



Arts and Sciences

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March 12, 2009

Daniel Mendelsohn  
Associate Professor, Mechanical Engineering  
E 338 Scott Lab  
201 West 19<sup>th</sup> Avenue  
CAMPUS

Dear Dan:

The Arts and Sciences Committee on Curriculum and Instruction (CCI) unanimously approved a revision to the **Microbiology Major** on March 6, 2009. The main proposers are Charles Daniels ([daniels.7@osu.edu](mailto:daniels.7@osu.edu)) and Caroline Breitenberger ([breitenberger.1@osu.edu](mailto:breitenberger.1@osu.edu)). The CCI Sciences Subcommittee approved the major at their meeting on February 9, 2009 and the Biological Sciences College Curriculum Committee approved this proposal on December 10, 2008. Please see the attached transmittal history for detailed minutes from these meetings.

The proposed revision was precipitated by related course change requests (see ECA requests MB 581.01 & .02) that constitute a one-credit hour increase in the Microbiology major program. By splitting the 5-credit hour course (Microbiology 581), consisting of a lecture and lab component into two, three-credit hour courses, a lecture (581.01) course and a lab (581.02) course, the Microbiology program hopes to align this course with the intensive work students are already doing, make maximum pedagogical use of lab time, and make it easier to schedule the required lab space.

The additional credit hour is offset by a one credit hour reduction in required elective credit hours. Reducing the required elective hours will not force students to take an additional elective course and students were strongly in favor of this change to the curriculum. Please see Gene Mumy's subcommittee cover letter for a detailed summary of the changes.

The CCI felt this was a creative way to change the curricular structure of the program that will benefit both students and the department in terms of flexibility and superior content delivery.

Please let me know if I can be of further assistance as CAA considers this proposal.

Sincerely,

Kathleen M. Hallihan  
Director, Curriculum and Assessment

c: Randy Smith  
Briggs Cormier  
Terry Gustafson

March 4, 2009

The CCI Sciences Subcommittee has considered a proposal to alter the Microbiology Major by splitting a 5 crd hr. course, consisting of a lecture and lab component into two 3 crd hr courses: a lecture course and a lab course. The additional credit hour is offset by a one credit hour reduction in required elective credit hours. The rationale for the change has 3 components:

1. Much of the lab time early in the course is wasted because there is not enough covered material in the lecture to ground the lab;
2. The lab is quite intensive and along with the lecture really is more like a 6 credit hour course
3. It is hard to schedule the required lab space in conjunction with the lecture.

The proposed change solves (1) by having the lab course be taken a quarter (or more) after the lecture course so that all of the lab time can be focused on material covered in the preceding lecture course. Point (2) is solved by increasing the credit of the lab component. Point (3) is solved by the ability to schedule sections of the lab not tied to the lecture course.

Concerns raised about this change were:

1. This may feel like more than a one crd hr increase to students because it is now two courses and encumbers schedules for at least two quarters rather than one;
2. Does the one crd hr reduction mean anything in terms of the credit hour distribution in courses that can be taken as electives?
3. Is it pedagogically sound to separate the lab applications from material covered in the lecture by one or two (maybe more) quarters?

With respect to point 1, the committee was satisfied that the material that needs to be covered in the labs justifies (no matter what the case is with point 2) the extra burden, if any. It was suggested that the case would be strengthened if majors were surveyed to see how they felt about it (this was not a mandate that such student consultation is necessary). Microbiology has provided a survey of students and a majority is indeed supportive of this change.

With respect to point 2, Microbiology does have 3, 4, and 5 crd hour courses that make the one credit hour reduction in electives meaningful at the credit hour level. With respect to point 3, the committee thought the benefits sufficient to endorse the split but

did make the recommendation that the lab courses should always start with a review of the lecture material that is being taken to the lab.

The committee voted unanimously in favor of the proposed change with the recommendation stated above.

Respectfully Submitted,

Gene E. Mumy  
Chair CCI Sciences Subcommittee



**Department of Microbiology**

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February 23, 2009

Dr. Kathleen M. Hallihan  
Colleges of the Arts and Sciences  
Director: Curriculum and Assessment Office  
4132 Smith Laboratory  
Campus

Dear Dr. Hallihan,

As you suggested, we shared our plans for revisions to Microbiology 581 with a group of Microbiology majors (rank 2-4) and asked for their comments and suggestions. The students were initially contacted by email with a short note describing the planned changes to Microbiology 581 and how it affected the number of required classes and elective hours needed to complete the major. The students were also invited to take a short survey that we had posted on SurveyMonkey.com. In addition, we reviewed the course schedules of 24 students, 18 of whom graduated in 2008, to explore the “paths” that recent students took to complete the Microbiology major.

I’ve enclosed a copy of the survey questions with the responses, and a selection of their comments. Overall the results indicate a positive feeling among the students, but many are still unsure how they may be affected by the changes. Perhaps more importantly, we did not see a strong negative opinion. The student’s comments point out a few advantages: “This will give undergrads the time to actually take in all that is covered in lab” and “I will be able to take an extra class that I am interested in”, and there were also some concerns. A number of students expressed concern about scheduling changes that would impact them as they neared completion of their program. We are aware of this problem and we propose a modification in the prerequisites for these students that would allow them to take the two classes concurrently if needed to complete their degree. Scheduling should not be a concern for future students. The review of student’s schedules confirmed an earlier objective; namely, that students follow a wide range of “paths” once they have completed Microbiology 520, the first required course in the major. We revised the major several years ago to allow for this flexibility. We also noted that, even within this small sampling, many students were taking more than 40 credits hours of required and elective courses in the major; total hours varied from 40 to 52. As we review our proposed changes, we do not foresee that offering separate lecture and laboratory classes will cause a potential scheduling bottleneck for the students or force them to take unwanted additional classes to balance their schedules. We expect that the change will add more flexibility.

We also noted a surprisingly strong opinion that students would welcome the opportunity to take either or both of the classes in the summer quarter. We see this as a great opportunity to help our majors through the program and we are planning to take this question to the faculty for their review.

I hope this information is helpful and don’t hesitate to contact me if you need further information. We look forward to your response.

Sincerely yours,

Charles J. Daniels, Ph.D.  
Professor  
Chair: Microbiology Curriculum Committee

## Survey of Rank 2,3 4 Microbiology Majors (33 respondents)

**1. Changing Microbiology 581 (Microbial Genetics) to separate lecture (3hr) and laboratory (3 hr) courses, where the lecture MUST be completed before taking the laboratory class, is a more effective way to present this material.**

39.4%	Agree
21.2%	Disagree
39.4%	Neutral or Don't know

**2. Changing Microbiology 581 to separate lecture and laboratory courses will NOT increase the credit hours required for the major, but will decrease the elective hours for the major from 20 to 19.**

43.8%	This is helpful; it gives me more flexibility to schedule the classes I need
28.1%	This will limit my flexibility to schedule the classes I need
28.1%	Neutral or Don't know

**3. Changing Microbiology 581 to separate lecture and laboratory courses could allow me to take an additional class that interests me.**

45.5%	Agree
30.3%	Disagree
27.3%	Neutral or Don't know

**4. If the Microbiology 581 classes were offered in the summer quarter I would be interesting in taking**

9.7%	M581 lecture
9.7%	M581 laboratory
87.1%	Either, if offered

**5. Have you already taken Microbiology 581?**

33.3%	Yes
66.7%	No

**6. What is your Rank?**

15.2%	2
36.4%	3
48.5%	4

**7. Do you have additional comments on the Microbiology major that you want to share?**

- I trust the instructors in making this determination. If they believe that we will do better if we take the lecture first, then that is what I'll do!
- It depends how the lab is oriented. In 520 and 521, the lecture did not really connect with the lab, and if it did, it was not together. It is a more effective way to present the material if there is a significant amount of time donated at the beginning of each class (or whenever) to educating us about the information in the lab.
- This is a change which will only prove detrimental towards students
- Unless these can be taken concurrently this is rather annoying for scheduling.

- I think it makes sense to learn the concepts before applying it in the lab.
- Some material from the lecture may be forgotten by the time it needs to be applied in lab.
- one credit hour doesn't make a difference. the only problem is when you have to fit in the 3 hour lab with two other micro classes so that now I would have to take all micro classes during one quarter.
- Instead of taking one five credit hour class one quarter, having to take it two separate quarters cuts a class availability. I don't have a two credit hour class to couple with the three hour class, so it's essentially taking up a block that would be a five credit class anyway, since I can't schedule another class along with this one.
- This coming fall when I take the lecture, I will be able to take an extra class that I am interested in.
- More classes need to be offered. Especially over the summer. I'd rather take more electives than 520 and 521. The material was dry at times and gets very repetitive with other classes i.e. mol gen 500 and micro 581. My upper level courses 647, 649, 581 were much more interesting than 520 and 521. Neither of the classes (lectures) seemed to be very useful for upper level courses.
- It would be VERY helpful if 581 (lab and-or lecture) was offered this summer!!
- This will be good in the long run, but at this point in my college planning, it screws me over. 581 should be offered in its old format in addition to the new version, at least for a few quarters to allow people who have planned very specifically on that class the chance to not have everything messed up for them.
- It would be nice if more of the required classes were offered in Winter. Everything is only offered Sp or Au, so that Wi quarters are hard to fill.
- I think this is a great move by the department. This will give undergrads the time to actually take in all that is covered in lab.



**Department of Microbiology**

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Dr. Kathleen M. Hallihan  
Colleges of the Arts and Sciences  
Director: Curriculum and Assessment Office  
4132 Smith Laboratory  
Campus

Dear Dr. Hallihan,

The Department of Microbiology would like to request a change in the organization and total credit hours for Microbiology 581, Microbial Genetics. This course is a required course for the Microbiology major and in its current form consists of both lecture (3-48 minute contacts/week) and laboratory (2-168 minute contacts/week) components. We are proposing to create two separate, but related sections: Microbiology 581.01 (3 credit hr.) and Microbiology 581.02 (3 credit hr.) that will encompass the lecture and laboratory aspects of the course, respectively. Both M581.01 and M581.02 will be required for the major and this change will add one additional credit hour to the total hours amassed by majors as they complete the core course requirements in the program. We are not requesting a change in the total hours needed for the major; this will remain at 40 hours. Consequently, the students will be required to take one hour less in their electives courses.

A number of factors led us to this model. The most significant factor was related to the teaching outcomes for the class. In recent years the fast passed changes in Molecular Microbiology have forced us to update and revise the laboratory exercises numerous times. This has made it difficult to maintain the continuity or the coupling of the laboratory exercises with the topics covered in the lecture portion of the class. This disorder resulted in some topics being introduced in the laboratory before they had been covered in depth in the lecture decreasing the effectiveness of the laboratory experience. A second factor was the increased demand for the course. We continue to experience a high level of demand for the class and we foresee, with this change, the opportunity accommodate more students and increase their flexibility in scheduling. This latter aspect should also help students complete the program in a timely manner.

We also felt that an increase in the total credit hours for the course, now a total of 6 credit hours, was justified and beneficial to the students. Increasing the credit hours associated with the laboratory section will allow us to add needed out-of-class exercises to reinforce concepts and incorporate more analytical approaches. We are also requesting that students complete the lecture section, M581.01, prior to taking the laboratory section. Here again, we feel that this will greatly increase the effectiveness of the laboratory and provide a better learning experience for the students.

Don't hesitate to contact me if you need further information. We look forward to your response.

Sincerely yours,

A handwritten signature in blue ink that reads "Charles J. Daniels".

Charles J. Daniels, Ph.D.  
Professor  
Chair: Microbiology Curriculum Committee

Microbiology Major Revision Transmittal History

A&S Committee on Curriculum and Instruction

3-6-09 **unapproved** minutes excerpt

Microbiology Revision to Major

A. Intro: Gene Mumy chair, CCI Sciences subcommittee: take Microbiology 581, split one 5-credit course into two, 3-hour courses (lecture and lab) which could be taken in different quarters. To offset credit hour increase, one elective credit hour

B. Not enough material covered in lecture to make labs meaningful, hours of student work is worth a 6-credit alignment, eases space constraints on scheduling lectures and labs in same quarter.

C. Concerns raised:

1. one credit hour, but another course is added to students schedules. Is this alright with students? Majority of students were in favor of changes.
2. Is removal of one elective credit going to make a difference to students? Yes, this was manageable with lower level electives.
3. Is it pedagogically sound to separate lab from lecture? Instructors accepted recommendation to give brief introduction of lecture material before lab class.

D. Would it be optimal to take in same quarter? No, scheduling issues would persist and the separation would aid lab learning. Microbiology has done this with some other courses (Immunology) and these 500-level course are taken in junior and senior year and most students choose to take course in subsequent quarters for pedagogical and scheduling reasons, conceiving of it often as a 2-quarter sequence.

E. Will summer sections be offered? No.

F. Students outside the major may take lecture only and more might do so without the scheduling restriction of having to take the lab.

G. Comment: one committee member has taught similar courses and this change makes sense. This is also a gain for the department within the budget model because an additional credit hour goes to the department and comes out of electives.

Subcommittee letter stands as motion to approve. 2<sup>nd</sup> Vaessin



## Unanimously Approved

\*2-23-09 Supplemental letter submitted by Chuck Daniels addressing committee's concerns

### CCI Sciences Subcommittee

2-9-09 minutes excerpt

#### Microbiology major revision

- A 5 cr course to 2 3-cr courses---splitting the lab and lecture
- Has Microbio surveyed the students regarding this change, i.e. feedback on how this would affect majors?- Chuck Daniels in response to G Mumy's initial concerns is starting this feedback process- Students now sit and register for 2 3-cr hour courses (rather than 1 course)
  - Idea seems good- labs are so time consuming that they deserve more credit hours; similar to Organic Chem, this works fine- most students take them together
- Techniques are important in these courses
- Lab is standardized (ASM dictates what has to be covered in the course specifically in the lab) and will not vary much by quarter
- **Completely segregating lab from lecture; now the lab can be taken quarters later than the lecture, which might be a substantive issue;** perhaps add a 48-min lecture that goes with the lab to review what was learned in the qtr before and what the lab will cover (**always provide introductory information in case students took it qtrs passed**)

**MOTION TO APPROVE** (*with recommendation above*)- Harder, Breitenberger; unanimously approved

### Biological Sciences College Curriculum Committee

12-10-08 Minutes excerpt

Chuck Daniels: Microbiology 581 proposed changes

\* separates lecture and lab, take lec before the lab (students perform best in lab when they already had the lecture), do the students a favor by separating the 2 because of the heavy load right now

\* adds one more hour of credit within the course & major; accompanies Micro major document

\* not substantial content changes in the short term; down the road in semesters, it would consume another 02 course offered as part of Micro program

\* OAA has some budgetary concern with the credit hour change; either the requirements have changed, more out of class work, the lack of overlap means more effort involved; perhaps include as a cover letter

\* Bio students have a lab requirement so this will help that out

\* Will add an exclusionary clause to those with credit in Micro 581 (should go on change form for 581 to change it to 581.01)

**\* MOTION TO APPROVE COURSE: Ding; APPROVED UNANIMOUSLY  
WITH CONTINGENCY**

**From:** Caroline Breitenberger  
**Sent:** Wednesday, January 14, 2009 11:38 AM  
**To:** Kathleen Hallihan; 'Chuck Daniels'  
**Subject:** RE: Micrbiol 581.01 & 581.02

Kate:

Quite a few biology majors take Microbiology 581. The proposed separation of lab from lecture will actually help those biology students who need another 3-hour content-oriented course but don't absolutely require the lab. On behalf of the CLSE and the biology major, I concur with the proposed change.

Caroline

**Microbiology 581.02  
Microbial Genetic Laboratory  
Course Syllabus**

Microbiology 581.02 Microbial Genetic Laboratory. (3 cr.)  
Autumn, Winter and Spring quarters

**Instructors:**

Kathleen Sandman, Ph.D. (Course Coordinator)  
Office: Biological Sciences building, room 476  
Phone: (614) 292-5867  
Email: [sandman.1@osu.edu](mailto:sandman.1@osu.edu)

Dr. Charles J. Daniels, Ph.D.  
Office: Biological Sciences building, room 428  
Phone: (614) 292-4599  
Email: [daniels.7@osu.edu](mailto:daniels.7@osu.edu)

**Laboratory schedule:**

Two three-hour lab sessions per week; T R, 9:30-12:18 and M W, 1:30-4:18. Lab will be held in the Biological Sciences building, room 311.

**Course Objectives:**

This is a required laboratory course for Microbiology Majors and complements the required lecture course, Microbial Genetics, Micro 581.01. Micro 581.02 provides an introduction to experimental methods in the structure, maintenance, expression and exchange of genetic materials in microbial cells. The laboratory is presented as four modules: Mutagenesis of green fluorescent protein; Transposon mutagenesis and analysis of Lac- mutants; Transposon mutagenesis and analysis of auxotroph mutants; Transposon mutagenesis and analysis of motility mutants. Each module builds on concepts presented in the foundation lecture course and illustrates concepts in experimental design and data analyses. Students will gain experience in numerous techniques, including both wet-lab approaches and computational analysis of numerical and DNA/protein sequence data.

Students completing the course will:

1. Understand the basic principals of experimental design as it pertains to the production and analysis of mutations in microbial cells.
2. Develop an understanding of the theory of modern molecular biological techniques and acquire hands-on experience in their application. This will encompass a variety of methods including the isolation and analysis of nucleic acids, the introduction of foreign DNA into microbial cells and the analysis of mutant phenotypes, site specific and transposon-mediated mutagenesis, and the bioinformatic analyses of DNA and protein sequences.

3. Develop experience in the interpretation and presentation of experimental results as written module reports.
4. Develop an understanding of how experimentation has defined our current understanding of microbial systems and how modern approaches are applied in analysis of new problems.

**Text:**

Microbiology 581.02 Lab Manual: Drs. Kathleen Sandman, Brian Ahmer and Irina Artsimovitch. 2008. A number of primary literature references are cited in the manual and serve as additional readings.

The course materials (data sets and student results), laboratory quizzes, study guides and review materials are also presented on the Carmen site for the course.

**Grading:**

Quiz	20 points
Final lab exam	20 points
Safety quiz	3 points
15 open book quizzes (Carmen) @3 points each	45 points
6 homework assignments @ 7 points each	42 points
3 module reports @ 20 points each	60 points
Laboratory Skills	5 points
Attendance	<u>5 points</u>
	200 points

**Academic misconduct:**

Academic misconduct will not be tolerated and will be dealt with as defined in the Code of Student Conduct: [http://studentaffairs.osu.edu/resource\\_csc.asp](http://studentaffairs.osu.edu/resource_csc.asp) and <http://trustees.osu.edu/Rules%2023/index.php>.

**Disability Services:**

Any student who may need an accommodation because of a disability should contact the instructor privately to discuss specific needs. The Office for Disability Services assists faculty in verifying the need for accommodations and developing accommodation strategies. Students with disabilities are encouraged to contact the Office for Disability Services at 614-292-3307, room 150 in Pomerene Hall.

Representative schedule:

Lab #	Date	Presentation	Tasks	Assignments
1	Sept 24/25	Safety Review, in vitro rxns Intro to GFP	Streak DH5 $\alpha$ -pGLO on 5 plates In vitro rxns, pouring agarose gels	
2	Sept 29/30	PCR & mutagenesis DNA sequence analysis	PCR mutagenesis fluorescence microscopy	Online safety quiz Online prelab quiz
3	Oct 1/2	Controls	Check PCR on gel; <i>E. coli</i> transformation	Online prelab quiz Homework #1 due
4	Oct 6/7	Troubleshooting Random vs SDM NEB cutter program	Clean up PCR, digest pGLO/PCRs, set up SDM reaction, pour gels	Online prelab quiz Homework #2 due
5	Oct 8/9		Check digests on gel, set up ligations, <i>EpnI</i> digestion	Online prelab quiz Homework #3 due
6	Oct 13/14		Transform <i>E. coli</i> ; restreak controls; assemble conj. filter	Online prelab quiz Homework #4 due
7	Oct 15/16	DNA sequencing Translate/Clustal programs	Select mutant and start overnight Set up filter mating	Online prelab quiz
8	Oct 20/21	Plasmid purification Tn mutagenesis Selection vs screen	Mini-preps, submit for DNA sequencing; plate transconjugants	Online prelab quiz Homework #5 due
9	Oct 22/23	Calculate mutation frequency  Screening for mutants	Count colonies, identify Lac- mutant, patch colonies for auxotroph/motility	Online prelab quiz  Study for quiz
9.5	Oct 23/24		Identify Mot- mutant & restreak	
10	Oct 27/28	Discuss <i>gfp</i> seq results  Lux fusion, control by lactose	Identify auxotroph, restreak on CAA, measure light from Lac- mutant; glycerol stocks; retest Mot- mutant	Online prelab quiz  QUIZ
11	Oct 29/30	Genomic DNA; <i>lac</i> PCR  Genomic sequencing; Aux/Mot assays; BLAST	Genomic DNA preps; set up Lac PCR; submit Aux/Mot for genomic seq; pour agarose gels; set up assays for Aux/Mot	Online prelab quiz  Module 1 report due
12	Nov 3/4	Inverse PCR	Lac PCR products on agarose gel; digest genomic DNA of Aux/Mot for iPCR; interpret Aux assays;	Online prelab quiz  Homework #6 due
13	Nov 5/6		Submit Lac PCRs for DNA sequence; Dilute ligation step for iPCR; Chemotaxis assays	Online prelab quiz
14	Nov 12/13	Hfr mapping	iPCR – Clean up ligation; <i>XmnI</i> digest Pour agarose gels; interpret chemotaxis	Online prelab quiz
15	Nov 17/18	Hfr mapping	iPCR amplify; agarose gel; submit for DNA sequence; mate Aux/Mot with Hfr strains	Online prelab quiz Module 2 report due
16	Nov 19/20		Pick Hfr strains onto Tet plates	Online prelab quiz
17	Nov 24/25		Count colonies from Hfr crosses	
18	Dec 1/2	Review/repeat		Turn in attendance sheet Module 3 report due
19	Dec 3/4	Final exam		