



PHILOSOPHY 920: PHILOSOPHY OF CLIMATE AND ENVIRONMENTAL SCIENCES FALL 2023

Meeting Time and Location: W 1:15-3:15pm, HCW 5181

Prof. Aja Watkins

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Office: 5173 Helen C. White

Office hours: M 12:00-2:00pm or by appt.

COURSE DESCRIPTION

We will focus this philosophy of science seminar on philosophy of climate science and other environmental sciences. The first half of the course or so we will devote to philosophy of climate science so far, which mainly consists of philosophical discussions of climate simulations (the main source of evidence that has been used to detect contemporary climate change, attribute it to human activities, and project its effects into the future). The second half of the course we will look at some areas in climate science and other environmental sciences that have not received much philosophical attention yet, but where (I suspect) the scientists could benefit from some philosophical insights.

REQUIRED TEXTS

All readings will be posted online. Readings listed as “optional” really are optional; think of them as papers that might be useful to read if you are doing a project on that week’s topic. I will add more optional readings throughout the semester as I learn more about everyone’s interests. Please read the week’s readings before that class so that you can meaningfully participate in discussion.

LEARNING OUTCOMES

1. Expert ability to think critically about arguments.
2. Expert ability to interpret complex texts accurately and analyze them logically.
3. Ability to communicate very precisely and concisely in both writing and in speech.
4. Interpretative charity and intellectual honesty which includes appropriate attribution to others of their ideas and recognition and frankness about the limitations of one’s own ideas.

ASSIGNMENTS AND EVALUATION

Grading Scheme

Discussion: 20%
Contracted assignments: 80%

Note this is the same breakdown for students in 701, although they will be expected to do fewer (if any) contracted assignments.

Please see the additional assignment contract document for more details.

Grading Scale

All assignments will only be given a letter grade or graded for completion, as per the assignment contract agreement for each student. In case it is easier for you to think of grades in numerical terms, here is a rough correspondence between percentages and letter grades.

93-100%	A
88-92.9%	AB
83-87.9%	B
77-82.9%	BC
70-76.9%	C
60-69.9%	D
0-59.9%	F

Attendance

Attendance to all course meetings is required and will contribute to your discussion grade. You will get **two unexcused absences** for the term. You will not be penalized for **excused** absences. Excused absences include sickness and family emergencies and require notification of the instructor. Appropriate accommodations will be made for students with McBurney visas.

University attendance policy: <https://kb.wisc.edu/lis/page.php?id=24628>

University religious observances policy: <https://kb.wisc.edu/lis/page.php?id=21698>

OTHER POLICIES

Add/Drop

The add/drop deadline with no tuition penalties is September 15, 2023. Please see the registrar's schedule for more information: <https://registrar.wisc.edu/dates>

Lateness Policy and Extensions

All assignments should be turned in on the due date agreed upon in your assignment contract.

If late, assignments will be penalized by a deduction from the grade for each day it is late. 1/2 grade step per day is the penalty. Hence after 2 days an AB becomes a B and after 4 days it becomes BC.

Extensions will be granted only to those students with a legitimate excuse, such as sickness. It is the student's responsibility to contact the instructor BEFORE the due date to discuss the possibility of an extension.

Office Hours and E-mail Policy

My office hours are the best resource for help outside of class. I will hold regular office hours, and I encourage you to stop by to chat. You do not need to have a specific question about the course in order to visit office hours. If there is anything that I can do to help you succeed in the course, please let me know!

You are welcome to send me an email if you have a question about the course. If your question requires more than a brief reply, I will ask you to come to our office hours to discuss it. I will check my e-mails daily and try to respond in a timely fashion, but please allow at least 24 hours for a reply.

Academic Integrity

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest standards of academic integrity. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review.

For more information, refer to <https://conduct.students.wisc.edu/academic-integrity/>

Note that you need not intend to plagiarize in order to do so. You are guilty of plagiarism if you represent the ideas of others as your own or if you present, as new, ideas derived from an existing source regardless of intending to do so.

Land Acknowledgement

UW Madison occupies ancestral Ho-Chunk land, a place their nation has called Teejop (day-JOPE) since time immemorial. In an 1832 treaty, the Ho-Chunk were forced to cede this territory. Decades of ethnic cleansing followed when both the federal and state government repeatedly, but

unsuccessfully, sought to forcibly remove the Ho-Chunk from Wisconsin. We acknowledge the circumstances that led to the forced removal of the Ho-Chunk people, and honor their legacy of resistance and resilience. This history of colonization informs our work and vision for a collaborative future. We recognize and respect the inherent sovereignty of the [Ho-Chunk Nation](#) and the other 11 Native Nations within the boundaries of the state of Wisconsin.

Accommodations

McBurney Disability Resource Center syllabus statement: “The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.”
<http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php>

I am committed to meeting and even exceeding the accommodations required by the university. I hope that you will feel comfortable letting me know if there's anything I can do to make your experience in this course go more smoothly or for the course environment to be more welcoming.

Diversity & Inclusion

Institutional statement on diversity: “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.” <https://diversity.wisc.edu/>

Discrimination on the basis of race, sex/gender, sexual orientation, disability status, religion, ethnicity, nationality, age, socioeconomic background, etc. will not be tolerated in this class. Please bring any inappropriate behaviors to my attention in whatever way you feel the most comfortable. If you are not comfortable speaking to me, the appropriate person to speak to is the Philosophy Department chair, [Emily Fletcher](#).

Title IX

In any cases of sexual harassment or misconduct, you are welcome to speak with me. However, I am a Title IX Mandatory Reporter, which means that I am obligated by law to report the incident to the UW Title IX Coordinator. Here is more information on Title IX: <https://compliance.wisc.edu/titleix>

COVID

I am committed to maintaining a classroom that is safe with respect to COVID-19. This might require that I change classroom policies mid-semester. See UW COVID updates here: <https://covidresponse.wisc.edu/>

Rules, Rights & Responsibilities

You are all expected to follow the classroom norms that we establish together. It is imperative that we treat one another with respect, even in the face of strong disagreement. It is our shared responsibility to create a classroom environment that is welcoming and supports the learning of all students.

Technology Policy

Turn off and put away cell phones before the start of class. Laptop and I-Pad use is permitted for note-taking purposes only. I reserve the right to establish a stricter technology policy if I find that students are regularly distracted by their devices.

Additional resources

If you are looking for additional support, the following on-campus resources might be useful:

- Academic Coaching and Tutoring Services (ACTS): <https://actsddea.wisc.edu/>
- Writing Center: <https://writing.wisc.edu/>

I would also encourage you to reach out to one another for help if you have questions on the readings or the assignments.

SCHEDULE OF TOPICS AND READINGS

(Subject to change; some notes in brackets)

Week 1: Introduction to philosophy of climate science (September 6)

Frigg, R., Thompson, E., & Werndl, C. (2015a). Philosophy of Climate Science Part I: Observing Climate Change. *Philosophy Compass*, 10(12), 953–964. <https://doi.org/10.1111/phc3.12294>

Frigg, R., Thompson, E., & Werndl, C. (2015b). Philosophy of Climate Science Part II: Modelling Climate Change. *Philosophy Compass*, 10(12), 965–977. <https://doi.org/10.1111/phc3.12297>

Optional: Katzav, J., & Parker, W. S. (2018). Issues in the theoretical foundations of climate science. *Studies in History and Philosophy of Modern Physics*, 141–149. <https://doi.org/10.1016/j.shpsb.2018.02.001>

Optional: Werndl, C. (2016). On Defining Climate and Climate Change. *The British Journal for the Philosophy of Science*, 67(2), 337–364. <https://doi.org/10.1093/bjps/axu048>

Optional: Parker, W. S. (2018). Climate Science. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Summer 2018). <https://plato.stanford.edu/entries/climate-science/>

Week 2: Model evaluation (September 13)

Held, I. M. (2005). The Gap between Simulation and Understanding in Climate Modeling. *Bulletin of the American Meteorological Society*, 86(11), 1609–1614.

Lloyd, E. A. (2009). Varieties of Support and Confirmation of Climate Models. *Aristotelian Society Supplementary Volume*, 83(1), 213–232. <https://doi.org/10.1111/j.1467-8349.2009.00179.x>

Parker, W. S. (2009). Confirmation and Adequacy-for-Purpose in Climate Modelling. *Aristotelian Society Supplementary Volume*, 83(1), 233–249. <https://doi.org/10.1111/j.1467-8349.2009.00180.x>

Optional but recommended: Parker, W. S. (2020). Model Evaluation: An Adequacy-for-Purpose View. *Philosophy of Science*, 87(3), 457–477. <https://doi.org/10.1086/708691>

Optional: Parker, W. S. (2010). Scientific Models and Adequacy-for-Purpose. *Modern Schoolman*, 87(3–4), 285–293. <https://doi.org/10.5840/schoolman2010873/410>

Optional: Lenhard, J., & Winsberg, E. (2010). Holism, entrenchment, and the future of climate model pluralism. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 41(3), 253–262. <https://doi.org/10.1016/j.shpsb.2010.07.001>

Optional: Kawamleh, S. (2022). Confirming (climate) change: A dynamical account of model evaluation. *Synthese*, 200(2), 122. <https://doi.org/10.1007/s11229-022-03659-1>

Super optional: Kovaka, K. (2021). Evaluating community science. *Studies in History and Philosophy of Science*, 88, 102–109. <https://doi.org/10.1016/j.shpsa.2021.05.004> [this paper is just to

get an idea for the ways others have used the adequacy-for-purpose view in areas besides model evaluation]

Week 3: Model-data symbiosis (September 20)

Lloyd, E. A. (2012). The role of ‘complex’ empiricism in the debates about satellite data and climate models. *Studies in History and Philosophy of Science Part A*, 43(2), 390–401. <https://doi.org/10.1016/j.shpsa.2012.02.001>

Parker, W. S. (2020). Local Model-Data Symbiosis in Meteorology and Climate Science. *Philosophy of Science*, 87(5), 807–818. <https://doi.org/10.1086/710621>

Optional: Mann, M. E. (2018). Reconciling Climate Model/Data Discrepancies: The Case of the ‘Trees That Didn’t Bark.’ In E. A. Lloyd & E. Winsberg (Eds.), *Climate Modelling: Philosophical and Conceptual Issues* (pp. 175–197). Springer International Publishing. https://doi.org/10.1007/978-3-319-65058-6_7

Optional: Edwards, P. N. (2010). *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. MIT Press. Chapter 10.

Optional: Bokulich, A. (2020). Towards a Taxonomy of the Model-Ladenness of Data. *Philosophy of Science*, 87(5), 793–806. <https://doi.org/10.1086/710516>

Super optional: Bokulich, A. (2021). Using models to correct data: Paleodiversity and the fossil record. *Synthese*, 198, 5919–5940. <https://doi.org/10.1007/s11229-018-1820-x> [this paper is again just to give you an idea of how the topic of model-data symbiosis has come up in other areas of philosophy of science as well as in climate science]

Week 4: Robustness and model agreement/disagreement (September 27)

Lloyd, E. A. (2015). Model robustness as a confirmatory virtue: The case of climate science. *Studies in History and Philosophy of Science Part A*, 49, 58–68. <https://doi.org/10.1016/j.shpsa.2014.12.002>

Parker, W. S. (2018). The Significance of Robust Climate Projections. In E. A. Lloyd & E. Winsberg (Eds.), *Climate Modelling* (pp. 273–296). Springer International Publishing. https://doi.org/10.1007/978-3-319-65058-6_9

Optional: O’Loughlin, R. (2021). Robustness reasoning in climate model comparisons. *Studies in History and Philosophy of Science Part A*, 85, 34–43. <https://doi.org/10.1016/j.shpsa.2020.12.005>

Optional: Winsberg, E. B. (2018). What does robustness teach us in climate science: A re-appraisal. *Synthese*. <https://doi.org/10.1007/s11229-018-01997-7>

Optional: Orzack, S. H., & Sober, E. (1993). A Critical Assessment of Levins’s The Strategy of Model Building in Population Biology (1966). *The Quarterly Review of Biology*, 68(4), 533–546. <https://doi.org/10.1086/418301>

Week 5: Climate data (October 4)

Lloyd, E., Lusk, G., Gluck, S., & McGinnis, S. (2022). Varieties of Data-Centric Science: Regional Climate Modeling and Model Organism Research. *Philosophy of Science*, 1–42. <https://doi.org/10.1017/psa.2021.50>

Parker, W. S. (2020). Evaluating Data Journeys: Climategate, Synthetic Data and the Benchmarking of Methods for Climate Data Processing. In S. Leonelli & N. Tempini (Eds.), *Data Journeys in the Sciences* (pp. 191–206). Springer International Publishing. https://doi.org/10.1007/978-3-030-37177-7_10

Optional but recommended: Bokulich, A., & Parker, W. (2021). Data models, representation, and adequacy-for-purpose. *European Journal for Philosophy of Science*, 11(31). <https://doi.org/10.1007/s13194-020-00345-2>

Super optional: Brönnimann, S., & Wintzer, J. (2019). Climate data empathy. *WIREs Climate Change*, 10(2), e559. <https://doi.org/10.1002/wcc.559>

Super optional: Jebeile, J., & Roussos, J. (2023). Usability of climate information: Toward a new scientific framework. *WIREs Climate Change*. <https://doi.org/10.1002/wcc.833>

Week 6: Values in climate science (October 11) – *Discussion led by Laura and Mark*

Winsberg, E. B. (2018). Communicating Uncertainty to Policymakers: The Ineliminable Role of Values. In E. A. Lloyd & E. B. Winsberg (Eds.), *Climate Modelling: Philosophical and Conceptual Issues* (pp. 381–412). Springer International Publishing. https://doi.org/10.1007/978-3-319-65058-6_13

Elabbar, A. (2023). Varying Evidential Standards as a Matter of Justice. *The British Journal for the Philosophy of Science*. <https://doi.org/10.1086/727429>

Optional: Pulkkinen, K., Undorf, S., Bender, F., Wikman-Svahn, P., Doblus-Reyes, F., Flynn, C., Hegerl, G. C., Jönsson, A., Leung, G.-K., Roussos, J., Shepherd, T. G., & Thompson, E. (2022). The value of values in climate science. *Nature Climate Change*, 1–3. <https://doi.org/10.1038/s41558-021-01238-9>

Optional: Winsberg, E. B., Oreskes, N., & Lloyd, E. (2020). Severe weather event attribution: Why values won't go away. *Studies in History and Philosophy of Science*, 8.

Week 7: Consensus and dissensus (October 18) – *Discussion led by Julia and Alex*

Oreskes, N. (2018). The Scientific Consensus on Climate Change: How Do We Know We're Not Wrong? In E. A. Lloyd & E. Winsberg (Eds.), *Climate Modelling* (pp. 31–64). Springer International Publishing. https://doi.org/10.1007/978-3-319-65058-6_2

Intemann, K. (2017). Who Needs Consensus Anyway? Addressing Manufactured Doubt and Increasing Public Trust in Climate Science. *Public Affairs Quarterly*, 31(3), 189–208. <https://doi.org/10.2307/44732792>

Week 8: Paleoclimate analogues (October 25)

Tierney, J. E., Poulsen, C. J., Montañez, I. P., Bhattacharya, T., Feng, R., Ford, H. L., Hönisch, B., Inglis, G. N., Petersen, S. V., Sago, N., Tabor, C. R., Thirumalai, K., Zhu, J., Burls, N. J., Foster, G. L., Goddérís, Y., Huber, B. T., Ivany, L. C., Turner, S. K., ... Zhang, Y. G. (2020). Past climates inform our future. *Science*, 370(6517). <https://doi.org/10.1126/science.aay3701>

Wilson, J. (2023). Paleoclimate analogues and the threshold problem. *Synthese*, 202(1), 17. <https://doi.org/10.1007/s11229-023-04202-6>

Optional: Lear, C. H., Anand, P., Blenkinsop, T., Foster, G. L., Gagen, M., Hoogakker, B., Larter, R. D., Lunt, D. J., McCave, I. N., McClymont, E., Pancost, R. D., Rickaby, R. E. M., Schultz, D. M., Summerhayes, C., Williams, C. J. R., & Zalasiewicz, J. (2021). Geological Society of London Scientific Statement: What the geological record tells us about our present and future climate. *Journal of the Geological Society*, 178(1). <https://doi.org/10.1144/jgs2020-239>

Optional: Rosol, C. (2017). Data, Models and Earth History in Deep Convolution: Paleoclimate Simulations and their Epistemological Unrest. *Berichte Zur Wissenschaftsgeschichte*, 40(2), 120–139. <https://doi.org/10.1002/bewi.201701822>

Optional: Schmidt, G. A. (2010). Enhancing the relevance of palaeoclimate model/data comparisons for assessments of future climate change. *Journal of Quaternary Science*, 25(1), 79–87. <https://doi.org/10.1002/jqs.1314>

Week 9: Anthropocene and Sixth Mass Extinction (November 1)

Santana, C. (2019). Waiting for the Anthropocene. *The British Journal for the Philosophy of Science*, 70(4), 1073–1096. <https://doi.org/10.1093/bjps/axy022>

Bocchi, F., Bokulich, A., Castillo Brache, L., Grand-Pierre, G., & Watkins, A. (2022). Are We in a Sixth Mass Extinction? The Challenges of Answering and Value of Asking. *The British Journal for the Philosophy of Science*. <https://doi.org/10.1086/722107>

Optional: Lucas, S. (2020). GSSP-based Chronostratigraphy: Should Boundaries Be Defined by Arbitrarily Chosen Non-Events? *Permophiles*, 68, 9.

Optional: Zalasiewicz, J., Waters, C. N., Wolfe, A. P., Barnosky, A. D., Cearreta, A., Edgeworth, M., Ellis, E. C., Fairchild, I. J., Gradstein, F. M., Grinevald, J., Haff, P., Head, M. J., Ivar do Sul, J. A., Jeandel, C., Leinfelder, R., McNeill, J. R., Oreskes, N., Poirier, C., Revkin, A., ... Williams, M. (2017). Making the case for a formal Anthropocene Epoch: An analysis of ongoing critiques. *Newsletters on Stratigraphy*, 50(2), 205–226. <https://doi.org/10.1127/nos/2017/0385>

Optional: Bocchi, F. (2022). Biodiversity vs. paleodiversity measurements: The incommensurability problem. *European Journal for Philosophy of Science*, 12(4), 64. <https://doi.org/10.1007/s13194-022-00494-6>

Week 10: Fire science and prescribed burning (November 8)

Christianson, A. C., Sutherland, C. R., Moola, F., Bautista, N. G., Young, D., & MacDonald, H. (2022). Centering Indigenous Voices: The Role of Fire in the Boreal Forest of North America. *Current Forestry Reports*. <https://doi.org/10.1007/s40725-022-00168-9>

Hiers, J. K., O'Brien, J. J., Varner, J. M., Butler, B. W., Dickinson, M., Furman, J., Gallagher, M., Godwin, D., Goodrick, S. L., Hood, S. M., Hudak, A., Kobziar, L. N., Linn, R., Loudermilk, E. L., McCaffrey, S., Robertson, K., Rowell, E. M., Skowronski, N., Watts, A. C., & Yedinak, K. M. (2020). Prescribed fire science: The case for a refined research agenda. *Fire Ecology*, 16(1), 11. <https://doi.org/10.1186/s42408-020-0070-8>

Penman, T. D., Collins, L., Duff, T. D., Price, O. F., & Cary, G. J. (2020). Scientific evidence regarding the effectiveness of prescribed burning. In A. Leavesley, M. Wouters, & R. Thornton (Eds.), *Prescribed burning in Australia: The science, practice and politics of burning the bush*. Australasian Fire and Emergency Services Council.

Week 11: Tipping points & feedback loops (November 15) – *Class visit from Hankel*

Lenton, T. M. (2020). Tipping positive change. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1794), 20190123. <https://doi.org/10.1098/rstb.2019.0123>

Hankel, C., & Tziperman, E. (2023). An approach for projecting the timing of abrupt winter Arctic sea ice loss. *Nonlinear Processes in Geophysics*, 30(3), 299–309. <https://doi.org/10.5194/npg-30-299-2023>

Week 12: Coral reef conservation & paleoecology (November 22) – *Peer review workshop day!*

Kiessling, W., Raja, N. B., Roden, V. J., Turvey, S. T., & Saupe, E. E. (2019). Addressing priority questions of conservation science with palaeontological data. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 374(1788), 20190222. <https://doi.org/10.1098/rstb.2019.0222>

Dillon, E. M., Pier, J. Q., Smith, J. A., Raja, N. B., Dimitrijevic, D., Austin, E. L., Cybulski, J. D., De Entrambasaguas, J., Durham, S. R., Grether, C. M., Haldar, H. S., Kocakova, K., Lin, C.-H., Mazzini, I., Mychajliw, A. M., Ollendorf, A. L., Pimiento, C., Regalado Fernández, O. R., Smith, I. E., & Dietl, G. P. (2022). What is conservation paleobiology? Tracking 20 years of research and development. *Frontiers in Ecology and Evolution*, 10. <https://doi.org/10.3389/fevo.2022.1031483>

Week 13: Paleoclimate proxies (November 29)

[The topic of this day may change to “measuring CO₂” if folks aren’t interested in paleoclimate]

Mann, M. E. (2002). The Value of Multiple Proxies. *Science*, 297(5586), 1481–1482. <https://doi.org/10.1126/science.1074318>

Charenko, M. (2020). Reconstructing Climate: Paleoecology and the Limits of Prediction during the 1930s Dust Bowl. *Historical Studies in the Natural Sciences*, 50(1–2), 90–128. <https://doi.org/10.1525/hsns.2020.50.1-2.90>

Rosol, C. (2015). Hauling data: Anthropocene analogues, paleoceanography and missing paradigm shifts. *Historical Social Research*, 40(2), 37–66. <https://doi.org/10.12759/hsr.40.2015.2.37-66>

Optional: Vezér, M. A. (2017). Variety-of-evidence reasoning about the distant past: A case study in paleoclimate reconstruction. *European Journal for Philosophy of Science*, 7(2), 257–265. <https://doi.org/10.1007/s13194-016-0156-y> [this article talks about the hockey-stick hypothesis in case anyone is interested in that]

Week 14: Soil science (December 6)

Moinet, G. Y. K., Hijbeek, R., van Vuuren, D. P., & Giller, K. E. (2022). Carbon for soils, not soils for carbon. *Global Change Biology*, n/a(n/a). <https://doi.org/10.1111/gcb.16570>

Popkin, G. (2021, July 27). A Soil-Science Revolution Upends Plans to Fight Climate Change. *Quanta Magazine*. <https://www.quantamagazine.org/a-soil-science-revolution-upends-plans-to-fight-climate-change-20210727/#>

Popkin, G. (2023, July 27). *Farmers are being paid millions to trap carbon in their soils. Will it actually help the planet?* <https://doi.org/10.1126/science.adj9509>

Week 15: Climate and environmental justice (December 13)

Whyte, K. (2020). Too late for indigenous climate justice: Ecological and relational tipping points. *WIREs Climate Change*, 11(1), e603. <https://doi.org/10.1002/wcc.603>

Táíwò, O. O. (2022). *Reconsidering Reparations*. Oxford University Press. Chapter 3.