

York University, Faculty of Science and Engineering
Natural Science 1730.06 Section A
Scientific Change
Summer Session 2011

Course Director:

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Lectures: Mondays, Tuesdays, Wednesdays, and Thursdays, 10:00 a.m.—1:00 p.m. in Curtis Lecture Hall E. 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: Friday, **May 6**, 2011 is the last day that students can enroll in the course without special permission of the Course Director. Friday, **May 27**, 2011 is the last day students can drop the course without a grade appearing on their transcripts. Monday, **May 23**, is Victoria Day, a holiday, so we have no class that day. Instead, we will meet on **Friday, June 3**, to make up for the lost day of class.

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. Alternately, 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*

Most of each of the above texts is assigned as required reading in the course. Copies are available in the York bookstore.

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: axiomatic mathematics, ancient planetary astronomy, terrestrial physics, 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 not have 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, 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 accessible from the course web site. Unless an announcement is made to the contrary, this schedule is fixed and students can rely upon it to plan their studying. All reading assignments are listed next to the lecture date on which similar material is to be presented in class. It works best if students read these assigned chapters carefully prior to the class for which they are assigned. Doing so makes the lectures more comprehensible. Moreover, the readings 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 reading assignments to back up.

The titles of videos 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. However, some may have been brought in from other libraries and will not be available for independent viewing. Occasionally listed videos will be skipped or others added as the course progresses. Any such changes will be made to the schedule posted on the course website.

Grading:

The course mark is determined entirely by written tests and a final examination. The breakdown is as follows:

- Two 90 minute tests, at the end of the 2nd and 4th weeks, worth 30% each.
- Final examination, at the end of the course, worth 40%.

Tests will primarily be on the material in lectures and assignments since the previous test, however much of the subject matter is cumulative. The analysis of a topic in, say, week 4 may depend upon material covered in week 1 of the course, so in that sense all parts of the course are interrelated. The final exam spans the entire course, from the first to the last day

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. Most, possibly all, 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. In some of the tests 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, 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. 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; the make-up test may either be during the regular term or during the period set aside for final examinations.

(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:

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. Almost every day in class is something completely different, though building on what went before. The only practical way to gain much from the course is to keep pace with the schedule as it is set out. The time to do the readings is *before* each class for which they are scheduled. Lectures should be attended without fail and careful notes taken. Likewise, videos should be seen and appreciated at the time they are set on the schedule. Only 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. The summer session goes by very quickly. It is virtually impossible to catch up if a student ever falls behind in the course. 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 failing grade any time up to May 25. 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.