

## Biology 3020: Molecular Genetics Laboratory Spring 2011

| Section:               | Time            | Location          |                      |
|------------------------|-----------------|-------------------|----------------------|
| Lecture (All Sections) | Mon 1 to 1.50pm | BO 2014 or BO1099 | Mandatory attendance |
| Section 1 Lab:         | Mon 2 to 4.50pm | BO 2014           |                      |

Instructor: Dr. John Gray      Office: WO3232      Phone: 530-1537 Lab: 530-1538  
 email: jgray5@utnet.utoledo.edu      Office Hour:      Mon 11 to 12 am

| Teaching Assistants: | Section: | Office/Phone | Office Hours |
|----------------------|----------|--------------|--------------|
| Paromita Das         | 1        | BO 1009-B    | TBA          |

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### Required Notebook , Clicker, and Lab coat:

It is not required to purchase a textbook for class – notes will be provided via WEBCT (Blackboard) or as photocopied handouts. A binder is recommended to keep such notes together.

Students are also required to provide a hardcovered ruled notebook (Composition book). This is to be used for class preparation, note taking and data collection. *Students must purchase a Response Card (Clicker) which will be used in the pre-lab lecture (See section on clickers in syllabus).* A lab coat is required for use during the lab sessions but protective goggles are not. Lab coats may be purchased from medical supply stores in Toledo (e.g Univ. Bookstore or Superior Uniform 821 Philips Ave. (419 476 9616 (approx. \$21) For computer based learning you need to purchase your own flash drives to backup your work. We will use PC computers so a PC formatted flash drive must be used.

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### WHAT IS BIOL 3020 ?

BIOL 3020 is a companion practical course to the co-requisite lecture course Biol 3010 (Molecular Genetics. BIOL 3020 is a **2 credit hour** course with the following functions:

- 1: To teach you the fundamental concepts and techniques for the use of recombinant DNA technology - a key tool in modern molecular genetic studies. Key concepts include the use of enzymes to cut and join DNA molecules, the engineering of new DNA molecules and their propagation in bacteria, and the analysis and detection of DNA molecules using electrophoretic separation and hybridization techniques.
  
- 2: To teach you the fundamental technique of experimental investigation (Research), the design of experiments, the performing of experiments, the collection of data, the proper analysis of data and the correct way to report and present a scientific research study.
  
- 3: To provide an introduction to the use of computer based manipulation and analysis of DNA sequence information as an essential tool in modern biology.
  
- 4: To provide you with new insights into the use of molecular genetics and it's impact on our daily lives and understanding of the world.

**GETTING THE MOST OUT OF BIOL 3020:**

In BIOL 3020 you will be exposed to some fascinating and powerful tools of modern genetics. About half of the experiments that you perform are related to an NSF funded research project so you will be performing new research. This provides a different perspective from other labs in which you may be repeating experiments already performed a million times. If you embrace this opportunity to explore modern biology using modern techniques, I expect that your educational experience will be richer.

Most of the procedures involve many steps and all experiments require careful attention to detail. Due to the limited time available there will not be possible to repeat an experiment if it should go wrong. Therefore you will maximize your experience by being very well prepared for each laboratory session. If you do this then you can concentrate on developing your skills "at the bench" and you will have time to dwell on and ask questions about the more advanced applications of the techniques you are learning. Your preparation will help make the lab, a less hectic affair and a make it a more enjoyable learning environment.

You must attend each laboratory session and will have thoroughly read the manual material and background references for each exercise. Active participation is encouraged and the teaching assistants are there to help you develop your experimental and analytical skills.

The pre-lab lecture will be used to review and add to the material that will be encountered in the laboratory. In addition two of these time periods will be used for short quizzes (see below). In this period we will discuss any changes in the lab session that deviate from the manual. In some instances this period may be curtailed in order to ensure that the experiments are completed within the allowed time.

Bring your notebook that contains your own abbreviation or flowchart of the protocols in the manual - by making these flowcharts you will have to have read the manual carefully and the nuances of the experiment will have become obvious. Use this notebook for recording data - prepare tables for recording the data beforehand if necessary. Use only ball-point pen in lab to record data and delete errors with a single slash, e.g., ~~0.002 gm~~ 0.05 gm. Scientists use notebooks that have carbon paper to create duplicate sheets to preserve data and although you are not required to purchase these more expensive notebooks you may prefer to do so.

During the lab session it will be important to move smoothly to complete all the objectives in a timely fashion. Some experimental steps involve times where you have to wait, use these lulls to prepare for the next steps or as an opportunity to discuss and learn about the broader aspects of the technique being utilized.

The short quizzes and final quiz will test your comprehension of the techniques you have learned and the application of them to solve real problems. Make use of the questions that are in your textbook and manual to help prepare for the quizzes. Sample problems may also be provided during the course for you to practice your understanding of the material you have learned.

Finally the teaching assistants will have office hours to help individuals with problems they are having with the material. It is best to identify your difficulties on a weekly basis and attend office hours as you need. Try to avoid leaving your request for assistance until just before quizzes as the T.A.s may be overwhelmed and they will have less time to give you individualized attention.

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## **F.I.R.E. Fostering the Integration of Research with Education CORN GENOMICS RESEARCH PROJECT:**

A modern undergraduate education is enhanced significantly by involvement in a real research study. About half of your work in BIOL 3020 is directly linked to a new Genomics Project in Dr. Gray's laboratory and funded by the National Science Foundation (NSF). This project which started in Fall 2007) aims at cloning and characterizing a large set of transcription factor (TF) genes from the important crop and model genetic organism *Zea mays* – otherwise known as Corn. The maize genome is now accessible at [www.maizesequence.org](http://www.maizesequence.org). You will work in pairs to clone a set of TFs that have never been studied before. You will use up-to-date cloning and bioinformatics techniques to accomplish your objectives and write up your findings in your lab reports. The skills that you will learn can be applied to any organism that you may work with in the future. I expect that you will find this to be both challenging (hard work) and rewarding. There will be opportunities for a few students to continue this work as honors projects in the lab of Dr. John Gray (WO 3232 phone 419 530 1537).

## **COMPUTER BASED DNA MANIPULATION AND ANALYSIS:**

### **Background:**

A key element in the BIOL 3020 course is the use of computer software to aid in the manipulation of DNA molecules and the analysis of DNA sequence information. The acquisition of these skills is essential for modern biologists and a major learning objective for this course. Entire new fields of study and research named Genomics and Bioinformatics employ computers as an intrinsic component of operation. The computer software site licenses (which retail at about \$4,000 per license) were originally purchased for this class using an award from the University of Toledo Program for Academic Excellence but are now licensed free for educational use. Last year a new mobile computer lab became available for use in the laboratory and assignments can be completed outside lab in the Biological Sciences Computer Cluster in BO 1099 (access limited to enrolled students in certain biology classes).

### **DNASTAR Lasergene DNA Analysis Software Package:**

The software package that you will learn about is the Lasergene package developed by DNASTAR Inc. ([www.dnastar.com](http://www.dnastar.com)). This is a comprehensive suite of programs that allows you to perform virtual manipulations of DNA that will parallel those you will perform in the laboratory. The more advanced aspects of Lasergene allow you to optimize the design of new recombinant DNA molecules and devise an optimal strategy for their synthesis in the lab (genetic engineering). The MegAlign and Editseq programs will allow you to compare DNA sequences with each other and those available in public databases over the internet. This resource will actually allow you to make new discoveries if you begin to master the software and the biological theories underlying them.

### **Learning Lasergene:**

You will be introduced to the software by in-class and in-lab demonstrations. Following these demonstrations you will be given assignments and questions to include in your lab reports. You will have access to the site-licensed Lasergene software on 12 computers in the New Biology Computer Cluster in BO 1099. This room will be by rocket card access only and is available most days during the semester (some times are reserved for use by other classes).

It will be necessary for you to arrange times where you can sit and perform the analysis either alone or preferably with your lab partner. Online manuals on how to use the software will be available. In addition each T.A. will be assigned an hour in which they will be present in the computer cluster to answer questions you may be having about the software or address any difficulties you may be encountering.

For all students and especially those who are not accustomed to using computer software there will be a sharp learning curve and you will need to apply yourself to learning the software early - it may be impossible to gain guaranteed access to computer terminals as the time for writing your reports nears. There are 60 students total enrolled in this course (30 pairs). With

12 terminals there is no bottleneck to getting your work done - but it is better to be early in getting your assignment done.

Remember you are encouraged to learn in pairs as that promotes scientific dialogue - so try to identify times when you and your lab partner can both work on a computer terminal to accomplish the assigned homework. Remember however that you **MUST** write your lab reports (other than the results section) independently of each other.

**Saving your work:**

All terminals are PC platforms and have USB ports for flash drives and CD writable drives. You must bring your own flash drives in order to save your work - there is a "Public folder" on the computer in which files can be temporarily stored but you should empty this when you leave the workstation. The computers are connected to a printer in the same room so you can print out your results for inclusion in your lab reports. **As always it is wise to backup your work in more than one place - do not learn the hard way!!**. The computer cluster is a resource that is expensive to maintain and you must leave each workstation in the state you found it. The computers will be fixed so that you will not be able to make any changes to the hard drive but if a person(s) is found tampering with the computers a heavy penalty will be applied.

**HOW YOUR PERFORMANCE IN BIOL 3020 WILL BE GRADED:**

Because of the small number of people in the course (less than 60) I do not grade on a curve but on an absolute scale. The breakdown of marks is tabulated below:

|                            | # of points | % of overall marks | Date              |
|----------------------------|-------------|--------------------|-------------------|
| Prelab "Clicker" Questions | 25          | 10                 | Prelab lectures   |
| Lab. Report #1             | 75          | 15                 | Due Feb 8th       |
| Lab. Report #2             | 100         | 20                 | Due Mar 15th      |
| Quiz on Labs 1 to 7        | 25          | 5                  | Mar 1st           |
| Final Exam                 | 25          | 5                  | Apr 26th          |
| News report                | 50          | 10                 | Due Apr 5th       |
| Lab. Report #3             | 125         | 25                 | Due Apr 29th      |
| Class Presentations.       | 50          | 10                 | Last Lab in Class |
|                            | 500         | 100%               |                   |

Clicker questions in the pre-lab lecture are based on the required reading for the next lab. There will be clicker questions throughout the course (worth 10% of the overall grade each -15% of the cumulative total will be dropped to account for absences, missed questions, or a defective clicker). Lab Reports (which account for the major part of the grade) will be in the format described in this handout. This report is due when you come to class at the above dates. **If a student does hand in a report late then there will be a 10% deduction of grade per day or part of a day (i.e. after 3 days delay a perfect report can only earn 70%)**.

Grade equivalents will be assigned as follows: This scale is based on the assumption that knowledge of 50% of the material is needed to pass this course.

| % of available marks | Grade | Standard  |
|----------------------|-------|---|
| 90-100               | A     | Achievement of outstanding quality                    |
| 88-89                | A-    | Achievement of slightly less than outstanding quality |
| 85-87                | B+    | Achievement of slightly more than high quality        |
| 74-84                | B     | Achievement of high quality                           |
| 71-73                | B-    | Achievement of slightly less than high quality        |
| 69-70                | C+    | Work of slightly more than acceptable quality         |
| 62-68                | C     | Work of acceptable quality                            |
| 60-61                | C-    | Work of slightly less than acceptable quality         |
| 58-59                | D+    | Work slightly above the quality expected              |
| 52-57                | D     | Work below the quality expected                       |
| 50-51                | D-    | Work slightly below the quality expected              |

**In Class Questions (Clicker Questions) (These will be worth 10% of your overall grade)**

To encourage active learning participation in the pre-lab lecture, a personal response system is employed during lectures. You are required to purchase a Turning Technology Response Card RF (also known as a “clicker”) for use in class. Your answers will be tracked and you will be awarded points. These points accumulatively will be worth 7% of your overall grade. Since the same clicker is used university wide, you may already have a clicker and that is sufficient for use in this and other classes. The clicker can be sold back to the bookstore later.

A variety of questions will be asked throughout each lecture aimed at testing your focus and understanding of the material. Most questions will be answered solo but in some instances you may be permitted to work in groups before selecting an answer. Obviously reading ahead will be a good step towards being ready for the lecture. Not all questions will be equally weighted but some will earn more points than others. Also there may be more than one correct answer to some questions.

**Registering your clicker:**

In the first week I will hand out a page for you to register your clicker with me. Registration permits me to match your responses to your name. If you don’t register, register incorrectly, or use a different clicker, your responses will not be credited to you.

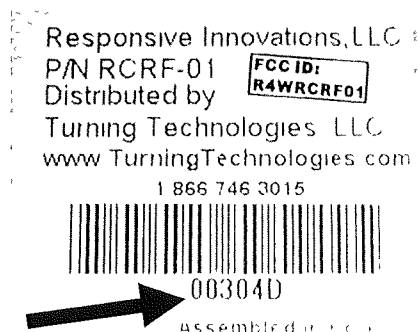
**Grading Clicker Questions:**

In this course, in class answers using clickers account for a total 7% of your grade. You will accumulate clicker points each day until the last day of lecture. 15% of the cumulative total will then be dropped to account for absences, missed questions, or a defective clicker. I do not give excused absences unless a medical or other valid documented excuse for several days is presented. For example, if the available total points is 115, then 100 points out of 115 is a perfect score. Earning over 100 points does not add to your grade. If you earned 93 points that is  $93/100 = 0.93 \times 7\% = 6.51\%$  for your In Class Questions part of the final grade.

**Using Your Clicker (Response Card) in BIOL3010-001**

Your Response Card is a radio Frequency (RF) transmitter. It sends a signal to the instructor’s receiver. The signal contains your answer and the transmitter’s ID code. This ID code must be matched to your name for you to receive credit.

**Clicker Buttons:** The Response card can be used for either letter or number answers. Press the button that corresponds to your answer. The “GO” button is used for channel setting. The “?” button sends a signal to your instructor that you have a question.



**IMPORTANT Register your Clicker in class or by emailing your UTAD user ID and clicker ID by no later than Jan 14th at Noon !**

**Channel Setting:** Your Clicker must be set to the same channel as your instructor’s receiver.

1. When your instructor has set up the program, press the “go” button .
2. The light should alternate red and green.
3. Type in the 2 digit channel code for the class. (Channel 1= 01 or channel 21=21)
4. The light should change to a solid green.
5. After the second digit is entered, press and release the “go” button again.
6. Press and release the 1/A button.

**Sending a Response :** When polling is open on a question, send your answer by pressing the correct response once. The button will stay green for a few seconds to indicate your response has been received. If the light only lights briefly with a red/green light, polling is not open or you are not on the correct channel.

**Each student is required to buy a transmitter.**

You must bring the transmitter to every lecture. No provisions will be made for forgotten, lost or broken transmitters. During lecture, the instructor will ask questions. Each student will send their answer using the transmitter. Some questions may be participation points only (bonus points). Some questions will be graded with correct responses worth more than incorrect responses.

**There are no excused absences for lecture.**

The first two weeks of the semester anyone with a transmitter will be encouraged to use it but the transmitter is not required. Use of the transmitter is required by the start of the 3rd week of lecture. I will have around 3 to 5 questions per lecture (sometimes less or more) for each lecture. The maximum number of clicker points will be set 15% below the actual total points offered. This margin is built in to eliminate excused absences, forgot the clicker, broken, dead batteries, etc.

Every device has a rate of failure. The transmitters have been thoroughly tested and flaws eliminated. If you feel your transmitter is not functioning, **it is your responsibility to check your grades online** at WebCT to see if your responses have been received and the correct transmitter # is recorded for you. If you feel the transmitter is not working, return it to the bookstore for a new unit. You **MUST** notify your lab lecture instructor immediately of the new transmitter number. Again, it is your responsibility to check your scores and make sure your transmitter is working.

**Note on Academic Dishonesty:**

Bringing a clicker to class for someone else is considered academic dishonesty for both parties. I can count the number of students in class and the number of responses. If the 2 do not match up, I will stop class and determine who is missing. The penalty will involve both parties getting an F in the entire course.

**WebCT (Blackboard).**

<http://www.dl.utoledo.edu/login.htm>. If you have problems with your WebCT account contact the Distance learning office at 1 (866) UTOLEDO (a toll free number). If you are having clicker problems, see me ASAP to solve the problem. It is your responsibility to check WebCT to make sure the points are correct and your clicker is working.

**Course Policy on Absences:**

You are expected to participate in all lab. sessions. *In the event of an unanticipated absence due to illness or emergency, evidence of the necessity of the absence must be provided in the form of a doctors letter or equivalent i.e. a contactable supervisory adult that will substantiate the necessity of your absence.* You must inform us as early as possible of an anticipated absence and we will attempt to include you in one of the other lab. sessions. Anticipated absences must be due to extenuating circumstances, - vacations, weddings, and interviews are not excusable reasons for not attending the laboratory. *Any unaccounted for absence constitutes failure in the course.*

**Course Policy on Cheating/Plagiarism:**

Very few students feel the need to cheat. You can get a very respectable grade of which you can be proud if you use the considerable talents and intellect that have propelled you this far in your studies. **Students caught cheating however will be recorded a zero for that quiz or assignment. All available information on the cheating incident will be forwarded to the Dean of Student Affairs for investigation and appropriate action.**

With the advent of the internet some students have copied the work of others directly into their writing assignments such as lab reports. **The copying of entire articles and paragraphs or even entire sentences is considered plagiarism and will be treated the same as cheating.** The

work of others must be paraphrased using your own words/sentences even if you maintain that "it is written better than I could" or "I could not think of another way of saying that" – the usual exception being a direct quote of a speech or announcement. Even when work is paraphrased you must also cite a source/reference of where you found the information so that the reader can locate it for his/herself. Web sources must also be cited by providing a complete web address of the reference material in the bibliography section of your report.

### **GUIDE TO WRITING YOUR LAB REPORTS:**

The major proportion of your grade will be evaluated by the three lab. reports that you will hand in after completing each of the three major sections of the course. The format for the lab. reports is the standard format for a scientific paper. The following general guidelines should be followed closely. Also, you should take the opportunity to either purchase the following book or read the copy on reserve in the Carlson Library:

**“Successful Lab Reports - A Manual for Science Students” by C.S. Lobban and M. Scheffer, Cambridge University Press (1992) 105 Pages.**

This book provides an excellent guide to the content of lab. reports and is useful for any science lab. you are taking now or in the future. For other more specific questions consult your T.A. during office hours. The T.A. will provide suggestions for improvement if you are having difficulties. The Writing Center can also be of invaluable assistance - many students make dramatic improvements in their writing skills after some timely and professional critical evaluation. The Writing Center is located in White Hall, Lower Level, Phone 530-4939. Note that the Writing Center is not just for those who have poor writing skills - some of the students that obtained the highest grades in this course have utilized this resource.

**General:** Lab-reports are due three times during the course on the days indicated on your course schedule. Reports should be typed with drawn figures or tables where appropriate. Use a font size of at least 10 and single spaced lines. Your reports must be prepared individually at all stages except for data collection where collaboration with your lab. partner is fine. There is no length restriction except for the one that science reports ought to be concise and to the point. Each report will be graded based upon its completeness, accuracy, organization and overall quality. The major portion of the points (about two thirds) will be awarded for the Results and Discussion sections of your report.

**Report Format:** The format will be typical of a scientific paper remembering however that the purpose here is to illustrate that you understood the experimental protocol, that you attempted to complete the experiment, that you gathered data which may or may not answer the proposed question, and that you correctly analyzed and interpreted your data.

### **Title (3%) and Abstract (6%):**

Provide a brief title (not more than 100 characters) of the experiment that is inclusive of all that was achieved. The abstract should report in less than 200 words, all the results that were achieved and the conclusions (or lack thereof) that can be made.

### **Introduction (12%):**

The introduction provides the context for the lab and most importantly poses the hypothesis that was tested in the study. The format should be background, question, hypothesis and prediction. e.g. Does the topology of a DNA molecule affect its migration during electrophoresis? - hypothesize that it does - Predict that the mobility of a supercoiled plasmid will be faster than that of a linear or open circular plasmid. You must cite any references that you use in the introduction including the manual of textbook chapter that are required for this class. The computer assignments are to be included as an individual objective/aim(s) within the introduction.

**Materials and Methods (12%):**

This is a summary of the methods and procedures used. In most instances this will consist of a brief statement verifying that the instructions in the lab. manual were followed - remember to cite the lab. manual. This is also the place to mention any changes in the protocol. If you did not follow a particular step in the manual this **must** be mentioned and if so why was this modification made ?

For the computer assignments you must mention the name of the software and computer platform you used to perform your analysis.

**Results (30%):**

Report in a series of paragraphs the outcome of each major step in the previous weeks experiments. Think of yourself as a news reporter for this section – record what you see and present the material in such a way that people could make up their own minds about the data – they should understand clearly how the data was collected and be able to read it. Include a table, diagram, graph or figure where necessary and have them numbered sequentially and clearly labeled. Each should have a brief legend (i.e. title) that accurately describes the data contained therein. Describe in the text what you found and draw a brief but valid conclusion from the data. Correct and accurate reporting of the results in a neat fashion is an important part of your report and will constitute about one third of the available points.

Where you have been assigned tasks using the Vector NTI software the printouts should be included in this part of your report.

You may work with your lab partner for collecting results and working on computer assignments. However this is the only section where you should do this – the rest of the report must show your individual understanding and interpretation of the material.

**Discussion (30%):**

This is the second important section of your report where you can demonstrate your analytical skills and judgment and for which another third of the points will be awarded. Here the results that you obtained are interpreted and clearly explained to the best of your ability. The following steps may help you organize your discussion.

- 1: Restate your question, hypothesis and prediction or objectives.
- 2: What is your interpretation of your results in the light of your hypothesis and what is known about this topic from the literature ? in some cases the experiment may have failed and not allowed you to answer the question posed and if so this must be stated
- 3: Write down the specific data that provided this answer and that allowed your hypothesis and prediction to be accepted or denied. Are your data reliable ? Are there any problems with your data ? Can you think of a better way to answer this question ? are there additional experiments required to answer this question ? if so what are they ?
- 4: What is the relevance of your results to the broader literature ? (keep very brief)

If you are reporting the results of several experiments you may organize the above information into several concise paragraphs. Do not ramble in your discussion and keep to the points of the experiments that you performed.

Interpret the results of your computer assignments in this section and if directly relevant compare with the results obtained in the lab. e.g. if you run a virtual gel electrophoresis then how does it compare with the actual gel result you obtained in the lab? what might be the reasons for any differences ? The best reports will show a very strong grasp of the material and a very good depth of understanding.



When you describing your analysis of a transcription factor from corn (Lab report 3)– write up your discussion as if you would be presenting a “finished product” to your boss if you were working in a company – provide a figure of the construct that you have made and a summary of the type of transcription factor it is – what TF family does it belong to? What are the characteristics of that TF family? What are the most closely related TFs from other species and is anything known about their role in metabolism?

**Literature cited (3%) and Overall Coherence (4%):**

Correctly cite any references you used throughout your report including the course textbook and manual. You are not required to do literature searches in this course and it is not expected that you will have more than 5 to 10 references in any of your reports. Use a reference format such as that found in a mainline scientific journal such as Cell. 4% of the grade will be awarded for overall connectivity of your report such as connecting aims or hypotheses in the introduction with interpretation of actual results in the discussion.

**Final Advice:**

It is wise to do a rough draft of your report which only you will read - then when your thoughts and data are organized go ahead and type up the final report. If you wish to show a draft of your report to your TA – bring it to them early – 10 days or a week before it is due – they cannot assess it carefully in a few minutes the day before it is due and you will be too stressed to make the changes they may request. **Back up your report** on a second disc so that you don't lose your work and have to retype the whole manuscript - backing up your data always provides peace of mind and you will sleep easier! Also when you are formatting

your thoughts some people find it helpful to imagine describing your experiments to a lab. partner that had missed the lab - you would have to provide a little background, describe what you did and how you did it, display the results and how you collected them, and finally interpret your results and provide some conclusions. Since the reports are required three times in the semester it is best to work on them each week - don't let them mount up - especially the last report which will be longer than the others - avoid getting stressed out towards the end of the semester!

This course ought to be an enjoyable learning experience for you if you approach it in the right fashion. The above guidelines are meant to ease the process of identifying what you need to do in order to achieve a good grade - so you can concentrate more on the process of doing and learning more about the fascinating field of modern molecular genetics.

**In class Presentations (This will be worth 10% of your overall grade)**

In the final lab, each pair of students will give a short 10 minute powerpoint presentation on the family of TFs that they have been studying for the semester and answer questions from the class and instructor. The presentation should include general information about the TF family that you have studied and a report on your success or failure in cloning a member of that family. A phylogenetic analysis of that TF should be included and finally an interesting recent paper (past 6 months) about a related TF in plants from the same TF family. Each student should present for 5 minutes. The expectation is that in preparing for this presentation you will be better prepared for writing your final lab report and taking the final exam.

**“News Article Assignment” (This will be worth 10% of your overall grade)**

The material that you learn in this course will be very important in helping you understand the technological society in which we now live. Biology has changed from being a leisurely pastime activity of the rich to a driving force of innovation and change throughout society - witness the impact of molecular genetics on everything from medicine and genetically modified crops to having babies and forensic evidence used in court.

To encourage you to relate the classroom experience with life around you I want you to write a short (no more than 300 word essay) on a current news topic (printed since this class began) that you encountered and which you felt you understood better because of studying DNA and laboratory techniques

The news article may be derived from any recent POPULAR PRESS source (***BUT NOT PROFESSIONAL SCIENCE/MEDICAL JOURNALS***)- newspaper, TV, radio, internet etc., and you should provide a reference to it - if possible by a photocopy of the article or a printout of a web-page attached to your assignment. If in doubt about what constitutes "Popular Press" apply the "Kroger magazine rack" test.

In your short essay, tell me what you understood more clearly in the news article because of understanding molecular genetics - or how understanding molecular genetics may or may not help the people in the article to resolve their situation.

The report will be graded as follows (10 points total)

- 1: complete, turned in on time, and grammatically well composed in your own words (4 points)
- 2: describing an article that is **relevant to molecular genetics** (2 points)
- 3: **for accurate description of the role of scientific knowledge** in the story (2 points).
- 4: for **relating the story to something you learned in class** (2 points)

I am sure that you will encounter many interesting news articles and I hope that your only complaint will be that 300 words is not enough space to write about it!

***Take responsibility for your education ! (its never too late)***

*Take responsibility for your own education. Here's the part where college distinguishes itself from high school. Students are in high school because they have to be. Students are in college because they want to be. You are paying dearly for your college education, so you should go out and get it. Don't wait for someone else to hand it to you; it won't come.*

*Taking responsibility for your own education means going to the dictionary when you run across a word you don't know. It also means asking your professor to read a draft of your essay, or raising your hand in class to ask for a difficult point to be repeated.*

*But taking responsibility for your education means more than this.*

*It means seeking out challenging courses and difficult professors, for only if you push yourself by taking hard courses will you improve your academic and intellectual skills.*

*It means engaging your friends in the dormitories and coffee shops about what you are learning in the classroom.*

*It means holding yourself to higher standards than you professors hold you. If you take only easy courses and sit passively through them, you will fail to gain the very education that you are paying so dearly for.*

Taken from: College is more than job training (The Blade: Toledo, Ohio, Saturday Sept 30, 2000)

Week Exercise Reference Dates

**Part 1 Lab 1 thru 4**

|   |  |   |          |
|---|--|---|----------|
| 1 | Introduction to laboratories on DNA Analysis. Exercise in pipetting accuracy | Handout 1, pp 2-20.   | Jan 11th |
| 2 | Determining the Length of DNA Molecules.                                     | Handout 1, p 21-24.   | Jan 18th |
| 3 | Restriction Mapping of DNA.  | Handout 1, p 25-30.<br><i>(No pre-lab lecture on Labor Day Sept 6th)</i><br><i>Last Day to Add/Drop Tues Sept 7th</i> | Jan 25th |
| 4 | Database Mining for flcDNA.  | Assigned Reading.   | Feb 1st  |

**Part 2 Lab 5 thru 8**

|   |  |                      |   |
|---|--|----------------------|---|
| 5 | DNA Hybridization Lab 1<br>Evolution of the Vertebrate Genome.<br>Introduction to computer based homology searches | Handout 2, pp 48-70. | Feb 8th<br><b>(1st Lab Report Due)</b>    |
| 6 | DNA Hybridization Lab 2<br>Detecting a gene in the Mammalian Genome  | Handout 2, p 71-84   | Feb 15th                                  |
| 7 | DNA Hybridization Lab 3<br>Development of Blots (Prehybridize day before lab)                                      | Handout 2, p 61-84.  | Feb 22nd                                  |
| 8 | Isolation of Plasmid DNA<br>Quantitation of DNA by UV spectrophotometry  | Assigned reading     | Mar 1st<br><b>(Quiz 1 on labs 1 to 7)</b> |

*No Lab March 8th due to Spring Break*

**Part 3 Lab 9 thru 14**

|    |   |                                       |   |
|----|---|---------------------------------------|---|
| 9  | PV92 PCR Informatics Experiment Part 1  | Manual, pp 86-90.<br>Assigned reading | Mar 15th<br><b>(2nd Lab report due)</b>       |
| 10 | PCR Amplification of cDNA clone<br>PV92 PCR Informatics Experiment Part 2                     | Assigned reading..                    | Mar 22nd                                      |
| 11 | Ligation of PCR product<br>Transformation of <i>E. coli</i> .                                 | Assigned reading..                    | Mar 29th                                      |
| 12 | Analysis of DNA sequence of Recombinant Plasmid<br>Transfer clone to destination vector       |                                       | Apr 5th<br><b>News Article Assignment due</b> |
| 13 | Final Lab Experiment<br>Transformation of <i>E. coli</i> .                                    | Assigned reading..                    | Apr 12  |
| 14 | Class Presentations   | Assigned reading..                    | Apr 19  |
| 15 | <b>Final Exam</b><br><b>3<sup>rd</sup> Lab Report due Friday Apr 29<sup>th</sup> at 5pm !</b> |                                       | Apr 26th                                      |
| 16 | <i>There will not be any tests in finals week</i>   |                                       |   |