

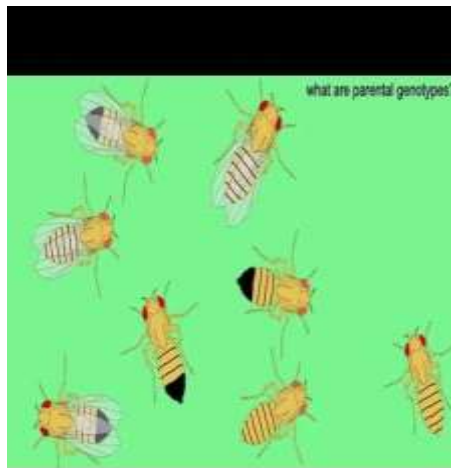
Genetics laboratory



T BIOL 305L-03

R BIOL 305L-04

Spring 2020



Richard Southgate, PhD
(southgater@cofc.edu),
T and R, 9:30 – 12:30 PM, RITA 169
Other possible make-up genetic
Labs (if you have an excuse, ill etc.):
T and R, 1 – 4pm RITA 169,
E-mail: Dr. Agnes Southgate
southgatea@cofc.edu for approval.

INSTRUCTOR:	Richard Southgate, PhD
OFFICE:	RITA 224
OFFICE HOURS:	Monday and Friday, 12:15pm – 1:45 pm. I also teach M, W and F, 11-11:50 (BIOL-111-02), so try and find me, around my teaching schedule or after the office hours) for short (~5 min.) talks or by appointment
EMAIL:	southgater@cofc.edu BEST I promise to answer your e-mails wishing 24 hours in the weekday (and probably much lesser) or up to Monday morning if you sent an e-mail to me after 5pm on Friday.
PHONE:	953-7374 – not very efficient, if I am not in my office or about to teach, etc...

Note that there are two other lab sections (T 1-4pm and R 1-4pm) by Dr. Agnes Southgate this semester. The similar experiment schedule (with a few differences) will be followed between in these four labs. If you miss a Lab., (illness etc. and with an excuse note from a doctor etc.) can TRY to make it up THAT SAME WEEK using one of the other sections. You need to inform Dr Agnes Southgate for permission, (southgatea@cofc.edu) and I will do the same for Dr. Agnes Southgate's students, so occasionally, you may see another student visiting in one of my planned labs. ...

COURSE DESCRIPTION:

An introduction to the principles of heredity using common experimental organisms. Recent techniques in molecular genetics are also covered as they shared in these to disciplines. Laboratory three hours per week.

Prerequisites: BIOL 111/111L, BIOL 112/112L.

Co-requisites or prerequisites: BIOL 211 and 211D, BIOL 305, MATH 250 or equivalent course in statistics or permission of instructor

LEARNING OUTCOMES

Students will

- Demonstrate the ability to analyze data obtained from crosses
- Understand Mendelian Genetics and common deviations, such as epistasis, penetrance and complex traits
- Apply basic statistical tools to genetics data.
- Demonstrate an understanding of the critical genetic concepts of mutations, alleles, and gene interaction in genotype-phenotype interpretation
- Demonstrate an understanding of some basic molecular genetic techniques.
- Exhibit proficiency for developing hypotheses and interpreting results on the basis of hypotheses.
- Format, analyze, and communicate experimental results.

TEXT BOOK

None. Protocols and other information will be provided in class or posted on OAKS

IMPORTANT DATES

Experiments schedule and due dates for lab reports **are posted on the Excel schedule file on OAKS. College academic calendar for this semester is:**

<https://registrar.cofc.edu/calendars/ac-2020spring.php>

PLANNED EXPERIMENTS

Below is a list of the experiments to be seen in the lab. sessions, but even though these activities will be probably in this order, but be aware live organisms in these labs. (*E. coli*,

Drosophila, yeast, DOG DNA, Human DNA etc. can have some hiccups, so the order is these sessions may be needed to be changed. For example, *Drosophila* have a two week life cycle but if we get a winter storm in February for example, the flies may be too old when to come back to the College.

MUTAGENIC AGENTS AND THEIR DETECTION

In genetics, a mutagen is a physical or chemical agent that changes the genetic material, usually DNA, of an organism and thus increases the frequency of mutations above the natural background level.

DNA POLYMORPHISM: EXAMPLE: PTC TASTING IN HUMANS,

The genetics of bitter taste caused by the PTC gene: TAS2R38.

ALLELISM TESTING IN YEAST

An allelism test is carried out by a complementation test. Two recessive genes can be 1) allelic, i.e. they fail to complement each other in the F₁ hybrids (i.e., the hybrid is of mutant phenotype). If the hybrid of two recessive individuals is of wild phenotype are allelic (i.e., they complement each other) the two genes are not allelic.

ALLELIC SERIES AND MOLECULAR BASIS OF PHENOTYPE IN DROSOPHILA

Allelic series describe different mutant alleles of a gene that cause a range of phenotypes, whereby each one carries a single point mutation within different regions of the same gene.

PENETRANCE AND EXPRESSIVITY IN DROSOPHILA, AND THE ROLE OF MODIFIER GENES

Although some types of inheritance in genetics are simple as autosomal dominant conditions, there can also be complicated types of inheritance. When dominant alleles are inherited, they are expected to express a particular trait or set of traits, which constitute a particular condition or a syndrome. However, in reality, dominant allele affect different people in different ways. On that account, a specific genotype may exhibit phenotypic variability or a range of different phenotypes. Penetrance and expressivity are two measurements that describe the range of phenotypic expression of a particular genotype in individuals. The main difference between penetrance and expressivity is that penetrance is a quantitative measurement, describing the levels of expression of a particular phenotype, which corresponds to a dominant genotype whereas expressivity is the extent of a given genotype expressed at the phenotypic level.

Modifier genes are defined as **genes** that affect the phenotypic and/or molecular expression of other **genes**. **Genetic modifiers** can affect penetrance, dominance, expressivity, and pleiotropy (Nadeau, 2001). <http://oge.med.ufl.edu/courses/syllabus/GMS6011-PDF/nadeau%202001.pdf>

COMPLEX TRAITS AND GENE MAPPING IN DOGS

Complex traits, also known as quantitative traits, are traits that do not behave according to simple Mendelian inheritance laws. ... Such traits show a continuous range of variation and are influenced by both environmental and genetic factors.

TENTATIVE SYLLABUS OF THE GENETICS LAB. ACTIVITIES IN THIS SEMESTER.

THEY HOPEFULLY WILL BE IN THE SEQUENCE BELOW BUT WEATHER, ILLNESS AND MANY OTHER POSSIBILITIES MAY LEAD TO A DIFFERENT ORDER, AND ANY CHANGES WILL BE POSTED ON OAKS BEFORE THE EVENT.

WEEK	MODULES	EXPERIMENT
T 1/14 and R 1/16		Lab introduction, safety Introduce Ames
T 1/21 and R 1/23	1	SAFETY QUIZ and Pipetting CLASS EXERCISE Ames experiment
T 1/28 and R 1/30	1	AMES QUIZ , End of the Ames experiment and analysis. NCBI gene, cDNA and translate CLASS EXERCISE
T 2/04 and R 2/6	2 3 4	AMES REPORT DUE ON OAKS Introduction to the Polymerase Chain Reaction (PCR) and PCR CLASS EXERCISE : finding primer, and product size Arabidopsis CLASS EXERCISE and CLASS REPORT
T 2/11 and R 2/13	4	PCR QUIZ PTC polymorphisms experiment DNA extraction + PCR set up Restriction Fragment Length Polymorphism (RFLP) IN CLASS EXERCISE
T 2/18 and R 2/20	4 3	PTC QUIZ PTC polymorphisms gel electrophoresis <i>Drosophila</i> familiarization
T 2/25 and R 2/27	5 6	PTC REPORT DUE ON OAKS Yeast genetics white alleles in CLASS REPORT
T 3/3 and R 3/5	5 6	YEAST QUIZ Yeast genetics end Complementation in CLASS EXERCISE Stickleback case studies and in CLASS REPORT
T 3/10 and R 3/12	7	YEAST REPORT DUE ON OAKS Dog DNA + PCR
T 3/17 and R 3/19	NO LABS	SPRING BREAK

T 3/24 and R 3/26	7	Dog gels / PCR Quantitative trait studies	
T 3/31 and R 4/2	7	Dog analysis of your conclusions	
T 4/07 and R 4/09	8	DOG REPORT DUE ON OAKS Lobe experiment P, F1 and F2	
T 4/14 and R 4/16		LOBE REPORT DUE ON OAKS LAB FINAL AND PRACTICAL.	THE END

Please check the announcements on OAKS. **As all experiments last more than a lab period, each lab section will usually deal with 2-3 different experiments (beginning, in the middle and conclusion).**

Detailed experiment schedule is provided on OAKS as an Excel file and in lab., but you need to have a **good notebook** to follow the week activities across several parallel experiments, so knowing what is happens on last week and the next week. Several of these experiments will probably require good organization on both your parts and mine and anyway, we should all still have some fun.

TESTING AND GRADING:

25% of all INDIVIDUAL quizzes, 30% of all TEAM class exercises/reports, 25% of all TEAM Lab reports, 20% of the INDIVIDUAL final test and practical. So 25% + 25% + 30% + 20% = 100%.

GRADING SCALE:

92 & above:	A	80 – 82.9	B-	67 – 69.9	D+
90 – 91.9	A-	77 – 79.9	C+	64 – 66.9	D
87 – 89.9	B+	74 – 76.9	C	60 – 63.9	D-
83 – 86.9	B	70 – 73.9	C-	Below 60	F = NO GRADE

COURSE POLICIES

1) LAB SAFETY:

A list of safety policy and procedures will be discussed in the first class. The **official SSM lab safety policy document** is posted on OAKS and **needs to be reviewed**. Remember, every different lab. has its own risks for the persons working in that lab. in addition, as we have at least 12 students per lab., your safety is paramount – therefore, **a lab safety quiz will need to be PASSED before you are allowed to work in the lab.** Observance of all safety regulations is expected. There will be **NO EXCEPTIONS. Failure to follow the SAFETY GUIDELINES will debar you from performing the experiment** on the given day and you will **not receive any grades for the same. Repeated offenses will lead to withdrawal from the course.**

Be aware that for all EMERGENCIES, the campus has just adopted the 911 number to call!!!

ATTENDANCE.

You are expected to do your share of the work. Many of the labs involve long periods of time at the microscope because you do not want to make mistakes when looking at *Drosophila* flies for example, (that may be reflected in lower lab. grades). At the same time, it is unfair to expect your lab partner to do all the work... If you were ill and missed a Lab., please **send your partner and me an e-mail** so that arrangements can be made. **Most of the investigations may be impossible to make up.** However, , there is possibility of a make up only if you can make arrangements with your partner and get yourself scheduled into one of the other sections of the BIOL 305L within the same week (Tuesday and Thursday morning (9:30 – 12:30 pm) and afternoon (1 – 4 pm) sessions), BIOL-305L-01, -02, -03 and -04.

EXCESSIVE ABSENCE

MISSING two LABORATORIES will result in a “WA “grade (withdrawn excessive absence) at midterm and/or final grade. At midterm, WA can still be changed to a regular final grade. A final “WA” grade is calculated as an “F” in your GPA.

This is College policy BUT IT DOES APPLY IF THE ABSENCES ARE DUE TO A MEDICAL OR PERSONAL REASONS AND VERIFICATION IS PROVIDED.

ELECTRONIC DEVICES

You are encouraged to bring your laptop or tablet for every class, but they can only be used for scientific activities in the labs... Breach of that trust will lead to you losing that right, and therefore the ability to perform certain experiments. Also, remember, these devices in a lab. environment are endangered due to water spills or slipping on the floor (common situations in student labs. so always know where it is and protect it ... but they are only used for lab. activities, not shopping, latest gossip / scandal / videos in RITA 169).

LAB REPORTS

Instructions for lab reports are available on OAKS. There will be questions to answer and analyses to perform for each investigation. **REPORTS ARE TEAM-BASED.** You must work closely with your partner to gather the data that has be clearly presented, legible, and neat (this includes for example cropping pictures for *Drosophila* eye colors, not a small, fuzzy picture of the whole fly). **The stepwise calculations done to obtain the results should be SHOWN, as you will be graded accordingly (your answer is describing how you came this calculation).** Reports are due on the week listed in the experiment schedule file and on OAKS. You have a weeklong "grace period" in which you could submit your report for half credit, but reports will not be accepted thereafter, except for extenuating circumstances.

LAB PERFORMANCE EVALUATION:

It is important to clean the lab after your experiment by putting away the materials used in the right place, cleaning your culture bottles/apparatus used and keeping the area tidy. **Failure to do so will be reflected in your team lab work evaluation. At the same time,**

do not let your partner do all the work.

You are also expected to either print the protocols for that day or have them available on your computer/tablet. Do not rely on your partner to do this for you....

You will keep a binder with all the lab information, experimental details, and recorded data. We will talk about the format of the binder during the first lab. binders will be randomly checked.

Care and attention to performance and experiment success will also be included in your grade, *i.e.* be prepared, follow instructions carefully, do not rush to get out as fast as possible, clean your space, *etc.*

COLLEGE POLICIES

• WEATHER-RELATED CLOSURES

If the College of Charleston closes and members of the community are evacuated due to inclement weather, students are responsible for taking course materials with them in order to continue with course assignments consistent with instructions provided by faculty. In cases of extended periods of institution-wide closure where students have relocated, instructors may articulate a plan that allows for supplemental academic engagement despite these circumstances. **Keep storm days (labeled as SD in Registrar calendar) free of any engagement (work, travel, etc.) in case they need to be used for making up canceled lab periods.**

• DISABILITY SERVICES

1. Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the first two weeks of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged.
2. The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP [= Students Needing Access Parity] located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before the accommodation is needed.
3. This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, (843) 953-1431) or me so that such accommodation may be arranged.

- **HONOR CODE AND ACADEMIC INTEGRITY**

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the *Student Handbook* at <http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php>

The college also has a Statement on Religious Accommodation for Students, if one of these religious days / events are in conflict with this lab. activity please let me know. <http://academicaffairs.cofc.edu/documents/procedures-and-practices/statement-of-accommodation.pdf>



SAFETY POLICY AND PROCEDURES

The School of Sciences and Mathematics of the College of Charleston understands that the safety of our students, staff and faculty is of paramount importance. Engendering a safety culture is an important part of our mission in teaching and doing science. Each department, course of instruction, or research lab may require higher standards or procedures. The policies and procedures set forth below are understood to be minimum requirements across our departments.

In this document, the term "laboratory" is meant for a work space/facility where chemicals, biological agents, or equipment is used for research and/or instruction.

No one (student, staff, faculty, or visitor) will be allowed in a laboratory (teaching or research) to perform experiments or where experiments may be in progress unless these regulations are followed.

Students dismissed from a teaching lab due to violations of the safety procedures will not be allowed to re-enter the laboratory until authorized to do so by their supervisor (instructor) and, in the case of research laboratories, by the department chair or designee. Any course work missed because of a violation of these guidelines cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence.

1. You are responsible for knowing the biological, chemical, electrical, ergonomic, mechanical, and physical hazards associated with the equipment and materials that are being utilized in the laboratory. Listen to all instructions and ask questions about that which you do not understand.
2. Know the location of safety equipment telephones, emergency shower, eyewash, fire extinguisher, fire alarm pull.
3. Know the appropriate emergency response procedures. For routine incidents (minor burns, cuts, spills, etc.) call 3-5611. For serious emergencies and all fires, call 911.
4. Do not work alone in the laboratory if you are working with hazardous materials or equipment.
5. Use hazardous chemicals, equipment, and biological agents only as directed and for their intended purpose.
6. Do not engage in horseplay, pranks or other acts of mischief while in lab.

7. Drinking, eating, and application of cosmetics is forbidden in laboratories where chemicals or biohazards are present. Smoking is forbidden in all College buildings.
8. Appropriate personal protective equipment shall be worn. The dress code for laboratory work when using chemicals, biological or physical hazards, or when instructed to do so by the laboratory supervisor is as follows:
 - a) Wear safety glasses or goggles at all times.
 - b) No exposed skin on arms, legs or torso.
 - c) Wear lab coats or other approved protective garments.
 - d) Wear gloves or other personal protective equipment (PPE) as directed by the instructor or mandated by prudent practices based on the chemicals being handled. If in doubt, wear appropriate gloves. Latex is not permitted. Avoid cross-contamination.
 - e) Remove PPE (gloves and lab coat) when exiting the laboratory.
 - f) Wash your hands, even if gloves were used, before leaving a lab where you did any lab work.
 - g) Closed toe shoes are required. The heel and top of foot must be covered. High-heeled shoes, sandals, and perforated shoes are not permitted.
 - h) Confine long hair and loose clothing.
9. Inspect equipment or apparatus for damage before adding chemical reagents or biological samples or energizing electrical equipment. Do not use damaged equipment.
10. Never remove chemicals, biological samples, or laboratory equipment from a lab without proper authorization.
11. Presume that all chemicals and biological samples used in the laboratory are hazardous for you and the environment, unless instructed otherwise.
12. Never leave an experiment unattended unless proper safety precautions are in place.
13. Read all labels on chemicals twice before using them in the lab. Read all instructions twice for the operation of any equipment or machinery.
14. Properly and safely dispose of all waste materials.
15. Treat sharps and broken glassware containers carefully.
 - a) Broken glass should be disposed of in properly marked safety containers. All sharps (needles, razor blades, etc.) used for any purpose must be disposed of in specially labeled SHARPS containers.
 - b) Do not place contaminated glass in the broken glassware container. Consult your supervisor.
 - c) Waste chemicals and contaminated PPE should be discarded as directed.
16. When using a reagent, replace the lid immediately. Never return unused reagents to stock bottles. Take only the amount needed for your experiment.
17. All chemicals and biological samples/media are to be disposed of in appropriately

labeled containers. Specific instructions for each material will be provided. Pay attention to waste container labels before adding the material to be discarded.

18. Use good personal hygiene. Keep your hands and face clean. Wash hands thoroughly with soap and water after handling any chemical or biological agent.

19. Keep the work area clean and uncluttered with chemicals and equipment. Clean up the work area on completion of an operation or an experiment. Before leaving the laboratory, you are responsible for making sure your lab area is clean and organized.

20. Never store a chemical or biological specimen in an unlabeled container.

20. Always have your College of Charleston identification and insurance information with you when working in a laboratory. MedicAlert identification must be worn if you have any potential life-threatening chemical sensitivities or medical conditions.

21. Report any accident or injury, however minor, to your teaching assistant, instructor, or lab supervisor immediately. An accident report form must be completed and forwarded to the department chair, dean, and to the Director of Environmental Health and Safety.

If you have questions/concerns about safety in the lab please first consult your instructor. If these are not answered, please see the department chair. Finally, you may consult the director of Environmental Health and Safety, Randy Beaver at 3-6802 or beaverr@cofc.edu.

Updated: January 8, 2020



CougarAlert

The College of Charleston has an emergency notification system that is capable of reaching students, faculty, staff and parents within minutes of a campus crisis. This system is called **CougarAlert**.

Information for Students

The CougarAlert emergency notification system will contact up to six phone numbers for the student. Students may include family member numbers in their address and phone number information.

All students should log onto MvCharleston to review their address and telephone information and update as needed.

To access the address and telephone information follow these steps:

1. Log on to MvCharleston
2. Click on the Academic Services tab
3. Click on the Banner Self-Service Link in the third column
4. Click on the Personal Information link
5. Click on the Update Address and Phones and CougarAlert link

The CougarAlert system will pull the phone number in the following order - cell phone with text messaging option, cell phone without text messaging option, residence hall room phone number, mailing phone number, home phone number, parent phone number and parent 2 phone number.

~~If you do not have one of these numbers in your student record, the system will~~ select the next number on the list. To avoid issues related to timely communication of emergency messages to the proper places, every student must update his or her contact information in MvCharleston with current accurate information.



CougarAlert Display Information

When you receive an emergency message from the College of Charleston's CougarAlert System, the return e-mail address will be displayed as cougaralert@cofc.edu, and Caller ID will be displayed as 843.725.7246 (this is the College's Emergency Information Hotline).

Testing and Implementation

Testing will be conducted each semester to verify all systems are operating properly. The campus community will be notified via e-mail and web page

postings when testing of the system will be conducted.

Blackboard Connect Software

[Blackboard Connect](#) is an emergency communication software that sends notification before, during and after an emergency. With this new system, the College will be able to communicate in many modes, including voice messages to home, work and cell phones; text messages to cell phones, PDA s and other devices, written messages to e-mail accounts: and messages to teletypewriters and telecommunication devices (TTY/TDD) for the hearing impaired. In combination with our existing communications methods and emergency response plans, this new notification system will significantly enhance the College of Charleston's ability to maintain a learning environment in which students are safe, secure and comfortable.

In an emergency, communications to the campus will be issued in the following priority order:

1. Message to the [Blackboard Connect](#) Emergency Notification System (phone and e-mail).
 2. Recorded message to the College's Emergency Information Hotline , 843.725. 246.
 3. Update to the Website.
 4. Printed update sheets to be distributed and posted on campus (if necessary).
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The Cougar Alert system will only be used to notify you in the event of a campus crisis m emergency.