

Moravian College
Department of Biology
Senior Seminar (BIO 370A)
“Contemporary Controversies in the Life Sciences”
Fall 2009

<u>Instructor</u>	<u>Phone</u>	<u>E-mail</u>	<u>Office</u>
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Office Hours: Tuesdays 10:00 – 11:30 am
Thursdays 10:00 – 11:30 a.m.
Fridays 10:00 – 11:00 pm

Class Meeting Times: Tu, Th 2:35 – 3:45 pm 301 PPHAC

Course Prerequisites: Senior status or permission of instructor

Required Textbook: McMillan, W.E. 2006. Writing Papers in the Biological Sciences. 4th Edition. Bedford/St. Martin’s

Additional Required Reading: *You will also have several readings from journals, and various media and internet sources throughout the semester.*

Course Introduction and Description:

The advances in the life sciences over the past few decades have been staggering in terms of both the knowledge that has been acquired and the technologies that have been developed. Genetic engineering has applications in many fields. Breakthroughs in medical research allow us to manipulate stem cells, alter reproduction processes, design race-based medicine, and artificially prolong life. Computers and nanotechnology now blur the division between man and machine. Industrialized nations have advanced tremendously using science-based technologies, but this has come at the expense of an altered planet – changes that are perhaps irreversible. Evolution continues to be debated and, despite reams of data, many skeptics warn about the “global warming *hoax*”. While the new frontiers in science are exciting and bring hope of eradicating many diseases, solving global-scale environmental problems, and creating new possibilities for reducing famine, the technologies also bring new ethical dilemmas especially since we now have the capacity to alter the very nature of “life”. In this seminar, you will utilize the scientific literature to explore the science behind these advances and the status and applications of some controversial technologies. We will discuss some of the ethical challenges confronting scientists, other users of the technologies, the general public, and policy makers.

Before we examine contemporary controversies in depth, I am interested in having you study some historical examples of scientific revolutions (transformative research) in the life sciences. I believe that this will allow you to see how our perspectives and paradigms change with time – especially as we gain new knowledge. Some of the things we take for granted now (the links between “germs” and disease, Mendel’s conclusions about genetic inheritance, etc.) were raised a lot of contentious debate or were simply ignored (as nonsense) when first proposed. I would like you to investigate how some initial scientific ideas that are now

well accepted were initially received by the science and non-science community. Some reports are immediately accepted by the scientific community (the Watson/Crick model of DNA, for example). Others are not (Mendel's ideas on inheritance, the chemiosmotic hypothesis, the concept of prions, McClintock's "jumping genes" or transposons). What makes these discoveries different? And why, in some cases, are scientific colleagues downright nasty with each other (as is the case when E.O. Wilson proposed the concept of sociobiology)? How does the scientific community come to accept controversial or radically different new ideas?

With some discoveries (i.e. restriction enzymes), scientists immediately recognize the potential of the tool and the ethical implications (hence the Asilomar Conference on Recombinant DNA was held in 1975 to establish "ground rules" and better understand potential risks). The implications of these new technologies weren't immediately understood by the general public, but we now know how the public reacts to cloning and genetically modified foods! So who should determine the ethical and moral boundaries of life science research? Does the scientific community do a sufficient job of policing itself?

To meet the writing intensive component of this course, you will be responsible for a number of writing assignments including journaling, op-ed assignments, reaction papers, abstracts and a major research paper. All students will be expected to give an oral formal presentation on a topic relevant to the course theme.

Course Objectives: Upon completion of this course the students will be able to:

- 1) describe important scientific issues and seminal discoveries through a variety of oral and written communication modes;
- 2) thoroughly research a specific topic related to controversial life science topics and major breakthroughs (scientific revolutions) that led to new scientific paradigms or fields ~ using primary and secondary literature sources;
- 3) find information on the responses/reactions from the scientific community, media and general public about such scientific breakthroughs and explore the reasons why some scientific topics are controversial;
- 4) identify ways in which the scientific community resolves conflict and/or accepts new paradigms;
- 5) identify ethical issues associated with new areas of life science research and technological applications;
- 6) concisely express a research topic in abstract form;
- 7) construct successful outlines and drafts of written work from peer and professor feedback;
- 8) complete a scientific research paper with appropriate scientific citations;
- 9) effectively discuss, explain, and critique primary literature and other readings through journal club sessions;
- 10) present their comprehensive research before peers and instructor using Power Point software as well as address questions regarding their work; and
- 11) objectively critique peer abstract writing samples and ask questions during discussions and after student presentations.

Finally, two years ago, the Department of Biological Sciences determined that we need to have a better understanding of what our majors are learning (or not) throughout their time at Moravian College. A valid assessment of student learning in biology will guide us to refine our curricular offerings and hopefully improve our programs. To this end, we agreed to pilot the ETS standardized test in biology in our senior seminar courses. This test will not count toward your grade in this course, but it is expected that you all participate and take the test seriously so that the information we glean from this is valid and useful. We will use the exam period assigned to this course to administer this test in December (December 18th at 8:30 a.m.).

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From: What Do You Care What Other People Think? (Concluding essay, "The Value of Science") by Richard Feynman, p. 245, 1988 (see: <http://laserstars.org/bio/Feynman.html> )

*"The scientist has a lot of experience with ignorance and doubt and uncertainty, and this experience is of very great importance, I think. When a scientist doesn't know the answer to a problem, he is ignorant. When he has a hunch as to what the result is, he is uncertain. And when he is pretty darn sure what the result is going to be, he is still in some doubt. We have found it of paramount importance that in order to progress we must recognize our ignorance and leave room for doubt. Scientific knowledge is a body of statements of varying degrees of certainty-some most unsure, some nearly sure, but none absolutely certain."*

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Grading: The grading system is as follows: (+/- will be administered as professor deems appropriate)

- A = 90 - 100 %
- B = 80 - 89 %
- C = 70 - 79 %
- D = 60 - 69 %

Course Requirements: The student's grade will be based on the following:

- Writing exercises (misc. assignments throughout semester, including questions for seminar speakers) 200 points
 - In class discussions and mini-formal presentations 200 points
 - Substantially complete draft of research paper due 2 weeks prior to oral presentation 50 points
 - One written research paper 200 points
 - Abstract and primary article submitted on time to the instructor for classmates to access 50 points
 - One research presentation and follow up question-answer session 200 points
 - Resume exercise 50 points
 - Overall class participation, engagement, & attendance 150 points
- 1100 points

** The "class participation grade" is based on your participation and preparation for each class session. Therefore, excessive absences will have a negative effect on your final grade for the course.

** Please note : it is within the instructor's purview to apply qualitative judgment in determining grades for assignments or the entire course

Expectations:

- a) Attendance: Regular class attendance is expected. **No** make-up presentations will be permitted unless you have an acceptable reason (family emergency, illness, etc) - with documentation. If an emergency should arise, you must notify the instructor prior to the presentation date and **not** after. Notification from the Moravian College Health Center, Learning Services or the Moravian College Dean of Students' Office will be necessary if you miss more than two seminar classes. I will recognize

legitimate excused absences such as when students are representing the university in an official capacity (e.g. for presentation at scientific meetings, intercollegiate athletic competition, but not practice, off-campus music performances, etc.). Such activities are scheduled ahead of time; thus, we expect you to make arrangements with us ahead of time as well. Please note: Students who arrive late to class disrupt the flow of the session and distract their peers. Please be prompt!

b) Cheating or plagiarism will not be tolerated. Plagiarism may result in failure of the course. Students will be held to the highest standards as specified by the Moravian College Honor Code. Violations of this code will be handled in the most severe manner allowed by college policy. Please read the Academic Honesty Policy that is included in the student handbook *and* the policy that will be distributed in class. We have attached a cover sheet to our policy that each of you will sign indicating that you have read and understand the policy and implications of violating it. If you have any questions about plagiarism or other forms of academic dishonesty, please ask. Several assignments in this class will involve the use of internet resources, and it is my experience that students often do not realize that copyright violations and plagiarism policies still apply.

c) Appropriate Literature Sources: All students will be required to understand the differences between primary and secondary literature sources. The college subscribes to many science-based databases that you should be familiar with as they will be invaluable sources of information for your paper and seminar; “Web of Science”, “Science Direct”, “SciFinder Scholar” are some examples. Public-domain internet sources can be helpful but you must critically evaluate the information obtained from such sources – especially if they are not primary sources. You should not typically use “Wikipedia” as a reference for assignments and material from this source is NOT acceptable for the formal research paper.

**** Throughout the semester, I would like for you to pay attention to media and popular press coverage of topics related to this course. We will routinely use part of our class period for “*Science in the News*” discussions. Your informed contributions to these discussions will be viewed favorably when assigning final grades! ****

d) Reading Assignments : should be completed prior to each class session

e) Writing Assignments : A rough draft of your final research paper is due to the instructor **two weeks** prior to your presentation date. Ten points will be deducted from your grade for every day it is late. It will be evaluated and returned to you within one week of submission. An abstract of your presentation as well as 2 of your primary research articles are to be submitted to me 1 week prior to your presentation date. These will be placed in the student reading room (311 Collier). Your final research paper (8 - 10 pages – excluding the title page and references) is due to the instructor on the day you are scheduled to present your research topic. If it is not submitted on that day, 20 points will be deducted from the “research paper” grade for every day it is late. You are each responsible for knowing the timeline for your assignments.

f) Extra Help : If any difficulties arise during this course from selecting a research topic to designing your presentation, please see me. *I will be happy to help!* The reference librarians in Reeves Library are also willing to assist you with reference materials. Please contact the Moravian College Writing Center for further assistance in writing and revising your abstracts and research papers

Best wishes for a great semester!

- D. Husic

Tentative Class Schedule¹

Subject to change!

<u>Date</u>	<u>Topic</u>
Sept. 1	Introduction and expectations for course Review of syllabus and criteria for paper and oral presentation Discussion of course themes Brainstorm about contemporary controversies in the life sciences Selection of presentation dates
Sept. 3	Discussion: Readings from Kricher, <u>The Balance of Nature</u> . <u>Ecology's Enduring Myth</u> , Chapters 1 & 3. Some scientific ideas that we got wrong; Creating and changing paradigms in science.
Sept. 8	Historical controversies: The composition of matter; theories of disease Continue discussion on theories of disease; dispelling incorrect beliefs Contemporary disease myths - Assignment
Sept. 10	Discussion on contemporary disease myths Introduction - searching the literature/citations/developing bibliographies Introduce Assignment : Investigating the reactions to some key scientific breakthroughs
Sept. 15	Library Session with D. Glew Primary and secondary sources in the scientific literature and other forms of databases
Sept. 17	The Sociobiology Controversy Tentative Topic for Seminar/Paper Due Debrief library session The Sociobiology Controversy - continue the discussion Implications of a genetic (or other biological) basis for human behavior Creating Power Point presentations and posters
Sept. 22	Student Presentations : Reactions to some key scientific breakthroughs
Sept. 24	Discussion: Creation myths and evolution
Sept. 29	Continue discussion on evolution Unresolved issues in evolutionary development What makes humans different? Are humans a part of nature?
Oct. 1	Introduction to abstract writing exercise/peer review Preparing drafts Writing a research paper vs. a review paper - finding examples of each Writing op-eds (What makes some science controversial?) The "rights" of other living organisms
Oct. 2	Outline for Semester Presentation due by 5:00 pm
Oct. 6	Animal research/animal rights
Oct. 8	Amy Saul - writing resumes Dr. Husic out of town: Peer review of abstracts Work on Power Point presentation
Oct. 13	NO CLASS: Fall Break

¹ Details on specific readings, assignments and class activities will be distributed in weekly course outlines.

- Oct. 15 Sample Power Point presentations by students/critiques
Draft paper for first seminar speaker due
- Oct. 16 Dr. John Haught's lecture "Evolution and Religion: What is the Problem?"
(Attendance expected); 7:30 p.m.
Assignment: reaction paper due 10/22
- Oct. 20 Discuss reactions to Darwin lecture
Asilomar (recombinant DNA technologies/genetic engineering)
- Oct. 22 Continue discussion on genetic engineering
- Oct. 27 **Presentation #1**
Journal club theme for week #9: Climate change science
- Oct. 29 **Presentation #2**
Journal club theme for week #9: Climate change science
- Nov. 3 **Presentation #3**
Journal club theme for week #10: Population and the carrying-capacity of the planet. How the life sciences are connected to these themes.
- Nov. 5 **Presentation #4**
Fred Pearce's lecture in Prosser Auditorium at 7:30
"When the Rivers Run Dry" (Attendance expected)
- Nov. 10 **Presentation #5**
Journal club theme for week #11: Extending human capacity/life extension technologies
- Nov. 12 **Presentation #6**
Journal club theme for week #11: Extending human capacity/life extension technologies
- Nov. 17 **Presentation #7**
Journal club theme for week #12: Stem cell research
- Nov. 19 **Presentation #8**
Journal club theme for week #12: TBD
- Nov. 24 **Presentation #9**
Draft Resumes Due
- Nov. 26 NO CLASS: **Thanksgiving!**
- Dec. 1 **Op-ed assignment due**; class discussion
- Dec. 3 Final Discussion – a return to the key questions posed in the syllabus
Course Debriefing
- Dec. 18th **Final Exam Period: ETS Standardized Test**
8:30 a.m.

Timeline and Important Suggestions for Writing Your Research Papers

Timeline:

- Topic due to Dr. Husic on September 17th at the beginning of class.
- The focus of your paper and talk should be on some area of contemporary life science research. I expect you to focus on specific research studies (primary literature) but you should also include commentary on the impact of this research (its significance) and why it is controversial – either within the scientific community or amongst the general public. I would expect you to also discuss your personal thoughts on why you chose this topic and whether you think the controversy is justified or not.
- Outline for seminar and paper due to Dr. Husic on October 2nd by 5:00 pm.
- Rough draft of your paper due two weeks prior to presentation date.
- Abstract and copy of one of your primary articles due to professor to be placed in student room in Collier (311) by 5:00pm one week prior to presentation date.
- All class members are to review speakers abstract and article and draft 1 to 2 questions for speaker – in writing and in advance of the presentation. These will be collected after each seminar along with any questions that you think of during the talk.
- Final paper due on day of your presentation! If you would like, you can write an addendum to your paper based on questions and feedback you get from the class during your oral presentation. For Tuesday presentations, this will be due on the following Friday. For Thursday presentations, this will be due on the following Monday.

Expectations:

- Your research paper and oral presentation are to be a **review and analysis** of scientific research projects reported by various scientists on your topic – do not give a summary of only one research paper. As noted above, include discussion on the broader impact of the research.
- You are expected to cite a minimum of **three primary scientific papers** and **two secondary references**.
- You are to submit copies of all primary literature **sources** with the rough draft of your paper.
- Your primary article to be shared with the class should not be from work published prior to 1998.
- Any figures or images should be attached at the end of the 8 - 10 page paper (as an appendix) – do not place in the body of your paper. The figures should be numbered and have titles and, if taken from

some source, this should be noted. Technically, you should have permission to use figures from published sources (including the internet).

- Please visit the Writing Center if you are having difficulties in composing your final draft.

Grading Criteria for Research Paper:

Clarity of writing	Quality of writing (grammar, punctuation, etc)
Ability to summarize research information	Appropriate detail/content
Correct interpretation of data	Correct use of key terms
Appropriate References	

Timeline and Important Suggestions for Oral Presentations

Timeline:

- Same as for paper (see previous page).

Expectations:

- See attached seminar evaluation sheet to get a sense of what your peers and I will be evaluating you on.
- Oral presentations must include a Power Point slide show which will be submitted to Dr. Husic on the day of your presentation.
- Oral presentations should be a minimum of 35 to 40 minute, but should not exceed 50 minutes. Plan on approximately 10 minutes of questioning from your audience.
- Topic due to Dr. Husic on September 17th at the beginning of class (the topic for your paper and presentation is the same although the specific content of each may vary).
- Practice, practice, practice! This is the way to gain familiarity with your presentation content, to gain confidence and to diminish the dependence on reading your notes during your actual talk. When you practice – do so with your Power Point presentation projected so you can also practice pointing out key information on your slides.
- Remember the importance of appearance, poise, etc. during a professional presentation. Developing confidence and presenting yourself in a professional manner will go far in helping you during interviews, future presentations for your career, etc.

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“*Contemporary Controversies in the Life Sciences*”
Class Outline for Weeks # 1 - 2

<u>Date</u>	<u>Topic</u>
Sept. 1	Personal introductions Overview of class and expectations/Review of syllabus Discussion of course themes Criteria for Paper and Oral Presentation/Selection of Presentation Dates Review of course themes Brainstorm about contemporary controversies in the life sciences Readings for 9/3/09: <ul style="list-style-type: none">• From Text: “How and Why Biologists Write”, pp. 1 - 4• Readings from John Kricher, <u>The Balance of Nature</u>. <u>Ecology’s Enduring Myth</u>, Chapters 1 & 3
Sept. 3	Discussion: Readings from Kricher: Identifying scientific ideas that we got wrong; Creating and changing paradigms in science. Historical controversies: The composition of matter; theories of disease
Sept. 8	Continue discussion on theories of disease; dispelling incorrect beliefs. What scientific breakthroughs enable us to better understand disease and to largely dispel the previous views of what caused disease? Assignment #1: Contemporary disease myths (see below for details) Readings for 9/10/09: <ul style="list-style-type: none">• From Text: “Locating and Using Biological Literature”, pp. 5 - 32 Assignment for 9/10/09: <ul style="list-style-type: none">• Find an internet-based source that challenges our concepts of modern day medicine and scientific views of the causes of disease.• Note the source of this site and the information (author, affiliation, specific studies cited, etc.)• Draft a short summary of the information and be prepared to present in class on 9/10/09• See if you can find a <u>primary</u> scientific reference to either support or refute one of the claims or concepts presented in your internet resource.
Sept. 10	Students discuss results of Assignment #1 Discussion on contemporary disease myths Introduction - searching the literature/citations/developing bibliographies Introduce Assignment #2: Investigating the reactions to some key scientific breakthroughs

Assignment #2 – Due 9/22/09 (to be presented to the class)

Choose one of the following individuals to explore: Gregor Mendel, Barbara McClintock, Peter Mitchell, Stanley Prusiner, Thomas Cech, Lynn Margulis, Rachel Carson, Richard Dawkins, or Theo Colborn. You will need to do a bit of research to find out what the scientific breakthroughs your chosen scientist was responsible for. What was the immediate reaction to what the scientist was proposing/reporting? (Be sure to note where you find this information.) In what circles was the research doubted or controversial? What led to the eventual acceptance of the research? What is the status of your scientist's reputation and the importance of their findings today?

Reading for 9/15/09:

- From text: "Documenting the Paper", pp. 137 - 166

Reading for 9/24/09

- Science, Evolution, and Creationism; The National Academies Press, 2008
available from <http://www.nap.edu/catalog/11876.html> or on BlackBoard.

Sept. 15 Library Session with Dorothy Glew; meet at the library (location to be announced)