

York University, Faculty of Science and Engineering
Natural Science 1730.06 Section B
Scientific Change
Fall 2009

Course Director:

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Lectures: Mondays and Thursdays, 4:00 p.m.—7:00 p.m. Classes will be held in Stedman Lecture Hall "A". The course website will have the particulars of the day-by-day schedule, with lecture topics, daily reading assignments, and the schedule of tests and exams.

Important dates: There are specific dates with respect to enrollment. These include: (1) September 24, 2009, the last day that students can enroll in the course without permission of the Course Director; (2) October 9, 2009, the last day for possible enrollment *with* the permission of the Course Director, and (3) November 6, 2009, the last day to withdraw from the course without receiving a grade that will appear on the student's transcript.

Web sites: The course website is www.yorku.ca/bwall/nats1730. Students should take note of it and check it frequently throughout the course. Any schedule changes or other announcements will be posted on this site. Interim marks will also be posted here. The site has useful links to further information on the topics of the course. The Division of Natural Science has its own website, www.nats.yorku.ca. This should be consulted for general information on Natural Science courses. It also has links to information about this course.

Email: All students are urged to obtain a York email account even if you prefer to use another account elsewhere. It is very easy to do at www.yorku.ca/computing/students/email/index.html. This is a web-based email service, which means you can access it from any computer that is on the internet. However, if you don't want to have to consult this email account, you can have it forward all your mail elsewhere using the Options feature in MyMail. Announcements to the class will often be made via email. If you do not have a York email account, we may not be able to reach you.

Required Texts:

James MacLachlan, *Children of Prometheus: A History of Science and Technology*, 2nd ed.
Byron Wall, *Glimpses of Reality: Episodes in the History of Science*
James D. Watson, *The Double Helix: A Personal Account of the Discovery of the Structure of DNA*

Most of each of the above texts is assigned as required reading in the course. Copies are available in the York bookstore and may also be available at Discount Textbooks on Keele St.

Course Description:

This course explores a small number of the most important discoveries and conceptions in the history of science. The objective is to understand how scientific theories are conceived, verified and accepted or rejected, and to gain some insight into what makes some kinds of ideas and theories scientific and others not. The topics include: the development of logic and reason, axiomatic mathematics, ancient planetary astronomy, terrestrial physics (especially inertia and

gravitation), thermodynamics and energy, relativity, cosmology, evolution, and genetics. While the topics are among the most technical and mathematical in science, the course is intended for those who are not primarily studying the sciences, and who may have not very much skill in mathematics. What *is* required is the ability to study, to read closely written material carefully, and to listen to long expositions.

Lectures:

The format of the course is lectures, reading assignments, a few videos or films, and tests. Most important are the lectures, which tell a long, connected story about the development of science supplemented with illustrations and key points highlighted on PowerPoint slides. The lectures present the material in one format; the textbooks tell the same story in a different format. Students will find the redundancy important for understanding. The PowerPoint slides used in lectures will be posted on the course website. The lecture hours are sometimes also used to screen a video or film that helps to clarify the topics being considered.

There are reading assignments for every lecture class. These are listed in the schedule which is posted on the course web site. All reading assignments are listed in the schedule next to the lecture date on which similar material is to be presented in class. It works best if students read these assigned chapters prior to the class for which they are listed, which helps to make the lectures more comprehensible. Otherwise, it is very difficult to absorb so much new material all at once. Moreover, the reading assignments are evenly spread across the course, making each assignment a manageable task. Much more will be retained and understood if students follow the schedule rather than allow assignments to back up. Ideally, students should also re-read the assignments after the class session in which the subjects concerned were presented. If this three step process is followed faithfully, students will find that the course falls into place much more easily and will make more sense: 1. Read the assigned chapters prior to class, noting the major issues to be dealt with. 2. Attend the lectures, taking notes either from scratch or by annotating the lecture notes which can be downloaded from the course website prior to class. 3. Re-read the assigned chapters, and take careful notes—far easier to do after following (1) and (2).

There are quite a few really fine videos that have been made on topics which we will take up in the course. Seeing them can bring the subject to life. They also provide another person's view of the same subject matter, which helps to make the subject more interesting. Therefore, several such videos will be shown during class time. The titles of videos and films to be shown in class are listed in the schedule so that students may, if they wish, view them again in the library. Most of the videos and films to be shown are available in the York Sound and Moving Image Library on the first floor of the Scott Library. They may be viewed there on one of the available VCRs or film projectors. However, some of the videos may have been brought in from other libraries and will not be available for independent viewing. Occasionally videos that are listed will be skipped or others added as the course progresses.

Grading:

The course mark is determined written tests and examinations. The breakdown is as follows:

- Two 80 minute tests given during regular class time, worth 30% each of the course mark.
- A three-hour final exam, worth 40% of the course mark.

Proviso:

The tests and examinations assess students' grasp of the objective, factual material of the course and the ability to work with some of the concepts studied. Many questions asked will be in the form of multiple-choice questions, which will, of necessity focus on detailed understanding of the facts of the course. There may be included some essay-type questions, requiring the student to

explain a concept or event in his or her own words. Any of the questions may be about names, events, (a few) dates, scientific ideas, social context, and some scientific and mathematical problems using the theories under discussion in class. Students must be well prepared for each test. *Anything* discussed in lectures, shown on the videos/films, or contained in the required assigned readings may be asked about in the tests.

It would be wise for all students to understand very clearly from the outset that there is **no opportunity for second chances**. The mark one receives in the course is that which is calculated from the formulae above. **There are no re-takes of tests, no alternate assignments, no special considerations for students who were not prepared, etc.** There are only two exceptions to this: inability to take a test due to illness, or a documented disability that requires special circumstances.

(1) In the case of illness, students who are unable to take a test or examination on the assigned date should contact the instructor by email within 24 hours of the test, explaining the situation, and then proceed to obtain a doctor's certification that the student was unable to attend on the given date. (The medical clinic in York Lanes may be used for such purposes.) When the student is well enough to return to class, the medical note is to be given to the instructor. A make-up test will be scheduled for such students. Note that this may mean that the make-up test may take place months after the regular sitting of the test.

(2) In the event of physical, learning, or psychiatric disabilities, or other extenuating circumstances that may prevent one from completing the course satisfactorily, students are encouraged to consult with the Course Director as soon as possible. York has extensive facilities to provide assistance for disabilities and personal problems, allowing for a variety of appropriate arrangements. This should be attended to at the beginning of the course.

General Advice:

The comments that follow here are generally applicable to this course regardless of the format in which it will be delivered. This course is very fast paced and deals with difficult concepts that require a great deal of attention to grasp properly. But the circumstances that apply to the course as it will be given in the Winter of 2009 make these comments even more appropriate and urgent. In the first place, this course is to be delivered in what is sometimes called "double-speed" format. That is, usually the course is given at the rate of three lecture hours per week, starting in September and ending in April. This section, however, has six lecture hours per week and has to fit completely in the winter term, which is usually from January to the first week of April. But this year, because of the CUPE 3903 strike, the winter term will be slightly shortened in length, there will be no Reading Week, and students will be under increased pressure in all their courses to keep up. The lecture hours in this course, which are normally packed with information to absorb, will be stuffed just a bit more than usual to fit it all in with fewer class hours. It is absolutely essential that students keep to a demanding schedule and never fall behind in preparing for class.

This is a course that develops a breadth of understanding through the process of briefly touching on events and thoughts that are widely separated in time and in outlook. Every day in class is something completely different, while at the same time building upon what went before. Because of that, the only practical way to gain much from the course is to keep pace with the schedule as it is set out. Lectures should be attended without fail and careful notes taken. Likewise, videos and films should be seen and appreciated at the time they are set on the schedule. Only unavoidable illness should prevent students from keeping pace. Otherwise, very little will be gained from the course; it will reduce itself to nothing but a series of tests to pass, and doing so will be exceedingly difficult because the parts will not fall together. Do not make the mistake of

thinking that there is time to catch up on readings before a test – they will make little sense when read in cram sessions. Similarly, do not think that having the PowerPoint slides, or getting notes from some other student, is an effective substitute for attending class in person and paying attention. Notes are merely a structure to help the experience hang together. They cannot do the job on their own. Moreover, the videos and films are there to help students put all the ideas being discussed in some meaningful context. To see them in class while not keeping up with the readings is to miss the point of much of what is shown, and renders the experience of little value. To skip them in class, even if they are seen later just before a test is to separate them from the ideas that they are to help clarify. In short, *pacing is everything* in this course. The students who keep to the schedule, attend all lectures and pay attention in them, and who participate fully in the tutorials, are those who will get the most from the course, and very likely those who will get the higher grades.

All students have the option to drop the course without receiving a grade any time up to the date that will be specified by the Registrar. Students who cannot live with the consequences of their performance in the course can use that option to remove the course from their transcript. Otherwise, they must live with their marks as earned on each test.

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With that out of the way, welcome to Scientific Change. This can be a very interesting course. It is a science course, but probably not like any science course you have taken before. The goal is to understand something about scientific thinking, its accomplishments, its limitations, and its place in our civilization. The issues of this course are part of the framework of our culture. Anyone who wants a good education should know about these things. This course is a small step in the direction of gaining that knowledge.

IMPORTANT COURSE INFORMATION FOR STUDENTS

Academic Honesty and Integrity

York students are required to maintain high standards of academic integrity and are subject to the Senate Policy on Academic Honesty (<http://www.yorku.ca/secretariat/legislation/senate/acadhonesty.htm>).

There is also an academic integrity website with complete information about academic honesty. Students are expected to review the materials on the Academic Integrity website (<http://www.yorku.ca/academicintegrity/students.htm>).

Access/Disability

York provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials.

It is the student's responsibility to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Failure to make these arrangements may jeopardize your opportunity to receive academic accommodations.

Additional information is available at www.yorku.ca/disabilityservices or from disability service providers:

- **Office for Persons with Disabilities:** N108 Ross, 416-736-5140, www.yorku.ca/opd
- **Learning and Psychiatric Disabilities Programs - Counselling & Development Centre:** 130 BSB, 416-736-5297, www.yorku.ca/cdc
- **Atkinson students - Atkinson Counselling & Supervision Centre:** 114 Atkinson, 416-736- 5225, www.yorku.ca/atkcsc
- **Glendon students - Glendon Counselling & Career Centre:** Glendon Hall 111, 416-487-6709, www.glendon.yorku.ca/counselling

Ethics Review Process

York students are subject to the York University *Policy for the Ethics Review Process for Research Involving Human Participants*. In particular, students proposing to undertake research involving human participants (e.g., interviewing the director of a company or government agency, having students complete a questionnaire, etc.) are required to submit an Application for Ethical Approval of Research Involving Human Participants at least one month before you plan to begin the research. If you are in doubt as to whether this requirement applies to you, contact your Course Director immediately

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately.

Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Examination Accommodation Form, which can be obtained from Student Client Services, Student Services Centre or online at http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf

Student Conduct

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect and to refrain from actions disruptive to such a relationship. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. A statement of the policy and procedures involving disruptive and/or harassing behaviour by students in academic situations is available on the York website <http://www.yorku.ca/secretariat/legislation/senate/harass.htm>

Please note that this information is subject to periodic update. For the most current information, please go to the CCAS webpage (see Reports, Initiatives, Documents): http://www.yorku.ca/secretariat/senate_cte_main_pages/ccas.htm.