INTRODUCTION TO THE HISTORY OF SCIENCE

(HSTC 1200/HSTC 2200/SCIE 2000/HIST 2074)
FALL 2017/ WINTER 2018
(6 CREDIT HOURS)

LECTURES: MON/WED 2:35 - 3:25PM
ALUMNI HALL, KING'S ACADEMIC BUILDING

TUTORIALS: WED 3:35-4:25 PM OR FRI 2:35-3:25 PM

General Description

Science is an inescapably pervasive aspect of our lives today. It is both a body of knowledge about the world and a set of methods for obtaining that knowledge. This course offers students the opportunity to critically explore the nature and significance of science through its history: a broad introductory survey of the emergence and growing importance of science through a set of central figures, discoveries, instruments, and theories, from ancient Babylonia to the contemporary world. While moving through the history we will explore resonances between the past and the present, as certain reemerging questions are as much alive today as they were centuries ago. This will include questions about: (1) the relation between science and utility: what is science *for* and how have sensibilities toward the utility of science changed over time? (2) the nature of science: what is the relationship between scientific knowledge and others forms of knowledge and belief? how do various scientific methods (pure reason, observation, classification, experiment, modelling, etc.) relate to one another? (3) the relation between science and society: what place has religion had in our understanding of nature? what is the relation between the scientific enterprise and the modern state? (4) the relation between science and technology: how have instruments and techniques helped science progress? how have scientific discoveries been transformed into everyday technology? (5) science as a global practice: how has science been shaped by global networks—through the circulation of peoples, goods and ideas—and how has science itself come to have increasingly global applications? (There are no prerequisite for this course.)

COURSE OBJECTIVES

1. Students will develop a historical sensibility about scientific knowledge and ways of knowing. They will be challenged to appreciate something of the "otherness" of past epochs: past senses of what the world is and past ways of knowing it.
2. Students will be challenged to address their own assumptions about the nature and place of science in society, past and present.
3. Students will have the opportunity to improve their writing through two short term papers, their oral skills through tutorial discussion, and their capacities for critical textual analysis by reading a broad range texts belonging to the history of science

INSTRUCTORS

Dr. Mélanie Frappier (melanie.frappier@ukings.ca) ; 902-422-1271
Dr. Andrew Inkpen (inkpen@dal.ca);
Dr. Gordon McOuat (gmcouat@dal.ca); 902-422-1271

OFFICE HOURS

Frappier: Fall: Mon. 12:30-2:30 pm; Winter: TBA
A&A Building, King's, rm: 131 (1st floor, by the Chaplain's Office)
Inkpen: Fall: Wed 3:30-5:30 pm; Winter: TBA
King's Link (opposite the King's Student Union Office) and 1376 LeMarchant St, rm: 202
McOuat: Winter: TBA
King's Link (opposite the King's Student Union Office)

Meetings with instructors are also available by appointments.

BRIGHTSPACE WEBSITE

https://dal.brightspace.com/d2l/home/53833

Students are responsible for downloading course material to ensure they have access to it at all times, including during internet outage, website maintenance periods, etc.

TEXTS (AVAILABLE AT THE KING'S BOOKSTORE)

Required (1) Online readings
(2) Joseph Carroll, ed. *Darwin: On the Origin of Species*. (Peterborough: Broadview Press, 2003)
(3) Watson, James, *The Double Helix: Text, Commentary, Reviews* (New York: W.W. Norton, 1980)
(4) Barbara L. Cline, *Men Who Made a New Physics* (Chicago: University of Chicago Press, 1987)

COURSE FORMAT

Readings This course places a heavy emphasis on engaging with primary texts. You are responsible for *all* the assigned readings. 'Supplementary' readings are also suggested to put the primary texts in contexts. They are recommended, but remain optional.

Lectures Lectures will provide historical and interpretative background to the primary texts, and will set them in the context of the course as a whole.

Lectures may from time to time be recorded. Please consult the instructor if this is an issue for you. Students are not allowed to record lectures or tutorials without permission of the instructor.

Tutorials The aim of the tutorials is to deepen the students' understanding of the course material and debate the material examined in lecture. Attendance is mandatory. A participation grade will be assigned for each term (5%), based on attendance and contribution to tutorial discussion.

EVALUATION

Term 1
Test 1: 10% (Date: October 11)
Short Paper 1: 10% (Due: November 22)
End-of-term Exam: 20% (Exam Period)
Participation: 5% (Ongoing)

Term 2
Test 2: 15% (Date: February 26)
Short Paper 2: 15% (Due: March 21)
End-of-term Exam: 20% (Exam Period)
Participation: 5% (Ongoing)

Tests and Exams Tests (1 hr) and exams (2 hrs) will be based on *all* readings and *everything* covered in lectures and tutorials. Tests will be held during regular lecture time, exams during the exam periods.

Short Papers Each short essay will focus on a close reading of primary sources and will answer one question chosen from a series of provided questions covering the course material.
NOTE: students enrolled in HSTC 1200 will have a word length requirement for both papers of 1200-1500 words. Students enrolled in HSTC 2200, SCIE 2000, or HIST 2074 will have world length requirements for both papers of 1700-2000 words.

Letter grade scale and Definitons See https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.html

Assignment Submission and Missed Evaluations Policies

Essays Essays must be submitted either **in class or to Sharon Brown in the HSTC office**, third floor, King's New Academic Building by 4:00pm on the day they are due. Essays submitted after the office closes will be considered as having been submitted on the next working day.

Essays must also be submitted online to **Urkund** (a tool for plagiarism control) through the Brightspace course website.

Late essays will be penalized 5% per day (including weekends) up to a maximum of seven days, after which they will not be accepted and will receive a zero. The penalty will be applied to the grade an essay receives: if an essay receives an initial grade of 85%, but is two days late, 10% will be deducted and it will receive a final penalized grade of 75%. **Extensions are only possible in special circumstances** (exceptional medical or family crises) and must be requested before the due date. Appropriate supporting documentation will be required for extensions to be granted.

Missed tests and exams Rescheduling of tests will be possible in special circumstances (exceptional medical or family crises, religions holidays, etc.). Appropriate supporting documentation may be required for extensions to be granted as dictated by Dalhousie's Student Absence policy.

Prolonged absence from tutorials If prolonged absence from tutorials in unavoidable, students must agree with their tutorial instructor on work to be completed in replacement of their tutorial participation.

Learning and Support Resources

Study Skills and Tutoring https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Writing Center If you need extra help with your writing, you can contact the Writing Centre in the Killam Library (https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html). A Study Skills Programme is offered by Academic Support (Killam Library: 494-3077).

Advising King's Academic Advising: https://ukings.ca/campus-community/student-services/academic-services/academic-advising/

Dalhousie Academic Advising : https://www.dal.ca/campus_life/academic-support/advising.html

Libraries King's library: https://ukings.ca/campus-community/library/
Dalhousie libraries: http://libraries.dal.ca

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/guidelines/fair-dealing-guidelines.html

UNIVERSITY STATEMENTS

This course is governed by the academic rules and regulations set forth in the University of King's College Calendar: https://ukings.ca/wp-content/uploads/2017/06/AcademicCalendar2017-2018.pdf

Academic Integrity At the University of King's College and Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student you are required to demonstrate these values in all of the work you do. Dalhousie University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity

For more information, visit https://www.dal.ca/dept/university_secretariat/academic-integrity.html.

Academic integrity issues involving King's courses are normally dealt with by the Academic Integrity Officer (AIO) of the University of King's College.

Accessibility The Advising and Access Services Centre is Dalhousie's centre of expertise for stud ent accessibility and accommodation for the University of King's College and Dalhousie
University. The advising team works with students who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other char acteristic protected under Human Rights legislation (NS, NB, PEI, NFLD). (read m ore: https://www.dal.ca/campus_life/academic-support/accessibility.html)

Student Code of Conduct Everyone at King's and Dalhousie is expected to treat others with dignity and respect. *Two* Codes of Conduct are relevant to students enrolled in Joint Dalhousie/King's classes:

1) The University of King's College Code of Conduct as contained in the Yellow Book (read more: http://policies.ukings.ca/wp-content/uploads/2017/01/YellowBook.pdf)
2) The Code of Conduct allows Dalhousie to take disciplinary action if studetns don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. (Read more: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html)

Diversity and Inclusion – Culture of Respect

The University of King's College is committed to a welcoming and respectful working and learning environment that is free from harassment and discrimination. We encourage open dialogue, however members of the class are expected to refrain from speaking or behaving in ways that are harmful to others, through racism, homophobia, sexism, or other derogatory treatment based on characteristics protected under the Nova Scotia Human Rights Act. The King's College Code of Conduct (*Yellow* Book) provides specifics. Students are also directed to Dalhousie's Strategy on Diversity and Inclusiveness: http://www.dal.ca/dept/dalrespect.html or http://www.dal.ca/cultureofrespect.html. The full list of characteristics protected under the Nova Scotia Human Rights Act can be found here: https://www.dal.ca/dept/university_secretariat/policies/human-rights---equity/prohibited-discrimination-.html. Please do not hesitate to speak with us if you have questions or concerns.

TERM 1 SCHEDULE

Wed Sep 6 — **Introduction - The history of what?**
Reading: The syllabus!
Supplementary: H. Chang. 2007. "The Myth of the Boiling Point" http://www.sites.hps.cam.ac.uk/boiling/ ; P. Fara 2009. *Science: A Four Thousand Year History*. Introduction [On reserve]

Sep 6/8 — **Tutorial 1**

SECTION A: THE INVENTION OF NATURE

Mon Sep 11 — **Reading the Signs: Babylonian Celestial Omens**
Reading: "A Babylonian Diviner's Manual"

Wed Sep 13 — **Hippocrates**
(**Guest lecturer: Dr. Ian Stewart**)
Reading: selection from Hippocrates, *Sacred Disease*
Supplementary: G.E.R. Lloyd. 1979. *Magic, Reason and Experience*, Chap. 1 [On reserve]

Sep13/15 — **Tutorial 2**

Mon Sep 18 — **Aristotle**
(**Guest lecturer: Dr. Eli Diamond**)
Reading: Aristotle. Selections from *On the Heavens* and *Physics* [Online]
Supplementary: D.C. Lindberg. 2008. *The Beginnings of Western Schience*, Chap. 3 [On reserve]

Wed Sep 20 — **Hellenistic Science**
Reading: selection from Ptolemy, *Syntaxis*
Supplementary: D.C. Lindberg. 2008. *The Beginnings of Western Science*, Chap.5 [On reserve]

Sep20/22 — **Tutorial 3**

Mon Sep 25 — **The House of Wisdom – The rise of Arabic science**
Reading: Habash, *The Book of Bodies and Distances*
Supplementary: D.C. Lindberg. 2008.*The Beginnings of Western Science*, Chap. 8 [On reserve]

Wed Sep 27 — **From Mathematics to Machines**
Readings: Selections from al-Khwārizmī, *Hindu Reckoning* and *Compendium on Calculation by Completion and Reduction*; al-Uqlīdisī on Hindu arithmetic; Kūshyār ibn Labbān, *Principles of Hindu Reckoning;* al-Jazari ibn al-Razzaz. *The Book of Knowledge of Ingenious Mechanical Devices*.
Supplementary: Nadarajan. "Islamic Automation" http://www.muslimheritage.com/article/islamic-automation-al-jazari%E2%80%99s-book-knowledge-ingenious-mechanical-devices

Sep 27/29	**Tutorial 4**
Mon Oct 2	**Plows and Mills: the European Middle Ages** Reading: Aelfric. *Colloquy.* http://www.kentarchaeology.ac/authors/016.pdf Supplementary: R. Friedel. 2010. *A Culture of Improvement*. Chap. 2 and 3 [On reserve]
Wed Oct 4	**A World Without Women: Universities and Late Medieval Scholastic Philosophy** Readings: Giles of Rome. "That a Woman Can Be Impregnated without the Emission of her own Sperm" and Jacopo da Forli "On the generation of embryos" Supplementary: D.C. Lindberg. 2008. *The Beginnings of Western Science*, Chap. 9 and 13 [On reserve]
Oct 4/6	**Tutorial 5**
Mon Oct 9	**Holiday - Thanksgiving**
Wed Oct 11	**Test 1 (No tutorial this week)**
SECTION B: STRANGE FACTS, NEW ORDERS	
Mon Oct 16	**Renaissance: Which Ancients? Agricola and Paracelsus.** Readings: Paracelsus. "Alchemy: The Third Column of Medicine"
Wed Oct 18	**Renaissance: The Copernican Revolution** Reading: selection from Galileo, *Dialogue Concerning the Two Chief World Systems*
Oct18/20	**Tutorial 6**
Mon Oct 23	**A new natural philosophy: Knowledge is power!** Reading: selection from Bacon, *New Atlantis* (1627) and *Great Instauration* (1620)
Wed Oct 25	**Nature as artist, nature as art: The mechanical philosophy** Reading: selection from Descartes, *Treatise on Light* (1629-33); selection from Shakespeare, *The Winter's Tale* (1623)
Oct 25/27	**Tutorial 7**
Mon Oct 30	**Chinese Science** (**Guest lecturer: Dr. Simon Kow**) Reading: Zhuxi, Principle & Material-Force; Selections from the journals of Matteo Ricci (you are responsible for pp. 26-32)
Wed Nov 1	**Experimental facts! Experiments of the heart** (**Guest lecturer: Dr. Gordon McOuat**) Reading: selection from Harvey, *On the motion of the heart* (1628)
Nov 1/3	**No tutorials**
Nov 6-10	**Holiday – Fall Study Break**

Mon Nov 13	**Holiday - Remembrance Day**
Wed Nov 15	**Microscopic facts!** (**Guest lecturer: Dr. Kathryn Morris**) Reading: selection from Hooke *Micrographia* (1665)
Nov 15/17	**Tutorial 8**
Mon Nov 20	**Scientific societies; Science and society** Readings: selection from Sprat, *History of the Royal Society* (1667); skim: Boyle *New Experiments Physico-Mechanical* (1669)

SECTION C: ENLIGHTENMENT: DARE TO KNOW!

Wed Nov 22	**SHORT PAPER 1 DUE!** **Isaac Newton: Mathematical-experimental science and the new physics** (**Guest lecturer: Dr. Stephen Snobelen**) Reading: Newton's 'Letter to Oldenburg, February 6, 1672', selection from Newton's *Principia* Supplementary: Margaret Osler, *Reconfiguring the world,* ch. 8
Nov 22/24	**Tutorial 9**
Mon Nov 27	**Classification systems** Reading: selection from Linnaeus the *Systema Naturae* (1735); selection from Buffon "Initial Discourse" (1753)
Wed Nov 29	**Chemical Affinities: Antoine Lavoisier, Marie-Anne Paulze and the Chemical Revolution** (**Guest lecturer: Dr. Melanie Frappier**) Reading: selections from Lavoisier and Séguin, *First report on animal respiration* and *First report on animal transpiration*
Nov 29/Dec 1	**Tutorial 10**
Mon Dec 4	**Shocking Discoveries and the end of the Old Order** (**Guest lecturer: Dr. Melanie Frappier**) Reading: selection from Nicholson "Account of the New Electrical Apparatus of Sig. Alex. Volta . . ."
Tue Dec 5	**Review**
Dec 7-17	**Exam Period**

TERM 2 SCHEDULE

SECTION A: LIFE AND ORIGINS

Mon Jan 8	**Rage against the machine: Romanticism, colour and archetypes (Guest lecturer: Danielle Inkpen)** Reading: Goethe, Theory of Colours, Goethe, "Experiment as Mediator between Object and Subject", Goethe, "Maxims and Reflections"
Wed Jan 10	**Being there: Discovering nature's space** Reading: Von Humboldt, *Cosmos*
Jan 10/12	**Tutorial 1**
Mon Jan 15	**Deep Time: Nature goes historical** Reading: Lamarck, *Zoological Philosophy* (in Carroll, *ed. Origin of* Species, pp. 573-579); Lyell, *Principles of* Geology (in Carroll, ed. *The Origin of Species* pp. 605-609);
Wed Jan 17	**Darwin I: Origins** Reading: Paley, *Natural Theology* (in Carroll, *The Origin of Species*, pp. 565-573), Malthus, *Principles of Population* (in Carroll, ed. *The Origin of Species*, pp. 595-604); and as much as possible from Darwin's *Origin of Species* (1859), with chapter XIV being essential (Carroll)
Jan 17/19	**Tutorial 2**
Mon Jan 22	**Darwin II. The *Origin of Species*** Finish Reading: Darwin's *Origin of Species*, concentrating on "Recapitulation and Conclusion"

SECTION B: IN THE WAKE OF THE *ORIGIN*

Wed Jan 24	**The *Descent of Man*** Readings: Darwin, *The Descent of Man* (in Carroll, ed. Read as much as possible, but concentrate on "Recapitulation and Conclusion", pp. 279-398)
Jan 24/26	**Tutorial 3**
Mon Jan 29	**Life and experimentation** Readings: selection from Bichat *Discourse on the Study of Physiology* (1798); selection from Bernard *Introduction to the Study of Experimental Medicine* (1865)
Wed Jan 31	**From physiology to psychoanalysis: Brücke and Freud** Readings: selection from Freud *Three Essays on the Theory of Sexuality* (1905)
Jan 31/Feb 2	**No tutorial (George III/Munro Day)**
Mon Feb 5	**The rise and triumph of the machines (Guest lecturer: Danielle Inkpen)** Herman von Helmholtz, "On the Conservation of Force"

Wed Feb 7	**Wilhelm Wundt and the rise of 'psychology without a soul'** (**Guest lecturer: Dr. Scott Edgar**) Readings: Wundt, *Outlines of Psychology*
Feb 7/9	**Tutorial 4**
Mon Feb 12	**Sociobiology and eugenics** Readings: Margaret Sanger, "Birth Control and Racial Betterment"; Carnegie, "Gospel of Wealth"; Kropotkin, "Mutual Aid"
Wed Feb 14	**Mendel's peas** Readings: Mendel, *Experiments in Plant Hybridisation;* Mayr, "80 years of watching the evolutionary scenery"
Feb 14/16	**No tutorials**
Mon Feb 19	**Holiday - Winter Study Break – Read *The Double Helix*.**
Wed Feb 21	**Holiday - Winter Study Break – Read *The Double Helix*.**
SECTION C: MODELLING THROUGH THE CODE	
Mon Feb 26	**Test 2**
Wed Feb 28	**The Double Helix** Reading: Watson, *The Double Helix*
Feb 28/Mar 2	**Tutorial 5**
SECTION D: END OF DETERMINISM	
Mon Mar 5	**Marie Curie: Cracking Atoms and Glass Ceilings** Readings: Eve Curie, "Method of Research", Cline, *Men Who Made a New Physics* [pp. 1-31]
Wed Mar 7	**Breakdown!!** Reading: Cline, *Men Who Made a New Physics*, pp. 31-108
Mar 7/9	**Tutorial 6**
SECTION E: AND THE END OF ABSOLUTES	
Mon Mar 12	**Relativity: Dissolving Space and Time.** Reading: Cline, *Men Who Made a New Physics*, pp. 108-172
Wed Mar 14	**Quantum: The End of Certainties** Reading: Cline, *Men Who Made a New Physics*, pp. 172-235
Mar 14/16	**Tutorial 7**
Mon Mar 19	**Physics and Philosophy: The Destruction of the Old Order** Reading: Cline, *Men Who Made a New Physics*, pp. 235-end
SECTION F: THE RISE OF BIG SCIENCE	

Wed Mar 21	**SHORT PAPER 2 DUE!** **Blowing up the World: Big Science and the Bomb** Reading: Einstein, "Letter to F.D. Roosevelt" (2nd August, 1939), browse the primary sources available at www.dannen.com/decision
Mar 21/23	**Tutorial 8**
Mon Mar 26	**Big Science II: Rebuilding Life and The Human Genome Project** (**Guest lecturer: Dr. Ford Doolittle**) Reading: TBA
Wed Mar 28	**Ecology and the Rise of Environmentalism** (**Guest lecturer: Danielle Inkpen**) Readings: John Muir, "A Near View of the High Sierra" (1894) [Online]; Rachel Carson, *Silent Spring* (1962)
Mar 28/30	**No tutorials** (**Good Friday**)
Mon Apr 2	**Global Science** Readings: TBA
SECTION G: HISTORY OF EVERYTHING	
Wed Apr 4	**The History of Everything** Reading: Stephen Hawking, "The Edge of Space-time"
Apr 4/6	**Tutorial 9 – Review Session**
Mon Apr 9	**FRIDAY Schedule – No tutorial, no class**
Tue Apr10	**FRIDAY Schedule – No tutorial, no class**
Apr 12-26	**Exam Period**