LIGHT READING

VANDERBILT BIOPHOTONICS CENTER

VOL. II |ISS. I

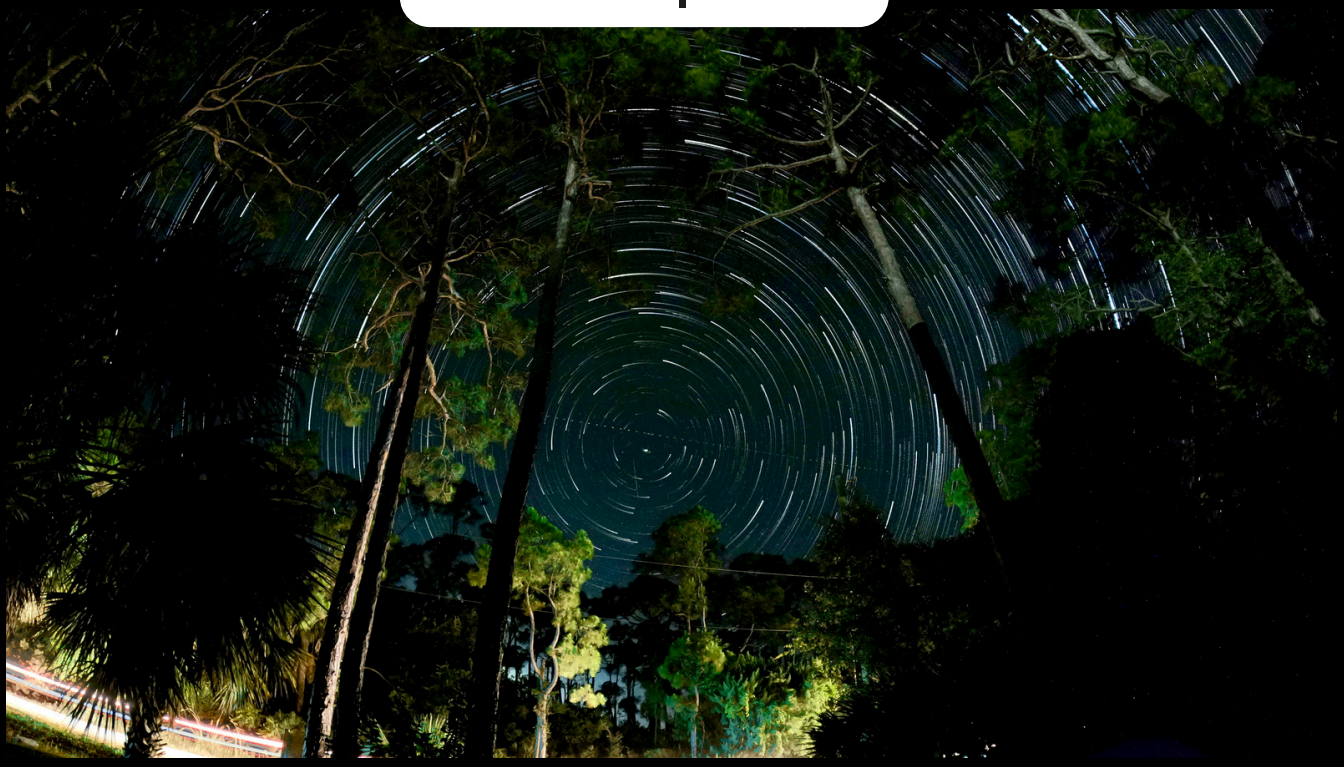


Image by: Bryan, Emma, and Faith Millis

What is this? Learn more on pg. 4!

FROM THE DIRECTOR'S DESK

Dear VBC friends and family,

It has been a year since we started "Light Reading", and I hope you have enjoyed reading it as much as I have. Since August 2024, we have published six issues to share the happenings and people at the VBC. Parker, Anna, and Alex (our three newsletter editors) have been phenomenal and have collectively built the newsletter from an idea to a highlight of the VBC shared with our internal and external community. So, Kudos to them. And if you have a moment – please convey your wishes and comments about the newsletter to them. I am sure they would love your feedback. Note that our Light Reading team has now expanded from three to seven members. In the coming year, we aim to include more guest writers and exciting content to keep you engaged and coming back for more.

There have been so many wonderful accomplishments from the current VBC team, and it is fun to watch. BioMIID, too, has grown since its inception from an idea to a world recognized leader in disseminating advanced optical microscopies to the global biological community, led by Bryan Millis. Since BioMIID moved to the Engineering and Science Building (ESB), the researchers have been pouring in. Just a reminder to everyone that BioMIID is a COLLABORATIVE advanced imaging center with more than a dozen non-commercial microscopes, customizable for individual project needs and available for anyone to come use at no cost. Our currency in exchange is grants and papers together. And we are seeing that this concept resonates with the researchers and funders!

As we look to the next year, the VBC continues to build connections with the optics and photonics community. We hosted the Thorlabs Mobile Photonics lab, to demonstrate the power of photonics to the Vanderbilt students while making our presence known to them. As we continue this journey, I'm excited to share that the 14th International Conference on Clinical Vibrational Spectroscopy (SPEC 2026) will be held at Vanderbilt University, the first in the U.S. since 2006. I remember attending the very first edition of this meeting in the nineties, and it is time to bring the vibrational spectroscopy community to Nashville and show them who we are and what we can do. We plan to focus the meeting on clinical translation of these technologies and provide an opportunity for early career scientists to connect with established experts in the field. We hope to see you in Nashville in 2026 (see the save-the-date flyer on page 4).

In more exciting news, we've launched the Vanderbilt Photonics Industry Network (VPIN), a program that will foster connections between the VBC and industry. Although it's still early days, collaborations are already developing through project partnerships, seminars, and more. VPIN's goal is to serve as a two-way bridge, connecting our people to the photonics industry and providing our industry colleagues and friends with the opportunity to work with us. Please share the link to VPIN with your connections in industry or reach out to us if you would like to partner with us and join VPIN. As we build the framework of our network, I hope to see the VPIN partnerships help increase the reach of VBC and achieve even more.

Yes, all this is a lot, but it shows you just how much we've grown and how many great things are happening. I often say the VBC is like an extended family, whether at picnics, parties, or the chaos of Fluids Lab, we make space for science, connection, and fun.

Thanks for joining us on this journey. Feel free to visit Nashville and say hello, we'd love to see you.

With warm regards,

Anita

LIGHT READING

Biophotonics Center

VOLUME II, ISSUE I

FROM PILOT TO PROFESSOR

Dr. Justin Baba, Adjunct Associate Professor at the VBC, is known for the many hats he wears in research, innovation, mentoring, and entrepreneurship. He is also the co-founder of the biomedical startup Yaya Scientific, where he serves as the chief scientific officer. As part of his being the Associate Director of the VBC, he heads the VIBES–Vanderbilt Internship in Biophotonics for Emerging Scholars–Program for undergraduate students. In a recent interview with Dr. Baba, we embarked on a journey of his scientific story.

Dr. Baba's love affair with science began in middle school, when he was chosen from amongst his classmates to assist in the chemistry lab, setting up high school experiments. This experience ignited his passion not just for chemistry, but for science as a whole. Inspired by the renowned scientist Louis Pasteur, young Justin was struck by the legacy of a scientist's name and impact, which could influence human life and discovery for generations to come. However, airplanes were his first love, and he pursued a bachelor's degree in aviation at LeTourneau University. But life had different plans for him.

Dr. Justin Baba

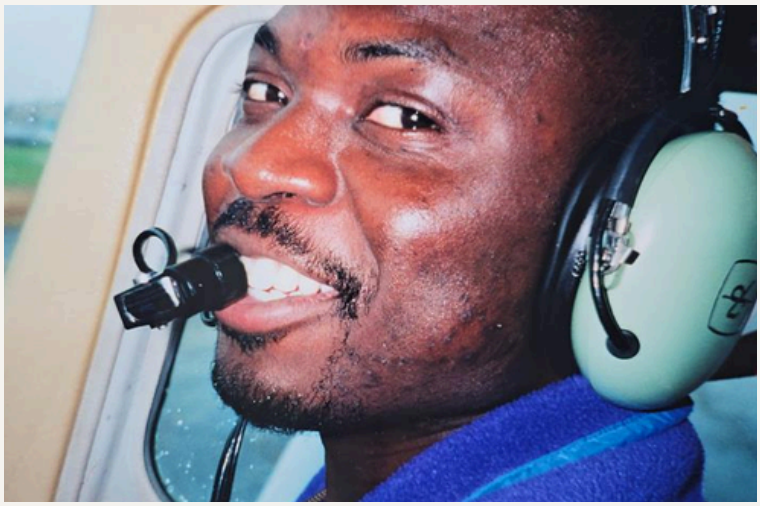
Dr. Baba and his undergraduate mentees at the Engineering Unleashed National Symposium

One fine day as a commercial pilot, Dr. Baba found himself in the exquisite comforts of the pilots' lounge at Dallas Addison Airport. As he sat there "marking" time, waiting for the return of the businessperson he had just flown, Dr. Baba began to question his life choices. A CNN piece on science and technology blaring across the enormous television screen caught his attention. One of the reports discussed scientists discovering a new cure for a disease. Reflecting on this pivotal moment, Dr. Baba said, "And I sat there, and I thought to myself, I could be doing that, coming up with this new therapy or new method, you know, for a cure, or doing something that's going to have an impact on human life and quality of life." Dr. Baba then decided to return to school, marking the next chapter in his career. He earned an associate's degree in electrical and electronic engineering and eventually a PhD in biomedical engineering at Texas A&M University, where he specialized in optical biosensing, and the rest is history.

Fast-forward to the early 2010s. While working at Oak Ridge National Laboratory on functional neural imaging, Dr. Baba met Dr. E. Duco Jansen and Dr. Anita Mahadevan-Jansen. They told Dr. Baba about the VBC and its mission to foster trans-institutional biophotonics research, technology development, and education at Vanderbilt University. He was attracted to the center's unique collaborative culture, which is located minutes from medical facilities and provides access to patients from diverse populations and demographics, creating an ideal environment for translational research and device development. As he began cross-collaborations with VBC and teaching courses at Vanderbilt, he joined as a full-time Research Associate Professor in 2019.

LIGHT READING
Biophotonics Center
VOLUME II, ISSUE I

FROM PILOT TO PROFESSOR



Dr. Baba in the cockpit of a plane

When he left Oak Ridge in 2019, Dr. Baba had 12 patents. Another one submitted at Vanderbilt for intraoperative nerve identification gave impetus to his startup, Yaya Scientific. Although not new to commercialization, Dr. Baba sought to take his inventions to the clinic, where clinicians and patients could access and benefit from them. Yaya Scientific was founded "to develop solutions that bridge the gap between medical needs and innovative technology." Besides nerve identification, Dr. Baba's team, which encompasses his lab at VBC and Yaya Scientific, is actively pursuing translational research questions related to glucose detection, thermographic imaging for neonates, and biomarker identification for systemic immune-based diseases.

When asked about his daily routine, Dr. Baba quips that a typical day for him starts early as he juggles between his company and Vanderbilt. At Vanderbilt, he supervises graduate students, including the recent PhD graduate Dr. Ezekiel Haugen, while mentoring undergraduate students and the summer interns. Simultaneously, he manages his cohort of recent graduates working at Yaya including VBC alum, Dr. Rachel Eimen (see Vol. I Iss. II, pg 5).

As he heads the VIBES program, Dr. Baba has been busy engaging with the summer interns, ensuring the students get the most out of the experience (Check out more about the summer interns on page 3).

He is also responsible for the professional development sessions, where he advocates the importance of the five mosaic elements of an individual's career at any point in time: associate, advocate, mentor, coach, and connector, which form the core of his mentoring philosophy. "An associate is an accountability partner or an encourager, typically someone in your cohort. An advocate is someone who knows your work and cares about your career and future. A mentorship is a two-way street, where learning goes both ways. A coach is someone you go to to develop certain skills, and a connector opens networks for your career", emphasizes Dr. Baba. He adds that it is essential to be cognizant of the need for these elements during your career. His advice for people starting out in academia or industry is, **"Don't focus on the outcomes; focus on the process.** If you are learning something every day, eventually, with time, you will finally become accomplished." An aviator at heart, Dr. Baba, who was once responsible for transporting people from point A to point B, now strives to thrust his mentees from a 'potential' to 'accomplishment' mindset.

Dr. Baba and family on vacation

By: Mahima Sharma, PhD

LIGHT READING
Biophotonics Center
VOLUME II, ISSUE I

INTERN INSIGHTS AT THE VBC

"Everyone is happy to strike up a conversation on the lab plants, the overworked coffee machine, present and past projects, or contributions to an undergraduate's game of tag", recounted Caroline Caveness fondly. Caroline was one of the 13 undergraduates who interned at the VBC this summer. Interns were guided by VBC graduate students, postdoctoral researchers, and faculty members to enhance their knowledge and develop research projects.

For Olivia Bisesi, a mechanical engineering student at Vanderbilt, the VBC internship began after learning about the center through Dr. Justin Baba in her Innovations in Biomedical Engineering seminar. Drawn to the VBC's mission of uniting engineering and biology, she joined a summer project on non-invasive glucose monitoring. "I've been encouraged to think critically to develop solutions to my project, which has helped me develop confidence and independence as a researcher," she said.

(Left to right): Vanessa Omatu, Olcaytu Hatipoglu, Ishaan Singh, Dr. Baba, Trey Dobson

(From left to right) Vivian Krause, Eden Tao, Trey Dobson, Olcaytu Hatipoglu, Riona Sifferman

Naznin Rima, another Vanderbilt student, investigated using noninvasive infrared thermography to monitor and diagnose systemic sclerosis (Scleroderma and Raynaud's Phenomenon). She remarked that this summer's research experience will help her "prepare for graduate school and/or industry work as I am interested in a career in biomedical engineering." In addition to participating in mentored research experiences, the interns attended weekly professional development seminars led by Dr. Baba and guest faculty members. During these seminars, they learned about presentation techniques, career planning, graduate school applications, and financial management. Graduate student coordinators Vivian Krause and Trey Dobson also organized social events for the interns to foster a sense of belonging within the VBC community and to emphasize the value of being part of a dynamic research environment.

Vanderbilt students are encouraged to contact our faculty if they want to get involved in undergraduate research at the VBC. External students should consider applying for the Vanderbilt Internship in Biophotonics for Emerging Scholars (VIBES), which offers a paid 10-week internship program. Applications for VIBES 2026 will open in October 2025. Learn more about the VIBES program experience in the next issue of Light Reading!

By: Vivian Krause & Vanessa Omatu

Cover page image description:

On his recent family vacation, Dr. Millis's kids wanted to go out to the beach at night and look at the stars. Wanting to capitalize on the opportunity, and being a self-described geek, he took his camera and thought it would be a great time to sneak in some science education, as well as potentially snag a cool picture or two. Not having tried any "star trails" photography before, he wasn't sure what to expect. He simply got his tripod out, located the North Star (Polaris), set up his camera to take regular 30-second exposures over the course of a few hours, and hoped for the best. Several conversations later, he checked his camera and what they saw shocked even him (bottom picture). With the added luck of having a mostly clear night and some fixed points of reference in the near field, the earth's axis of rotation (which happens to be very close to the direction of Polaris) was unmistakable, and the concentric rotation of stars was a thrill for the whole family. The next night, they repeated the same thing from the front of their rental facing the street. Here you can not only see the previously described "star trails", but the streaks of both head (and tail) lights as cars periodically passed. Dr. Millis is quick to point out that this kind of "star trails" photography is nothing new, but doing such things for yourself (or your kids) is just good fun.

Editors: Alex Cousart, Parker Willmon, & Miguel de Jesus

RECENT PUBLICATIONS, PRESENTATIONS, & AWARDS

Publications

- "Near-Infrared Autofluorescence for Parathyroid Detection During Endocrine Neck Surgery: A Randomized Clinical Trial"
  - Alexandria Cousart, Colleen Kiernan, Parker Willmon, Giju Thomas, Anita Mahadevan-Jansen, Carmen Solórzano, et al.
- "Biochemical detection of pediatric eosinophilic esophagitis using high wavenumber Raman endoscopy and stimulated Raman microscopy"
  - Ezekiel Haugen, Andrea Locke, Lily Dao, Alec Walter, Pratheepa Rasiah, Justin Baba, Matthew Buendia, Hernán Correa, Girish Hiremath & Anita Mahadevan-Jansen
- "TNF-Stimulated Gene-6, Part of Extracellular Vesicles in Adipose Tissue-Derived Mesenchymal Stem Cell Concentrated Conditioned Medium, Affects Microglial Activity"
  - Hossain MS, Rasiah Pratheepa, et al.
- "Investigating microbiota and biochemical changes in vaginal fluid toward point-of-care microbial monitoring using surface-enhanced Raman spectroscopy"
  - Anna Rourke-Funderburg, Viannely Francisco, Dalton Nelson, Kate L. Goncalves, Frederick Haselton, Emad Elsamadicy, Andrea Locke

Presentations

VINSE NanoExchange

- "Development of an aptamer-based biosensor for l-lactate detection in vaginal fluid", Darby Heffer

Awards

- CPS: Medium: iCMS: Intelligent Cyber Microscopy System for Long-term Microscope Imaging (NSF Award) awarded **$1,200,000** to **Dr. Yuankai Huo**, **Dr. Jason Valentine**, and **Dr. Bryan Millis**
- Vanderbilt Institute of Nanoscale Science and Engineering (VINSE) pilot award for studying women's health awarded to **Dr. Andrea Locke, Kauryn Datcher,** and **Darby Heffer**

FOLLOW US

ANNOUNCEMENTS

- Welcome Vanessa Omatu, Pratheepa kumari Rasiah, Mahima Sharma, Miguel de Jesus, and Vivian Krause to the Light Reading team!
- Anna Funderburg and Ezekiel Haugen successfully defended their doctoral work! Tune in next time to hear from them!
- Manasa Sripati has joined the steering committee of Women of VISE!