WELCOME TO THE 'EMERGING PROFESSIONALS' ISSUE

By Michael Thuis

The modern student is entering an increasingly transient world. From artificial intelligence to quantum computing to climate change, the problems materials scientists and engineers face are growing more multifaceted. The next generation of ceramists must be prepared not only with a technical appreciation of their field but also a full social, ethical, and professional understanding to craft a successful career.

For students, fulfilling all these expectations is difficult to navigate alone. That is why, as an ACerS community, we are building a home for students to equip themselves with these essential skills and tools.

The 2023–2024 PCSA delegates at the PCSA annual meeting in October 2023.

The ACerS President's Council of Student Advisors is working this year to integrate these ideas further into the ACerS ecosystem. Halfway through 2024, the Council's 38 delegates, from 19 universities and five countries, have already expanded new and existing programs through the PCSA's five committees.

- **The Conference Programming Committee** arranged for student-focused activities at every ACerS conference in 2024. The Committee also created a conference guide to help students become oriented at their first conference.
- **The Professional Development Committee** continues to expand the library of ACerS student webinars focused on early career development. This expansion coincides with supporting IGNITE MSE, a new professional development program organized by the Ceramic and Glass Industry Foundation that runs in conjunction with select ACerS conferences.
- **The Education Committee** shared Materials Science Classroom Kit lessons and Mini Kits at the 2024 National Science Teaching Association conference, which is the largest conference for science teachers in the U.S.
- **The Recruitment and Retention Committee** worked tirelessly last year to recruit leaders from the ACerS community from nontraditional backgrounds, with a particular focus toward fostering the ACerS community in Africa. Their work allowed this year's PCSA delegation to be the largest to date.
- **The Communications Committee** continues to grow the PCSA's social media presence and is working to communicate PCSA initiatives with a broader scientific audience.

The PCSA Communications Committee also led the rebranding and expansion of the annual student section in this year's June/July *Bulletin*. The new "Emerging Professionals" section aims to better showcase young ACerS members along every step of their journey, from undergraduates to recent graduates. The section consists of two parts:

- **Research articles**: Three full-page articles describe research based on this issue's theme, "Ceramics for digital technologies." These articles are contributed by Material Advantage, Global Graduate Research Network, and Young Professionals Network members.
- **"Science for Society" articles**: This two-page spread features three stories on the IGNITE MSE poster topics of outreach and community engagement; technology for social good; and inclusivity, diversity, and ethics in research.

This year also features two bonus articles contributed by ACerS members and staff, which describe the need for inclusivity in Q&A sessions at scientific conferences and the success of new diversity scholarships funded by ACerS, respectively.

I hope you find this year's "Emerging Professionals" issue of the *ACerS Bulletin* insightful.

Michael Thuis is a Ph.D. candidate at Northwestern University studying in the Haile Lab. As the 2023–2024 PCSA Council Chair, he has worked to expand the presences of the PCSA in the ACerS community while sharing lessons learned. ■

New architectures and materials for electronic packaging

By Javier Mena-Garcia

It can be difficult to imagine our daily routine without the electronic devices and gadgets that enable everything from our energy infrastructures to transportation systems to communication networks. The importance of electronics to modern life is recognized by the outpouring of funding and initiatives in recent years to support the manufacture of semiconductor chips,[1] which form the heart of today's electronics.

Developing new ways to package semiconductor chips is a focus of these programs. Traditionally, the performance of electronic devices was improved by making semiconductors smaller, which allowed more to be placed on each chip and increased processing power. However, semiconductors are now so small they are running up against the laws of physics. So, instead of shrinking chips further, designing novel strategies for combining (packaging) semiconductors together can reduce power consumption and increase processing power.[2]

3D packaging is an emerging approach to chip design that involves using traditional circuit connection methods to achieve vertical stacking of memory layers directly on a processor chip. This architecture provides the benefits of miniaturization while also reducing the time required for data transfer due to the processing and memory chips being closer together. To make the most use out of this architecture, however, ferroelectric materials that can be deposited at low temperatures on the chip must be developed.[3]

In addition to new architectures, designing materials with enhanced electrical and thermal properties is another way to improve the performance of electronics. For example, ceramic matrix composites (CMCs) may play a role in future circuits.

CMCs consist of fibers, modifiers, and filler materials placed within a ceramic matrix. CMCs are frequently talked about in the context of aerospace structural components, but they are also being considered for use in electronics because, depending on the fillers, they can exhibit higher thermal conductivity and higher electrical resistivity while simultaneously preserving a low dielectric loss.

As a Ph.D. candidate in professor Clive Randall's group at The Pennsylvania State University, I have investigated the feasibility of fabricating CMCs for electronics using cold sintering.[4] Cold sintering uses a transient transport phase (typically liquid) and pressure to enable densification of a ceramic system at much lower temperatures than traditional methods.[5]

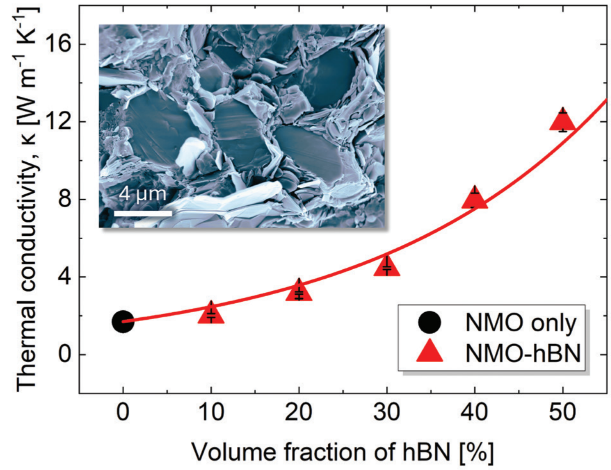

Figure 1. Inset picture: Scanning electron microscopy image of engineered microstructure of sodium molybdate (NMO) with 40 vol.% of hexagonal boron nitride (hBN) filler, enabled by cold sintering. Main graph: Improvement of thermal conductivity as a function of filler volume fraction. Adapted from Reference 5.

To achieve CMCs with low dielectric loss and enhanced thermal conductivity, we engineered grain boundaries in the ceramic matrix using filler materials with strong covalent bonds and wide band gaps, such as hexagonal boron nitride and diamond (Figure 1). The integration of these fillers into the CMC also decreased the composite's effective relative permittivity, brought the thermal coefficient of resonance frequency closer to zero, and improved the electrical insulation breakdown strength.

I feel fortunate to conduct research that advances the electronics field. The scientific discoveries and inventions we have and will make are key to realizing a more sustainable world.

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Javier Mena-Garcia is a Ph.D. candidate in materials science and engineering at The Pennsylvania State University. He studies structure–property relationships in ceramic matrix composites enabled by cold sintering. He is a Fulbright alumnus from Mexico, who enjoys going on long road trips with his wife, Cristy, and playing basketball. ■

ACerS Global Graduate Research Network

ACerS Global Graduate Researcher Network (GGRN) membership addresses the professional and career development needs of graduate-level research students who have a primary interest in ceramics and glass. Learn more at https://ceramics.org/ggrn.

The ins and outs of multilayer ceramic capacitors

By Sevag Momjian

Long gone are the days when computers filled an entire room. Now, digital devices the size of your palm can perform operations in seconds that used to take computers days.

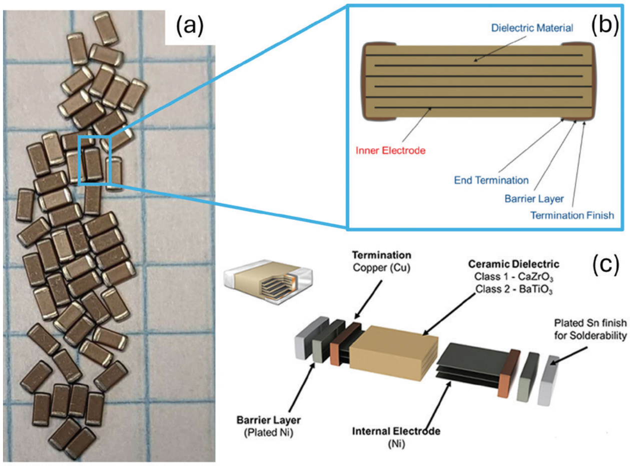
Miniaturization of these electronic packages results from smaller circuit components and compact hybrid integrated circuit designs. These circuits consist of active and passive components. Active components, such as transistors, perform all computational and memory processes. Passive components supply charge to the processing chips.

Multilayer ceramic capacitors (MLCCs) are one of the most common passive components (Figure 1a). MLCCs serve various roles in electronic packaging, including as energy storage devices, transient energy suppliers, and noise filters for electromagnetic signals. In general, MLCCs consist of dielectric (electrically insulating) materials placed between metal electrodes, typically nickel or silver-palladium alloys, in thin alternating layers (Figure 1b). These electrodes are connected on opposite sides of a metal termination layer (Figure 1c).

There are two main classes of dielectrics used in MLCCs. Class I or "linear" dielectrics are stable and reliable over a wide temperature range but store less energy per volume. Class II or "nonlinear" dielectrics store more energy per volume but have a smaller operating temperature range and are less stable. $BaTiO_3$, which undergoes a phase transition from the ferroelectric to paraelectric phase at 125°C, is a Class II dielectric.[1] This phase transition limits the operating temperature range for $BaTiO_3$-based MLCCs, but it remains the preferred dielectric in hybrid integrated circuits due to the need for high volumetric efficiency.

MLCCs are produced by a co-firing process. First, nanoscale ceramic powder is mixed with a plasticizer and binder to form a slurry, which is then tape cast and dried into a large sheet. Next, metal electrodes are screen printed onto these sheets, which are then stacked, laminated, and cut into shape. Following burnout of the binder at about 400°C, the MLCCs are co-fired at about 1,200°C, which densifies and fuses the dielectric and electrode layer. Finally, metal termination layers are applied.

MLCC technology has advanced the miniaturization trend by reducing layer thickness to less than a micron and increasing the number of layers to hundreds, achieving typical dimensions of about 0.02 inches by 0.01 inches. But while decreasing layer thickness enhances capacitive volumetric efficiency, it poses challenges to reliability. Heightened electric fields within the thinner layers accelerates diffusion of oxygen vacancies to the ceramic–electrode interface, causing degradation.[2] For this reason, MLCCs account for about 30% of failures in hybrid integrated circuits.



Credit: (a) Sevag Momjian; (b,c) KEMET Corporation

Figure 1. (a) Typical MLCCs used in hybrid integrated circuits. (b) Schematic of basic MLCC with alternating electrode (gray) and dielectric (beige) layers. (c) Structure and material makeup of an MLCC.

Finding a balance between volumetric efficiency and reliability requires advances in manufacturing and particle design. Manufacturing advances include fast firing in the initial co-firing step, which reduces interface roughness and differences in a layer's thickness. A second firing step at a lower temperature and higher oxygen partial pressure oxidizes the $BaTiO_3$–metal interface, which moves oxygen vacancies away from the interface and into the $BaTiO_3$ grains.

Regarding particle design, decreasing particle size results in smaller grains with more grain boundaries, which can act as barriers to the migration of oxygen vacancies and improve reliability. Compositional engineering can lower oxygen vacancy concentrations as well and improve the dielectric's temperature stability.

New models and tests are also being developed to understand and predict the degradation behavior and lifetime of MLCCs. These methods, when paired with our knowledge of defect and crystal chemistry, further guide innovations in dielectric design.

Together, this partnership between modeling and experimentation will help guide development of next-generation MLCCs.

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Sevag Momjian is a Ph.D. candidate at The Pennsylvania State University in professor Clive Randall's group. He studies the cold sintering of dielectrics materials and the mechanisms enabling such densification. Outside of school, he enjoys playing soccer, tennis, and cooking. ■

From experiment to digital-powered materials science: My transition from academia to research at Leonardo Labs

By Alessandro De Zanet

Materials research and digital technologies are extremely intertwined fields nowadays. On the one hand, advanced materials are core components of the state-of-the-art computing, communication, and sensing technologies that make our world go round. On the other hand, systems powered by artificial intelligence and high-performance computing architectures are enabling the rapid design, analysis, and upscaling of new materials.

The increasing importance of and reliance on computational tools to advanced materials research has been discussed in some previous *Bulletin* articles.[1,2] The topic gained new relevance to me after I graduated with my Ph.D. and entered the workforce as a Research Fellow at Leonardo Labs in April 2023.

Leonardo Labs are extensions of Leonardo (Rome, Italy), a global player in the aerospace and defense sector. These technological hubs, which are spread across the entire Italian peninsula, create synergies with local research ecosystems and Leonardo manufacturing sites. They focus on the research and development of cutting-edge technologies in several research areas, including Materials Technologies, Quantum Technologies, and Applied Artificial Intelligence, to name a few.

I work in the Materials Technologies area at Leonardo Labs in Rome, Italy. In my role, I carry out research on adhesion technologies and ceramic materials, with a strong focus on the importance of digitalization at all stages of the product development process, from early stages to its release and often beyond.

Before joining Leonardo Labs, I conducted mainly experimental work for my Ph.D. research on nonoxide ceramic matrix composite joints. This research was interesting and allowed me to acquire a lot of materials knowledge and experimental skills, but I only had a small taste of everything that falls under the umbrella of computational tools.

In the fast-paced world of industry, however, relying only on experimental methods to identify and develop new materials and processes will not let you keep pace with your competitors. For this reason, I have dedicated myself to enriching my toolkit as an experimental researcher with new computational skills.

For instance, I am exploring the use of finite element analysis (FEA) to virtually assess dissimilar joints and coatings. I use existing data for model pre-validation and training, and then I use the model to determine the most promising solutions for real-world testing. To improve predictability of the FEA model, we follow an iterative process: compare virtual results with real experiment outcomes, adjust the model based on discrepancies, and refine through multiple cycles. This process of continuous validation and adjustment enhances the model's accuracy, making our predictions more reliable over time.

Executing these simulations, however, requires a balance between achieving high accuracy and managing computational time demands. Fortunately, our organization benefits from access to a proprietary supercomputer named davinci-1.[3] The davinci-1 supercomputer plays a pivotal role in our company's ambitious strategy of achieving comprehensive digitalization and integration of artificial intelligence across all processes. Its computational abilities free us from the typical constraints of processing power, thus allowing us to perform extensive simulations involving complex models swiftly and without sacrificing accuracy.

Of course, even as I am dedicating myself to enriching my toolkit, it is impractical to master every skill. Fostering collaborations with experts from diverse backgrounds and expertise becomes essential, and fortunately Leonardo Labs is structured to allow for such cross-disciplinary collaborations, internally and externally.

As I continue to advance in my professional career, I look forward to the collaboration and upskilling opportunities that Leonardo Labs affords me. But I also want to note the importance of actively participating in international professional societies, such as ACerS. These societies allow for interaction with professionals from all sectors and to stay updated on the main trends in the world of ceramics and the broader materials research community.

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Alessandro De Zanet is a Materials Research Fellow at Leonardo Labs (Rome, Italy). His research focuses on adhesion technologies and the development of innovative ceramic-based solutions to address materials challenges. He is co-chair of the ACerS Young Professionals Network. Beyond his professional pursuits, Alessandro is passionate about spending quality time with family and friends. ■

SCIENCE FOR SOCIETY

IGNITE MSE: Igniting student passion for materials research

For many ACerS members, their passion for materials research is driven by a desire to create a positive impact on society through their scientific endeavors. ACerS student members can share this passion at ACerS conferences through IGNITE MSE, a special student professional development event organized by the Ceramic and Glass Industry Foundation.

IGNITE MSE poster sessions are designed to showcase the human side of research, with submissions focused on outreach and community engagement; technology for social good; and inclusivity, diversity, and ethics in research.

Drawing on this format, we have invited student-written articles from each of these topic areas for the June/July *Bulletin*. Read the articles below and learn more about IGNITE MSE by visiting https://foundation.ceramics.org/ignite-mse.

IGNITE MSE

Navigating through the noise: Key factors for effective outreach in an age of information overload

[OUTREACH AND COMMUNITY ENGAGEMENT]

By Rishabh Kundu

In an era where billions of gigabytes of data are generated daily,[1] effectively disseminating information—particularly in scientific realms—presents significant challenges. Hence, strategic approaches to outreach and community engagement become imperative.

Through insights gained from more than five years of engagement in outreach initiatives, I aim to highlight several essential factors that can significantly aid in fruitfully getting the word out about science.

Target audience

Identifying a specific audience and tailoring your content for them will allow information to be communicated more effectively. While aspiring to engage a wide and varied demographic is commendable, crafting a "one-size-fits-all" delivery approach is challenging when you consider the diverse viewpoints held by each individual, as influenced by their age and cultural background.

Appropriate platform

Once you have established the target audience, it is important to determine their primary sources/platforms of information. Attempting to engage teenagers effectively through LinkedIn, for instance, would not be ideal because they typically do not use that platform.

Engaging content

Even with the right place (*appropriate platform*) and the right people (*target audience*), the content needs to be engaging to capture and hold the audience's attention. For example, when introducing high school students to materials science at institutional open house days, I incorporate interactive elements into my demonstration, such as posing questions with multiple correct answers. This format keeps all avenues of engagement open regardless of their response—and an engaged audience is an attentive audience.

Feedback

While we may be passionate about the topics we are promoting, it is ultimately the audience's interest we must spike. So, seeking feedback from the target audience is crucial to supporting effective engagement. I learned the value of feedback during my undergraduate studies, when I delivered a presentation on heat shields to high school students. I crafted the presentation based on my interests, but the students expressed boredom and disinterest in the subject matter. Though initially disheartening, their feedback taught me a valuable lesson—what inspires me may not necessarily captivate others. So, I revised the content based on their feedback, resulting in a more effective presentation.

Iteration

Outreach is a recursive process, meaning it requires timely follow-ups to maintain engagement and retention. Even if you develop an engaging content plan that ticks all the boxes above, information is quickly forgotten if you do not review or revisit it again.[2]

This list is not exhaustive, and I welcome feedback and discussions from peers involved in outreach activities or those motivated to embark on such endeavors.

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Rishabh Kundu is an incoming Ph.D. student at Case Western Reserve University. He has been recognized as an ACerS Global Ambassador and is highly engaged in outreach efforts focusing on materials science and sustainability. Contact Rishabh at kundurishabh@gmail.com. ■

From Himalayan roots to technological heights: Experiencing the impact of science on society

TECHNOLOGY FOR SOCIAL GOOD

By Seema Negi

Technological advancements and innovations do not happen in a void; as innocuous as a development may seem, new devices are bound to have some level of impact on society. Whether this impact is beneficial or not, however, is an open question.

My first encounter with the impact that technology can have on local communities was in my childhood home of Thatyur, a small village in the Himalayan heartland of Uttarakhand, India. A defining moment in the history of this area was the construction of the Tehri Dam, the tallest dam in India. This significant development reshaped the landscape and required the mass relocation of many villages and their inhabitants. But it also brought new job opportunities that many members of my community, including my relatives, embraced. Our school trips to the dam further fueled my interest in engineering, showing me the tangible benefits of technology in our daily lives.

In 2007, I gained a deeper appreciation for how technology can address social and environmental issues during my time at Govind Ballabh Pant Engineering College in Pauri. As a member of the robotics club, I built robots using recycled materials, a project that showcased the possibilities for sustainable manufacturing. In addition, the lack of internet access meant we had to rely on books and senior students' knowledge, which emphasized to me the importance of shared knowledge and resourcefulness in technological innovation.

In 2014, when I was studying materials science at the Indian Institute of Technology Gandhinagar, I became the senior student sharing their knowledge when I taught students from institutes with fewer resources about various advanced material characterization techniques. This experience showed me the power of technology in promoting educational equity.

Later during my studies, in 2017, I was introduced to the world of 3D printing. I researched and demonstrated that a cheap resin printer can be used to 3D print ceramics. This demonstration shows the possibilities for resource-constrained colleges and universities to partake in basic 3D printing research as well.

My work with ceramic slurries for 3D printing helped accelerate the development of a silver-based ink with higher stability. This ink is now being used in an educational project called "Electricity on Paper," which teaches electrical concepts to kids.

Reflecting on my journey, I see technology as a bridge connecting individuals, ideas, and solutions, surpassing geographical and resource limitations. My experiences affirm the role of technology as a catalyst for social good.

Seema Negi is a Ph.D. candidate at the Indian Institute of Technology Bombay who develops photosensitive ceramic slurries for 3D-printed ceramics. In her spare time, Seema enjoys dancing, knitting, and cooking. ■

Alloying my love of pottery with my love of materials science

INCLUSIVITY, DIVERSITY, AND ETHICS IN RESEARCH

By Alex I. Tam

Growing up, my father drilled into me that "the hard work of today is the success of tomorrow." Rather poetically, this mantra is reflected in my Chinese name, which contains the character for "complete."

As a child, I would grip my pencil so tightly while completing assignments that it left indents in my hand. Outside of school, I worked in my maternal grandmother's antique shop, helping sell porcelain pillows, antiques, and clay idols.

This job gave me an interest in art, and in both middle school and college, I spent time working on pottery and porcelain at the town's craft center. During that time, I experimented briefly with crazing, which involves choosing glazes with different thermal expansion coefficients than the base ceramic so a web of tiny cracks will appear and cover the final surface.

This love of pottery and crazing, in addition to my interest in studying the Japanese language, led to my discovery of the Japanese artform of kintsugi. In contrast to crazing, which only introduces small line fractures into the glaze, kintsugi involves breaking the entire ceramic vessel and then joining the pieces back together using lacquer and gold. The repaired ceramic gives the effect of permanent evanescence because the breaking of a singular moment is captured in all eternity.

This idea that something can be complete "because of" rather than "despite" the cracks is echoed in my undergraduate studies in materials science. Engineering of grain boundaries is a major tool in the design of ceramics and composite materials. By deliberately introducing cracks into a ceramic's microstructures, it can halt the transmission of defects while increasing the material's strength.

These lessons from pottery and materials science about "completeness" changed my understanding of the concept. Like everyone, I am not without my internal contradictions. But these flaws play a role in bolstering my character and integrity.

In addition, my memories working in the antique shop and listening to my father's and grandparents' stories help me cherish my current opportunities: my grandparents never went to university as I am doing now. So, through my internal flaws and bonds with others, I can learn to improve myself, thus living up to my "complete" name.

Alex I. Tam is a third-year undergraduate student at the University of California, Davis, working with professor Subhash H. Risbud on the characterization of novel superconductors and professor Mingwei Zhang on the characterization of novel high-entropy alloys. His hobbies include studying other languages, reading history books, and experimenting with porcelain. ■

DEI at ACerS

The American Ceramic Society values and seeks diverse and inclusive participation within the field of ceramic science and engineering. Learn more about how you can foster diversity, inclusivity, and equity in the sciences on the ACerS "Fostering equity in science" resource page at https://ceramics.org/fostering-DEI.

More inclusive Q&A sessions will lead to more learning

By Chris Rom

Conference presentations and academic seminars are a key way to share ideas across institutions and build networks with other researchers. However, the question and answer (Q&A) sessions that follow are not fully inclusive: Women ask fewer questions than their share of the audience.[1]

This finding comes from a study led by Alecia Carter, professor in evolutionary anthropology at University College London. Her team collected data from 247 academic seminars across biology and psychology departments in 10 different countries, counting the men and women in the audience and tallying the questions asked by each group. They found that, on average, women composed 51% of the audiences but asked only 32% of the questions.

Frustrated by the inequity their work revealed, I wondered: Does this problem happen in my communities of ceramics and solid-state chemistry? I replicated their methods at the public talks I attended during my graduate and postdoc studies.* Figure 1 shows that this imbalance also affects my communities, including at a recent ACerS conference.

Q&A sessions provide the benefits of additional learning and enhanced visibility for audience members who ask questions, but women are missing out on these benefits. As a community, we also miss out on the thought-provoking questions that would be asked if Q&A sessions were fully inclusive.

We can and should do better, but how? Raising awareness helps. In 2015, Stanford University graduate student Natalie Telis and colleagues noticed a huge imbalance in the Q&A sessions at the genetics conference they were attending.[2] They discussed the issue on Twitter, which led to a mid-conference presentation on the problem along with a rule change: The first question after each talk must come from a student. Subsequent Q&A sessions at that conference were nearly, though not quite, gender balanced.

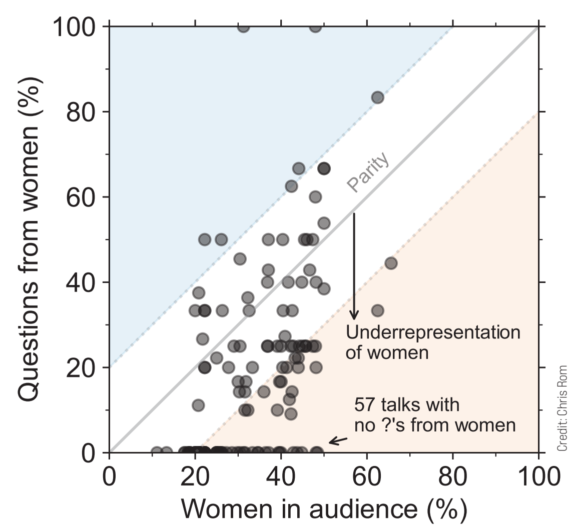

Figure 1. Percentage of women in the audience versus the percentage of questions from women (n = 133 Q&A sessions). Data were collected at in-person conference presentations and academic seminars attended by the author between 2018 and 2024.

Another approach is to pause between the talk and Q&A session so audience members can discuss amongst themselves. Carter et al. suggested that this strategy may help by "[giving] people time to formulate a question and try it out on a colleague."[1] However, evidence on the classroom equivalent of this Q&A strategy (the think-pair-share pedagogical technique) suggests it may not lead to more inclusive public Q&A.[3]

A third option is to enable audience members to ask questions anonymously to remove the pressure of off-the-cuff public speaking. Various online platforms exist to anonymously solicit questions via a QR code, such as Slido and Google forms. But this approach comes at the cost of visibility for those who ask questions.

Despite the tradeoffs with each method, I believe they are better options than the status quo. We should experiment and assess how effective these and other strategies are at encouraging participation from all types of people. If we improve the format of Q&A sessions, we will become more effective at learning from each other and solving big challenges.

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About the author

Chris Rom is a postdoctoral researcher at the National Renewable Energy Laboratory, where he works on new materials for semiconductors, batteries, and magnets. Contact Rom at christopher.rom@nrel.gov. ■

*I did not count nonbinary attendees or question-askers to protect their privacy, as small datasets risk being identifiable (ethical approval CSU IRB #3835).

Celebrating underrepresented students with the CGIF's Underrepresented Student Scholarship Fund

By Helen Widman

The Underrepresented Student Scholarship Fund, a program sponsored by the Ceramic and Glass Industry Foundation (CGIF) and ACerS, serves to support underrepresented undergraduate students studying materials science. The CGIF partners with the National Society of Black Engineers (NSBE) and the Society for Hispanic Professional Engineers (SHPE) on this annual scholarship.

In 2023, the CGIF awarded three students with the scholarship: Megan Bynoe (NSBE), Alejandra Almaraz (SHPE), and Fernanda Garcia (SHPE). Learn more about each student's research and goals in the bios on this page.

Help the CGIF support underrepresented students in materials science by contributing to the Underrepresented Student Scholarship Fund at https://ceramics.org/donate. ■

Megan Bynoe, NSBE

Bynoe is a fourth-year undergraduate student in materials science and engineering at Rutgers, The State University of New Jersey. The goal of her research is to create 3D-printed ceramics for aerospace applications, and her dream role after graduation in 2024 involves continuing to work in the aerospace industry. She is also an ambassador for the Rutgers School of Engineering, where she gives tours to prospective engineering students and emphasizes the importance of diversity in the engineering field.

"I think the beauty of bringing in diversity is that you're always going to have different diversity of thought with that, too. I think that is really important because that's how you can move on, that's how you can be challenged, that's how new ideas come about."

– Megan Bynoe

Full profile: https://foundation.ceramics.org/cgif-news/megan-bynoe

Alejandra Almaraz, SHPE

Almaraz is president of SHPE at Boise State University in Idaho, where she studies materials science and engineering. She uses aerosol jet printing to deposit nanoparticle-based inks consisting of titanium carbide MXenes. She hopes to one day use her research to combine materials science with biomedical applications while also encouraging women and Hispanic youth to pursue careers in STEM. She also serves as an officer of the Society of Women Engineers.

"I just think it is super important to have all the different perspectives and for young minds to be able to see that people of color and women are welcome in fields that are traditionally white male dominated."

– Alejandra Almaraz

Full profile: https://foundation.ceramics.org/cgif-news/alejandra-almaraz

Fernanda Garcia, SHPE

Garcia is a materials science and engineering student at California Polytechnic State University. She conducted her senior project on batteries and polymers and knows that she wants her future career in materials science to provide opportunities for giving back to young women in STEM. She feels passionate about supporting migrant students in STEM through her volunteer efforts, such as at Girls in Engineering Camp, Baskin Girls in Engineering Camp, and The Mary Louise Academy Summerfest engineering camp in New York, among others.

"Support comes in so many different shapes. Something that I encourage a lot of women to do is to get into science and to try it out and see if that's for them. There are a lot of females who are inside, who feel lonely, and would love to have more females. We're here to help. And for those who are already in STEM, I would say to just keep going: We're almost there."

– Fernanda Garcia

Full profile: https://foundation.ceramics.org/cgif-news/fernanda-garcia