Department: MCB

Course No.: 1405

Credits: 3

Title: Honors Core: The Genetics Revolution in Contemporary Culture

Contact: David Knecht

Content Area: CA 3 Science and Technology

Catalog Copy: MCB 125 (MCB 1405) Honors Core: The Genetics Revolution in Contemporary Culture Second Semester. Three credits. Open only to freshmen and sophomores in the Honors Program. R. O'Neill, M. O'Neill. Exploration of the use of genetics concepts in popular culture. Topics include genetic analysis, genetic engineering, cloning and DNA forensics as represented in media including news, film, literature and art. Discussion includes influence on society, attitudes towards science, domestic and foreign policy as well as medical practice and law.

Justification:

1. Reasons for adding this course: Introduce a Gen Ed 100's level course in Group Three: Science and Technology that will be incorporated into the Honors Core Curriculum. This satisfies the proposal guidelines for the 2006 Honors Interdisciplinary Course Development Grant Competition.

2. Academic Merit: Paradigm shifts in the sciences often have immediate repercussions in society and culture. Relativity and quantum mechanics ushered in the nuclear age and irrevocably altered, and still alters, the geo-political landscape. While fragments or "knowledge bytes" of a scientific revolution sometimes filter into culture –Einstein's iconic formula, E=mc2, for example—the lay public is not usually compelled to assimilate a working knowledge of the new science. The genetics revolution has changed that. Obtaining an appropriate health care regimen may require that a patient know the complex inheritance of a multigenic disease; trial by jury may require jurors to understand population genetics at the level of a graduate student in the field. The knowledge that has filtered into culture from the genomics revolution informs, for better or worse, debates at the core of modern society. Traditionally, science courses are geared to those students who will pursue an undergraduate career in a science discipline. Advances in genetic analyses and technologies, and more importantly the impact of such advances on policy, medicine and healthcare, have created a dilemma for instructors of undergraduate science courses: attracting and educating students, of all disciplines, in genetics.

Various media forms used in popular culture profoundly influence our view of society and modern science. For example, advances in genetic engineering formed the backdrop of Michael Crichton's bestselling book, and eventual blockbuster film, Jurassic Park. Unfortunately, the lay public often has difficulty separating fact from fiction; soon after the release of this film, fears that scientists would really develop new dinosaur breeds became the fodder of many news clips

and talk shows. Nevertheless, movies, books and art that embrace science can provide educators with the case-studies from which to develop a genetic curriculum for the student who is likely not to pursue a career in science.

Syllabus: -a. Course Goals: This course will introduce students to genetics and genetic technologies. Various forms of popular culture, including news clips, movies, books and art will be used to provide a framework for the syllabus and will introduce students to various genetics and technology topics. A textbook will be used for the scientific material, which will be discussed in the context of the interpretation of science in modern society. The students will learn the scientific principles of genetics and genetic technology as well as the impact these topics have had on our culture, attitudes towards science, domestic and foreign policy as well as medical practice and law.

b. Course requirements: Three exams will be offered in essay format and will constitute 50% of the final grade. Participation in discussion groups will constitute 30% of the final grade. Discussion in these groups will be facilitated by teams of students each week who will prepare discussion topics based on class material and guest lectures. The final 20% of the grade will be a journal that each student will keep over the course of the class. This will highlight their perceptions of the topics and media presentations over the time-line of the course, with a final assessment of changes in personal attitude based on course components.

c. Major themes, topics etc: Topics covered will be supplemented with lectures and a required scientific text. The inclusion of several guest lecturers from different departments at UCONN will be sought to facilitate the blending of real-world examples of scientific discovery with the interpretation of these discoveries in popular culture and their incorporation into societal attitudes.

Justification: Explores the use of genetics concepts in popular culture. Topics include genetic analysis, genetic engineering, cloning and DNA forensics in the context of how they are used in various forms of media including news, film, literature and art. Discussion includes influence on society, attitudes towards science, domestic and foreign policy as well as medical practice and law.

Course Information: Three exams will be offered in essay format and will constitute 50% of the final grade. Participation in discussion groups will constitute 30% of the final grade. Discussion in these groups will be facilitated by teams of students each week who will prepare discussion topics based on class material and guest lectures. The final 20% of the grade will be a journal that each student will keep over the course of the class. This will highlight their perceptions of the topics and media presentations over the time-line of the course, with a final assessment of changes in personal attitude based on course components.

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blending of real-world examples of scientific discovery with the interpretation of these discoveries in popular culture and their incorporation into societal attitudes.

Meets Goals of Gen Ed::

1. Become articulate: Students will be required to facilitate dialog in discussion groups in a panel format. This will require preparation and presentation of the topic to be discussed as well as skills in mediation.

2. Acquire intellectual breadth and versatility: Students will be introduced and examined on topics in genetics as well as policy, law, culture and influences on public perception and attitudes.

3. Acquire critical judgment: The journal prepared by each student will present a critical assessment of the topics, both scientific and cultural, over the course of the class. This will be an evolving document that should culminate in a synthesis on how scientific problems and solutions are presented and interpreted in modern society.

4. Acquire moral sensitivity: Ethical topics will be covered in class from the scientist's perspective, including stem cell research, cloning and prenatal testing.

5. Acquire awareness of their era and society: This will be covered through the scientific material (i.e. the research as it stands today) and through the cultural material (how society interprets this information and how such information can be used to market a product, i.e. movies).

CA3 Criteria:

1. This course will cover a broad range of genetics and genetic technology topics, supported by a required textbook. The cultural objects incorporate real or imagined applications and theory of genetic science. The relationship of these applications and theories to the current state of the field will be explored.

2. The concepts of genetic science presented in the cultural objects will be deconstructed in terms of the central tenets of scientific inquiry to discern the objectives of the authors as well as to critique the authors' own understanding of scientific method.

3. By incorporating modern genetic and technological advances into the material offered in this course, students will understand the current state of this technology and its limitations and potentialities.

4. By critically examining the integration of genetic science in post-modern culture it is hoped that students, whether pursuing science degrees or not, will develop the critical faculties to understand the uses and misuses of genetic
science.

Role of Grad Students: The TA will be responsible for grading, offering help sessions, and facilitating discussion during "break out" discussion sections.

Supplementary Information:

MCB125 Honors Core: The Genetics Revolution in Contemporary Culture. Second Semester. Three credits. Open only to freshmen and sophomores in the Honors Program. *R. O'Neill, M. O'Neill*.

Explores the use of genetics concepts in popular culture. Topics include genetic analysis, genetic engineering, cloning and DNA forensics in the context of how they are used in various forms of media including news, film, literature and art. Discussion includes influence on society, attitudes towards science, domestic and foreign policy as well as medical practice and law.

Examples for current and future offerings:

Film:

GATTACA; Genetic engineering, DNA typing and profiling; Legal implications, ethics of eugenics, social implications of genetic technology, use of science fiction in postmodern film, efficacy of genetic determinism.

Boys from Brazil, The Island; Cloning by nuclear transfer; Ethics of cloning, egg donation, "nature vs nurture", therapeutic cloning policy and societal impact.

Bladerunner, Lilo and Stitch; Genetic engineering and embryonic stem cell manipulation; Start of "life", legal rights of embryos, genetic manipulation, science fiction in children's films.

Corn; Transgenic plants; "Frakenfoods", environmental and health risks, policy and land management.

Literature:

Darwin's Radio, G. Bear; Landscape of the human genome, structure and function of genes, DNA and "junk DNA", viral evolution; Impact of viral evolution on society, epidemiology of pandemics, globalization of health care management.

Intuition, A. Goodman; Research society and education; Pressures posed by grant-driven research, psychological impact of "publish or perish".

Non fiction works (excerpts):

Genes in Conflict: The Biology of Selfish Elements, Burt and Trivers; Mechanisms and consequences for genomes of the action of mobile DNA; Evolution and cognition.

Natural Selection and Social Theory: Selected Papers of Robert Trivers; The influence of intragenomic conflict on the expression of genes; behavioral evolution and sociobiology, the structure of human families and societies.

Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life, E. Jablonka; Epigenetic inheritance and the assembly and propagation of chromatin structures; philosophical issues in biology and psychology.

Art:

Several exhibitions using DNA and genetic engineering as a central theme in mixed media presentations (photographs, oils, sculptures and mixed media) have been presented in a variety of venues. Selections of these "DNA Art" pieces will also be included in the curriculum to elicit dialog on the aesthetic influences that genetics has on our view of society and culture.

Attachment #1: Honors Core GEOC proposal (CA3), O'Neill

MCB 125

The Genetics Revolution in Contemporary Culture

Syllabus Spring 2008

Four exams will be offered in essay format; the grades of the three highest will constitute 50% of the final grade. Participation in discussion groups will constitute 30% of the final grade. Discussion in these groups will be facilitated by teams of students each week who will prepare discussion topics based on class material and guest lectures. The final 20% of the grade will be a journal that each student will keep over the course of the class. This will highlight their perceptions of the topics and media presentations (including the art introduced in each lecture) over the time-line of the course, with a final assessment of changes in personal attitude based on course components. All lectures are supported by textbook material as well as additional material to be distributed in each class.

Week:

- I. a Jan 23: Introduction-Advances that contributed to the field of Genetics; tour of Genome Space (pg 17)

Discussion: Class expectations, discussion assignments, and journal guidelines

- II. Jan 28: DNA and the Genetic Code: Replication and recombination (pp 42-58)

Jan 30: Mendelian inheritance (pp 138-176)

Discussion: Genetics problems and help session

III. Feb 4: *GATTACA*

Feb 6: *GATTACA*

Discussion: Eugenics, ethics of DNA profiling

IV. Feb 11: PCR, sequencing and DNA typing techniques (pp 60-79)

Feb 13*: Mutation, Polymorphism, Chromosomes (pp176-207)

Discussion: Who "owns" DNA rights?

V. Feb 18: Epigenetic inheritance (pp228-236)

Feb 20: *GATTACA*: deconstructed

Discussion: Fallacy of genetic determinism

VI. Feb 25: EXAM I

Feb 27: *Boys from Brazil*

Discussion: *Boys from Brazil*

VII. Mar 3: Stem cells and pluripotency (pp 298-307)

Mar 5: Nuclear transfer and cloning (cells and embryos) (pp 420-422)

Discussion: ethical considerations of egg donation and surrogacy

VIII. SPRING BREAK:

IX. Mar 17: Epigenetic defects and cloning

Mar 19: Gene manipulation and chimeras

Discussion: Individualism and clones

X. Mar 24: Current topics in cloning: the newest primate clone

Mar 26: *Boys from Brazil*: deconstructed

Discussion: exam review, *Oryx and Crake*: first impressions

XI. Mar 31: **EXAM II**

April 2: Genetic engineering in plants: methodologies

Discussion: Development of new food sources through transgenics

XII. April 7: Genetic engineering in plants: Bt corn

April 9: Genetic engineering in animals: knockouts and knockins

Discussion: Genetic technologies: the impact of local vs international implementation of genetic manipulation

XIII. April 14: Genetic engineering in animals: *gfp* constructs, "smart" mice

April 16: Economy of genetic engineering

Discussion: Ethics of gene manipulation/transgenics in medicine

XIV. April 21: Genotype to phenotype

April 23: Engineered organisms and natural selection

Discussion: The "Mad Scientist" and Contemporary Culture

XV. April 28: *Oryx and Crake*: deconstructed

April 30: **EXAM III**

FINAL EXAM

Required Reading: (can be found in the UCONN COOP)

Color Atlas of Genetics, 3rd Edition

E. Passarge, 2007

Oryx and Crake

M. Atwood, 2003

Supplemental Reading: (on reserve in Babbidge Library)

Principles of Gene Manipulation : an introduction to genetic engineering

Old, RW and Primrose, S.B., 1985

An Introduction to Genetic Engineering

D. Nicholl, 2002

Other good texts: (can be purchased from publisher)

A Primer of Genome Science

G. Gibson and S. Muse, 2002

From Genes to Genomes

J. Dale and M. von Schantz

Genomes 2nd edition

T.A. Brown

Attachment #2: Honors Core GEOC proposal (CA3), O'Neill

Specific Criteria for Content Area: An example derived from weeks I-V of the course (this is NOT all inclusive but is illustrative of the coverage of these topics in the current syllabus).

"Courses appropriate for Group III- Science and Technology - must acquaint students with scientific thought, observation, experimentation, and formal hypothesis testing, and enable students to consider the impact that developments in science and technology have on the nature and quality of life. Courses in this group should meet the following criteria:

1. Explore an area of science or technology by introducing students to a broad, coherent body of knowledge and contemporary scientific or technical methods;

GATTACA: This film will be used as the "case" to introduce students to the topics of Mendelian inheritance, epigenetic inheritance and the methodologies used in DNA typing, such as PCR, sequencing and RFLP analyses.

2. Promote an understanding of the nature of modern scientific inquiry, the process of investigation, and the interplay of data, hypotheses, and principles in the development and application of scientific knowledge;

Following the lectures based on the genetics and techniques behind current DNA typing methodologies, genetic determinism and Mendelian genetics, we will then "deconstruct" the film. We will examine the science in the film and discuss inaccuracies in scientific content. This analysis will include an examination of the possible motives of the author and director in their use of poetic license in the presentation of the scientific material and whether truly accurate scientific content would have affected the film's story line.

3. Introduce students to unresolved questions in some area of science or technology and discuss how progress might be made in answering these questions; and

The full analysis of the technologies and theories presented in *GATTACA* in the context of the technologies in use today will instruct students in the limitations and "real life" applications of genetics and genetics technologies.

4. Promote interest, competence, and commitment to continued learning about contemporary science and technology and their impact upon the world and human society.

Each student will participate in discussions on ethics and legal topics presented in the film, including eugenics, the ethics of DNA profiling, who has legal purview over DNA samples and the fallacy of genetic determinism. Students will be expected to reflect on these in their journals, based on both their own personal experiences as well as their academic progress on the course material.