Nanyang Technological University
Humanities and Social Sciences
Semester 1, AY2017-2018

HH3010

Biotechnology and Society

Syllabus

Subject Description

This subject will introduce students to selected research and commercial applications of modern biotechnology in order to discuss the broader social, ethical, risk, and regulatory issues that arise from them. A range of topics will be covered in this subject, including genetic engineering, cloning, stem cell research, the production of pharmaceuticals, the human genome project, genetic testing, assisted reproductive technologies, and synthetic biology. Students will consider debates that have taken place in the wider community about ownership, commercialisation, identity, governance, animal welfare, human well-being, and expertise in relation to these applications of modern biotechnology.

Prerequisites: Nil
Academic Units: 3

Teaching Staff

Hallam Stevens
Office: HSS-05-07
Email: hstevens@ntu.edu.sg

Attendance Requirements

Students are expected to attend one two-hour lecture and one one-hour tutorial once per week:

Lectures: Wednesdays 12.30-2.30pm (LHS Lecture Theatre)
Tutorials: Wednesdays 3.30pm-4.30pm **OR** 4.30pm-5.30pm OR 5.30-6.30pm (LHS TR+45)

Tutorials begin in Week 2 and run through to Week 13 (except for weeks 7 and 9). You are **required to attend at least eight** of these tutorials. If you attend fewer than **8** tutorials you will get zero for your participation and discussion grade (20% of your overall grade). This includes any excused absences (eg. medical reasons still count as "missed" tutorials).

Medical certificates are not a get out of jail free card. Missing a seminar without an MC will mean an automatic zero for any attendance and participation marks awarded for that week. Presenting an MC confers on you the right to make up the grade for your missed class. Usually, this means I will ask you to write a 500-word response paper on the readings for that week. The grade on this response paper will make up your attendance and participation grade for that week.

Website

The course *Blackboard* site is an important source of information for this subject. Useful resources such as this syllabus, links to further readings, details of assessment, and subject announcements will be available through this website. Check the website regularly for subject announcements and updates.

Readings

PDFs of these required readings are also available on *Blackboard*. Required readings represent the minimum expected for you to participate effectively in class.

Further recommended readings are listed on the website. These references are intended as an additional guide for research and resources for assignments.

There is also an unofficial textbook for this course, written by the instructor: *Biotechnology and Society: An Introduction* (University of Chicago Press, 2016). This is not required reading for the class, but it may be helpful in preparing for the midterm test and for deeper investigation of topics covered in the module.

Assessment Structure and policies

Group presentation – 20%
Mid-term test – 30%
"White paper" report – 30%

Participation and discussion – 20%

Any assessable material that is late will lose marks at the rate of 10% (of the maximum grade) per day. Missing a scheduled in class presentation or not scheduling a presentation will result in a zero grade for the presentation.

Extensions will only be granted in very special cases and in any case will be granted only one week or more in advance of a deadline.

Ensure that you follow appropriate citation conventions for all assignments and familiarize yourself with the University's policies on plagiarism and collaboration.

Group Presentation

The topics are listed in the week-by-week description of the course, below. You may also choose or develop your own topic, with the approval of the instructor. The presentations should last from 15-20 minutes. They should be thoroughly researched – this requires going to the library, not just looking up a few things online. Many of the topics are more technical – you should do you best to try to understand the topic and then explain it in a way that your classmates can understand. If you have difficulty with your topic, consult with Prof. Stevens. The size of the groups will depend on the total size of the class, but will likely consist of four to five students each.

Mid-term Test

Examination-conditions test on material on weeks 1-6 of the course. The test will take place in the first half of the lecture session. It will be based on short "identification" questions. More details will be given closer to the date.

27th September during lecture, 12.35-1.50pm.

"White Paper"

Each student is required to write a 2000-word "white paper" report.

"White papers" are special reports prepared by experts or government agencies in order to advise the government on how to develop policy with regard to special or technical issues. You will be asked to compose such a report to advise

the Singapore government (or another government if you wish) about how to deal with a specific issue raised by biotechnology.

Suggestions for possible topics will be provided during the semester. You are encouraged to devise your own paper topic in consultation with Prof. Stevens.

Due date: Friday November 17th, 5pm (via TurnItIn).

Class Participation

Each week of the semester (except for weeks 1, 7 and 9) will include one very small graded task. This may take place in lecture or tutorial time. The nature of the task will vary but may include a simple question or very short writing assignment. These tasks will be graded pass/fail or on a 0, 1, 2, 3 scale. Each of these tasks will contribute to your overall participation score for the module (20% of your total grade).

Lecture Schedule

Week 1 (16th August): Introduction

Lecture: Introduction to the central themes of the module as well an overview of the "long" history of biotechnology.

Reading:

- Robert Bud (1992). "The Zymotechnic Roots of Biotechnology" *British Journal of the History of Science* 25: 127-144.

No Presentations.

Week 2 (23rd August): Genetic Engineering

Lecture: The emergence of genetic engineering in the 1970s and the debates surrounding it.

Reading:

- Everett Mendelsohn (1984). "'Frankenstein at Harvard' The Public Politics of Recombinant DNA Research" in *Tradition and Transformation in the Sciences*, E. Mendelsohn, ed., pp. 317-335.

No presentations.

Week 3 (30th August): Owning Life: Patents and Profits

Lecture: How has life come to be something that can be owned? What are some of the problems raised by the ownership of life?

Reading:

- Diamond v. Chakrabarty, 447 U.S. 303.
- Daniel Kevles. (2002) "Of Mice and Money: The Story of the World's First Animal Patent" Daedalus, 131 (Spring): 78-88.

Presentations: Genentech; Cetus; Amgen; Biogen; Plant Patent Act; Myraid Genetics (BRCA1 & BRCA2); Ex Parte Allen; Oncomouse.

Week 4 (6th September): Genetically Modified Foods

Lecture: The development of genetically modified foods and new practices of ownership in agriculture and its effects on our food supply and economy.

Reading:

- William Boyd (2003) "Wonderful Potencies: Deep Structure and the Problem of Monopoly in Agricultural Biotechnology." In: Engineering Trouble: Genetic Engineering and its Discontents, Kelso and Schurman, eds. Berkeley: University of Calfornia Press.

Film Screening: *Food Inc.* (2008) [during second half of lecture and/or tutorial]

Presentations: Flavr Savr; Roundup Ready Eggplants; Roundup Ready Soybeans; Roundup Ready Corn; Roundup Ready Cotton; Golden Rice; AquaAdvantage Salmon.

Week 5 (13th September): Bioprospecting and biocolonialism

Lecture: What are bioprospecting and biocolonialism? What implications do they have for human rights?

Reading:

- Debra Harry, Stephanie Howard, Brett Lee Shelton (2000). "Indigenous people, genes, and genetics: what indigenous people should know about biocolonialism" Indigenous Peoples Council on Biocolonialism.

Presentations: HapMap project; Genographic Project; Human Genome Diversity Project; Neem Tree (as object of bioprospecting); Turmeric (as object of bioprospecting); Pozol (as object of bioprospecting); Basmati rice (as object of bioprospecting); Hoodia (as object of bioprospecting)

Week 6 (20th September): Genetic Testing, Discrimination, and Bioethics

Lecture: What will happen as we gain a greater and greater ability to perform genetic tests that purport to predict peoples' risk for disease? How do we ensure that this does not result in discrimination?

Film screening: *Gattaca* (1997) Andrew Niccol, director.

Reading:

- Julian Savulescu (2001). "Procreative Beneficence: Why we Should Select the Best Children." Bioethics 15(5/6): 413-426.
- R. Bennett and J. Harris (2002). "Are There Lives not Worth Living? When is it Morally Wrong to Reproduce?" in *Ethical issues in Maternal-Fetal Medicine* D. Dickenson, ed. Cambridge: Cambridge University Press.

Presentations: No presentations due to film screening.

Week 7 (27th September): Mid-term test

The mid-term test will take place during the first 75 minutes of the lecture period. No tutorials this week.

Mid-Term Break!

Week 8 (11th October): Assisted Reproduction

Lecture: History of contraception, IVF and other forms of assisted reproduction.

Reading:

- Andrea Tone (2001). "Developing the Pill" in *Devices and Desires: A History of Contraception in America*, New York: Hill and Wang, pp. 203-232.

- Renate Klein (1992). *The Ultimate Colonisation: Reproductive and Genetic Engineering.* Dublin: Attic Press.

Presentations: Louise Brown; Margaret Sanger; John Rock; Steptoe and Edwards; Carl Wood.

Week 9 (18th October): Public Holiday (Deepavali)

No class this week.

Week 10 (25th October): Cloning and Stem cells

Lecture: A history of cloning; introduction to politics and ethics of somatic cell nuclear transfer and the politics and ethics of stem cells.

Reading:

- Sarah Franklin. (2007). "Sex" in *Dolly Mixtures: The Re-Making of Human Genealogy,* Duke University Press, pp. 19-45.
- Charis Thompson (2010) "Asian regeneration? Nationalism and Internationalism in Stem Cell Research in South Korea and Singapore," in Aihwa Ong and Nancy N. Chen, eds. *Asian Biotech: Ethics and Communities of Fate* (Durham, NC: Duke University Press).

Presentations: Polly and Molly; Megan and Morag; Stem cell tourism.

Week 11 (1st November): Minding Your Own Biological Business

Lecture: What social, economic, political, and legal issues are raised by the new field of personal genomics?

Reading:

- Nikolas Rose (2008). "Race, risk, and medicine in the age of your own personal genome" Biosocieties 3(4): 423-439.
- Explore online: https://www.23andme.com/howitworks/

Presentations: Illumina; ABI Solid; Helicos Biosciences; Ion Torrent; AncestryDNA; WeGene; George Church's PGP.

Week 12 (8th November): Biotech in Asia

Lecture: What are the political and economic conditions under which biotechnology has developed in Asia?

Reading:

- Laurence Schneider, Biology and Revolution in Twentieth-Century China (Rowman & Littlefield Publishers, Inc. 2003), Chapter 9 "Biotechnology Becomes a Developmental Priority, 1978-2002," pp. 241-270.
- Waldby, Catherine (2009). "Singapore Biopolis: Bare Life in the City State" *East Asian Science Technology and Society* 3, no. 2-3: 367-383.

Presentations: Hwang Woo-Suk scandal; SARS; Indonesia and H5N1; Lysenkoism in China; artemisinin.

Week 13 (15th November): Biological Futures

Lecture: Introduction to synthetic biology and a consideration of where biotechnology is likely to take humans in the near future.

Readings:

- Explore online: http://partsregistry.org/Main_Page
- Freeman Dyson (2007). "Our Biotech Future" The New York Review of Books 54(12 – July 19).
- J. Craig Venter, Sarah Franklin, Peter Lipton, Chris Mason. (2008). "Debate: Beyond the Genome: The Challenge of Synthetic Biology" *Biosocieties* 3(1): 3-20.

Presentations: Investigate a "part" created at IGEM; The Singularity; Post-humanism or transhumanism; Repressilator.