

January 1, 2021

Dear Black Trailblazers in Engineering Admissions Committee,

Thank you for your effort in making this program a reality. I immediately recognized the value of this program because I recently completed my first academic job interview. Upon reflection of that experience, I am daunted by the prospect of becoming a new faculty member in the next few years. Specifically, I need to learn more about funding sources and establishing a successful research group. Therefore, the BTE events that I would benefit most from are the Keynote Panel about obtaining research funding and the Success Strategies for New Faculty Members workshop.

I hope to pursue a career in academia because I have a vision about how to improve the field of civil engineering by increasing attention to issues of climate equity and social justice. The academic structure of research, teaching, and service lends itself well to executing this vision.

I approach issues of climate justice through a distinct interdisciplinary lens; I am an equity-focused civil engineer and behavioral scientist. My research seeks to identify and mitigate behavioral biases that limit equitable design decision-making for climate adaptation. The perceptions of engineers, architects, planners, and elected officials shape the decisions they make and, in turn, the decisions they make determine how the next generation perceives the world. When bias infiltrates this reinforcing system, it can add to the harms that historically disadvantaged groups already experience. My goal is to disrupt this system by uncovering the biases that most affect designers' ability to create for climate justice. The goals of my research are to understand how individuals can 1) conceptualize collective identities in increasingly diverse spaces, 2) overcome the environmental cues that restrict inclinations for equitable decision-making, and 3) leverage climate adaptation to work in favor of our most vulnerable communities.

Thus far, I have co-authored two papers relating to cross-disciplinary efforts in sustainability, equity, and the built environment. The first manuscript was a systematic review that uncovered significant research gaps at the nexus of sustainable design for the built environment and behavioral science. It was published in *Nature Sustainability*. The second manuscript was published in *Environmental Engineering Science*. We explored stereotypes of Black female engineers working in rural Belize and found that, in that context, shared racial identity allowed the community to quickly build trust when exploring the possibility of implementing an anaerobic digester for fuel. I also have a paper under review that addresses the risk perceptions and social factors of climate change.

For the remainder of my Ph.D. work, which is supported by an NSF GRFP, I am delving into the effects of income inequality and perceptions of racial progress in including equity in large-scale civil infrastructure projects. Specifically, I am drawing on foundational studies in psychology to better understand how decision-making for the self translates to decision-making for the built environment. And by using a population of design professionals, I will be able to learn more about the contexts that enable the prioritization of equity goals. This work fills a gap in understanding the relevance of individual designer bias for infrastructure project goals.

I also apply equity principles to my teaching. For example, I am currently developing a *Social Justice for Engineers* course that will teach students how to engage with social justice issues in their future careers. I will serve as lead instructor of this course in the 2021 January-Term. The school of Engineering at the

University of Virginia does not have a history of offering such courses and does not often allow doctoral students to serve as lead instructors, so I was honored to earn this opportunity. I designed this course to improve retention of underrepresented students, who are often motivated by prosocial values and wish to help their communities through their chosen career.

I have served in leadership positions at the departmental, school, and national levels. I prioritize service activities that create and maintain systems that allow underrepresented voices to be heard. For example, I was appointed to the National Executive Board of *500 Women Scientists* where I managed an editorial board of over 100 volunteers that revised op-eds about current events from around the world.

In summary, I am eager to pursue an academic career and I believe that Black Trailblazers in Engineering will provide me with the tools and network to prepare for a career as future STEM faculty. Thank you for your time and consideration.

Sincerely,

Bethany Gordon

PhD Candidate

Department of Engineering Systems and Environment, University of Virginia

Professional Mission Statement: I seek to mitigate the effects of climate change in frontline and historically disadvantaged communities by advancing knowledge at the intersection of civil and environmental engineering, climate equity, and behavioral science.

Past Research. Early in my graduate career, I co-authored a manuscript that was ultimately published in *Nature Sustainability*. In our systematic review, my co-authors and I uncovered significant research gaps at the nexus of sustainable design for the built environment and behavioral science (Klotz et al., 2018). The paper has since been cited in research on topics ranging from ethical design to heuristics in project management. By assisting with the writing, reference-checking, and revision, I was able to see a wide variety of research opportunities in this space. Specifically, from this project, I observed opportunities to research stereotyping and risk perception.

In pursuing a research project about stereotypes, I collaborated with a post-doctoral fellow to study the perceptions of Black female engineers in a rural village in Belize. In this study, which was ultimately published in *Environmental Engineering Science*, we were originally going to analyze survey data in conjunction with brain scans using functional near-infrared light spectroscopy (fNIRS) (Hobbs, Gordon, Morton, & Klotz, 2019). However, when we began collecting data in Belize, we realized that our fNIRS machine was not producing the quality of data we expected. While some of this was due to non-optimal lighting conditions, we realized that there was a relationship between the quality of the data we were able to collect and the ethnicity of the participants. The machine did not work as well on people with brown skin and curly hair, which comprised most of the village, and we were not able to collect enough usable fNIRS data. This research hurdle exemplifies how designer bias can infiltrate design; the fNIRS machine was developed in Japan and bias of that environment became a part of that technology. The implications of such a bias are major because when the technology we use in our research omits a group, especially a group that is historically disadvantaged, we further cement the systemic biases that are already in place.

I observed a similar effect at the policy level while developing my research project about risk perceptions of coastal infrastructure. To better understand the context for this project, I lived in the coastal city of Norfolk, Virginia. I spoke with designers involved in sea-level rise adaptation and learned that the city planned to tear down public housing located in a frequently flooded area. The replacement housing had fewer units than what was needed to provide residence for everyone in the community who would be displaced. Though this concerned the designers, they were occupied with other projects that sidelined this concern. Ultimately the research study I designed during my time in Norfolk focused on the public instead of designers, but the conversations I had with the designers influenced my current work. The research project from that summer became a manuscript, “Risk Perceptions of Coastal Infrastructure in the United States,” which is currently under review with *ASCE Natural Hazards Review* (Gordon & Klotz, 2020). I conducted an online experiment to understand if validated psychological measures could improve design. Though I did not find a difference in this case, the data provided an understanding of the public’s risk perceptions. The manuscript provides insight into how “green” (natural) and gray (man-made) infrastructure may affect perceptions of well-being and safety.

Current Research. Through my experiences in Sittee River Village, Belize and Norfolk, Virginia, I became interested in how perceptions of race and economic inequality contribute to designer bias. A deep history of research exists for both of these topics in psychology, but the connections have not been made to if and how these factors play a role in design decisions for the built environment. I am drawing on foundational studies in psychology to better understand how decision-making for the self translates to decision-making for the built environment. And by using a population of design professionals, I will be

able to learn more about the contexts that enable the prioritization of equity goals. This work fills a gap in understanding about the relevance of individual designer bias for infrastructure project goals. If I find that race and economic inequality play a role in designers' prioritization of equity goals, this will indicate that bias caused by these factors may be infiltrating processes that purport to serve everyone fairly. Publishing this work will provide grounds for advocating for structural changes in design systems, such as design codes and bidding documents.

Future Research. **As a faculty member, I plan to identify and address the behavioral biases that limit designers' ability to advance climate equity and environmental justice.** For example, how does empathy impact design of social infrastructure for a future that will likely involve climate refugees and worsening economic inequality? Research suggests that emotional empathy does not always contribute to the design process, but cognitive empathy might offer greater potential. These types of questions have implications for a variety of factors, from social cohesion to determining how we make investments in infrastructure.

Teaching. I believe good teaching is socially engaged and inclusive, regardless of the subject. A few years ago, I participated in the Course Design Institute, an intensive two-week workshop for developing and teaching pedagogically informed courses. I developed a *Social Justice for Engineers* course that I will be teaching in the January 2021 term. The purpose of this course is to teach students how to engage with social justice issues through their careers as engineers. In this course, students assess the knowledge they have gained in their degree programs, their lived experiences, and their career aspirations. Then, they choose an ongoing social justice issue as their context for the remainder of the course. By the end of the course, they will propose a solution to the class and identify what their role, as an engineer, would be in carrying that solution forward. To help them through this process, I will provide them with guidance from the literature and guest speakers who actively pursue social justice through the design of the built environment. My hope is that students will finish the course with the knowledge and tools to engage confidently and respectfully with these challenges in their careers. This is a course that I plan to continue iterating on and improving.

As with many classes taught this academic year, I am preparing to teach *Social Justice for Engineers* in an online format. To prepare to teach online, I participated in a training session based on the Community of Inquiry (CoI) framework (Garrison, Anderson, & Archer, 1999). This framework provides guidelines for creating an engaging online learning environment. The three pillars of the CoI framework — cognitive presence, teaching presence, and social presence — all emphasize the ways in which we can be intentional about communicating our expectations and building community so that the unspoken, implicit cues that might be communicated via the environment for in-person classes can be made clear in a virtual environment. In learning about this framework, I realized that because of the pandemic we have a unique opportunity to reevaluate the cultural norms we've developed around in-person instruction. I am excited to use these circumstances as an opportunity to hone new strategies for inclusivity in the classroom.

We need to acknowledge our subjectivity and harness it to strengthen the rigor and fairness of our work and decision-making. While this statement is old news to social scientists, it has yet to take hold in engineering. The idea that subjectivity and rigor can be complementary will involve a cultural shift in the way that we teach engineering. I plan to lead through example in my research, teaching and service.

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The internet and higher education*, 2(2-3), 87-105.

Gordon, B., Klotz, L. (Under review). Risk perceptions of coastal infrastructure in the United States.

Hobbs, S. R., Gordon, B., Morton, E. V., & Klotz, L. (2019). Black Women Engineers as Allies in Adoption of Environmental Technology: Evidence from a Community in Belize. *Environmental Engineering Science*, 36(8), 851-862. doi:10.1089/ees.2018.0463

Klotz, L., Weber, E., Johnson, E., Shealy, T., Hernandez, M., & Gordon, B. (2018). Beyond rationality in engineering design for sustainability. *Nature Sustainability*, 1(5), 225-233.

EDUCATION

- University of Virginia** Charlottesville, VA
Ph.D. in Civil and Environmental Engineering, Advisor: Leidy Klotz, Ph.D. 2017–Dec.2021
– Dissertation: Designer power and energy justice for large-scale infrastructure decision-making
- B.S. in in Civil and Environmental Engineering 2012–2017
– Thesis: Bio-inspired Self-Sensing Concrete

RESEARCH EXPERIENCE

- University of Virginia** Charlottesville, VA
Graduate Research Fellow (PI: Leidy Klotz, Ph.D.) 2017
– Uncovered research opportunities at the nexus of behavioral science, equity, and design of the built environment
– Investigated how perceived risks influence public opinions of climate adaptation measures.
– *Resulted in 7 publications (1 under review, 4 in progress), 6 presentations, and funded by NSF GRFP*
- Undergraduate Research Assistant(PI: Osman Ozbulut) Summer 2015, Fall 2016
– Embedded shape memory alloys and graphene nanoparticles into mortar to explore sensing and self-healing properties
– *Resulted in 2 poster presentations and an award for Best Group Project*
- Tuff Armenia Project
Civil Engineering Lead 2014-2017
– Designed a mortar with fine aggregate sourced from local Armenian tuff stone and tested to ASTM standards
– Researched affordable and efficient housing solutions for survivors of the 1988 Spitak earthquake
– Captured 360 virtual reality footage to increase awareness of the housing crisis among engineers
– *This student-led project resulted in 2 publications in student journals (1 first author), in 3 invited presentations, and was awarded over \$30,000 in research funding*

PUBLICATIONS

- Gordon, B.** (2020). How to Sustain Your Activism Against Police Brutality Beyond this Moment. *Behavioral Scientist*.
- Hobbs, S. R., **Gordon, B.**, Morton, E. V., Klotz, L. (2019). Black Women Engineers as Allies in Adoption of Environmental Technology: Evidence from a Community in Belize. *Environmental Engineering Science*.
- Klotz, L., Weber, E., Johnson, E., Shealy, T., Hernandez, M., **Gordon, B.** (2018). Beyond rationality in engineering design for sustainability. *Nature Sustainability*, 1(5), 225–233.
- Gordon, B.**, Genuario, K., Mayfield, L., Roca, S., Jones, M., Kha, L., Yacoubian, L. (2018). Restructuring Resilience: Sustainable housing solutions in Gyumri, Armenia. *Conflux Student Journal*.
- Yacoubian, L., Genuario, K., **Gordon, B.**, Mayfield, L., Roca, S., Jones, M., Kha, L. (2018). The Tuff Armenia Project. *The University of Virginia Jefferson Public Citizens Journal*.

6. **Gordon, B.**, Klotz, L. Risk Perceptions of Coastal Infrastructure in the United States. *Under review.*
7. **Gordon, B.**, Campbell, J., Klotz, L. Behavioral Science for Equitable Resilience: A Systematic Review. *In preparation.*
8. **Gordon, B.**, Klotz, L. Are designers less likely to improve equity when economic inequality is high? *In preparation.*
9. **Gordon, B.**, Klotz, L. Does envisioning an equitable future increase equity-centred design goals more than reflecting on past progress? *In preparation.*
10. **Gordon, B.**, Turner, S., Stenger, K., Hancock, P. What is the role of social justice in engineering education at the University of Virginia?: A case study. *In preparation.*

FUNDING

- NSF Graduate Research Fellowship Program (\$138,000) 2019–2021
- UVA Dean’s Fellowship (\$19,000) 2018 –2019
- UVA Distinguished Fellowship (\$32,000) 2017 –2018
- Jefferson Public Citizens Grant (\$20,000) 2017–2018
- UVA Center for Global Health Grant (\$10,000) 2017–2018

HONORS AND AWARDS

- People’s Choice Award, UVA ESE Graduate Research Symposium 2019
- The Raven Honor Society 2018
- UVA Dean’s Fellowship 2018 –2019
- UVA Engineering Distinguished Fellowship 2017–2018
- Summer Institute for Sustainability and Energy (SISE) Fellowship 2018
- 2nd Place, SISE Innovative Research Award 2013–2018
- Featured Speaker, Thornton Society Dinner 2017
- 1st Place, How to Change the World International Podcast Competition 2017
- Best Group Project Award, UVA Dept. of Civil and Environmental Engineering Capstone Symposium 2016

INVITED PRESENTATIONS

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| UC Berkeley Research Seminar Series
<i>Designer Power and Climate Justice for Energy Infrastructure Decision-Making</i> | Oakland, CA
December 2020 |
| Vecellio Construction Engineering and Management Graduate Student Seminar Series
<i>Designer Power and Community Engagement in a Construction Management Context</i> | Blacksburg, VA
December 2020 |
| Nature Sustainability, Two Years Later: Designing Behavior for Sustainability Panel
<i>Status Quo Bias and Climate Equity</i> | Charlottesville, VA
November 2020 |
| Guest Lecture, STS 3500: Matters of Race in Engineering and Technology
<i>The Designer-Bias Feedback Loop: Interrupting White Supremacy with Behavioral Science</i> | Charlottesville, VA
October 2020 |
| Engineering Sustainability
<i>Risk Perceptions of Coastal Infrastructure</i> | Pittsburgh, PA
April 2019 |

UVA ESE Graduate Research Symposium <i>Risk Communication and Coastal Infrastructure</i> – People’s Choice Award.	Charlottesville, VA February 2019
Guest Lecture, STS 2500: Responsible Innovation <i>Behavioral Science, Sustainability, and Engineering</i>	Charlottesville, VA October 2018
Community Engagement Practices and the Adoption of Green Technology <i>Loss aversion in Physical Decisions-Making Under Risk</i>	Charlottesville, VA February 2018
GEM National Consortium and American Society for Engineering Education <i>Loss aversion in Physical Decisions-Making Under Risk</i>	Washington, DC January 2018
UVA Center for Global Health Fall Research Symposium <i>Restructuring Resilience: Sustainable Housing Solutions in Gyumri, Armenia</i>	Charlottesville, VA October 2017
UVA Thornton Society, Featured Speaker <i>Seizing Opportunities for Self-Guided Undergraduate Research</i>	Charlottesville, VA October 2017
National GEM Consortium Annual Meeting <i>Virtual reality for humanitarian applications in Gyumri, Armenia</i>	New York City, NY September 2017
Armenian General Benevolent Union <i>Voices from the Domiks: Interviews with Gyumri Residents</i>	Yerevan, Armenia July 2017
UVA Dept. of Civil and Environmental Engineering Capstone Symposium <i>Bio-inspired Self-Sensing Composites for Civil Structures</i> – Best Group Project Award.	Charlottesville, VA December 2016
MATS-UTC Symposium <i>Flexural strength of shape memory alloy reinforced mortar</i>	Charlottesville, VA July 2015

TEACHING AND MENTORING

- **Creator and Instructor** of Engineering Social Justice (CE 4500/SYS4501) January 2021
University of Virginia
 - Designed a pedagogically-informed course to prepare engineers to confidently and respectfully engage with social justice issues in their careers.
 - Will be the primary instructor for an advanced undergraduate course during 2021 January Term.
 - This course is a product of the Course Design Institute at UVA.
- **Guest Lecturer** for Matters of Race in Engineering and Technology (STS 3500) October 2020
University of Virginia
 - Will teach a 90-minute interactive class for 15 students about the legacies of white supremacy in the built environment and the behavioral science implications of that legacy.
- **Panelist** for Diversity in STEM Colloquium August 2020
University of Virginia
 - Presented a 10-minute talk about how meritocratic ideologies and depoliticization of engineering topics contributes to engineering’s diversity problem.
- **Panelist** for Navigating Advisor Expectations in Graduate School Luncheon August 2020
University of Virginia

- Answered questions and discussed advisor expectations with 2 faculty members and another graduate student for a group of underrepresented graduate students.
- **Teaching Assistant** for Water for the World (CE 3100) Fall 2018
University of Virginia
 - Taught during weekly office hours and provided written feedback on graded assignments for 70-students.
- **Guest Lecturer** for Responsible Innovation (STS 2500) October 2018
University of Virginia
 - Taught a 90-minute class about behavioral science and sustainability in engineering to a class of 50 students. After a brief lecture, students completed an activity that allowed them to identify common biases in their own thinking.

LEADERSHIP AND SERVICE

- Engineering Graduate Student Selections Chair, Raven Society 2020–2021
The Raven Society is an honor society at the University of Virginia. I am organizing the nomination and selection process for the engineering graduate students for the 2020-2021 academic year.
- Editorial Board Coordinator, 500 Women Scientists National Leadership Team 4.2019–12.2019
I managed a board of over 100 volunteer editors and made connections between writers and editors with similar interests.
- Charter Committee, UVA Engineering Systems and Environment Graduate Student Council 2018 –2019
I co-wrote the charter to form a graduate student council in my department. The council was created to provide avenues for graduate student engagement, increased inclusion, and department cohesion.
- Department Representative, Graduate Student Society of Women Engineers 2018 –2019
I communicated events to students in the department and recruited faculty to speak at events.
- Steering Committee, Bread and Roses Food Justice Non-profit 2017 –Current
Planning and maintaining a garden that provides vegetables for the surrounding community.
- Graduate Mentor, UVA Center for Diversity in Engineering 2017 –2018
I held consistent office hours, where students could ask me about graduate school, their coursework, and a variety of other topics.
- Workshop Leader, She Started It STEM Day 2017 and 2018
I helped start a chapter of the American Concrete Institute at the University of Virginia. I served as president the first year and treasurer the second year.
- Chapter Executive Officer, National Society of Black Engineers 2012 –2016
I served in a variety of executive officer roles for the University of Virginia Chapter of NSBE as an undergraduate.



Leidy Klotz, Ph.D.
Copenhaver Associate Professor
Engineering Systems and Environment
Lk6me@virginia.edu

Re: Bethany Gordon – Black Trailblazers in Engineering recommendation

Dear Reviewer:

I am absolutely certain that Bethany Gordon will continue to make unique and valuable contributions to climate equity and environmental justice as an exceptional faculty member. At this stage of her development, Bethany's capabilities and potential compare favorably with the ten others I have advised who have gone on to faculty positions in top engineering programs (including at Purdue, Virginia Tech, Florida, and Colorado State). Moreover, among the cohort of eleven exceptional doctoral students I am currently advising, Bethany is the most advanced, and the most perfect fit for your Black Trailblazers in Engineering program.

As a doctoral student at UVA, Bethany is already performing the roles of a faculty member. She is producing a constant stream of publications that represent valuable contributions to knowledge. She has secured competitive funding for her research. She has done research on various topics and using a range of methods. She has initiated and performed service abroad in Armenia and Belize. And she has developed and is the lead instructor for a new upcoming course on Environmental Justice for Engineers. But Bethany's application materials cover her exceptional teaching, research, and service qualifications, so rather than restating them I hope the rest of this letter can share a few of the great things about Bethany that may not be obvious from her CV.

What really sets Bethany apart are her intelligence, persistence, and work-ethic, attributes which are my top indicator of success for Ph.D. students and academic careers. For example, despite a full load of courses and involvement in other research and service projects, Bethany initially sought me out because of mutual interest in pursuing climate equity goals via scholarship at the intersection of behavioral science and engineering. Plenty of students show interest, so I typically recommend some reading or other activities and suggest a follow-up discussion. Bethany devoured several of my recommendations and demonstrated the ability to think critically about and question what was written. She even asked for reading and video recommendations for the holiday break, and we traded e-mails about them. It was clear to me then that Bethany's work ethic was driving her unmatched trajectory of growth. That trend has only continued.

Bethany's topical expertise positions her well for funding and collaborative scholarship in climate equity and environmental justice. Such topics require integrated study from engineering and social science perspectives (among others), and I have encountered few



Leidy Klotz, Ph.D.
Copenhaver Associate Professor
Engineering Systems and Environment
Lk6me@virginia.edu

young scholars who can match Bethany's interest in and ability to merge these fields. Bethany is motivated by the implications not only for environmental issues, such as climate change, but also social ones, such as food deserts in low-income communities. This big-picture motivation combined with thoughtful steps to execute is why I am sure Bethany will persist in her scholarship and help others do the same.

Since August of 2016, it has been my pleasure to work with Bethany on research, teaching, and program development as they align with her plans to become a faculty member. Bethany has potential to change the world equal to anyone I have worked with. I think she would flourish and make unique and valuable contributions to this year's BTE cohort. Please do not hesitate to call if you have any questions (610-247-9067).

Thank you for your consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read "Leidy Klotz".

Leidy Klotz, Ph.D.
Copenhaver Associate Professor
Department of Engineering Systems and Environment

December 29, 2020

Recommendation Letter – Bethany Gordon

I am very pleased to offer this letter of recommendation for Bethany Gordon, a graduate student nearing completion of her PhD in our program at the University of Virginia. I met Bethany as an undergraduate student, and I have had the pleasure to work with her in a variety of ways during her time at UVA. She is an outstanding student, and exceptional person, and I am certain that she will be an outstanding faculty member. In fact, I have been fortunate to work with many gifted PhD students in my career who are now faculty members at top universities. It is my opinion that Ms. Gordon has the highest potential as a faculty member of any student who I have worked with in my 20+ year career.

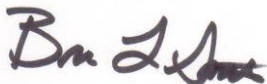
From a research perspective, Bethany is focused on the behavioral science of equitable resilience. She works in a very interdisciplinary group – including faculty and students from psychology, business, engineering, and architecture. She will be right at home in the interdisciplinary research groups. Bethany has also published in a very prestigious journal and has participated in many international conferences. The maturity of her research program and her level of collaboration is quite striking.

Bethany will also be entering academia with teaching experience beyond that of her peers. Beyond the standard teaching assistant roles, she has significant instructional training and is developing a course entitled “Social Justice for Civil and Systems Engineers” to be offered in January. Bethany is also a very good mentor – helping many of our graduate and undergraduate students.

Finally, Bethany excels at service. She is a quiet leader with a determination and conviction that allows her to take on difficult and important tasks. A great example of this is her winning 1st place in an international podcast competition about Engineering Global Challenges. I had the pleasure to watch her present a version of this to our annual Advancement dinner with roughly 300 attendees. She absolutely captivated and inspired the audience.

In short, I am truly excited to see the contributions that Bethany makes to society in her academic career. She will hit the ground running and make a lasting impression at any institution.

Sincerely,



Brian L. Smith, Ph.D., P.E., F.ASCE
Professor and Chair