



# **HSTC 4000**

## **Science and Nature in the Modern World.**

### **2013-2014**

Time: Tuesdays and Thursdays, 10:05-11:25am  
Location: Frazee Room, 2<sup>nd</sup> floor, New Academic Building

#### **Instructor**

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Office Hours: TH: 11:30am-12:45pm or by appointment

#### **Course Description**

Studying the history of science and technology in the modern period is as exciting as it is daunting. No other era is as close to our own, and helps us understand our own, as much as the modern. Yet this can also make it difficult to be able to fully appreciate how even the recent past was very different from the world we live in now. The modern period saw the rise of most of our current political “-ismism” along with the birth of the nation state as we known it. It also saw the intensification of colonial and corporate networks of power and exchange, controversies surrounding the rights of women and of LGBTQ+ people, and the changes brought about by the development of the steam press, radio, television, and the internet. Alongside these changes came the rise of counter cultures, professionalization, evolutionary naturalism, the chemical revolution, industrialization, the new physics, the discovery of DNA, and growing anxieties about the relationship between science and religion. This class will help students understand how these things were related, how they can be understood in their own terms, and how this historical understanding can begin to help us address the problems and concerns of contemporary life.

#### **Required Texts**

Abbott, *Flatland: A Romance of Many Dimensions*. Joseph Carroll, ed. *Darwin: On the Origin of Species*. Suggested: Michael Frayn’s *Copenhagen*. All other texts will be distributed electronically.

#### **Course website/Reading list**

For the Fall semester, students will find the readings and other course material online on the course OWL website accessible through Dalhousie’s homepage or at:

<https://dalhousie.blackboard.com>.

## Reading & Lecture Schedule

Thursday, September 4

### **Introduction to the History of the Modern**

No Reading.

Tuesday, September 9

### **What is Enlightenment?**

Reading: Immanuel Kant, "What is Enlightenment?" (Handout); The artwork of Goya, particularly his prints in *Caprichos*.

Thursday, September 11

### **"More Light!"**

Reading: Newton, "The Particle Theory of Light", selections; Young: "The Vindication of the Wave Theory of Light", selections; Huygens, "The Wave Theory of Light", selections; Goethe, "Theory of Colours", selections. All on blackboard.

Tuesday, September 16

### **Liebig's Familiar Letters on Chemistry**

Reading: Liebig, *Familiar Letters on Chemistry*, selections, on blackboard

Thursday, September 18

### **Natural Theology and Theodicy**

Reading: W. Paley, *Natural Theology*, in Carroll 565-573; *Reasons for Contentment* (<https://archive.org/details/reasonsforconten00paleiala>); Malthus, *An Essay on the Principle of Population*, in Carroll 595-605.

Tuesday, September 23

### **On the Connexion of the Sciences**

Reading: Mary Somerville, "On the Connexion of the Physical Sciences", Introduction, Section XXXVII; Whewell's Review of Somerville in the *Quarterly Review*, Vol. LI, March & June, 1834, pg 54-68  
(<https://play.google.com/store/books/details?id=uWsJAAAAQAAJ&rdid=book-uWsJAAAAQAAJ&rdot=1>)

Thursday, September 25

### **Deep Time**

Reading: Lamarck, *Zoological Philosophy*, in Carroll 573-580 ; Hutton, *Theory of the Earth*, Chapter I, focus on Section I and IV  
(<http://www.gutenberg.org/files/12861/12861-h/12861-h.htm>); C. Lyell, *Principles of Geology*, in Carroll 605-610

Tuesday, September 30

### **Deep Space**

Reading: Brewster, *More Worlds Than One*, Preface, Introduction, Chapter I, VII, X, XI, XII, XIII, XV (<https://archive.org/details/moreworldsthanon00brewuoft>); Whewell, *Of the Plurality of Worlds*, Preface, Chapter I, II, III, IV, XI, XII, XIII (<https://archive.org/details/ofpluralityofwor00whewuoft>); Proctor, *Other Worlds than Ours*, Preface, Introduction, Chapter I, XII, XIII (<https://archive.org/details/otherworldsthan01procgoog>);

Thursday, October 2

### **Being There: Picturing the Globe**

Reading: von Humboldt, *Cosmos*, Vol 1. Preface, pg 1-17 (<https://archive.org/details/cosmosasketchap08humbgoog>), Vol 2, pg 230-268, 353-359 (<https://archive.org/details/cosmos03humbgoog>)

Tuesday, October 7

### **The Context of the Origin**

Reading: Chambers, *Vestiges of the Natural History of Creation*, pg 361-390 (<https://archive.org/details/vestigesofnatura00unse>); Poe, *Eureka*, selections, on blackboard

Thursday, October 9

### **The Origin**

Reading: Darwin, *The Origin of Species*, Chapter I, II, III, IV, V, VI, XVI. Try to read the summaries at the end of each chapter in the book.

Tuesday, October 14

### **The Reception of the Origins**

Reading: Lange, *History of Materialism*, vol. III. Chapt. IV “Darwinism and Teleology” (<https://archive.org/stream/historyofmateria03lang#page/26/mode/2up>)

Thursday, October 16

### **The Descent of “Man”**

Reading: Darwin, *The Descent of Man*, Chapt. V, VII, VIII, XIX, XX, XXI (<http://darwin-online.org.uk/content/frameset?itemID=F955&viewtype=text&pageseq=1>)

Tuesday, October 21

### **The Rise of the Machines**

Reading: Helmholtz, “On the Conservation of Force” (<http://www.bartleby.com/30/125.html>), Thompson, “On the Age of the Sun’s Heat” ([http://zapatopi.net/kelvin/papers/on\\_the\\_age\\_of\\_the\\_suns\\_heat.html](http://zapatopi.net/kelvin/papers/on_the_age_of_the_suns_heat.html))

Thursday, October 23

### **Scientific Cosmopolitanism**

Helmholtz, "On the Aim and Progress of Physical Science"  
(<https://archive.org/stream/popularlectureso00helmuoft#page/362/mode/2up>) and  
"On Academic Freedom in German Universities"  
(<https://archive.org/stream/popularlectureso00helmrch#page/236/mode/2up>)

Tuesday, October 28

### **The Professionalization of Science**

Reading: Weber, *Science as a Vocation*  
(<http://www.wisdom.weizmann.ac.il/~oded/X/WeberScienceVocation.pdf>)

Thursday, October 30

### **Social Darwinism and Eugenics**

Reading: Spencer, *Social Statics: or, the Conditions Essential to Human Happiness Specified, and the First of Them Developed*, Chapt. XXV  
(<http://oll.libertyfund.org/titles/273>);  
Galton: *Hereditary Genius: An Inquiry into Its Laws and Consequences*,  
"Prefatory Chapter to the Edition of 1892", Preface,  
(<http://www.mugu.com/galton/books/hereditary-genius/text/pdf/galton-1869-genius-v3.pdf>)

Tuesday, November 4

### **Radical Science: Anarchism, Spiritualism, Evolution, and Free Love**

Reading: Kropotkin, *Evolution and Anarchism*, selections, blackboard; Woodhull,  
"The Elixir of Life", on blackboard

Thursday, November 6

### **Expectant Attention and the Subliminal Self**

Reading: Myers, "Automatic Writing", on blackboard; Carpenter, "The Fallacies  
of Testimony in Relation to the Supernatural", on blackboard

**Tuesday, November 11 – Remembrance Day – No Classes**

Thursday, November 13

### **Alfred Russel Wallace and Spiritualism on Trial**

Reading: Wallace, *A Defence of Modern Spiritualism*, selections, TBA

Tuesday, November 18

**Neo-Kantian Physiology and the Limits of Knowledge**

Reading: Lange, *History of Materialism*, selections; Nietzsche, *The Pre-Platonic Philosophers*, selections; *Letters*, selections; *Beyond Good and Evil*, selections.  
TBA

Thursday, November 20

**“Passing through the long and ghastly kitchen”**

Reading: Anna Kingsford, *Unscientific Science: Moral Aspects of Vivisection and The Uselessness of Vivisection*; Claude Bernard, Introduction to the Study of Experimental Medicine, selections, TBA

Tuesday, November 25

**Spontaneous Generation**

Reading: Pasteur, *Studies on Fermentation*, selections, TBA

Thursday, November 27

**The Romance of Dimensions**

Reading: Abbot, *Flatland: A Romance of Many Dimensions*

Tuesday, December 2

**Physiological Aesthetics**

Reading: Grant Allen, *Physiological Aesthetics*, selections; Vernon Lee, *Beauty & Ugliness and Other Studies in Psychological Aesthetics*, selections, TBA

**Winter Break**

Tuesday, January 6

**When Did the Nineteenth Century End?**

Reading: None.

Thursday, January 8

**Things Unseen: X-Rays, N-Rays, Uranic Rays, and the Ether**

Reading: Curie, The Discovery of Radium, selections; Röntgen, “On a New Kind of Rays”; Michelson, “The Ether and Optical Experiments”, selections

Tuesday, January 13

**The Current Wars**

Reading: Tesla, *My Invention*, selections, TBA

Thursday, January 15

**Telegraphy, Telepathy, and the Media**

Reading: Stead, *Telegraphy Without Wires*, *The Miracle of the Marconi Waves*, and *The Next Wonder of the World*, blackboard

Tuesday, January 20

**More Light! Special Relativity I**

Reading: Einstein, *On the Electrodynamics of Moving Bodies*, selections; *What is the Theory of Relativity?*, and “The Postulates of the Special Theory of Relativity”

Thursday, January 22

**Special Relativity II**

Reading: See readings for January 20<sup>th</sup>

Tuesday, January 27

**Taylorism and Ford**

Reading: Ford, *My Life and Work*, selections; Taylor, *The Principles of Scientific Management*, selections; Look at the Detroit Industry Murals by Diego Rivera

Thursday, January 29

**General Relativity**

Reading: Einstein and Infeld, “Outside and Inside the Elevator”; Eddington, TBA

Tuesday, February 3

**The Modern Synthesis**

Reading: Fischer, “Has Mendel’s Work Been Rediscovered?”, J Huxley, *Evolution: The Modern Synthesis*, selections.

Thursday, February 5

**The Monkey Trial**

Reading: Hunter, *Civic Biology*, 192-196; 253; 261-265 (online at: <http://www.archive.org/details/civicbiologypres00hunt>)

Tuesday, February 10

**Copenhagen I**

Reading: Heisenberg, *A Brief History of Quantum Mechanics*. Supplement: Frayn, Copenhagen.

Thursday, February 12

**Copenhagen II**

Reading: Heisenberg, “On the Perceptual Content of Quantum Theoretical Kinematics and Mechanics”, Supplement: Frayn, Copenhagen.

**February 16 – 20 – Study Break**

Tuesday, February 24

**“I am Become Death the Destroyer of Worlds”**

Reading: Einstein, “Letter to F.D. Roosevelt”; Oppenheimer, TBA; Committee on Political and Social Problems, Manhattan Project, “Franck Report”, check out the documents at [www.dannen.com/decision](http://www.dannen.com/decision)

Thursday, February 26

**On the So-called Evil: Imprinting and Aggression**

Reading: Lorenz, *On Aggression*, selections.

Tuesday, March 3

**The Double Helix**

Reading: Watson, *The Double Helix*, selections.

Thursday, March 5

**Locating the Brain**

Reading: Penfield, *The Mystery of the Mind: A Critical Study of Consciousness and the Human Brain*, selections; Young, *Philosophy and the Brain*, selections

Tuesday, March 10

**Machine Intelligence**

Reading: Turing, “Computing Machinery and Intelligence”

Thursday, March 12

**Environmentalism and Climate Change**

Reading: Carson, *Silent Spring*, selections; Study of Critical Environmental Problems (SCEP), *Man's Impact On The Global Environment*, selections

Tuesday, March 17

**AIDS and Citizen Science**

Reading: Interview with Martin Delaney  
(<http://www.pbs.org/wgbh/pages/frontline/aids/interviews/delaney.html>);  
supplementary reading: Epstein, *Impure Science*.

Thursday, March 19

**The Human Genome Project**

Reading: Lisa Gannett, “The Human Genome Project”, selections

Tuesday, March 24

**Time Travel in a Bending, Expanding Universe**

Reading: Hawking, “The Edge of Spacetime”

Thursday, March 26

**The Fractal Geometry of Nature**

Reading: Mandelbrot, *The Fractal Geometry of Nature*, selections

Tuesday, March 31

**Our World(s): Geoengineering and  
Terraforming**

Reading: Launder and Thompson, eds, *Geo-engineering climate change*,  
selections; Beech, Terraforming: *The Creating of Habitable Worlds*, selections

Thursday, April 2

**Singularitarianism I**

Reading: Kurzweil, *The Age of Spiritual Machines*, selections; *The Singularity is  
Near*, selections; Drexler, *Engines of Creation*, selections

Tuesday, April 7

**Singularitarianism II**

Readings: See April 2<sup>nd</sup>.

Thursday, April 9

**Conclusions**





## Evaluations

### Fall Semester

- |                               |       |        |
|-------------------------------|-------|--------|
| 1. Participation<br>and posts | (15%) |        |
| 2. Presentation               | (10%) |        |
| 3. Research project           | (15%) | Dec. 2 |
| 4. Take Home Exam             | (10%) | Dec. 2 |

### Winter Semester

- |                               |                    |
|-------------------------------|--------------------|
| 1. Participation (10%)        |                    |
| 2. Presentation (10%)         | 1 present per term |
| 3. Research Project (15%)     | Last class, Apr. 9 |
| 4. Final take home exam (15%) | Apr. 9             |

*Class Participation:* Participation is mandatory and students are expected to have done the readings BEFORE lecture. Failure to do so will result in a lower grade. In the FALL semester the students are expected to post at least two (2) 500-word reflections on an assigned reading at least 12 hours before the meeting when the reading will be discussed.

*Oral Presentations:* Students will have to present one topic in both semesters. The topic of the first presentation is up to the discretion of the student in consultation with the teacher. In the Winter Semester students will be expected to give a presentation on the topic of either their first term or second term research projects.

*Research project.* Students must produce a research project. The latter can take many forms (research paper, play, exhibit, talk, guided tour, etc.), but must present original research content and serious historiography on the history of modern science or technology (1800-present). Students are expected to consult with their teacher about their topic and the direction their work is taking at least a week before the deadline.

### *Final Exam*

There will be take-home exams covering each semester's material in December and April.

Failure to submit all assignments will result in a failing final grade.



### ***Keeping academic term***

Mandatory in-class assessments dates (oral presentations) cannot be changed to accommodate travel plans or other personal activities. It is the obligation of each student to ensure that travel arrangements and personal obligations do not conflict in-class evaluations. The keeping of academic term is the responsibility of every student.

### **Late Policy**

Unexcused late work will be marked down at a rate of 10% per day.

### **Academic Honesty**

Plagiarism is a serious academic offense and a form of cheating. Just don't do it. Remember that **you are expected to know and abide by the University's Academic Integrity Policies** (see [http://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](http://www.dal.ca/dept/university_secretariat/academic-integrity.html)). Please note that in this class self-plagiarism (i.e. use of work done in another class without proper quotation) and disguised plagiarism (i.e. the change of only a few elements in another author's word or the use of ideas without proper reference) is also considered plagiarism. Unless otherwise noted, "collaborative" work is also unacceptable (it does not mean that you can't help each other to a certain extent, but make sure you present your own original work (i.e. you present your own take on the topic, you use your own sources, etc)). You may be asked to submit a research portfolio or an electronic copy of your work for plagiarism checking in order to receive credit for your work. If you prefer the authenticity of your work to be assessed differently, you must let the course instructors know before the end of the add/drop period and tell them if, in-lieu of electronic submission, you will—if asked—submit either an annotated bibliography of your research or submit a series of draft showing the progress of your work throughout the semester.

Plagiarized work will be reported to the University's Academic Integrity Officer and serious offenders will fail the course or suffer other academic penalties.

*Citation:* All sources you used in your research must be cited or referenced. Standard citation techniques can be found in any writing handbook, e.g., *The Chicago Manual of Style* or online at: <http://owl.english.purdue.edu/>. If you are doing an "unconventional" research project and are not sure how to reference your sources, consult with the instructor.

### **Accommodations**

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic under the Nova Scotia Human Rights Act. Students who require academic accommodation for either classroom participation or the writing of tests and exams should make their request to the Advising and Access Services Center (AASC) prior to or at the outset of the regular academic year. Please visit [www.dal.ca/access](http://www.dal.ca/access) for more information and to obtain the Request for Accommodation – Form A.

Please note that your classroom may contain specialized accessible furniture and equipment. It is important that these items remain in the classroom, untouched, so that students who require their usage will be able to participate in the class.