

SOC 5028
325 U7000
Genomics and Societies
2022 Fall
National Taiwan University

Class: Monday 7, 8, 9
R112

Instructor: Meng-Jung Lin mjlinmj@ntu.edu.tw

Office hours: Tuesdays 1:00-5:00 PM in R320C or online via Google Meet (please sign-up using Calendly: <https://calendly.com/mjlinmj/15min>) and by appointment

This course examines why and how we should integrate social sciences and genomics to understand the societies and human behaviors. Topics cover introduction to molecular genetics; polygenic scores; gene-environment interaction; epigenetics; ancestry, race, and ethnicity; sex and gender; precision medicine; and ethical issues in genetic studies.

Goals of this course

In the last few decades, the rapid developments in molecular genetics have changed the landscape of medicine and challenged one of the fundamental assumptions of social sciences that individual differences are solely due to environmental influences. This course will analyze important areas in social sciences in light of advances in molecular genetics.

The aim of this course is to introduce biological factors, especially genetic factors, to students in sociology, psychology, political science, history, and business. You do not need training in biology or genetics to succeed in this course. At the same time, students with biology, chemistry, and medicine backgrounds will be able to develop a broader view regarding human genomics. These include health behavior, race and ethnicity, gender/sex, peers, genetically modified food, and ethical issues in genomic studies.

After taking this course, you should be able to:

1. Summarize the current state of Sociogenomics in their own words.
2. Apply knowledge to develop a research proposal in Sociogenomics.
3. Evaluate related research articles published in social sciences journals.

Course Requirements

Questions for required readings (20%): You are required to submit one or two theoretical or empirical question(s) every week. The submission with the lowest score will be dropped.

Presentation, critique, and discussion leading (20%): You will have at least one or two opportunities to present the required readings and lead the discussion.

Research Proposal (50%): You will need to develop a research proposal using the knowledge learned from the class and other sources by the end of the semester. The final research proposal should be about 10 pages in length (double-spaced).

Class participation and attendance (10%): Every class (including practicum) counts. You may miss 1 week of classes. Please contact me for additional absences. For those who have time conflicts, please let me know beforehand.

Class Policy

1. Respect others and be responsible.

2. You are allowed to use your laptop or/and smartphones during class if that helps your learning. However, please pay attention to the discussion (i.e., listen to others and contribute your ideas).

3. Check your email account daily: When assignments are available in NTU COOL, notification will be sent to your email address. Any changes to the course schedule will also be announced in COOL and through notification.

4. I will try to reply to your emails within 24 hours during weekdays (Monday thru Friday). I usually answer them between 9 AM to 5 PM, so please arrange your time accordingly to ensure that I have enough time to get back to you before the deadlines.

Honor Code

You have to complete all assignments independently. I will make a checkbox available to you to indicate whether you do the work by yourself when you submit your works. You can familiarize yourself with the [NTU Honor Code here](#). The Honor Code of the University is in effect at all times, and the submission of work signifies understanding and acceptance of those requirements. Plagiarism will not be tolerated. Please consult with me if you have any questions about the Honor Code.

Accessibility Resources

Please contact me if you need accommodations due to disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in barriers to fully accessing the course. You may receive extensions to your exams or/and assignments, and you may be allowed to make-up your absences by watching recordings. We can negotiate about your accommodations depending on your circumstances.

Counseling and Psychological Services

The NTU Student Counseling Center is strongly committed to help students with mental health problems and psychological well-being needs through consultation and connection to clinically appropriate services. Go to their website: https://scc_osa.ntu.edu.tw/ or visit their facilities at Downtown Campus College of Medicine Area C (R204-1) to learn more.

Schedule

***You should choose from these readings to lead class discussion.**

Abbreviations:

Conley and Fletcher: Conley, Dalton, and Jason Fletcher. 2017. *The Genome Factor*. Princeton University Press.

Mills et al.: Mills, Melinda C., Nicola Barban, and Felix C. Tropf. 2020. *An Introduction to Statistical Genetic Data Analysis*. MIT Press.

Harden: Harden, Kathryn Paige. 2021. *The genetic lottery: why DNA matters for social equality*. Princeton University Press.

9/5 Week 1: Introduction

Mills, Melinda C., and Felix C. Tropf. 2020. "Sociology, Genetics, and the Coming of Age of Sociogenomics." *Annual Review of Sociology* 46: 553-581.

Mills et al. Chapter 1, 4, & 5.

9/12 Week 2: Twin Study and Candidate Genes Study

*Baier, Tina, Volker Lang, Michael Grätz, Kieron J Barclay, Dalton C Conley, Christopher T Dawes, Thomas Laidley, Torkild H Lyngstad. 2022. "Genetic Influences on Educational Achievement in Cross-National Perspective." *European Sociological Review*: jcac014.

Guo, Guang. 2005. "Twin Studies: What Can They Tell Us about Nature and Nurture?" *Contexts* 4(3): 43-47.

Caspi, Avshalom, Joseph McClay, Terrie E. Moffitt, Jonathan Mill, Judy Martin, Ian W. Craig, Alan Taylor, and Richie Poulton. 2002. "Role of Genotype in the Cycle of Violence in Maltreated Children." *Science* 297(5582): 851-854.

*Guo, Guang, Michael E. Roettger, and Tianji Cai. 2008. "The Integration of Genetic Propensities into Social-Control Models of Delinquency and Violence among Male Youths." *American Sociological Review* 73(4): 543-568.

9/19 Week 3: Linking Genetic Variants to Human Outcomes in Social Context

Ripke, Stephan, et al. 2014. "Biological Insights from 108 Schizophrenia-Associated Genetic Loci." *Nature* 511(7510): 421.

*Boardman, Jason D., and Jason M. Fletcher. 2021. "Evaluating the Continued Integration of Genetics into Medical Sociology." *Journal of Health and Social Behavior* 62(3): 404-418.

Okbay, Aysu, et al. 2022. "Polygenic Prediction of Educational Attainment Within and Between Families from Genome-wide Association Analyses in 3 million Individuals." *Nature Genetics* 54: 1-13.

9/26 Week 4: Gene-Environment Interaction

Mills et al. Chapter 6.

*Shanahan, Michael J., and Scott M. Hofer. 2005. "Social Context in Gene–Environment Interactions:

Retrospect and Prospect." *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 60. Special Issue 1: 65-76.

*Nielsen, François. 2016. "The Status-Achievement Process: Insights from Genetics." *Frontiers in Sociology* 1: 9.

10/3 Week 5: Evolutionary Psychology and Friend Networks

Psychology Today. 2022. *Evolutionary Psychology*. Retrieved from

<https://www.psychologytoday.com/us/basics/evolutionary-psychology> (May 1, 2022)

*Fowler, James H., Jaime E. Settle, and Nicholas A. Christakis. 2011. "Correlated Genotypes in Friendship Networks." *Proceedings of the National Academy of Sciences* 108(5): 1993-1997.

*Domingue, Benjamin W., Daniel W. Belsky, Jason M. Fletcher, Dalton Conley, Jason D. Boardman, and Kathleen Mullan Harris. 2018. "The Social Genome of Friends and Schoolmates in the National Longitudinal Study of Adolescent to Adult Health." *Proceedings of the National Academy of Sciences* 115(4): 702-707.

10/10 Week 6: National Day (No Class)

10/17 Week 7: History of Human Evolution and Contemporary Race/Ethnicity

Conley and Fletcher. Chapter 5.

*Guo, Guang, Yilan Fu, Hedwig Lee, Tianji Cai, Kathleen Mullan Harris, and Yi Li. 2014. "Genetic Bio-ancestry and Social Construction of Racial Classification in Social Surveys in the Contemporary United States." *Demography* 51(1): 141-172.

Racimo, Fernando, Martin Sikora, Marc Vander Linden, Hannes Schroeder & Carles Lalueza-Fox. 2020. "Beyond Broad Strokes: Sociocultural Insights from the Study of Ancient Genomes." *Nature Reviews Genetics* 21(6): 355-366.

Suggested reading:

Micheletti, Steven J., Kasia Bryc, Samantha G. Ancona Esselmann, William A. Freyman, Meghan E. Moreno, G. David Poznik, Anjali J. Shastri. 2020. "Genetic Consequences of the Transatlantic Slave Trade in the Americas." *The American Journal of Human Genetics* 107(2): 265-277.

10/24 Week 8: Social Stratification

*Belsky, Daniel W., et al. 2018. "Genetic Analysis of Social-Class Mobility in Five Longitudinal Studies." *Proceedings of the National Academy of Sciences* 115(31): E7275-E7284.

*Trejo, Sam, Daniel W Belsky, Jason D. Boardman, Jeremy Freese, Kathleen Mullan Harris, Pam Herd, Kamil Sicinski, Benjamin W. Domingue. 2018. "Schools as Moderators of Genetic Associations with Life Course Attainments: Evidence from the WLS and Add Heath." *Sociological Science* 5: 513-540.

*Liu, Hexuan. 2018. "Social and Genetic Pathways in Multigenerational Transmission of Educational Attainment." *American Sociological Review* 83(2): 278-304.

Suggested reading:

- Kong, Augustine, et al. 2018. "The Nature of Nurture: Effects of Parental Genotypes." *Science* 359(6374): 424-428.
- Demange, Perline A., et al. 2021. "Investigating the Genetic Architecture of Noncognitive Skills Using GWAS-by-subtraction." *Nature Genetics* 53(1): 35-44.
- Harden, K. Paige, Benjamin W. Domingue, Daniel W. Belsky, Jason D. Boardman, Robert Crosnoe, Margherita Malanchini, Michel Nivard, Elliot M. Tucker-Drob & Kathleen Mullan Harris. 2020. "Genetic Associations with Mathematics Tracking and Persistence in Secondary School." *NPJ Science of Learning* 5(1): 1-8.
- Hill, W. David, et al. 2016. "Molecular Genetic Contributions to Social Deprivation and Household Income in UK Biobank." *Current Biology* 26(22): 3083-3089.

10/31 Week 9: Sex and Gender

- *Perry, Brea L. 2016. "Gendering Genetics: Biological Contingencies in the Protective Effects of Social Integration for Men and Women." *American Journal of Sociology* 121(6): 1655-1696.
- Ganna, Andrea, et al. 2019. "Large-scale GWAS Reveals Insights into the Genetic Architecture of Same-sex Sexual Behavior." *Science* 365(6456): eaat7693.
- *Herd, Pamela, Jeremy Freese, Kamil Sicinski, Benjamin W. Domingue, Kathleen Mullan Harris, Caiping Wei, Robert M. Hauser. 2019. "Genes, Gender Inequality, and Educational Attainment." *American Sociological Review* 84(6): 1069-1098.

11/7 Week 10: Research Briefings (Proposal Idea Discussion)

11/14 Week 11: Health Inequality

- *Wedow, Robbee, Meghan Zacher, Brooke M. Huibregtse, Kathleen Mullan Harris, Benjamin W. Domingue, Jason D. Boardman. 2018. "Education, Smoking, and Cohort Change: Forwarding a Multidimensional Theory of the Environmental Moderation of Genetic Effects." *American Sociological Review* 83(4): 802-832.
- *Liu, Hexuan, and Guang Guo. 2015. "Lifetime Socioeconomic Status, Historical Context, and Genetic Inheritance in Shaping Body Mass in Middle and Late Adulthood." *American Sociological Review* 80(4): 705-737.
- Mills, Melinda C., Nicola Barban, and Felix C. Tropf. 2018. "The Sociogenomics of Polygenic Scores of Reproductive Behavior and Their Relationship to Other Fertility Traits." *RSF: The Russell Sage Foundation Journal of the Social Sciences* 4(4): 122-136.

11/21 Week 12: Epigenetics and Epigenomics

- Horvath, Steve, and Kenneth Raj. 2018. "DNA Methylation-based Biomarkers and the Epigenetic Clock Theory of Ageing." *Nature Reviews Genetics* 19(6): 371-384.
- *Raffington, Laurel, Daniel W. Belsky, Meeraj Kothari, Margherita Malanchini, Elliot M. Tucker-Drob,

K. Paige Harden. 2021. "Socioeconomic Disadvantage and the Pace of Biological Aging in Children." *Pediatrics* 147(6): e2020024406.

Suggested reading:

Liu, Zuyun, Diana Leung, Kyra Thrush, Wei Zhao, Scott Ratliff, Toshiko Tanaka, Lauren L. Schmitz, Jennifer A. Smith, Luigi Ferrucci, Morgan E. Levine. 2020. "Underlying Features of Epigenetic Aging Clocks In Vivo and In Vitro." *Aging Cell* 19(10): e13229.

11/28 Week 13: Precision Medicine, Personalized Policy, CRISPR, and Designer Babies

*Conley and Fletcher. Chapter 7.

Plumer, Brad, Eliza Barclay, Julia Belluz, and Umair Irfan. 2018. "A Simple Guide to CRISPR, One of the Biggest Science Stories of the Decade." *VOX Media*.

Cyranoski, David. 2019. "The CRISPR-Baby Scandal: What's Next for Human Gene-Editing." *Nature* 566(7745): 440-443.

Hercher, Laura. 2021. "A New Era of Designer Babies May Be Based on Overhyped Science." *Scientific American*. Retrieved from <https://www.scientificamerican.com/article/a-new-era-of-designer-babies-may-be-based-on-overhyped-science/> (May 1, 2022)

Suggested reading:

Harden. Chapter 8 to 12.

Pereira, Luisa, Leon Mutesa, Paulina Tindana, and Michele Ramsay. 2021. "African Genetic Diversity and Adaptation Inform a Precision Medicine Agenda." *Nature Reviews Genetics* 22(5): 284-306.

12/5 Week 14: Genetically Modified Food

Freedman, D. 2013. "The Truth about Genetically Modified Food." *Scientific American*. Retrieved from <https://www.scientificamerican.com/article/the-truth-about-genetically-modified-food/>. (May 1, 2022)

Garland, Sarah. 2020. "STOP Arguing over GMO Crops." *Scientific American*. Retrieved from <https://www.scientificamerican.com/article/stop-arguing-over-gmo-crops/>. (May 1, 2022)

Gilbert, Natasha. 2013. "A Hard Look at GM Crops." *Nature* 497(7447): 24-26.

12/12 Week 15: The Ethical, Legal, and Social Issues in Genetic Studies

Mills et al. Chapter 14.

Ioannidis, John, Evangelia E. Ntzani, Thomas A. Trikalinos, and Despina G. Contopoulos-Ioannidis. 2001. "Replication Validity of Genetic Association Studies." *Nature Genetics* 29(3): 306-309.

*Kesselheim, Aaron S., Robert M. Cook-Deegan, David E. Winickoff, and Michelle M. Mello. 2013. "Gene Patenting—the Supreme Court Finally Speaks." *The New England Journal of Medicine* 369(9): 869.

*Shaer, Matthew. 2016. "The False Promise of DNA Testing." *The Atlantic* 317: 46-55.
Mills, Melinda C., and Charles Rahal. 2019. "A Scientometric Review of Genome-wide Association Studies." *Communications Biology* 2(1): 1-11.

Suggested reading:

Evans, Linnea, Michal Engelman, Alex Mikulas, Kristen Malecki. 2021. "How Are Social Determinants of Health Integrated into Epigenetic Research? A Systematic Review." *Social Science & Medicine* 273: 113738.

12/19 Week 16: Research Proposal Presentation

*The professor reserves the right to make changes to the syllabus, including due dates and presentation dates. These changes will be announced as early as possible.