

Phil*4140 – Fall 2017

Current Debates in the Philosophy of Science

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Monday & Wednesday 2:30-3:50 / ALEX 309

Office: Mackinnon 358. Hours: Wednesday 4:00-5:00 or by appointment

Introduction

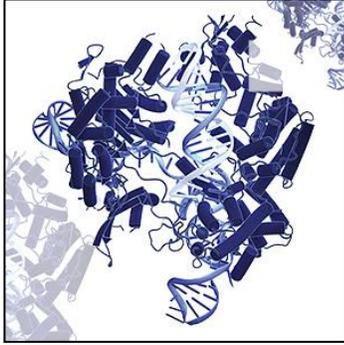
These days, almost every dimension of our lives is touched by the science of genomics. From the food we consume to the medical solutions that we place our hopes upon, from the classification of psychiatric disorders to our understanding of what it means to be human. At every turn, the science of genomics has something to say. Political and environmental philosophers have explored some of the promises and social dangers of genomics. In this course, these issues will be in the background as we focus on the science itself. At the heart of this discipline are some controversial assumptions about what genomes are and how they function. Scientists often embrace a particular view of the genome without recognizing its controversial aspects or how it guides their work. Our aim will be to articulate and critically assess different scientific ideologies about the nature of the genome and its importance.



As an organizing theme, much of this course will focus on how scientists have conceptualized and investigated so called “junk” DNA. Roughly, this term refers to any genetic material not involved in the coding of proteins which are functional for the organism as a whole. In humans, this composes roughly 95% of our genome. By looking at competing ideas about the significance of this genetic “dark matter” (as it has been recently called) we gain important insights into the epistemic and ontological assumptions of this discipline.

The course begins with a close read of Evelyn Fox Keller’s *A Feeling for the Organism*. This book tracks the career of Barbara McClintock, discoverer of transposable genetic elements. Keller defends the feminist thesis that McClintock’s status as lone female researcher in a male-dominated field enabled her important discoveries. But, arguably, McClintock was ostracized for reasons that go beyond gender. Many of her contemporaries took her to be a vitalist because she assigned unorthodox causal powers to mobile genetic elements. Interestingly, her work is now enjoying a revival among some scientists. It is therefore important to explore this historical figure, not only as a case-study in feminist epistemology, but also as the defender of an influential view of genome structure and function.

The next stage of the course will examine so called “Selfish DNA” theory. This is a radically different conception of junk DNA. Instead of viewing non-coding DNA through the lens of the host organism, this perspective views it as a kind of parasite within the “host” genome. We will consider how these competing perspectives play out in the ways that genomics research is conducted and, more generally, in the way that genomes are conceptualized.



The third stage of the course will view genomics in the era of “Big Science.” The Human Genome Project (HGP) was one of the largest and most controversial project in the history of modern biology. It is widely recognized that this project over-promised and under-delivered in its results. Why was this so? What have we learned about the nature of the genome as a result of this project? What does the HGP teach us about the way that Big Science exploits common misconceptions about the genome in order to justify itself? This course will conclude with a second, more recent case of Big Science meets genomics – The ENCODE project, which has promised to pick up where the HGP left off. Interestingly, ENCODE has generated just as much critical scrutiny as its scientific forbearer. Are there general lessons to be learned about the ways that large scientific projects operate and the caution one must place on their findings?

Learning Objectives

- By completing the reading and reflection assignments, and through their participation in seminar discussion, students will gain a critical understanding of the main theoretical orientations in genomics.
- By completing the first paper, students will sharpen their skills in argument reconstruction and analysis.
- By completing the final paper, students will also gain valuable practice in devising and executing a research project.

Grading

- Reflection assignments (2-3 pages x 5) 40%
- Participating in seminar discussion 10%
- First paper (4 pages) 15% – due October 25.
- Final research paper (6-8 pages) 35% – due approximately December 7

Readings

Required

- Evelyn Fox Keller (1983) *A Feeling for the Organism: The Life and Work of Barbara McClintock*. W.H. Freeman and Co.
- Nessa Carey (2015) *Junk DNA: A Journey Through the Dark Matter of the Genome*. Columbia University Press.
- Various articles available on Ares Course Reserves System.

Supplementary

- Paul E. Griffiths & Karola Stotz (2014) *Genomics and Philosophy*. Cambridge University Press.

Readings and Seminar Schedule

Week	Monday	Wednesday
Sept. 11 & 13	Introduction to course. Historical overview of early genetics (1900-1953).	Read: Keller, Preface & Chapter1 (p.ix-14).
Sept. 18 & 20	Keller, Chapters 3,4 & 5.	Keller, Chapter 6.
Sept. 25 & 27	Keller, Chapters 7-10	Keller Chapters 11 & 12. Discuss answers to review questions, <u>due Tuesday, Sept 24.</u>
Oct. 2 & 4	Doucet & Mauthner (2002), “Knowing Responsibly”	Comfort (1995), “Two genes, no enzymes”
Oct. 11	No class	Comfort (1999), “The Point is Control” Discuss answers to review questions <u>Due Tuesday Oct. 10</u>
Oct 16 & 18	Doolittle & Sapienza, Orgel & Crick (1980) Selfish DNA papers.	Doolittle (1982) “Selfish DNA after 14 months.”
Oct. 23 & 25	Tauber & Sarkar (1992) “The HGP- has blind reductionism gone too far?”	Garcia Sancho (2006) “The rise and fall of genetic information.” <u>Midterm paper due.</u>
Oct. 30, Nov 1	Rosenberg (2005) “does epigenetics threaten the central dogma?”	Hayden (2010) “Life is complicated”
Nov. 6 & 8	Carey, Chapters 1-5	Carey, Chapters 6-10.
Nov. 13 & 15	Carey, Chapters 11-16	Carey, Chapters 17-20 Discuss answers to review questions <u>Due Tuesday Nov 12.</u>
Nov. 20 & 22	Keller (2014) “from gene action to reactive genomics”	Doolittle (2012) “Is Junk DNA Bunk?”
Nov. 27 & 29	Leoneli (2014) “What difference does quantity make?”	Callebaut (2011) “A philosopher’s response to big data biology” Discuss answers to review questions <u>Due Tuesday Nov 28.</u>

College of Arts Standard Statements

E-mail Communication

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. [See the undergraduate calendar for information on regulations and procedures for Academic Consideration.](#)

Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day (Friday, 3 November 2017); two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

[For more information see the SAS web site.](#)

Student Rights and Responsibilities

Each student at the University of Guelph has rights which carry commensurate responsibilities that involve, broadly, being a civil and respectful member of the University community. [The Rights and Responsibilities are detailed in the Undergraduate Calendar](#)

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be

aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

[The Academic Misconduct Policy is detailed in the Undergraduate Calendar.](#)

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.