

# The Scientific Enterprise

## NSM 202B; Spring 2013

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Office Hours: MW 9:00-10:25 am, T 1:30-4:30 pm or by appointment  
Time: MW 12:00 noon-2:00 pm in KOSC 214

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### Book and Written Material

Written reference and reading material will draw upon numerous sources, including the following:

- Hazen, R. and J. Trefil. 2009. *Science Matters: Achieving scientific literacy*. Anchor Books, New York, NY.
- Muller, R. 2008. *Physics for Future Presidents: The science behind the headlines*. W.W. Norton, New York, NY.
- Collins, F. 2006. *The Language of God*. Free Press, New York, NY.

### Introduction

Science, through its methods of rational inquiry, has proven to be a powerful and extremely effective way to discover knowledge about the natural world. An appreciation for the natural sciences and for the technological outworking of science can make profound contributions to how we know the Creator, how we understand and advance our Faith in the world, and how effectively we support Christian values and leadership in society.

*The Scientific Enterprise* explores the essential methods and processes that characterize the human endeavor of science. Students are invited to actively participate in the process of scientific inquiry, employing scientific and quantitative reasoning skills, to explore significant issues confronting our society, referencing and using many of the important understandings and ideas of science and technology. Students are invited to consider the importance of being a scientifically literate citizen in our democratic society and are encouraged to pursue a lifelong quest for such literacy. The reconciliation of scientific knowledge with Scripture and various religious traditions will support development of a comprehensive Christian view of the natural world.

Through theory and practice, using logical analysis and creative intuition, *The Scientific Enterprise* invites students to explore descriptive, explanatory, and predictive insights about the natural world that are both compelling and powerful. Students are encouraged and supported to consider the implications of such knowledge, appreciate its relevance and reflect on the responsibilities such knowledge requires of individuals and of society. Plus, it's cool.

### Objectives

*The Scientific Enterprise* seeks to:

1. Encourage and support understanding and appreciation of the distinguishing characteristics of natural science and the scientific enterprise, including the presuppositions that underpin the scientific enterprise, the scientific methods for discovering new knowledge about the physical world, the processes by which scientific understanding advances and is accepted, the strengths, limitations, and self-correcting nature of science, and the essential connection between science and technology.
2. Invite and facilitate understanding of some of the important concepts and theories of natural science, through exploration of the rich and varied patterns and processes found in the natural world.
3. Promote appreciation for the need for scientific literacy and provide guidance as to how students may discern and make wise decisions regarding scientific issues; and
4. Facilitate consideration of the proper place of nature and the scientific enterprise within a Christian worldview.

### Pedagogy

Methods employed to foster a more effective learning experience will include a variety of active inquiry (hands-on) and peer-learning exercises, integrated lecture-demonstrations, and guided classroom discussions. All of the material in the course will be presented in association with context-rich issues that are highly relevant to students and modern society. These connections will place the scientific enterprise in a framework that illustrates how science and technology inform and contribute to significant decisions that must be made by various individual, corporate, and governmental constituencies.

Formative assessment methods that engage students and provide regular, real-time feedback about student progress will be employed. These may include the use of “concept tests” during course sessions, interactive problem solving exercises, and short reflection papers in preparation for classroom discussions or in reaction to assigned reading. We will attempt to integrate the traditional lecture and science laboratory/activity experiences, so that hands-on inquiry using the methods and instruments of science occur seamlessly with student engagement of the relevant theories and concepts.

### **Course Schedule**

This course consists of four modules: 1) the nature, methods, and processes of science; 2) the application of science in current issues of energy; 3) the application of science in environmental stewardship; and (4) the conciliation of faith and science. Technology, which can either facilitate scientific advance or become the visible outworking of such advances, will be addressed and referenced throughout the course. Each module consists of seven sessions.

The four modules are interconnected. For example, the presuppositions, methods, and processes of science introduced in Module 1 are demonstrated and reinforced throughout the course, and the interconnectedness of science and technology referenced in the first three modules will be highlighted in a discussion of biotechnology at the commencement of Module 4.

### **Course Requirements and Procedures**

1. **Blackboard:** Blackboard includes two sites for this course. Material that is common to all sections of the course (e.g. course documents) will be posted on a common site, and materials specific to this section (e.g. syllabus, grades) will be posted on the section-specific site.
2. *The Scientific Enterprise* is designed for students with sophomore standing, or above. Prerequisites are the successful completion of Old Testament Literature, History and Theology (BCM 101) and The Great Conversation (COR 107 or 109).
3. **Attendance:** Attendance (and timely arrival) at all sessions is expected. Athletes and others that have a scheduling conflict are expected to provide the instructor with a list of anticipated conflicts by Friday 25 January. In general, students will not be excused from tests. Few students do well in the core science courses without regular attendance. If you will miss a class session, please make arrangements with the instructor or another student to pick up hand outs, to turn in your homework when it is due, and to obtain the assignment for the next class session.
4. **Course Sessions:** Sessions may present you with new material, expand upon material in homework assignments, provide opportunities to practice and develop skills, demonstrate key principles, or serve as occasions for peer discussion and cooperative learning. Reading and other homework assignments are designed to introduce, reinforce and supplement material presented in course sessions. Most reading assignments are expected to be completed before coming to class. Each student is responsible for all material assigned and all material presented in sessions.
5. **Reading Assignments:** Reading a science book may be very different than reading other types of written material. It is not sufficient to read the words. You must read to understand the concepts and principles being presented. Often this will include careful, simultaneous consideration of graphs, diagrams, tables, and other support material. It may require you to reread a section multiple times in order to comprehend the concepts or relationships being presented and to read short sections at a time to connect more deeply with the material.
6. **Participation:** Effort will be made to establish a class environment that invites student participation. At times this will be accomplished through interactive demonstrations, peer collaborative learning experiences and classroom discussions. Active participation is so important that 10% of your final grade will be based on such active engagement. Criteria for the grade will include class attendance, quiz results, and willingness to actively participate in other ways during classroom activities. Both the quality and consistency of participation will be considered in assigning a grade. The assigned grade for participation will be based upon the cumulative attendance and participation results, modified by the instructor’s assessment of how effectively you have actively engaged in the course.

In order to accommodate varsity athletic competitions, illness, field trips, emergencies, and personal situations that result in an absence from a course session, each student’s cumulative attendance/participation grade will be multiplied by a numerical factor (with grades capped at 100% of the maximum points allowed). As a result,

students that are unable to attend all course sessions because of other obligations are still able to earn an A for participation.

7. Homework: Homework will typically consist of an assignment asking you to read and interact with material in a book, article, or a video. It may also involve a written summary-reaction-response that must be submitted online or turned in at the beginning of a course session. On occasion you will be asked to work collaboratively with other students on an exercise or activity, and you may be asked to make an oral report or presentation to the class.

The homework you turn in must be substantially your own work. Although some discussion concerning the general approach to an assignment may take place with other students, the peer mentor, or the instructor, the actual work you submit must be your own. Please do not share your homework with others.

Homework is due at the beginning of course sessions. Most assignments should be submitted through Blackboard. Please place your name, the assignment name and the date the assignment is due at the top of each assignment. Written homework will be graded based upon the (a) degree to which you are able to demonstrate reasonable command of the material, (b) care and thoughtfulness with which you present your responses, (c) organization of work and legibility of response, (d) completeness of response or solution, and, as applicable, (e) correct or acceptable response or solution. You should submit whatever homework you have completed. Please refer to "Evaluation" at the end of the syllabus for further information about grading homework.

Late homework may be accepted at the discretion of the instructor, but with a 10% deduction for each day it is late. You are expected make every effort to turn in homework on time, even if you are unable to attend a session.

8. Exams: There will be four module exams (approximately 35-45 minutes) and a final cumulative exam. The fourth module exam and cumulative exam will be administered during the time designated for the final exam. The schedule of tests and exams is as follows.

Test 1 (Nature of Science): Wednesday 13 February

Test 2 (Energy): Monday 18 March

Test 3 (Climate Change): Monday 15 April

Test 4 (Faith and Science) and Final Exam: Tuesday 14 May 12:00 noon (as scheduled by registrar)

Tests and the cumulative final exam may consist of a variety of question formats (multiple choice, true/false, matching, and both long and short response) designed to assess command of the concepts, command of facts, facility solving problems, and ability to integrate science and societal issues.

9. Module Assignments: There will be three major assignments: one for module 1 (due at the last class session for the module), one for module 2 and part of 3 (due in the middle of module 3), and one for module 4 (due at the last class session for the module.) Details of each assignment will be posted on Blackboard by the start of the module, so you will have time to work on it over the course of the module. As you complete these assignments:
  - a. Be sure to read the assignment carefully, and do exactly what is assigned. In fact, you would do well to re-read the assignment after you've completed your initial work, to be sure you did the right thing.
  - b. Each assignment will include a grading rubric at the end. Read this over carefully when doing the assignment, to be sure you've done everything listed in it.
  - c. Do not wait until the last minute to do the assignment. These are meant to be major, integrative pieces of work.

### **Course Policies**

1. Academic Integrity: Absolutely no form of academic dishonesty will be tolerated (this includes, but is not limited to, plagiarism, cheating, lying, providing answers to other students, etc.). The minimum penalty for academic dishonesty will be score of 0 on the assignment, but may be an F for the course. Plagiarism is the presentation of anyone else's work as your own. This can apply to ideas, words, tables, figures, pictures, film clips, music, and cartoons. To avoid plagiarism, cite properly anything you present that came from someplace else. This is not limited to quotes, but includes all ideas, unless they are common knowledge. It is not acceptable to cut and paste material from web sites. Many pictures and tables, even on the web, are copyright protected. Be sure you follow guidelines for citing material.

However, peer interaction is a vital component of the learning process and is encouraged. Do not hesitate to speak with an instructor if there are any questions concerning the distinction between cooperative learning experiences and matters of academic integrity.

2. **Academic Support:** For most students, learning science routinely involves support from instructors, teaching assistants, and peers. Students are encouraged to seek the support that they require. Often this may be accomplished through participation in scheduled tutoring sessions. Instructors are also prepared to meet individually with students to address any specific difficulties that may arise. Please contact an instructor as soon as you recognize that you are having difficulty with this course or realize you are not effectively working toward your goals for the course.
3. **Electronic Devices:** Cell phone use and texting are not permitted in class. Turn off your phone and put it away before entering class. Laptop computer use is limited to activities related to this class (e.g., taking notes, consulting assigned material, or accessing materials being presented in class). Laptops may not be used for activities pertaining to another course or non-academic purposes (e.g., email, playing games, social networking).
4. **Students with Disabilities:** Gordon College is committed to assisting students with documented disabilities (see Academic Catalog Appendix C, for documentation guidelines). A student with a disability who may need academic accommodations should follow this procedure:
  1. Meet with a staff person from the Academic Support Center (Jenks 412 X4746) to:
    - a. make sure documentation of your disability is on file in the ASC,
    - b. discuss the accommodations for which you are eligible,
    - c. discuss the procedures for obtaining the accommodations, and
    - d. obtain a Faculty Notification Form.
  2. Deliver a Faculty Notification Form to each course professor by Friday 25 January; at that time make an appointment to discuss your needs with each professor.

Failure to register in time with your professor and the ASC may compromise our ability to provide the accommodations. Questions or disputes about accommodations should be immediately referred to the Academic Support Center. See Grievance Procedures available from the ASC.

5. **Posting Grades:** Grades will be posted regularly on Blackboard.
6. **Time Commitment:** We recommend that students allocate about one and a half hours studying out-of-class for each hour in class. While there is significant variation among students based upon previous preparation and individual goals, you should plan on spending an average of 6 hours per week studying for this course.
7. **Communication:** Notices about changes in procedure, schedule adjustments, tutorial sessions, and other course related matters may be provided in class, distributed by email, or posted on Blackboard. Students are expected to check email at least daily.

### Evaluation

Grades are earned with the following ranges: >93% = A; 90 – 92 = A-; 87 – 89 = B+; 83 – 86 = B; etc. You must reach the appropriate cutoff in order to receive the higher grade. Grades will not be rounded up or down. The following table represents the relative weighting for course activities.

Activity	Percent Weighting
Exams (11% each)	55
Participation/Attendance	10
Homework	20
Module Assignments (5% each)	15
TOTAL	100