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Competition Details

Competition Title: 2023 CTL/BP Junior Faculty Teaching Excellence Award

Category:

Cycle:

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Application Information

Submitted By: Jacqueline Mohalley Snedeker

Application ID: 9839

Application Title: Dr. Saad Bhamla

Date Submitted: 02/12/2023 3:41 PM

Personal Details

Applicant First Name: Saad

Applicant Last Name: Bhamla

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Phone Number:

Primary School or Department

School of Chemical and Biomolecular Engineering

Primary Appointment Title: Assistant Professor

Application Details

Proposal Title

Dr. Saad Bhamla

February 1, 2023

CTL/BP Junior Faculty Teaching Excellence Award

Dear Award Selection Committee:

It is my pleasure to nominate Dr. **Saad Bhamla** for the CTL/BP Junior Faculty Teaching Excellence Award. Saad has great, highly visible enthusiasm for his research, for teaching, and for mentoring. He brings great energy to all these activities and is among the most effective people I have ever encountered in stoking the curiosity of others, be they students, researchers, faculty, or members of the general public. I have co-taught with him and found him to be an engaging lecturer and classroom leader. It is no surprise that he has received an endless number of thank-a-teacher recognitions and feedback from his students, as documented in this package.

A particular strength of Saad's is using technology to ignite curiosity (i.e. with thoughtful use of videos) and to engage and inspire students. He also employs toys and kitchen experiments to connect practical observations with basic science and engineering principles. He effectively communicates to students that he is their partner in the learning journey, making all materials available to the class including historical problems and exams, recording lectures and responding to their real-time reactions, expressions and needs in the classroom.

Saad is so adept at inspiring students, in part, because he is an expert story-teller and communicator. His innovations often appear in stories in mass media like the *New York Times*, *Wired!*, and other respected outlets. He has an active Twitter channel with thousands of followers, and considers the scope of his leadership and teaching activities to expand beyond the classrooms and halls of Georgia Tech.

Consistent with this approach, he has recently launched his Frugal Science Academy, which focuses on inspiring K-12 students to pursue STEM careers through projects focused on designing low cost, high accessibility scientific devices. I believe that Saad Bhamla has the widest network of student followers of any current ChBE@GT professor.

As one might expect based on his exceptional record described above and enumerated in detail in this packet, Saad also has strong, conventional teaching ratings through CIOS. He routinely scores between 4.4 – 4.9 on teaching effectiveness, 4.7 – 4.9 on respect for students,



School of Chemical & Biomolecular Engineering

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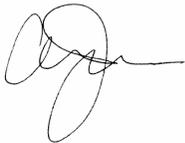
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and 4.7 – 5.0 on instructor enthusiasm. His first course offering featured lower scores, but since then he has been a consistent top performer as assessed by CIOS metrics.

I believe Prof. Saad Bhamla is an ideal candidate for recognition with the CTL/BP Junior Faculty Teaching Excellence Award, and he has my full endorsement.

Sincerely,



Christopher W. Jones, Ph.D.
John F. Brock III School Chair and Professor
School of Chemical & Biomolecular Engineering
Georgia Institute of Technology



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after the final exam. My goal is to teach them fluid dynamics for a lifetime, not just for a course! As expected, students love this:

I loved the videos at the beginning of class!

I really enjoyed and appreciated the videos Dr. Bhamla showed during the lecture. Besides being interesting, they also made certain fluid mechanics phenomena more tangible and easier to understand. This was especially true in case of creeping flow and flow at low Reynolds numbers.

The videos at the beginning of class helped motivate why one should care about transport phenomena in general and consider how to apply ideas from class in real life.

I really enjoyed the short videos that helped frame the course subject. Dr. Bhamla brought an enthusiasm to the class that engaged everyone and collectively made the learning environment one that invites curiosity and different ways of thinking.

Dr. Bhamla obviously loves this subject (and science in general), and I think his enthusiasm really shines through in his teaching of this course.

Very well rounded, robust teaching style. This material is not easy. Even if some of us walk away still struggling with the math, we probably all have a good grasp of the important concepts. I think that is more important anyways. The math comes with practice.

He genuinely had a passion for the course material that was apparent to everyone. This is very rare, especially for an engineering core subject. He also taught as to impart some of this excitement to the students.

2. Thermodynamics through toys (and kitchen science!)

If you ask any engineering student which course they dread the most, thermodynamics will likely be among the top three, along with fluid dynamics. It's no surprise then that a classical thermodynamics book begins with the quote, "Ludwig Boltzmann, who spent much of his life studying statistical mechanics (thermodynamics), died in 1906 by his own hand. Paul Ehrenfest, carrying on the work, died similarly in 1933. Now it's our turn to study statistical mechanics (thermodynamics). Perhaps it would be wise to approach the subject cautiously."

To engage undergraduate students in active learning and help them develop an intuition for abstract concepts such as "entropy" and "fugacity," I bring in toys such as Sterling engines. I also use interactive virtual labs and simulations to strengthen students' foundations and improve their grasp of these mathematical and theoretical ideas. Due to the COVID-19 pandemic, I have had to rely on videos using high-speed cameras, Schlieren imaging, and infrared imaging to teach thermodynamics. As we discuss the laws of thermodynamics, I give examples of how a matchstick burns (what is a flame, exactly?) or how Orbeez balls jump on a frying pan (the elastic Leidenfrost effect) to help students contextualize classical thermodynamics that hasn't changed in a century, and see how modern scientists are advancing our knowledge and what new ideas in thermodynamics look like. During the pandemic, when everyone was spending more time in the kitchen baking and cooking, I used our lab's portable IR camera to show students how oil droplets jump out of a hot pan or how a brownie cooks.

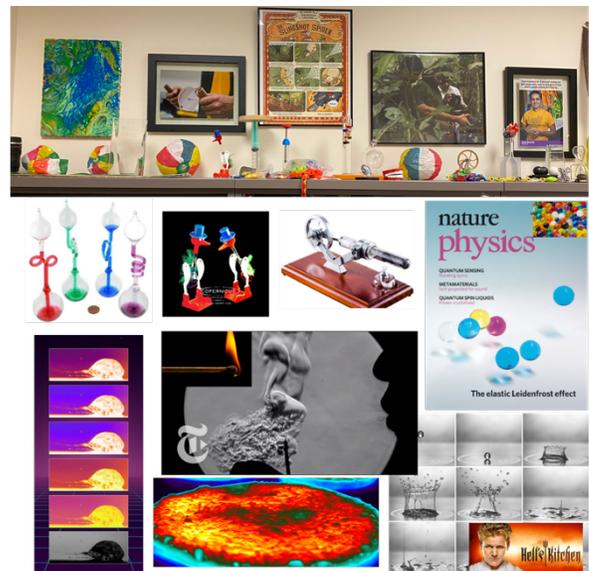


Figure 2: Toys in Bhamla's office and other examples used to teach thermodynamics (ChBE 2130)

The students found that even a boring topic like thermodynamics was interesting and relevant to their lives.

the toys that explained thermodynamics – best aspect of course

I enjoyed the short videos to start the class to see what kinds of thing chemical engineers around the world are researching.

Dr. Bhamla seemed genuinely enthusiastic about teaching the course, and i believe this to be an extremely important characteristic of a professor

He constantly tried to improve himself as a teacher. Furthermore, he did an excellent job at providing concrete examples for the very abstract concepts in thermodynamics

Gave lots of practical, real-world examples. Challenged students to internalize thermodynamics

His ability to convey thermodynamic concepts in applicable ways to our life while giving us real world examples. His brief history lessons on the material was also very interesting.

Bhamla's greatest strength is certainly his ability communicate non-intuitive concepts from the material. He presented content in a very comprehensive manner.

Bhamla has done one of the best jobs of presenting content that I have seen at this school. He allows for ample break-out discussions on new concepts, gives feedback in class, leads into class with a video, and provides examples. He does just about as much as one could ask for, and I hope he is recognized as such.

If I could give a 6/5 I'd do it

One of the best teachers I've had at Tech.

3. Facing the students, encouraging peer-learning, and eliminating 'copying notes stress'.

As an undergraduate and graduate student, I often found myself staring at the backs of my professors as they solved problems on the board. Worse still, they would erase the board, leaving me scrambling to jot down notes fast enough before they were gone.

When I became a faculty member at Georgia Tech in Fall 2017, I was determined to find a better way. Using my own funds, I invested in an iPad and the app "Notability," which allowed me to share my screen on the projector. This simple change had a profound impact on both the students and me. I was able to engage more meaningfully and deeply with the class, facing them. With this digital media, I could also record my lectures and post them immediately after class. This reduced students' cognitive load by freeing them from the stress of copying notes and instead allowing them to focus on understanding the concepts. Additionally, the recorded lectures made the class more accessible to students who needed extra time to re-watch the content and master the material.

having handwritten notes projected onto the board that were then available after class

The best features of this class include its problem-solving nature, intriguing fluid mechanics videos — I loved those, and access to recorded lectures and recitations.



Figure 3: Using digital technologies to engage students and make class accessible (ChBE 6200, ChBE 2130, ChBE 4535).

1. I did really like having the lectures recorded. I went back many times to go over class problems and re-work through how we got them. 2. I liked getting to break into pairs or groups to solve problems.

By facing the students, I can observe their "aha" moments and puzzled expressions. I frequently stop to give them time to "digest" concepts and answer any questions they may have. Before solving problems, I often give them 5-10 minutes to get "primed" and focused. I believe that if I solve the problem before they have a chance to try it on their own, it robs them of the opportunity to find their own path to understanding the problem. I have found that one of the hardest parts of engineering problems is getting started and understanding what the problem is asking.

This has led to a subtle yet critical shift in my attitude and the student's attitude. I make sure to tell my students that my course policy is to give them full access to all course information. For example, all lectures are recorded and past exams with extensive practice problems and solutions are made available. This has resulted in a shift in focus from being involved to spending time mastering the course content without having to worry about course logistics.

I think the best aspect of this course was the interactive discussions in class, especially about counter-intuitive or challenging concepts. Also I really liked that sometimes Prof. Bhamla would give us a problem and let us work on it for a little bit and try to solve it on our own.

The breakdown of problems was exceptional. I've NEVER had a class that took this approach where most lectures were tied to specific problems. Very interesting I think it's a good idea.

Lectures are very good. Dr. Bhamla is a great instructor and very passionate about science. Having all the lectures and all materials recorded was great (very convenient for those busy with research etc.)

Relating transport to real life and research. Pausing to allow students to "digest"

The open discussions during class time. I really appreciated how Dr. Bhamla was open to all questions and really took the time to think of answers together and have the class open for discussion. The interactive environment really helped me think and learn as we went and made class more enjoyable.

Very communicative. I could tell Dr. Bhamla was very enthusiastic of what we was teaching and really wanted us to learn.

Discussions. Rather than just solving the problems, Dr. Bhamla would pause to allow discussion and questions.

Prof. Bhamla did a good job of facilitating student participation in the lectures. I discovered very soon that being a part of discussions and answering questions, even if you gave a wild guess or were totally wrong, helped me learn.

Not sure I've ever heard someone use the word "intuit" so much.. Also, your style reminds me of Khan academy

4. Teaching excellence and continuously refining my pedagogical techniques.

As a new faculty member at Georgia Tech, I was determined to improve my teaching skills after receiving a low overall CIOS score of 3.4 in my first semester of teaching ChBE 2130. I sought guidance from my faculty mentors and the Chair, and carefully analyzed student feedback to identify key areas for improvement.

Determined to improve, I spent the following academic year reading pedagogical literature ('How Learning Works' by Ambrose et al.), observing other ChBE faculty, and actively participating in the Class of 1969 Teaching Fellows program. Through these efforts, I was able to significantly improve his teaching skills and achieve an overall instructor

effectiveness score of 4.9, as shown by the positive feedback from my students. Each semester I now take notes from previous semesters feedback and make at least 2-3 changes, which I share with the students in the syllabus.

Dr. Bhamla seems to have refined his pedagogical philosophy over years of teaching, and it shows. We had lively class discussions and there was ample time for questions and discussion. He respected our time and was clearly enthusiastic about the course.

The class was very well taught & structured - i would have learned a lot more if i had chosen to/been able to dedicate more of my attention to it. The back & forth between problem sets and class problems Was very thoughtful in terms of illustrating problem solving strategies that became useful on the homeworks. The videos at the start of class were also excellent, though it was not always clear to me how they tied to the specific problems we were looking at that day in class if there were such a connection. Lastly, Saad being approachable and accommodating was a huge positive feature of this class.

Dr. Bhamla was an exceptional lecturer and was easy to follow.

I thought the participation level of the students during lecture was very good. It definitely helps me to learn more by participating rather than just being lectured at in every class. This helps force me to pay attention and engage.

Dr, Bhamla's lectures were very interactive and educative.

I really enjoyed the engagement of students by Dr. Bhamla. He encouraged us to take an active role in our learning by pushing our understanding, and as a result I gained a lot of confidence in my ability to do transport

Interactive classroom is much easier to learn in. We were given the opportunity to embarrass ourselves, impress ourselves, and hear how other students thought about problems. This was Professor Bhamla's goal and it worked very well.

Genuine Enthusiasm, kindness, and availability/flexibility do a lot to make anyone a great teacher, and these are present in droves.

He genuinely had a passion for the course material that was apparent to everyone. This is very rare, especially for an engineering core subject. He also taught as to impart some of this excitement to the students.

This instructors enthusiasm about the material was infectious

This was one of the best-structured classes I had at GT. I felt engaged the entire semester, and greatly appreciated the multiple guest speakers. Hearing about other chemical engineers' path and success has gave me insight into what I want into the future. I honestly feel I have learned a lot more from this class than other classes in terms of real-life applications. The fact that this course was not exam/quiz dependent was truly a refreshing change. I appreciate it, and always looked forward to attending this class instead of dreading it. Thank you!

TEACHING OUTSIDE THE CLASSROOM

Hand-on Undergraduate Research.

I am passionate about involving undergraduate students in research and empowering them to recognize their potential as scientists and problem-solvers. To achieve this, I have developed a robust pedagogical approach to mentoring in the laboratory. I have mentored more than 30 undergraduate students, many of whom have received the competitive Georgia Tech Presidential Undergraduate Research Award (PURA). Ten of the undergraduates have served as co-authors, and many are currently pursuing graduate



Figure 4: Studying worm blobs in an Atlanta creek with UG's.

degrees (three with NSF GRFP support). A few of my undergraduates are also co-patent holders, and one UG (Gaurav Byagathvalli) will be the co-founding CEO of a new spin-out (Piezo Therapeutics) with me.

An example is of a discussion during office hours of how we snap our fingers and if there is heat generated that ultimately led to a publication on 'physics of a finger snap' led by a UG as a first author Raghav Acharya who is now pursuing a Ph.D. at MIT with NSF GRFP. I also take students into the field, both in our backyards and to the Amazon Rainforest to study organisms in their natural environments and bring them back to the lab for further investigation. My ultimate goal is to encourage students to develop and defend their ideas and contribute to the body of scientific knowledge.

Teaching the next-generation diverse and inclusive teachers

I am firmly committed to mentoring and training a diverse group of scientists. I have mentored more than 50 high school, undergraduate, graduate, and postdoctoral early career researchers from diverse historically excluded groups, including researchers who are LatinX, African-American, LGBTQ+, or first-generation, students with disabilities or low socioeconomic status, and women in physics, engineering, and biology. As an Assistant Professor, I have mentored postdoctoral fellow Dr. Symone Alexander, an African-American first-generation Ph.D. student in biophysics, and now a tenure-track faculty at Auburn University, and Dr. Victor Ortega-Jimenez who is a Hispanic first-generation scholar, and now a tenure-track faculty at the University of Maine.



Figure 5: Dr. Symone Alexander, former Bhamla Lab postdoc and now faculty at Auburn University studying slingshot spiders in the Amazon Rainforest.

TEACHING BEAUTY OF SCIENCE THROUGH BILINGUAL COMICS TO TAX-PAYERS AND CITIZENS

Curious Zoo of Crazy Organisms [Curioso zoológico de Organismos locos] Comics

I share the beauty of organismal biophysics with both English- and Spanish-speaking communities through bilingual comics. I am motivated to reach out to Hispanic communities in the US, who often face language barriers that limit their access to educational opportunities in STEM fields. I use our research to create a one-page, bilingual graphic novel that explains our research in a way that is accessible to a broad audience. The comic book format offers many advantages over traditional media in reaching different audiences. Comics are also surprisingly effective at communicating difficult ideas that often spread virally within short time frames as 'edutainment'. My comics have been widely disseminated, including on NSF social media, and were recently highlighted in the August 2022 National Science Board meeting by Assistant Director Dr. Joanne Tornow. See full comics at <http://bhamla.gatech.edu/comics>

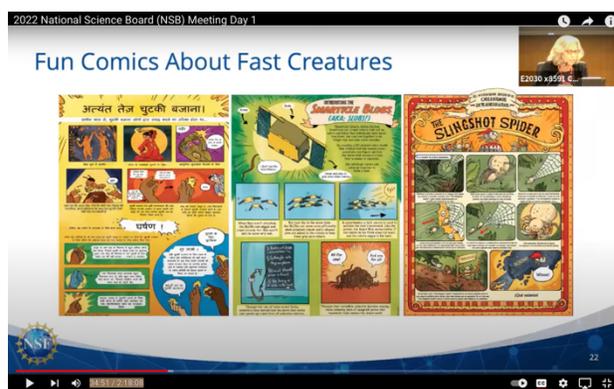


Figure 6: Multilingual comics by Bhamla Lab highlighted at the National Science Board meeting in Aug 2022.

K-12 LEARNING AND FRUGAL SCIENCE ACADEMY (FSA)

For the past 5 years, since starting as an Assistant Professor at Georgia Tech, I have been mentoring the Lambert High School iGEM team. It is one of the only few high school teams that has won gold at the international synthetic biology iGEM conference competing amongst other undergraduate teams. Building on this foundation, we will establish an NIH-funded FSA for the next 5 years at Georgia Tech to train the next generation of high school students and teachers in synthetic biology wetware and hardware.

Successful Outcomes. Through this Frugal Science Academy, so far we have:

1. Mentored >25 Lambert iGEM students to increase participation in STEM through the development of frugal hardware devices for synthetic biology to enable accessibility and affordability of tools.

- Lambert iGEM is one of 50 high school teams to participate in this international competition. Nonetheless, during 2018, 2019, 2020, 2021, and 2022 the Lambert high school team has won **five Gold** medals, including the 2022 Grand Prize for High School division.
- 58 of the Lambert iGEM team members have gone on to pursue higher degrees, 91% in STEM including 10 students enrolled at Georgia Tech.
- Currently, by mentoring Lambert iGEM, we have developed a low-cost 3d-printed centrifuge and a 3d-printed electroporator, results of which were published in two peer-reviewed publications in PLOS Biology, on which the 1st author was a high school student (Gaurav Byagathvalli) and also included their science teacher (Janet Standeven) as a co-author.



Figure 7: PI Bhamla with Lambert iGEM high school students in 2017-2020.

CITIZEN-SCIENCE AND PUBLIC OUTREACH

I find joy in sharing the beauty of the living world with a broad audience and have conducted many hands-on microscopy workshops with \$1 Foldscopes (paper microscopes) for high school students. I am an active contributor to the global Foldscope community and share discoveries of microorganisms with kids and citizen scientists from nearly 140 countries.

While I regularly disseminate the findings of my work through university press releases, I am mindful of the potential for overhyping research findings and distorting scientific discovery. To address this, I have started using social media to deliver our findings directly and provide context and caveats, as well as revealing the diverse humans behind the scenes. I use our lab’s Twitter channel (@BhamlaLab, with about 3,000 followers) for this purpose. I have also worked with science communicators such as Mark Rober, and a video featuring my research has ~14 million views on YouTube. I also recently gave a TED talk highlighting “curiosity-driven science” to a broad audience. I also participate in outreach activities with the Atlanta Zoo and Atlanta Science Festival.



Figure 10: Outreach PI sharing organismal videos with young students in Peru.

ILLUSTRATION OF TEACHING EXCELLENCE THROUGH CIOS SCORES

Year	Term	Course (CHBE)	Class N	No. Resp.	Enthusiasm	Respect	Overall Effective
2022	Spring	CHBE 6200 Transport Phenomena	56	54	4.7	4.7	4.4
2022	Fall	CHBE 4535 Chemical Product Design	55	30	4.9	4.7	4.7
2021	Spring	CHBE 6200 Transport Phenomena	58	55	4.9	4.7	4.6
2021	Fall	CHBE 4535 Chemical Product Design	41	15	5	4.8	4.6
2019	Spring	CHBE 2130 Chem Eng Thermo I	44	39	4.8	4.8	4.9
2019	Fall	CHBE 6200 Transport Phenomena	49	39	5	4.7	4.8
2018	Fall	CHBE 6200 Transport Phenomena	54	48	5	4.9	4.9
2017	Fall	CHBE 2130 Chem Eng Thermo I	45	43	4.2	3.9	3.4

EXAMPLES OF UNSOLICITED THANK A TEACHER NOTES AND EMAILS

Laila Mirza, Spring 2020, 2130

Hello Dr. Bhamla,

I wanted to take this time to thank you so much for this semester. I really have enjoyed learning about the concepts of thermodynamics and how it applies to life as a chemical engineer. This semester ended unlike any other and I want to thank you for your commitment and dedication to the course. It was an absolute pleasure to be in your class and I really learned a lot. Have a great rest of your summer and I hope to see you on campus in the fall!

Shreya Mishra, Spring 2021, 6200

Hello Dr. Bhamla,

You are an amazing professor - and your dedication and hard work show! Before you teach us what fluid dynamics is - you show us why its important and how its being applied now in industry and research. This makes even students with no background in the topic find it interesting. Thank you so much for all you do. Your passion is contagious and I'm grateful I have a professor like you in my life inspiring me daily! :)

Suryateja Ravutla, Spring 2021, 6200

Dear Dr. Bhamla,

Your class was one of the few courses I enjoyed thoroughly. It was primarily because of your teaching style, those awesome videos and your enthusiasm and inquisitiveness when you explain something that you teach and show their applications in the most daily life examples, which I would have failed to notice otherwise. Thank you for making this course interesting!

Fidel Amezcua, Spring 2021, 6200

Dr. Bhamla,

I came into your Transport class without knowing much about the subject. Now that we are finished with the semester, I want to let you know that I worked my tail off in your course, and I pushed through a lot of the material by sheer force - get it? LOL. The HW took me forever to understand, and I think that was apparent on the final since I found it difficult. However, overall I'm grateful to have gone through the mtions because I now understand what it takes to succeed in research and GT.

Emily Frobos, Fall 2018, 6200

Dear Professor Bhamla,

I want to thank you for a fulfilling semester and an energizing beginning to my graduate career. I am very grateful that my first-semester happened upon your class. Even though it was

so early, and I wasn't always ready for the day... I loved going to your lecture. You were excited to be there so I was excited to be there. You are beyond an effective instructor, and you left many impressions on me that I will use as inspiration for the remainder of my graduate career and after.

One of my favorite aspects of your instruction were the opportunities you gave us to engage during lecture. Thank you for allowing us to interrupt you to ask questions, to have a moment to think, to have discussions and go back and forth with our colleagues under your guidance, encouraging us to take intellectual leaps, and to be vulnerable and unsure in front of our colleagues. These moments take more effort but teach us concepts much more meaningfully than from only reading our books or following along a monologue full of new concepts. It also teaches us how to be graceful in our communications and be diligent in our understanding. Your dedication to our learning will help us become better thinkers, engineers, and problem solvers.

You also helped to strengthen my conviction. I will recall when I visited you in your office in the beginning of the semester: I lacked confidence as a new graduate student. I was shy but felt it was important to explain my non-traditional situation for the upcoming semester in case that work might interfere with school, for say a meeting, etc. I was surprised and touched that you took a moment to ask about the path that led me to this semester and of my interests. I've always felt self-conscious about the way I've had to go about my education as I come from a family that is historically uneducated and not wealthy, often feeling unprepared or not good enough in the context of Georgia Tech. I recalled to you my seemingly meandering choices over the years as I've slowly chipped at my dreams. After some discussion, you concluded that I'd chosen challenging paths all along, and that even though this new situation would be difficult, you saw no reason to believe I shouldn't be successful.

Your simple observation shook me- it was unprecedented credit from an academic figure. Your acknowledgement validated my choices and helped me uproot my imposter syndrome, something my unconditionally-loving parents could not. It made me feel more comfortable to admitting that I'm intelligent and I belong here and gave me courage to act as a graduate student. This may seem ridiculous, but it's sincere. So, without intimidation and with integrity and encouraged by your enthusiasm for the content, I worked very hard this semester, and even though I didn't earn the best test grades I am very proud of myself for my change of heart and for recognizing what I know I'm capable of. I believe I learned a great deal and have the tools to continue mastering this material. I will continue improving as a student, professional, scientist/engineer, and individual. Thank you for voicing that you believed in my abilities. It has much more impact than you might suspect.

I want to conclude by saying when I read your thank you note following the survey I was truly taken aback, I gasped out loud, to realize this was your first semester teaching. To reiterate, you are a very effective and professional educator and role model. I think it's important for you to know it because I know you worked very hard for our class, and I hope that you continue teaching with such fervor. It will surely have a significant impact on many students and future scientists, engineers or academics, whatever we all become. Also, the stress tensor analogy from the last lecture is so amazing and simple. I appreciate you waiting to share it at the end. It cemented my understanding of stresses and will resonate years later when I need to recall the fundamentals of fluid dynamics.

Copy of your Thank A Teacher Email

December 14, 2019

Your Name: Your OG undergrads (Soham, Kate, & Luke)

Instructor Name: Saad Bhamla

Title of the course: Chemical & Biomolecular Engineering 4698

The semester/year of the course: Fall 2019

Campus Address of Instructor: Chemical and Biomolecular Engineering/0100

What would you like to tell instructor?

Thanks for being a transport & thermo teacher and a research mentor. You've helped us through our ups and downs, encouraged us to be the best versions of ourselves, and taught us countless invaluable life lessons during our research projects. Thank you!!

Copy of your Thank A Teacher Email

April 13, 2019

Your Name: Anonymous

Instructor Name: Saad Bhamla

Title of the course: Chemical & Biomolecular Engr 2130

The semester/year of the course: Spring 2019

Campus Address of Instructor: Chemical and Biomolecular Engineering/0100

What would you like to tell instructor? You really are a force of positivity. I can't tell you how much you've improved my state of being this semester. Thank you so much for being you. (And also for all the incredible energy you put in for us.)

Your Name: Anonymous

Instructor Name: Saad Bhamla

Title of the course: Chemical & Biomolecular Engineering 2130

The semester/year of the course: Spring 2019

Campus Address of Instructor: Chemical and Biomolecular Engineering/0100

What would you like to tell instructor?

Your enthusiasm and child-like curiosity (I promise, this is not a bad thing) is so contagious, and I can only hope to appreciate this world as much as you. Thank you so much for inspiring me to keep questioning how the world works.

Feb 11th, 2022

Dear Award Committee Members,

My name is Yuhang Hu. I am an Associate Professor at School of Mechanical Engineering and School of Chemical and Molecular Engineering. Dr. Bhamla and I co-taught ChBE 2130 Chemical Engineering Thermodynamic in the spring semester of 2019. I witnessed Dr. Bhamla's teaching excellence. I am writing this letter to provide my best support for his nomination for the 2023 GT CTL/BP Junior Faculty Teaching Excellence Award.

Dr. Bhamla strives to be excellent in teaching. He makes great efforts to improve interactions with students and student engagement. For instance, he uses Turning Point to encourage active learning. Well-structured questions keep students engaged and the instant polling results provide immediate feedback to him and the students. He also strongly encourages and facilitates small group discussions among the students in order to answer the questions considered. Furthermore, he adapts an online forum Piazza to maintain instant and constant communication with students. Students can post, in a private or public mode, questions and pictures of written materials on the forum which are addressed online by other students and the teaching team. This is both a superior experience for students (immediate feedback, round-the-clock office hours) and enables the instructor's and teaching assistants' resources to scale effectively. Effective communication with his students is the result of a unified and hard-working instructional team. When I was co-teaching the ChBE 2130 class, we dealt with the logistics together. We met weekly with the teaching assistants to coordinate project activities, discuss the common challenges of the students, and collect feedback about course contents including lectures, homework, quizzes, and worksheets. The use of different ways to communicate with the students ensures that the students get a more personalized learning experience and the teaching team can receive instant feedback that we can act on. It is also an effective way to mentor the teaching assistants to become good educators in the future.

Dr. Bhamla is an inspiring and enthusiastic instructor. Dr. Bhamla uses online tools and new technologies wherever it makes sense to bring more fun and inspiration to his classes. For instance, he uses tablet to deliver written materials, videos, and animations. He incorporates YouTube videos in almost all his lectures to inspire students to become curious about natural phenomena and practical problems. It not only makes the lectures engaging and fun, but also makes the lecture contents easy to comprehend and leaves vivid memories in students' mind.

Dr. Bhamla's teaching is not limited to the classroom. He created many unique programs to include undergraduates, teachers, and K-12 students to the STEM studies. Many of those

programs have received high publicities. For instance, his science channel on YouTube is widely viewed by people all over the world; his “curious zoo of crazy organisms” is highlighted by the NSF social media, and many more.

In summary, Dr. Bhamla is an excellent teacher. He is engaging, inspiring and energetic. I strongly endorse the nomination for Dr. Bhamla for the 2023 GT CTL/BP Junior Faculty Teaching Excellence Award. I hope you give his nomination your best attention. If there are any questions, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Yuhang Hu". The signature is written in a cursive, flowing style.

Yuhang Hu
Associate Professor
George W. Woodruff School of Mechanical Engineering
School of Chemical and Biomolecular Engineering
Georgia Institute of Technology

801 Ferst Drive Atlanta, Georgia 30332-0405 U.S.A.
PHONE 404.894.2555
yuhang.hu@me.gatech.edu

Dear CTL Awards Committee,

If there is one person who singlehandedly changed my life in the past 5 years, it will have to be Dr. Saad Bhamla. **His philosophy, passion, advice, and unwavering support of me during my time at Georgia Tech from 2017-2020, and beyond is simply incomparable, and cannot be stated with words because it will do him injustice,** but I will try to expand on some of them.

I met him in my first week of college in August, 2017 – I had been rejected by 5 other professors for a research role, and all had stated that I was too young, too inexperienced, and too naïve to be doing research. I still remember that day; I knocked on the door, fully expecting to hear some kind words and be sent on my way. However, when I opened the door, not only was I not treated with dismissal, but complete acceptance. We found out that we had a few things in common – namely, his focus on building low-cost tools, and our shared experience with dealing with hearing loss in our family. He took me on as the first student in his lab, and gave me a research project that directly impacted me as a hearing disabled person – “Let’s build a \$1 Hearing Aid.” I want to re-iterate this point – **Dr. Bhamla took a first week undergraduate as member of his lab, and did so with no hesitation.**

Dr. Bhamla not only supported me through the entire research experience – he paid for my funding, he gave advice, he stayed back on Friday nights when everyone else was gone to help me, he listened to me vent my frustrations for 3 years, and he never once gave up on me. Furthermore, he took the opportunity to take me on field trips to see the broader scientific world. In May 2018, he took me on a trip to California; we met his PhD and postdoctoral advisors at Stanford, we met his colleagues at Berkeley, and we went and collected field data on California Sharpshooters. His support for my scientific and research education beyond my classes was instrumental in shaping my view of academia, and is one of the principal reasons why I want to become a professor today. He always pushed me to not just do research for research’s sake, but to truly understand why we are doing what we are doing. As a result, we published 3 papers together, with one first author publication on the \$1 Hearing Aid.

Dr. Bhamla’s belief in the accessibility of science did not just stop with me; he accepted other undergraduates and even high schoolers in the lab. He didn’t believe in the idea of simply pairing undergrads and high school students with grad students, instead he gave them research projects that they were the lead authors on. The two undergraduates that I graduated with at the same time Xinjing (Luke) Xu, and Katherine Burgener; they also finished with first author publications with Dr. Bhamla. A high schooler, Gaurav Byagathvalli, had first author publications with Dr. Bhamla before he even started college at Georgia Tech. **There is no other professor I have met in my time at Georgia Tech, who was so invested in undergraduate or high school research education as Dr. Bhamla was.**

Dr. Bhamla is an amazing lecturer as well. When I took his class in graduate fluid dynamics as an undergraduate, I found out that he could break the toughest concepts down to ideas that we could all understand. His way of seeing the world, and his ability to communicate not just with his peers, but with everyone he meets – from the professors, to the high-schoolers is

truly remarkable. He spent hours preparing for his lectures in fluid, and often came with a live demo of the concepts he would teach.

Dr. Bhamla is a genius, but more than that he is simply an amazing person. **Rather than research recognition, he pursues helpfulness of his ideas. Rather than ignorance, he pursues understanding of mentees. Rather than grades, he pursues learning of his students.**

For that, I strongly support his nomination for the Excellence in Teaching Award.

Respectfully,

Soham Sinha

Bioengineering Ph.D. Student, Stanford University

B.S Chemical and Biomolecular Engineering (Georgia Tech, 2020)

B.S Chemistry (Georgia Tech, 2020)

M.S. Bioengineering (Stanford 2022)

January 28, 2023

Dear CTL Awards Committee:

My name is Sophia Ung, a fourth-year chemical and biomolecular engineering student at Georgia Institute of Technology, and I am honored to write this letter supporting Dr. Saad Bhamla for the Georgia Tech 2023 CTL/BP Junior Faculty Teaching Excellence Award. I had the privilege of learning in Dr. Bhamla's classroom for Chemical Product Design in Fall 2022. Within the first class, I was resolved to taking this elective course, moved by his passion and enthusiasm for the curriculum and excited for the course schedule filled with unparalleled opportunities.

Dr. Bhamla led his classroom uniquely from all other classes I experienced at Georgia Tech. He embodied the "show, not tell" mentality and seamlessly integrated case studies, interactive discussions, and industry professional presentations to create a narrative for this class. Immediately, Dr. Bhamla demonstrated his passion and commitment to chemical product design, sharing about his research in frugal science. Candidly discussing the challenges his team faced and the ultimate impact these innovations had, Dr. Bhamla inspires me to remain openminded and explore answers to seemingly trivial, "impossible" problems. This openness also carried into the classroom dynamic, where Dr. Bhamla fostered an environment that welcomed all forms of discussion. One of my many favorite moments was the class-wide brainstorming session, discussing new cooling solutions for mattresses to innovative laundry methods. While developing strong technical and problem-solving skills, I also gained new perspectives and learned to challenge traditional mindsets.

Determined to provide us with as many opportunities and resources as possible, Dr. Bhamla also invited numerous guest speakers from various industries and backgrounds. We heard from research and development directors to intellectual property lawyers, and I am grateful to have had such an opportunity to network and learn from a wide range of experiences. Discussing case studies with the professional who worked on those projects, I received invaluable insight and exposure to upcoming industry trends as a college student. The effort Dr. Bhamla put forth to secure these speakers, including housing one of them in his home, is a testament to Dr. Bhamla's dedication to teaching, which I would wholly described as selfless.

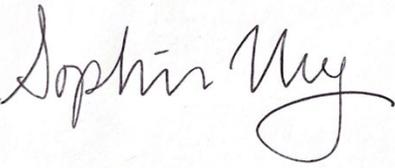
This characterization of selflessness also describes his interactions with students. Despite an incredibly busy schedule, Dr. Bhamla made himself readily accessible to meet with. For each phase of our semester-long project, my group, along with many other groups, met with Dr. Bhamla and received valuable, group-specific feedback. In these conversations, Dr. Bhamla always felt like a peer contributor, rather than the professor responsible for assessing our work. Specifically for my group, Dr. Bhamla helped us navigate a team dynamics issue, emphasizing

Georgia Institute of Technology
School of Chemical and Biomolecular Engineering

the parallels that would exist beyond college and transforming the issue into a learning experience. The personal skills I developed through this class are the greatest takeaways, that I will continue applying in all aspects of my life.

Dr. Bhamla was an undoubtedly passionate and dedicated professor, never hesitating to adjust and accommodate to ensure a positive and successful learning experience. Having such a lasting impression despite only being taught by Dr. Bhamla for one semester, I cannot imagine a more fitting candidate for the Georgia Tech 2023 CTL/BP Junior Faculty Teaching Excellence Award.

Sincerely,

A handwritten signature in black ink that reads "Sophia Ung". The signature is written in a cursive style with a large, looping 'U' at the end.

Sophia Ung
Candidate for Chemical and Biomolecular Engineering, B.S.
s.ung@gatech.edu

Dear CTL Awards Committee,

Feb 1, 2023

I am writing to highly recommend Dr. Saad Bhamla for the CLT BP Junior Faculty Teaching Excellence Award. In the past 4 and a half years I have had the opportunity to take Dr. Bhamla's Advanced Fluid Dynamics course (2018 Fall), help him as a TA for the same course (Fall 2019) and work closely with him as a graduate student in his research lab. Thus, I am in a unique position to speak to his exceptional teaching abilities and dedication to his students.

Dr. Bhamla is passionate about teaching and learning, and this is clearly visible in the creative styles of teaching that he brings to the classroom. He consistently started each class with a video emphasizing the relevance of the subject and highlighting its various applications. These videos were one of the key reasons for me to arrive earlier than usual for an 8 am class. It must be noted here that advance fluid dynamics course is often a challenging course due to heavy involvement of calculus whereby the relevance of the subject can be easily lost on students. However, Dr. Bhamla beautifully brought the importance into perspective through these videos thereby orienting our mindset towards curiosity about the subject.

Dr. Bhamla demonstrated excellence in teaching by seamlessly incorporating basic theoretical understanding of the subject with modern, current research in the field. He builds upon basic concepts throughout the course, helping students to understand the complexity of the subject matter. This skill was specially demonstrated by the way he set homework questions for us to practice. These problems would often seem complex at first glance; however, he would divide the main question into subsections each focusing on one aspect. These subsections often borrowed from the basic concepts that we learned in class. As we moved along the sections, we were able to solve an otherwise complex question by building upon the basics of the subject that we learned in class. This also helped us learn how to break a seemingly complex problem into its fundamental parts.

Dr. Bhamla values learning and strives to create an environment that cultivates this in his classroom. As his TA, I observed the amount of work that went into providing us with this wonderful learning environment. Apart from staying up to date with scientific literature, Dr. Bhamla always had an eye open for opportunities of learning in popular media spaces. One such example is when he shared a YouTube video of a slow-motion bursting of a water filled balloon to emphasize the inertial boundary effects and use of high-speed cameras in research. His open-door policy in addition to dedicated office hours is a testament to his dedication to his students. Furthermore, to help students who might be struggling in his course but are shy of asking for help, he encouraged me as a TA to conduct weekly recitals where we practiced fundamentals and problems outside of traditional class hours. This helped create a space for students to further practice, ask for help and succeed in the course.

Apart from having passion and dedication for teaching, Dr. Bhamla also deeply cares about his student's welfare. In August of 2022, I met with a car accident thereby breaking both the bones in my right hand which required subsequent surgery. As a 4th year PhD student trying to graduate soon, this was a very stressful time for me both physically and mentally as I was unable to make

any progress in my research. Dr. Bhamla showed exceptional compassion in these times by making sure I was focusing on my recovery first. He would often check-in with me about my recovery, made sure I stayed connected to lab member through zoom lab meeting and reassuring me that I will be able to complete my research in time for graduation once I recover. Thus, his help and support were essential components in my recovery.

In conclusion, Dr. Bhamla is an exceptional teacher who goes above and beyond to ensure that his students are engaged, challenged, and inspired. He deserves recognition for his dedication, innovation, and impact on his students' lives. He is a deserving candidate for the CLT BP Junior Faculty Teaching Excellence Award.

Sincerely,
Udita Ringania
PhD Candidate
Chemical and Biomolecular Engineering
Georgia Institute of Technology