

Acknowledgments

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We also want to thank three more individuals for the work they put into making this course a truly memorable experience. Caitlin Daley for her work in helping us schedule and organize different events for the seminar. Nadir Jeevanjee, a postdoctoral fellow in the Geosciences department, volunteered hours of his time each week, helping us grow as budding climate scientists and assisting us with our final papers. Finally, we would like to thank Professor Socolow for all of his guidance throughout this semester. We are grateful for his vision and the work he put into making FRS 151 an experience that will stay with us throughout our time at Princeton and beyond.

Description of the Event

Welcome to the presentation from FRS 151: Time Capsules for Climate Change-- a freshman seminar taught by Professor Robert Socolow.

For the past semester, six freshmen have been thinking about climate change and the impact on their futures. After extensively researching their respective topics, they have each prepared a final term paper that will be placed into four different time capsules that are to be opened at their graduation, 10th reunion, 25th reunion, and 50th reunion. The entire process has been an exercise in honing their analytical skills and learning how to conceptualize their near and far futures.

Today, the students will share some thoughts on both their selected paper topic and their reflections on the course. They hope that this will be an opportunity to open up a dialogue about reactions to climate change and to encourage audience members to reflect on their projections for the future.

Agenda

1. Welcome
2. Introduction
 - a. Logistics of the Course and Event
 - b. Acknowledgements
 - c. Introduction to “Destiny Studies” & Conceptualizing the Future
 - d. Changes in Perception of Climate Change
 - e. Challenges of the Course
3. Energy Cluster
 - a. Cluster Introduction
 - b. Presentations
 - i. Lauren Sanchez -- Photovoltaic Solar Energy
 - ii. Meléa Emunah -- Battery Energy Storage
 - iii. Dana Iverson -- Electric Cars
 - c. Questions
4. Climate Cluster
 - a. Cluster Introduction
 - b. Presentations
 - i. Dora Zhao -- Sea Level & Urban Resilience
 - ii. Jason Kong -- Geoengineering: Stratospheric Aerosols
 - iii. Gianna Mavica -- Geoengineering: Carbon Dioxide Removal
 - c. Questions
5. Final Remarks & Reflections on the Course

Reflections on FRS151: Time Capsules & Climate Change

Mel  a:

This course made me consider the interaction between individual and collective responsibility. A lot of what we talked about in the course, and a lot of how many people perceive solutions to climate change, is on the individual level. Although the national frame that a lot of our capsule papers took was on a scale larger than the individual, they still failed to consider the full story. Global climate change is by nature global. I feel like I have taken away a better understanding of both how difficult it is to coordinate different international efforts, yet also how critical it is if the human species wants to effect substantive and immediate change to reduce the effects of climate change for future generations. This class made me appreciate just how inextricably connected humans are across the planet, whether we like it or not.

Gianna:

This course gave me a new sense of personal and societal responsibility in addressing the climate change problem. Before this course, the concept of climate change seemed remote to say the least. I understood that it was highly contested, and particularly problematic, but overall, the issue seemed out of touch with my reality. However, now, in consideration of our classes' discussions and research, I have come to a new understanding of climate change, realizing how wrong this initial perception was. Climate change affects everything and everyone, and will be the end of humanity if we do nothing to stop it. At the end of the day, if nothing else, I understand that climate change is a not merely a science problem, it's a human problem, and we have a human obligation to prevent our Earth from getting to the point of irreversible consequence.

Dana:

Throughout this course, I have gained a greater understanding of my own role in the climate change conversation. Previously, I was afraid to participate in it, nervous that I was uninformed or even misinformed about the issues and solutions; I didn't feel that I had the authority, given I'm not a professional scientist or expert. However, I have since learned that many parts of the conversation are within my grasp. With a bit of discerning and critical research, I indeed can understand the issues and form legitimate opinions and predictions on them. In fact, Professor Socolow has really emphasized that he believes our judgements, with the right tools, have the potential to be just as good as the experts. So, in short, I am grateful to this class for showing me that young voices, including ours, have a truly important place in the climate debate, where continuous innovation is necessary to form urgent solutions.

Jason:

The more I dived deep into my topic and the more I ruminated about my future, the more I have been motivated to enact change in the world. Manifested inside me is a duty to share my experiences and tell you that you can do it too. For something like climate change, it takes the whole world to combat something of this magnitude. I encourage you to reflect on your future, that of your kids, and that of your legacy as I have done throughout this

course. At the end of the day, the consequences of climate change will beg questions about the survival of the human race. This problem is not religious nor political in its nature, rather it's a matter of being human. So push on, fight on, think big, and live on.

Dora:

Being able to think about the future is a valuable task, and something that we do not do often enough. It can be overwhelming at Princeton. We are working until the next deadline, measuring our lives until the end of class, the next day, the start of the weekend. It is easy to compartmentalize time into digestible chunks, only looking as far as we need. Because of this, we can lose sight of the bigger picture—what exactly we are working to. Of course, the future is nebulous. It is a great unknown that we rarely get the chance to ponder, but FRS has given the six of us the chance to think about what the future may hold. Even though we are all considering the “bigger” questions of life from transportation means to geoengineering, there is an integral personal portion of our papers. Our lives are closely interwoven into the possibilities of the future. It seems crazy to fathom it now at eighteen, but we could be opening our capsules one day with our spouses, children, grandchildren. The world that waits out there in the unknown possibility we call the future depends on our actions today.

Thus, this reflection is also a wish for the future. It is the wish that, no matter how old we are and no matter what time brings, we have the same hope—a hope that we are moving towards something better and maybe something bigger than ourselves.

Lauren:

When asked to reflect on how we've grown since the start of the class, I went back to the short essay I wrote to be admitted to this class. It was only fitting that in the spirit of the class I should reflect on something written previously. I stated that Climate Change is arguably the most pressing issue we face today. I still stand by that statement and would add that solutions are needed immediately. I stated that I was familiar with the threat and conscious of solutions. Reflecting on that statement, I wouldn't say that I was ignorant of either the consequences or possible solutions to climate change, but perhaps familiar was the wrong word. Throughout this class, we've encountered a multitude of different perspectives on climate change and realized how little certainty exists when attempting to make predictions into the future. This holds especially true concerning climate change because of the nature of the problem being both a new phenomena and within our reality for the long period of time. I learned to think by myself in this class. Instead of reading the latest New York Times headline and blindly agreeing that we're all dead soon, I learned to dig deeper and find the science behind the headlines. Lastly, I spoke of two perspectives in the conversation surrounding solutions. I termed them the scientist and the grassroots lobbyist. I've come to learn many more. There are policy makers, teachers, entrepreneurs, and so many voices that are still finding their own stance. I entered this course because I was afraid of what our future would hold. I was scared that there wasn't people paying attention to the bigger picture and that within my lifetime, or my children's lifetime, there would be great suffering because of that. Now, where I wouldn't describe my relationship with climate change as at ease, it has improved tremendously where I am no longer scared for what the future holds. In fact I'm quite optimistic that despite the uncertainty ahead of us, no matter what the setbacks are, a solution will arise through the determination of the human spirit.

**Meléa Emunah**

Meléa is from a small town in coastal West Marin, California (the Bay Area). The natural beauty of her hometown inspired her passion for environmentalism, a feeling that she has carried with her to college. She plans to concentrate in Civil and Environmental Engineering, and possibly pursue certificates in Environmental Studies or Sustainable Energy. Meléa was excited to use this course as a medium to explore the implications of climate change over a substantial period of her lifetime (2021 through 2071).

**Dana Iverson**

Dana Iverson is from Mt. Prospect, Illinois, a suburb of Chicago. She is a prospective Woodrow Wilson School major; she is also pursuing a certificate in Dance. After enjoying this seminar, she is considering a more environmental policy track. On campus, she is a member of PUBallet, diSiac Dance Company, City Step Service Program, and Princeton Students for Gender Equality. She would like to thank Professor Socolow and her classmates for making this course truly informative, challenging, and enlightening.

**Jason Kong**

Jason Kong is currently pursuing a major in economics with a certificate in environmental studies. His topic is focused on geoengineering by way of stratospheric aerosol injection. He believes that our future is all about planning for the unknown, preparing for the worst. He hopes that we will be able to agree on one thing when the time comes for us to make a decision.

**Gianna Mavica**

Gianna Mavica is from Colts Neck, a small town ten minutes off the shore in central New Jersey. She is thinking of majoring in public and international affairs at the Woodrow Wilson School. Gianna enrolled in this class with the intention of fulfilling the formidable STN requirement, but her project on geoengineering, specifically carbon dioxide removal, opened her eyes to the world of science in an entirely new way. She is excited to share with you our work this semester as this course draws to a close, but she is positive that our class's commitment to the issue of climate change will not subside as we take on new courses this spring.

**Lauren Sanchez**

18-year-old Lauren Sanchez is from Medford, NY and hopes to study politics at Princeton, concentrating in either Political Science or the Woodrow Wilson School. She is a member of the Model United Nations team and the lightweight crew team at Princeton. In addition, she is an active volunteer in the Special Olympic program at the boathouse, Princeton's Disabilities Awareness club, and Princeton's Varsity Club. Lauren is interested in an array of issues, such as educational reforms, gender & racial inequalities, worker's rights and environmental responsibilities. In her research project, she chose solar energy

to study in order to better understand future energy demand and supply in the United States.



Dora Zhao

Dora Zhao is from Newtown, Pennsylvania-- a suburb forty-five minutes from Philadelphia. She plans to pursue a major in the Woodrow Wilson School with a certificate in Applications of Computing. On campus, Dora is involved in the Asian American Student Association, University Student Life Committee, and the Social Stigma & Perception Laboratory. Her final paper focuses on urban resilience in the face of sea level rise, looking particularly at New York City. While Dora has always been passionate about the environment, this class has given her the scientific and analytical skills necessary to further consider the question of climate change.



Nadir Jeevanjee

Nadir Jeevanjee is a Harry Hess postdoctoral fellow in the Princeton Geosciences department, and also served as an unofficial teaching assistant for FRS 151. Nadir studies the physics of climate, and so served as the course's resident climate scientist, helping Rob to devise lectures and homeworks related to ice core records, seasonal and spatial variations of carbon dioxide, and the carbon cycle. Nadir hopes that the students' experience reading papers and doing back-of-the-envelope calculations in FRS 151 will enable them to check the claims they hear and read, and that they will always remember to first look at the axes of a graph before anything else!



Robert Socolow

This is the first Freshman Seminar Rob Socolow has taught, and this is his 47th year on the Princeton faculty! He had not understood how liberating it could be to invent a novel classroom experience and how enthusiastic Princeton freshmen would be. He has had a blast.

Rob changed fields from theoretical physics to energy and environmental studies five years past his Ph.D., drawn to its deep questions about how the world's people could lead exuberant lives on a small planet. His six students in FRS151, each of them studying humanity's future through the lens of a single topic for the whole term, recapitulated Rob's experience. They gained self-confidence as they appreciated that there are no experts about the future, which indeed is contingent in no small part on choices their generation will make.

This course satisfies the university's science requirement. Rob's students learned to see science as an accessible human enterprise, they practiced back-of-the-envelope calculations aimed at getting the exponent right, and they gained appreciation for the power inherent in "combining numbers and words."

Rob hopes each capsule opening will be a meaningful event for Lauren, Dora, Dina, Meléa, Gianna, and Jason. At their 50th reunion (when he would be 133), and earlier as well, he hopes that they will find their own ways to stimulate thinking about the future on the part of people much younger than themselves, who will continue the chain.