

# EXPLORING ELECTRONIC LAB NOTEBOOKS (ELNs)

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## AN OVERVIEW

- What are ELNs?
- Penn's partnered ELN service: LabArchives
- What are the advantages to using ELNs?
- How do I use and integrate ELNs?

# What are ELNs?

**An ELN is a digital record of your research process and results.**

## Similarities with traditional lab notebooks:

- Compile protocols
- Document experiments
- Store collected data
- Gather references
- Serve as an immutable record of your research

## Unique and advantageous features of ELNs:

- Enhanced accessibility
- Enhanced searchability (e.g., searchable with keywords)
- Secure and redundant
- Easier, more flexible organization
- Can track and review all changes

**ELNs have many features of a traditional, paper-based lab notebook, with added benefits.**

# LabArchives – Penn’s partnered ELN provider

## LabArchives

- Common ELN features
- Legal/security protection
- Free for Penn students

## Other options:

- Evernote
- OneNote
- Google Drive/Box

The screenshot displays the LabArchives Professional Edition web interface. The top navigation bar includes links for Inventory, Education, Research, Corporate, Enterprise, Support, and a Sign in button. The main content area shows a notebook entry titled '4limb clasper' with the following details:

- Gene Symbol: *Rarb*
- Gene Name: RAR-related orphan receptor beta
- Accession Number: MGC:38728, N0172, R20-2426, R25B, retinoic acid-binding receptor beta, retinoid-related orphan receptor beta
- Allele: e-1limb clasper
- Institutional Source: Drexler Lab
- Chromosomal Location: 19
- Chromosomal Location: 19,005-19,105 Mb (-)
- Type of Mutation: MISSENSE
- DNA Base Change: T to C at 1902764 bp
- Amino Acid Change: Serine changed to Proline
- Ref Sequences: S87P in Ensembl: ENSEMBL:SP0000047597 (fasta), S79P in Ensembl: ENSEMBL:SP0000108451 (fasta), S79P in NCBI: NP\_061036819.1 (fasta), S87P in NCBI: NP\_646207.3 (fasta)

Below the text, there is a genomic track visualization showing SMART Domains and a Predicted Effect bar chart. The SMART Domains table is as follows:

Domain	Start	End	Value	Type
Zfp_C4	18	89	1.51e	SMART
coiled coil region	95	133		NONINTRINSIC
low complexity region	134	145		NONINTRINSIC
HSL1	275	431	1.83e	SMART

The Predicted Effect bar chart shows a score of 1.000 (Sensitivity: 0.00; Specificity: 1.00) with a color gradient from green to red.

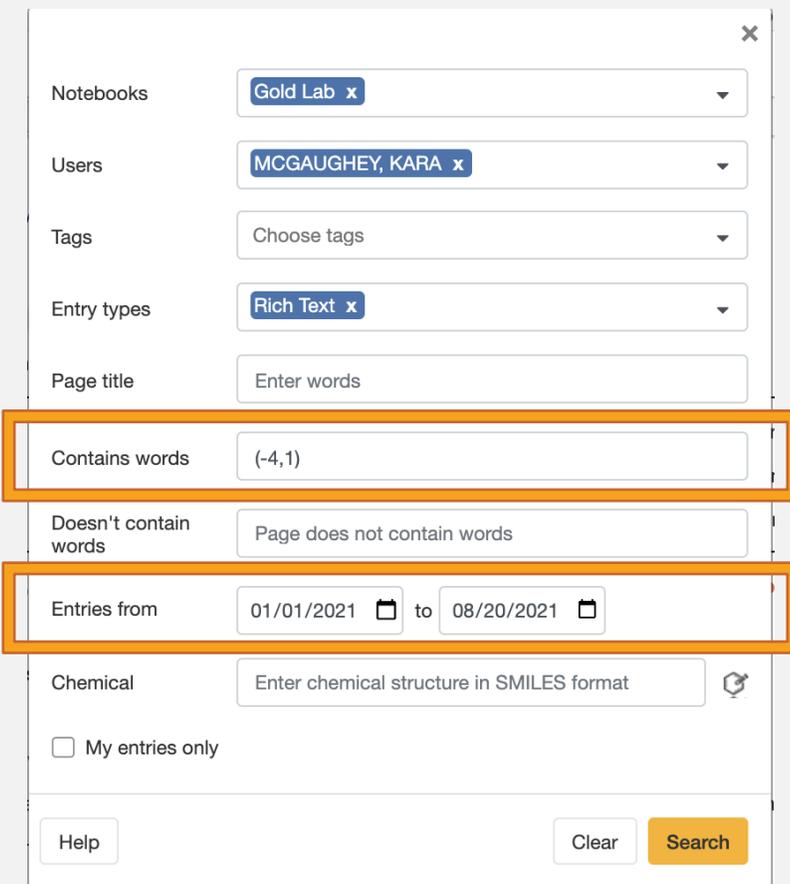
You can use a combination of ELNs and other data storage tools to best suit your individual needs.

## ELNs are easily accessible

- Cloud-based system allows you to access your ELN from wherever you are whenever you want.
- LabArchives has apps for mobile devices and tablets and runs through the web browser for laptops/desktops.
- Can also download files for easy offline viewing



# ELNs offer enhanced searchability



A screenshot of an ELN search interface. The interface includes several filter categories: Notebooks (Gold Lab), Users (MCGAUGHEY, KARA), Tags (Choose tags), Entry types (Rich Text), and Page title (Enter words). Two filters are highlighted with orange boxes: 'Contains words' with the value '(-4,1)' and 'Entries from' with the date range '01/01/2021 to 08/20/2021'. Other filters include 'Doesn't contain words' (Page does not contain words), 'Chemical' (Enter chemical structure in SMILES format), and a checkbox for 'My entries only'. At the bottom, there are buttons for 'Help', 'Clear', and 'Search'.

Notebooks: Gold Lab x

Users: MCGAUGHEY, KARA x

Tags: Choose tags

Entry types: Rich Text x

Page title: Enter words

Contains words: (-4,1)

Doesn't contain words: Page does not contain words

Entries from: 01/01/2021 to 08/20/2021

Chemical: Enter chemical structure in SMILES format

My entries only

Help Clear Search

Using **keywords** or **phrases**, you can search entire ELNs.

You can restrict and refine your search to entries created by certain users, entries of a specific type, and/or entries within a specific date range.

# ELNs offer enhanced searchability

Showing 1-8 of 8 entries   Sort by Relevancy

	Relevancy	
 Physiology/Dots Reversal task/Anubis/	Relevancy	Post-COVID/An06242021
 Physiology/Dots Reversal task/Anubis/	Newest to oldest	6302021
 Physiology/Dots Reversal task/Anubis/	Oldest to newest	empted/An07302021
 Physiology/Dots Reversal task/Anubis/Recording/EXP/An07192021	User A-Z	
 Physiology/Dots Reversal task/Anubis/Recording/EXP/An07142021	User Z-A	
 Physiology/Dots Reversal task/Anubis/Recording/EXP/An07012021		
 Physiology/Dots Reversal task/Anubis/Recording/EXP/An06282021		
 Physiology/Dots Reversal task/Anubis/Recording/Mapping/Post-COVID/An06072021		

**ELNs are searchable, so finding things is easier and faster.**

## LabArchives is secure and stored in multiple locations

- LabArchives ELN data are **securely stored on servers off-site**
  - Password protected (aka requires PennKey & two-factor authentication)
  - Data is encrypted in transit and on servers
  - Security measures are routinely tested and upgraded
- LabArchives ELN data are stored in multiple locations
  - Primary on East Coast, secondary on West Coast
  - Backups stored in multiple locations off-site to protect against disasters (fires, flooding, etc.)

# LabArchives and ELNs allow for flexible organization

The screenshot displays the Penn LabArchives interface. At the top, the University of Pennsylvania logo is visible. Below it, the 'Notebooks' section is shown with a count of 2 and a notification icon with the number 1. The main content area lists the following items:

- Gold Lab (Notebook)
- Physiology (Folder)
  - Roots (Subfolder)
  - Monkeys (Subfolder)
  - SPMs (Subfolder)
  - Dots Reversal task (Folder, highlighted with a blue box)
  - Cheetah (Subfolder)
  - Anubis (Subfolder)
  - Root Files (Subfolder)
  - template (Page/entry)
  - Table\_Information\_Sessions (Page/entry)
  - + New...

Annotations on the right side of the interface use arrows to identify the types of items:

- An arrow points from the text **Notebook** to the 'Gold Lab' item.
- An arrow points from the text **Folder** to the 'Dots Reversal task' item.
- An arrow points from the text **Subfolder** to the 'Root Files' item.
- An arrow points from the text **Page/entry** to the 'template' item.

# Quickly copy, download, or share entries, folders, and entire notebooks

- Recording
  - Mapping
    - Pre-COVID
    - Post-COVID
    - + New...
  - EXP

- + Add new folder...
- + Add new page...
- Copy existing page...
- Copy from another notebook...
- Copy to another notebook...
- Rename...
- Delete...
- Search from here...
- PDF...
- Share...
- Permissions...
- DOI...
- Reload from server...

An08112021 + New Widget Gold Lab Dail... Rich Text Heading Gold Lab Exp... Attachment ⌵

KARA MCGAUGHEY - Aug 11, 2021, 1:52 PM EDT

**Recording Location: (-4,1)**

AO Lot #51985/2020 (1st use w/ impedance ~0.9 -- meter being weird again)

26th use of GT. This GT is ~2 mm longer, so the **new zero point should be 60 mm instead of 62.**

Electrode @ 5 mm	Feeling slight tension w/ GT @ 60 mm; GT pop up (because re-clamped it yesterday after checking if bent)
GT @ 42 mm	GT lock @ 61 mm
Relative distance = 37 mm	GT zero @ 60 mm; E zero @ 23 mm -- (E through GT @ 2-3 mm)

**NOTE: After soaking/sterilizing, remember to match NAN drive electrode position to actual electrode position before driving.**

@23 mm: Zero electrode position and advance @0.008 mm/s until exit GT (@11:35AM)

@1.15 mm: Hearing the beginning of a transition; decreasing driving speed to 0.005 mm/s and going to ~8 mm

@3.0 mm: In brain; VERY clear transition here. Not seeing cells yet, though.

@4.11 mm: Some (+) spikes here

@4.31 mm: Weird cell here -- long, short WFs and then gone

@4.5 mm: Quiet again here with steady signal

@4.7 mm: Some spikes here -- narrow, sharp WFs

@5.3 mm: Steady signal here

@5.4 mm: Mechanical artifact

@6.13 mm: Some spikes here; longer WFs. Background still quiet, though.

@6.3 mm: Sharp WFs; background starting to sound like it could be picking up.

@6.5 mm: Transition-y sound; things getting whooshy/whispy

@6.779 mm: Larger WF visible here, but cell is injured. Going to settle here for 10 min. (@11:57AM-12:07PM). During the settle, things getting pretty choppy.... Lots of noise/uninterpretable MU activity.

# LabArchives tracks changes and revisions

An08062021

+ New Widget • Gold Lab Dail... Rich Text Heading • Gold Lab Exp... Attachme

hide revisions

Date and Time	Entry version #	Revised by	Revised by ip	Revision Action	Data Type	Change	Revert
Aug 24, 2021 @05:30 AM EDT	12	KARA MCGAUGHEY	69.249.177.76	automatically saved	text entry	8.6 MB	
Aug 24, 2021 @05:29 AM EDT	5	KARA MCGAUGHEY	69.249.177.76	edited	widget entry	1.1 KB	revert to this version
Aug 06, 2021 @03:55 PM EDT	4	KARA MCGAUGHEY	170.212.0.96	edited	widget entry	1.1 KB	revert to this version
Aug 06, 2021 @03:55 PM EDT	11	KARA MCGAUGHEY	170.212.0.96	edited	text entry	8.6 MB	revert to this version
Aug 06, 2021 @03:50 PM EDT	10	KARA MCGAUGHEY	130.91.99.34	edited	text entry	8.6 MB	revert to this version
Aug 06, 2021 @02:54 PM EDT	9	KARA MCGAUGHEY	170.212.0.96	edited	text entry	8.3 MB	revert to this version
Aug 06, 2021 @01:50 PM EDT	8	KARA MCGAUGHEY	130.91.99.34	edited	text entry	8.3 MB	revert to this version
Aug 06, 2021 @01:49 PM EDT	7	KARA MCGAUGHEY	170.212.0.96	edited	text entry	8.2 MB	revert to this version
Aug 06, 2021 @01:03 PM EDT	6	KARA MCGAUGHEY	130.91.99.34	edited	text entry	8.2 MB	revert to this version
Aug 06, 2021 @01:01 PM EDT	5	KARA MCGAUGHEY	170.212.0.96	edited	text entry	7.9 MB	revert to this version
Aug 06, 2021 @12:11 PM EDT	3	KARA MCGAUGHEY	170.212.0.96	edited	widget entry	1.1 KB	revert to this version
Aug 06, 2021 @11:50 AM EDT	4	KARA MCGAUGHEY	170.212.0.96	automatically saved	text entry	7.9 MB	revert to this version

Rename page...  
Delete page...  
Print page...  
Share page...  
View revisions  
Refresh page

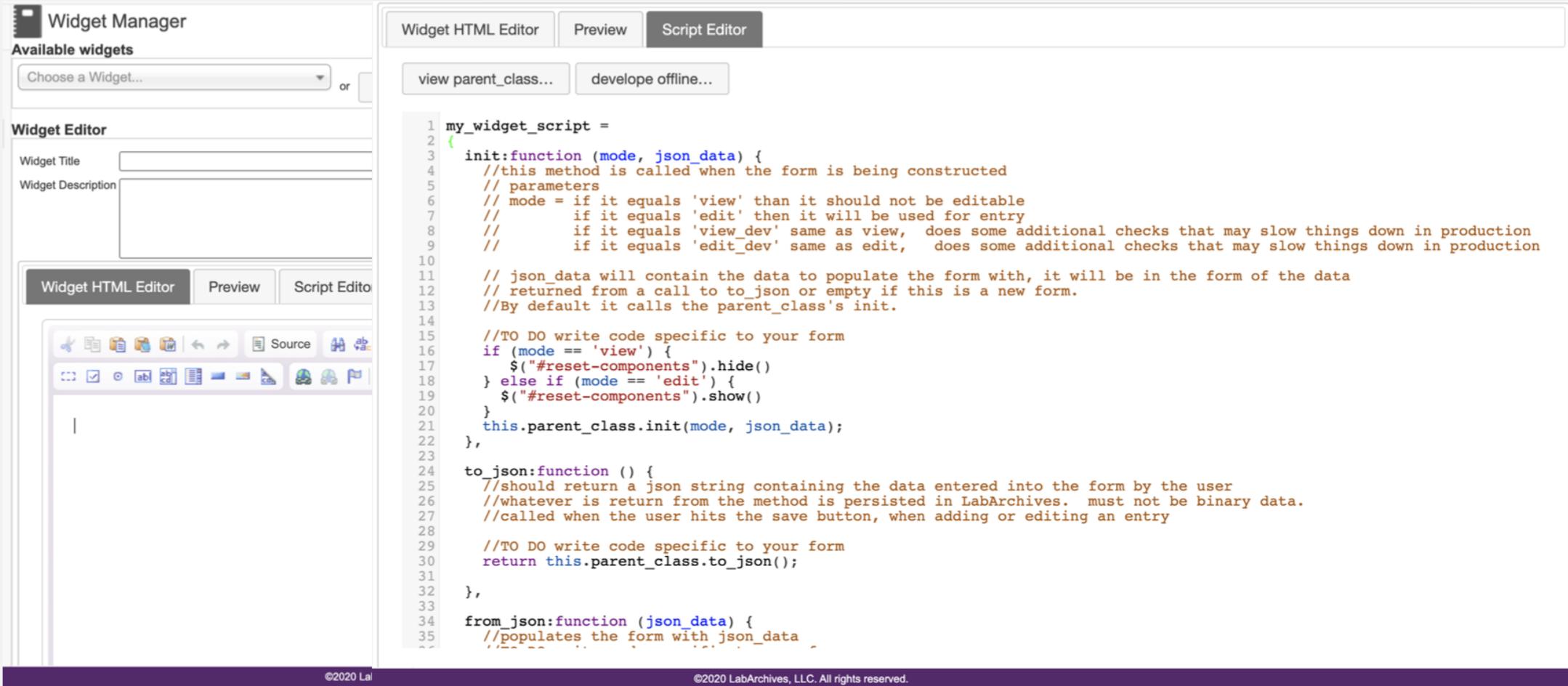
Tracking changes allows you correct mistakes and protect the integrity of your research.

## Widgets in LabArchives

LabArchives has widgets – little tools that you can embed in your notebook pages to make your experimental prep easier.

- Acid and Base Molarity Calculator
- Bacterial Growth Calculator
- Buffer Calculator
- Chemical Inventory
- Chemical Sketcher
- CUI Coversheet
- Dilution Calculator
- DNA-RNA Calculator
- Example 1 - Density of an unknown Liquid
- Example 2 - Acidity of a liquid
- Fire Diamond Widget
- Freezer Box - General
- Google Calendar
- Google Docs
- Lab Recipes Calculator
- Meeting Template
- Molarity Calculator
- Molecular Weight Calculator
- PCR Calculator
- Periodic Table
- Plasmid Database
- Radioactivity Calculator
- Scientific Calculator
- Spreadsheet
- Unit Converter

# You can make your own widgets!



The screenshot displays the LabArchives Widget Manager interface. On the left, the 'Widget Manager' panel includes an 'Available widgets' section with a dropdown menu and a 'Widget Editor' section with input fields for 'Widget Title' and 'Widget Description'. Below these are tabs for 'Widget HTML Editor', 'Preview', and 'Script Editor'. The 'Script Editor' is active, showing a JavaScript code snippet. The code defines a widget script with an initialization function, a JSON output function, and a JSON input function. The code is as follows:

```
1 my_widget_script =
2 {
3   init:function (mode, json_data) {
4     //this method is called when the form is being constructed
5     // parameters
6     // mode = if it equals 'view' than it should not be editable
7     //         if it equals 'edit' then it will be used for entry
8     //         if it equals 'view_dev' same as view, does some additional checks that may slow things down in production
9     //         if it equals 'edit_dev' same as edit, does some additional checks that may slow things down in production
10
11    // json_data will contain the data to populate the form with, it will be in the form of the data
12    // returned from a call to to_json or empty if this is a new form.
13    //By default it calls the parent_class's init.
14
15    //TO DO write code specific to your form
16    if (mode == 'view') {
17      $("#reset-components").hide()
18    } else if (mode == 'edit') {
19      $("#reset-components").show()
20    }
21    this.parent_class.init(mode, json_data);
22  },
23
24  to_json:function () {
25    //should return a json string containing the data entered into the form by the user
26    //whatever is return from the method is persisted in LabArchives. must not be binary data.
27    //called when the user hits the save button, when adding or editing an entry
28
29    //TO DO write code specific to your form
30    return this.parent_class.to_json();
31  },
32
33  from_json:function (json_data) {
34    //populates the form with json_data
35  }
```

At the bottom of the interface, there are two copyright notices: '©2020 LabArchives, LLC. All rights reserved.' on the left and '©2020 LabArchives, LLC. All rights reserved.' on the right.

# LabArchives widgets make storing your information easier

**Edit Entry** ✕

Date   \*

Total Fluid (mL)  ▼

Weight (kg)

Urination?  ▼

Defecation?  ▼

Removed?  ▼

Time Removed

Time Returned

Cylinder Cleaned

Chair Cleaned

Pair Housed

Notes

Initials  \*

# LabArchives widgets make tracking your experiments easier

**Laboratory Record Information:**

Date: \*

	Start Time:	End Time:
Lab:	<input type="text" value="10:50 am"/>	<input type="text" value="2:10 pm"/>
Booth:	<input type="text" value="11:30 am"/>	<input type="text" value="2:05 pm"/>

Experiment: \*

Monkey:

Cleaned Edges:

Cleaned Cylinder:  Notes:

Recorded:  Notes:

Fluid:  Amount:  Type:

Performance: Total Trials:  Correct Trials:

**Experiment Information**

Rig:  ▾

Paradigm:

Root File:

Links?  Root:  SPM/Conversion Code:  Analysis Code:  Preliminary Analysis:

Behavior In Booth

Session Notes

\*\*\*\* 7th day running T5/T6 only with 50% coherence \*\*\*\*

# LabArchives widgets make tracking your experiments easier

Notebooks 2 > An08062021

+ New Widget • Gold Lab Dail... F

EXP

- An03112021
- An03182021
- An03222021
- An06142021
- An06212021
- An06252021
- An06282021
- An06302021
- An07012021
- An07022021
- An07082021
- An07092021
- An07122021
- An07142021
- An07162021
- An07192021
- An08052021
- An08062021

+ New...  
EXP\_Attempted  
+ New...  
+ New...

@7.727 mm: n cells here. Going to settle for 10 min (@11:28-11:40AM) and then slowly advance to a cell before calibrating him

@7.887 mm: Mapped 2 cells around here. Very weak and non-selective responses

**Rasters** | **PSTHs**

Unit: 1001  
Sort by: dot\_dir  
Raster sort: Trial  
Bin size: 20

Raster begin time  
dot\_on 0  
dot\_off 0

Raster end time  
dot\_off 0

Rate begin time (wrt)  
dot\_on 0  
dot\_off 0

Rate end time  
dot\_off 0

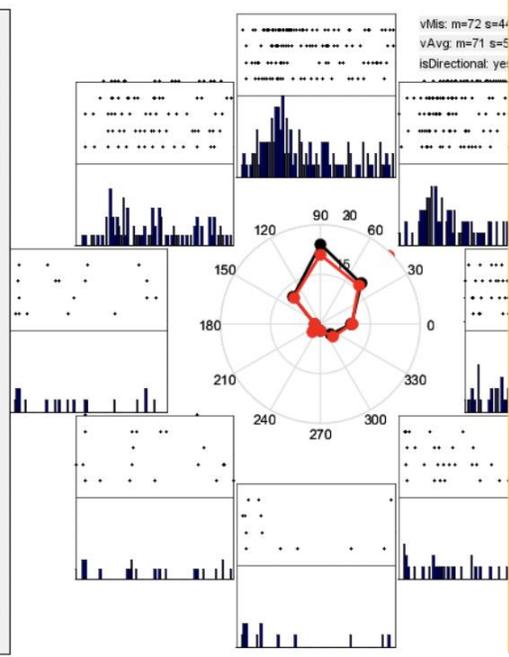
Marker 1  
dot\_off 0

Marker 2  
none 0

Current trial  
Show previous...

Select... Update

vMts: m=72 s=4  
vAvg: m=71 s=5  
isDirectional: ye



@7.9 mm: Weird WF here.... cell injured

@8.0 mm: REALLY tonically active cell

@8.2 mm: Mapped two nice cells here that both preferred 45 degrees, but had different and relatively non-overlapping RF preferences... on.

⇒ .plx mapping w/ T2  
② Looks like two units here, seem beautifully separated

@10.775mm: Seems a bit less active here. Not bumping into any nice units  
→ Sidd could tell we were right up against a cell.  
→ It died, so maybe will get some signal back

@11.15 mm: Sidd found RF to be bottom R. putting dots there

⇒ .plx Mapping w/ T2  
③ 4001 looks maybe down and R. looks similar to previous @4000

But, firing maybe same amount when he's sitting w/ his eyes closed  
→ increasing d = 300

# LabArchives widgets make tracking your experiments easier

TERMS BY PENNSYLVANIA

An08062021

+ New Widget • Gold Lab Dail... Rich Text Heading

An08062021\_5e-- EXP

- Dir1 = 45
- Dir2 = 225
- RF (0,-50)
- SZ = 150
- SP = 40
- Coherence = 50%
- Running 200 trials 3:1 T6/T4: (400: 72.22%; 401: 59.52%; 600: 84.06%; 601: 75%)
- Running 200 trials 3:1 T5/T3 (300: 54%; 301: 39%; 500: 87.57%; 501: 80.72%)
- **Note:** Lost cell briefly a few minutes in. Data should still be present, but in the noise unit.
- **Note:** Cell seems not super responsive..... The pattern of responses on the raster plot look spot on, but it's just much less active than when I was mapping
- **Note:** Anubis taking a break after 73 trials of T3/T5. Paused rex and .plx file. Cell is definitely more active when his eyes are closed lol.

Rasters  PST...

Unit: 1001

Sort: dot\_dir none

Bin size: 20

Raster begin time  
trial\_begin 0

Raster end time  
trial\_end 0

Rate begin time (wrt)  
dot\_on 0

Rate end time  
dot\_off 0

Marker 1  
none 0

Marker 2  
none 0

Current trial  
< >

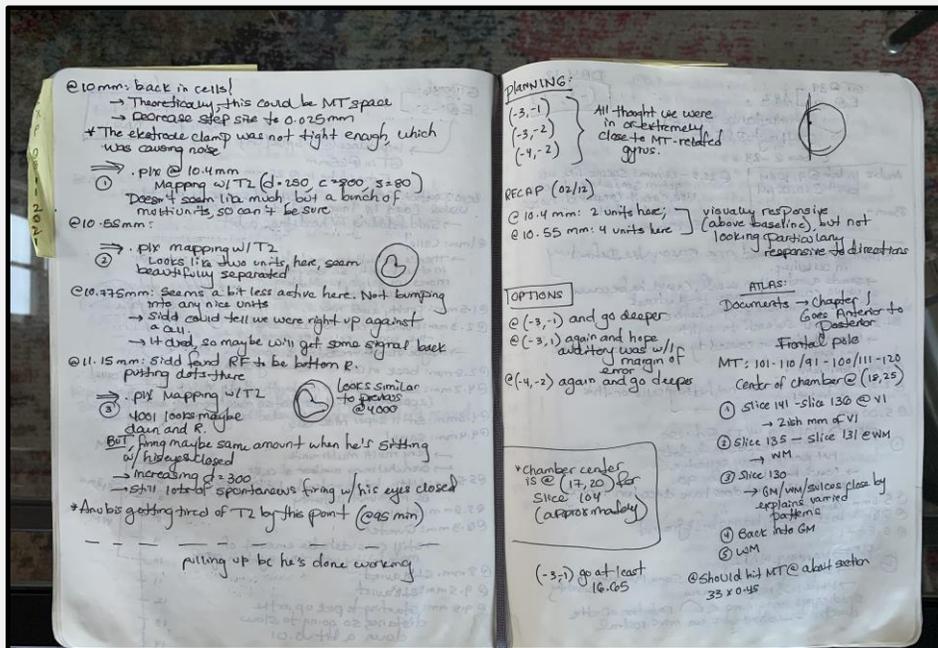
Show previous...  
< >

Select... Update

dot.dir=45.0 (n=192; bt=225)  
3.6+-3.8 / 3.1+-6.5

dot.dir=225.0 (n=205; bt=225)  
3.6+-3.8 / 3.5+-6.4

The widget displays two raster plots side-by-side. The left plot is for dot.dir=45.0 (n=192; bt=225) and the right plot is for dot.dir=225.0 (n=205; bt=225). Below each raster plot is a corresponding histogram showing the distribution of responses over time. The histograms show a similar pattern of activity, with a peak in the middle of the trial.



University of Pennsylvania logo and search bar at the top.

Search notebook: [ ]

powered by labarchives®

KARA MCGAUGHEY

Notepbooks > An07162021

An07162021\_a -- EXP @ 9.09 mm

- Dir1 = 45
- Dir2 = 225
- RF = (0.50)
- SZ = 125
- SP = 30
- Running 29 min @ T4/T6: Anubis finished - 240 trials (400: 62.75%; 401: 54%; 600: 95%; 601: 92.54%)
- Running 20 min @ T3/T5: Anubis finished - 240 trials (300: 69.57%; 301: 51%; 500: 94.37%; 501: 81.63%)
- Note: @ 4 min: Paused rex and .pix file to fix isolation by moving up -- @ 9.04 mm
- Note: @ 50 trials, Anubis doing really poorly on 401 (23%)... Don't want to turn on repeat flag, though, because he's above 90% on HC trials.
- Note: @ 100 trials, he's picking up performance here with 401 and is now at 50% with 66.7% on 400
- Note: @ 22 min: Moving electrode up a bit to maintain isolation -- @ 9.03 mm
- Note: @ 28 min: Anubis switched well to second block. He's struggling with 301 a bit today, too, but not as bad as 401
- Note: Cell is -- interestingly -- firing a bit for 225 after if it sees 45 first
- Note: @ 40 min: Moved electrode up a bit to maintain isolation -- @ 9.02 mm
- Note: @ 41 min: Moved electrode up a bit to maintain isolation -- @ 9.01 mm
- Note: @ 48 min: Paused rex and .pix file because Anubis taking a break. He's done 156 T3/T5 trials with decent performance. Took a ~10 min break and got back to it.
- Note: @ 53 min: Moved electrode up a bit -- @ 8.990 mm

**dot.dir=45.0 (n=113; bt=125)**  
18.9+12.1 / 24.8+27.7

**dot.dir=225.0 (n=110; bt=125)**  
13.9+11.6 / 19.2+23.1

Left panel: Rasters (PST) showing spike trains for unit 1001. Bin size: 20. Trial begin/end times are 0. Rate end time is 0. dot\_off is 0. Marker 1 and 2 are none.

Right panel: Raster plots and firing rate histograms for the two conditions shown above.

Interested in trying out LabArchives?

Attend the ELN session!

FAH Rtel mice - OneNote

Search (Alt+Q)

Rowe, Melissa RM

File Home Insert Draw History Review View Help

Paste Cut Copy Format Painter

Clipboard

Calibri 11

Basic Text

Heading 1

Heading 2

Styles

To Do (Ctrl+1)

Important (Ctrl+2)

Question (Ctrl+3)

Tags

To Do Tag

Find Tags

Outlook Tasks

Email Page

Meeting Details

Email

Meetings

Kaestner Lab

Daily Planners

Big picture tasks

Telomouse

Experimental and proto...

Lab chore list

Party planning

Cell lines

Macrophages and lipids

Prelim stuff

Search (Ctrl+E)

## FAH Rtel mice

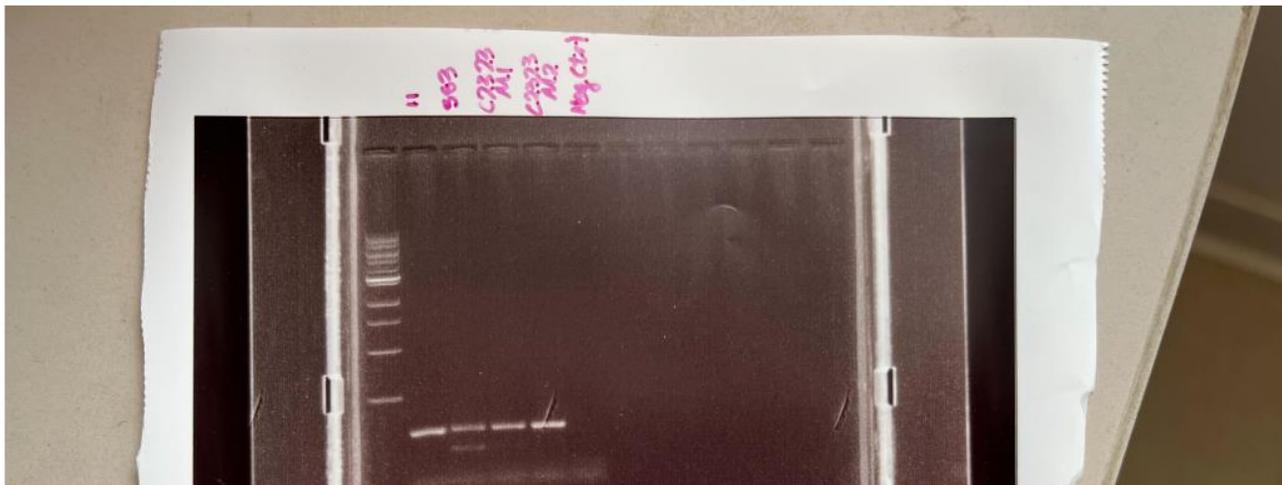
Monday, July 18, 2022 12:10 PM

### 7/18 PCR

- Followed Eric's protocol (no extra cycles, template)
- Two experimental mice (1944 and 2217) and two controls (383 and 11)
- First four lanes use the original primers Eric has been using, and the last four use the new primer Klaus and I developed

### Re-establishment of line (February 2023)

Genotyped C2323 M1 and M2, neither lane showed clear second bands (see below)



- Each file is a notebook
- Notebooks are organized into tabs
- Each tab has unique pages
- Pages can hold text, photos, files, etc.
- Controls are similar to other Microsoft products (such as Word or Powerpoint)

Search (Ctrl+E)

+ Add Page

Overview

FAH Rtel mice

- FAH-/- genotyping
- cMyc-NRAS
  - c-Myc only injected mice (Jpl)
  - NRAS-c-Myc plasmid
- De novo tumor generation
- DSS and irradiation staining
- Irradiation w/ VO (rotation)
  - vData: irradiated mouse weigh
  - Scrambled image identities
- GTT on aged RTEL mice (Jan 2023)
- Speck lab collaboration
  - SFU treated mice
  - Secondary BM transplant
- sgP53-N90Bcat