

Term Information

Effective Term Autumn 2015
Previous Value Autumn 2014

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

We are requesting GE status in the Natural Science (Biological Science) category and changing the course number.

What is the rationale for the proposed change(s)?

This course meets the rationale and learning outcomes for the GE category or categories we are requesting, as outlined in the Curriculum and Assessment handbook. This is not an advanced course and we fear the current number would deter otherwise qualified students from enrolling.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

N/A

Is approval of the request contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area Anthropology
Fiscal Unit/Academic Org Anthropology - D0711
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 3597.04
Previous Value 4597.04
Course Title The Molecular Revolution: Genes, Genomes, and Genomania
Transcript Abbreviation Molecular Rev
Course Description Interface of genetic technology, genome project, and health against background of societal tensions, genomania, and dilemmas of genetic testing, and repercussions of molecular revolution.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week, 7 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites

[Previous Value](#)

Prereq: Jr or Sr standing.

Exclusions

Not open to students with credit for 597.04 or 4597.04.

[Previous Value](#)

Not open to students with credit for 597.04.

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code

26.0807

Subsidy Level

Baccalaureate Course

Intended Rank

Sophomore, Junior, Senior

[Previous Value](#)

Junior, Senior

Requirement/Elective Designation

General Education course:

Biological Science; Cross-Disciplinary Seminar (597 successors and new)

[Previous Value](#)

General Education course:

Cross-Disciplinary Seminar (597 successors and new)

Course Details

Course goals or learning objectives/outcomes

- Students should have a working knowledge of genomics, to the course materials along with additional readings on multiple applications of genetics to modern life.
- Students will be able to identify both proper scientific and misuses and abuses of genetic data in the scientific literature and other outlets for genetic information.
- Students will understand the ongoing molecular revolution, including its differential manifestations in developing and developed nations, consequences of increasing gaps between professional and public understandings of modern genes and genomes.
- *Goals NA*

[Previous Value](#)

Content Topic List

- Interface of genetic technology.
- Molecular Anthropology
- Genetics
- Disease
- Adaptation

COURSE CHANGE REQUEST
3597.04 - Status: PENDING

Last Updated: Haddad,Deborah Moore
10/29/2014

Attachments

- Dr Larsen letter 10 07 14.doc: Chair's Letter
(Cover Letter. Owner: Freeman,Elizabeth A.)
- 3597.04 GE Assessment plan.docx: GE Assessment Plan
(GEC Course Assessment Plan. Owner: Freeman,Elizabeth A.)
- 3597.04 GE Rationale.docx: GE Rationale
(GEC Model Curriculum Compliance Stmt. Owner: Freeman,Elizabeth A.)
- 3597.04 Syllabus.doc: Syllabus
(Syllabus. Owner: Freeman,Elizabeth A.)

Comments

- Please bear in mind that OAA has set aside the following numbers for courses that have GE Cross-Disciplinary seminar: 3597, 4597 *(by Vankeerbergen,Bernadette Chantal on 10/28/2014 02:56 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Freeman,Elizabeth A.	10/22/2014 03:18 PM	Submitted for Approval
Approved	McGraw,William Scott	10/23/2014 08:51 AM	Unit Approval
Approved	Haddad,Deborah Moore	10/23/2014 11:56 AM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	10/28/2014 02:57 PM	ASCCAO Approval
Submitted	Freeman,Elizabeth A.	10/29/2014 08:05 AM	Submitted for Approval
Approved	McGraw,William Scott	10/29/2014 08:08 AM	Unit Approval
Approved	Haddad,Deborah Moore	10/29/2014 09:45 AM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler Hogle,Danielle Nicole	10/29/2014 09:45 AM	ASCCAO Approval



Department of Anthropology

4034 Smith Laboratory
174 West 18th Avenue
Columbus, OH 43210-1106

Phone (614) 292-4149
Fax (614) 292-4155
<http://anthropology.ohio-state.edu>

7 October 2014

Dear Curriculum Panel Members,

I am pleased to submit this curricular bundle for your review. This bundle includes a number of new courses, courses for General Education consideration, and several course changes. These submissions reflect the evolving profile of our teaching mission and what we have to offer our students and the institution generally. The Department of Anthropology has taken on one of its biggest curriculum revisions, involving both undergraduate majors (Anthropological Sciences, Anthropology) and graduate program, in its recent history. I am excited to endorse all of these submissions, and look forward to implementing the revisions to the Anthropology curriculum.

Best regards,

A handwritten signature in blue ink that reads "Clark S. Larsen".

Clark Spencer Larsen
Distinguished Professor of Social and Behavioral Sciences and Chair

Genes, Genomes, and Genomania: The Molecular Revolution Anthropology 3597.04

Instructor: Douglas E. Crews, crews.8@osu.edu 4004 Smith Laboratory, 292-1329

Lectures: MWF 9:10 – 10:05 AM Smith Laboratory 1076

Office hours: MWF 11:15 PM – 12:15 PM & by appointment

Texts: Assigned Weekly Readings

Curriculum Fulfillment:

This is a core course in the **Evolutionary Studies Minor**. Information on the Evolutionary Studies Minor and requirements may be found at <http://artsandsciences.osu.edu/interdisciplinary>.

GE LEARNING OUTCOMES WILL BE ADDED IF APPROVED

Expected Learning Outcomes for this course:

After successful completion of this course, you will have, the ongoing molecular revolution, including its differential manifestations in developing and developed nations, consequences of increasing gaps between professional and public understandings of modern genes and genomes and be able to identify both proper scientific and misuses and abuses of genetic data in the scientific literature and other outlets for genetic information. By the end of this course you should have a working knowledge of genomics, to the course materials along with additional readings on multiple applications of genetics to modern life.

Course Description:

The molecular revolution started with an understanding of the double helix. Since then genetics have influenced human health and food production, forensic identification techniques, reproductive choices and expanded understanding of human biological variation and evolutionary biology. Advances in producing genetically modified food, organisms and spare organs from stem cells and 3-D copying are leading to a brave new world while also producing worldwide controversies and suggestions of a new eugenics on the horizon. This class explores recent advances in human understandings of genes, microbiomes, RNA, genomics and their broader scientific and social implications. To explore uses and misuses of genetic information and technology a basic understanding of genetics and evolutionary theory are needed. This will be provided through lectures, readings and writing assignments that form the core of this class.

“Students with disabilities that have been certified by the Office for Disability Services will be accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.”

Course Requirements:

Active class participation	15%
Response papers/Critiques	15%
Quizzes	30%
Research paper	20%
Research paper presentation	10%
Midterm	10%

1) Active Class Participation – 15%

Class participation includes participation in class debates, timely submission of article critiques, being discussion leader, and regularly attending class. Participation is a major aspect of this grade. Attend class regularly to receive full credit. Missing a class is not an excuse for not knowing material, information, or completing assignments. Attendance is recorded regularly throughout the semester and will be reviewed when final grades are determined. Be sure to bring assigned readings to class in order to participate fully in discussions.

2) Five 1-page Critiques of Assigned Readings – 15%

During the semester, you will write 5 critical responses to readings from the course reading list. Hard copies of response papers are due at the beginning of the class in which we will discuss your assigned reading. Do not send response papers to me by e-mail. Response paper grades will reflect how well you explain the paper’s data/evidence, clarity of your report and of course your grammar, spelling, and adherence to guidelines.

Critiques are one-page, typed, double-spaced, with 1-inch margins on all sides, 12 point, Times News Roman font. Do not waste space with headers or paper titles. Include only your name and date on a single line at the top. These are **critiques not summaries of the article!** You are to critical respond to the article by presenting your thoughts on the topic and provide a critical opinion (positive/negative) of what the author(s) intended for readers to accept and believe? Use specific examples to support your critiques.

3) Quizzes – 30%

There will be 7 quizzes throughout the semester, each worth 5% or your final grade. They will cover material discussed in class lectures and discussions. Be sure to keep up with all readings! If you miss a quiz there will be no make-up. However, the lowest quiz grade, including a miss, will be dropped.

4) Review Paper – 20%

1) **Topic/Concept:** Include: Title, Research Question, and Thesis Statement in 20 words, and bibliographic information for three peer-reviewed articles along with their first pages. Topics will be discussed in class. Paper topics must be pertinent to some aspect of the course materials and how the genetic revolution influences human health, behavior, diet or physiology. Use a broad focus. A research question states the specific topic your paper is addressing, a one sentence summary. Prepare Title, Research Question, and Thesis Statement on a 3x5 inch notecard (available from instructor), **due week 6**.

2) **Abstract:** Submit a 150-word abstract of your term paper. Abstracts are summaries highlighting the topic, research question, argument, and conclusions. It is **not a proposal on what will or could be written later**. Abstracts must be logical and concise, and will be discussed in class. Use one of the assigned readings as an example. When due please bring 2 copies to class with you, **due week 9**.

3) **Presentations: (10%):** You will make a 10-15 minute presentation of your paper the last 2-3 weeks of class. This will be a visual presentation using PP or Prezi. Load on classroom computer before class begins. Your grade will depend on argument strength, evidence, poise, clarity, creativity, and your ability to answer questions about your presentation. All students are expected to attend all presentations and ask questions at the end of each presentation. If you miss more than 1 day of student presentations without a documented excuse, you will be docked 1 unit of the total participation grade for the semester.

4) **Paper: (20%):** You will submit a hardcopy of your 7-8-page paper during the final week of class. The purpose of papers is to develop writing skills and explore a course topic in depth. You are encouraged to construct a well-substantiated argument addressing genes, genomes, GMOs, influences of genetics and genomics of medicine, health or reproductive behaviors or use/abuse of genetic information for your topic. You will be graded on the strength of your data and analyses, evidence, clarity, spelling, grammar and adherence to instructions. **Although I do not provide possible paper topics, we will work through these in class. Topics may not overlap greatly. Papers must include at least 2 figures or tables, page numbers, section headings and a title page.**

5) Midterm – 10%

Paper Guidelines – Type papers double-spaced with 1-inch margins, Times New Roman, 12 point font, have page numbers, and staple before turning in to instructor during the final two weeks of class. Follow the Harvard Style citation format. Relate your topic back to material discussed in class. To backup your arguments and provide sufficient background, you must have a minimum of 10 primary sources for your paper. **Internet websites other than .gov are not acceptable primary sources.** Failure to cite properly constitutes *plagiarism*. Whenever you relate an idea that is not your own, you must provide a citation, whether or not you are paraphrasing. Do not use direct quotes except for emphasis or introducing a subject. Figures and tables require parenthetical citation at the end of the first sentence addressing them in the text, like this: (Figure 1). They also both need a caption; figure captions go at the bottom of the figure (ex. “Figure 2: Decline in population...”), whereas, table captions go at the top before the table itself (ex. “Table 5: Decline

in family wealth...”). Also, always list references to any figure you copy or the data sources for any figure/table you develop on your own at the bottom of the figure or table and in the references cited listing.

Be sure to include the following in your paper:

- Cover/Title page with your paper’s title, your name, class, date, and the paper abstract
- Number pages consecutively, title page does not included in text page count
- Include at least 2 Figures/Tables at the end of the paper after references
- Use MAJOR HEADINGS in BOLD LETTERS and Minor Headings in This Style
- INTRODUCTION, METHODS, RESULTS, DISCUSSION, CONCLUSION ARE BOLD
- List all references cited in your text

Citation Format:

Harvard style: http://authorservices.wiley.com/reference_text.asp?site=1#harvard

Another style: <http://onlinelibrary.wiley.com/doi/10.1002/ajpa.21365/pdf>

Class/Discussion and Conduct: The format of this course is lecture and student participation in discussion. Some topics may be sensitive for some. Be respectful of others in the classroom during any discussions. Everyone has the right to 1) be addressed in a respectful manner, 2) be listened to without interruption, and 3) feel safe in our classroom. No one has the right to threaten, harass or demean others in class. Please maintain a professional demeanor, address others respectfully and listen without interruption; attempt to identify and understand multiple sides of all issues; analyze and critique ideas, not people presenting ideas. Additionally, do not text or search the Internet during class as this distracts from learning. Bring ASSIGNED READINGS TO CLASS EVERY DAY. You may use a laptop for class materials, however, do not surf the internet during classes.

Grading: Letter grades are based on a standardized scale using the total points earned for all assignments. Grades are earned – the instructor does not “give” them. You can check your general progress by comparing your score against the following scale: 93-100=A; 90-92=A-; 87-89=B+; 83-86=B; 80-82=B-; 77-79=C+; 73-76=C; 70-72=C-; 67-69=D+; 60-66=D; <60=E. University rules, do not allow instructors to discuss grades over the phone or through e-mail. You must see the instructor in person to discuss your grade. Do not call the Department of Anthropology office regarding grades, as you will only be directed to see your instructor.

Late Assignments: If you miss any assignment, e-mail me within 24 hours of the due date. Late assignments receive full credit only if accompanied by appropriate documentation accounting for *each day late*. Assignments turned in late without such will drop in grade by 10% of their total per day. One day is a standard calendar day, not a class period. E-mailed late assignments are not accepted without prior approval.

Academic Misconduct: All students should be familiar with the rules governing alleged academic misconduct. See the Code of Student Conduct, Chapter 3335-25, in The Ohio State University Handbook for further details on what constitutes academic misconduct. All students should be familiar with what constitutes academic misconduct, especially as it pertains to plagiarism and test taking. Ignorance of the rules governing academic misconduct or ignorance of what constitutes academic misconduct is not an acceptable defense. Alleged cases of academic

misconduct will be referred to the proper university committees. “It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.”

Reading Schedule

Changes to scheduled readings, quizzes, and assignments will be announced in class. If you miss a class, it is your responsibility to contact the instructor regarding announcements you may have missed and a fellow student for any class notes. All course readings may be found online through OSU. Search the university library catalogue of electronic journals or ISI for readings.

Week	Class activities
01	Lectures – Introduction to genes, loci, proteins, genomics and proteomics – Why anthropology – Environment of Evolutionary Adaptation (EEA) – Reading the Scientific Literature – the omics revolution, microarrays, CRISPR
02	Epigenetics and microRNAs – Changing health in the 19 th through 21 st centuries – Personalized or Impersonal medicine and Genomics
03	From DNA to phenotypes. Common genetic variation and human traits Genomics and its impact on science and society (see genomics.energy.gov) The HLA system, Cloning, Forces of Evolution – Quiz 1
04	Evolution in action: SARS, CCR5-delta32, single locus and multi-locus conditions, antagonistic pleiotropy, epistasis, gene-environment interactions – Modern Human Variation – Ecological Fallacies – The New Eugenics
05	Biological determinism, sociobiology, natural experiments, heritability, non-communicable diseases and chronic degenerative conditions, cholesterol, salt, integrating genetics with epidemiology, evolutionary medicine and the future – Quiz 2
06	Readings, critiques, discussions: “Impersonal Genomics and Anthropology” Adam Van Arsdale, Anthropology News 21 September 2012 (Available from Instructor) “Common genetic variation and human traits” David B. Goldstein, New England J Med 360:17, 23 April 2009 “Rethinking behavioral genetics” Dean Hamer, Science 298:71-72, 4 October 2002. “Altered States” Carina Dennis, Science 421:686-688, 13 February 2003. PAPER TOPIC NOTECARD AND 1ST PAGES OF 3 ARTICLES DUE Discussion of titles and topics
07	“The double puzzle of diabetes” Jared Diamond, Nature 423:599-602, 5 June 2005. “Nature, nurture and human disease” A. Chackravarti & Peter Little, Nature 421:412-414, 23 January 2003.

“Gene-culture coevolution between cattle milk protein genes and human lactase genes”
Beja-Pereira et al. *Nature Genetics* 35(4):311-313. 2003

“Private and public eugenics: Genetic testing and screening in India”
Jyotsna Gupta, *Bioethical Inquiry* 2007 4:217-228.

Quiz 3

08 “Your genes and privacy” Louise M. Slaughter, *Science* 316:797, 11 May 2007
“ASHG statement on direct-to-consumer genetic testing in the US” Kathy
Hudson et al for the ASHG Social Issues Committee, *Obstetrics &
Gynecology* 110(6):1392-1395. 2007.

“The prospect of genome-guided preventive medicine: A need and opportunity
for genetic counselors” Julianne M. O'Daniel, *J Genetic Counsel* 19:315-
327. 2010

Guest Lecturer: Heather Hampel, CGC, Genetic Counselor The James

09 “Influence of life stress on depression: Moderation by polymorphism in the
5-HTT gene” Avshalom Caspi et al, *Science* 301:386-389.

“Genetic variation, classification and 'race'” LB Jorde & SP Wooding, *Nature
Genetics Supplement* 36(11):528-533. November 2004.

“Double helix jeopardy” Simon A. Cole, *IEEE Spectrum* August 2007, pp 44-49.

“Tales of a prehistoric human genome” Elizabeth Pennisi (with Ann
Gibbons), *Science* 323:866-877.

“How does scientific risk assessment of GM crops fit within the wider risk
analysis?” Katy L. Johnson, AF Raybould et al, *TRENDS in Plant Science*
12(1):1-5 2006.

Quiz 4 PAPER ABSTRACTS DUE – Discussion of abstracts

10 “Maize plants: An ideal production platform for effective and safe molecular
pharming” Koreen Ramessar et al, *Plant Science* 174:409-419 2008.

“Human health concerns with GM crops” Trish Malarkey, *Reviews in Mutation
Research* 544:217-221 2003.

“How does scientific risk assessment of GM crops fit within the wider risk
analysis?” Katy L. Johnson, AF Raybould et al, *TRENDS in Plant Science*
12(1):1-5 2006.

“Consumer risk perceptions toward agricultural biotechnology, self-protection,
and food demand: The case of milk in the US” Lydia Zepeda et al, *Risk
Analysis* 23(5):973-984 2003

11 “Gene patenting: Is the pendulum swinging back?” Aaron S. Kesselheim & MM
Mello, *New England J of Medicine* 362(20):1855-1858, 20 May 2010

“Did the end of smallpox vaccination cause the explosive spread of HIV?”
Science Daily, 18 May 2010. *BioMed Central*

“First birth of an animal from an extinct subspecies (*Capra pyrenaica pyrenaica*)
by cloning” Folchira J et al, *Theriogenology* 71:1026-1034. 2009

“The dangers of diagnostic monopolies” Robert Cook-Deegan et al, *Nature*
458:405-406, 26, March 2009

Midterm

- 12 “Prenatal genetic testing kits sold at your local pharmacy: promoting autonomy or promoting confusion?” Modra L, *Bioethics* 20(5):254-263
 “Meet your unborn child – before it’s even conceived” *New Scientist*, 9 April 2014, www.newscientist.com/article/mg22229642.800-meet-your-unborn-child-before-it-s-even-conceived
 “Common DNA markers can account for more than half of the genetic influence on cognitive abilities” Plomin R et al, *Psychological Science* 24(4):562-568

13 **Student Presentations**

14 **Student Presentations**
 Quiz 7 FINAL SEMESTER PAPERS DUE

All readings will be available on Carmen and are also available through the library

Some additional references of possible interest:

Costa-Font, M; Gil, J; Traill, W. 2008. Consumer acceptance, valuation of and attitudes towards genetically modified food: Review and implications for food policy. *Food Policy*, 33(2): 99-111.

Crews DE, Williams SL. 1999. Molecular aspects of blood pressure regulation. *Human Biology* 71(4):475-803.

Crews DE, LJ Gerber. Genes, Geographic Ancestry, and Disease Susceptibility: Applications of Evolutionary Medicine to Clinical Settings. In: *Evolutionary Medicine and health: New perspectives*. WR Trevathan, EO Smith, JJ McKenna, eds. Oxford University Press: New York, pp.368-381, 2008.

Eaton SB, Strassman BI, Nesse RM, Neel JV, Ewald PW, Williams GC, Weder AB, Eaton SB, Lindeberg S, Konner MJ, Myserud I, Cordain L. 2002. Evolutionary health promotion. *Preventive Medicine* 34:109-118.

Ekberg, M. 2007. The old eugenics and the new genetics compared. *Social History of medicine*, 20(3): 581-593.

Eltis K. 2007. Genetic Determinism and Discrimination: A Call to Re-Orient Prevailing Human Rights Discourse to Better Comport with the Public Implications of Individual Genetic Testing. *The Journal of Law, Medicine & Ethics* 35(2): 282-294

Farrelly, C. 2007. Gene patents and justice. *The Journal of Value Inquiry* (2007) 41:147–163.

Gerber LM, DE Crews. 2007. Evolutionary Perspectives on Chronic Diseases: Changing Environments, Life Styles, and Life Expectancy. *Evolutionary Medicine*. WR Trevathan,

JJ McKenna, N Smith (eds.), Oxford University Press: New York, Chapter 18, pp. 443-469. 1999.

Glossary of Molecular Biology and Genetic Terms.

Guttmacher AE, Collins FS. 2002. Genomic Medicine – A Primer. NEJM 347:1512-1520.

Heyman, Y, Chavatte-Palmer, P, Fromentin, G, Berthelot, V, et al. Quality and safety of bovine clones and their products. *Animal*, 1(7): 963-972.

Hubbard R. 1995. Genomania and health. *American Scientist* 83: Jan-Feb, 8-10.

Miles, S; Ueland, O; Frewer, L. 2005. Public attitudes towards genetically-modified food. *British Food Journal*, 107(4-5): 46-262.

Rosenberg NA, Pritchard JK, Weber JL, Cann HM, Kidd KK, Zhivotovsky LA, Feldman MW. 2002. Genetic structure of human populations. *Science* 298(5602):2381-2385.

Takahashi, S, Ito, Y. 2004. Evaluation of meat products from cloned cattle: Biological and biochemical properties. *Cloning and Stem cells*, 6(2): 165-171.

Underkuffler LS. 2007. Human Genetics Studies: The Case for Group Rights *The Journal of Law, Medicine & Ethics*, 35(3): 383–395.

Vakili, S; Caudill, MA. 2007. Personalized nutrition: Nutritional Genomics as a potential tool for targeted medical nutrition therapy. *NUTRITION REVIEWS*, 65 (7): 301-315 JUL 2007

Yoon PW, Scheuner MT, Khoury MJ 2003. Research priorities for evaluating family history in the prevention of common chronic diseases. *American Journal of Preventive Medicine* 24(2):128-135.

The New Scientist Meet your unborn child – before it's even conceived

09 April 2014 by Catherine de Lange Magazine issue 2964.

http://www.newscientist.com/article/mg22229642.800-meet-your-unborn-child--before-its-even-conceived.html?utm_source=NSNS&utm_medium=SOC&utm_campaign=facebookgoogletwitter&cmpid=SOC%7CNSNS%7C2012-GLOBAL-facebookgoogletwitter

COURSE CHANGE REQUEST

Anthropology 4597.04 - The Molecular Revolution: Genes, Genomes, and Genomania

Changes Proposed:

1. Add to the Natural Science (Biological Science) GE category.
2. Change course number to 3597.04 from 4597.04.

Rationale for Proposed Change:

This course is based upon hypothesis-driven research on the multiple uses of genomics and genes in the everyday life of humans in modern settings. Its objectives are multifold: 1) introduce students to the molecular revolution by providing them a working knowledge of genes, genomes, gene transfer and proteomics and the diversity of their application in food production, medicine, and pharmacology; 2) to use the molecular revolution as a platform for introducing the scientific methods and for illustrating major concepts in evolutionary biology as they are applied to research, discovery and problem solving; 3) help students understand how genomic knowledge crosses multiple fields beyond molecular biology and how molecular technology is changing humankind's view of health, illness, ethics, personhood, society and ethics. Most students, including those pursuing non-biological fields, have a working knowledge of genes, heredity and the molecular revolution. Helping them understand how the molecular revolution is affecting them provides an excellent entry to core concepts in natural (biological) sciences.

This course is constructed around 5 basic questions. 1) What are DNA, RNA, genes, alleles, genomes and proteins and how does DNA get translated into phenotypes? 2) What are the ways genetic information is modified via epigenetic markings, microRNAs, and by researchers who insert genes from one species into a different species (e.g.: CRISPER)? 3) How does molecular technology influence human health, food production, forensic identification, reproductive choices and modify human phenotypic variation? 4) What are the broader scientific and social implications of gene transfer and genomics and what are possible uses and misuses of genetic information and technology? 5) What are possible consequences of increasing gaps between professional scientific and public understandings of modern genes and genomes and how do molecular technology and genetically modified organisms differentially manifest in the worldviews of citizens from different nations? By discussing and answering these questions, students are introduced to multiple scientific topics and methodologies, including hypothesis testing, scientific method, evolutionary biology, natural and artificial selection, genomics, gene transfer, genetically modified organisms (GMOs), molecular biology, biotechnology, evolutionary medicine, pharmacogenomics, and personalized genomic medicine. The purpose of this course is not to make every student a geneticist or molecular biologist, rather by surveying the diversity of scientific, molecular, philosophical, ethical and practical issue surrounding the molecular revolution student learn how the scientific process works and the influences of society and culture on the progress of genetic and genomic information and applications.

NB: This course is approved as a core course within the Evolutionary Studies minor. It also is a physical anthropology elective within Anthropological Science (BS) and Anthropology (BA) majors.

Over the years since its inception, as a GEC, “The Molecular Revolution” has brought together an eclectic cross-section of ASC students majoring in fields ranging across art to molecular genetics and from psychology to math, as it still does. However, as evolving knowledge of not only the human genome, but those of many other species has grown, so have our understandings of how our DNA, RNA, and microbiomes interact with our diets (GMOs, organic foods), environments, and ecological settings to influence our physiology, health, and reproductive and behavioral choices. This has necessitated additions of materials on genomics, gene transfer, and proteomics to the course materials along with additional readings on multiple applications of genetics to modern life. This knowledge crosses multiple fields beyond molecular biology illustrating how molecular technology is changing humankind’s worldview and concepts of health, illness, ethics, personhood, society and ethics. The request to add this course to a Natural Science (Biological Science) GE is in keeping with these developments as the course fits the goals for Natural Science GE courses.

Support for this course being a Natural Science (Biological Science) GE:

- a. **Course objectives:** After successful completion of this course, you will have a working knowledge of genes, genomes, the ongoing molecular revolution, including its differential manifestations in developing and developed nations, consequences of increasing gaps between professional and public understandings of modern genes and genomes and be able to identify both proper scientific and misuses and abuses of genetic data in the scientific literature and other outlets for genetic information. By the end of this course you should have a working knowledge of genomics, gene transfer, and proteomics to the course materials along with additional readings on multiple applications of genetics to modern life. You should also understand how this knowledge crosses multiple fields beyond molecular biology and be able to illustrate how molecular technology is changing humankind’s worldview and concepts of health, illness, ethics, personhood, society and ethics.
- b. **Readings:** All reading for this course comes from primary sources, most published since 2000. The current reading list (included in the attached syllabus) has been updated regularly as the molecular revolution is a rapidly moving target. Early readings complement the lectures and concentrate of basics of genes, genomes, and current methods for examining DNA. Examples range from Neanderthals to mammoths and round-up ready plants and bt corn to pharming of pharmaceuticals in edible crops. As the course progresses readings explore increasingly complex regulatory, ethical, and legal issues that surround applications of genetic knowledge to medical settings, modifying plants and animals, and designing novel organisms and humans. These lead naturally to student’s written critiques and oral presentations of articles assigned as readings.

- c. **Topics:** DNA and its multifold relationships to knowledge and research reaches across the spectrum of evolving human knowledge. As such, the course covers basic genetics, epistasis, pleiotropy, gene-environment interactions, eugenics, ecological fallacies, genomics, gene transfer (CRISPR), proteomics, microbiomes, microRNAs, microarrays, quantitative trait loci, cloning, evolutionary biology, forces of evolution, non-communicable diseases, genetic epidemiology, genetically modified organisms (GMOs), molecular pharming, ethics, designer babies, and legal aspects of genetic patenting and the Genetic Information Non-Discrimination Act (GINA).
- d. **Written assignments:** Writing is an integral way that students manifest their understanding of course concepts, principles and theories presented in lectures and readings. Each week during the ten week readings section of the course each student turns in a critique of one of the assigned articles. They are expected to not only critique their assigned reading, but also to briefly state in class the major points of the paper. Critiques are returned too students weekly with comments for improving writing style and suggestions for writing their future research papers. Throughout the latter half of the course students develop their own semester research paper. This assignment begins with developing a topic based upon course topics and readings and personal inclinations, writing a brief title and 20-word description of their topic, and discussing their proposed topic in class during the 6th week of class. These will form the basis for abstracts due the 10th week. Each student will make a 10-15 minute oral presentation of their topic during the final weeks of the semester and turn in a review paper following guidelines of the APA. Papers and presentations are expected to be of a quality to be submitted for scientific meetings.

2. A course number change is requested because the 4000-level designation may prevent many interested 1st and 2nd year students from including this class in their curriculum.

Programmatic Implications:

Including this class in the Natural Science (Biological Science) GE category will not necessitate and programmatic changes within Anthropology.

Specific learning Outcomes of Natural Science (Biological Science) courses

1) Students understand the basic facts, principles, theories and methods of modern science.

Response: This course is concerned explicitly with the molecular revolution as it affects humans, their crops, animals, and all food sources. By examining applications of genetic and genomic information and methodologies to medicine, animal husbandry and farming students are exposed to hypothesis construction and testing in real-world situations such as exploring how well round-up ready plants, bt corn and cloned animals respond to the environment or may pass transferred

traits to their wild relatives. Thereby, they are introduced to the methodological approaches, principles and facts of modern genetics, gene transfer techniques, and uses of GMO in everyday diets. Students come to understand not only the dynamic self-correcting nature of scientific inquiry, but also the influences of sociopolitical forces thereon.

2) Students understand key events in the development of science and recognize that science is an evolving body of knowledge.

Response: “Genes, Genomes and Genomania” begins with lectures on evolutionary biology, genetics, genomics and proteins. This includes key events such as Darwin’s natural selection, Mendelian genetics, the new synthesis and the emergence of cloning and gene transfer technologies in the late 20th and early 21st centuries. It is these cutting edge methodologies and how they address current societal problems, food production using GMOs, molecular pharming of needed pharmaceuticals, and personal medicine that form the core of this class. Using this basis we explore not only the dynamic development of modern science, but also its evolving nature as genes and genomics are applied to multiple areas of human health.

3) Students describe the inter-dependence of scientific and technological developments.

Response: One of the major goals of this course is to illustrate how scientific developments in understanding genes and genomes are being transferred into technological advancements. These include new directions in medical care and disease interventions, improving availability and quality of food and cash crops and livestock, and producing needed pharmaceuticals using plants and animals via gene transfer.

4) Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

Response: Genes and genomics and their implications currently are at the forefront of ethical and scientific debates in applying biological sciences to improving the well-being of humankind worldwide. In some settings, such as the European Union (EU) all products containing GMOs must be labeled as such. In the United States (USA) over half of all foods on market shelves contain GMOs, but none need be so labeled. Interestingly, and an obvious contradiction to the EU, in the USA products not containing any GMOs are more likely to be labeled as such than are GMOs to be labeled. GMOs have aided many societies in feeding ever increasing numbers, while being almost outlawed in others. Across Africa the variation in those nations accepting versus outlawing GMOs is most obvious. Lack of understanding among many of the nature of DNA and transferred DNA in our diets is staggering. This course originally was designed to address issues of the contemporary world and the area of genomics, gene transfer and GMOs is one of the best to illustrate such current problems and debates.

3597.04 GE Assessment plan:

- a. Assessment is an integral part of the class quiz format and testing procedures as outlined in the attached syllabus. On the second day of class all students complete a mock quiz with 10 questions to illustrate the types of questions that will be asked on future quizzes. Following completion of the quizzes they are graded and each question discussed in class. Over the course of the semester there are 7 additional quizzes based upon materials presented in lectures, readings, and student presentations. Over the course of the semester, these quizzes will include the 10 questions asked in the mock quiz day 2. These will be compared to assess changes in knowledge related to course materials. The course will be assessed as effective in achieving its desired outcomes if pre- and post-responses show an increase in correct responses between quizzes of 100% for those at or below 40% correct on the pre-quiz or 25% for those at or above 50% correct, with no criteria for percent correct responses that already exceeded 75% on the pre-quiz. In addition to pre- and post-test assessments, at the end of the semester all students are provided a response sheet asking their opinions of the class and to mention what was most surprising for them in the course and what they most enjoyed learning. These responses do not have a definition for success, but reflect whether students valued their learning experience within the class.

Pre- and post-quiz data will be used to determine which course subjects, materials and facts students already know (pre-quiz correct response at 75%+) and may be limited in their presentation and which they are less familiar with and must be guided through more thoroughly (pre-quiz correct response 50% or less). Failure to improve scores below 50% over the semester will indicate that the faculty member may not be sufficiently clarifying these topics and needs to improve teaching methods. If students respond enthusiastically to the open-ended questions on aspects of the class they learned and enjoyed this indicates some level of knowledge taken from and some degree of satisfaction with the class. If they do not, then they likely were not satisfied with the class.