

The Electronic Lab Notebook: Piloting a Research Data Management Tool at Cornell University

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Abstract

The maintenance of laboratory records in the digital age can be a complicated and continuously evolving task, yet clear, consistent documentation is critical for tracking, sharing and reproducing research. One tool that can be used to manage and organize such records is an Electronic Lab Notebook (ELN). The Cornell University Library and Cornell's Academic Technologies Group are currently engaged in a joint pilot program to determine the feasibility of offering a campus-wide ELN service. The pilot, which began in January and runs through June 2013, involves ELN use in research and classroom labs. Shown here are key features of the product being trialed and an early look at the interest and feedback of researchers using the ELN.

What?

Electronic Lab Notebooks are digital tools used to *DOCUMENT, STORE, ORGANIZE AND SHARE* research laboratory data. The idea of paperless record keeping systems is not new to research labs (Lysakowski 1995; Bulter 2005), but recent advances in design and technology have led to a increase in feature options and alternatives, improved ease of use and perhaps even an increase in adoption rates across science domains (Giles 2012).

Prompted by requests from both teaching and research faculty, Cornell is offering a six month trial of LabArchives to interested users (<http://www.labarchives.com>). Pilot participant feedback will then guide the decision-making process regarding an institutional license for an ELN product.

Why?

Digital record keeping offers several advantages over traditional "pen & paper" style laboratory notebooks, including:

- Legibility
- Searchable text
- Content management & organization
- Easy sharing, within groups or with outside collaborators
- Redundancy reduction
- Access control
- Version control
- Archival / Backup efficiency

Who?

To date, one class (Mechanical Engineering, ~145 students) and 13 research labs are either using the ELN or have expressed interest in participating in the pilot. Research domains include:

- Engineering
- Chemistry
- Nutritional Science
- Microbiology
- NanoScale Science
- Plant Science / Biology
- Policy Analysis and Management

How do we determine success?

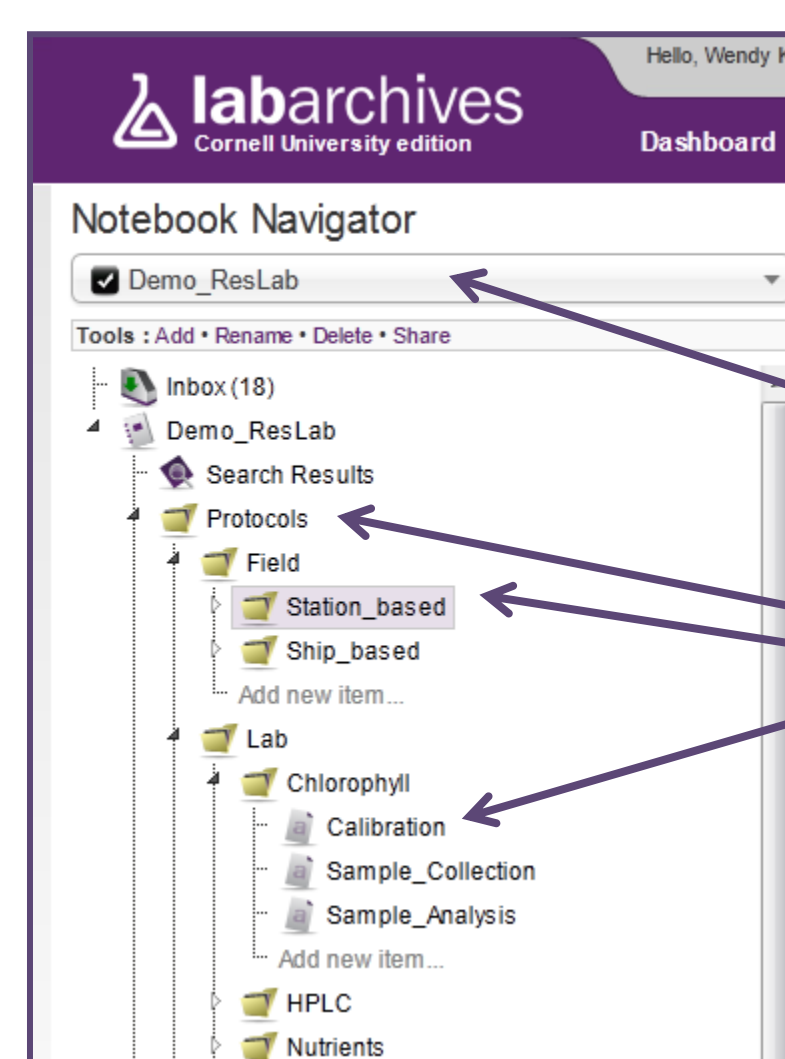
User feedback (online surveys, personal interviews etc.) will help determine if:

- ELNs are a desirable tool for teaching and research use
- LabArchives met most users' ELN needs
- Cornell should pursue a campus-wide service for ELNs

Initial reactions to the pilot have been positive, with over 230 new CU ELN accounts requested since announcement of the trial. Comments have included: "Large multi-site teams are difficult to maintain any good methodology for tracking process and keeping notes [sic], and I'm heartened to know you're looking for feasible options."

References: Butler, D. Nature 436, 20-21 (7 July 2005) doi:10.1038/436020a; Giles, J. Nature 481, 430-431 (26 January 2012) doi:10.1038/481430a; Lysakowski, R. Biotechnology 13, 347-348 (13 April 1995) doi:10.1038/nbt0495-347

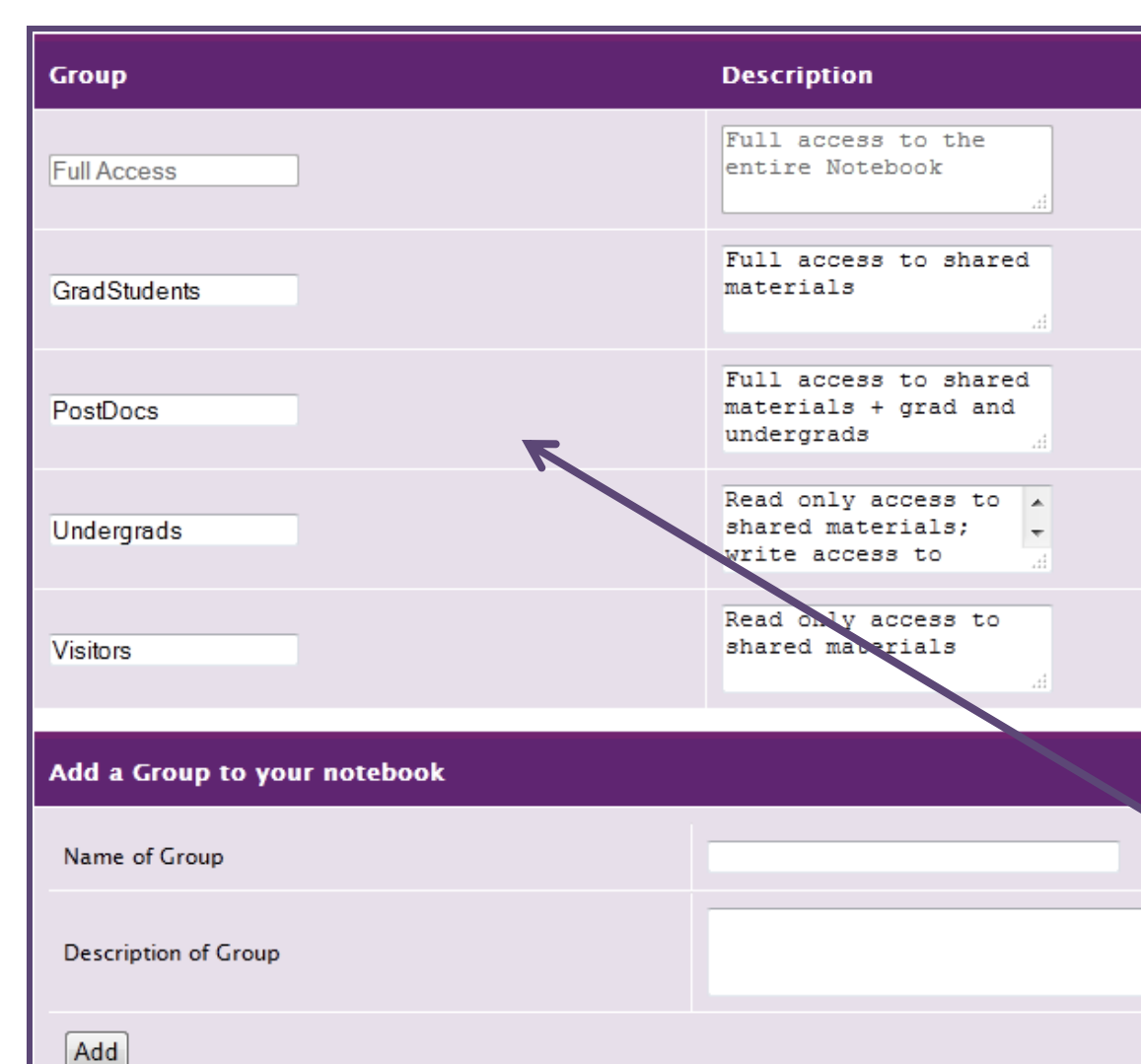
LabArchives - Key Features



Organization

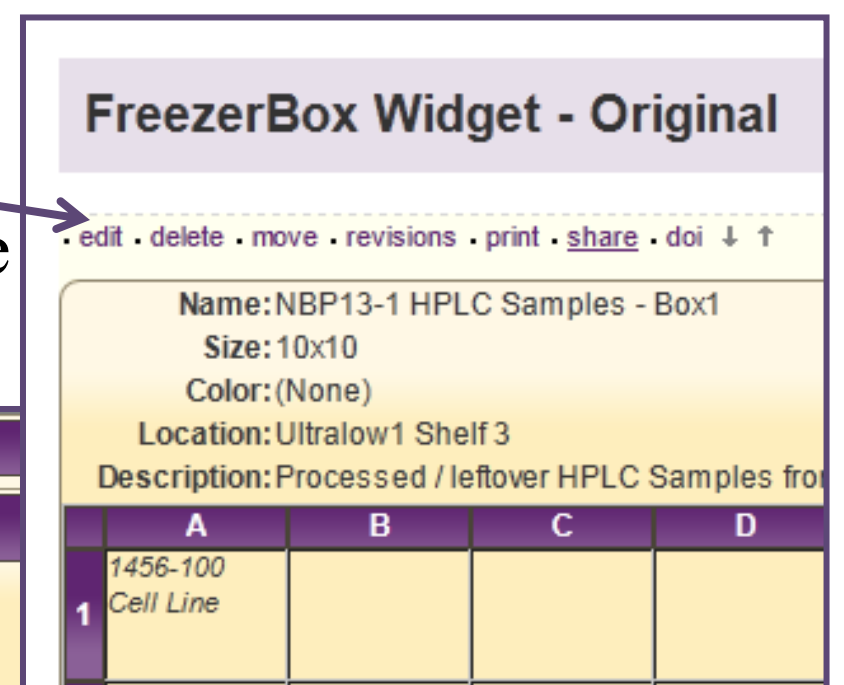
- Cloud based (Amazon S3), accessible via Mac, Windows or Linux browsers
- Individual notebooks selected from a drop-down menu in the Navigator pane
- Notebooks are divided into *folders*, *subfolders* and *pages*; all can easily be rearranged, renamed, added or removed
- Pages contain unlimited numbers of *entries*, the base unit of data storage

Sharing and Collaboration



- Notebook *owners* can add multiple *users*, who can be assigned rights to notebooks or portions of notebooks.
- *Users* can be granted *read-write* (RW), *read-only* (R) or *guest* (RW or R, but no sharing) privileges.
- *Users* can be organized into *groups* for easy assignment of permissions to notebooks or sections of notebooks.

- Sharing can be done at a Notebook, Folder, Page or Entry level
- Content can also be shared with outside users via URLs and DOIs



Content Management

- Rich or plain text entry
- "Drag and Drop" or select to add attachments of any file type
- Use pre-designed or

- create customized widgets for common templates, tools & tasks
- Use sketching tools for drawing or annotating image files
- Create TeX-based mathematical equations or use a ChemDoodle-based tool for creating chemical structures
- Link material and create tags and comments

Intellectual Property Protection

Date and Time	Entry version #	Revised by	Revised by ip	Revision Action	Data Type	Change
Feb 01, 2013 @02:40 PM EST	6	Wendy Kozlowski	128.84.124.35	added/deleted annotation		8.4 KB
Feb 01, 2013 @02:29 PM EST	23	Wendy Kozlowski	128.84.124.35	edited		6.7 KB revert to this version
Feb 01, 2013 @11:45 AM EST	2	Wendy Kozlowski	128.84.117.19	deleted		8.2 KB undelete
Feb 01, 2013 @11:44 AM EST	1	Wendy Kozlowski	128.84.117.19	file uploaded		8.2 KB revert to this version
Feb 01, 2013 @11:25 AM EST	22	Wendy Kozlowski	128.84.117.19	edited		6.7 KB revert to this version

- Track version history for pages and entries, including NIST date and time, access IP and revision action; restore previous content when necessary
- Sign (permanently close) pages (CFR Title 21 Section 11 compliant)
- Export material to PDF and offline notebooks for locally maintained hard copy archives
- FERPA compliant (HIPAA pending)

