

**Great Issues In Science: 8 Big Ideas That Shaped Science**

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 Palenske 226  
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–Also by appointment. I’m around fairly often–feel free to stop by.

Web schedule: <http://mathcs.albion.edu/~mbollman/Fall 21.html>

Course URL: <http://mathcs.albion.edu/~mbollman/Honors/index.html>. Note well that this is *not* at the Albion Course Web site.

–Reading assignments will be posted here, as will discussion questions, project material, and other news of interest.

**Course Description:** This course will examine eight major scientific ideas, each one of which has had a revolutionary impact on a particular area of science.

<p><i>Astronomy:</i> Big Bang theory  <i>Biology:</i> Evolution  <i>Computer science:</i> Information theory  <i>Mathematics:</i> Non-Euclidean geometry</p>	<p><i>Biochemistry:</i> DNA structure  <i>Chemistry:</i> Periodic Law  <i>Geology:</i> Plate tectonics  <i>Physics:</i> Atomic structure</p>
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In several cases, students will read the original papers that reported the discovery. Laboratory work with Geometer’s Sketchpad will be used to explore the world of hyperbolic geometry. Evaluation will be based on a sequence of short papers, a collection of laboratory reports from Sketchpad, and a substantial final project.

**Grading:**

Projects:

1. Scientific autobiography.....	100 pts.
2. The moment of discovery.....	100 pts.
3. The story so far.....	100 pts.
4. The state of the universe.....	100 pts.
5. Hyperbolic geometry exercises .....	100 pts.
6. Stockholm 1962.....	100 pts.
Laboratory work with <i>Geometer’s Sketchpad</i> .....	100 pts.
Final project: Counter-creationism argument.....	200 pts.
<b>TOTAL</b> .....	<b>900 pts.</b>

Percentage	Points	Grade	Percentage	Points	Grade
[92,100]	[828,900]	4.0	[72,78)	[648,701]	2.0
[90,92)	[810,819]	3.7	[70,72)	[630,647]	1.7
[88,90)	[792,809]	3.3	[68,70)	[602,629]	1.3
[82,88)	[738,791]	3.0	[60,68)	[540,601]	1.0
[80,82)	[720,737]	2.7	[0,60)	[0,539]	0.0
[78,80)	[702,719]	2.3	This space intentionally left blank.		

**Texts:** The Canon, by Natalie Angier. (TC)  
The Discoveries, by Alan Lightman. (TD)  
The Double Helix, by James D. Watson. (TDH)  
Fortune's Formula, by William Poundstone (FF)  
Mendeleev on the Periodic Law, edited by William B. Jensen. (MPL)  
The Non-Euclidean Revolution, by Richard J. Trudeau. (TNER)  
The Origin of Species, by Charles Darwin. (TOS)  
Plate Tectonics, edited by Naomi Oreskes (PT)  
 Additional material to be distributed.

Lab sessions will use *Geometer's Sketchpad* (GSP) dynamic geometry software, which is available in the Sleight computer lab in Palenske 231.

<b>Tentative schedule of events</b>				
<b>Week of (M)</b>	<b>Reading assignments and other news (Text codes appear above)</b>			
	<b>Monday</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Friday</b>
<b>8/30</b>	Introduction	TC Intro & Ch. 1	TC Ch. 3	TC Ch. 5
<b>9/6</b>	Labor Day	MPL Papers 1-3 <i>Project 1 due</i>	MPL Papers 4-8	MPL Papers 9-13
<b>9/13</b>	TC Ch. 4	TD Ch. 5	TD Ch. 8	Zweig paper
<b>9/20</b>	TD Ch. 21	TC Ch. 9	TD Ch. 12	TD Ch. 19 <i>Project 2 due</i>
<b>9/27</b>	TC Ch. 8	Wegener paper	PT Preface & Ch. 1	PT Ch. 2
<b>10/4</b>	PT Ch. 6	PT Ch. 7	PT Ch. 14	TC Ch. 2
<b>10/11</b>	FF Prologue & Ch. 1	FF Ch. 2	Filler	FF Ch. 3 <i>Project 3 due</i>
<b>10/18</b>	Fall Break		FF Ch. 4	Shannon paper
<b>10/25</b>	Orientation to axiomatics	TNER Ch. 1	TNER Ch. 2a p. 22-86	TNER Ch. 2b p. 86-105
<b>11/1</b>	GSP Lab 1 <i>Project 4 due</i>	TNER Ch. 3	TNER Ch. 4	TNER Ch. 5
<b>11/8</b>	GSP Lab 2	TNER Ch. 6	TNER Ch. 7-8	GSP Lab 3
<b>11/15</b>	TC Ch. 7	GSP Lab 4	TD Ch. 17 <i>Project 5 due</i>	TDH Ch. 1- 11 Lab 3 report due
<b>11/22</b>	TDH Ch. 12-23	TDH Ch. 24-29 Lab 4 report due	Thanksgiving Break	
<b>11/29</b>	TC Ch. 6	TOS Ch. 0-3	TOS Ch. 4-6	TOS Ch. 7-8
<b>12/6</b>	TOS Ch. 9-10	TOS Ch. 11-12 <i>Project 6 due</i>	TOS Ch. 13-14	Recap
<b>12/13</b>	<b>Final Exam Week:</b> Meeting <i>Thursday, December 16</i> , 1130 AM–130 PM. Final projects–papers and presentations–due at this meeting.			

### **Thoughts At Large:**

1. Attendance at all class meetings (MTWF 100–150 PM, Observatory; four indicated lab days in Palenske 231) is required. Your decision to take this course constitutes a decision to attend class every time it meets. (This works both ways, incidentally: My decision to teach this course is a commitment to offer class sessions worth attending. I am sure you will let me know if I'm not doing that.) This course moves *extremely* rapidly, and those who miss class frequently will find themselves soon behind. Students missing *four or more days of class* (one week of class) for other than College-sponsored events or health problems as certified by a health care professional, will be ineligible for any deviation from the grading scale given above.

2. All assignments will have the due date and time clearly specified. Late assignments will receive a 25% deduction per day late, and will not be accepted after graded work has been returned. Assignments for this course must be submitted on paper; no emailed work will be accepted.

3. The academic dishonesty policy for this course will be that specified in the Student Handbook, with the following modification: The local penalty for confirmed cases of academic dishonesty will be a *double negative* grade on the assignment—that is, if the assignment in question is worth (for example) 100 points, your grade for that assignment will be -200 points. Note that a confirmed case of dishonesty on any of the first six written projects means that the highest grade you can earn is a 1.0, and a confirmed case of dishonesty on the final project will make it impossible for you to pass the course.

4. Everything submitted to a professor in writing, be it email, lab report, or essay, should follow the rules of (American) English grammar and spelling to the best of the writer's ability.

5. Unless you are a cardiac surgeon, arms-control negotiator, or emergency medical technician, you do not need a cell phone that is turned on during class. Turn your phone off and put it away. If I *see* or *hear* your cell phone during class, you will receive a 2% deduction in your final grade, cumulative with each incident.

6. Laptop computers are allowed in class only with my preapproval, and then only for circumstances of documented need.

7. This course (like so many others at Albion) fulfills the *Modeling and Analysis* Mode of Inquiry in the College core curriculum. Courses in this mode derive some essential or simplified features from logical, physical, social or biological phenomena, and describe and interpret them within an analytical framework. In order to fulfill this mode of inquiry, courses must:

- Explore logical, physical, social or biological phenomena;
- Enable students to decide which features of the phenomena to describe and what simplifying assumptions to make;
- Derive predictions from the model and interpret them in the original context;
- Consider the usefulness and the limits of the model and compare it with other possible models.

8. Most class sessions will be discussion-based, with discussions to be led by students. Everyone will have several opportunities to lead the day's discussion. Failure to lead an equitable share of class discussions will result in a lowered grade. You are expected to check the class Web site each day before coming to class to familiarize yourself with the questions that will guide our discussion.

### **Guidelines for discussion leaders**

1. There will usually be two persons responsible for a reading. Work together when you can.

2. When preparing to lead a discussion, you may assume that everyone has read the assignment carefully. Therefore, it is not necessary to give a general summary of the material.

3. Focus the discussion on issues, arguments, interpretations, scientific or cultural contexts, contemporary implications, or difficult points in the reading. The only restrictions are that the discussion questions pertain to the reading and be worth our time and energy.

4. Take your role as discussion leader seriously, and do not hesitate to call upon your fellow students.

5. Email your questions or discussion points to me not later than **midnight** the night before. Discussion questions will be posted to the class Web site each class morning. Note well: This requires advance preparation—it's not a good idea to wait until the day before your turn as discussion leader to read the material.

The following information is required by the College:

- It is the policy of Albion College to accommodate students with disabilities and qualifying diagnosed conditions in accordance with federal and state laws. Any student who feels that they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis, should contact Accessibility Services Director, Elizabeth Rudolph (erudolph@albion.edu), to develop a plan for reasonable accommodation(s) based on supporting documentation. If you have completed this process and requested accommodations for this semester, plan to meet with Elizabeth Rudolph and with me as early as possible to discuss a plan for implementing these modifications in this class. It is best to schedule these meetings at least one week prior to their implementation. Accessibility Services is housed in the Cutler Center on the first floor of the Stockwell Library and is open during regular business hours. The main phone is 517/ 629-0562 or email cutler@albion.edu for more information.
- The Cutler Center for Student Success is located in the Stockwell Library and provides free supplemental peer tutoring (math, science, economics and more), writing assistance, fellowship advising, accessibility accommodations, success coaching, supplemental advising, and loaner laptops and calculators. The Cutler Center has student drop-in hours Monday-Friday noon-2pm with their 15 Minute Fix. The Cutler Center is also home to the First-Year Peer Mentor Program, Stockwell Scholars, Transfer Advising, and the TRIO Student Support Services program. To connect with the Cutler Center, please email cutler@albion.edu or call 517-629-0562 to be connected to the resource you need to be successful this term.
- Because it's 2021...When Calhoun County is experiencing substantial or high COVID-19 transmission rates, students must wear a mask at all times in classrooms and other indoor public spaces. Research clearly indicates that an infected person wearing a mask may reduce the likelihood of spreading the disease to others. Since a person infected with COVID-19 may not exhibit symptoms for several days, they may unknowingly spread the virus when interacting with others. If Calhoun County transmission rates drop to low or moderate levels, then vaccinated individuals will be allowed to remove masks indoors, but unvaccinated individuals must still wear masks indoors at all times. If you will not wear a mask, you may not come to class. If you are scheduled to be a discussion leader on a day when you will not wear a mask, you will receive a 2% deduction in your final grade, cumulative with each incident.