**Welcome to the lab!**

The Varney Genetics Training Checklist

This is a long list, and I know looks like a lot. But the idea is that you can move through this list in as little as two weeks, after which you will be independent and will be able to set your own working hours. My goal is to make this easy and fun for all of us, and the list makes sure I don’t forget anything!

The expected times of each step are listed in red; some have multiple configurations, so we can figure out what works best for all of us. I train typically by doing something with you once, having you do it again with me around but not at the bench with you, and then your doing it again completely independently. This only works if you communicate with me! Tell me if you feel ready, tell me if you don’t! Remember that this is not a race, but a collaboration between the two of us to do some science.

Along those lines, you’re here for this semester for sure. If you find that you enjoy your time and the work, you can stay longer. We have had several undergraduates that have gone on to take ownership of their own research project in the lab, and that research can be taken to conferences, and if completed can sometimes be published! You will go as far as you show me you want to go.

**I. The Boring Stuff**

(1 hour)

(Can be combined with multiple students)

* Meet the people! We’re all here to help you!
* Lab tour, including safety equipment and food/drink rules, highlight hazard areas and work zones
  + Lab etiquette and pet peeves:
    - Don’t lick the science.
    - Ask about the music.
* Safety training – official safety training must be completed prior to your beginning benchwork!
* Why are you here?
  + What do you hope to gain from this experience?
  + What do we expect to gain from having you here?
* Expectations of time commitment
  + Share our schedules!
* Overview of the PLAN: get you working as an independent scientist, setting your own hours

**II. Science time!**

(20 minutes)

(Can be combined with multiple students)

* Introduction to overarching goals of research project(s)
* Find your glove size!
  + Glove etiquette
* Lab notebook assignment
  + What does a good notebook look like?
    - Name
    - Date
    - Process you’ll be running
    - Sample identification
    - Protocol
    - NOTES!
      * “Sample 3 turned lime green and spent five minutes of the incubation dancing on the countertop.”
    - Mistakes
  + Why is your notebook the single more important thing you’ll do?
* Introduction to the spreadsheet.
* Aliquots- everybody gets their own science!
  + Why do we do this?
* Pipetting skill drill: (See **Pipetting Documentation**)
  + Water weights (100uL, 1000uL)
  + Parafilm play (10uL, 5uL, 1uL)
  + Ethanol – saturate your tips
  + Protective layers – bubble on purpose
* The part where I scare you slightly by talking about how I’m giving you real samples to work with from Day 1, and we talk about trust in the lab.

**III. DNA Extraction**

(start digestion early if desired to accelerate training)

(Max of 2 students at a time)

(3 hours OR 2 hours one day, 30 minutes next day, OR 15 min first day, 1 hour next day, 30 minutes third day)

* Introduction to genetic samples
  + EtOH vs. RNALater vs. Frozen – why use each? Where are they stored?
    - **Pop Quiz**! How many fridges and freezers are there in the lab, and what is each for?
  + DNA vs. RNA
* General process of getting DNA from cells
  + What are the five steps that every DNA extraction has?
* Salting Out DNA together (see **Salting Out Protocol**).
  + BENCH TECHNIQUE DRILL

**IV. Gel Electrophoresis** (see **Gel Electrophoresis Protocol**)

(1.5 hours for gel prep and run, 20 minutes for imaging and processing)

(Can be combined for multiple students)

* What is a gel? How does a gel work?
  + Why must gel match running buffer?
* Make a gel (20 minutes)
* While cooling: <https://www.youtube.com/watch?v=tTj8p05jAFM>
* Load first gel
  + WHICH SAMPLE IS WHERE? WILL YOU REMEMBER? (hint: the answer is no. Write it down in your notebook.)
* Run
* Image first gel
* Process image on computer (see **GIMP Protocol**)
  + Rules of pictures in science:
    - The original, unedited pictures will ALWAYS be saved
    - All saved images will have your INITIALS and the DATE
* Did your first extraction work?!

**V. CHECK-IN**

(INDIVIDUAL MEETINGS)

* Check-in: how are we feeling about DNA extraction and gels? The lab? The people? The training? Classes? Life?

**VI. The independent work begins (if you want to)!**

* Run salting out on the four samples laid out for you. Remember to go slow and ask lots of questions when you have them! I’ll be around the lab the whole time. Use your lab notebook!
* Run a gel on the DNA you extracted. Remember to record in your lab notebook what voltage you used and how long you ran it!
* **Discussion**: how did it go? What could you do better? What do you know you did really well?

**VII. The independent work continues!**

* Run three more salting outs/gels and discuss the results of each with me after each run!
* LOOK AT ALL THE SCIENCE YOU’RE DOING!
* Play online:
  + http://learn.genetics.utah.edu/content/labs/pcr/
* Find and watch 2 more videos about PCR on YouTube.
* Tell me that you’re done with your homework.

**VIII. PCR TIME**

(1.5 hours the first time, plus removal after completion)

(Can be combined for multiple students)

* Read over the **PCR Protocol**
* What is the purpose of each step?
* Why MasterMix?
* Primer aliquots
* Discuss where primers come from
  + Literature
  + Resuspension
  + Storage
  + Contamination
* We’ll run your first PCR together (COI)! YAY PCR!

**IX. Check your first PCR**

(1 hour, 2 hours if training on multichannel for motivated students)

* **Run a gel** with me on your PCR product, the same way you ran one on your extracted DNA! (I’ll help with the strip tubes!)

**X. PCR 2**

(45 minutes to start PCR, plus independent gel)

* A more complex PCR- let’s get to know a new set of primers
  + What is a gradient?
  + How is this going to matter when we run our gel?
* PCR: how can we cheat/change our MasterMix here?

**XI. THE FINAL COUNTDOWN**

* Run a PCR with primers for COI on your first four DNA samples.
* Run a gel on this PCR, and present me with your lab notebook and results.
* Troubleshooting time!
* Receive gold star.

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Typically, our undergraduates function here, extracting DNA and running PCRs. If you are interested in learning more, feel free to ask to be trained on:

* DNA Sequencing: where does the PCR go, what comes back, and what does it mean?
* Lab Upkeep: what goes into keeping a lab going?
* Other methods of DNA Extraction (oh yes, there are more!) Very beneficial for your resume if you want to go on in genetics.
* Other types of PCR (e.g. qPCR)
* Working with RNA
* Working with DNA from other types of animals/plants
* Collecting DNA samples
* Anything else you see and want to learn to do! Our lab is here for you!