

Are the Identical Books still Identical?

Matija Strlič¹, May Cassar¹, Jana Kolar², Alan Vaughan Hughes³, Velson Horie⁴, Barry Knight⁴

1 University College London, Centre for Sustainable Heritage, The Bartlett School of Graduate Studies, Gower Street, London, U.K.

2 Morana RTD, Ivancna Gorica, Slovenia

3 National Library of Wales, Aberystwyth, Ceredigion, Wales SY23 3BU, U.K.

4 British Library, St Pancras, 96 Euston Road, London NW1 2DB, U.K.

Introduction

The purpose of the Identical Books research strand of the Mellon research project was (i) to investigate the differences between the microclimate and pollution of library environments, (ii) to establish whether there are any differences between books in the UK legal deposit libraries, and (iii) to carry out a lifetime prediction study. This abstract presents interim findings of points (i) and (ii).

Study of Microclimates

Microclimates in three repositories: National Library of Wales (Aberystwyth), British Library (St. Pancras, London) and British Library (Colindale, London) were investigated in detail. Temperature (T) and relative humidity (RH) were logged at 10 different locations in each repository for a period of one year during 2008/9. The purpose of this study was to examine whether the differences in microclimates within a repository are comparable to the differences in average microclimates among different repositories.

While the BL (St.Pancras) repository is an extremely stable (mechanically climatized) environment, the microenvironments in the BL (Colindale) and in the National Library of Wales (Aberystwyth) are more variable. The maximum difference between two micro-locations in the same repository was 12 °C. One should note that an increase in the average storage temperature of 4-5 °C results in doubling of the rate of degradation of acidic paper. Furthermore, the difference in the annual average temperature between NLW (Aberystwyth) and BL (St.Pancras) is lower than the maximum difference within the BL (St.Pancras) repository. Since the microclimatic history of individual objects is unknown, it is not possible to correlate the condition of individual objects with microclimatic data.

Pollution study

Research into past concentrations of SO₂ showed 5-15x higher concentrations in central London than in Wales. Nowadays, the concentrations of exogenous pollutants (SO₂, NO_x, O₃) are similar in Aberystwyth, St.Pancras and Colindale.

Studies in 2008/2009 demonstrated that the indoor environment in the BL (St.Pancras) repository is particularly clean, while the external atmosphere had higher concentrations particularly of NO₂ (25 ppb) and O₃ (25 ppb) The external concentrations of O₃ in Colindale are slightly higher (~40 ppb), which may be due to lower concentrations of NO₂ (10 ppb), which is an ozone scavenger. This is especially evident in the case of NLW data, where external concentrations of O₃ are the highest (50 ppb), while the concentrations of NO₂ are lower (2.5 ppb) in comparison with the London sites.

Indoor concentrations of SO₂ are comparable at all sites (<0.5 ppb), while the indoor concentrations of O₃ are 2-10x higher and the concentrations of NO₂ 5-10x higher in Colindale and Aberystwyth than at the St.Pancras site (0.25 ppb and 0.2 ppb, respectively).

Characterisation of identical book collections at BL and NLW

Using micro-samples extracted from paper with a hollow needle of 0.8 mm diameter, we were able to determine the following properties: pH, molar mass and fibre furnish, both in the centres and margins of identical pages in identical books of the two collections, so that an evaluation of differences was possible. Samples, in which pH has been determined, were dried after analyses and then forwarded for determination of molecular weight using size exclusion chromatography.

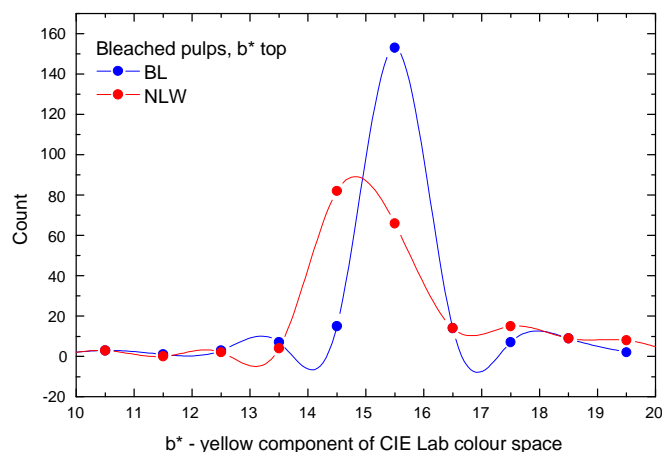


Fig. 1: Frequency plot for b^* (yellowness) of the margins of the BL and NLW identical book collections. The margins in the BL collection are on average more yellow.

Acidification of paper can be the result of paper degradation or absorption of acidic gasses from the environment. Yellowing of book margins could be the result of oxidation (e.g. lignin) or extensive hydrolysis due to absorption of e.g. SO_2 . Degradation of paper was assessed on the basis of differences in molar mass of cellulose.

Book margins in NLW are in general less degraded and less yellow than in the BL (Fig. 1), while pH is on average very similar. Interesting differences in the behaviour of groundwood containing paper and bleached wood pulp containing paper were established. The differences could be the result of different pollution levels, although differences in storage conditions cannot be ruled out, as discussed earlier.

Conclusions

The study of two identical book collections and repositories from the National Library of Wales and British Library showed that:

- The microclimatic differences within a repository are comparable to average differences in the indoor climate between the three observed sites: BL (St. Pancras), BL (Colindale), NLW (Aberystwyth).
- The BL collection was exposed to 5-15x higher historical concentrations of SO_2 than the NLW collection.
- Book margins in NLW are in general less degraded and less yellow than in the BL, while pH is on average very similar. This could be due to different pollution levels, although differences in microclimatic conditions cannot be ruled out.

The well characterised Identical Book collections represent an important result of this research, and will undoubtedly prove to be a very important reference sample database for future research.