Chante' Vines
Civil, Environmental, Geodetic Engineering
The Ohio State University
Columbus, OH 43210
vines.24@osu.edu

Black Trailblazers in Engineering Committee
Purdue University

Dear Application Committee Members:

I am writing to apply for the position of fellow within the Black Trailblazers in Engineering virtual workshop at Purdue University. I am currently a Ph.D. candidate in the Civil Engineering department at The Ohio State University. I believe that participating in this program will make me a viable candidate for future academic positions. Throughout my graduate career, I have volunteered for several organizations that benefits underrepresented graduate students. I have held the title of Engineering Graduate Ambassador, assisting with graduate recruitment efforts within the College of Engineering; I served as the Vice President of the Women in Engineering Graduate Council (WEGC) where I co-hosted a bi-weekly book club that grants graduate engineering students the opportunity to discuss current issues such as feminism, salary negotiations, and managing stress; I served as the Social and Community Service Chair of the Black Graduate and Professional Student Caucus where I helped to create engaging activities for Black graduate students across campus.

My experience as a graduate teaching assistant has allowed me to create a teaching style that celebrates the diversity in learning styles that students bring to the classroom, whether virtual or in-person. My teaching style is based on three principles: 1) adaptable teaching style for greater student engagement 2) fostering a healthy learning environment through effective communication and 3) preparing students for real-world engagement.

The goal of my research is to study the interactions between the atmosphere and the land surface using high functioning equipment. The goal of my research is to characterize greenhouse gases resulting from shale gas systems. Through understanding of atmosphere-surface interactions, I will be able to map out these interactions succinctly. My research skills include analyzing large datasets, measuring methane concentrations using closed path sensors, and using large eddy simulations to model atmospheric dispersion. I am passionate about mentorship and helping aspiring engineers to achieve their goals. The tools that I use include numerical modeling, high performance computing and machine learning.

Thank you for reviewing my application. Please contact me if there are any questions.

Sincerely,

Chante' Vines

<u>Research and Educational Plan</u>

I attended Morgan State University, a historically black college, for my undergraduate degree. The earliest memory of my first learned concept at Morgan State University was taught to me as freshman during an engineering orientation course. The concept was that engineers solve problems. I carried this statement throughout my undergraduate studies and well into my graduate career. The approach to solve a problem may be different, nevertheless a problem can always be solved. Similarly, the way that a student receives information may vary, therefore the approach should evolve as well.

This prompted me to favor a teaching method that celebrates the diversity in learning styles that students bring to the classroom. This method should be adaptable enough that all students succeed, despite the background they start with. Due to these observations, my teaching style is based on three principles: 1) adaptable teaching style for greater student engagement 2) fostering a healthy learning environment through effective communication and 3) preparing students for real-world engagement.

As an undergraduate student, I realized that I was a visual learner, which required me to learn concepts with diagrams, pictures and drawings. This early recognition allowed me to tailor my learning style and work along with the professors to learn effectively. As a graduate teaching assistant, teaching Numerical Methods within the Civil Engineering department, the concepts can get tedious and difficult to grasp. Using my teaching style, I determined that using visual learning tools would assist students in better understanding the concepts. For example, there are several methods to estimate the root of non-linear equations. In preparation for the midterm, I created a chart to compare the different methods for easier studying and comprehension. With the use of videos, and digital note taking, students may be able to grasp material better. I would like to encourage student engagement through use of mixed media and learning styles. Some specific student evaluations about my teaching stated that I was "extremely helpful" and several students "enjoyed that I worked slowly" through the material.

In tandem with adaptability, I have worked continuously to improve my communication with students. To that end, I met with the professor of the Numerical Methods course, Dr. Qin, many times to discuss effective ways to communicate to the students since this was my first-time teaching. Some effective communication methods we found were: 1. Writing concepts on the chalkboard. Though it appears simple, it gives students more time to take notes, however, an additional improvement that I found was taking some additional time to transcribe those same notes to the laptop. This satisfied both the requirement for more time while simultaneously generating clearer notes. 2. Communication was also facilitated with students by making time for them. I've met with students outside of my office hours in order to provide more assistance and help with the material. I believe that knowing how to communicate to students in different ways is a very important skill.

Finally, my last teaching goal is to prepare students for the real-world. I want to relate the material to real-world problems as often as possible. While teaching Numerical Methods, I explained that in the same way that we are using math methods to estimate problems, similarly I

use math models to estimate methane emissions from natural gas systems. Whenever I had the chance, I would relate the classwork to my own research. I truly believe that training in the classroom prepares students for industry jobs or higher education opportunities. The approach to solve a problem in the classroom may be different than solving a problem in an industry job or within academia, but the major point is to figure out the solution.

The main goal of my research is to characterize anthropogenic related methane emissions from shale gas infrastructure. I am currently working with collaborators from various universities to develop an off-site approach to monitor methane emissions from hydraulic fracturing infrastructure. We have conducted off-site measurements of atmospheric methane near a Marcellus Shale hydraulic fracturing site. We began taking measurements before any drilling activity occurred and continued throughout the drilling timeline to determine the differences in released atmospheric methane over time. I am currently using an atmospheric dispersion model to simulate methane plumes to determine the trajectory of methane over time. My research experience has allowed me to work with large datasets, understand several coding languages and think critically about various environmental topics. Learning how to solve problems through critical thinking is the largest takeaway from my research experience.

The combined use of horizontal drilling and hydraulic fracturing has increased natural gas exploration within the Marcellus Shale. Mobile and airborne monitoring has shown a positive correlation between methane concentration and gas production due to released fugitive emissions. However, these monitoring techniques are not temporally continuous. Furthermore, it can be difficult to assign a source to the measured atmospheric methane as natural emissions around the site may add to the observed methane fluxes. We set up an eddy covariance tower in West Virginia to continuously measure off-site methane concentration and additional meteorological variables within a mile of a Marcellus Shale hydraulic fracturing site for eighteen months. Continuous measurements 4 months prior to the start of any drilling activity allowed us to parameterize a model for the baseline methane concentration. Estimated methane concentration from an artificial neural network (ANN) model was used to identify spikes of methane. We found that the median magnitude of CH4 concentration spikes during the vertical drilling phase was 316% larger than that of the baseline phase, and the median magnitude of CH4 concentration spikes was 509% larger in the hydraulic stimulation (fracking) stage compared to the baseline phase.

Inspiring the next generation of engineers is the main driver behind my interests in teaching and conducting research. There is a selflessness involved that I truly hope to embody as a future faculty member.

Chante' D. Vines

Department of Civil, Environmental and Geodetic Engineering
The Ohio State University
416 Bolz Hall, 2036 Neil Ave
Columbus, OH 43210
Chante.vines@gmail.com | 202-246-6829

EDUCATION

PhD in Civil Engineering, The Ohio State University, Columbus, OH
Supervisor: Gil Bohrer, Ph.D.
The Measurement of Methane Emissions from Hydrofracking using the Parallelized Large Eddy Simulation Model for Atmospheric and Oceanic flows (PALM) model
GPA **3.45/4.0**, Anticipated Graduation: **Aug 2021**

B.S. in Civil Engineering, Morgan State University, Baltimore, MD
GPA **3.5/4.0**, Graduation: May 2015, cum laude

RESEARCH EXPERIENCE

Graduate Research Associate, The Ohio State University   2015 - present
Eddy Covariance Methods to measure fugitive methane emissions near a hydrofracking site
-Used Artificial Neural Network modeling to simulate methane emissions
-Predicted methane concentration using baseline data and environmental variables to determine values throughout drilling
 activity
-Examined plume dispersion using a large eddy simulation model

Undergraduate Intern, National Centers for Environmental Information Intern   2014
National Oceanic and Atmospheric Administration
Asheville, NC
Supervisor: Michael Palecki, PhD
Evaluation of the 2012 US drought through comparison of modeled and observed data for soil moisture and precipitation variables

Undergraduate Intern National Ocean Service Intern   2013
National Oceanic and Atmospheric Administration
Silver Spring, MD
Supervisor: Kimani Kimbrough, PhD
Assessment of contaminant concentrations in dressenid mussels in the Great Lakes using population and land-use variables

Undergraduate Researcher, Minority Opportunities in Biomedical Research Programs
Research Initiative for Scientific Enhancement (MBRS RISE) Participant   2014 –2015
Morgan State University
Baltimore, MD
Supervisor: Richard Damoah, PhD

Related the amount of Dengue virus cases to rainfall accumulation and amount of mosquito eggs in a Kenyan city

TEACHING EXPERIENCE

Graduate Teaching Assistant, Department of Civil Engineering, The Ohio State University, 2019- 2020
- Assisted two professors within the Civil Engineering department with an undergraduate Numerical Methods course
  -Developed homework and quiz questions and solutions – 10 hours/week
  -Taught classes during professor absences and conducted office hours throughout the semester
  -Managed Carmen course page, proficient with TopHat, oversaw undergraduate graders and helped grade midterms and finals

Graduate Teaching Assistant, Department of Engineering Education, The Ohio State University , 2020-2021
- Intro to Engineering Lab teacher
  -Taught weekly lab material to three sections of 72 students virtually using Zoom, conducted office hours throughout the semester
  -Managed Carmen course page, oversaw undergraduate teaching assistants and helped grade midterms and finals

- Graphics course teacher
  -Taught Solidworks and isometric drawing to three sections of 72 students virtually using Zoom, conducted office hours throughout the semester
  -Managed Carmen course page, facilitate quizzes and exams, oversaw undergraduate teaching assistants and helped grade midterms and finals

PUBLICATIONS AND PRESENTATIONS

Russell, S.J., **Vines, C.D**., Bohrer, G., Johnson, D.R., Villa, J.A., Heltzel, R., Rey-Sanchez, Matthes, J.H. 2020. Quantifying CH4 concentration spikes above baseline and attributing CH4 sources to hydraulic fracturing activities by continuous monitoring at an off-site tower.*Atmospheric Environment*. 228.

Villa, J.A., Ju, Y., **Vines, C.**, Rey-Sanchez, C., Morin, T.H., Wrighton, K.C.2019. Relationships Between Methane and Carbon Dioxide Fluxes in a Temperate Cattail-Dominated Freshwater Wetland, *Journal of Geophysical Research: Biogeosciences*. 124. 7.

Vines, C., Rey-Sanchez, AC, Johnson, D., Hatala-Matthes, J., Russell, S., Bohrer, G., 2019. Evaluating Fugitive Methane Emissions from Hydraulic Fracturing using an Artificial Neural Network, <u>American Ecological Engineering Society Meeting</u>, Asheville, NC

Vines, C., Rey-Sanchez, AC, Johnson, D., Hatala-Matthes, J., Russell, S., Bohrer, G., 2019. Evaluating Baseline Methane Concentrations using Eddy Covariance Methods near a Hydraulic Fracturing Site, Byrd Center Symposium, Columbus, OH

Vines, C., Rey-Sanchez, AC, Johnson, D., Hatala-Matthes, J., Russell, S., Bohrer, G., 2018. Baseline Methane Concentrations using Eddy Covariance Methods near a Hydraulic Fracturing Site, American Geophysical Union Fall Meeting, Washington DC

Leeper R and Bell, J., **Vines, C.**, Palecki, M. 2017. An Evaluation of the North American Regional Reanalysis Simulated Soil Moisture Conditions during the 2011-13 Drought Period. Amer. Metero. Soc. 18. 2.

FELLOWSHIPS AND AWARDS

Graduate Teaching Assistant, Department of Civil, Environmental, and Geodetic Engineering, The Ohio State University   2019– 2020
Graduate Teaching Assistant, Department of Engineering Education, The Ohio State University   2020– 2021
Best Graduate Student Poster, American Ecological Engineering Society Annual Meeting   2019
Mechanisms and Interactions of Climate Change in Mountain Regions Fellow, Karlsruhe Institute of Technology   2015 – 2020
Vice President, Women in Engineering Graduate Council, The Ohio State University,   2018 – 2019
Secretary, The Black Graduate and Professional Student Caucus   2017
Scholar, NOAA Educational Partnership Program   2013 - 2015

PROFESSIONAL ORGANIZATIONS AFFILIATION

National Society of Black Engineers
American Society of Civil Engineers

COMMUNITY OUTREACH EXPERIENCE

- Founding Member/ Coordinator – The Ohio State University's Women in Engineering Graduate Council   Jan 2016 - Present
- Engineering Graduate Ambassador –   2015 - Present
- Member – New Salem Baptist Church Young Adult Choir   2016 - 2018
- Secretary – The Black Graduate and Professional Student Caucus   Apr 2016 - Present
- Mentored middle school girls – Young Women's Summer Institute   July 2016

Dr. Chris Ratcliff
Engineering Education Department
The Ohio State University

244 Hitchcock Hall
2070 Neil Ave
Columbus, OH 43210
614-271-7677
Ratcliff.21@osu.edu

THE OHIO STATE UNIVERSITY

January 21, 2021

To the Black Trailblazers in Engineering Selection Committee,

I am happy to write to recommend Chante' Vines as a program participant. Chante' has been the Graduate Teaching Assistant (GTA) associated with my Autumn 2020 and Spring 2021 Fundamentals of Engineering courses within the Engineering Education Department at Ohio State University. In Autumn, we shared two sections of the class and this spring we share one.

The Fundamentals of Engineering program at OSU is a two-semester sequence that introduces undergraduate students to engineering basics. The autumn version of the class contains a lecture component, which is taught by a faculty member, and a lab component which is taught by the GTA. Over the last month and a half of the semester, the two sections combine and faculty and GTA teach and support students together. In the spring semester of the class, the GTA teaches graphics and SolidWorks modeling. Because these classes are organized and developed by the Engineering Education Department, we see these courses as a space for graduate students to develop their teaching. They have autonomy over the lab portion of the class, taking responsibility for the teaching, for organizing undergraduate teaching assistants around the topics, and for managing assessments. These classes seat 72 students each, who are divided into 18 groups of four, and as such it is an environment that tests an instructor's managerial and organizational skills especially when teaching three separate sections as Chante' has done this year.

From working with Chante' in this capacity, I have found her to be an excellent colleague who has been remarkably successful at teaching these courses, especially given that this is her first time through the curriculum. The students respond extremely well to her, and one can tell that teaching is not just something she has to do, but something that she treats as a vocation and an opportunity to expand her skillset. She is thoughtful, patient, and engaging in the way that she explains concepts to students and strives to help them understand the context and details of the course concepts.

Unfortunately, given the online environment of classes this year, I've had fewer opportunities to observe Chante's teaching and to get to know her better on both a professional and personal level than I have with teaching assistants in past years. So the range of anecdotes and observations to share are far more limited than they have been in the past and thus restrict my ability to pull out concrete examples of what it's like to work with Chante'. But what I can say is that, after working with her over the course of one entire semester and a portion of another, she is impressively on top of her work, has a wonderful knack for working well with a team (including myself as a faculty and undergraduate teaching assistants), but also isn't afraid to ask advice and express

uncertainties that come with teaching a curriculum for the first time. She seems to me to have the mix of being outgoing, confident, personable, and professional that makes for a really bright future. She has been wonderful to work with and as such, I think she would be a wonderful participant in any program and know that this opportunity to expand her horizons and networks would be extremely beneficial.

Sincerely,

Chris Ratcliff

Chris Ratcliff, PhD
Senior Lecturer, The Ohio State University
ratcliff.21@osu.edu
College of Engineering, Department of Engineering Education
College of Engineering, Department of Food, Agricultural and Biological Engineering
2070 Neil Ave, Rm 244, Columbus, Ohio, 43210