

CORE 101 Science: Discoveries in Context

Time: MWF 9:00-9:50

Location: GHH 105

Instructor: Dr. Loren B. Byrne

Phone: X 3890

Email: lbyrne@rwu.edu

Office: 243 MNS

Office Hours: Mondays 10-11am, 2-3pm; Tuesdays 3:30-4pm; Fridays 10-11am; or by appt.

Quotes that summarize Dr. Byrne's teaching & learning philosophy:*"The mind is not a vessel to be filled but a fire to be kindled."* ~ Plutarch*"Teachers open the door. You must enter by yourself."* ~ Chinese proverb*"(Intelligence) is 1% inspiration and 99% perspiration."* ~ Thomas Alva Edison*"Today a reader, tomorrow a leader."* ~ W. Fusselman*"When we try to pick out anything by itself, we find it is tied to everything else in the universe."* ~ John Muir*"High-quality learning is absolutely essential for high-quality living."* ~ L. Dee Fink**Course introduction:**

Following the focus of the core curriculum, the springboards and context for this course are the three core questions:

⇒ *Who am I?* ⇒ *What can I know?* ⇒ *Based on what I know, how should I act?*

Unique to this particular core course is exploring answers to these questions through the lens of science. Scientific understanding is characterized by objective observation and analyses of patterns and phenomena in the observable universe, i.e., anything that can be seen by the human eye or technological tools and measured (quantified). Thus, scientific methods are all about collecting objective, reliable data to test hypotheses about phenomena and, then, developing theories that summarize and explain those data and phenomena. There are many other aspects of scientific inquiry, including the practical aspects of how scientists do what they do and the application of scientific knowledge that we will discuss throughout the semester. However, objective observations and data form the basis of scientifically-informed worldviews and decisions; thus, all good scientific analyses and arguments must be based on reliable observations and data.

Additional context for this course comes from the other four core courses and students' majors. We will seek to compare and contrast knowledge that comes from science with knowledge that is generated by other ways that humans explore ourselves and our relationships with nature. Although the readings will not explore these ideas explicitly, investigating such comparisons will form the basis for many group discussions and could help guide your research projects.

Be forewarned: this course is reading and discussion intensive! (This is a good thing for your education—see quotes 3 and 4 above.) Lectures will constitute a minor part of class time and will mostly be used to illustrate topics covered in the texts with case studies, diagrams, images, etc. Thus, to fully understand the issues, you must read WHILE THINKING CRITICALLY about the material (i.e., not just skim quick late at night or just before class). Thinking critically means digesting and evaluating the material and linking it with your previously-gained knowledge. Evidence of your critical thinking will be provided by the entries you write in your journal. Everyone will benefit the most from this course if we all critically read the material before class and *engage each other in civil discourse* about it during class.

Course objectives:

As a result of this course, students are expected to:

- Develop an interdisciplinary, synthetic scientific vocabulary and understanding
- Gain deeper knowledge of scientific and ecological concepts and their relevance to humanity
- Interpret scientific information and perspectives in the context of important societal issues
- Improve their critical scientific thinking and communication skills
- *and perhaps most importantly:* Enjoy the pursuit of scientific knowledge, learning and understanding!

Required texts:Angier, Natalie. 2007. *The Canon*. Houghton Mifflin Co., Boston.Baskin, Yvonne. 1997. *The Work of Nature*. Island Press, Washington, DC.

Other readings from the literature to be provided digitally or as hard-copies.

Important dates:

September 19 - last day to drop the course without receiving a W

October 21 - last day to drop the course and receive a W

Attendance policy:

Because we form a learning *community* in this course, the presence and participation of each student in each class benefits us all. Thus, attendance is expected (*read: required*) for all class meetings. Excused absences will be granted only for legitimate reasons (severe illness or other extenuating circumstances such as family emergencies) and only when the student informs the professor (by email is OK) in advance of the expected absence (ASAP or at least 12 hours notice for emergencies or illness).

- If you will miss class for legitimate religious observances, you must inform the professor ASAP.
- You will not receive credit for missed in-class work or exams due to unexcused absences.

- NO MAKE-UP or extra credit opportunities will be given in place of missed in-class work (including exams).
- Students are responsible for turning assignments in on time even if they miss the class period when the assignment is due. Points will be deducted from all assignments turned in late and dates will be established after which assignments will not be accepted and a score of zero will be assigned.
- You must attend CORE 101 lab sections for this course and you will receive one final grade for the lecture and lab.

Missing 3 labs (excused or unexcused) will result in FAILURE of the entire course.

Academic integrity and classroom civility (including cell phone policy)

By becoming an RWU student, you have agreed to abide by the Academic Integrity pledge (“...to pursue the highest ideals of academic life... to be honest...”) which means that you will not cheat, fabricate information, plagiarize, be fraudulent or interfere with others’ work. The University Statement on Plagiarism in the Undergraduate Catalog reads: “A first offense may result in failure of the course involved, plus an entry on the student’s permanent record. A second offense is punishable by expulsion from the University.” **So don’t plagiarize!** The professor of this course is skilled in identifying plagiarism, uses computer programs to help identify plagiarism, and will document this or any other instances of academic dishonesty in any student’s permanent file and/or will allow a student to fail the course.

In addition, maintaining academic integrity (e.g., civility) includes respecting others and learning how to disagree with ideas while not being disagreeable. All students should respect their classmates and the learning environment of a classroom; this includes not being disruptive by talking out of turn, texting on mobile devices or using computers for non-class purposes! **Such disruptions are distracting and disrespectful to the professor and other students and will not be tolerated.** Any student who violates these classroom policies will bear the consequences following the definitions, policies and procedures described in the University Catalog. In addition students engaging in such behaviors may be identified by name to the class, or be asked to leave the classroom if they do not conduct themselves civilly or cannot refrain from texting in class. In such instances, the student will receive an unexcused absence with loss of credit for in-class activities.

Academic support services

If you are a student with a disability and you wish to receive academic accommodations for any aspect of this course, you must first register with Student Accessibility Services on the second floor of the University Library in the Center for Academic Development. All students wishing to receive accommodations must inform the professor and submit required forms **7 days** (\pm 1 day) in advance of every date for which an accommodation is sought.

Assignment submission & communications:

The course website Bridges will be used for submission of assignments and to provide course materials. Email (.rwu accounts only) will also be used often to provide course information and communicate important reminders. Students are responsible for using these resources and should communicate any concerns to the professor ASAP.

Required assignments & grading:

Students’ grades will be based on the following:

	% Value of final grade
➤ Laboratory grade (provided by lab instructor)	20
➤ Homework & in-class assignments (half sheets, quizzes, group work, etc.)	25
➤ 12 Learning journal entries based on readings	20
➤ Scientific literacy project (data collection or literature research)	20
➤ Final discussion (during final exam period based on synthesis essays below)	5
➤ Final synthesis essay (with draft) based on 1 of the following questions:	10
• <i>What are the relationships among science, society, the environment, education, and sustainability?</i>	
• <i>Does scientific knowledge affect how you answer the three Core questions? Why and how or why not?</i>	

Grading scale and the meaning of grades:

A= \geq 93% Excellent	A- = 90-92.9% Great	B+ = 87-89.9% Very Good	B= 83-86.9% Good	B- = 80-82.9% Good
C+= 77-79.9% Average	C= 73-76.9% Average	C- = 70-72.9% Average	D= 60-69.9% Poor	F= \leq 59.9% Failure

Suggestions for improving your success in this (and all) classes:

- Actually do the readings! This will help increase your success as a student and scientifically-literate citizen.
- Spend \geq 2 hours per class period outside of class (\geq 6 hours per week) reading, studying and working on projects.
- Maintain a list of vocabulary words and their definitions; learning words and how to use them correctly is essential to becoming a successful and respected person/scientist/student!
- Write down questions and muddy-points in your notes and ASK about them discuss in class.
- After each class, write down several questions from the reading and info covered in class that you think would make good quiz questions. (These could be given to Dr. Byrne to actually use!)
- Work with classmates to improve your learning! Study together, edit each others’ papers, etc. (But make sure you DO YOUR OWN WORK!)
- **Remember: Ultimately you are responsible for your own learning! No one else but you can rewire the neurons in your brain to generate personal understanding and knowledge.**

Core 101: Semester schedule Fall 2011

Week	Topic	Readings
1	8/31: No class – <i>Darn you, Irene!</i> PART 1: Science as a way of knowing 9/2: Introduction and expectations	
2	9/5: Why should we be scientifically literate? 9/7: How does one think scientifically? 9/9: What do scientists do? Do they work together?	9/5: Angier, Intro., pp. 1-17 9/7: Angier, Ch. 1, pp. 18-25 9/9: Angier, Ch. 1, pp. 26-37
3	9/12: Should scientists be trusted? What is truth? 9/14: Why are probability and uncertainty important? 9/16: Case study: The troubles for frogs	9/12: Angier, Ch. 1, pp. 37-46; Bloom & Weisberg 2007 9/14: Angier, Ch. 2, 47-70; journal due w/ 2 entries 9/16: jigsaw articles
4	9/19: Synthesis & project discussions PART 2: Foundations of scientific literacy 9/21: The Carbon Cycle Context 9/23: Physics I: What are atoms & electricity?	9/19: TBD 9/21: TBD 9/23: Angier, Ch. 4, pp. 87-104
5	9/26: Physics II: What are matter & energy? 9/28: Physics III: Why is the 2 nd law THE law? 9/30: Chem. I: Science 007: the bonds, C, N	9/26: Angier, Ch. 4, pp. 104-115 9/28: Angier, pp. 115-120, Entropy handout 9/30: Angier, Ch. 5, pp. 121-138
6	10/3: Chem. II: A toast to reactions! Part 3: Emerging complexity: Autopoiesis & evolution 10/5: Shifting “From the parts to the whole” 10/7: Bio I: What is life? How did it begin?	10/3: Angier, Ch. 5, pp. 138-146; jnl due w/ 2 ents 10/5: Capra, Web of Life Handout 10/7: Capra, Ch. 1, pp. 3-32
7	10/10-12: Peer review of projects 10/14: Bio. II: What’s in a cell?	10/14: Angier, Ch. 7, 183-195
8	10/17: Bio. III: Making sense of A, C, T & G 10/19: Bio. IV: Why are Ps & Rs essential to life? 10/21: Bio. V: Is the Earth alive? What is Gaia?	10/17: Angier, Ch. 7, pp. 196-211 10/19: TBD 10/21: Angier, Ch. 8, pp. 228-234
9	10/24: Bio. VI: theory & controversy of evolution 10/26: Bio. VII: The evidence & process of evolution PART 4: Ecology, biodiversity and ecosystem services 10/28: What do ecologists study? Why should we care?	10/24: Angier, Ch. 6, pp.147-162, Miller et al. 2006 10/26: Angier, Ch. 6, pp. 162-182 10/28: IES website; MEA; journal due w/ 3 entries
10	10/31: What is happening to global biodiversity? 11/2: Which species are important? Why? 11/4: How do species interact? Part 1	10/31: Baskin, Ch. 1, pp. 3-14 11/2: Baskin, Ch. 2, pp. 17-28 11/4: Baskin Ch.3, pp. 28-32, 41-43
11	11/7: How do species interact? Part 2 11/9: Dirty ecology: the life underground 11/11: Application: Soils, fertility, food & forestry	11/7: Baskin, Ch. 3, pp. 43-55 11/9: Baskin, Ch. 5, pp. 105-116 11/11: Baskin, Ch. 5, pp. 116-126
12	11/14: Application: Should we conserve BD? Why? 11/16: Synthesis: Energy, BD, ecosystems 11/18: What are key pools and fluxes in the C cycle?	11/14: Baskin Ch. 9, pp. 207-219, McCauley 2006 11/16: TBD; journal due w/ 3 entries 11/18: Wikipedia article
13	11/21: Is global climate change real & a problem? 11/23 & 25: No class: Thanksgiving break	11/21: Baskin, pp.181-185, 193-204
14	11/28: C cycling & energy research Part 5: Science for decision-making & citizenship 11/30: Science, energy, society & politics 12/2: C footprints & the consumption of stuff	11/28: jigsaw articles 11/30: TBD 12/2: TBD
	12/5: If we want to, how can we conserve energy? 12/7: Research presentations 12/9: Research presentations	12/5: Kilowatt Ours video
15	12/12: Conclusion: What did we learn? What next?	12/12: TBD; journal due w/ 2 entries

Final exam period: Fri. Dec 16, 8-10am: Required final discussion about final essays
****The professor reserves the right to modify this schedule at any time****

Assignment and assessment details (Part 1):

A. Homework and in-class assignments (e.g., half sheets, quizzes, reading guides, group activities, 25% of final grade), based on assigned readings and class lectures and discussion, are meant to assess students' recall and understanding of concepts and vocabulary (levels 1-2 of Bloom's taxonomy, refer to table) as well as develop higher-level critical thinking skills (Bloom's levels 3-6) including application of concepts to problems and self-reflection.

- **A rough guide to assessment criteria:** (specific criteria & point values will vary with assignment)
 - Recall and comprehension questions: Correct answers will receive full credit and incomplete or incorrect answers will receive no credit.
 - Short-answer application, interpretation or opinion-based questions will be evaluated on evidence of higher-level critical thinking (refer to Bloom handout for key words that provide evidence). Answers with clear evidence of synthetic, analytical or self-reflective thinking will receive full credit. If limited evidence of such thinking is indicated, partial credit will be given. Answers providing no evidence of critical thinking or that lack relevance to readings will receive no credit.
 - For group activities, all group members will receive the same score based on a group half-sheet response or other finished product. Groups completing the activity and providing a fully satisfactory written response providing evidence of critical engagement with the topic will receive full credit. Groups completing most of the activity and/or proving a less than satisfactory written response or product will receive partial credit. Groups failing to complete the activity or exhibiting behaviors that suggest a low level of engagement with the topic and providing an unsatisfactory written response will receive no credit.

B. Learning Journal construction (3% of journal score): Each student will construct a journal that will be used to take notes about and respond to readings. **The journal (including a 1-page reflective entry, rule 4 below) and the first 2 reading-based entries on pp. 1-70 of Angier entry are due Sept. 14** (*points will be deducted for lateness*).

- **The journal's construction will be assessed based on the following rules (criteria):**
 1. **Use only non-virgin materials:** A non-virgin material is one that is not being used for the first time (i.e., it had a prior purpose). Examples of material that can be used are: cardboard from used boxes, string from existing packaging, sheets of paper printed on 1-side. *Your journal should have a cover and binding that you create, not ones bought from a store.*
 2. **Design the journal to be durable and portable:** Make sure that: 1) the pages are securely fastened together, 2) that the professor can carry it easily and 3) it will last all semester long.
 3. **Make it personal: Be creative and have the journal reflect your personality and interests!**
 4. **Required first entry:** On the first page of your journal, write a paragraph or two describing how you feel about the journal-making process and your finished journal. Is it what you envisioned? Were materials easy to find? How does it reflect you as a creative, cultural person? Etc....
This entry does not count as one of the 13 required reading-based entries so don't number it 1.
- **Scores for the journal will be awarded using the following guidelines:**
 - Full credit (10 pts) will be given for journals that conform to rules 1 and 2, that have a first entry that satisfactorily shows the student's self-reflection about the finished journal and process and that are handed in on time.
 - Partial credit (6-9 pts) will be given for journals that do not fully conform to rules 1 and 2 (e.g., some new materials used) and/or for a first entry that does not adequately exhibit a student's self-reflection and/or that is handed in late.
 - No credit will be given for journals that were not made by the student or are not turned in on time.

C. Learning Journal entries (17% of journal score): Your journal is a place for you to record notes and your thoughts as you read assigned texts. You can record key vocabulary words and concepts to help you remember the information as well as write down questions about confusing/unknown points. In general, you should focus the content of your entries around the following three key questions:

- **What is the main “take-home message” of the reading?**
- **Why is the information in this reading important and relevant for people to understand?**
- **What are my personal responses to and reflections about the reading?**

- A total of 12 individual 2-page entries are required for full credit.
- Readings that are associated with half-sheets or homework assignments can NOT be used for entries.
- **One entry is required** on the 10/28 for the MEA reading.
- The remaining entries for each due date are to be based on selections from (mostly) Angier and Baskin from the 2-3 weeks preceding each due date but students may choose the selections to write about.
- If less than the minimum number of entries is submitted on a due date, students will have 3 days following the return of journals to hand in a make-up entry for partial credit. Following this, no MAKE UP entries will be accepted.

Individual journal entries (12 required for 17% of the final grade) will be assessed (graded) based on how well they convey the student’s engagement with and critical thinking about the assigned reading.

Evidence of engagement and critical thinking will be shown by the following types of entries:

- 1) vocabulary words that are *defined*
- 2) summaries of main points (the take-home message) from the reading selection
- 3) questions about confusing or unknown concepts
- 4) synthesis of concepts from across reading selections and/or courses
- 5) personal responses and self-reflection to the readings including comments about the importance and/or relevance of the material to society and/or the student’s life and/or academic major
- 6) other critical analysis of the material (e.g., how it impacts decision making).

Refer to the Bloom’s taxonomy table (see reverse side) for additional guidelines about how to provide evidence of higher-level thinking in your journal.

In addition, evidence of sufficient engagement with the reading will be provided by:

- One entry per one-day assigned reading that fills ~2 full 8 ½ x 11” sheets of paper (or the equivalent)
 - Notes that span most of the reading assignment (i.e., from beginning to end, not just the first few pages).
- Points for entries will be awarded (out of 10) based on the following criteria:
- 9-10 points: Entries that contain a variety of formats (at least 4 of the 6 described above) especially several that indicate higher-levels of critical thinking (types 4-6 above, refer to Bloom’s taxonomy hand-out for criteria) and that are ~2 full pages
 - 5-8 points: Entries that contain fewer formats (2-3 of the 6) and limited evidence of critical student engagement with the readings (i.e., little synthesis, analysis or self-reflection) or are 1-1½ pages
 - 0-4 points: No entries or ones that are <1 page long and/or contain only brief vocabulary lists or summaries and provide no or limited evidence of higher-level critical thinking.

D. Info about the scientific-literacy project and final synthesis essay will be provided in a timely manner.

Bloom's Taxonomy of Educational Objectives ¹

Levels	Competence	Skills demonstrated
1 and 2	Knowledge and Comprehension	<p>Knowledge</p> <ul style="list-style-type: none"> • Observation and recall of information • Knowledge of dates, events, places • Knowledge of major ideas • Mastery of subject matter <p>Question cues: list, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.</p> <p>Comprehension</p> <ul style="list-style-type: none"> • Understanding information <i>w/ia context of "universe"</i> • Grasp meaning • Translate knowledge into new context • Interpret facts, compare, contrast • Order, group, infer causes • Predict consequences <p>Questions cues: summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend</p>
3 and 4	Application and Analysis	<p>Application</p> <ul style="list-style-type: none"> • Use information • Use methods, concepts, theories in new situations • Solve problems using required skills or knowledge <p>Question cues: apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover</p> <p>Analysis</p> <ul style="list-style-type: none"> • Seeing patterns • Organization of parts • Recognition of hidden meanings • Identification of components <p>Question cues: analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer</p>
5 and 6	Synthesis and Evaluation	<p>Synthesis</p> <ul style="list-style-type: none"> • Use old ideas to create new ones • Generalize from given facts • Relate knowledge from several areas • Predict, draw conclusions <p>Question cues: combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if?, compose, formulate, prepare, generalize, rewrite</p> <p>Evaluation</p> <ul style="list-style-type: none"> • Compare and discriminate between ideas • Assess value of theories, presentations • Make choices based on reasonable argument • Verify value of evidence • Recognize subjectivity <p>Question cues: assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize</p>

¹ adapted from Anderson WL and Krathwohl DR. eds. 2001. A taxonomy for learning, teaching, and assessing. New York, Longman.