Using IPI's Preservation Metrics to Analyze Risk

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What Are Preservation Metrics?

- Algorithms (step by step instructions for computers) for transforming T & RH data into meaningful conclusions
- Developed by IPI and implemented in IPI-created software and web sites
- Yield numerical estimates of the risks of environmentally-induced decay

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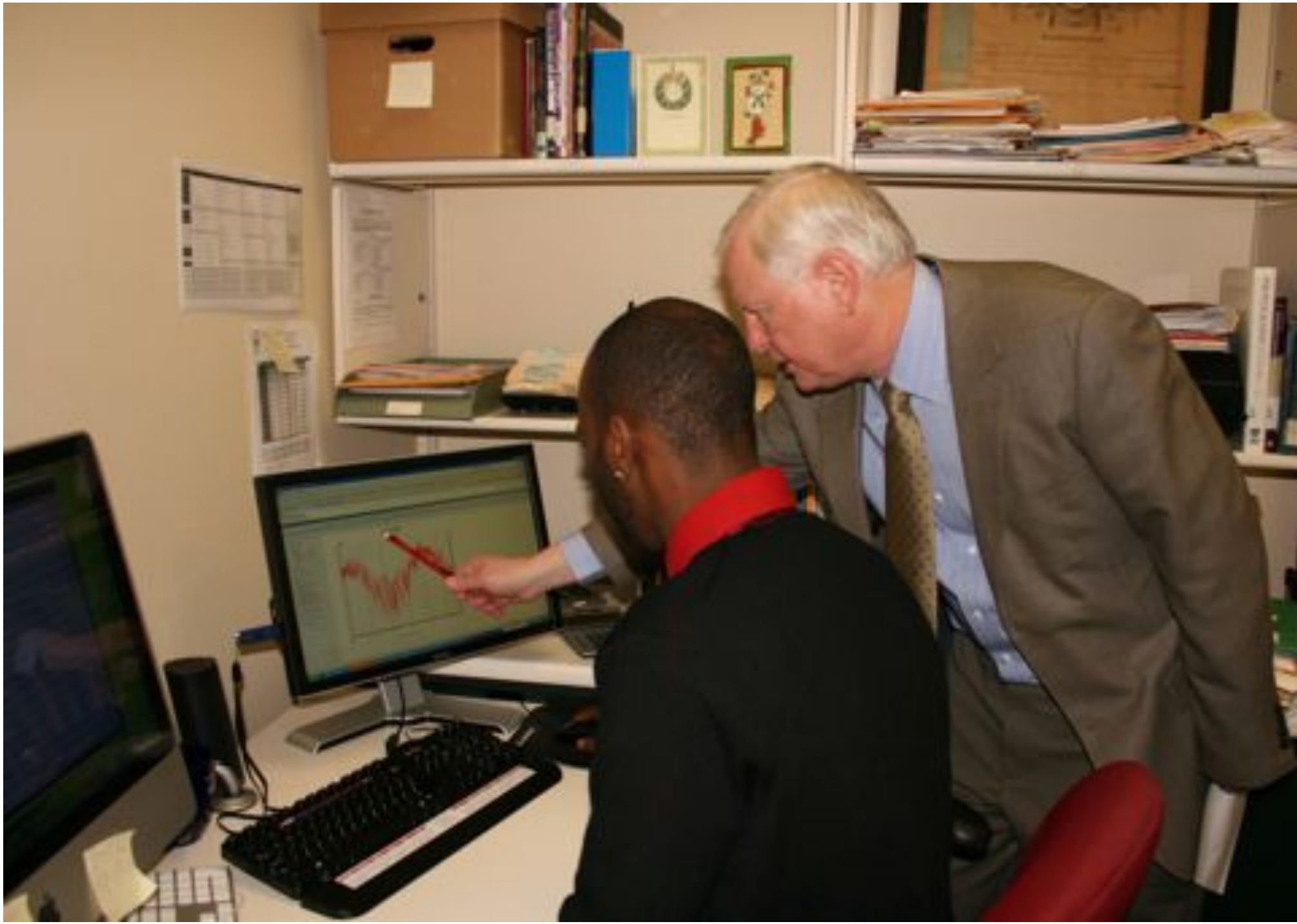

Why Have Preservation Metrics?

- Address shortcomings of subjective 'eyeball' analysis of graphical data or summary statistics
  - Axis scaling
  - Inconsistencies
  - Target ranges for T & RH may not have been thoughtfully set
- Need for analysis-based collection risks

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Why Have Preservation Metrics?

- Standardized, repeatable
- Allow for
  - Room to room comparisons
  - Incremental improvements
  - Demonstrating progress and stewardship
  - Make fast work of analysis of large amounts of data
  - Non-experts to do good analysis

Real-World Analysis

- Targets and statistics are enough for engineers and building operators
  - But not for collections care
- In practice, both targets and metrics are useful
  - But not at all mutually exclusive

Using Metrics in Practice

- Learn a few ‘rules of thumb’ to help interpret the numbers
- Invest a little time to understand what the metrics are telling you
- Remember, the metrics describe environments in preservation terms
  - But YOU have to know the vulnerabilities of your collection

IPI Preservation Metrics

- Chemical Change (Natural Aging)
  - Preservation Index (PI)
  - Time-Weighted Preservation Index (TWPI)
- Applies to:
  - Organic materials (paper, leather, plastics, dyes, textiles)
- Concept
  - Integrate heat and moisture over time to estimate natural aging rate

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Natural Aging: PI vs. TWPI

- PI (Preservation Index)
  - IPI has assigned a number (the PI) to every combination of T & RH
  - Higher is better, means longer life and slower decay
- PI values describe a static, unchanging condition

Natural Aging: PI vs. TWPI

- TWPI (Time-Weighted Preservation Index)
  - Integrate PI values over a period of time
  - 'Averages' them correctly
- Most useful when analyzing a full years' data
- Most significant metric for library and archive collections

Type of Decay:

Natural Aging

Metrics Used:
Time Weighted Preservation Index (TWPI)

Interpretation:
Higher the TWPI, the better

TWPI Value (years)	Interpretation
≥75	Good
45-75	OK
≤45	RISK

Measures:
The rate of "natural aging" as determined by the rate of spontaneous chemical change in organic materials.

IPI Preservation Metrics

- Mechanical Risk Metrics
  - Dryness & Dampness extremes - % EMC
  - Fluctuation extreme - % DC
- Applies to
  - Hygroscopic materials (wood, paper, leather, textiles)
- Concept
  - Physical Risks arise from extremes of dryness and dampness, excursions between extremes

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Type of Decay:

Mechanical Damage

Metrics Used:

Minimum % Equilibrium Moisture Content (min % EMC)

Maximum % Equilibrium Moisture Content (max % EMC)

% Dimensional Change (% DC)

% Min EMC, % Max EMC and % DC	Interpretation
Min EMC > 5.0 AND Max EMC < 12.5 AND DC < 0.5	Good
Min EMC > 5.0 AND Max EMC < 12.5 AND DC < 1.5	OK
Min EMC < 5.0 OR Max EMC > 12.5 OR DC > 1.5	RISK

Interpretation:

Moderate % EMC is best ==> % EMC between 5% and 12 % maintains appropriate levels of moisture

The lower % DC, the better ==> fewer, smaller fluctuations between maximum EMC and minimum EMC

IPI Preservation Metrics

- Mold Risk
  - Mold Risk Factor (MRF)
- Applies to:
  - Anything that mold can grow on
- Concept
  - Integrates T & RH over time
  - Estimates whether mold spores would germinate and overall severity of mold outbreak

Type of Decay:
Mold Growth

Metrics Used:
Mold Risk Factor (MRF)

Measures:
The risk for growth of the xerophilic mold species on collection objects or in collection areas.

Mold Risk Factor	Interpretation
≤ 0.5	Good
> 0.5	RISK

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IPI Preservation Metrics

- Metal Corrosion
  - % EMC Max
- Applies to:
  - Ferrous and other metals
- Concept
  - RH sustained above 55% for 30 days or more causes corrosion

Type of Decay:
Metal Corrosion

Metrics Used:
Maximum Equilibrium Moisture Content (% EMC max)

Interpretation:
Lower % EMC is better

% EMC (max)	Interpretation
≤ 7.0	Good
≥ 7.1 and ≤ 10.5	OK
≥ 10.6	RISK

Metrics in Practice

- How can I analyze my data with the IPI Metrics?
  - www.PEMData.org
    - PEM and PEM2 files
    - Climate Notebook .dbf files
  - IPI's Climate Notebook software
    - www.imagepermanenceinstitute.org

PEMdata

web-based preservation management

Graphs | Statistics | **Preservation Metrics** | Collection Risks | Dew Point Calculator

Preservation Quality Analysis - Based on observed environmental conditions, but independent of the collections within the space.

Date Range

Preset: All

Start: 2008-01-01

End: 2008-06-19

Datasets

(Max 5 per graph):

- [ ] AL-AUBURN-2008
- [ ] archives hall
- [x] archives library
- [ ] archives main
- [ ] archives media
- [x] P2_00051
- [x] P2_00278
- [x] P2_00279
- [x] P2_00298

Dataset	archives library	P2_00051	P2_00278	P2_00279	P2_00298
Risk Summary					
Natural Aging	RISK	RISK	RISK	RISK	RISK
Mechanical Damage	OK	RISK	RISK	RISK	OK
Mold Growth	Good	Good	RISK	Good	Good
Metal Corrosion	OK	RISK	RISK	RISK	RISK
Preservation Metrics					
TWPI	44	39	41	40	37
MRF	0	0.44	0.85	0.11	0.04
% DC Max	0.65	1	1.2	0.88	0.76
% EMC Min	7.4	10.1	10	9.8	8.6
EMC Max	9.7	13.7	14.2	12.9	11.4
EMC Mean	8.53	11.31	11.35	10.84	9.7
Data Overview					
Start	2008-03-14	2008-03-13	2008-03-13	2008-03-13	2008-03-14
End	2008-03-28	2008-06-18	2008-06-18	2008-06-18	2008-06-18
$T°F_{mean}$	70.1	65.6	65.3	66.4	69.8
$\%\ RH_{mean}$	38.9	63	63.2	60.4	54.2
$DP°F_{mean}$	42.9	52.2	51.8	51.8	51.9

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