Freshman Seminar: Genome

Biol 1905, Section 13, Fall 2013 (University of Minnesota, Twin Cities)

Meeting time: Wednesdays 1:55-3:50 pm

Meeting place: Varies every week. See course schedule for each week’s meeting site

This is a 2 credit hour course.

Instructor:

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**Course goals and objectives: learning and development outcomes**

By the end of this course, you will be able to

• outline the connections between the human genome and human concerns including our identity and history as living organisms and *Homo sapiens* in particular, fate, environment, intelligence, instinct, conflict, self-interest, disease, stress, personality, development, pre-history, immortality, sex, memory, death, cures, prevention, politics, eugenics, free will, ancestors, cooperation, mothers, energy, ecology and experience.

• describe the human genome in conceptual terms with appropriate terminology and qualification, with accuracy, perspective, and nuance, and with an ability to describe what we *don’t* yet know about the genome.

• explore your own genome’s variations from the human reference sequence. In particular, you will know how use your genome to trace your ancient and recent origins, identify distant relatives, and compare DNA sequences with family members.

• examine your genome for inherited traits (physical and personality) and liability to (or protection from) mild and severe health conditions.

• identify genes (by name and normal function) for which student’s possess variant DNA sequences (SNPs), and describe for at least some of them, what consequences at the protein level of the DNA sequence variant might be.

• describe the U of M learning and development outcomes addressed by the course.

**What I want you to get out of this class**

*Explore* your *genome*

1) I want you to be able to

• explore your partial genome sequence as provided by 23andMe using the tools provided at their site as well as by additional analyses using freely available online databases and tools, as well as inexpensive services such as Promethease.

• carry out ten analyses with your genome data that the average person using 23andMe might not do, using multiple points of entry into the genome.

• succinctly describe ten fascinating things that you discover about your genome that you could tell a family member at Thanksgiving using non-technical language.

• realize significant value added to justify the expense of the testing procedure.

• have a solid foundation for your subsequent biology courses, anticipating, foreshadowing and scaffolding some of what’s to come.

• be prepared for how to process and interpret the more complete sequencing of the genome that you will likely receive in the years ahead so that you will be able to extract what is most important and interesting from that data.

• begin your autogenomography, a collection of stories that your genome tells about you, from the revelation of the student’s genomic history to the prediction of particular traits that you should now have or may later acquire.

• participate in the 23andMe online community, contributing to it by helping others to make sense of their genome data or find answers their questions.

• be prepared for the possible inclusion of personal genomics in your life and in your career in the years ahead

*Understand what is universal about the human genome*

2) I want you to read and understand deeply the book *Genome: Autobiography of the Species in 23 Chapters* by Matt Ridley. In particular, I’d like you to

• learn its “big ideas”, be familiar with the genes and traits the book discusses, be able to name and describe in one sentence the contributions of ten scientists the book mentions, and critique the author’s point of view and possible biases.

• know how one story from each chapter has played out in the years since the book was written.

• make connections between what you read in *Genome* and the process of analysis of your own genome sequence.

• make connections between what you read in *Genome* and other readings, videos, and experiences you have had.

• see how the genome, being part of all of us, has connections to art, music, philosophy, and many aspects of the human experience.

*Explore a sample of your memome and associated behaviors related to college success*

3) To understand that in humans behaviors are rooted in genetics but also significantly in environment and experience. These together lead to values and beliefs and what we attend to. The transmission of these values and beliefs is both vertical (from parent to child) and horizontal (from influencer to influenced). Memes, elements of a culture or systems of behavior that can be passed from one individual to another by non-genetic means, esp. imitation, are important to consider because they live within our brains, sometime parasitic, sometimes neutral, and sometimes adaptive. Like genes they can be considered to be selfish. Also, as has happened with genes in our cells, we have evolved mechanisms to protect the carrier (us, our brain) from “infection” and adverse effects, of meme adoption. Since a college education is fundamentally about meme adoption for the enhancement of one’s mental capacities it is useful to explore meme’s associated with college success, to both become aware of how to do well in college but also to just become more self-aware, a virtue in its own right. By the end of this course you should have a better understanding of *how* to learn. I want you to

• be aware of the values and beliefs that underlie your own college-success-relevant behaviors.

• understand correlation, effect size, and significance.

• be able to analyze, at a basic level, meme associations and transfer/adoption.

• have a higher CalNew20 score at the end of the course, a 3.2 or higher GPA over the years ahead, and high satisfaction about your college experience and your engagement as a college student.

*Make progress toward freedom, growth, finding your voice & realizing your own Self.*

*4)* I want you to claim your education, to become more active in identifying how you can develop your own Selves for your own purposes. I want you to

• recognize what your genome says to you about your health and history and to act on that information in appropriate ways (e.g. confirming an apparent genetic liability with a physiological test, adopting behaviors especially pro-survival for them, recognizing the alleles that you would *not* want to be homozygous in your future offspring).

• recognize how your values and beliefs and resulting behaviors might affect your college (and subsequent) success, and not only understand how to make those behavioral changes but to actually make some of them.

• appreciate the power of behavioral (and value) inertia, and have tried several approaches to making lasting changes in behaviors that don’t currently support your authentic growth, self-realization, emergence of your true Self.

We’ve had our own journey thus far and have our own journey ahead. We must find our own voice, our own talents, pursue our own dreams.

**What I expect of you**

*Preparation – Reading Genome* *and studying the resources posted at the Moodle site*

There will be on average 25 pages of reading *Genome* to read each week. There will also be between 8 and 12 online resources (short readings, web pages, videos…) that connect to that reading or to the particular section of autogenomography we’re working on during a given week. Sometimes these will be providing an update of what we have learned in the decade since Ridley wrote the book.

*Preparation – Weekly reading response questions (10% of course grade)*

As one of my goals for you is that you gain practice reading closely and critically, there will be up to eight questions about the reading for you to answer each week by two days before our class meeting. The questions generally focus on the assumptions and implications of the ideas Ridley raises, as well as the relationship between the reading and your genome, life and society.

*Preparation – Weekly reflection (10% of course grade)*

Looking beyond Ridley text and considering the other material (videos, essays, etc. posted on the course Moodle site), you will be asked to write a personal reflection on the those items, what you thought of them, and how they connect. Note, this *isn’t* about summarizing what the subject of the videos or essays was. It is about how you see them fitting together, about the thoughts and feelings they brought out in you. Its about finding connections.

*Participation – Weekly seminar meeting (20% of course grade)*

You will have the opportunity to express yourself, exchange ideas with classmates and your professor, and ask questions that you may still have after the preparation you’ve done. The seminar will have an around-the-table discussion format where you will be invited to (and expected to!) share your ideas and/or questions at every class meeting. This is your chance to get to know your classmates, learn from them and their genome explorations, and be guided through any particularly difficult concepts or tasks. The more you prepare yourself for the seminar by reading, watching posted videos, reflecting, writing & working on your autogenomography project, the more able you will be to take part in a high level discussion in the seminar meeting. This is your live performance opportunity. Make full use of it ☺.

*Autogenomography project (60% of course grade)*

The autogenomography project is the major assignment of the course and the most direct opportunity for you to do some “hands on” learning about something you, I hope, really care about: yourself. An autogenomography – I made up this word ☺ – is simply the story of *your* genome: how it unfolds to lead to your physical traits, disease liability, and personality, and what it tells you about where it has been – and by extension where your ancestors have been. It is something you can create only if you have personal genomic data. While you don’t have your complete genome sequence, completing this project will give you a lot of insight, help you develop confidence in carrying out the analyses we do, and prepare you to make good use of your complete genome sequence data when you one day have access to that.

The project is divided into parts that are due over the course of the semester as first drafts. In each section you examine a different aspect of your genome using the 23andMe generated SNP data – your variants from the reference genome. You’ll be asked to report some data, where you will have a choice about what to report whenever there might be something you’d prefer *not* to discuss with other members of the seminar. You will also be asked to reason using the data, contextualize it, illustrate the assumptions and implications of it, identify cause and effect relationships, and sometimes to make quantitative conclusions using it. Citing sources will be expected as will attending to formatting and mechanics of writing.

The components of the autogenomography due at the end of the semester are:

• Cover page

• Table of contents

• Introduction

• Physical traits

• Personality traits

• Health – increased and reduced disease risk

• Health – inherited traits

• Health – tendency toward more worrisome conditions

• Ancestry – LUCA to present in two pages: dates, images, some maps

• Ancestry – Neanderthal percentage and Neaderthal alleles

• Ancestry – Maternal (and, if available, paternal) lineage origins

• Ancestry – Regional origins

• Ancestry – Geneology

• Ancestry – Distant cousins

• Annotation – 1 million base pairs, one gene, my SNPs

• Literature – Personal genomics in candidate career

• Literature – Genetics of a trait of personal interest

*Outside of class meetings*

Three times during the semester (weeks of 9/26, 10/24 & 11/21) I meet with each student individually to discuss progress on the autogenomography and provide feedback.