



### Message from the Chair

Trevor Harding

Welcome to the winter issue of the Cal Poly Materials Engineering Department newsletter. We've included a year's-end [video](#) of department highlights for you to check out — and we're excited about the new year, too! You'll be seeing a number of new faculty faces in the department, as well as new opportunities for existing faculty. Among those we're welcoming: full-time lecturers **Yong Hao** and **Ryan Smith**, as well as **John Nelson** and **Eric Paton** who join us as part-time lecturers.

I'm also pleased to share that **Kathy Chen**, long-time MATE professor, is on leave for the 2017-18 academic year to serve as director of the Worcester Polytechnic Institute STEM Education Center. At the Center, Dr. Chen will be investigating ways to work with K-12 teachers to promote STEM education and careers to a wider diversity of individuals. This one-year leave of absence is directly in line with Dr. Chen's long-time passion at Cal Poly for STEM outreach and teacher education. We congratulate her on this thrilling new endeavor.

All of these changes are

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## 3-D Printing with Carbon Fiber

Cal Poly students' startup Mantis Composites awarded NSF grant

**M**ichael Chapiro, a materials engineering senior, can be excused for missing class.

He's one of four founders of a student startup recently awarded \$225,000 by the National Science Foundation as part of its Small Business Innovation Research program. The grant funds cutting-edge research with broad commercial applications, and all four entrepreneurs have taken a two-year leave of absence from their studies to work full time on the endeavor.

"We're the youngest team to ever win this grant," Chapiro, 24, chief technical officer, said about his team, which includes aerospace engineering majors **Ryan Dunn**, 21, chief executive officer, and **David Zilar**, 22, chief operations

officer, as well as electrical engineering major **Michael DeDelay**, 21.

Their company, Mantis Composites, has developed a multi-axis continuous carbon fiber 3-D printing system with high-temperature thermoplastics, primarily targeted for aerospace and high-performance automotive applications. Chapiro works on materials processing, selection and research, as well as business strategy and communications.

"This grant enabled us to develop technology that brings the full properties of carbon fiber composites to the kind of intricate high-performance parts that are impossible to make

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**"There's a lot of excitement right now surrounding metal 3-D printing, but carbon fiber's performance blows metal out of the water."**

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perfectly aligned with the Department's vision to create a community of scholars dedicated to transformative learning experiences for our students and creating a more sustainable future, while remaining true to our legacy areas of expertise in materials engineering.

Whether it's developing new battery technology to support more renewable energy storage, introducing students to the world of computer modeling, or deepening their knowledge of good-ol' steel, we believe strongly that the future of Cal Poly Materials Engineering is bright. Indeed, this year we welcomed our largest first-year class ever — 63 students. That brings our total enrollment to 209 students — one of the largest undergraduate materials engineering programs in the country.

As our students leave us to enter the working world, we see that they're being hired earlier and offered higher salaries than ever before.

We'd love to hear about your own achievements and personal stories. Update us [here](#), or you can reach the department by emailing [matedep@calpoly.edu](mailto:matedep@calpoly.edu).

I especially want to thank all of you who have given of your time and treasure to support the department over the years. Without your support the department would be severely limited in its ability to provide a nationally recognized education to hundreds of future materials engineers.

Whether your contribution is a gift, supporting a senior project, hiring an intern or serving on our advisory board, you have our deepest appreciation.

Wishing you a peaceful and blessed 2018!

**Trevor Harding**  
Chair, Materials Engineering

## MATE Memories Video:

<http://bit.ly/2FNvSlr>

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out of anything other than metals," said Chapiro. "It offers a faster, more affordable alternative for industry sectors where machined aluminum has been the only option."

Not to mention it's strong: The team believes it has produced the strongest material to be 3-D printed by weight, and stronger than aerospace-grade titanium in absolute terms.

"Unlike other current technologies, our process uses continuous carbon fiber to produce the strongest parts possible," said Chapiro. "By combining this with high-performance thermoplastic, we can produce parts that not only allow for faster turnaround times than machined parts, but have



The Mantis Composites team includes Cal Poly Engineering students, from left, Michael DeLay, David Zilar, Ryan Dunn and Michael Chapiro.

higher overall mechanical performance than commonly used metals.

"There's a lot of excitement right

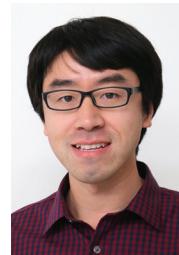
now surrounding metal 3-D printing," he said, "but carbon fiber's performance blows metal out of the water. Our system has numerous challenges, but could represent a dramatic leap in the capabilities of engineering in everything from transportation to space travel."

## Related link:

[www.mantiscomposites.com](http://www.mantiscomposites.com)

## New MATE Faculty

■ **Yong Hao** is fresh from Florida International University in Miami where he conducted post-doctoral research using nanotubes to enhance the performance of cutting-edge rechargeable battery and supercapacitor technologies. At Cal Poly, he's teaching in the area of electronic materials, and has developed a new course on electrochemical energy storage. He's currently working with materials engineering senior Glenn Lee on a research grant funded by Cal Poly to study lithium-sulfur batteries.



Yong Hao

a strong trend at graduate schools and in industry. Smith's post-doctoral studies at NCSU involved computer modeling of new stainless steel alloys that can withstand the radiation damage that plagues nuclear reactor materials.

■ **John Nelson** recently retired from China Lake Naval Air Warfare Center where he worked for more than three decades serving as a researcher and head of the materials engineering division. He brings a wealth of experience in the areas of metals, composites, failure analysis and, importantly, additive manufacturing. Nelson will be primarily teaching introductory lab courses and other first-year introductory courses, but he is similarly intent on working with students on senior projects and building collaborations across the College of Engineering.



John Nelson

■ **Ryan Smith** arrived at Cal Poly in September after crossing the country from North Carolina State University — in just three days. Similarly, he has created two new elective courses for the department in no time: His ferrous metallurgy course strengthens the department's offerings in an industrial sector that has been part of MATE's lineage since its founding, and his computational materials analysis course provides students the opportunity to predict material performance without the expense and time of physical experiments — which is



Ryan Smith



Eric Paton

■ After a 20-year career in the field of micro-electronic processing and founding several startups, **Eric Paton** (MATE, '95) is back on campus as a part-time lecturer, teaching Introduction to Materials Engineering.

# Hooked on Materials Engineering

*Ursula Krummel honored as first Cal Poly woman in metallurgy*

**U**rsula Krummel recently returned to the Materials Engineering Department for the first time since the 1960s — to be honored as the program's first woman in metallurgy. She was among the latest recipients of the Forgeng Hook award, which recognizes outstanding engagement with the department.

"The award was a total surprise, and you've really hooked me now," she said.

"My family emigrated from Germany when I was 17, and I was eager to pursue an engineering education in the U.S.," Krummel said. "I soon learned about Cal Poly, and that's where I dreamed of going — its hands-on approach was my ideal — but it was an all-male school at the time. So I took drafting classes at Valley Junior College in Van Nuys, Calif., which led to working with a graduate student at USC, correcting his work."

In 1961, when Cal Poly became co-ed, Krummel immediately enrolled.

"By that time, I was about seven years older than most of the students in my classes, and I was the only female in the program. The gender divide wasn't really



**Ursula Krummel**, center, was given a tour of the Materials Engineering Department by students, from left, Katherine Adelman, Jessica Fordham, Jada Evers and Allison Tuuri.

an issue, though. Due to my age and work experience, I was more of a motherly or big sister figure to the boys in my classes."

Krummel chose materials engineering because it "looks at the inside" of problems in a way that combines both science and engineering. "I was never afraid of using my hands, and I loved working in labs."

Though she had to leave Cal Poly before graduation to care for her mother in Southern California, she went on to enjoy a long and successful engineering career, including 20 years as lab supervisor in the failure analysis lab at Allied Signal (formally Bendix).

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## MATE Student Goes to Washington to Promote Materials Engineering

**D**ecisions made in the nation's capital have a tremendous effect on higher education. That's what brought **Juan Ortiz Salazar**, a Cal Poly materials engineering and political science senior, to Congressional Visit Days in Washington, D.C. last spring. Salazar was part of an elite national student delegation selected to educate Congress about the importance of research in materials engineering, science and manufacturing. The event was sponsored by Material Advantage, a national program for materials science and engineering students.

"It was a privilege — especially as a student — to meet face to face with Rep. Salud Carbajal (D-CA) at his Washington, D.C. office," said Salazar who was among 39 students from universities throughout the nation whose stories served as "real life" examples of the value of a materials engineering and research education — and the American Dream.

"Although I was born into poverty in Colombia, my father's resilience, love and dedication has allowed me to pursue a fruitful life," Salazar said. "After graduating from high school, I attended Pasadena City College for two years before transferring to Cal Poly where I'm currently pursuing degrees in both materials engineering and political science, with a global politics concentration."

Salazar's passions span a wide variety of disciplines, "I find constant pleasure in learning, and materials engineering is at the pinnacle in terms of inspiring my curiosity and expanding my expertise. Outside of my studies, I immerse myself in researching public policy, technology and federal R&D funding."

It was funding closer to home that enabled Salazar to represent Cal Poly in the nation's capital. The College of Engineering was able to cover his travel expenses from



This past spring, Materials Engineering student Juan Ortiz Salazar met with Rep. Salud Carbajal (D-CA) at his Washington D.C. office.

funds contributed to the college during #GivingTuesday, the 24-hour national day of giving.

"It was an extraordinary opportunity to be in our nation's capital and to feel a part of this vital democratic process," Salazar said.

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"Throughout my career, I was able to apply my skills all over the place — from metallurgy and integrated circuit boards to working on the first turbo component for the Lockheed Electra — and I credit Cal Poly for that ability."

While still a student at Cal Poly, she also led tours in Europe. "On one tour, there were some metallurgy students from MIT and I asked about the equipment they used and how they prepared samples. One of them responded that, 'I just look at the prepared samples and don't have to do the metallography.' I couldn't help but think, 'How would he know if his visual findings were correct and, without challenging himself, wouldn't it be pretty boring?' He only reinforced my appreciation for my metallurgy education at Cal Poly."

After a recent tour of MATE she marveled at the advances.

"Today's students have so many more opportunities. I'm jealous of all that equipment — especially the electronics. And I'm totally in awe of what Cal Poly students are accomplishing. Collaboration and interdisciplinarity is wired in now. In my day, we had to develop it ourselves, and we did. I also observed the cohesiveness between men and women at Cal Poly. Best of all, is seeing our students' outreach into the world — there could be no finer ambassadors of how Learn by Doing can make the world a better place."

Other recipients of this year's Forgeng Hook award included **Roger Benham**, (MATE, '84), a senior projects donor, and **Noni Smyth**, who retired as the department's administrative support coordinator in 2010 after more than 30 years of service

and then established the Smyth Humanitarian Award.

"It was a pleasure to meet Roger and Noni," Krummel said. "We're all so different, yet so similar in our deep connection to the department."

### About the Forgeng Hook Award

Following early retirement from research development at U.S. Steel in Pittsburgh, Penn. in 1980, **Bill Forgeng** became a professor in the Metallurgical Engineering Department (precursor of Materials Engineering) at Cal Poly, where he was particularly influential in the areas of metallography and ferrous metallurgy. His lasting legacy continues through the Forgeng Metallurgy Fund and, more recently, the Forgeng Hooks — more than 30 hand-forged coat hooks he made after retiring from Cal Poly that his wife, **Maureen**, and daughter, **Karen**, generously donated to the department to honor those who have made meaningful contributions to the department.



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