

## Entering Experiments in labElephant

Experiments are stored in labElephant in a way that:

- a) Is linked with Knowledge (through association with Ingots)
- b) Is organized prospectively around hypotheses (through linkage to Issues)
- c) Flows into Summaries that combine data from multiple Experiments.
- d) Along with Summaries provides Figures that can be organized retrospectively in Stories, for papers, presentations and grant applications.

Experiments also enable easy insertion and tracking of Materials and Methods, searching of historic data, and generation of digitally signed Experiment reports in pdf form.

Experiments are stored in labElephant by Project, as specified on the Main (Switchboard) form. Users have access to different Investigations/Projects as specified by permissions granted by the Principal Investigator on the Investigations and Projects forms, accessible through the Edit button.


Experimental data in labElephant is not stored in the database directly, but is accessed via Object Linking and Embedding (OLE), images of data (pics), & hyperlinks. OLE objects allow that any changes made in data files are automatically shown in the database, and the use of pics and hyperlinks keeps the size of the database back-end small.

Data security in labElephant relies on the security of the network lab drive. Copies of the data can also be kept on the secure U drive of individual users, as a check against data tampering within the lab. Links in labElephant to the data on the lab drive will make the data visible to all within the Project who have access to the lab drive, which promotes synergy among Project members.


To open the Experiments form, select the relevant Investigation & Project on the Main (Switchboard) form. All the controls in the lower rectangle on this form are specific to the Project selected. Select the Experiments button. This brings up Experiments for this Project.

If there are currently no Experiments entered under this Project, you will be asked if you want to enter a new Experiment. Select OK.

When the Experiments form opens, Experiments (if any) already entered (by anyone) under this Project are listed by date under the **Browse** tab. This makes all Experiments in the Project accessible to all those who are a part of the Project. Individual Experiments can be viewed by selecting them from this list.

[Tip: Selecting records is not the same as Marking records: selection requires a click on the record selector at the left end of the record ( Mark Figure ).]

When an Experiment is selected from the Browse list, all information on the Experiment header (above the tabs) is then specific to the selected Experiment, as is other information under the other tabs on the form.

To create a new Experiment record, select the “add record” button: 

### **Section 1: Experiment Header**

The Experiment header is the section of the form above the tabs.

1. Edit the date field in the Experiment header to reflect the actual date of the Experiment. This can be a past, present or future (for a planned experiment) date.
2. Enter an Experiment title in the title field above the tabs. [Note: the title cannot be entered on the Browse form, but will be shown there when updated.]
3. Select the person from the drop-down box who did (or will do) this experiment. The drop-down box contains a list of all the people given permission for this Project by the PI.
4. Commence data entry under the tabs (see below).

### **Section 2: Rationale**


The rationale section contains the background to the experiment, using Ingots created on the Knowledge form.


1. Open the Knowledge form and find and Mark the Ingot(s) under the Ingots tab that are relevant to the rationale for this experiment. See “Making Nuggets and Ingots in labElephant” for more details on how to do this. Close the Knowledge form.
2. Select the Rationale tab, and link the marked Ingots to this Experiment by selecting the “Paste Ingots to Expt” button. The pasted Ingots will be listed by title. Selection of an Ingot record will show the Ingot in the text field below, along with (on the subform) any references made within the Ingot. Pdfs of Paper references can be accessed directly by selecting the reference on the subform, & then the pdf button. Linking the Ingots in this way connects the Experiment with the thoughts from which the Experiment emerged.
3. In the “Additional Rationale” field, add any further rationale specific to your Experiment.

### **Section 3: Issues**

Issues are hypotheses, expressed as questions, that are addressed by Experiments. By connecting Experiments with Issues, progress with Issues can be tracked over time.

1. Select the Issues tab. Issues for this Project are listed in the top panel. If the Issue addressed by this Experiment is on the list, select it, and select the OK button. This will assign the Issue to the Experiment, and it will show up in the lower panel. Several Issues can be assigned to the same Experiment. Figures can then (under the Figures tab,

- Section 5) be linked to the Issues addressed. Go to Section 4 if Issues addressed are all on the list.
2. If the Issue addressed by this Experiment is not on the list, select the “Edit Issues” button to open the Issues form, where new Issues can be created and organized. Select the new Issue button: . You may wish to create several new Issues, if you know that your Project will address them.
  3. Enter the new Issue on the new record under the Edit tab of the Issues form, under “Edit Selected Issue”.
  4. Select the Organize tab. The new Issue will show in the bottom panel of Unassigned Issues or Ideas. Issues do not have to be organized, but organization helps to maintain clarity. Issues are organized into 3 levels. Level 1 Issues are the broadest, level 3 the most specific. Issues can be reorganized at any time.


Tip: Give some thought to how you define Issues and assign them to different levels. If the Issue is so broad that all Experiments in the Project will address it in one way or another, it is more like the title of the Project than a functionally useful Issue as defined here. The more specific you can make the Issue, the better. However, you can always edit Issue text and reorganize Issues, as the Project evolves, so it does not have to be perfect.
  5. If you wish to assign the Unassigned Issue to level 1, select the Unassigned Issue, and then the Assign to 1 button. The Issue will move from the bottom panel to the #1 panel.
  6. If you wish to assign the Unassigned Issue to level 2, select the level 1 Issue (#1 panel) you wish it to be under, select the Unassigned Issue, and then the Assign to 2 button. The Issue will be indented, and move from the bottom panel to the #2 panel.
  7. If you wish to assign the Unassigned Issue to level 3, select the level 1 Issue (#1 panel) above the level 2 Issue you wish it to be under, select the level 2 Issue (#2 panel), select the Unassigned Issue, and then the Assign to 3 button. The Issue will be further indented, and move from the bottom panel to the #3 panel.
  8. Close the Issues form.
  9. The revised Issues for this Project will be listed under the Issues tab of the Experiments form. The new Issue can be found quickly by selecting the Sort order option to “by date”.
  10. Select the Issue addressed by this Experiment, and select the OK button. This will assign the Issue to the Experiment, and it will show up in the lower panel. Several Issues can be assigned to the same Experiment. Issues addressed can be removed from the lower panel by selecting the Issue in the lower panel, and then the delete record () button.

#### **Section 4: Materials and Methods**

Materials and Methods allows simple entry of these important details, using a rapid look-up of Materials and Methods already entered.

1. Select the Materials and Methods tab on the Experiments form.

[Tip: It is worth taking the time to enter Materials and Methods, even though it does require some effort to enter this information for the first time. Doing this in subsequent Experiments is much faster (see #7 below).]

2. Edit the hyperlink under Experimental Plans to locate the document containing your Experimental Plans for this Experiment, using the “Set File” button (). This will take you to the default location of your Plans.

[Tip: The Link field on the Experimental Plans subform should by default contain the hyperlink path to your folder that holds your Experimental Plans, as entered on your Defaults form during Initial Data Setup. This will speed up the location of your Experimental Plan files.]

Select the file containing your plans for the experiment. Click OK when done. The hyperlink on the Experimental Plans subform should now show the path and file name. The file can then be opened by a click on the hyperlink. Enter links to more files if needed.

3. Edit the drop-down boxes that list the Species, Preparation and Condition of the experimental system, if relevant. The contents of these drop-down boxes can be edited from the Edit button on the Main form, to reflect the scope of your lab.
4. Edit the Experimental Methods subform by selecting the Category drop-down box. This will list all currently-entered Experimental Methods for the lab. Select one of the Method Versions to be used in this Experiment. Then add more Method Versions as needed. Hyperlinks to each Method Version selected can be viewed using the horizontal scroll bar on the Experimental Methods subform.

[Tip: Experimental Methods are added to labElephant using the Methods button on the Switchboard form. These are organized by Category and Method (for each Category) for the whole lab. There are then different Versions for each Method. Methods may evolve over time, or be implemented differently by different people, so different Versions allow this to be documented. Each Version is owned by whoever enters it, and it is identified as theirs. Each Version record contains a comment field for identifying how this Version is different, and a hyperlink field to contain the link to the document describing the Version. Additional links to other files relevant to the Version can be made under the Data Links tab, if needed. Thus, to enter Methods into labElephant you can simply link to the protocol files you already have. See “Entering Methods in labElephant” for more details.]

5. Edit the Materials subform by selecting the Material drop-down box. This will list all currently-entered Materials for the lab, including each specific item of each Material. Select one of the Material items to be used in this Experiment. Then add more Material items as needed.
6. Select any Flags by which you wish to flag this Experiment, if desired. Flags allow you to search for Experiments by a specific flag, using the Search button on the Main form. You can enter a new flag directly on the form. Flags can be added later if needed.
7. Entry of Materials and Methods can be speeded up a lot when experiments are similar to previous experiments, by copying the details of the previous Experiment to the new Experiment. To do this, select the date of the previous Experiment from the “Entries as for”

drop-down box, and then select the appropriate buttons to Paste entries for that Experiment into Methods, Flags and/or Materials.


[Caution: entries copied in this way should be carefully checked and edited if necessary to ensure that all details from the prior experiment do indeed carry over.]

## Section 5: Figures

The Figures section allows experimental data to be displayed and entered as a link to a figure, table, or image. The main two data types are either via OLE linkage to the figure in another software program such as Excel that is an OLE server, or via “pics” that are images of the data made by labElephant and stored in small files in a folder called “labElePics” in the same folder as the data.

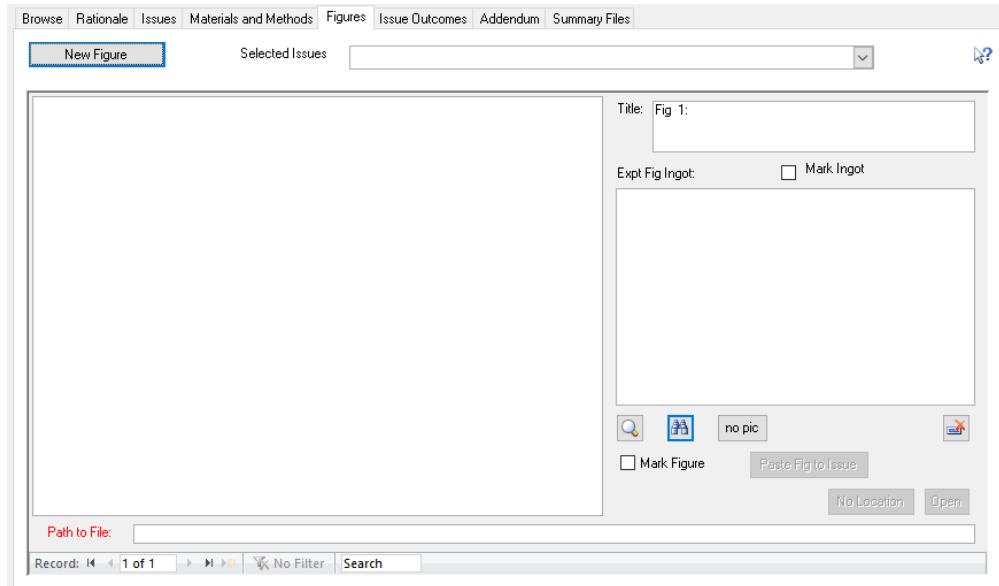
OLE objects allow that any changes made in data files are automatically shown in the database. OLE links also give immediate (double click on the figure) “drill-down” capability that is especially useful for quickly accessing other experimental details that are in the file but that may not be in the figure. The downsides of OLE links are first that the links are hard-coded into the OLE object and hence break when the server changes or the file is moved or deleted, and second that the OLE link can be resource-heavy: OLE links can cause the database back end to grow in size very quickly, especially when the target is data-heavy. Broken links can cause labElephant to hang when it attempts to display the Figure with the broken link.


[Tip: There is a utility from the Edit form/“Remove OLE objects” that will allow the removal of broken OLE object links. Also, from the Edit form/PI Settings button, the PI has the option to disallow OLE links for the application.]

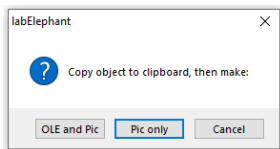
“pics” are automatically made whether or not an OLE link is made. When OLE object links are deleted, the pic for that figure will be displayed automatically. Pics thus function as an automatic back-up for OLE links, an additional record of the relevant data. However, pics can also be the preferred choice for complex Figures, as they do not add to the back end size. A drill-down capability is still present: while a double click on a pic will not open the data file as for an OLE link, the data file can still be opened via the “Open” button, though not necessarily to the figure itself (like an OLE link). However, for data stored in applications that allow Bookmarks, a Bookmark can be set using the  button. This makes data in large Excel files with many sheets easy to locate even without OLE links. Finally, pic paths are of enduring value, even through server changes.

[Tip: There is a utility from the Edit form/“Globally Replace Path Data” that will allow the global editing of path data, for example in the event of a lab move or lab drive letter change.]

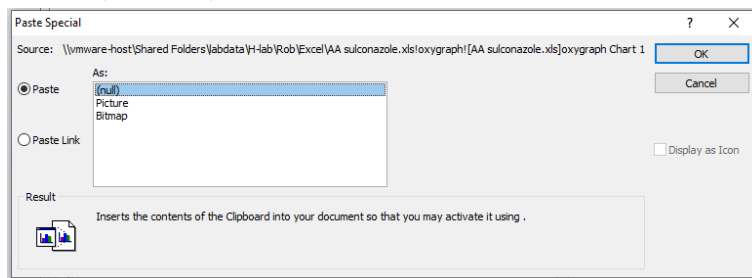
1. Select the Figures tab.
2. To create a new Figure, select the New Figure button. A new record appears:






3. Select the binoculars button (  ) and browse to the file containing the data you wish to show in the Figure.
4. Select Open to open the file in its host application, browse to the figure you wish to enter, select it, and copy it to Windows clipboard (shortcuts: Ctrl Insert, or Ctrl C, or use the application's Copy button) . Minimize the host application.  
 [Tip: files can be set to be always opened by their host applications using the "Open with" option in Windows Explorer, with a right click on the relevant file.]
5. Select either "OLE and Pic" to make an OLE link and a Pic, or "Pic only" to make just a Pic:



6. If you select "OLE and Pic", the "Paste Special" window opens. If the Paste Link option is enabled, select it, and click OK:




Paste Link should be enabled for figures that come from applications that are servers for Object Linking and Embedding (OLE). This includes Microsoft Excel, Graphpad Prism, and Sigmaplot. Paste Link has three advantages over the Paste option: first, any updates made to the figures will show automatically in labElephant; second, a double click on the figure in labElephant will open the original file at the figure in the original application; and third, the figure is not itself stored in labElephant, which is a more efficient utilization of available space, though the space used can still be considerable. Select Paste Link. If the Paste Link

- option is not enabled, select Cancel and remake the Figure as a pic only. Otherwise, a pic will be made automatically after the OLE link is set. Allow pic-making to finish.
7. The data copied should now appear in the Figure. To see an enlarged version of the figure, select the  button. To see the pic version of the Figure, select the pic () button.
  8. Enter a Title for the figure in the Title field.
  9. Enter a description of the data in the figure, including what it shows, in the Ingot field. Since this description is an Ingot, you can if you wish also assign references from the literature to it. To do this you mark the figure Ingot by selecting the Mark Ingot check box above the Ingot ( Mark Ingot), and closing the Experiments form. Then go to the Knowledge form, Foundry tab, and Paste the Ingot into the Foundry, by selecting the bottom right  button. You can then add references in the Knowledge form, as described in “Making Nuggets and Ingots”.
  10. From the Selected Issues drop-down box, select an issue that this figure addresses, then select the Paste Figure to Issue button. This will create a record on the Issue Outcomes form (see Section 6 below). Repeat for any other Issues in the drop-down box that this figure addresses.
  11. Repeat from step 2, for additional Figures.


## Section 6: Issue Outcomes

Issue Outcomes record your explicit analysis of how an Issue addressed was impacted by the data you linked it with. This analysis is then appended to the Issue Summary, to create a longitudinal narrative for that Issue.

1. Select the Issue Outcomes tab, and then select an Issue from the “Selected Issues” drop-down box. Records are listed according to how Issues were assigned to Figures in Section 5. The default Outcome for each Issue addressed by a Figure is the Ingot for that Figure as entered in Section 5. Edit the Outcome of the first record to reflect specifically how this Figure sheds light on this Issue. If you think the Issue is conclusively resolved by this Figure, select the “Resolved by this Expt?” check box.
2. Repeat step 1 for other records.
3. To view the Status of an Issue, select a record where that Issue is addressed. The Issue Status will show below the Issues Outcome form, and the adjacent “Update Issue Summary for Selected Issue” button () will be enabled. Selecting this button then adds this Outcome to the Summary, listed with the Experiment date, below the previous entry. This is an easy way to track in Summary form the history of how this Issue has been addressed. Figures that address particular Issues can be reviewed comprehensively in the Issues form, accessible by the Issues button on the Switchboard.
4. Individually select all other Issues addressed, and update their Summaries, as above.



## Section 7: Addendum

The Addendum section allows other information to be recorded that is pertinent to the Experiment, but which does not fit into the previous categories. This section may often not contain any information.

1. **Conclusions Summary:** the Conclusions Summary is provided for completeness, for those who may prefer not to utilize the Issues/Issues Outcomes format of analysis, which serves a similar function. The Issues Outcomes format is superior to simply stating conclusions because it allows individual Issues to be tracked through Experiments in a way that is easily retrievable on the Issues form. This summary may therefore be left blank, if Issues/Issues Outcomes are utilized. It may also contain comments that bring together the outcome of the experiment.
2. **Other Observations:** any observations that cannot easily be shown in figures can be entered here.
3. **Experimental Log:** any notes made during the conduct of the experiment may be entered here.
4. **Problems:** any problems encountered during the conduct of the experiment are entered here.
5. **Other Data Files:** the experiment may generate many data files, not all of which are accessible through the Figures. The location of these files or folders can be entered via the binoculars button () along with notes about what they are in the Comment field. Multiple files can be added to this list simultaneously. The default file location can be set on the user's Default form.
6. **Nuggets:** Nuggets may be generated from Experiments, as from other sources as described in "Making Nuggets and Ingots". Experiment Nuggets can then be Marked and Pasted to Ingots on the Knowledge form. This allows knowledge learned from Experiments to be integrated with other Knowledge, with a reference. Typically, Experiment Nuggets are only made when a need for them arises, while making an Ingot. To make an Experiment Nugget, select the "Add Experiment Nuggets" button, and enter the Nugget into the new record on the subform.


## Section 8: Summary Files

Summary files contain data aggregated from multiple experiments. Those files, and the origin of the data in each file, is tracked under the Summary Files tab.



1. Make a Summary File that contains your aggregate data. This could be in Excel, Prism, Sigmaplot, or whatever program you prefer to use.
2. To enter that Summary File into labElephant, select the Summary Files tab, and select the "New Record" button () at the header of the Summary Files subform. Then select the binoculars button on the header (). Browse to your Summary File and select Open. The

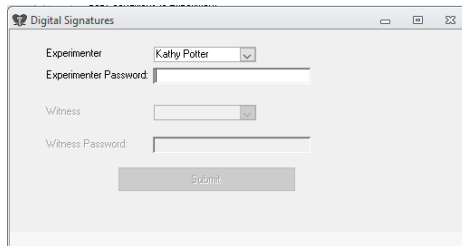


path to your Summary File will be displayed in the new record. Briefly describe the contents of the Summary File in the comment field above the path. Selecting the “Open” button will open the file if desired. Figures from Summary Files are made in the Summaries form (see “Summaries” document).

3. To record which Experiments contributed to the Summary File, first select the Summary File record. This will enable the “Add Expt” button () to the right of the Experiments subform. If data from the current experiment is in this Summary File, select the “Add Expt” button. The Experiment (by date) is added to the list. To add another experiment to the list, go to the Browse tab, select the appropriate Experiment, return to the Summary Files tab, and select the “Add Expt” button. Continue until all experiments that contributed data to this Summary File are listed.
4. Experiments may contribute data to more than one Summary File. The subform “Summary Files for Expt” on the bottom right lists all of the Summary Files that the current Experiment has contributed data to.

## Section 9: Signing Reports

1. Report Preview: When data entry is complete, an Experiment report can be generated by selecting the Preview Report button: . This report contains all of the information entered for this Experiment. This unsigned report can be inspected for completeness and accuracy, and will be saved to the default “Vault” location.
2. Sign Report and Save: Once you are satisfied with the experimental data entry, select the button to Sign and Save the Report (). The Digital Signature form will appear:



3. The Experimenter must enter their labElephant password here to validate their identity. They may at this point save the Report with their digital signature by selecting the enabled Submit without Witness button. The Report is then saved with a time-stamped filename to the Vault path specified by the PI under PI Settings. The page footers contain the digital signature and also the time stamp. The time stamp is UTC time (Coordinated Universal Time), a.k.a. GMT (Greenwich Mean Time). The time stamp requires an internet connection. The Report file then opens, showing the Experimenter’s signature.
4. Better for the protection of intellectual property, the Report can be saved with a witness to the digital signature of the Experimenter:

Digital Signatures

Experimenter: Kafly Potter

Experimenter Password: \*\*\*\*\*

Witness: Rob Hawthoth

Witness Password: \*\*\*\*\*

Submit with Witness

Reports should ideally be made on the same day as the Experiment, or as soon thereafter as possible. The witness must be a lab person with a labElephant password, whose digital signature is registered in labElephant. The witness should be someone who has a basic knowledge of the work being conducted, but should ideally not be a co-inventor or someone working on the project. The Report is then saved with both signatures. The Report file then opens showing both signatures.