

The Physician's Garden

Fall 2020

Transfer Student Seminar Course taught in the fall semester Course limit is 20 students (only 10 in 2020 due to CoViD-19), <u>must be a first year</u> <u>transfer student or professor permission</u> Meets Tuesdays 3-4:15 (rm 1377 GSB) and Thursdays 3-6:00 (242 Wilson Hall) for

~6 instructor-student contact hr/wk Credits 3 hours

IMPORTANT MESSAGE: The Department of Biology believes that diversity is crucial to our pursuit of academic excellence and is deeply committed to creating a diverse and inclusive community. This class is a safe place for you. Feel free to talk to me if anything I or someone else says makes you feel uncomfortable.

Prior to the first class, you must view James Burkes episode 12 of his series called *Connections*² <u>https://www.youtube.com/watch?v=-Lmjl4yNAaM</u>

Please read before August 11th: Wicked Plants by Amy Stewart

Read this article before class:

https://www.chathamnewsrecord.com/stories/the-next-frontierfor-hemp,2163

Must watch before August 20th introductory tutorial systematics and cladistics

https://www.youtube.com/watch?v=5Jlz-Uq35-A

Required book: *Wildflowers of the Atlantic Southeast* by Cotterman et al ISBN 9781604697605 Please **READ** the introduction before August 20th

ON-LINE lectures will be synchronous but recorded. You must keep your video on and your microphone muted during lecture. We will use the "raise hand" function and break out rooms.

ON AND OFF CAMPUS exercises require a mask worn at all times.





Date Due	Task	Comments
Before August 11 th	View Connections ² video	This is how the class is structured (i.e.
5		loosely)
Before August 11 th	Read Wicked Plants	Read at least 6 stories
Before August 11 th	Take tutorial on systematics	Link above. You may need to continue to
5		learn from similar tutorials you find on your
		own.
August 18 th	Watch video on leaf types	See link below
August 18 th	Form 2 teams	elect captains
August 19 th	Learn Terms to Keying Exercise	See table below page 17
Before August 20th	Order and receive Wildflowers of	Read introduction
	the Atlantic Southeast	
August 13 th	Bring dues for GAEA club	
August 13 th	Read letters from 2019	
August 20 th	Announce your 1 st and 2 nd choice	
-	for Faculty Coffee	
August <mark>27th</mark>	Don't forget to bring WAS book	You will need this for class
August 27th	Must elect co-chairs for T-shirt	2-3 people to chair this
	design	
Before Sept 1 st	Read article on hemp	https://www.chathamnewsrecord.com/stories/the-
		next-frontier-for-hemp,2163
Sept 1 st	Learn how to make a hypothesis	https://www.scribbr.com/research-process/hypotheses/
Sept 4 th	1 st set of Peerwise questions due	See list for class dates covered
Sept 8 th	Exam I	
Sept 10 th	Tutorial on Adobe Illustrator and	
	laser cutter	
Sept 11 th	First draft of sign design due	Send to Dr. Jones
Sept 22 nd	Faculty Report due	Or have a confirmed date.
Oct 9 th	2 nd set of Peerwise questions due	See list for class dates covered
Oct 13 th	Exam II	
Oct 15 th	~1 page hypothesis	- email to Dr. Jones
Oct 1 <mark>4th</mark>	Plant material MAILED. One per	This will be lyophilized for next week lab
	person in each team. Mail it	
Oct 21 st	Watch video on Serial dilution disk	See link below
	assay	
Oct 27 th	Place your Tee-shirt order	
Nov 5 th	Final Draft of sign design	 email to Dr. Jones
Nov 12 th	Team letter to class 2021	See the example below
Nov 12 th	Lab Report due	See the template below and example PDF
Nov 13th	3 rd set of Peerwise questions	See list for class dates covered
	due	
Nov. 17 th	EXAM III	
	Assign Drivers to visit Medicago	CANCELLED DUE TO CoViD19
	Assign Drivers to visit Syngenta	CANCELLED DUE TO CoViD19
	Herbarium Service Hours	CANCELLED DUE TO CoViD19
	NCBG Service Hours	CANCELLED DUE TO COVID 19

Red text has been canceled due to campus closing August 19th

Week 1

<u>Tuesday, Aug 11th</u> ON-LINE Introduction Meet two of our Biol 217 family members (overview, expectations, assignments, THERE IS A LOT OF INFORMATION IN THIS PACKET- IT IS YOUR FIRST "GO TO" SOURCE WHEN YOU HAVE A QUESTION), Brief introduction to Systematics. Scientific paper assignment. Discuss transportation for upcoming field tripS. Sign up for GAEA club. Presentation by the Gardening and Ethnobotany in Academia club, GAEA. Meet a former student from this class. Remember to bring club dues for Thursday class.

<u>Thursday, Aug 13th</u> OFF CAMPUS Presentation by *Elizabeth Gardner, Esq of a* Kava Bar (*Krave,* Carrboro) and Sgt Deshaises, The Birth of Ethnobotanical Subculture in America: Contemporary Uses of Kava Kava, Kratom, and Hempderived CBD—at odds with Big Pharma. Law Enforcement Issues with Legalized Herbals. Take J bus to Krave in Carrboro. Meet first in Wilson 242 then we leave immediately (do not be late) to catch J bus at 3:15 in front of Health Science Library. Arrive 3:40. Return no later than 5:25 J bus

CANCELED DUE TO CoViD-19: Choose 2 hosts for *cold* youpon served on tour (get tea from Dr. Jones this day)

Note that your faculty choices are **due next week**. Email me by Monday.

Week 2

<u>Tuesday, Aug 18th</u> ON LINE How the Pacific Yew, the Periwinkle, and the Autumn Crocus Cured Cancer (Taxus brevifolia, Colchicum autumnale, Catharanthus roseus, colchicine, tubulin and microtubules) Read assigned science paper before Thursday class (even though we are not discussing this paper until November).

Thursday Aug 20th Cancelled due to campus closure

WATCH VIDEO on leaf type nomenclature. https://www.youtube.com/watch?v=GHzIUjeZIQI

Week 3

<u>Tuesday, Aug 25th</u> ON LINE *The Weed that Killed Lincoln's Mother* (*Eupatorium rugosum*, white snakeroot, *The Milk Sickness*, tremetol, citric acid cycle).

BEFORE CLASS ON THURSDAY, PICK SOME WILD FLOWERS AND KEEP FRESH SO WE CAN USE THEM TO IDENTIFY THEM ON THURSDAY.

<u>Thursday, Aug 27th</u> ON LINE Learn to use a key to identify plants. (Dr. Alan Weakley and Carol Ann McCormick).

EACH member of the team must *identify* and collect one sample. Samples due Oct 15th.

Also, start thinking about your Tee shirt design to be ordered October 27th . Elect co-chairs of the Tee-shirt committee.

Week 4

<u>Tuesday, Sept 1st</u> **Convoluted Cannabis**. (Cannabis sativa, hemp or marijuana, CB1 receptors, brain)

Read this article before class: <u>https://www.chathamnewsrecord.com/stories/the-next-frontier-for-hemp,2163</u>

Required tutorial due today: https://www.scribbr.com/research-process/hypotheses/

<u>Thursday, Sept 3rd</u> **ON LINE** Virtual walk through the garden, we will discuss the signs and your sign project.

ON-LINE- make-up lecture for campus pause. The Weed that Killed Lincoln's

Mother (*Eupatorium rugosum*, white snakeroot, *The Milk Sickness*, tremetol, citric acid cycle).

Work on: Research Hypothesis on *Plant extract* Antibiotic Activity and Plan in writing-You may work in teams but each student produces a 1-page hypothesis to turn in. Use this time to start your work on your hypothesis regarding your plant extract and antibiotic activity against *Staph epidermydis*.

Peerwise questions (set 1) due Sept 4th

Week 5

Tuesday, Sept 8th Exam I

<u>Thursday, Sept 10th</u> **ON YOUR OWN** Read the sign manual and use this time to prepare draft 1 of your sign. Turn in by tomorrow for approval to move forward. Take the on-line introductory tutorial and the laser-cutting tutorial and score 100% on the exam.

Your herb and tea kits for next Tuesday are mailed to you.

Week 6

<u>Tuesday, Sept 15th</u> ON LINE (Jones is on Capital Hill) Guest Speaker Ms. Adrianna (Ade) James-Rizzi *Building a flavor and medicinal profile for medicinal teas*. During this lecture/workshop, you will learn about medicinal properties of different herbs and teas. You will prepare different teas on line so you will need a source of hot water for this class. You will also hear the story of one of our own Biol 217 family members starting a business around herbs and teas.

<u>Thursday, Sept 17th</u> **ON LINE The Death of Socrates** (Conium maculatum, Strychnos toxifera, hemlock alkaloids, curares, poison arrows, neuromascular synapse, nicotinic acetylcholine receptor).

Week 7

<u>Tuesday, Sept 22nd</u> ON LINE Holy Hot Pepper! (*Capsicum,* the deadly nightshade family, Capsaicin, vanilloid receptor subtype 1, ion transport)

Kayaks, Kramps, and Kures. Scientific curiosity leads to a company with a good product

DUE TODAY: You must have completed your faculty interview OR have a confirmed near future date to meet.

Thursday, Sept 24th The Death Angel (Amanita, amanitin, mRNA,

Week 8

Tuesday, Sept 29th ON LINE Practical aspects of mycology

Wednesday, Sept 30th Mushroom hunt. View the video (TBA) and go on a mushroom hunt. Save your specimens for discussion in class on Thursday

You should have received your mushroom culture kits by now.

<u>Thursday, Oct 1st</u> ON LINE Guest Mycologist, Dr. Henry van Cotter, cooking mushrooms (CANCELLED DUE TO CoVid19) demo *Reishi* and *Pleurotus* cultures that you can do at home, mushroom hunt on campus, rain or shine- <u>dress appropriately</u> – note: in fall 2018, we went out during a hurricane (and had a blast!)





<u>Tuesday, Oct 6th</u> **ON LINE Opiates and** μ (*Papaver somniferum*, poppy, opium, morphine, mu 2 receptors, G-protein coupled signaling, receptors, G protein coupled signaling in muscle cells)



Beautiful Lady, What Big Eyes You Have (*Atropa belladonna*, deadly nightshade, muscarinic acetylcholine

<u>Thursday, Oct 8th</u> EACH ON THEIR OWN: COLLECT AND MAIL your plant material to be tested for antibiotics on this day. Label with names and information about material. Ship to: Dr. Alan Jones Dept of Biology CB#3280 Coker Hall University of North Carolina, Chapel Hill, NC 27599-3280

Turn in your hypothesis (1-page).

Peerwise questions (set 2) due Oct 9th

Week 10

Tuesday, Oct 13th Exam II

<u>Thursday, Oct 15th</u> ON LINE (zoom hosted by Tee-shirt co-captains) Design a GAEA club T-shirt. Must place order on this day for the shirts to be done in time. See examples of past shirts below. Cannot use images you find on the web unless you alter them. You cannot use UNC logos. You will be using Custom Ink <u>https://www.customink.com/</u>

Week 11

<u>Tuesday, Oct 20th</u> **ON LINE** *Homer's Cyclops* (California corn lily, *Veratrum californicum*, the teratogen cyclopamine and the hedgehog signaling pathway)

MUST READ the lab requirement section below before you begin this week. p 14

DUE TODAY You must watch tutorial on Serial dilution Disk assay – see link p 15.

<u>Thursday, Oct 22nd</u> ON-LINE Testing the antibiotic effect of plant extracts: Part 1controls and preparation of plant material. Learning to use a pipette and pour a lawn. Part II.

Week 12

<u>Tuesday, Oct 27th</u> **A Walk in the Woods of the Human Immune System** (*Toxicodendron* [poison ivy], urushiol oils, human immune system and the allergic reaction).

<u>Thursday, Oct 29th</u> **ON-LINE TBA** Probably go over last week's data together and get ready to write your lab report.

Week 13

<u>Tuesday, Nov 3rd</u> ON LINE *The Hound of Hades* (The dog named Cerberus, *Cerbera*, Suicide Tree, Kerala India, Oleander, spies with poisons, cardiac glycosides, the heart, Na+/K+ pump)

Pushkin's Upas Tree and the Thirteen Concubines (*Antiaris toxicara*, The Upas tree, cardiac glycosides in art and lore)

<u>Thursday, Nov 5th</u> New plant signs must turned in today after a final check by Dr. Jones for any needed changes. Finish writing your team letter to Class 2021

Week 14

<u>Tuesday</u>, Nov 10th **ON-LINE** Discuss the assigned etoposide paper in class.

Thursday Nov 12th No Class. Send me a photo of you wearing your Tee-shirt

Peerwise questions (set 2) due Nov 13th

Week 15

Tuesday Nov 17th EXAM 3

Assignments:

1. Zoom Coffee with Faculty. - You are assigned to write 1-2-page article on a UNC life science researcher. Faculty member working on problems in the life sciences are found in the Dept of Biology, Department of Psychology, Department of Pharmacy and throughout the Schools of Medicine. This must be a tenure-track research faculty of any rank. Instructors, aka teaching faculty, cannot be used for this assignment. You may not pick a professor you know already- e.g. teaches a course you are taking or took. You must have a first and second choice approved by Dr. Jones in class on August 20th. Your article will contain a (screen shot) photo of you and your interviewee with your coffees plus illustrated with one or more figures on the science you discuss. DUE Sept 22nd.

Any life science research faculty except the following:

(2017) C. Mitchel, M Evans, D. McKay, A Maddox (Shaub), Riveros (Geology), Vicky LeGrys, H. Kelly, Z Nimchuk, J Bruno, K Bloom, C. Willet, J. Bruno, Wikberg (clinical tech), Ashkin, B. Stahl

(2018) A Baldwin, E Yeh, Scott Williams, G Pielak, D Penn, S Burmeister, V. Bautch, K Lohmann, B McKee, F Conlon, M. Prinstein, K Pfennig, A Weakley, K Reissner, C. Perou

(2019) L Miller, S Algoe, T Furey, Sarah Grant, A Harris, B Taylor, R Dowen, Bill Kier, T Hedrick, D Matute, J Reed, S Ahmed, K Sockman

2. Write a letter to class 2021 and deposit all materials there

HOW TO ACCESS THE CLASS DROP BOX FILES

https://www.dropbox.com/home

NAME: PHYSICIANSGARDEN@GMAIL.COM

PSWRD: biology217

Go to the Fall 2019 folder to find everything you need. It would also be helpful for you to peruse the other folders.

You will set up a Fall 2020 folder in this dropbox site

Each team will have their own folder labeled with the Team name (changes each year)

Your Fall 2020 folder is where you will deposit all your files that you generate such as signs, photos (e.g. before and after, class photos), protocols (weeding, mulching, watering, installing, etc).

DUE BEFORE Nov 12th. Each team must write a letter to the 2021 year class. This file is labeled in this manner "[team] (e.g. Public Affairs) Letter to the 2021 class" Send this to Dr. Jones AND save in the Fall 2020 folder

3a. Write questions to be chosen for your exam. One question per person for each of the days you have an instructor present (not work days etc) For exam I, write one question each for 8/11, 8/13, 8/18, 8/20, 8/25, 8/27, 9/1; for exam II one question each for 9/10, 9/29, 10/1, 10/6 and two questions for 9/22; for exam iii, write one question each for 10/20, 10/22, 10/29, 11/3, and two questions for 11/10. This is a total of 19 questions this semester. Peerwise keeps track of your work and reports to the instructor.

3b. You must leave a comment on at least **10** questions.

How to access Peerwise to deposit your questions

Go to PeerWise

https://peerwise.cs.auckland.ac.nz/at/?unc_edu

The course ID is 21523 called The Physicians Garden fall 2020

4. Garden Legacy. CANCELLED due to CoViD-19 Plan to leave something behind that will be a useful part of the garden when you come back to campus in ten years. Past examples were birdhouses, path lights, stepping stones, new paths

2019 Garden Teams- (I've included this so you can see how past teams were structured, but due to CoViD-19, we are not doing this in 2020)

Design Team - Signage (10 people)

- Determine if some plants need signs removed- remove them. (see note below)
- *Check for accuracy all signs- see note from visitor below
- Create your two signs from list

Web Technology

- Make-over (i.e. New) of web page interface for cell phone
- Confirm each sign has a page and that the QR code is working from cell phone
- Make a consistent format with each page that looks good on a cell phone
- Find a way to un-bury the Garden web page from HSL website
- Determine key bottleneck issues for 2019 class

Public Affairs

- Assemble list of garden clubs Presidents and addresses for letter 1.
- Assemble a letter of rich donors started by class last year.
- Meet with wall artist to get a written description of her vision to be used in a letter for donations

- Send letter 1: Get financial commitments form Chapel Hill/Carrboro Garden Clubs to finish bench acquisition project ~\$3000
- Brochure makeover
- Send letter 2: Make the vision clear and the target (\$30K) justified.

More Assignments:

- **CANCELLED DUE TO SARS2-CoV2** One Thursday afternoon working in your medicinal garden (club requirement).
- Presentations. 20-min+ Presentation, Letter to 2021 Class, other tangible items such as a brochure or letter of solicitation. NOTE THAT ALL ITEMS MUST BE IN A WORDDOC OR PDF FORMAT (EVEN YOUR PRESENTATIONnote that companies like Prezi charge \$\$ for pdf files- don't use them).
- CANCELLED DUE TO SARS2-CoV2. Service hours. You are required to spend 1 ½ h service to the UNC herbarium, 1 ½ h service to GAEA club (to be completed - hours working outside on the garden for class count), and 1 ½ h service to the NCBG. Sign-up for the UNC herbarium is located here:

CANCELED The sign up sheet for the Herbarium is located here: <u>https://docs.google.com/document/d/1W60zOdS6xKG59ZSoJV7XxOdV7isk9lZPZqZqeIAT93s/</u> <u>edit</u>

CANCELLED The sign up sheet for the NCBG is located here: <u>https://docs.google.com/spreadsheets/d/1QL1eabO81_BLwy-GiKjeN1T7hW0V7w8zrRzc-</u> i1Dd0M/edit?usp=sharing

- CANCELLED DUE TO SARS2-CoV2 Immediate Club membership. You are required to be a member in good standing with the Gardening And Ethnobotany in Academia Club (GAEA) for one year. Show proof of membership, paid dues, and 1 ½ h service/year, meeting attendance. Noel Martinez is the club treasurer and will handle the dues.
- 2. Lab report of your experiments. See template at end. Due Nov 12th.

Absence and tardy penalty:

You may not miss a class without prior excuse. HOWEVER, if you feel sick, <u>do not</u> <u>attend a physical class</u>- go to the infirmary and have them let me know that you were seen by a physician.

Reading:

- 1. No course pack. *Wicked Plants* by Amy Stewart- to be purchased on line (~\$4 used)- not the book store. OR check it out of the library.
- 2. You must **own** a copy of *Wildflowers of the Atlantic Southeast*.
- 3. You will read a scientific paper for discussion to be determined and maybe a cell biology text chapter if determined to be needed for some of the lectures. The lectures and the scientific paper will be sent to you by email.

Class forum:

Feel free to use your class-designated Sakai site to form blogs, chat groups, share resources, etc. This site will not be monitored by the instructor- it is your "safe space".

Grading:

Grading: Exams 1 through 3 will account for 50% of the total final grade, the remaining 50% are for enthusiastic participation, the coffee meeting with faculty report, service, final presentation, etc. The grading is not curved. Missing or late assignments will be given a score of zero.

Final letter grade assignments are based the following

A - Mastery of course content at the highest level of attainment that can reasonably be expected of students at a given stage of development. The A grade states clearly that the student has shown such outstanding promise in the aspect of the discipline under study that he/she may be strongly encouraged to continue.

B - Strong performance demonstrating a high level of attainment for a student at a given stage of development. The B grade states that the student has shown solid promise in the aspect of the discipline under study.

C - A totally acceptable performance demonstrating an adequate level of attainment for a student at a given stage of development. The C grade states that, while not yet showing any unusual promise, the student may continue to study in the discipline with reasonable hope of intellectual development.

D - A marginal performance in the required exercises demonstrating a minimal passing level of attainment for a student at a given stage of development. The D grade states that the student has given no evidence of prospective growth in the discipline; an accumulation of D grades should be taken to mean that the student would be well advised not to continue in the academic field.

F - For whatever reasons, an unacceptable performance. The F grade indicates that the student's performance in the required exercises has revealed almost no understanding of the course content. A grade of F should warrant an adviser's questioning whether the student may suitably register for further study in the discipline before remedial work is undertaken.

Biol 217 RESEARCH REQUIREMENT

Introduction to research. Prior to the two weeks dedicated to experiments in this course, you were assigned to come up with a hypothesis to test. Constraints were given and the assay to use was growth inhibition of *Staphylococcus epidermidis*.

Week 1.

Pipetting, Growth measurement using spectrometry, graph analyses.

Questions to answer: 1) what is a good starting density to observe exponential to stationary growth of S. epidermydis within the time we have in lab class? 2) What is the maximum amount of plant extract carrier (EtOH) that we can add to the *S. epidermidis* without affecting growth. WHY?

Collect your specimens for testing next week. Tare your tubes, collect, calculate fresh weight in your tube.

Spectrometry. Learn the basics. Learn to "blank" using media.

Week 2.

Questions to answer: What is the quantitative effect of your extract on the growth of S. epidermidis?

*Optional. Is the effect on growth due to death or not? i.e. bactericide or bacteriostatic

Agents which kill cells are called cidal agents; agents **which inhibit the growth** of cells (without killing them) are referred to as static agents. Thus, the term bactericidal refers to killing **bacteria**, and bacteriostatic refers to **inhibiting the growth of bacterial** cells.

Set up your cultures first thing. Use the appropriate density determined last week.

Add your extract based on what you learned last week.

Quantitate growth over time, plot, conclusion, write your report.

*Testing if extract is a bactericide. At a determined point in the growth curve (what would this be), collect samples from treatments and controls, adjust so that all comparisons have same starting A600 values, plate on LB plates. Make a series of dilutions so that it will be possible to obtain single colony counts per a unit of volume - colony forming units CFU

More to know before this lab exercise

How to Calculate CFU From Dilution

By Eric Moll; Updated June 04, 2018 https://sciencing.com/calculate-cfu-dilution-7806269.html

CFU stands for Colony Forming Units, a microbiology term used to quantify how many bacteria exist in a solution. Depending on the concentration of your sample, you need to perform multiple dilutions and



plate the different samples onto petri dishes. If you have too many bacterial colonies, they are hard to count, and if there are too few, the sample may not be representative. It is generally a good idea to plate the original solution, then a 1/10 dilution (1 part solution, 9 parts saline), a 1/100 dilution and possibly a 1/1000 dilution.

Calculating CFU from Bacterial Dilution

Perform Preliminary Count

Perform a preliminary count of each dish once the bacteria incubates, which usually takes one or two days. Count only individual colonies, which should be distinct, isolated dots, not a whole blob of different colonies grown together. Choose the plate which has more than 30 of these colonies but less than 300.

Count Individual Colonies

Count the number of individual colonies. This is the CFU number of your dilution -- you will have to perform a simple calculation to determine the CFU of the original sample. For this example, use a hypothetical plate containing 46 colonies.

Determine Size of Dilution

Determine the size of the dilution you used. (Ideally, you labeled the petri dishes ahead of time.) For this example, mix 1 mL of bacterial culture with 99 mL of saline. This is a 1/100 dilution. **Multiply Degree of Dilution by Amount Plated**

Multiply the degree of the dilution by the amount you actually plated. If you plated 0.1 mL of your 1/100 dilution onto the agar, you multiply 0.1 x 1/100, for a result of 1/1000 or 0.001.

Divide CFU of Dilution

Divide the CFU of the dilution (the number of colonies you counted) by the result from step 4. For this example, you work out $46 \div 1/1000$, which is the same as $46 \times 1,000$. The result is 46,000 CFU in the original sample.

Testing antibiotic activity using the disk diffusion assay

You must watch this video:

https://www.google.com/search?q=how+to++test+for+antibiotic+using+filter+disks+on+lawn&gws_rd=ssl#gws_rd =ssl&kpvalbx=_0dpSXduyLaem_QaUjoVw7&spf=1565711057332_

Outline for Lab Reports

Use the outline below as a template to guide you. You need not limit yourself to this outline. This outline will later be used to help you put together your lab report as you add more information to it. The final lab report will not include the roman numerals, letters and numbers but instead you will write each section in paragraph form.

Title and date (centered on first page)

The title should reflect the independent and dependent variable. For example, "The effects of *Hypericum* extract on the growth of *Staph. epidermydis*". It should be brief and descriptive.

I. <u>Abstract (</u>200 word max)

II. Introduction

- A. Include (here) a few sentences of preliminary observations or background information (what is already known) about the subject
 - 1. Answer here: Why is the lab experiment being done (What do you hope to learn)?
- B. Hypothesis

- 1. Include here a possible answer to why you are doing the lab (If we do this.... then we think this should happen)
- 2. Identify independent and dependent variables here

III. <u>Materials and Methods</u>

- A. For this section of the outline briefly state in step-by-step fashion what and how you did the experiment. Write down how lab was conducted with materials as part of the procedure.
- B. Include controls used here

IV. <u>Results</u>

- A. Here summarize data collected by describing a condensed version of the data
 - 1. Use tables, graphs, and charts with appropriate units, labeled axis and legends

V. <u>Discussion</u>

- A. First, state whether you accept or reject your hypothesis based on your results.
- B. Then include interpretations and opinions of your data and observations
 - 1. Why did the results turn out the way they did?
 - 2. How does your control affect the results?
- C. Discuss any sources of error. Include any unusual circumstances, problems or difficulties that were encountered and ways they could be improved.
- D. In this section you should discuss how the information gathered during the project is useful to society or the individual and what you have learned.

References

Properly cite all sources used. Minimum of two major sources one of which includes the lab manual.

PLANTS FOR TEAMS TO RESEARCH FOR LABELS FALL 2020

PICK ONE OF THESE

Plant List will be provided

AND PICK ONE OF THESE SIGNS FOR PAINTING

- a. Vinca
- b. Galega
- c. Capsicum
- d. Cannabis
- e. Digitalis Foxglove
- f. Atropa
- g. Papaver
- h. Colchicum autumnale
- i. Glory lily
- j. Salix nigra black willow

Terms to learn before the Keying Exercise on August 19th (prepared for you by a 2019 classmate)

TAXONOMY - The science of description, identification, naming, and classification of organisms SYSTEMATICS – The classification/naming of organisms based on morphology (Kingdom -> Phylum -> Class -> Order -> Family -> Genus -> Species) PHYLOGENY – Classifying based on relationship to other organisms (family tree) PROCESS OF EVOLUTION – Changes based on sources of variability (environment, food, etc.) PHYLOGENETICS – The study of phylogeny – plant molecule systematics GENOME – All the inheritable traits of an organism (full set of DNA) GENOMICS – The study of genomes (for us, especially for classification purposes) ANGIOSPERM – "vessel seed" – enclosed seed (ex: flowering) GYMNOSPERM – "naked seed" – unenclosed seed (ex: coniferous) COTYLEDON – plant embryo MONOCOTYLEDON – an angiosperm with one cotyledon; endogenous growth (ex: corn) DICOTYLEDON – an angiosperm with two cotyledons; exogenous growth (ex: bean) EUDICOTYLEDON - a true dicot, does not have mixed traits ENDOGENOUS – growing/developing from within EXOGENOUS – growing/developing from outside SIMPLE LEAF – Has one broad, undivided leaf COMPOUND LEAF – Leaf is divided into several leaflets PINNATE COMPOUND LEAF – Leaflets are across from each other (either evenly or oddly spaced) DOUBLE PINNATE COMPOUND LEAF – Sets of pinnate compounds leaflets are across from each other

PALMATE LEAF – Leaflets all stem from one point at the base of the leaf and fan out around it



TOOL BOX (I am hoping that one of you will add more to this table for everyone in 2021- there's extra credit in it for you)

Compound	Inspired Drug	Plant	Use
	Taxol	Taxus	cancer
Colchicine	Colcemid	Colchicum	cancer
	Vinblastine, vincristine	Cantharanthus	Cancer
Tremetol		Eupatorium	Citric acid cycle
Capsaicin		Capsicum	pain
alkaloids		Conium, Stychnos	
amanitin		Amanita	ribosome
Opium	Morphine	Papaver	pain
Cardiac glycosides			
Etoposide			telomerase
opiods	Naloxone/naltrexone	synthetic	Opiod receptor GPCR

Compounds Already Tested- DO NOT CHOOSE THESE unless they are inconclusive

Plant	Method	Results	Year
St John's Wort	Liquid culture	Highly effective	2016, 2017, 2018
		bacteriocide	
garlic	Halo on lawn of S. epidermydis	Not inhibitory	2019
oregano	Halo on lawn of S. epidermydis	inconclusive	2019
mugwort	Halo on lawn of S. epidermydis	inconclusive	2019
bay leaves	Halo on lawn of S. epidermydis	inconclusive	2019
spearmint	Halo on lawn of S. epidermydis	Not inhibitory	2019
pepper	Halo on lawn of S. epidermydis	inconclusive	2019
passiflora	Halo on lawn of S. epidermydis	Not inhibitory	2019
burdock root	Halo on lawn of S. epidermydis	inhibitory	2019
oregano	Halo on lawn of S. epidermydis	Not inhibitory	2019
annice hyssop	Halo on lawn of S. epidermydis	Not inhibitory	2019
ginger	Halo on lawn of S. epidermydis	inconclusive	2019
iopmea	Halo on lawn of S. epidermydis	inconclusive	2019

Example of a letter from a previous class (2019)

2020 VISION BABY

Hi all! First and foremost, I want to congratulate you guys on transferring in to UNC! It's going to be hectic to say the least, but with a community like the one you will build in this class, you will for sure persevere! In saying that, some crazy stuff can happen in this class... it is anything but traditional or cookie cutter. Your professor, Dr. Jones, always wears Hawaiian shirts and a few of us are almost certain he has a tiki girl in one of his vehicles but we haven't been able to prove it yet. He will most likely ask you guys out for drinks several times throughout the semester... take him up on it! He's a cool dude! In saying that, I'm going to highlight a few funny things that happened during our time in BIOL 217...

• Stuff Dr. Jones has said/done: 0 "Has anyone tried marijuana?" Everyone just sat in their seats staring at him, low key perplexed... was this a trick question? Why all of the sudden? wHyYy? "Well I have... am I the only honest one here?"

 $\circ~$ "It took me forever to get these seeds because they are illegal in America." Not again Dr. Jones \ldots NoT aGaIn.

o "Don't burn the house down." He says before leaving to run back to his office really quick. Suddenly fire breaks out in the bowl of ethanol, catching the things around it on fire. One of my classmates is throwing absorbent sponges full of water at it and my other classmate is running for the fire blanket... welp... at least what we thought was the fire blanket. Long story short, Dr. Jones came back in as all of this was dying down and he says, "you guys... what was the one thing I said? Don't burn the house down. And what did you do?" He ordered a fire extinguisher before the next class.

o "You like tea?!" He runs to his office and brings back a mug of hot tea, handing it to me... he even let me keep the mug!!!

• He may have illegally planted hemp in our garden. It is legal now, but let me tell you... where we started with four full, beautiful cannabis plants, we are now down to none... people keep hacking them down and stealing them. It won't get you high... just saying.

• He also may have illegally planted opium poppy in his own personal garden to see just how tedious it would be to extract opium from it.

• He has put several recipes in our lectures... and I'll be honest... they look pretty damn good if it wasn't for the one poisonous ingredient in there that would kill you if you ever ingested it. One may or may not have been for an ex-boyfriend of mine. In saying that, Dr. Jones has your back!

• Last but not least, he has a mini popcorn machine. In saying that, prepare to gain that "freshman fifteen" two years late.

Now... to the logistics...

{PLANTS WE ADDED}

During our first gardening day we planted a willow tree in the Sunny garden and three new Galega plants. In the shady garden we planted another willow tree, poet's laurel, and several Valerian roots. During our second gardening day we planted horseweed and foxglove in the Shady garden and wild quinine in the Sunny. The best recommendation we can give the future Design/Sunny Garden team is take notes as you work, because at the end of the semester you will no longer remember the names of the plants you installed.

{WE CHANGED THE OLD SIGNS... WHY?!?!}

A lot of old signs in the garden needed replaced. The previous class made signs that included common name, scientific name, a fact about historical medicinal use, and a QR code for people to find more information. The

QR database didn't contain much additional information about the plants. The signs were made of paper, so they were ruined by weather.

{WELP... HOW'D WE GET STARTED? (RESEARCH, TRACING, & ADOBE)}

After we assessed the problems with the current signs, we decided we were going to make long-lasting signs for the garden (hopefully permanent ones). To do this, we started the process by using Adobe Illustrator (being a student at UNC means you can get a lot of free software if you didn't know) to trace the leaves and the active compounds of the plants. First, we made a spreadsheet of the plants we wanted to make signs for- there were 16 in total. Then, each person was assigned two plants to research, finding the common and scientific names, a picture of the leaf, the active compound (and a picture of it), the drug it inspired, a little bit of its history/origin, and how it's used in medicine today. We each did our research, compiled all of the signs (2-panel signs). The template included all of that information in 70 words or less, along with the traced images of the leaves and the compounds.

To trace the leaves and compounds, we had everyone upload their two images into drop box. Susan showed Andrea and me how to trace the images in Adobe Illustrator:

Firstly, it was necessary that the picture was on a plain white background, and didn't get grainy when enlarged. Our team took some pictures from online, but for the ones that couldn't be found online, we took the pictures manually in the garden in front of a white piece of paper.

- Save the picture into your computer

- Go into Adobe Illustrator and click "New" and then "custom"
- Once it opens a new project, click "file-place" then choose the image from your saved
- Transfer the image to the page and "transform" it to fit the page
- Click the image and select "Image Trace" then "silhouette."
- "Object" then "expand"
- Click the image again and change the color to magenta (for compounds) or green (for leaves)

We uploaded the images into folders on drop box, and then put them into the final designs according to our template. We had some difficulty with this because the traces only worked if the images were on a plain white background (white enough to match the color of the empty document on Adobe Illustrator), or else, the trace would color everything in. For some of the plants, members of the team had to actually go down to the garden and manually take a picture of the leaf on a white piece of paper. We also had to make sure that the compounds were clear when enlarged, or else they would also show up completely black when traced. Some of the compounds also had complex 3-D structures, so those were more difficult to trace. Despite these minor setbacks, the team was very helpful and efficient in the process, so we were able to get the signs designed in a timely manner.

{SIGN OVERVIEW}

Designing the new signs was an interesting experience. A few of us had to teach ourselves how to use Adobe Illustrator in order to make a file format that the laser engraver can work with... we did not expect to get thrown into the world of design in a bio class, but I think we enjoyed it. We put a lot of work into designing these signs with hope that your/our garden can now better educate people while being a beautiful place to spend time.

Our design includes two signs, one to grab attention and one to provide information. The old signs didn't have a picture of the plant they represented, and because of the way the garden is laid out, that made it difficult to discern which sign belonged to which plant. To add on, the QR codes weren't really functional either... We decided to include images of the leaves/plants to help make the signs more useful. We also decided to include a blurb about some modern medicine that was created based on compounds found in the plant. Seeing a sign that says "This plant inspired chemotherapy drugs" grabs attention and gets people to read our signs. For the informational sign, we included some folk medicine to give the plant's use historical context, then ended with its modern medicinal use. We had to keep the text under 80 words so only the most important and interesting information made the cut. We also included a compound of medicinal importance on this sign to help draw attention and to provide a visual reminder of the scientific aspect of the garden. We remade signs for the following plants: poet's laurel, wild quinine, paw paw, valerian root, St. John's wort, camptotheca (happy tree), staghorn sumac, plume poppy, English ivy, Madagascar periwinkle, galega, cannabis, hot pepper, foxglove, atropa belladonna, autumn crocus, glory lily, and black willow. **Please see attached document for step-by-step instructions about how to make the signs**

{OUR LEGACY...}

For our sunny garden legacy, we wanted something simple but purposeful. Since we were already making signs for the plants, we thought making a welcome sign for the garden would be a great idea. Since it's made of wood, it will last a long time. It matches the new plant signs, which will help bring cohesion between sunny and shady gardens. It also identifies it as the Physician's Garden and shows the GAEA club as caretakers. It's unusual that a campus garden is taken care of by a class/club instead of by campus maintenance, so we wanted to celebrate that in a way that everyone walking through the garden can see!

{THE CONCRETE WALL IS GETTING A MAKEOVER Y'ALL}

I guess after a while of people making remarks to Dr. Jones about how ugly the concrete wall is at the back of the sunny garden, he got fed up and *poof* now we have an artist that we are collaborating with. This section is dedicated to that...

For our first meeting with Alyssa, the artist, she told us about her idea that we would require incorporating electromagnetic waves from plants into our design. An engineer, Lily from NYU, had to first collect electromagnetic data from the plants and then covert that information into binary code that we could use in some way. That binary code could then be either converted into colors, images, etc, etc. We were then asked to upload any visual imagery we would like to see incorporated into the design of the wall to Dropbox. For our second meeting, Alyssa and the team met at Honeysuckle cafe in Carrboro and went over the mural imagery we submitted to Dropbox (still available to you guys). We settled on making a live moss wall and were really excited about it. Unfortunately, since the wall is in direct sunlight for the majority of the day, the wall would require too much maintenance. In saying that, the idea fell through and we finished the semester still tossing around ideas, not really settling on one.

In her most recent email, Alyssa stated that her and Lily were close to solidifying the design output for the mural wall and that they were settling on the image output based on frequency collected from the plants. The project will continue on through the Spring semester so I am sure there will be a lot more progress by the time your class takes over.

{TIPS AND TRICKS FOR BIOL 217}

Honestly, this class is a lot. It isn't hard, per se, but it requires that you put time into it. A lot of it. Like I said in the beginning, you will find a community in this class. You'll grow to care about it and be proud of it. You are required to join GAEA and be an active member, volunteer at the North Carolina Botanical Gardens, and volunteer at the Herbarium in Coker Hall (right by your class). You also have to take a faculty member on a coffee date and get to know them (so you can write a paper about it), write a scientific paper, and write a letter to the class after you (like I am doing right now). You also will be required to work in the garden multiple times. So yeah. I'm not going to lie. It is A LOT. But it is also a lot of fun. You get to go on field trips and meet amazing people. You get to make amazing memories, friends, and for me, a best friend. You also gain a lifelong mentor that will write you killer recommendation letters, never fail at wearing a Hawaiian shirt, and never fail at showing just how much he cares about the lot of us.

As far as advice goes...Become Dr. Jones' friend!

- Try getting a head start on things because boy does it pile up during final prep for other classes.
- • Start you signs EARLY!!!
- • Utilize the Dropbox files from previous classes!

• • Record his lessons! A lot of what he puts on the exam may not be in the slides. He is one of those professors that says something, likes the ring of it, and is like... hmmm yeah that would make a good exam question. My recordings have helped me immensely on the take home exams.

• Let yourself breathe easy for a bit. He does have a lot of requirements but they aren't hard. He isn't what anyone in the whole universe would call structured. He makes mistakes and will push deadlines around sometimes. But he is also very understanding when you are in a jam because of his non-structured, laid back personality.

• • Have fun!



Front pocket position



Back of shirt



back



Front pocket position. The rod of Asclepius. Text = The Physician's Garden