

GLACIERS AND GLOBAL CHANGE

Earth and Space Sciences 203

Course Syllabus 2021

Class Website: <https://courses.washington.edu/ess203/>

Instructor Team:

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Office Hours: Discussing course ideas and projects is an important part of learning.
We are all happy to chat with you about course ideas or concerns.
Please arrange appointments by email or phone.

Glaciers, arctic sea ice, seasonal snow, and permafrost – they are all melting as Planet Earth warms up. The 2013 IPCC report AR5 is more definite than ever that human activities, particularly burning fossil fuels, are causing glaciers to melt, and that meltwater is causing sea level to rise. Nonetheless, some political systems are slow to accept the strong scientific consensus.

So, glaciers might be important to your future. Glaciers and polar ice sheets can alter climate, landscape and sea level in the future, both locally and globally. They can also teach us about past climate and environmental changes, both natural and human-caused. Glaciers slowly advance and retreat in response to past and present climate changes, and their weight can push down the Earth's crust. As a result, changes in Earth's glacial environment today can tell us about climate in the past. Layers of buried glacier ice from earlier climate periods also contain a rich and detailed history of the atmosphere and the climate in the past, unlike the records found anywhere else. We examine theories of the Ice Ages, and look at evidence for glaciers that covered Puget Sound. Along the way, we consider how ice on our planet is changing today, and how it might change in the future, with accompanying impacts on our society.

Although you may not plan to be a scientist, knowing what science is and how scientists do their work can be helpful in any career, because science has shaped so much in our society. As we look at ice in the environment, we will also investigate how scientists get answers to the questions they ask, how they communicate results, and what is meant by a scientific consensus. You will explore the basis of reliable scientific knowledge through peer review. Although scientists are also humans, peer review helps them to (mostly) stay above politics and belief in their work. This course also investigates the dichotomy

between the scientific consensus and the media treatment of glacier melt and climate change.

You will have an opportunity to take an anthropological/sociological viewpoint – investigating this exotic tribe called *Scientists*. You will also have opportunities to play the role of *the Curious Scientist*, by asking questions and formulating answers.

LEARNING OBJECTIVES:

- You will understand how the ice on Planet Earth is changing today.
- You will appreciate how glaciers and polar ice sheets alter climate, landscape and sea level in ways that affect our society.
- You will gain insight into the ways earth scientists can extract a wealth of information about past environments from measurements on ordinary materials like ice, stone, mud, or wood, and how they communicate those results to other scientists and to the public.
- You will be able to read scientific research papers, to get the story from the original source.
- You will be able to use the power and usefulness of simple arithmetic to help you find approximate answers to fundamental environmental questions, as well as throughout your other life activities beyond this course.

TENTATIVE TIMETABLE:

Week 1: What is a glacier? Where are they and why?

Week 2: Climate and Glaciers

Week 3: Glaciers on the Move - Ice flow

Week 4: Ice-Age World

Week 5: Peer Review and Scientific Communication

Week 6: Climate (non)Controversies

Week 7: Glacier response to changing climate

Week 8: Ice cores reveal climate changes

Week 9: Melting glaciers, sea level rise

Week 10: Lake Vostok - ancient life under the ice, a stepping stone to the planets?

COURSE READING MATERIALS: Textbook:

Frozen Earth: the once and future story of ice ages. D. Macdougall. University of California Press. 2013.

We will not follow this book in all details, but it is a "good read" on the topic of ice and a changing world. We will use extensive sections from the book for some topics and Labs. The text is available at <http://site.ebrary.com/lib/uwash/reader.action?docID=10654376>

Optional additional text:

Glaciers and environmental change. Atle Nesje and Svein Olaf Dahl. London Arnold; New York: co-published in the U.S. by Oxford University Press, 2000.

This is a textbook aimed at science majors.

Scientific articles:

- Publications from scientific articles written for general audiences with some scientific background (such as this class), e.g. journals *Nature* and *Science*.

Articles that we will discuss during the Quarter will be available on the class web page

<http://courses.washington.edu/ess203/>

Look under the READING tab to access the reading materials. You need to login with your UW Net ID login and password. The reading materials are in pdf format.

Additional reading:

Ice ages: solving the mystery. John Imbrie and Katherine Palmer Imbrie. Cambridge MA: Harvard University Press, 1979.

This is a classic book describing the development of the scientific theories of the ice ages.
The Ice Finders: how a poet, a professor, and a politician discovered the Ice Age. Edmund Blair Bolles.
Washington DC. Counterpoint Press, 1999.

This is another good story about the discovery of the ice ages.

SCHEDULE

We will meet synchronously for classes.	M-W-F	1:30-2:20
Lab sections (choose one)	T or Th	9:30-12:20

COURSE STRUCTURE

Classes:

Classes will be a mix of instruction and group discussions. I will expect you to attend classes and contribute to discussions. Your preparation will include some reading and library and/or web research of topics for class discussions.

There will be regular short writing assignments on topics to be discussed. These assignments will be due at the start of the next class (***please type and print your answers***). To help me to assess your understanding of the course material, I will read your written work and give you feedback on content and writing style on some assignments. Completion of these assignments will contribute significantly to your class grade (below). I will not give you a numerical grade for each assignment. They will be C/NC; however, if I think that you have missed the major points in the assignment, I may ask you to revise your answers before you get credit.

At the start of each class, I will ask for a volunteer to note 2 or 3 high points of the class, and summarize them in a paragraph. The volunteer then verbally reports those highlights at the start of the next class (60 seconds or less), and turns in his or her paragraph.

Volunteering for this activity will also contribute to your class participation grade.

Labs:

Labs start in Week 1. We expect you to attend for credit; however, there will be no graded assignment from the Week 1 Lab.

Please download the posted Lab notes for each week

Each Lab session will have activities to be discussed and/or carried out in groups. Attending Labs and participating in the activities is essential for achieving the learning objectives of the class. Lab activities will include:

- exploring topics from class in greater depth
- taking (virtual) field trips to see results of glacier action around Seattle
- finding and using simple numbers and your life experiences to understand the world around us.

There are writing assignments for each Lab except for Lab 1. These exercises can be completed in the lab or finished up as homework. You are encouraged to work through all the exercises with your Lab group. However, each person should turn in his or her own answers at the beginning of the following Lab period. These Lab assignments will be graded by your TA. See the **Lab Syllabus** under the LABS tab on the course web site.

Group Research Reports

Most often, stories in the popular press about glaciers and Earth's ice in general are triggered by a press release by a Lab or a University about publication of an article in the peer-reviewed scientific literature. The reporter will often interview some of the authors and other scientists on the field.

For term projects in this class, you will form a group, with 1 or 2 other classmates.

- Your group will find a story about the cryosphere in the popular press.
- You will identify the peer-reviewed publication on which the popular report is based.
- You will download and read that peer-reviewed paper.

- Your group will write a collaborative report of about 3000-4000 words equivalent (6-8 pages) about the issues involved. (This is the way most scientific papers are written in the 21st century).
- In your group paper, you will report on the science in the peer-reviewed source. For example,
 - what was the objective?
 - what was the method?
 - what was the result?
- You will also assess the popular press report. For example
 - Did it get the science story right?
 - Was it biased?
 - Did it stay on the topic?
- Can you relate the story to material that you have learned in ESS 203?
- You are encouraged to meet with your group early and often to make plans and get your research started.
- During the last week of the quarter, each group will present its findings to other class members in your Lab sections. I expect that you will question the other groups, to satisfy your curiosity about their topics and to ensure that they explain their research to you adequately. This is also your responsibility as an audience of Curious Scientists. ☺
- Ideally, each group member will contribute substantially to your group paper. In addition to the group paper, I will also ask each of you to turn in a short (1 page or less) paper describing *your* activities and *your* contributions to the group project and paper.

Group-paper timetable:

- After the first 4 weeks, you will have formed tentative groups and identified tentative topics to explore.
- During Week 7, each Group will prepare and submit a one-page outline of their paper.
- During Lab sessions in Week 10, each group will present its findings to the rest of the class.
- The co-authored written papers are due on the first day of exam week.

TESTS:

There will be 2 take-at-home tests during the quarter:

- After 4 weeks (Wednesday February 3) and after 8 weeks (Wednesday March 3).
- Prose answers to 3 questions related to concepts discussed in class. I will post study questions approximately one week ahead. The test will consist of some of those questions.
- Be sure to read the notes about writing essays and tests on the class web site.

There will be *no final exam*.

COURSE GRADES:

25% - class tests (2)

40% - lab participation and reports

10% - short homework writing assignments due at class

15% - group research project and report

10% - participation in class discussions

DISABILITY-RELATED NEEDS

To request academic accommodations due to a disability, please contact Disability Resources for Students (DRS) 011 Mary Gates Hall

uwdrs@uw.edu

206-543-8924 (Voice), 206-543-8925 (TTY), 206-616-8379 (FAX).

If you have a letter from DRS, please present the letter to the coordinating instructor so that he or she can discuss with you the accommodations that you might need in this class.

ACADEMIC INTEGRITY:

At the University level, passing off anyone else's scholarly work (which can include written material, exam answers, graphics or other images, and even ideas) as your own, without proper attribution, is considered to be academic misconduct. *For example, cutting and pasting text from a web site and submitting it as your own work is plagiarism, and repeat offenses can lead to dismissal from the university.*

Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120).

<http://www.washington.edu/cssc/for-students/student-code-of-conduct/>

We expect that you will know and follow the university's policies on cheating and plagiarism. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington **Community Standards and Student Conduct** website.

<http://www.washington.edu/cssc/>

Please also review the College of the Environment **Academic Misconduct Policy**.

<http://coenv.washington.edu/intranet/academics/academic-policies/academic-misconduct/>

NOTICE

The University has a license agreement with SimCheck by Turnitin, an educational tool that helps prevent or identify plagiarism from Internet resources. Your instructor may use the service in this class by requiring that assignments be submitted electronically to be checked by SimCheck. The SimCheck Report will indicate the amount of original text in your work and whether all material that you quoted, paraphrased, summarized, or used from another source is appropriately referenced.

RELIGIOUS ACCOMMODATION

Washington state law (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/> [SB 5166-2019-20](#)) requires institutions of higher education to administer a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's Religious Accommodation Policy is available at

<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>

Accommodations must be requested within the first two weeks of any course using the Religious Accommodation Request Form

<https://registrar.washington.edu/students/religious-accommodations-request/>

SAFETY

Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus's team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

ACTION ITEMS –

1. Writing assignment due on Wednesday:

- (a) Describe 2 things that you learned today about glaciers. (If you did *not* learn something new, you can find 2 things by looking up "glaciers" on the web or in an encyclopedia. Do not cut-and-paste!)
- (b) What is 1 thing that you want to know about glaciers but don't (yet)?
To keep it easy, please do not exceed 1 paragraph or 1/2 page. Thanks!

2. Reading assignment:

During the next week or so, we will be asking “*What is a Glacier?*”

- Please read the Wikipedia entry *Glacier* at
<http://en.wikipedia.org/wiki/Glacier>
in particular the sections **Types, Formation, Structure, and Motion**

3. Class Questionnaire:

We have posted a short Questionnaire under the **Quizzes** tab in Canvas, so that we can learn more about your backgrounds and interests.

- Please fill in the Questionnaire by Friday, or as soon as you can. Thanks.