

Scientific Method and Experimental Design in Preservation and Conservation Research:

Part III: Multiple Object Designs

- A design check sheet can be used to ensure the most important aspects of an experimental design have been thought out and written down; helps a lot when writing the final paper!
- Sketching out the design or creating a flow chart is a good visual summary tool

Experimental Design Check Sheet

OBSERVATION:

RESEARCH PROBLEM OR QUESTION:

HYPOTHESES:

Implications and rationale for hypotheses:

OBJECT PROTOCOL:

Experimental units (definition, real or facsimile)

Number of replicates:

Experimental Design Check Sheet

MEASUREMENT PROTOCOL:

Types and method of outcome measures:

Randomization of measurement order needed?

TREATMENT PROTOCOL:

Groups (treatments/controls):

Test factors:

Randomization of specimens to treatment groups:

METHOD OF INTERPRETATION/ANALYSIS:

ATTACH SKETCH OR FLOWCHART OF EXPERIMENTAL DESIGN

4 Adhesives 1 2 3 4 Tests after accelerated aging

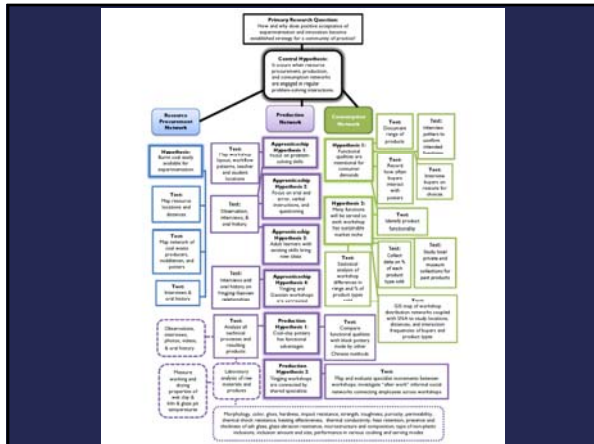
All on 1 paper type

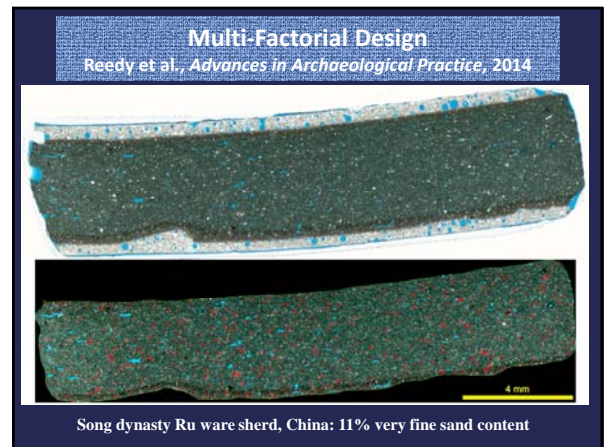
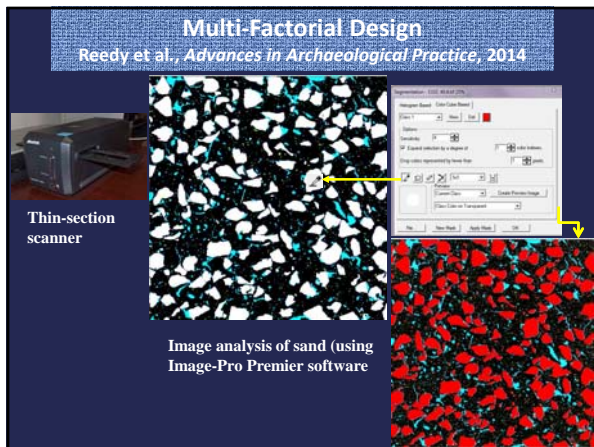
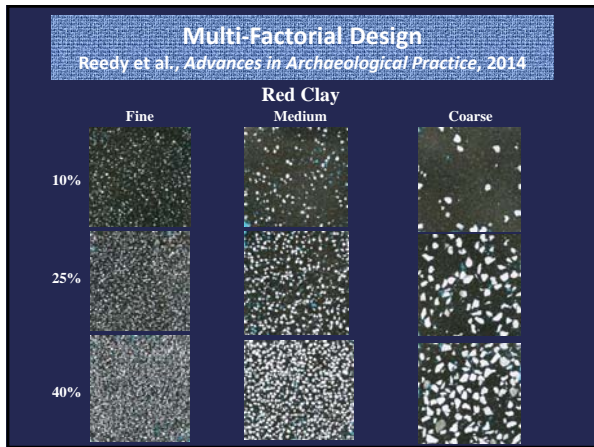
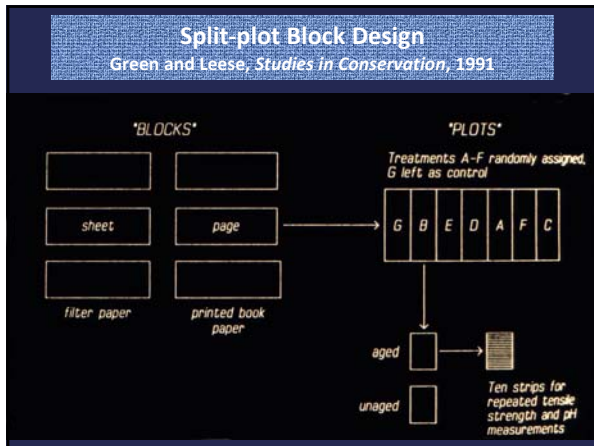


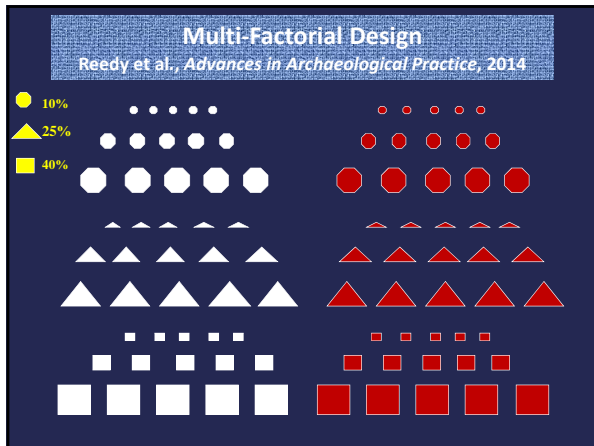
→ Color Change

→ Yellowing

→ Peel Strength (destructive)

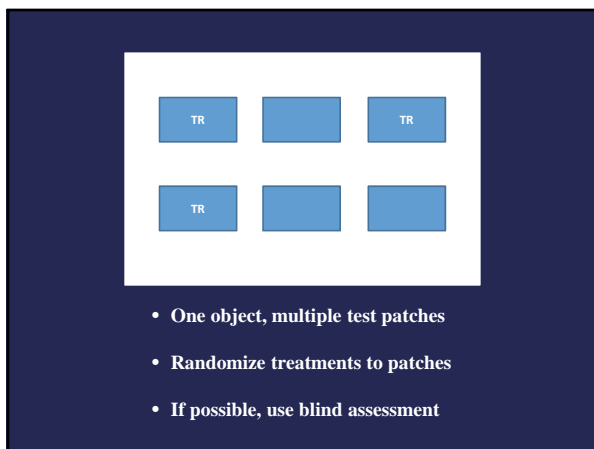






- ### Example: Elegant, clear, well described experimental design in conservation
- Grissom, Grabow, Smith Riley, and Charola  
2013, *JAIC*, 52(2): 82-96
- Evaluates 12 coatings for protection of silver from hydrogen sulfide
  - Does not over-complicate by varying too many factors
  - At each step of experimental design procedures and rationales are clearly stated
  - Appropriate replication and randomization
  - Clear and useful results were obtained that move conservation practice forward

- ### Scientific Method and Experimental Design in Preservation and Conservation Research:
- Part IV: Single Object Designs, Design Variations
- Can do statistically valid study (quantitative data) or highly-reliable qualitative study even if only a single object is available
  - Main idea is to make an object its own control by treating it more than once in a formal experimental design with randomization (and blinding if possible)



### Conservation Case Study: Single Object Design




Eric F. Hansen and Stan Dereljan, *Journal of Museum Management and Curatorship*, 1990, 10(1): 13-16

### Condition Assessment of a Single Library Collection



### Screening Tests

- For quick testing of many treatments
- No replication
- Useful for formulating hypotheses and identifying possible treatments
- Always requires follow-up testing with replication before treatment decisions

### Screening Tests



### Screening Tests

Dennis Piechota and Jane Drake Piechota, 2016, *Studies in Conservation*, 61(1): 58-61



### Treatment Trials (Clinical Trials)

- Standard in medicine since 1930's
- Brings experimentation out of lab and into setting of real practice





- The Principal Investigator (PI) in medical treatment trials is a physician



## Ethical Concerns

- Does a treatment really work as it is intended to?
- Does the treatment itself cause harm now or later?
- Is the treatment better compared to other potential treatments?

## The Treatment Trial

- A planned experiment comparing a test treatment to a control treatment
- Both groups enrolled, treated, and followed over the same time period
- Control may be no treatment or a standard treatment
- The trial must include enough patients to adequately evaluate the results

## Components of the trial

- Randomization
- Blinding
- Controls
- Detailed treatment protocols
- Good measurement protocols for relevant outcome measures
- Adequate sample size and replication

Curtis L. Meinert

## CLINICAL TRIALS

Design,  
Conduct,  
and  
Analysis

Lawrence M. Friedman · Curt D. Furberg  
David L. DeMets · David M. Reboussin  
Christopher B. Granger

## Fundamentals of Clinical Trials

Springer

## Funding

- Medicine: N.I.H., drug companies
- Conservation???
- Preservation???



## Thanks!

- Thanks for your attention and for your interest in research design and experimental design issues
- Thanks to NCPTT for sponsoring this webinar