**BIOSC 1860: MICROBIOLOGY LABORATORY**
Department of Biological Sciences
University of Pittsburgh

**Faculty & Staff**

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- **Tech support:**
  Email: TBA

**Office hours**
By appointment only – we will meet for almost 7 hours each week and most questions are usually raised and addressed during class time. If you need more time to talk to your instructor, arrange for an office hour by sending her email specifying 2-3 times you can meet. Check back for the reply/confirmation of the appointment.

**Meeting times**

**Lab sections, G5 Clapp Hall:**

- Mo & We: 9:00-11:50am – Dr. Czapski
- Tu & Th: 9:00-11:50am – Dr. Swigonova

**Common Recitation, 266 Chevron Computer Lab:** Fri: 10:00-10:50am
You have to be registered for one lab section and the recitation. Notice that the recitation is NOT in the complex of Biological Sciences.

**Attendance is mandatory in both labs and recitations!**

**Course objectives**

In this course you will (i) learn basic techniques and methods used in studying microorganisms and (ii) practice the process of scientific method by conducting research in the field of microbiology.

During the semester you will:

- master techniques and methods commonly applied to study of microbes
- develop research project; revise approaches; provide critical evaluations to your classmate’s projects
- formulate and investigate hypotheses
- collect scientific data
- evaluate experiments and design some experiments
- analyze data and make scientific conclusions

Communication is an essential skill in any working environment and you will have numerous opportunities to build this skill by taking part in group discussions of the experiments, orally report on your research progress, and share results and conclusions of your research project with your peers and other members of the department during poster presentation at the conclusion of the term.

In addition to the two laboratory sessions per week, this course also includes a one-hour recitation session. The recitation will be used for: special instruction, Science2016, review, the midterm exam, oral presentations, preparation for the special projects, and presentations of research progress.

**The Experiments:** most of the time, you will be conducting two or more experiments
at once. This is standard practice in microbiology; because what we do mostly is inoculate cultures for some test or experiment, then wait for them to grow up for use or results interpretation. To use our time efficiently, we must do more than one thing at a time, so we aren’t just twiddling our thumbs while things grow. The coursework is loosely grouped into the following sections:

- Cultivation-Dependent Community Analysis
- Cultivation-Independent Community Analysis
- Phenotypic characterization of bacterial isolates
- Bioinformatics Analysis of 16S rRNA genes
- Molecular Evolution: phylogenetic analysis
- Special Project – independent research; poster preparation & presentation

There are two required manuals for the course. Other materials will be supplied as handouts in class, on CourseWeb, or via class/course PittBox.


This book is also available as an eBook through PittCat, and a hard copy is on 2-hour reserve in Langley Library. To access the eBook, simply search PittCat for *Microbiologist* and choose the book (not the book review). There may be limitations on the number of pages that you can print, so please be aware of potential difficulties when using this library eBook. The eBook may be purchased or rented through VitalSource or CourseSmart. If you choose to rent, please be careful of your rental time limit.


The protocols from this manual are posted in the Supplements section of the CourseWeb site.

In addition the textbook that is required in Biosc 1850 (pre or co-requisite to the lab course), or any other comparable Microbiology textbook, should be used to supplement the theory, and for any background review.

Together these materials provide background material and protocols adapted from the technical literature in microbiology, some from other published sources, and some developed specifically for your experiments.

It is necessary for you to realize that in using these sources you may not perform an experiment exactly as it appears in your texts. Rather you will use these sources as you would a cookbook: the source provides a recipe that you adapt to your own needs. We may want to use a technique described in the manuals for *E. coli* in an experiment we are doing with a different type of bacteria.

If you are considering a career in laboratory biology, it is essential for you to become comfortable with this approach to experimental protocols. The lack of published procedures that are specifically designed for your own needs is a situation you will encounter frequently as you pursue your careers. Learning to use protocols thoughtfully and imaginatively is part of your preparation for such careers, and class sessions will focus on this skill.
**Course Web & PittBox**

The **CourseWeb**, [http://courseweb.pitt.edu](http://courseweb.pitt.edu), will be used to post notes on experimental protocols, how to use laboratory instrumentation, course and class announcements, and other additional material. After log in on the main page you will have access to your “My CourseWeb” page where you find the link to the class. If you need help contact computer help desk at 412-624-HELP.

In addition, we will share documents via **PittBox**. During your independent research projects, you will collaborate with members of your research team. To facilitate communication and file sharing with each member of your research group and the instructors, you will regularly upload your files (notes, images, results, reports) into the PittBox.

**Student evaluation**

Good laboratory work develops as a combination of many different skills. If you are better at the lab bench than at the examination desk, we want your grade to give you credit for that. Consequently, our evaluation of your coursework will proceed at several levels.

*Preparation for class:* It is crucial that you are coming to the laboratory having read the day’s protocol(s). If we find that many in the class are not doing this, we will start giving quizzes covering the day’s procedures. Should this happen, we will adjust score contributions to the final grade so that the quizzes would be a significant component. We would not do this without first telling you that it is going to happen.

*Examinations:* There will be two one-hour midterm examinations (during a Friday recitation/lecture session) and no final examination. The examination dates will be announced two weeks prior to the exam. If, and only if, you provide documentation for an acceptable excuse for missing an exam, you may be allowed to take a make-up exam. Documentation must be presented within one week (5 business days) of the missed exam. All make-up exams will have a combination of written and oral components.

*Practical examinations:* there will be at least one laboratory practical examination and a short written exam on microbiology–type calculations skills. The dates will be announced two weeks prior to the exams. These examinations may cover serial dilutions, spread plating, staining, PCR, and other techniques covered in class; and quantitative problems similar to the ones given in the Microcosm manual, used in class, and included on the diagnostic lab math quiz. Information on the practical exams is posted on CourseWeb. These practical exams will be graded numerically.

*Laboratory work assignments:* On specific occasions, you will hand in cultures or other materials you have prepared during the course. These will be given a numerical grade, with criteria for scoring posted in the assignments section of the CourseWeb. Throughout the term there will be both pre- and post-lab written assignments and pre- and post-lab quizzes.

*Laboratory notebook* – You will maintain a laboratory notebook in which information about soil collection site, performed experiments, results or any additional work will be recoded in detail. Brief introduction to writing a laboratory notebook and rubric for evaluation will be provided. Laboratory notebooks will be evaluated based on the quality of laboratory note taking and completeness of the information included.
**Poster presentations:** In consultation with the instructors, groups of 3 or 4 students will work together on the *l, Microbiologist* microbial ecology and molecular evolution project. The poster presentation will be a compilation of the experiments, data, results, and conclusions from the semester long project. The poster presentation grade will also include the quality of your PittBox collaborative work, general laboratory competence and engagement, and oral presentation.

**Oral presentations:** There will be several oral presentations scheduled mostly during Friday’s recitation. The dates will be announced in class since they depend on the research progress in each of the classes. Those will span from informal, impromptu oral presentation focusing on some topic from the course experiments or on some preliminary work on your special project; to semi-formal presentation of your preliminary results; and finally a formal presentation dealing with your special research investigations.

**Necessary adjustments:** Biosc 1860 will give you a real research experience. As a consequence, inevitably there will be modifications to the schedule of experiments that may lead to adjustments in the grading criteria, timing of assignments and exams, etc. You will be apprised of any of these changes in a timely manner. Please be aware that we *strive diligently to make sure that all of your assessments will be fair and true reflections of your performance and competence.*

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### Course Grade

The grade will be determined as follows:

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<tr>
<th>Assessment</th>
<th>Grade proportion</th>
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<tbody>
<tr>
<td>Practical examination</td>
<td>15.0%</td>
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<tr>
<td>Materials, Assignments, Quizzes</td>
<td>20.0%</td>
</tr>
<tr>
<td>Lab notebook</td>
<td>10.0%</td>
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<tr>
<td>Poster presentation (incl. oral presentation &amp;</td>
<td>30.0%</td>
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<tr>
<td>PittBox collaboration)</td>
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<tr>
<td>Examinations (2 exams)</td>
<td>25.0%</td>
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### Exam Re-grades

You may request a re-grade of any portion of an exam by submitting your request in writing and explaining why you think the grading was in error. You must include a detailed justification for the correctness of your answer, including references to the text used in the course (text, page, paragraph). This request must be submitted to the instructor within one week (5 business days) after the date the exam results are posted. Unless the re-grade is due to an additional error, please be aware that your entire exam may be reevaluated and any question that was graded incorrectly (in your favor) may also be re-graded resulting in points deducted from your total.

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### G grade

If you wish to petition for a G grade, you must submit a request for this change in writing and you must document your reason(s). You will be required to make arrangements, in person, for the specific tasks you must complete in order to remove the G grade. You will be expected to sign documentation describing the work that has to be completed and the due date. All required work must be completed by the specified date otherwise a zero will be assigned for the work and final grade will be determined using this score. Remember that G grades, according to CAS guidelines, are to be given only when students who have been attending a course and have been making regular progress are prevented by circumstances beyond their control from completing the course after it is too late to withdraw.
Absences

If you aren’t certain whether your reason for an absence will meet our guidelines, please ask. We try to be as accommodating as we can while still treating everyone fairly. Any need for an absence or request for extra time on an assignment must be documented. We are happy to accommodate requests for post-graduate interviews; please provide a copy of the interview invitation to your instructor.

If you miss an exam and are permitted to take a makeup exam, the makeup may not be of the same kind as the exam taken by the class; for example it could be composed of essay questions instead or short answers or might be an oral exam.

If you must be absent from a laboratory session and wish to make up the lab work, you may be able to do so by arranging to attend some other section for that session if, and only if, you ask us about it during or before the previous week; and if there are other sections of the class offered. Otherwise, we may be able to accommodate you or we may not. You will not be permitted to attend a different section’s class meeting without arranging it with us in advance. There are classes meeting both morning and afternoon in the laboratory classroom, so scheduling make-up work is very difficult and in some cases impossible.

If you will be unable to attend any day that material is scheduled, we may or may not be able to arrange for you to make up the work, depending on what experiments are involved. Some class materials are unstable and complicated to prepare and we may not be able to make them available at additional times.

Absences will not excuse you from responsibility for assignments, practical exams, or other examination coverage of missed work.

Since the introductory and background material for a class is presented at the beginning of the session, missing the start of a class counts as a minimum of missing one half of the class. If you arrive to class late, you will be allowed to participate in the day's experiments only at the discretion of the instructor. If your late arrival results in either a safety concern or an undue instructional burden, you will not be allowed to attend the class. In this case you will be responsible for scheduling a make-up session, if that can be accommodated. Missed work = missed credit, so please be considerate of your instructors and your classmates, and be conscientious in your attendance.

Office hours are intended for meetings with the instructors for help and discussion on experiments, research progress, or other course related issues; they are NOT to be used for making up missed work.

• If you miss a class because of an emergency, we hope you will be able to let us know. Please send an email to the instructor or call (or ask someone else to call). If no one is available to answer the phone you may leave a message on the answering machine 412-624-3288 (Dr. Swigonova) or 412-648-3641 (Dr. Czapski).

• Keep in mind that any unexcused absence is unacceptable and impossible to overlook. Any incomplete lab exercise will affect your grade. It is your responsibility to follow-up on missed work within a week of a missed class. If you do not clear missed work within a week you will obtain a zero score for the missed work.

• Missing more than 10% of the laboratory periods will result in a failing grade (‘F’) no matter how well you do on the examinations and assignments.
Late submission policy

There will be a 20% penalty for the late submission of any required course material. This includes electronic or hard copies of assignments, and any cultures or sample preparations. Late submissions will be accepted only up to 3 days past the due date/time. In other words, a Monday 6pm due date/time will be accepted only up to 6pm of the following Thursday, and a Friday due date/time will be accepted only up to the following Wednesday.

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity and the Dietrich School of Arts and Sciences Academic Integrity guidelines. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

Please note that academic integrity goes in both directions. Just as we expect you to act in an honest and honorable manner when attending this class, we will treat all students fairly and respectfully. We will not favor any student nor discriminate against any student. View the complete policy at: http://www.cfo.pitt.edu/policies/policy/02/02-03-02.html.

Student Conduct

In keeping with the University of Pittsburgh Student Code of Conduct, all students are expected to behave as respectful and civil members of the university community. All instructors and students will act in a considerate manner in order to create and maintain a classroom atmosphere that is conducive to learning. In addition to being unacceptable on the grounds of common decency, disruptive and disrespectful behavior contributes to unsafe working conditions.

Disruptive and disrespectful behavior will not be tolerated!

Examples of disruptive behavior include, but are not limited to, repeated tardiness, texting in class, speaking or acting in any sexually, racially, or ethnically harassing manner, cheating, misuse and abuse of laboratory equipment and material, disregarding any safety guidelines.

Disruptive students will be referred to the Office of Student Conduct for mediation, discipline, or both.

Email communication policy

Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students that choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address. To forward e-mail sent to your University account, go to
http://accounts.pitt.edu, log into your account, click on Edit Forwarding Addresses, and follow the instructions on the page. Be sure to log out of your account when you have finished.

For more detail go to: http://www.bc.pitt.edu/policies/policy/09/09-10-01.html

Disability Services
If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and Disability Resources and Services no later than the second week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call (412) 648-7890 (Voice or TTD) to schedule an appointment. The Disability Resources and Services office is located in 140 William Pitt Union on the Oakland campus.
For more information visit: http://www.studentaffairs.pitt.edu/drsabout

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Accessibility
Blackboard is ADA Compliant and has fully implemented the final accessibility standards for electronic and information technology covered by Section 508 of the Rehabilitation Act Amendments of 1998. Please note that, due to the flexibility provided in this product, it is possible for some material to inadvertently fall outside of these guidelines.

Statement on classroom recording
To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student’s own private use.

We are looking forward to a successful and productive semester,

Dr. Swigonova & Dr. Czapski
BIOSC 1860(2164): Lab schedule
Tuesday – Thursday: Dr. Swigonova

In the Protocols column, bracketed protocol numbers such as [1.1] or [1] refer to I, Microbiologist, the required text by Sanders and Miller; parenthetical protocol numbers such as (2.2) refer to the Godfrey manual, A Microcosm under a Cabbage. Additional documents are indicated as (LI) for Lab Instrumentation, and (SP) for Supplemental Protocols. Microcosm, (LI), and (SP) documents are located in the Course Documents section of the Biosc 1860 CourseWeb/Blackboard site. Be sure to read any introductory and background material associated with the protocols. You will be responsible for it. When necessary to refresh your background knowledge, I expect you to refer to a suitable Microbiology textbook.

All reading assignments are due as hard copies at the beginning of class as well as electronically submitted via courseweb (check the due dates specified for each assignment).

Note: This is a schedule for the first four weeks of classes. Due to inherent nature of the research-based course, protocols will be incorporated based on the research progress. Therefore, rest of the schedule will be available via courseweb and regularly updated. You are responsible to check the course schedule online.

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<tr>
<th>Week</th>
<th>Date</th>
<th>Protocols schedule (Schedule will be modified based on class progress)</th>
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| 1    | 8/30 | Course business. Course organization & expectations. Introductions. Basic aseptic techniques (Microcosm 1.3). Micropipettor care and use (LI). Serial dilutions & viable cell counts (Microcosm 1.5, 1.5.1, 1.5.2, 1.8, 1.8.1). Glass bead shaking technique (SP).  
  • HW: Lab math diagnostic quiz (take home) & pre-lab survey Genome Solver (online) – due 9/01  |
  • Reading: I, Microbiologist – Unit 1, section 1.1  
  • HW: Reading Assessment #1 – Questions 1,2, and 3 (pg.18) – due 9/6  |
| 2    | 9/06 | Review Math diagnostic quiz.  
  Follow up on water content [1.3]. Aseptic transfers: T-streak [1.2]. Start second enrichment ISP4, R2A, & N₂-BAP [2.2]  
  Metagenomic DNA isolation using MoBio PowerSoil DNA Isolation Kit [SP].  
  • Reading & discussion: I, Microbiologist – Unit 2, section 2.1; Davis K.E.R., et al. (2005). Effects of growth medium, inoculum size, and incubation time on culturability and isolation of soil bacteria. AEM. 7: 826-834  
  • HW: Reading Assignment #2: Davis et al. (2005) – see posted assignment on courseweb; hard copy and e-submission due 9/8, by 9:00am.  |
| 2    | 9/08 | Metagenomic DNA recovery & purity determination [5.5].  
  PCR practice on E. coli genomic DNA, without KCl in buffer [3.2].  
  Continue second enrichment [2.2], start purification of microbial isolates [2.3].  
  Microscopy, microscope care and use (LI), simple staining (Microcosm 2.2.3)  
  • Reading: I, microbiologist - Unit 3, section 3.1  
  • HW: Reading Assignments #3: PCR – Questions 3,4,5 (pg.83) in I, microbiologist – due 9/13 by 9:00am (hard copy in class and e-copy on courseweb)  |
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<th>Week</th>
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<th>Activities</th>
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| 3    | 9/13 | Continue purification of microbial isolates [2.3]; Microscopy – simple & negative staining (Microcosm 2.2.2); follow up on N₂-fixers [SP]. Gel electrophoresis of E. coli PCR product [5.3] & troubleshooting.  
• *Reading:* I microbiologist – Unit 5, section 5.1  
• *HW:* Reading assessment #4 – Question 1 and 4 (pg. 218) in I, microbiologist – due 9/15  
• *Review background on media (R2A, ISP4, N2-BAP; Davis et al. 2005), PCR and gel electrophoresis – Quiz in class on 9/15 |
| 4    | 9/15 | PCR amplification of metagenomic 16S rDNA [5.2]  
Continue purification of microbial isolates [2.3]. Microscopy (LI) - simple & negative staining (Microcosm 2.2.2). Colony morphology (Lab handout)  
• *Quiz #1:* on media, Davis et al. 2005; PCR and gel electrophoresis |
| 5    | 9/13 | Visualization of meta 16S rDNA PCR products & troubleshooting [5.3]  
Continue purification of bacterial isolates [2.3] – 1x/week re-streak, if appropriate. Check original titration plates for appearance of new colonies. Microscopy (LI) – simple and negative staining (Microcosm 2.2.2)  
Colony PCR practice on E. coli, B. cereus [3.1 & 3.2]  
| 6    | 9/22 | Troubleshooting - PCR of metagenomic 16S rDNA [1:10, 1:50, 1:100 dilutions; 5.3]  
Gel visualization of E. coli colony PCR product [3.3]  
Phenotypic characterization: colony & cell morphology (handout); simple & negative staining (Microcosm 2.2.2).  
• *HW:* Reading assessment #5 – Heijden et al., 2008 – due on 9/27 |
| 7    | 9/27 | Visualization of meta 16SrDNA PCR products ± troubleshooting [5.3]  
Continue purification of bacterial isolates [2.3] - 1x/week re-streak  
Phenotypic characterization: finish simple & negative staining; Gram stain [4.3], 3% KOH test  
• Heijden et al. 2008 – paper discussion |
| 8    | 9/29 | Gel purification of meta 16SrDNA PCR products [5.4 – part 1, gel bands]. Phenotypic characterization: Gram stain [4.3], 3% KOH test  
Lab notebook: summarize colony & cell morphology data; include completed handouts (see “Strain description” in Soil collection sites tab on courseweb)  
• *HW:* Reading assignment – Unit 4, section 4.1  
• *HW:* reading assessment #6: I, microbiologist Q2,4,6 (pg 131) – due 9/29 |
| 9    | 10/04| Gel purified meta 16SrDNA PCR product clean-up (QIAquick gel extraction kit) [5.4], DNA quantitation [5.5]  
Strain maintenance – streak 1x/week  
Phenotypic characterization: Gram stain [4.3]; negative stain  
Lab notebook: summarize colony & cell morphology data; include completed handouts (include photos of colony & cell morphology) |
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<th>Activity</th>
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| 10/06      | Meta 16S rDNA TOPO cloning and transformation [5.6]  
Phenotypic characterization of isolates: simple stain, negative stain, gram stain  
• Reading: TOPO cloning manual – posted on courseweb                                                                                         |
| 10/11      | TOPO: streak-purify transformants (15 transformants/group) [5.6] – (2/plate)  
Strain maintenance: 1x/week re-streak if appropriate  
Phenotypic characterization of isolates: Antibiotic production [4.4], India ink wet mount (SP); LB liquid test growth of strains; Fluid thioglycollate medium (SP)  
Lab notebooks – first feedback (3 groups)                                                                                                   |
| 10/13      | TOPO clones: WEDNESDAY (10/12) set up LB broth + Kan overnight cultures for plasmid preparation (5/student or 15/group) [5.7-part 1]  
TOPO clones: Plasmid isolation using QIAprep Spin Miniprep kit [5.7-part 2]  
Phenotypic characterization: Follow-up on antibiotic production [4.4]; score FTM (SP); catalase test (SP); oxidase test (SP)  
Lab notebook – first feedback (3 groups)                                                                                                   |
| 10/18      | *No class. Fall break – Monday’s schedule*                                                                                                                                                                |
| 10/20      | TOPO clones: EcoRI restriction analysis [5.8]. Gel analysis of restriction digests [5.8]  
Strain maintenance: 1x/week re-streak if appropriate  
Physiological tests: Test for growth on Mueller-Hinton agar (15 strain/plate)  
HW: Submit a summary of your antibiotic production experiment – due 10/20                                                                       |
| 10/25      | TOPO clones: prepare samples for sequencing  
Strain maintenance: 1x/week re-streak if appropriate  
Lab Practical (part 1): PCR; serial dilutions & laboratory techniques  
Phenotypic characterization of isolates: Antibiotic resistance [4.5]; India ink wet mount (SP);  
Independent project: Consult experimental design and request material                                                                             |
| 10/27      | Lab Practical (part 2): Written part & gel electrophoresis  
Phenotypic characterization of isolates: Follow up on antibiotic resistance [4.5] and Motility stab test; India Ink wet mount (SP)  
Independent project: Continue experimental design and request material  
HW: Submit a summary of your antibiotic resistance experiment - due 11/1 by 9:00am (hard copy in class and electronic copy on courseweb) |
| 11/1       | Set up cultures for strain freezing [2.4]  
Culture independent: Sequence analysis  
Strain maintenance: 1x/week re-streak if appropriate  
Start your independent project                                                                                                                 |
| 11/3       | Strain freezing – cryogenic storage  
Culture independent: sequence analysis  
Continue independent project – have a list of supplies ready!!                                                                                   |
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<th>Activity</th>
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| 11/8  | 11  | Continue independent project – think of controls and methods of data analyses; request materials  
Consultations – DNA sequence analysis/physiological tests – based on your project |
| 11/10 | 11  | Continue independent project – think of controls and methods of data analyses; request materials  
Consultations – DNA sequence analysis/physiological tests – based on your project |
| 11/15 | 12  | Continue independent project – think of controls and methods of data analyses; request materials;  
Analyze sequence data and construct phylogenetic tree - how will you combine data from culture independent and culture dependent part of your project?  
Visit posters in our hallways for brainstorming ideas |
| 11/17 | 12  | Continue independent project – think of controls and methods of data analyses; request materials  
Consultations – DNA sequence analysis/physiological tests – based on your project |
| 11/22 | 13  | Continue independent project – think of controls and methods of data analyses; request materials  
Consultations – DNA sequence analysis/physiological tests – based on your project; get a feedback on your phylogenetic tree! |
| 11/3  |     | *No class – Happy Thanksgiving!* |
| 11/29 | 14  | Finish all experiments / complete analyses / work on your poster  
12/1   |     | Formal presentations – 3 groups (3 groups will present during Friday’s recitation)  
Finish all experiments / complete analyses / work on your poster |
| 12/6  |     | Poster preparation |
| 12/8  |     | Lab clean-up. Final meeting before poster session  
(POSTERS on Friday, 12/09, A219B Langley Hall). |
# SCHEDULE FOR LECTURE/RECITATION SESSIONS

This schedule is partial and will be completed as the term progresses – activities will be determined based on research projects (those will include discussions, presentations, intro to bioinformatics and data analyses, etc.).

**266 Chevron (Computer Lab), Friday 10:00 to 11:50 am**

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<th>Wk</th>
<th>Date</th>
<th>Session</th>
<th>Focus</th>
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| 1  | 9/02 | EHS Safety training (Keith Duval)  
In-class pre-bioinformatics survey | Lab safety Survey |

**Intro to course objectives**

**Homework 1:** See courseweb, recitation assignments folder; due 9/16 | Background: Soil metagenome Course overview |

**Research teams discussion (20 mins)**

**Homework 2:** (i) Summarize what you have learned from your discussion with the other research group, submit your summary as an individual; (ii) Formulate two scientific questions for your research, this is a group work – only one submission per group; post online by 9/23 | Metagenome of New York City |
| 4  | 9/23 | TOPO cloning presentations – 4 groups presenting (2 MW and 2 TTH)  
Non-presenters will complete TOPO-Quiz online; the Quiz is due on Monday, September 26, by 9:00 am  
**Reading:** I, microbiologist – Unit 5, section 5.1, and experimental overview (pg. 221) | Metagenomic experimental approach |
| 5  | 9/30 |  
**Collaborative Groups (CG) discussion:** each group will discuss 1-2 papers they have identified to advance on their research questions (20 mins)  
**Research Teams (RT) discussion:** RT discuss prospective collaboration (20 mins)  
**Homework 3:** Proposal for (i) CG groups and (ii) RT teams – due online by 11:59pm on 10/07 | Collaboration |
| 6  | 10/7 |  
**Collaborative & Research teams discussion**  
**Work on your proposals – submission of your CG and RT proposals is today, by 11:59pm.**  
**Note:** Both proposals are group work, thus one submission per CG and one submission per RT. | Research planning  
Collaboration |
| 7  | 10/14 | Presentations – bacterial physiology  
- **Antibiotic resistance** – Dye Hard  
- **Antibiotic production** – RBS  
- **Oxygen requirements** – Streptomighties  
- **Spore formation** – SRK | Bacterial physiology |
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td>10/21</td>
<td>Science 2016: Game Changers; <a href="http://www.science2016.pitt.edu">http://www.science2016.pitt.edu</a></td>
<td>Homework 4: You must submit a short (~half page, single-spaced, Times New Roman, size 12) summary of the talk/poster you attended; If you are presenting a poster, you may upload your abstract. (see recitation assignments - Science 2016) - due by 10:00am, October 28. Broadening your horizons</td>
</tr>
<tr>
<td>9</td>
<td>10/28</td>
<td>Sequence editing (trace files) – (handout) Homework: Edit at least one sequence and establish RDPII account before recitation on 11/04</td>
<td>Bioinformatics</td>
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<tr>
<td>10</td>
<td>11/04</td>
<td>RDPII database – sequence homology and taxon sampling (handout) MEGA – sequence alignment and phylogenetic tree (handout) <strong>Reading:</strong> I, microbiologist – Unit 6 (part 6.2-6.4) and Unit 7 (part 7.1-7.2)</td>
<td>Bioinformatics</td>
</tr>
<tr>
<td>12</td>
<td>11/18</td>
<td>Semi-formal presentation of research projects</td>
<td>Scientific presentation</td>
</tr>
<tr>
<td>13</td>
<td>11/25</td>
<td><strong>Happy Thanksgiving!</strong></td>
<td>Enjoy the break!</td>
</tr>
<tr>
<td>14</td>
<td>12/02</td>
<td>Formal Presentations of independent research</td>
<td>Scientific report</td>
</tr>
<tr>
<td>15</td>
<td>12/09</td>
<td><strong>POSTER PRESENTATIONS</strong> – A219B Langley Hall; 10:00-10:50am</td>
<td>Showing off your data and knowledge</td>
</tr>
</tbody>
</table>

*Please note:*
- Homework assignments have due date posted in the schedule.
- **During week 6, you must attend one session of Science 2016, which runs Oct. 19-21. You can get information about this science conference by following this link -- [http://www.science2016.pitt.edu](http://www.science2016.pitt.edu)