San José State University
Department of Geography and Urban and Regional Planning
Geog001: Geography of the Natural Environment, Section 80

Fall 2020

Course and Contact Information

Instructor:	Gary Pereira
Office Location:	Washington Square Hall 113
Telephone:	(510) 825-3506 (text please, at least initially)
Email:	(Canvas messaging preferred, or text 510-825-3506 in emergency) gary.manuel.pereira@gmail.com
Office Hours:	Please contact me if you would like to set up an appointment.
Class Days/Time:	Online
GE/SJSU Studies Category:	Area B1

Course Format

This is an online course. Internet connectivity and a computer are required. Course materials (including this syllabus) can be found on the Canvas Leaning Management System course login website at http://sjsu.instructure.com, under **Files**.

For this course, students are required submit one homework assignment each week, as well as a final evaluation paper. Study material and assignments are listed and described under **Assignments**, but additional requirements or suggestions may be discussed within recent **Announcements**. Please check **Announcements** at least once a week, and before submitting homework. All homework must be submitted, even if late. Repeated lateness should be explained in a message. As each assignment is viewed and graded, comments may be pinned to particular submissions. Check for such comments, regardless of whether you have received a grade, and address any concerns expressed there. If you would like to respond to a comment, please do so with an independent message. A final evaluation paper must also be submitted. That's it in a nutshell.

I provide the photo above to represent (with a little humor) how my courses might relate to some of the available online educational technologies that we are often encouraged to use. Look closely; you should notice something. The metal structure over the bench looks like something that might provide shade or shelter from rain, but in fact ***it does neither, at any time***. Nevertheless, its oddly aligned slats need spikes to keep the birds away.

Imagine the bench in the photo as representing the three Canvas tabs that we will be using: **Assignments**, **Announcements**, and **Files**, communicating individually if necessary with Canvas **messaging**.

Imagine the metal structure in the photo as the rest of Canvas, which you may safely ignore for my classes. I don't mind it being there, but all we really need is the bench, from which you can metaphorically watch golden eagles, hawks, meadowlarks, gulls, waterfowl, songbirds, jackrabbits and colonies of ground squirrels just beyond the fence.

From the videos and texts I will ask you to examine, you can explore a great many things in great depth. The subject matter is what (hopefully) makes it engaging, not the structure of a course. Don't mistake the finger pointing at the moon for the moon itself. The finger is not important. Obeying the elaborate structures of education and social media is not the goal of my courses. I hope to keep that stuff to a minimum.

You should all be working and writing as individuals, so there is no need in my classes for group communication via skype, zoom, or whatever the latest platform may be. I will point out any interesting observations or advice that I might have generally about your homework responses in the **Announcements**, but I will never identify individual student publicly. If I send you a message, you may rest assured that I will keep any information we exchange private. Nevertheless, you may release any conversations that you have with me publicly at any time.

Within Canvas, conversations cannot be tampered with, ignored, or shared with others. There are no such assurances with email. That is why I would prefer never to use email. You may text my private phone number if you ever need to reach me in a hurry or in an emergency. Being late with homework is not an emergency.

Please read and view the material at the beginning of each homework assignment, as well as any new **Announcements**, every week. These are where my 'lectures' are located. If I suspect that you are not paying attention (by, for example, not addressing an additional question that I may have posed in a recent **Announcement**), this will be reflected in your grade. I encourage you to get someone to read and edit your homework before submission if you are uncertain, but your words and thoughts should be your own. You may quote extensively from material in the assigned or suggested texts or videos, but please provide attribution, by means of formal notes or references.

The university expects that each student put at least nine hours of work per week into each three-credit course. Your homework assignments and final paper are evaluated and graded primarily on the degree to which this expectation has been met, based on my impressions of your work. The more detailed, organized, and thoughtful your responses are, relative to your classmates, the better your grades will be. I do not grade on the basis of the opinions or conclusions you may express on any issue, even when I may ask you to express one. Further details are discussed below under Course Requirements and Assignments and in the Course Schedule.

Course Description

This course covers the basic sciences that describe the Earth's atmosphere, hydrosphere, biosphere, and lithosphere.

Course Goals and Learning Outcomes

This course is approved for General Education Core Physical Science area, B1. Upon successful completion of this course, students will be able to:

1: use the methods of science and knowledge derived from current scientific inquiry in life or physical science to question existing explanations.

Evidence-based learning and discovery form the basis of scientific inquiry. The focus of this class is therefore on evidence, rather than belief. Challenges to existing explanations are approached through examination of evidence.

2: demonstrate ways in which science influences and is influenced by complex societies, including political and moral issues.

The technical and cognitive methods of understanding used by researchers in physical geography are described throughout the course. The goal of achieving relative independence of the natural sciences from social belief systems is recognized, as is the influence of such belief systems on the process of achieving that goal. The influence of the resulting comprehension of natural systems on human societies is emphasized throughout the course, particularly with regard to natural disasters like earthquakes, as well as the complex impact of climate change on social systems.

3: recognize the methods of science, including quantitative, analytical reasoning techniques.

The tools and methodologies of the physical geographical sciences, as well as the analytical and algorithmic reasoning techniques, are studied in some detail. Students shall understand how knowledge is achieved and improved on an ongoing basis.gh time; systems of classification; and physical processes of the natural environment.

Textbook

The **Fundamentals of Physical Geography** (2nd edition) is a free online textbook with over 300 pages and 400 illustrations, photos and animated graphics. It is the work of two professors from the University of British Columbia Okanagan – Dr. Michael Pidwirny & Scott Jones. Important terms are hyperlinked to a glossary. There are links to study guide pages and additional reading within each chapter. Most importantly, 'weblinks' are provided for each chapter that provide a wealth of well-respected sources of additional data and social media. The textbook is accessible here:

http://www.physicalgeography.net/fundamentals/contents.html

Additional Readings

These files are all available from Canvas, under **Files**: NCA4_Ch25_Southwest_Full.pdf, 2018indicatorssummary.pdf StayingSafeWhereTheEarthShakes_BayArea.pdf, PuttingDownRootsInEarthquakeCountry_BayArea.pdf

Other technology requirements

A device capable of streaming video from the Internet is required for this course. Most of these streaming videos (including my own) are being offered in high definition. Your computer and Internet connection should be sufficiently powerful to portray them smoothly at the original resolution.

Videos

Videos are a big part of this course, and much of the homework will be judged on the basis of how closely you considered them in your discussions. If you are accessing each assignment through CANVAS **Assignments**, you might be given the choice of opening a video in a separate browser or of watching it embedded within CANVAS. Whichever method you use, feel free to scrub and pause each video frequently and watch portions repeatedly, taking notes as you watch. Watching videos within separate browsers often provides you with additional information, as well as access to other material on the author's channel. You might want to pull up videos on your phone or tablet as you write on a laptop. Do whatever feels comfortable, but make sure you have a large enough screen and sufficient bandwidth to see the details (including text) that are important to most of these videos, including mine. I encourage you to explore the work of any YouTube contributor whose work you appreciate.

Many YouTube videos are preceded by ads. Usually, these ads can be cut short by clicking on 'Skip Ad' at the lower right of the screen, or by clicking on the x at the upper right of a popup ad. There are never ads on my own videos, and I get no monetary benefit from YouTube. I also provide no tags on my videos. If you view a video within Canvas (by clicking on the image rather than the link), this is not counted as a 'view' by YouTube. For these reasons, my videos (intentionally) get few views. However, you may share my videos at any time.

Course Requirements and Assignments

Homework

Fourteen homework assignments must be completed on or before the due dates, as described in the course schedule below. Please submit these responses via Canvas. For each homework assignment, I would prefer you use primarily 10pt font with 1½ line spacing. Put your name, the homework number, 'Pereira', 'geog1-80' and 'Fall 2019', arranged at the upper right of the first page. Text, figures, and images lifted from documents or screenshots may be embedded in your homework, but these must all include full attribution. In other words, be honest about which words, figures and images are your and which are from other sources. It is often helpful to include this sort of material, but these should be explicitly cited. Habitual lateness in submitting assignments may result in a full grade change at the instructor's discretion.

You will be graded relative to the performance of your classmates in the current and former semesters. I may offer comments or advice in Canvas for each assignment. Check back on each assignment not only for your grade, but also for any comments I may have left. If you'd like to continue the conversation (which I welcome) please do so as a Canvas message to me independently of that particular assignment, which I am unlikely to check back on.

Announcements

Please check the **Announcements** tab every week. Discussions of homework results and expectations, current events, and other issues of interest to this class will be posted there. Additional homework questions may also be posted, due more than a week after posting.

Final Evaluation

In at least four to five pages (10pt font, 1 ½ spaced as usual), you will be asked to describe steps that might be taken before, during, and after a major destructive earthquake, from the perspective of a family member, and/or neighbor, public servant, health care worker, business officer, planner, etc. in order to reduce suffering and loss. Hopefully, this will never

happen to you. But living where we do, we all need to take this seriously. That's why I've chosen this topic in place of a comprehensive test. A full description is provided in the Course Schedule below.

You all should create and begin populating your own Portfolium accounts, which you can constantly revise and over which you have total control. It's free. Here is one I made a few years ago: https://portfolium.com/garympereira/portfolio

Grading Information

Fourteen homework assignments and the Final Exam must be completed on or before the due dates, as described in the Course Schedule below. Please submit these responses as either Word or pdf files via Canvas.

Determination of Grades

Homework assignments (6.5% each) x 14	91%
Final Evaluation	9%
Total	**100%**

98% and above	A+
94% - 97%	A
93% - 90%	A-
89% - 87%	B+
86% - 84%	B
83% - 80%	B-
79% - 77%	C+
76% - 74%	C
73% - 70%	C-
69% - 67%	D+
66% - 64%	D
63% - 60%	D-
below 60%	**F**

University Policies

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Note that "All students have the right, within a reasonable time, to know their academic scores, to reWatch their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/

Geog1-80, Geography of the Natural Environment, Fall 2020

Please submit your homework responses as Word or pdf files by the due date indicated. Use 10 point font, with 1 ½ line spacing and normal margins. Put at upper right on the first page of each submission your name, the homework #, geog1-80, Fall 2020.

Course Schedule

Week	Due Date	Discussion, Readings, Videos, Assignments
1		Topic: **The nature of the natural sciences** (If you haven't watched the general notes video, please do so.) **Optional:** General notes for my online classes [Gary Pereira] https://youtu.be/_AN8k0Ogwl0 **Watch:** Rupert Sheldrake - The Science Delusion [revolutionloveevolve] https://youtu.be/JKHUaNAxsTg Sheldrake's views may appear controversial, but his physics is accurate, and he brings up a number of interesting points. I've asked you to watch this in order to disabuse you of the notion that you have to be a materialist in order to be a scientist. Nonlinearities (in the mathematical sense) yield all sorts of weird and wonderful things. Nature itself is almost entirely nonlinear in form and function. As we begin to look ever more closely at astronomical objects, from stars to galaxies and beyond, they appear to be as complex in their own way as living things here on Earth. The universe itself, as we see it more closely, reveals its own evolution. It actually resembles something far more interesting than the mechanical caricature we've ascribed to it. As an example of the sorts of things that come out of a relatively simple nonlinear relationship, consider the Mandelbrot Set. As you zoom into the boundary of solutions to an iterative equation on eth complex number plane, it reveals itself in astonishing complexity. Again, these fractal patterns that come out of pure mathematics appear to be more biological than mechanical. **Optional:** Sapphires - Mandelbrot Fractal Zoom [Maths Town] https://youtu.be/8cgp2WNNKmQ The forms you can see emerging from the background and dissolving into the foreground as we zoom in are actually emerging from the calculations as they are performed. As with chaotic phenomena, as with evolutionary phenomena, we cannot predict very far ahead what sorts of forms will appear. Emergence seems to be of fundamental significance in both the mathematical and observable world, even if we cannot fully conceptualize it. The concept is difficult to formalize in words. **Watch:** Emergence [Systems Innovation] https://youtu.be/QItTWZc7hKs **Watch:** The Science of Patterns [Systems Innovation] https://youtu.be/kh6KMW8J3RQ **Watch:** Synergies [Systems Innovation] https://youtu.be/rsn5EQoAhUc

Week	Due Date	Discussion, Readings, Videos, Assignments
	08/25/20	**Optional:** Pattern formation in Nature 2: lichens and terracettes [Gary Pereira] https://youtu.be/AZ14PyiqM28 **Optional:** Pattern formation in Nature 3: bird song [Gary Pereira] https://youtu.be/UvGue54F4lk **Homework 1:** 1. Describe the concepts of emergence, synergies, and pattern formation, and try to illustrate them in the context of the natural sciences with a few examples.
2	**09/01/20**	Topic: **Emergence, resilience, and antifragility** **Watch:** Long Tail Distributions [Systems Innovation] https://youtu.be/vIp1kY0H0yw The significance of nonlinear phenomena (that is, most things) cannot be determined by addition and subtraction alone. Imagine bumping into a wall at 1 mile per hour. No big deal. Now imagine doing that fifty times in a row. It would be kind of silly but still, no big deal. Now imagine bumping into the wall just once, but moving at fifty miles per hour. Obviously, a very different result from doing it fifty times at 1 mph. A great deal of what happens in the real world is not simply additive. The sorts of events that carry the most significance (possibly the only significance) are often very those rare events that are strung out along the long tail of the powerfulness v frequency distribution. These are the events that actually change lives, nations, and civilizations. We need look no further than the past few months for the perfect example of a highly nonlinear process involving evolution, viral reproduction, and spreading, whose effects will touch upon every single one of the topics we will be discussing here, possibly for the rest of our lives. So how do you respond to such potentially malevolent nonlinear phenomena? We should try first to understand them. We should also discover, develop, and promote processes that would help benign, fragile, but beneficial entities survive, thrive, and possibly grow stronger under adverse conditions. This characteristic has recently been termed 'antifragility'; Nassim Taleb has written a book on the topic. As Taleb himself points out, this is a very old idea, based very often on close observation of living things, including human beings. **Watch:** Nassim Taleb Explains Antifragility in Under 5 Minutes https://youtu.be/C40zwpdc_yo https://en.wikipedia.org/wiki/Antifragile **Homework 2:** 1. What are long-tailed statistical distributions? How might events following a power-law or long-tailed distribution make assumptions of long-term normality nonsensical? In other words, are common statistical terms always meaningful? For example, can the mean of a power-law distribution ever be determined? 2. What is antifragility? Try to explain how it is different from resilience or robustness.

Week	Due Date	Discussion, Readings, Videos, Assignments
3	09/08/20	**Topic:** Energy **Watch:** A guide to the energy of the Earth https://youtu.be/fHztd6k5ZXY Access the text **Fundamentals of Physical Geography** http://www.physicalgeography.net/fundamentals/contents.html **Read** CHAPTER 6: Energy and Matter Each chapter of the online text **Fundamentals of Physical Geography** includes a Study Guide page. At the bottom of each Study Guide page is a list of Essay Questions. Responses to questions from the book may be partially copied and pasted from the text, but most of the writing should be your own. Take your answers, at least in part, from the section of that chapter that discusses the topic at hand. Do NOT take them from the summary of the chapter. Use your own words most of the time, and incorporate what you learn from the videos. **Homework 3:** 1. Describe some internal and external sources of energy for the Earth. Chapter 6 Essay Questions 3, 4, 5, 6, 7, 9 , 10, 11, 12: 6.3. How do the three mechanisms of conduction, convection and radiation move energy from one place to another? 6.4. Outline the three laws of thermodynamics. 6.5. What is radiation? How is it created? What factors determine its quantity and quality? 6.6. Define the Stefan-Boltzmann Law. What does it describe? 6.7. Define Wien's Law. What does it describe? 6.9. How does the Sun create the energy that drives most systems on the Earth? 6.10. How does the tilt of the Earth's axis influence the annual solar insolation received at a site located at 50 degrees North latitude? 6.11. What influence does Earth rotation have on solar insolation received at the equator? 6.12. How does angle of incidence control the intensity of solar radiation received at the Earth's surface?

Week	Due Date	Discussion, Readings, Videos, Assignments
4	**09/15/20**	Topic: **Sense and Representation; Endeavors in Science** **Watch:** What is Remote Sensing? https://youtu.be/xIsUP1Ds5Pg **Watch:** How Does LiDAR Remote Sensing Work? Light Detection and Ranging https://youtu.be/EYbhNSUnIdU **Watch:** Satellite Remote Sensing for Environmental Protection https://youtu.be/aKfsh2NAuR8 **Homework 4:** 1. What is remote sensing? What types of remote sensing instruments have been developed to monitor the Earth? What sorts of things do they measure? 2. How Does LiDAR Remote Sensing Work? 3. Describe some of the ways satellites are being used to observe and characterize the world's environments. **4.** Look through the many pages of videos available at the following Public Television website: http://ww2.kqed.org/quest/tag/tag-video/ Use the 'next page' button at the bottom of each page to access additional pages. Choose any two videos, and (using at least ½ of a page per video), write a summary and brief discussion of what you found most interesting about each of them and any questions they bring to mind. Indicate the title of each video as subheadings. Make sure to look through a few pages before making your selections. Don't just stick with the first couple of pages.
5	**09/22/20**	**Topic:** The Atmosphere **Watch:** Careers In Atmospheric Science https://youtu.be/Fk-uqrXkkG8 Access the text **Fundamentals of Physical Geography** http://www.physicalgeography.net/fundamentals/contents.html **Read** CHAPTER 7: Introduction to the Atmosphere **Homework 5:** 1. Describe the career(s) in atmospheric science from in the video that you find most interesting.

Week	Due Date	Discussion, Readings, Videos, Assignments
		Chapter 7 Essay Questions 3, 4, 5, 6, 7, 10 7.3. Why is ozone important for life on Earth? Where is it found and how is it formed? How is human activity influencing this important atmospheric gas? 7.4. How is the incoming shortwave solar radiation from the Sun modified by the atmosphere and the Earth's surface? 7.5. Describe the difference between the following two terms: heat and temperature. 7.6. Describe the shortwave radiation cascade as it relates to the Earth's energy balance. 7.7. Discuss how the Greenhouse Effect works. How has human activity over the last few centuries enhanced this natural process? How will global warming change the environment of the Earth? 7.10. What is a hurricane? Where, when and why does it form? How is global warming likely to influence hurricane intensity and frequency?
6	**09/29/20**	**Topic:** The Atmosphere **Watch:** Water Vapor Fuels Hurricane https://ca.pbslearningmedia.org/resource/nves.sci.earth.hurricane/water-vapor-fuels-hurricanes/ **Watch:** NOVA: Earth From Space | Monitoring Earth's Water Vapor https://ca.pbslearningmedia.org/resource/nves.sci.earth.vapor/monitoring-earths-water-vapor **Homework 6:** 1. What is the primary function of the Aqua satellite? How does it monitor the production of water vapor? 3. Describe in detail the role of the Sun in the formation of thunderstorms. 4. What is a geostationary orbit? Why do you think it would be useful to have a satellite remain in orbit over one point on Earth? Why do scientists combine data from multiple satellites in geostationary orbit? 5. Explain how topography, latitude, and other factors combine to change the impact of water vapor regionally. Chapter 7 Essay Questions 13, 15, 21 7.13. Discuss the formation and characteristics of the various types of thunderstorms. 7.15. What factors are responsible for the altered micro-climate of urban areas? 7.21. Why do urban areas have more energy available for the creation of sensible heat than rural areas?

Week	Due Date	Discussion, Readings, Videos, Assignments
7	**10/06/20**	**Topic:** Climate **Watch:** NOVA: Extreme Ice | Ice-Core Record of Climate https://ca.pbslearningmedia.org/resource/nvei.sci.earth.climate/ice-core-record-of-climate/ **Watch:** NASA | The Ocean: A Driving Force for Weather and Climate https://youtu.be/6vgvTeuoDWY **Watch:** What is a Climate Model? https://youtu.be/bkcrH9tYv8g **Homework 7:** 1. What is an ice core? Why is it useful? 2. What happened to the level of carbon dioxide in the atmosphere about 125,000 years ago? 3. What precisely is the relationship between greenhouse gases, global temperatures, and sea level? 4. Why would it be wrong to claim that the Earth's climate concerns the atmosphere alone? 5. How do climate models work? Details, please.
8		**Topic:** The Hydrosphere **Watch:** Is the world's fresh water supply running out? https://youtu.be/iVcTQdOJMMw **Watch:** Water Resource Management https://youtu.be/odngssDFMrU **Optional:** The Three Gorges Dam [Gary Pereira] https://youtu.be/pPKV_GTI4gk **Optional:** The Three Gorges [Gary Pereira] https://youtu.be/yQ7lrqE_bKU Access the text **Fundamentals of Physical Geography** http://www.physicalgeography.net/fundamentals/contents.html **Read** CHAPTER 8: Introduction to the Hydrosphere I worked for a couple of years for the National Operational Hydrologic Remote Sensing Center, or

Week	Due Date	Discussion, Readings, Videos, Assignments
	10/13/20	NOHRSC: https://www.nohrsc.noaa.gov NOHRSC is NOAA's "source for snow information" and other hydrological data products and models. Every winter day, several satellite datasets are downloaded to this facility and analyzed, and by evening a variety of maps and graphs are generated and uploaded onto the Internet for use by regional hydrological agencies, businesses, and others to inform their own work and decisions. One important variable that has to be mapped is called 'snow water equivalent', or SWE: the liquid water equivalent of a given volume of snow. This can be checked on the ground at various points using automated 'snow pillows' and other devices, but it can also be checked from above. NOAA pilots run low altitude flight-lines over snow with instruments that estimate SWE by measuring the degree to which the natural radioactivity of the ground beneath is dampened, or attenuated by the snow. **Homework 8:** 1. What is an aquifer, and what is the current state of aquifers around the world? Where is the problem worst? 2. What are some of the careers described in the video on water resources management? Chapter 8 Essay Questions 1, 3, 4, 5: 8.1. What is streamflow? How can it be expressed in a mathematical model? Describe the effect of an intense 1 hour storm on streamflow over 24 hours using a hydrograph. 8.3. Discuss the movement of water into soils. How and why does infiltration vary with time? 8.4. Why does runoff occur? 8.5. What forces influence the storage of water in the soil matrix?
9		**Topic:** The Hydrosphere Access the text **Fundamentals of Physical Geography** http://www.physicalgeography.net/fundamentals/contents.html **Read** CHAPTER 8: Introduction to the Hydrosphere **Watch:** The Water Cycle https://youtu.be/al-do-HGuIk **Watch:** Calaveras Reservoir [Gary Pereira] https://youtu.be/_Eqehbxjf Uk

Week	Due Date	Discussion, Readings, Videos, Assignments
	10/20/20	**Homework 9:** 1. Describe the global water cycle in terms of flows and stores. 2. What are the sources of our local water? Details, please. You'll need to search online to find this. 3. Why was the new Calaveras Reservoir Dam designed to hold up to four times as much water as it is currently holding? Chapter 8 Essay Questions 7, 10, 12, 16 8.7. Describe the mathematical equation used to model stream discharge. 8.10. What is potential evapotranspiration and how does it differ from actual evapotranspiration? What factors control the rate at which water leaves the Earth's surface by way of evaporation and transpiration? 8.12. Explain how relative humidity is measured. 8.16. Discuss how tides form. What is the difference between a Neap and Spring tide? Explain diurnal, semidurinal, and mixed tides.
10	**10/27/20**	**Topic:** The Biosphere **Watch:** Plants Affect the Atmosphere https://ca.pbslearningmedia.org/resource/nves.sci.earth.atmosphere/plants-affect-the-atmosphere/ **Read** CHAPTER 9: Introduction to the Biosphere Most life on Earth gets its energy from the sun, either directly or indirectly, via an evolved set of processes called photosynthesis and respiration. Carbon dioxide is required, and water and oxygen are released, globally, on a massive scale. Living things therefore are key determinants of just how much carbon is in the atmosphere, and so they are largely responsible for the sort of climate that has evolved on this planet. In order to fully understand climate, we have to understand life. We can change the direction that the world climate takes in the future, one way or another, depending on how well we understand and treat living things. **Homework 10:** 1. What primary components of Earth's atmosphere do plants modify through photosynthesis and respiration? 2. How do photosynthesis and respiration relate to one another? 3. How have plants contributed to making Earth a habitable planet? 4. Describe how Earth's atmosphere changes over the course of 24 hours.

Week	Due Date	Discussion, Readings, Videos, Assignments
		5. Why does the Amazon rainforest have such a dramatic impact on the atmosphere? Chapter 9 Essay Questions 2, 3, 5, 9, 10 9.2. Compare and contrast the function and structure of the grazing and detritus food chain. 9.3. What is an ecosystem? How does it differ from a community? What are some of its important components? 9.5. Explain in detail how energy moves through the grazing food chain and the detritus food chain. Also, discuss how these food chains are related to each other and are necessary for the cycling of nutrients in an ecosystem. 9.9. What are some of the major components of ecosystems? How are these components related to each other? 9.10. Describe how energy flows through ecosystems.
11	**11/03/20**	**Topic:** The Biosphere **Read** CHAPTER 9: Introduction to the Biosphere **Watch:** NOVA: Earth From Space | Lightning Produces Nitrates https://ca.pbslearningmedia.org/resource/nves.sci.earth.nitrate/lightning-produces-nitrates/ Besides a source of energy and water, life depends on the presence of a few other elements, particularly nitrogen. Most living things cannot get this nitrogen directly from the air; they get it indirectly from specialized microbes, as well as from lightning. Another direct link between the biosphere and the atmosphere that most of us are unaware of. **Homework 11:** 1. On average, how many lightning strikes occur on Earth each second? 2. How does lightning produce nitrate? 3. Why is nitrate important for living things? 4. How does nitrate produced in clouds end up in human bodies? Chapter 9 Essay Questions 11, 14, 4: 9.11. Discuss the term dispersal. Include in your answer an explanation of why organisms want to disperse, and how organisms accomplish this life-cycle strategy. 9.14. Compare and contrast the characteristics (climate, plant types, animal life, soil types, etc.) of the

Week	Due Date	Discussion, Readings, Videos, Assignments
		following biomes: Tundra, Temperate Deciduous Forest, Desert, and Tropical Rainforest. 9.4. Evolution describes the process by which species come to possess adaptations. In an essay, describe how evolution works through natural selection, spatial isolation, and gene mutation.
12		**Topic:** The Lithosphere **Access via CANVAS (Files):** StayingSafeWhereTheEarthShakes_BayArea.pdf PuttingDownRootsInEarthquakeCountry_BayArea.pdf **Access:** CHAPTER 10: Introduction to the Lithosphere Surface expressions of lithospheric phenomena are some of the most awe-inspiring on Earth. I'd like to share with you a trip I took recently to a Chinese national park that sits in an out of the way spot right up against the North Korean border, surrounding a massive volcano called Changbaishan, or Changbai Mountain. It last erupted, with tremendous force, about a thousand years ago. The scars remain, and have created some unique and magical ecosystems in northeast Asia (see videos below). Anyone who grew up with either Lord of the Rings or Harry Potter would love this place. The China/DPRK border runs right through the lake. This is a holy site in Korean mythology. Kim Jong Un visited the lake several times. So have members of the Chinese leadership. If you look at a map (or watch the beginning of the above video) you can see how the China/DPRK border was intentionally diverted to allow Korean access to this lake. Unfortunately, the North Korean people do not seem to have been given such access. Despite the fact that getting there involves long car and/or bus rides, many South Koreans who travel to China do manage to visit this wonderful place from its Chinese access points. The crater lake is often There were no guards or soldiers in sight. We were in China. Weather on the mountain is treacherous, and the park was closed when we arrived. It finally cleared up enough to allow us to climb up to the rim of the crater and watch the lake emerge from the mist… **Optional:** 1442 Steps to Heaven Lake [Gary Pereira] https://youtu.be/TsnoFuC4zrw **Optional:** Valley Float Stone Forest of Changbai Mountain [Gary Pereira] https://youtu.be/_HSdtL-AQyM **Optional:** Jinjiang River Canyon [Gary Pereira] https://youtu.be/l_JWAZkvNQk **Optional:** Natural History Museum of Changbaishan [Gary Pereira] https://youtu.be/Un6ig2Z9lIY Within the park itself, visitors are not allowed to go off trail, camp, or gather forest products without special permission. But there are plenty of interesting sites and solitude if you want it. The trails are well maintained. In a rare flat valley, deep within the park, we visited some of the park's rare residents: an ethnic Korean village! Of course, it conforms to Chinese law and policy, but it offers an authentic glimpse of what life may have been like before the modern era. I have plenty of video from our visit that

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	11/10/20	I still haven't edited or published yet, so I'll just give you a short description for now. The village grows all its own food, and it earns disposable income primarily by growing and selling ginseng, which is an unusual crop. It takes several years before the root is generally harvested, and the longer you wait the stronger and more valuable the root becomes. Sometimes they wait 25 years or more. So growing and harvesting requires a great deal of patience and long term planning. It is grown in shaded greenhouses or on the grounds of the park itself. The latter method of growing and harvesting ginseng is the more interesting. These village people have permission to wander through the park and plant and harvest ginseng and other products, sustainably. They are counted among the stewards of the park, along with the rangers and firefighters. They keep an eye on things, note any unusual changes, assist with scientific work, and report any intruders or poachers. By often allowing people to live and work in its parks, China seems to do a decent job of protecting and maintaining its natural environment, at lower government expense. But of course there are far fewer freedoms than what the Western visitor would expect. You can't camp or wander off trail in China without permission. Generally, permission is not given. That does help to protect fragile environments. My sister in law, for example, had been to Changbaishan many years earlier, and she had been able to walk over the crater rim and right down to the water's edge. No more. **Homework 12:** 1. In an essay, describe steps that should be taken before, during, and after a major destructive earthquake, from the perspective of you as a family member and/or neighbor, public servant, health care worker, business officer, planner, etc. in order to reduce suffering and loss. In other words, I want to know more than just what you would do for yourself during and immediately after the earthquake. I also want to know about long-term planning, and about the long-term aftermath. Assume that the earthquake has caused casualties, and that people around you are in need of first aid, at the very least. Assume that gas lines are ruptured, that electricity is off, and that communications via cell phone is unreliable. Assume that you have the ability to move and do things. You may be at work, or school, at home or on the streets. You may fictionalize your account, with specifics, or you may write in the manner of the USGS documents. This essay should take at least a couple of pages. Chapter 10 Essay Questions 6, 12, 13, 14: 10.6. What geologic features are found at the boundaries of tectonic plates? Briefly explain how plate tectonics is responsible for their formation or occurrence. 10.12. Describe the various layers that make up the solid Earth. 10.13. Describe the various physiological features associated with the ocean basins. 10.14. What is a volcano? Where and why do they form? Describe the five different types of volcanoes.
13		**Topic:** The Lithosphere **Read:** CHAPTER 10: Introduction to the Lithosphere

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	11/17/20	**Homework 13:** Essay Questions 17, 20, 21, 25, 28, 32, 33, 34 10.17. Outline the various processes of physical, chemical, or biological weathering. 10.20. Describe the physical characteristics of a location that would favor each of the following types of mass movements: rock fall, rockslide, mudflow, slump, and creep. 10.21. What is a glacier? What conditions are necessary for a glacier to form? Why did continental glaciers form over certain specific regions of the North American continent? 10.25. How do glaciers influence the surface configuration of the Earth by way of erosion and deposition? 10.28. How does beach drift and longshore drift move sediment along coastlines? 10.32. Describe some of the landforms common to environments influenced by eolian processes. 10.33. Describe some the important characteristics of soil. 10.34. What five factors are important in pedogenesis? Explain. Outline how the pedogenic processes operate.
14	**11/24/20**	**Topic:** The Oceans **Watch:** Nutrients from Deep-Sea Vents https://ca.pbslearningmedia.org/resource/nves.sci.earth.hydro/nutrients-from-deep-sea-vents/ **Watch:** Deep-sea mining could transform the globe https://youtu.be/IYKaKeJv2dQ **Watch:** The Next Frontier in Mining: Deep Sea Exploitation in the Pacific https://youtu.be/PuEXmFQEJpw https://en.wikipedia.org/wiki/Deep_sea_mining https://www.nature.com/articles/d41586-019-02242-y https://en.wikipedia.org/wiki/International_Seabed_Authority https://en.wikipedia.org/wiki/United_Nations_Convention_on_the_Law_of_the_Sea Countries bordered by oceans often claim an exclusive economic zone that extends far out to sea. Many of these waters are disputed among various nations (e.g., the South China Sea). Fissures along plate boundaries and hotspots in the deep ocean bring minerals up from deep beneath the crust. Many islands and seamounts associated with such processes have abundant minerals in their seabed. Unknown forms

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		of life, that we have barely begun to understand, exist in these environments as well. **Homework 14:** 1. What is a hydrothermal vent? 2. Describe the process by which hydrothermal vents produce nutrient-rich water. 3. What did scientists see in NASA's Aqua satellite data that indicated a phytoplankton bloom? **4.** What (if anything) is being done to regulate the exploitation of the seabed for minerals? Discuss the history and significance of national claims of exclusive rights over offshore resources.
15	**12/01/20**	**No work due. Please work on your term paper.**
16		**Final Evaluation:** Choose either Option 1, or Option 2, and write an essay as described at the end. **Option 1:** Write an essay on some aspect of the COVID-19 epidemic that intersects with any of the topics we have discussed in this class. You might want to look through some of the following videos first to get some ideas. **Optional:** How Pandemics Spread [TED-Ed] https://youtu.be/UG8YbNbdaco **Optional:** Spatial Epidemiology & Geography of Disease [The Great Courses Plus] https://youtu.be/-T4VUZmohAo **Optional:** Viral Intelligence: What Is Coronavirus? [The Great Courses Plus] https://youtu.be/P2AueO_pcAU **Optional:** Introduction to Infectious Diseases: Travel, War, and Natural Disasters [The Great Courses Plus] https://youtu.be/sghMinCXX4Y **Optional:** Why are outbreaks of infectious diseases on the rise? [DW News] https://youtu.be/4J1AqK0ayTE **Optional:** How we conquered the deadly smallpox virus [TED-Ed] https://youtu.be/yqUFy-t4MlQ **Optional:** COVID-19: Where It Starts and Stops [Wildlife Conservation Society] https://youtu.be/_D_6a56zI_U **Optional:** How wildlife trade is linked to coronavirus [Vox]

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		https://youtu.be/TPpoJGYlW54 **Optional:** Covid 19 is causing a conservation crisis. Endangered species at risk [Evening Standard] https://youtu.be/CGJ9X2MGzxw **Access** How deforestation helps deadly viruses jump from animals to humans https://theconversation.com/how-deforestation-helps-deadly-viruses-jump-from-animals-to-humans-139645 **Access**: How Climate Change Is Contributing to Skyrocketing Rates of Infectious Disease [ProPublica] https://www.propublica.org/article/climate-infectious-diseases **Option 2:** Write an essay on regional vulnerabilities to climate change and climate refugees. Again, you might want to look through some of the following videos first, to get some ideas. **Optional:** Climate Refugees: Nations under threat [CBS News] https://youtu.be/4MXoUbsswHY **Optional:** Fleeing climate change — the real environmental disaster [DW Documentary] https://youtu.be/cl4Uv9_7KJE Here's an interesting report from Elizabeth White of the University of San Francisco's Geospatial Analysis Lab: **Optional: Watch:** Exploring the relationship between Climate Change and Human Migration in Africa [USFGsAL] https://youtu.be/HtUw_jvv3GU **Optional:** Climate Change: Rising Sea Levels + Coastal Megacities = Forced Migration [Big Think] https://youtu.be/s4UgekcYg2o (The transcript of Dr. Khanna's talk is available in the notes below the video if you open it in a separate browser.) **Optional:** Climate change and migration: How do they connect? [DIEnewsflash] https://youtu.be/t5SygtZCFzo **Optional:** Climate Change Impacts in Bangladesh [World Bank] https://youtu.be/V3IL6Y1TDHo **Optional:** Climate refugees in Bangladesh [DW Documentary] https://youtu.be/co5uywe-1Z8 **Optional:** Changing Climate, Moving People: A film on climate stress related migration [TERI] https://youtu.be/NjYR3LohMM0
	12/09/20	Choose either Option 1 or Option 2 and write a thoughtful term paper on some aspect of that topic. The paper should begin with an introduction to the topic, and a conclusion, but it need not be comprehensive.

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		Provide at least four citations. It doesn't matter what format you use, so long as you are consistent. I suggest that you choose a serious topic that is aligned with your interests or career plans. The resulting paper's text should be at least four pages long, easily more. Use the same font and spacing as for the homework, please. You may also include graphics and extended quotations, if you provide citations. I encourage you to produce some of your own graphics if you are so inclined. You will find these to be useful if you upload your work to Portfolium. There is no upper limit to the length of the paper, but please don't lengthen it with unnecessary repetition. I expect all of you to produce a paper that you can publish online without further editing.