Add Course Request

Submitted on: 2013-11-05 11:06:07

1. **COURSE SUBJECT**	MCB
2. **COURSE NUMBER** (OR PROPOSED NUMBER)	3602W
3. **COURSE TITLE**	Intro to Bioinformatic Tools for Microbial Ge
4. **INITIATING DEPARTMENT or UNIT**	Molecular and Cell Biology
5. **NAME OF SUBMITTER**	Lisa A Dejesse
6. **PHONE of SUBMITTER**	Phone: +1 860 486 4329
7. **EMAIL of SUBMITTER**	Email: lisa.dejesse@uconn.edu
8. **CONTACT PERSON**	Ken Noll
9.**UNIT NUMBER of CONTACT PERSON** (U-BOX)	3125
10. **PHONE of contact person**	Phone: 486-4688
11. **EMAIL of of contact person**	Email: kenneth.noll@uconn.edu
12. Departmental Approval Date	4/12/2013
13. School/College Approval Date	9/24/2013
14. Names and Dates of additional Department and School/College approvals	
15. Proposed Implementation Date	Term: Spring, Year: 2015
16.Offered before next printed catalog is distributed?	
17. **General Education Content Area**	
18. **General Education Skill Code (W/Q).** Any non-W section?	W
19. Terms Offered	Semester: Spring Year: Every_Year
20. Sections	Sections Taught: 1
21. Student Number	Students/Sections: 12
22. Clarification:	
23. **Number of Credits**	1 if VAR Min: Max: credits each term

24. INSTRUCTIONAL PATTERN
One two-hour class per week

25. Will this course be taught in a language other than English?	No If yes, then name the language:
26. Please list any prerequisites, recommended preparation or suggested preparation: MCB 2000 or 2610 ...	
27. Is Instructor, Dept. Head or Unit **Consent Required**?	No
28. Permissions and Exclusions:	
29. Is this course **repeatable for credit**?	No If yes, total credits allowed: Allow multiple enrollments in same term?
30. **Grading Basis**	Graded
31. If satisfactory/unsatisfactory grading is proposed, please provide **rationale**:	
32. Will the course or any sections of the course be taught as Honors? n.a	
33. Additional Details:	
34. Special Attributes:	
35. **REGIONAL CAMPUS AVAILABILITY**: This course is offered in Storrs with departmental faculty instructors.	
36. PROVIDE THE PROPOSED TITLE AND COMPLETE CATALOG COPY: MCB 3602W. Introduction to Bioinformatic Tools for Microbial Genome Annotation One credit. One 2-hour computer lab period. Prerequisite: MCB 2000, OR 2610 OR 3010; ENGL 1010 OR 1011 OR 2011 OR 3800. Analysis of microbial genome sequences using computational tools to examine metabolic pathways and genetic features as they relate to an organism's lifestyle. Writing assignments utilize information gathered from the relevant scientific literature and students' analyses of genome-derived information.	
37. **RATIONALE** FOR ACTION REQUESTED Microbial genome sequence information is opening new areas of research and students with interests in the microbiological and molecular biological sciences must be prepared to understand this information and contribute to its effective use. This course has been taught for three semesters as MCB 3601W as a 4-credit course at the same time as MCB3601, a 3-credit lecture course. These courses shared the twice-weekly lectures and MCB3601W had an additional 2-hour computer laboratory each week. It became apparent that it was difficult to effectively integrate the contents of these two courses and for the instructor to develop the subject matter of each course adequately when both were offered at the same time. By offering the two courses in separate semesters, each course will be able to educate the students about their respective topics in a more comprehensive manner.	

Overlapping Courses (see Note M): None
Number of Students Expected: 12
Number and Size of Section: 12
Effects on Other Departments (see Note N): None
Effects on Regional Campuses: None
Staffing (see Note P):
Dates approved by (see Note Q):
Department Curriculum Committee: 9/9/13
Department Faculty: 9/13/13
CLAS C&C: 9/24/2013
10. Name, Phone Number, and e-mail address of principal contact
person: Kenneth Noll, 486-4688, kenneth.noll@uconn.edu

38. **SYLLABUS:**

Online URL: (https://web2.uconn.edu/senateform/request/course_uploads/lad02009-1383667246-125-MCB-3602W-Syllabus.pdf)

39. **Course Information: ALL General Education courses, including W and Q courses, MUST answer this question**

The course objective is to provide students with an introduction to the process of identifying genes in genomic DNA sequence data and assigning putative functions to those genes ("annotation"). This will be done using data derived from the sequencing of microbial genomes. A suite of on-line bioinformatic tools assembled by the
US Dept. of Energy through its Undergraduate Research in Microbial Genome Annotation program will be used in the course. Dr. Noll attended a DOE workshop in January 2011 to learn how to use their Integrated Microbial Genomes Annotation Collaboration Toolkit (IMG-ACT) and became a collaborator in their undergraduate research educational program. This toolkit provides links to several on-line sequence analysis sites and provides an electronic lab notebook for students to collect the results of their analyses of
sequence data. The instructor can review those notebooks to 3 provide feedback to students. If new discoveries are made as a result of these analyses, the notebook's data can be used by IMG to enter that information into their research database. Students in MCB3602W will meet weekly to examine the annotation of genes encoded in the genomes of bacteria and archaea. Students will examine and annotate genes encoding fundamental metabolic pathways, cellular structures, and regulatory systems. Novel genes and pathways may be discovered in the course. Short lectures will be delivered to provide students with
information necessary to use the bioinformatics tools and to understand the physiological processes that their assigned genes
play a role in. Students will write to learn while conducting projects in the
computer lab. These writing assignments will reinforce their research efforts and teach them to integrate the course material into their analyses. They will also learn to write in several different forms (professional memo, a technical lab report, a technical progress report, or a press release for the general public), each applicable to modes of communication they might encounter in their
professional careers. Their ability to apply this information to their assigned annotation projects

will be assessed through their writing. A total of 15 pages of revised writing will be assigned. Up to five writing assignments will be made that will familiarize them with the use of published research literature and teach them how to
integrate research data into a report.

40. Goals of General Education: All Courses Proposed for a Gen Ed Content Area MUST answer this question

41. Content Area and/or Competency Criteria: ALL General Education courses, including W and Q courses, MUST answer this question.: Specific Criteria

    a. **Arts and Humanities:**
    b. **Social Sciences:**
    c. **Science and Technology:**
       i. **Laboratory:**

Lab will use data derived from the sequencing of microbial genomes. A suite of on-line bioinformatic tools to annotate microbial genomes.

    d. **Diversity and Multiculturalism:**
       43. **International:**
    e. **Q course:**
    f. **W course:**

Students will write to learn while conducting projects in the computer lab. These writing assignments will reinforce their research efforts and teach them to integrate the course material into their analyses. They will also learn to write in several different forms (professional memo, a technical lab report, a technical
progress report, or a press release for the general public), each applicable to modes of communication they might encounter in their
professional careers. Their ability to apply this information to their assigned annotation projects will be assessed through their writing.
A total of 15 pages of revised writing will be assigned. Up to five writing assignments will be made that will familiarize them with the
use of published research literature and teach them how to integrate research data into a report.

42. RESOURCES:

Does the department/school/program currently have resources to offer the course as proposed YES
If NO, please explain why and what resources are required to offer the course.

43. SUPPLEMENTARY INFORMATION:

1. Describe how the writing assignments will enable and enhance learning the content of the course. Describe the page requirements of the assignments, and the relative weighting of the \\\"W\\\" component of the course for the course grade.
Students will write to learn while conducting projects in the computer lab. These writing assignments will reinforce their research efforts and teach them to integrate the course material

into their analyses. They will also learn to write in several different forms (including a professional memo, a technical progress report, and a technical lab report), each applicable to modes of communication they might encounter in their professional careers. Their ability to apply this information to their assigned annotation projects will be assessed through their writing. A total of 15 pages of revised writing will be assigned. Writing assignments will familiarize them with the use of published research literature and teach them how to integrate research data into a report.

Following are elements taken from the course syllabus.
Final course grade components points
Four writing assignments*
Report on an assigned article, 2 pgs 8
Report on an assigned article, 3 pgs 12
Technical report, 4 pgs 20
Research project report, 6 pgs 50
Homework assignments 10
Total 100
* each submitted as a first draft and a final draft
Failure of the writing portion of this course will result in a failing grade for the course.
Writing Assignments
Expectations of the reports on articles, technical report, and project report
You will write two short reports on assigned articles, one technical report using data you have gathered from your genome annotation analyses, and a final project report using your data that will be due in the final weeks of the course. Each assignment will be submitted as preliminary and final drafts.
In evaluating these writing exercises, I will examine their content, format, appropriateness to the target audience, and grammar. Except for the first paper, you will use literature sources including primary literature (journal articles) and review articles. Although you can consult textbooks or websites for background information for yourself, you cannot use textbooks or websites as cited information sources unless they are database or bioinformatic analysis sites. All your references must be cited in the text and full references given on a separate page at the end (this page does not count in the page requirement). See details of formatting your papers below.
Homework Assignments
You will be assigned a homework problem each week in the first weeks of the lab. The solution will be due the following Friday. Those will be sent electronically to the instructor. Solving the problems will give you experience in the methods so that the instructor can help you learn how to use them.
Grade Calculations for the Writing Assignments
The time of submission for papers will be determined by the time listed on their posting to SafeAssign. Papers turned in after the due date and time will have points deducted from their scores (2 for the reports and 8 for the final paper). If a paper is turned 24-48 hrs after the due date and time, more points will be deducted (4 for the reports and 16 for the summary paper). No paper will be accepted after 48 hrs.
Scores for the writing assignments will be assigned for both the first draft and final draft. A final score for these assignments will be calculated as follows. A score based on the assignment's total points will be provided on the first drafts (8 pts, 12 pts, 20 pts, or 50 pts). Another grade, also

based on the assignment's total points will be provided on the final drafts (again, 8 pts, 12 pts, 20 pts, or 50 pts). The score of the final draft will be tripled and added to the draft's score and this sum will be divided by four to give the assignment's total score. This means the draft counts for one fourth of the final score for the assignment.

If evidence of plagiarism is found on any assignment, that assignment will receive a grade of zero points. I reserve the right to change the grade on an assignment to zero if I learn later that it contained plagiarized material.

2. Describe the primary modes of writing instruction in the course (e.g. individual conferences, written commentary, formal instruction to the class, and so on.)

The primary mode of instruction will be formal instruction in the class and detailed feedback on each assignment through written comments and individual conferences.

3. Explain how opportunities for revision will be structured into the writing assignments in the course.

See relevant element from the course syllabus above

4. State that the syllabus will inform students that they must pass the \\\"W\\\" component of the course in order to pass the course. (Failure to include this clause will result in a request for revisions on your proposal.)

See relevant element from the course syllabus above

ADMIN COMMENT:

5/5/14 Senate approved W. // NewW_11/6/13kcp.

Course Information

MCB 3602W Introduction to Bioinformatic Tools for Microbial Genome Annotation

Spring 2015

Instructor: Kenneth Noll

Office: BPB407 Phone: 486-4688 email: kenneth.noll@uconn.edu
Office hours by appointment
Required text: To be determined

HuskyCT resources

The course HuskyCT site has several links and posted files that you will be required to access.
If you are unfamiliar with using HuskyCT, please ask for assistance.

Final course grade components points

Four writing assignments*
one report on an assigned article, 2 pgs TBD

one report on an assigned article, 2 pgs TBD
one technical report, 4 pgs TBD
one research project report, 6 pgs TBD
Final exam: TBD
Total 100

* each submitted as a first draft and a final draft
Failure of the writing portion of this course will result in a failing grade for the course.

Exams and Absences from Exams

Exam will be short-answer questions covering the material indicated on the syllabus. Questions will be drawn from lectures, the textbook, and assigned readings. The exam will be open-book and open-notes. Only the course textbook, any assigned articles, and your notes are allowed. No electronic devices are allowed in the exam, so if you take notes electronically, you will need to print out your notes if you want to use them.

You need to inform Dr. Noll at least a week before scheduled exam or other assignments if you have a potential conflict due to a religious holiday or an extra-curricular/co–curricular activity performed in the interest of the university and/or that supports your scholarly development (i.e. scholarly presentations, performing arts, and intercollegiate sports, when the participation is at the request of, or coordinated by, a University official).

It is your responsibility to contact me immediately in the event of an illness or other emergency that affects attendance at the scheduled exam. If you are unable to do this (is, for example, seriously ill or unable to access a computer or telephone), the Office of Student Services and Advocacy (Wilbur Cross Building, Rm. 203; 486-3426) staff may do this for you. If you were ill, you must present me with a signed excuse from a physician on their office stationary with the physician's phone number.

If, due to extenuating circumstances, you cannot take the final examination at the scheduled time, you must ask permission from the Office of Student Services and Advocacy (Wilbur Cross Building, Rm. 203; 486-3426) to reschedule the examination. When you have permission to reschedule, I will schedule it at an agreeable time. An absence from the final examination not excused in this way shall receive no credit for the final exam. If you have 4 examinations in two consecutive calendar days, 3 examinations in one calendar day, or 3 examinations in consecutive time-blocks spanning parts of two consecutive days, then you may request the Office of Student Services and Advocacy to rearrange your schedule.

Writing Assignments

Requirements for all writing assignments

Submit all assignments as a MicroSoft Word document to SafeAssign. If you use different word processing software, see Dr. Noll before submitting an assignment. All your writing assignments must be typed using 12 point Times font, double spacing, 0 pt spacing between paragraphs, and one-inch margins at both sides, top and bottom. Some word processing programs use a 1¼ inch default setting, so change this if necessary. I only need your name at the top of the page. Do not include other information such as the date, the course name, your social security number or any other extraneous information. These requirements will be strictly enforced and points will be deducted if they are not met.

Writing assignment schedule

All writing assignments are due through SafeAssign by noon on the dates indicated below. If an assignment is not submitted to SafeAssign before it is due I will reduce its score by half. See late penalties described under "Grade Calculations" below.

1. Date TBD: 2-page paper on an assigned article (final draft due Date TBD)
2. Date TBD: 3-page report on an assigned article (final draft due Date TBD)
3. Date TBD: 4-page partial report on assigned annotation project (final draft due Date TBD)
4. Date TBD: 6-page report on assigned annotation project (final draft due Date TBD)

Writing Assignments

1. Indiana University plagiarism Confirmation Certificate

There is a link to the Indiana University "How to Recognize Plagiarism" site on the course homepage. At that site is a quiz that will help you recognize different kinds of plagiarism that might not be obvious. There is also a link there that defines of these types of plagiarism. You should read through their descriptions so you can take the quiz successfully. When you get all ten questions correct, you can print out a Confirmation Certificate that certifies that you have successfully completed the quiz. You can take the test repeatedly until you get all the questions correctly answered. Beware, although the site tells you which questions you missed, when you retake it erases your previous answers, so you need to remember what the correct answers were. Before your first draft of the first assignment is graded, you must turn in the Confirmation Certificate from the Indiana University website. After completing the online test, you can print out this Certificate. Change the "Indiana University" phrase in the boxed text on the Certificate to "the University of Connecticut," complete the form, sign it, and turn this in either before or with your first assignment on Date TBD. The assignment will not be graded until a signed Certificate is turned in. If it is not turned in before the final draft is due on Date TBD, the first assignment will receive a score of zero. No writing assignments after then will be accepted until the Certificate is turned in.

2. Short Papers, Progress Reports, and Final Report

You will write three short papers and I will describe each of these assignments in detail in class. You will also write a 6-page technical report of your project in the final weeks of the course. Each assignment will be submitted as preliminary and final drafts.
In evaluating these writing exercises, I will examine their content, format, appropriateness to the target audience, and grammar. Except for the first paper, you will use literature sources including primary literature (journal articles) and review articles. Although you can consult textbooks or websites for background information for yourself, you cannot use textbooks or websites as cited information sources unless they are database or bioinformatic analysis sites. All your references must be cited in the text and full references given on a separate page at the end (this page does not count in the page requirement). See details of formatting your papers below.

General Guidelines for Formatting Papers

When you cite an article in your papers, use the format used in journals published by the American Society for Microbiology, ASM. There is a pdf file ("ASM citation styles") posted on the HuskyCT site under "Writing websites and resources." In brief, you should list at the end of your paper under the heading "References" your cited references in the order in which they are mentioned in the text. This list should be numbered. In the text, the citations are indicated by placing the appropriate number in parentheses at the end of the sentence in which the information is mentioned. Do not list any sources in your reference list that are not cited in the text. The Reference section is not included in the number of assigned pages. You must use the formatting style dictated by the ASM standards, i.e. all authors listed, full title, abbreviated journal title, volume number, full listing of pages, and year of publication. Below is an example of what a typical reference for a journal article looks like.

Arendsen, A. F., M. Q. Solimar, and S. W. Ragsdale. 1999. Nitrate-dependent regulation of acetate biosynthesis by Clostridium thermoaceticum. J. Bacteriol. 181:1489-1495.

Lab Homework Assignments

You will be assigned a homework problem each week in the first weeks of the lab. The solution will be due the following Friday. Those will be sent electronically to the teaching assistant. Solving the problems will give you experience in the methods so that the assistant can help you learn how to use them. You will not be graded on these assignments, but you will lose points if you do not turn them in. For each missed assignment, you will lose points from your extra credit points (see below).

Grade Calculations

The time of submission for papers will be determined by the time listed on their posting to SafeAssign. Papers turned in after the due date and time will have points deducted from their scores (0.5 for the reports and 2 for the final paper). If a paper is turned 24-48 hrs after the due date and time, more points will be deducted (1 for the reports and 4 for the summary paper). No paper will be accepted after 48 hrs.

Scores for the writing assignments will be assigned for both the first draft and final draft. A final score for these assignments will be calculated as follows. A score based on the assignment's total points will be provided on the first drafts (2 pts, 3 pts, 5 pts, or 15 pts). Another grade, also based on the assignment's total points will be provided on the final drafts (again, 2 pts, 3 pts, 5 pts, or 15 pts). The score of the final draft will be tripled and added to the draft's score and this sum will be divided by four to give the assignment's total score. This means the draft counts for one fourth of the final score for the assignment.

If evidence of plagiarism is found on any assignment, that assignment will receive a grade of zero points. I reserve the right to change the grade on an assignment to zero if I learn later that it contained plagiarized material.

Plagiarism

In the past there have been misunderstandings about whether it is appropriate to copy material from published sources, internet materials, or other students. Briefly, it is never appropriate to copy anything written by someone else (including other students, published works or internet material). The work you turn in must be in your own words. Do not copy anything from work written by others. All facts and interpretations of facts that are not your own must include a literature citation. When describing factual material, you should describe it in your own words. Do not take phrases from the published work and connect them with your own words. It is best to write your paper without looking at the original work to avoid using those authors' words. All the references in your reference lists must be cited in your work.

Although we will use the SafeAssign software to check for possible plagiarism (see below) the final determination of the authenticity of your writing rests with Dr. Noll. Even if SafeAssign does not recognize copied or "creatively reiterated" material, if Dr. Noll determines that it is unacceptable, that is the final decision.

Academic misconduct in any form is in violation of the University of Connecticut Student Conduct Code and will not be tolerated. This includes, but is not limited to copying or sharing answers on tests or assignments, plagiarism, and having someone else do your academic work. If you have any questions about the acceptability of your work regarding plagiarism, contact Dr. Noll before submitting the work. If submitted work is deemed by the instructor to be in violation of this policy, that

assignment will be given a grade of zero points. Subsequent violations will be dealt with according to the guidelines given in The Student Code (see the link at the course HuskyCT site). Depending on the act, the Code stipulates that a student could receive an F grade on the test/assignment, F grade for the course, or could be suspended or expelled. See the UConn plagiarism tutorial on the course HuskyCT site ("Writing websites and resources").

Use of SafeAssign

All your writing assignments will be submitted electronically through the SafeAssign software available on the course HuskyCT site. This software checks your paper for plagiarism. It is designed to help you learn about correct usage of information in the literature and proper citation of that information.

You will submit your papers to SafeAssign sites that will check the document against a large database of journal articles and websites as well as papers submitted to the SafeAssign database from UConn and other schools. You will receive a report showing the extent to which your writing matches text in that database. If your score is 15-40, you should examine your paper for possible copying and make necessary changes. If the score is above 40, there may be some serious overlap between your work and that of others and you need to address this. For each assignment, you can submit your document to a link called "Test document" under the SafeAssign link on the course's HuskyCT site. This will allow you to get a score on your paper so you can make changes if needed. Be aware that this submission does not check your paper against those of others in the class, but this will be checked when your paper is submitted to me. I will not look at submission to the test run site.

For each final and draft submission there is a SafeAssign link. These submissions will come to me and cannot be revoked. These are the submissions that must be made by the deadlines posted in the syllabus. These submissions will be compared with papers submitted by other students in the course (but not against your earlier drafts) to catch within-course copying. Thus it is very important that you not share electronic copies of your papers with anyone else so there will be no chance of misunderstandings regarding authorship.

Please do not wait to the last minute to upload your paper to SafeAssign if you have not tested the use of the system beforehand. There can be problems and it can take many minutes to process a paper. It is best to use FireFox or Explorer to upload to SafeAssign. Safari will block access in its default settings, so you must disable the feature that prevents pop-ups. To be safe, use FireFox. Word processing software other than Microsoft Word sometimes does not upload properly. It is your responsibility to make sure documents upload properly.

There are files posted at the course's HuskyCT site that show an example of a SafeAssign report and that provide detailed information about submitting papers (in the "Writing assignments

and SafeAssign" folder). Please read the message above under "Plagiarism" regarding SafeAssign. This software only provides suggestions of possible plagiarism. The final determination of authenticity lies with Dr. Noll.

Draft syllabus for MCB3602W
(Note that the topic for the course will likely change from year to year as might the specific paper assignments.)
Topics for in-class bioinformatic analyses
The course will use the US Dept. of Energy's IMG-ACT site as a means to link to web resources for microbial genome annotation tools and to allow you to keep an electronic notebook of your work.
We will be using the following modules from the IMG-ACT site.
Basic Information Module
DNA coordinates, DNA sequence, Protein Sequence, Isoelectric Point
Sequence-based Similarity Data Module
BLAST, CDD, T-Coffee, WebLogo
Cellular Location Data Module
TMHMM, SignalP, PSORT, Phobius
Alternative Open Reading Frame Module
Structure-based Evidence Module
TIGRfam, Pfam, PDB
Enzymatic Function Module
KEGG, MetaCyc, E.C. Number
Duplication and Degradation Module
Paralog, Pseudogene
Horizontal Gene Transfer Module
(Phylogenetic Tree), Gene Content, Chromosome Viewer GC Heat Map
Lectures at the beginning of each class will cover the theory behind these tools.
Lectures
Some classes, especially early in the semester, will be lectures about:
• Writing, web resources for writing, Library resources for writing, and literature citation software.
• Overview of molecular biological processes of bacteria and archaea (transcription and translation in particular)
• Physiological processes relevant to the topics in the course

Assignment 1

You will write a two-page paper that summarizes the content of the assigned article: Stephanopolis, G. Challenges in engineering microbes for biofuels production. Science 315:801-804. 2007.

The audience for your report is your supervisor who does not have time to read all the relevant papers for the project you are working on and depends upon you to read articles like this and provide succinct and informative summaries. Your summary must be written in a technically correct and professional style and summarize the key points of the paper in the areas of the physiology of the organisms involved, the product goals of the industry, the modifications to the microbes' physiology that need to be made to meet those goals, and new advances made in making such modifications.

Assignment 2

You will write a three-page paper that summarizes the content of the assigned article: Carere, et al. Linking genome content to biofuel production yields: a meta-analysis of major catabolic pathways among select H2 and ethanol-producing bacteria. BMC Microbiol. 12: 295. 2012.

The audience and style for your report is as above. You will address the following questions in this report.
1. What was the authors' purpose in making these comparisons between genomes?
2. What enzymes of pyruvate oxidative decarboxylation are associated with organisms that produce ethanol and/or hydrogen?
3. The two archaea studied here have an unusual way to make acetate acetyl-CoA. What is it?
4. It is difficult for hydrogenases to generate hydrogen by oxidizing NADH or NADPH [often written as NAD(P)H]. Considering the free energy involved, why is this difficult? One hydrogenase mentioned in the article has solved the problem, which one and how does it solve the thermodynamic problem?
5. What are the best genes to have in a bacterium for maximal hydrogen synthesis? What are the best genes to have in a bacterium for maximal ethanol synthesis?

Final two writing assignments and associated project

Your last two writing assignments are as follows:

1. A 4-page report (worth 5 pts). The first draft is due Wednesday April 10 and the final draft is due Wednesday April 17.

2. A 6-page report (worth 15 points). The first draft is due Wednesday April 24 and the final draft is due Friday May 3.

The first report will be a part of the second report, so only two additional pages of text and accompanying figures, tables, and references are required for the second report. Each of these reports requires that you consult the research literature and cite those references properly in the text and provide a bibliography at the end. The format for these is discussed in the course information handed out at the beginning of the semester. The bibliography page is not counted in the 4 and 6 page requirement so it is an additional page. Pages containing figures and tables are to be placed after the bibliography page and also do not count in the required page lengths.

Audience for these papers

Write these papers as a report to your supervisor as to whether this organism has the capacity to produce the product (either ethanol or hydrogen) that you are assigned to report on. This includes its ability to use different biomass-derived carbon sources. Your supervisor should be able to use your report to decide whether this is an organism that should be used for a research and development program in this area. You need to provide an evidence-based justification for your recommendation as to its use for this purpose. You should provide the pros and cons for its use based on the evidence that you find in its genome. Your report should be technically and professionally phrased for your supervisor who is well versed in genome annotation and physiology work.

4-page report
Your report will contain about 2½ to 3 pages of background information about your bacterium including:
• a citation of its first isolation,
• its growth temperature range and optimum,
• what polysaccharide carbon sources it grows or does not grow on (if any are reported),
• whether it grows in marine or freshwater media,
• any reports of polysaccharide hydrolytic enzymes it has (cloned and expressed or isolated from the organism),
• studies of its carbon catabolic pathways,
• studies examining its ability to produce fuels (including ethanol and hydrogen), and
• summary of major findings from any genome sequence analysis reports.

The remaining pages will describe your preliminary results about the organism's ability to produce ethanol or hydrogen (whichever you were assigned to investigate). Use

the Carere, et al paper that you read and wrote about previously as the basis of your analysis. Look for the kinds of enzymes they indicated are involved in production of your fuel and tell whether or not your organism has them and what that means for its ability to make the desired product.

6-page report

You can add to and revise the 4-page report as needed and then include it as the first pages of this report. Do not, however, make it longer. You can condense it, if necessary, so that you can include the required additional information and stay within the 6-page limit.

You need to include the following tables and figure in your report on pages following the bibliography. Add rows to the tables as needed In the text, describe why you chose the enzymes you listed in Table 1 and what relevance they have to the production of your fuel. If an enzymatic step is missing that is needed for production of your fuel justify why it is likely that this protein is not encoded in this genome and the steps that you used to try to find the missing gene(s). For example, the rest of the catabolism of the organism is like other organisms that also generally lack this enzyme. If you have reason to suspect that the enzyme is present, but an annotation error caused it to not be listed, explain why you think this and discuss how you looked for it in the genome sequence. In your discussion of the pathways, you do not have to write out each step of the pathways. You can refer to their depictions in Figure 1 for the details. Along with your partner, you need to look for enzymes that could potentially hydrolyze plant polysaccharides. You should list those in Table 2. For each one, you need to use the tools in IMG-ACT to determine its cellular location (cytoplasmic, periplasmic, or extracellular). You need to provide a table listing the evidence you have gathered that demonstrates where the enzyme is located. If there is evidence that it might be anchored to the exterior surface of the cell, provide evidence for that as well.

Table 1. Enzymes involved in production of (place "ethanol" or "hydrogen" here).
Enzyme Locus tag
Table 2. Polysaccharide hydrolases.
Enzyme Locus tag Cell location
Table 3. Evidence for cellular location of polysaccharide hydrolases.
Enzyme Locus tag Evidence for cell location
Figure 1. Pathways involved in production of (place "ethanol" or "hydrogen" here)
Place images of pathways like those in KEGG or MetaCyc. Only include the reactions for the enzymes in Table 1. This figure will have to placed in a separate document and you will have to make a pdf file of it to email to Dr. Noll. It cannot be submitted through SafeAssign.

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Strategy

Each of you has been paired with another student to examine the genome content of a bacterium. One of you is assigned to look for evidence about how or if this organism could be used to generate hydrogen and the other assigned to do the same regarding ethanol generation. Together you will look for enzymes that might allow it to hydrolyze complex plant polysaccharides.

For each genome I assigned both of you the following pathways: glycan degradation, glycolysis, other glycan degradation, pyruvate metabolism, starch and sucrose metabolism, and xylene degradation. These pathways should contain all the enzymes you need to consider for your project. If you find other relevant enzymes outside these assigned pathways, feel free to include them in your report along with a justification for doing so. Do not feel obliged to include information from any of these pathways if they do not have relevant enzymes in them.

Be careful about the potential for plagiarism.

You can work with your partner to gather the background information about your organism and you will work together on the search for hydrolases. You should not exchange your writing. You each need to write up all this information separately. Your first drafts will not go into the SafeAssign database, so it will not alert you to similarities to your partner's document. I will be looking for those, though. Consequently, it is best to not share text with one another. Innocent use of the partner's text could jeopardize both submissions, so don't take the chance.