces within the building was analysed to cross-compare content over location.

In order to determine the current dust accumulation rates and distribution, the loss of gloss technique of Adams (1997) was employed in 2008 on 40 sites in the Long Room and 5 in locked storage areas over a 9-month period. The results show that significantly lower rates of accumulation exist in the locked storage areas which are out of bounds to the visitors. Secondly, the gap from the head of the book to the overlying shelf is a key factor in the accumulation of dust – those shelves with a gap exceeding 40mm showed significantly higher levels than those with gaps from 5 to 40mm.

The distribution of the dust in the Long Room shows influence from the central stair-well used by visitors exiting the room. It is believed that a chimney effect brings particles from the shop, exhibition space and possibly outside into the Long Room, which deposit close to the stairwell.

SEM ED-XRF examination of the material showed that the particle size distribution is heavily biased towards the $>10\mu\text{m}$ fraction and that the $<2.5\mu\text{m}$ fraction, which is considered as a health hazard (Tétreault, 2003), makes up less than 5% of the dust and is largely inorganic.

Gaseous pollutants

A survey of 29 sites with passive diffusion tubes for SO_2 and NO_2 and Tenax tubes for VOC's was conducted in November 2008, following on from 3 site measurements by the University of Strathclyde for the BL/Mellon VOC study. In the more extensive survey, the equipment and analyses were supplied by Gradko International LTD. Preliminary results from passive sampling of VOC's show the presence of compounds such as furfural which is diagnostic of acid hydrolysis of cellulosic paper and seen in many other similar collections. 30 different VOCs were detected in the study, including several alkanes which have not yet been linked to degradation pathways of the collection but show promise as indicators of air exchange. Overall, VOC concentrations are low (average summed values $<10\text{ppb}$) across all sample sites.

Low SO_2 concentrations ($<0.4\text{ppb}$) are seen in all except on site and NO_2 concentrations are typically in the 0.4 – 0.6ppb range. Comparisons of observed levels with recommended guidelines (Grzywacz, 2006) suggest that, with the exception of NO_2 the levels for the collection are acceptable. The urban location of TCD and its proximity to a $>30\text{ppb}$ off-peak NO_2 concentrations in the streets which surround campus make obtaining low concentrations unlikely.

Conclusions

The high numbers of visitors to the Old Library and urban situation of Trinity College Dublin create significant environmental pressure on the storage conditions within the 277 year-old building. Preliminary results suggest that dust accumulation is a significant problem but further study is needed to assess the impact of it and of other environmental conditions on the collection.

References

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