

PSYC-3112, Behavioral Genetics II
Spring 2015, Tuesdays and Thursdays, 2-3:15pm
Muenzinger E431
Syllabus

Instructor: Scott Vrieze, PhD, IBG 256, 303-492-1743

Office Hours: Fridays at 3pm and by appointment

Room 256, Institute for Behavioral Genetics, 1480 30th street, Boulder

Credits: 3

Prerequisite: PSYC-3102 Behavioral Genetics I, genetics coursework from other departments (e.g., MCDB), or Instructor Approval

Overview: Behavioral genetics is rapidly evolving. Traditional behavioral genetics questions and experimental designs are as important as ever. New genotyping and sequencing technologies are allowing us to ask new questions about how genes and environment influence behavioral characteristics. We will review the current state of genetic association and genome sequencing approaches to explore the genetic and environmental bases of human behavior.

Course Format: Each week we will read and discuss several papers. As necessary, I will provide background and facilitate discussion.

Lab Component: As part of this course, we will analyze genetic data, whether your personal genotypes or a publicly available genome. I will take a class period to instruct on how to do the analysis and then assign a homework problem set for you to complete on your own.

Genotyping Yourself: Students can elect to genotype themselves, likely through 23andMe. Getting genotyped is entirely voluntary and will not affect your grade, your relationship with the instructor, or your relationship with CU. We will discuss benefits and risks of being genotyped during the first class period.

Assignments

- **Classroom Participation and Article Questions (19 points)** Each week, students are expected to carefully read each article prior to the first class period that week, and be ready to discuss the articles.
 - On the first class of each week, please hand in three questions (and the answers to those questions!) about the assigned readings (absent students can email). These questions will be graded for quality and insightfulness, and contribute to the participation component of your grade.
- **Homework (21 points)** There will be three homework assignments, one for each lab. Each homework is due 1 week after it is assigned, to be handed in within 5 minutes of the beginning of class. Late homework, even by 6 minutes, will not be accepted.
- **Student Journal Articles (20 points)** Each student will be asked to facilitate the discussion of two journal articles of their choice during the semester. These can be articles already assigned or, with instructor approval, a new article of the student's choice relevant to the week's topic.
- **Review Paper (40 points)** Each student will write a paper on a topic of their choosing. Papers must be 10 pages, double-spaced, 11pt Arial font, minimum 1 inch margins. ***Late work will receive an additional 50% reduction in points for each day it is late.*** The paper timeline is as follows:
 - Feb 3 -- topic selected, as discussed with instructor
 - Feb 24 -- outline with title, sections, subsections, and handful of primary references (5 points)
 - March 19 -- 8-page draft due (15 points) with the following grading rubric:
 - Writing (5 points) -- primarily clarity of presentation but also including grammar, sentence structure, readability, transitions, flow.
 - Grasp of important concepts (5 points) -- demonstrate that you have a mastery of the material by discussing your references in the context of what you have learned in class, and your broader knowledge of behavioral genetics.
 - Depth (5 points) -- did you dig deep into your chosen topic? Or have you skimmed the surface in a shallow attempt? Did you simply recapitulate a separate review article? Or did you attempt to synthesize your references yourself?
 - April 30 -- 10-page final draft due (20 points)
 - Rubric is same as above with additional 5 points for quality of your response to my comments on the March 19 draft.

Grading Scale

The scale will be as follows. I reserve the right to curve grades.

A = \geq 90% B = 80-99% C = 70-79% D = 60-69% F = \leq 59%

Schedule

<u>Week</u>	<u>Topic</u>	<u>Reading</u>
Jan 13	Plans for Course Benefits and risks of genotyping oneself Laptop inventory	http://blogs.nature.com/news/2012/10/personal-genomics-in-the-classroom-students-sequence-themselves.html http://www.mountsinai.org/about-us/newsroom/press-releases/mount-sinai-school-of-medicine-offers-first-ever-course-with-whole-genome-sequencing http://www.theguardian.com/science/occams-corner/2012/oct/11/genetic-screening http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0068853
Jan 20	Genetic Influences on Behavioral Traits and the Power of Behavioral Genetic Designs Please select the articles for which you will facilitate discussion by Jan 20	<p>Rutter (2007). Proceeding from observed correlation to causal inference: the use of natural experiments. <i>Perspectives on Psychological Science</i>, 2:4, 377-395.</p> <p>Bouchard et al (1990) <i>Science</i>, 250: 223-228.</p> <p>Ersche et al (2012). Abnormal Brain Structure Implicated in Stimulant Drug Addiction. <i>Science</i>, 335:6068, 601-604.</p> <p>Keyes et al. (2008). Parental Smoking and Adolescent Problem Behavior: An Adoption Study of General and Specific Effects. <i>American Journal of Psychiatry</i>, 165, 1338-1344.</p>
Jan 27	Candidate Gene Studies	<p>Duncan & Keller (2011). <i>American Journal of Psychiatry</i>, 168(10), 1041-1049.</p> <p>Franco et al. (2014). Publication bias in the social sciences: Unlocking the file drawer. <i>Science</i>, 345:6203, 1502-1505.</p>
Feb 3	GWAS Designs Select Your Paper Topic	McCarthy et al (2008). Genome-wide association studies for complex traits: consensus, uncertainty and challenges. <i>Nature Reviews Genetics</i> , 9, 356-369.
Feb 10	GWAS Results	<p>PGC Schizophrenia Workgroup, <i>Nature</i>, 2014</p> <p>Sullivan, P. F., Daly, M. J., & O'Donovan, M. C. (2012). Genetic architectures of psychiatric disorders: The emerging picture and its implications. <i>Nature Reviews Genetics</i>, 13, 537-551.</p> <p>Karayiorgou (2010). 22a11.2 microdeletions: linking DNA structural variation to brain dysfunction and schizophrenia. <i>Nature Reviews Neuroscience</i>, 11, 402-416.</p>

Feb 17	Population Genetics	<p>Novembre et al (2008). Genes mirror geography within Europe. <i>Nature</i>, 455, 861.</p> <p>Bryc et al (2014). The genetic ancestry of African Americans, Latinos, and European Americans across the United States. <i>American Journal of Human Genetics</i>, 96, 1-17.</p> <p>De et al (2015). No evidence that selection has been less effective at removing deleterious mutations in Europeans than in Africans. <i>Nature Genetics</i>.</p> <p>http://www.nytimes.com/2014/12/25/science/23andme-genetic-ethnicity-study.html</p>
Feb 24	Cognitive Ability Paper Outline Due Feb 24	<p>Turkheimer et al (2003). Socioeconomic status modifies heritability of IQ in young children. <i>Psychological Science</i>, 623-628.</p> <p>Duyme (1999). How can we boost IQs of “dull children”? A late adoption study. <i>PNAS</i>, 8790-8794.</p> <p>Ligt (2012). Diagnostic exome sequencing in persons with severe intellectual disability. <i>New England Journal of Medicine</i>, 367:20, 1921-1929</p>
March 3	Lab 1 -- navigating UNIX shell, Variant Call Format files (VCF), PLINK, and vcf-tools Bring your Computer! Homework 1 assigned	<p>Google is your best friend. Search for things like: “Navigating UNIX filesystem” “Basic UNIX commands” Here is a good one: https://www.youtube.com/watch?v=Ms5sNYyejEw</p> <p>Plink -- https://www.cog-genomics.org/plink2/ vcf-tools -- http://vcftools.sourceforge.net/ vcf file -- http://samtools.github.io/hts-specs/VCFv4.2.pdf</p>
March 10	Gene Structure and Function Homework 1 due on March 10	<p>Feero, W. G., Guttmacher, A. E., & Collins, F. S. (2010). Genomic Medicine: Genomic Medicine -- An Updated Primer. <i>New England Journal of Medicine</i>, 362(21), 2001-2011.</p> <p>Maurano et al. (2012). Systematic localization of common disease-associated variation in regulatory DNA. <i>Science</i>, 337, 1190-1195.</p> <p>ENCODE Project Writes Eulogy for Junk DNA. <i>Science</i> 337, 1159-1160.</p>
March 17	Genome Sequencing	<p>1000 Genomes Project Consortium. <i>Nature</i> 491:56-65.</p> <p>Lander (2011). Initial impact of sequencing the human genome. <i>Nature</i> 470, 187-197.</p>

		Ridaura et al (2013). Gut microbiota from twins discordant for obesity modulate metabolism in mice. Science.
March 23	Spring break	
March 31	Privacy & Return of Incidental Findings 8-page paper draft due March 31	Yu (2013). Self-guided management of exome and whole-genome sequencing results: changing the results return model. Genetics in Medicine, 15, 684-690. Green (2009). Disclosure of APOE genotype for risk of Alzheimer's Disease. New England Journal of Medicine, 361, 245-254. Green (2013). ACMG recommendations for reporting of incidental findings in clinical exome and genome sequencing. Genetics in Medicine, 15, 565-574. Privacy Protections: The Genome Hacker. (2013). Nature, 497, 172-174
April 7	Imputation & Lab 2	Abecasis (2010). MaCH: Using sequence and genotype data to estimate haplotypes and unobserved genotypes. Genetic Epidemiology, 34:8, 816-834.
April 14	Loss of Function and Pathogenic Variants in Humans. Homework 2 assigned April 14	MacArthur (2012). A systematic survey of loss-of-function variants in human protein coding genes. Science, 335:6070, 823-828. Tabor et al (2014). Pathogenic variants for Mendelian and complex traits in exomes of 6,517 European and African Americans: Implications for the return of incidental findings. American Journal of Human Genetics, 95:2, 183-193. Mak (2014). Effects of the absence of Apolipoprotein E on lipoproteins, neurocognitive function, and retinal function. 71(10), 1228-1236.
April 21	Lab 3 Homework 2 due on April 21 Homework 3 assigned	We'll have an in-class lab and catchup on readings this week.
April 28	Developmental Plasticity and Cryptic Genetic Variation Homework 3 due on April 28	Paaby & Rockman, Nature Reviews Genetics 15:247-258 Johnson, W. (2012). Development and Psychopathology 24:1164-1177.
April 30	<p style="text-align: center;">Final Class Period -- Final Paper Due at Beginning of Class ***Please hand in your draft paper that has my comments***</p> <p style="text-align: center;">I'll also ask for additional feedback on the course as we plan for the next time it's offered.</p>	

General Policies

Academic Dishonesty

In addition to the standard CU policy, anyone caught cheating, plagiarizing, or otherwise engaging in academic dishonesty will fail the course.

Disability

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671 or dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with me. See <http://www.colorado.edu/disabilityservices> for more information.

Religious Observances

Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. If you anticipate any conflicts with the course requirements described in the syllabus due to religious observances, please bring those to my attention now so that alternative arrangements can be made. See full details at http://www.colorado.edu/policies/fac_relig.html

Honor Code

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information can be found at <http://www.colorado.edu/policies/honor.html> and <http://www.colorado.edu/academics/honorcode/>

Classroom Behavior Policy

Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty have the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which they and their students express opinions. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race,

culture, religion, politics, sexual orientation, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

Sexual Harassment

The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. The University of Colorado does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10, amended 11/8/2001). CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, or veteran status. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at <http://hr.colorado.edu/dh/>