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Article: Library and Archives Conservation Discussion Group 2025 Managing Existing Mold on Library and Archives Collections
Authors: Heather Hamilton and Genevieve Pierce Kyle
Source: Book and Paper Group Annual 44, 2025
Pages: 41–45
Editors: Amy Crist, Managing Editor, and Lindsey Tyne, Assistant Editor
Editorial Office: bpgannual@gmail.com
ISSN: 2835-7418

The *Book and Paper Group Annual* is published once a year by the Book and Paper Group (BPG), a specialty group of the American Institute for Conservation (AIC). It was published in print from 1982 to 2021 and transitioned to a digital publication in 2022. All issues are available online at https://www.culturalheritage.org/bpg-annual.

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The *Book and Paper Group Annual* is a non-juried publication. Papers presented at the Book and Paper Session of the annual meeting of the American Institute for Conservation are selected by committee based on abstracts. After presentation, authors have the opportunity to revise their papers before submitting them for publication in the *Annual*; there is no further selection review of these papers. Independent submissions are published at the discretion of the BPG Publications Committee. Publication in the *Annual* does not constitute official statements or endorsements by the BPG or AIC.

HEATHER HAMILTON AND GENEVIEVE PIERCE KYLE
MODERATORS, DISCUSSION GROUP CO-CHAIRS

Library and Archives Conservation Discussion Group 2025 Managing Existing Mold on Library and Archives Collections

CRediT Statement
Writing, Original Draft and Writing, Review and Editing: HH and GPK

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The 2024 Library and Archives Conservation Discussion Group (LACDG) Session during the AIC 52nd Annual Meeting in Salt Lake City, Utah, focused on acquisitions processes in libraries and archives, from the initial decision to acquire materials to receiving them and integrating them into our collections. One subject that garnered a lot of discussion was mold on newly acquired books, papers, and beyond. The overwhelming interest in this topic inspired this year's theme. We had three presentations from our colleagues who actively work to tackle the problem of mold that we bring into our collections, followed by a question and answer discussion.

SUMMARY OF PRESENTATIONS

A Proactive Approach to Managing Mold in Library Acquisitions

Clara Huisman, Book & Paper Conservator, University of Miami Libraries, Coral Gables, FL, chuisman@miami.edu

Credit Statement
Conceptualization, Visualization, Writing – original draft, Writing – review and editing: CH

Clara Huisman outlined the preventive measures implemented by the University of Miami Libraries' Preservation Department to mitigate mold in incoming archival collections. These measures include routine intake reviews, interdepartmental coordination, policies for accepting and remediating mold-affected materials, and participation in site visits prior to acquisition. Huisman also examined challenges in integrating preservation practices early in the intake process while balancing cost, safety, and logistical constraints. Case studies shared in the presentation illustrated the increasing role of outsourced remediation as a safer, more sustainable approach to managing biological risks amid the library's growing collections.

Effective Collaboration for Mold Remediation and Policy Development

Marieka Kaye, Director, Preservation Services, Physical Collections, University of Michigan Library, Ann Arbor, MI, marieka@umich.edu

Credit Statement
Conceptualization, Visualization, Writing – original draft, Writing – review and editing: MK

Marieka Kaye examined the challenges and solutions related to mold management in large academic libraries. The University of Michigan Library system, spanning the Ann Arbor, Dearborn, and Flint campuses, manages more than 16 million volumes in diverse facilities, including 14 buildings in Ann Arbor alone. These buildings serve multiple functions, such as open and closed stacks, study areas, event spaces, and off-site storage. Monitoring climate conditions is essential but challenging due to older Preservation Environment Monitors (PEMs) that lack real-time data, necessitating vigilant staff oversight to address potential issues promptly.

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The library often partners with BELFOR, a vendor experienced in mold issues in sensitive environments. This partnership is essential due to the library's vast infrastructure and limited staff for in-house mold management. BELFOR provides remediation and preventative services, such as installing in situ protection during renovations to avoid relocating collections, thereby reducing risks to valuable materials. This underscores the importance of selecting trusted vendors capable of handling cultural heritage materials.

Safety protocols are a critical focus, with Kaye sharing personal experiences that highlight the need for personal protective equipment (PPE) to prevent health risks. A personal incident involving a lung infection due to inadequate protection stressed the importance of PPE, leading to a reassessment of staff exposure risks and a greater reliance on outsourcing remediation. Collaboration with the Environmental Health and Safety (EHS) division ensures adherence to best practices, facilitated by a dedicated safety specialist who conducts inspections and maintains procedural updates.

The library employs a comprehensive standard operating procedure (SOP) for mold assessment and remediation, guiding decisions on retaining or disposing of materials. The SOP is adaptable to in-house and vendor-based scenarios, offering flexibility in responding to various levels of mold challenges. A supplementary SOP exists for situations where vendor intervention is the only solution, ensuring efficient management of large, low-use material outbreaks.

Effective communication, coordination, and collaboration are vital for successful mold management. The conservation laboratory's strong ties with the library's facilities department and EHS division enable a unified approach to complex scenarios. Regular staff training in wet book rescue techniques enhances preparedness, allowing for swift responses before vendor intervention. Kaye concludes by emphasizing the necessity of having a comprehensive emergency preparedness plan in place, complete with contact information and processes, before a mold outbreak happens, and that it is crucial for protecting staff safety and the library's collections.

How Much Is Enough? Re-Examining the Mold Treatment Protocol for Works on Paper From Harvard Library's Special Collections

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After vacuuming and surface cleaning, each document was flattened between sheets of thick blotter covered with Plexiglas and weight. Once sufficiently flattened, tears were mended and loose pieces were reattached with solvent-set tissue (1.6-g NAJ toned tengucho from Hiromi Paper Inc., coated with a 5% solution of Klucel G, and dried) reactivated in ethanol to avoid exposing the brown ink and remaining mold to aqueous materials. The documents were stored flat in individual archival folders in a two-piece archival box.

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FURTHER READING

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QUESTION AND ANSWER DISCUSSION

After the presentations, the session moderators led a question and answer discussion. These questions, as well as the responses, are paraphrased here.

Question: How do you get staff and administration at your institution to take mold seriously, especially if there is no health and safety department?

Answers:

(Eliza Spaulding): Harvard Library staff do take mold seriously, and conservation staff are frequently called upon to respond to suspected mold incidents.

(Marieka Kaye): Wet book rescue workshops help in getting staff to take mold risk seriously. We hold wet book workshops and include as many staff as possible.

(Sarah Reidell, Penn Libraries): We created cost of ingest guidelines, which feed into donation and gift guidelines, to make clear the high cost of managing damaged acquisitions.

(Tara Kennedy, Yale Libraries): We teach a broad range of staff to identify mold and that helps a lot with buy-in.

(Morgan Adams, Columbia University Libraries): We've gained more support by including our curators and archivists in discussions. We are transparent about cost and labor around mold affected materials. We offer entry points for changes at the acquisitions stage to control these expenses.

Question: After collections have been cleaned, are you able to make them available to readers again?

Answers:

(Clara Huisman): The materials that were treated with gamma radiation (described in the presentation) are too fragile to be served to readers. Because the library was able to reformat these items, digital versions are available and the originals are restricted.

(Eliza Spaulding): Harvard Library is actively considering guidelines around making previously cleaned materials available to readers. As of now, decisions about access are made by individual collecting units.

(Marieka Kaye): Special collections have the benefit that we can restrict their use. Circulating collections go back to stacks with a physical note that they have been cleaned for mold. Withdrawing moldy materials is also not uncommon.

Question: What about active vs. inactive mold?

Answers:

(Marieka Kaye): I have to treat all mold in the collections as though it is active.

(Kathryn Kenney, Folger Shakespeare Library): To encourage our colleagues to take inactive mold more seriously, we now refer to it as "temporarily inactive mold."

Question: Have you used the ATP swab test to detect the presence of mold?

Answer:

(Eliza Spaulding): Harvard Library is not actively using the swab test to evaluate efficacy of cleaning. My understanding is that the ATB swab test is effective but needs to be used in combination with visual assessment by trained staff.

Question: Do you use an ethanol chamber or mist for treating mold?

Answers:

(Marieka Kaye): At the University of Michigan, ethanol solution delivered by mist is used in some cases.

(Eliza Spaulding): At Harvard, this method has been used in the cleaning of photos, but, so far, not in the cleaning of paper.

Question: Have you encountered recurring mold on the same books?

Answer:

(Marieka Kaye): Yes. Leaks often happen in the same places. In the case I discussed in my presentation, we had no choice but to return the affected books to the same place in the stacks. As a temporary measure, the books were placed in paper boxes that could absorb the water, should there be another water event. Eventually, a new location was found and the books were moved.

Question: Do you send books, as well as loose paper materials, to BELFOR (or another vendor) for cleaning? If so, how do you handle concerns about the security of unbound materials that are not inventoried?

Answers:

(Marieka Kaye): We have only sent books and only when there are 20 items or more.

(Tara Kennedy): At Yale, we have sent unbound paper materials to BELFOR for freeze-drying with no problems. We are comfortable with their security measures.

Question: Do you spot-check materials after they come back from the vendor?

Answers:
(Tara Kennedy): Yes, we spot check the materials before paying the BELFOR invoice.
(Marieka Kaye): The Bentley Library sent materials for gamma radiation as a precleaning measure, after which they cleaned them in-house.

Question: How do small institutions without health and safety departments get health and safety questions answered?
Answer: (Tara Kennedy): OSHA has a great program for this and will come on-site to help evaluate your situation. They are not policing you, but really providing help. Visit www.osha.gov/consultation.

ACKNOWLEDGMENTS

Thank you, Samantha Garza, *Conservation Technician at the Harry Ransom Center*, for your help throughout this session.

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Question: How do you get staff and administration at your institution to take mold seriously, especially if there is no health and safety department?

Answers:

(Eliza Spaulding): Harvard Library staff do take mold seriously, and conservation staff are frequently called upon to respond to suspected mold incidents.

(Marieka Kaye): Wet book rescue workshops help in getting staff to take mold risk seriously. We hold wet book workshops and include as many staff as possible.

(Sarah Reidell, Penn Libraries): We created cost of ingest guidelines, which feed into donation and gift guidelines, to make clear the high cost of managing damaged acquisitions.

(Tara Kennedy, Yale Libraries): We teach a broad range of staff to identify mold and that helps a lot with buy-in.

(Morgan Adams, Columbia University Libraries): We've gained more support by including our curators and archivists in discussions. We are transparent about cost and labor around mold affected materials. We offer entry points for changes at the acquisitions stage to control these expenses.

Question: After collections have been cleaned, are you able to make them available to readers again?

Answers:

(Clara Huisman): The materials that were treated with gamma radiation (described in the presentation) are too fragile to be served to readers. Because the library was able to reformat these items, digital versions are available and the originals are restricted.

(Eliza Spaulding): Harvard Library is actively considering guidelines around making previously cleaned materials available to readers. As of now, decisions about access are made by individual collecting units.

(Marieka Kaye): Special collections have the benefit that we can restrict their use. Circulating collections go back to stacks with a physical note that they have been cleaned for mold. Withdrawing moldy materials is also not uncommon.

Question: What about active vs. inactive mold?

Answers:

(Marieka Kaye): I have to treat all mold in the collections as though it is active.

(Kathryn Kenney, Folger Shakespeare Library): To encourage our colleagues to take inactive mold more seriously, we now refer to it as "temporarily inactive mold."

Question: Have you used the ATP swab test to detect the presence of mold?

Answer:

(Eliza Spaulding): Harvard Library is not actively using the swab test to evaluate efficacy of cleaning. My understanding is that the ATB swab test is effective but needs to be used in combination with visual assessment by trained staff.

Question: Do you use an ethanol chamber or mist for treating mold?

Answers:

(Marieka Kaye): At the University of Michigan, ethanol solution delivered by mist is used in some cases.

(Eliza Spaulding): At Harvard, this method has been used in the cleaning of photos, but, so far, not in the cleaning of paper.

Question: Have you encountered recurring mold on the same books?

Answer:

(Marieka Kaye): Yes. Leaks often happen in the same places. In the case I discussed in my presentation, we had no choice but to return the affected books to the same place in the stacks. As a temporary measure, the books were placed in paper boxes that could absorb the water, should there be another water event. Eventually, a new location was found and the books were moved.

Question: Do you send books, as well as loose paper materials, to BELFOR (or another vendor) for cleaning? If so, how do you handle concerns about the security of unbound materials that are not inventoried?

Answers:

(Marieka Kaye): We have only sent books and only when there are 20 items or more.

(Tara Kennedy): At Yale, we have sent unbound paper materials to BELFOR for freeze-drying with no problems. We are comfortable with their security measures.

Question: Do you spot-check materials after they come back from the vendor?

Answers:
(Tara Kennedy): Yes, we spot check the materials before paying the BELFOR invoice.
(Marieka Kaye): The Bentley Library sent materials for gamma radiation as a precleaning measure, after which they cleaned them in-house.

Question: How do small institutions without health and safety departments get health and safety questions answered?
Answer: (Tara Kennedy): OSHA has a great program for this and will come on-site to help evaluate your situation. They are not policing you, but really providing help. Visit www.osha.gov/consultation.

ACKNOWLEDGMENTS

Thank you, Samantha Garza, *Conservation Technician at the Harry Ransom Center*, for your help throughout this session.

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