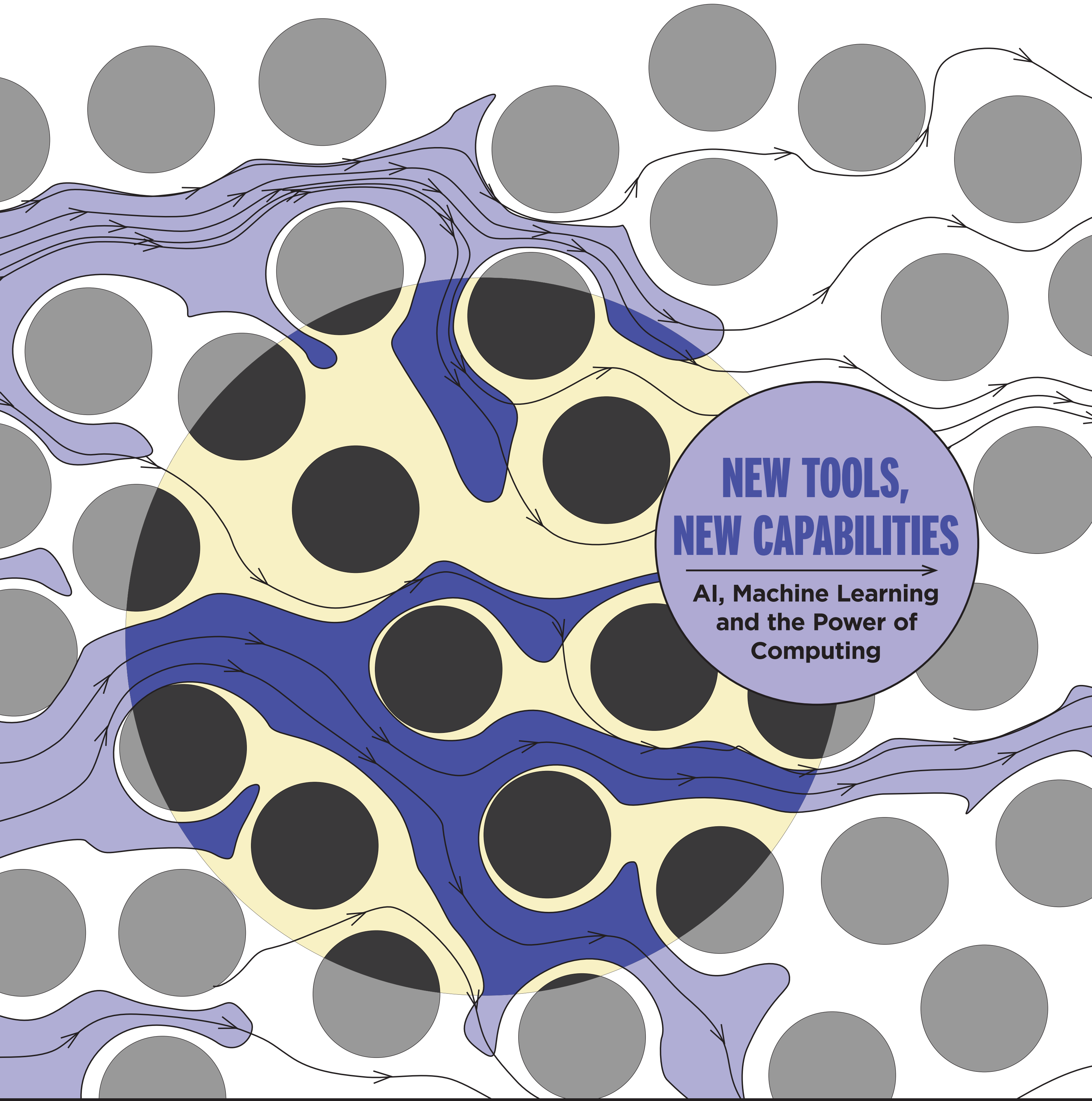
FALL 2021 | THE A. JAMES CLARK SCHOOL OF ENGINEERING

UNIVERSITY OF MARYLAND 1856

METRICS

MECHANICAL ENGINEERING AT MARYLAND



NEW TOOLS, NEW CAPABILITIES

AI, Machine Learning and the Power of Computing

Chair's Message

Dear Friends,

The advent of supercomputers and intelligent machines has opened up computing and data science horizons that engineering researchers could only dream of before. UMD mechanical engineering faculty are leading the way when it comes to realizing the potential of these new technologies. In this issue of *Metrics*, we highlight some of the exciting, cutting-edge work they are doing.

You'll learn about how Mark Fuge has been exploring the use of machine learning to improve outcomes for patients with congenital heart defects, how Johan Larsson utilizes supercomputers to arrive at more precise measurements of turbulence, and how Amir Riaz models phenomena that occur over large timescales, as is the case with carbon sequestration. We also feature an interview with Peter Chung, who envisions a future in which intelligent machines will not only conduct data mining on behalf of researchers, but even brainstorm research topics and identify promising avenues of inquiry.

Finally, we highlight ongoing work being done by our Center for Advanced Life Cycle Engineering, headed by Michael Pecht, using machine learning and AI techniques to identify product defects and counterfeit parts. All of this is only a snapshot of the computational research in progress at our department.

Of course, our faculty continue to make advances in many other areas as well. Over the past summer, Ryan Sochol made national news for a breakthrough in soft robotics; he and his students not only created an integrated fluidic circuit that vastly simplifies control processes, but devised a method for 3D printing a robotic hand in a single run. Meanwhile, Jelena Srebric and her team at City@UMD have developed a new, more comfortable type of personal protective equipment that can benefit workers who need protection against COVID-19 while on the job. I'm delighted to share with you the news that Dr. Srebric has been appointed Margaret G. and Frederick H. Kohloss Professor in the department.

This fall, we welcome the new dean of the A. James Clark School—and he is a mechanical engineer! Dr. Samuel Graham, Jr. comes to us from Georgia Tech, where he served as head of the George W. Woodruff School of Mechanical Engineering. Please join me in welcoming him as he prepares to take the Clark School to even greater heights.

As excited as I am about the creative and innovative spirit on display throughout our unit, I must also share some sad news. We mourn the loss of three of our highly esteemed faculty members—Distinguished University Professor Avram Bar-Cohen, Professor Emeritus and former A. James Clark School Dean George Dieter, and Professor Linda Schmidt—who passed away during the 2020-21 academic year. The legacy they have left behind is considerable and they will be sorely missed.

Meanwhile, our work continues. We hope you'll enjoy these updates on the rich, expansive world of mechanical engineering at UMD. And as we continue to navigate the post-pandemic environment and its challenges, I wish you health, happiness, and success in the months ahead.

Best regards,

Balakumar Balachandran
CHAIR AND MINTA MARTIN PROFESSOR
DEPARTMENT OF MECHANICAL ENGINEERING

TABLE OF CONTENTS

METRICS
MECHANICAL ENGINEERING AT MARYLAND

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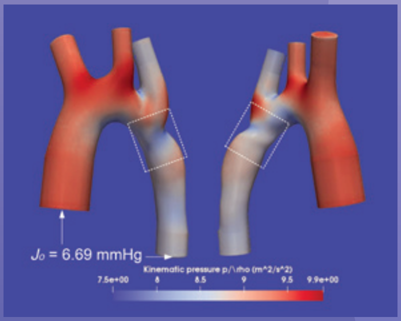
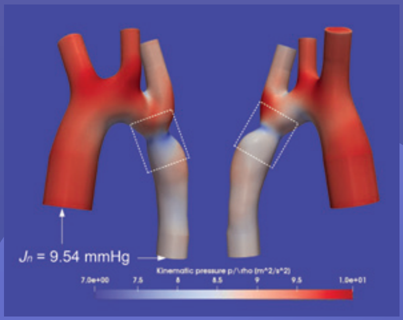
NEW TOOLS, NEW CAPABILITIES

AI, Machine Learning and the Power of Computing



A COMPARISON OF OPTIMIZED (ABOVE) AND NATIVE (BELOW) AORTA MODELS, SHOWING THE RESPECTIVE PRESSURE FIELD DISTRIBUTIONS. RESEARCHERS LIKE UMD ASSISTANT PROFESSOR MARK FUGE INCREASINGLY USE MODELING, SIMULATION, AND MACHINE LEARNING TO HELP BRING ABOUT ADVANCEMENTS IN TREATMENT.



Around nine out of 1,000 children born each year come into the world with misshapen hearts. These congenital defects, which hamper the flow of blood to the brain and body, can be deadly—and, until the early part of the 20th century, usually were.

Today, thanks to modern medicine, many children with heart defects go on to live healthy lives: CDC data puts the long-term survival rate at between 70% and 95%, depending on the severity of the case.

Now, engineers are using advanced technologies—including machine learning and 3D printing—to further refine the surgical procedures used to treat children with congenital heart defects. Among them is Mark Fuge, associate professor of mechanical engineering at the University of Maryland's A. James Clark School of Engineering, working in partnership with The University of Chicago Advocate Children's Hospital, Johns Hopkins University, and Children's National Hospital.

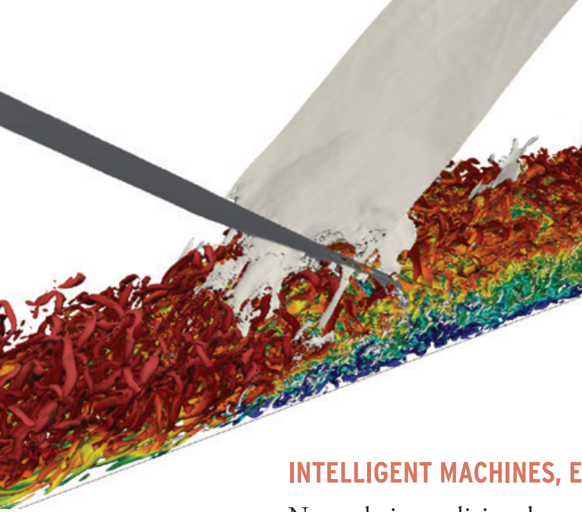
With the help of advanced computing technology, Fuge and his team of graduate students are taking aim at one of the thorniest problems affecting surgical treatment: the fact that no two hearts—or set of heart defects—are precisely the same.

"During some surgeries, tubes are inserted into the child's heart to ensure the blood flows to the places it needs to go," Fuge explains. "But the tubes are blunt instruments. Up until now, it's been difficult to customize them for individual patients—it requires weeks or even months to conduct the needed fluid simulations, and the patient just can't wait that long for the implant."

One solution: train a computer by feeding it data on congenital heart defects, and have it run simulations in advance. The results won't be spot-on for a given patient—but they'll be close enough to allow surgeons to design a better modification and plan an operation in the limited time the patient has.

"The idea here is to use machine learning algorithms to get as much work done in advance as we can, while time is not a factor," Fuge said. "We do what we can in advance, using our algorithms, so we have less to do when the patient needs an operation and time is critical."

"In this way, we can customize treatment and do so with great efficiency," Fuge said. "And that translates into improved outcomes for the patient."



SHOCK WAVES, DEPICTED HERE AS WHITE SHEETS, INTERACT WITH TURBULENT EDDIES (THE WORM-LIKE, COLORED STRUCTURES) IN THE FLOW OVER A FLAT SURFACE. UMD MECHANICAL ENGINEERING PROFESSOR JOHAN LARSSON IS USING ADVANCED COMPUTING TECHNOLOGY TO REFINE OUR UNDERSTANDING OF TURBULENCE, A PHENOMENON CHARACTERIZED BY A FORMIDABLE DEGREE OF MATHEMATICAL COMPLEXITY.

INTELLIGENT MACHINES, ENHANCED PROBLEM-SOLVING CAPABILITIES

Not only in medicine, but across an almost limitless range of fields, advanced computing technologies help humans solve problems that, in the past, posed intractable barriers due to their mathematical complexity. A high-powered computer solves equations that would take a human years to tackle; moreover, it can do so for multiple data sets. In addition, an intelligent machine can train itself and also teach other machines. All of this adds up to a "force multiplier" that can revolutionize an entire field, not unlike the way the internal combustion engine revolutionized transportation.

Take, for example, the Navier-Stokes equations, used to model different kinds of flows, from ocean currents to the movement of air around an airplane wing. The equations are computationally intense and, indeed, often impossible for a human engineer to solve with the precision needed for practical application. Though these equations date from the 1800s, it required the advent of computers in the early 20th century to make them truly usable.

Now, with supercomputers, engineers such as UMD Associate Professor Johan Larsson are able to harness these equations to arrive at a more precise understanding of turbulence, a phenomenon encompassing everything from disrupted airflow over an airplane's wings to the motion of air inside a convection oven.

"When I tell people that I work on turbulence, 99% say 'oh, you mean when the plane is bumpy?'," Larsson said. "But that's only one example. The flow inside your dishwasher is turbulence. So is the flow inside the engine of your car. If you light a cigarette, you can see that the smoke does not go in a straight line—it billows. That's because the background air flow is turbulent. The easiest to see is water flow in a river: if you look down and see it undulating, you're seeing turbulence."

Makers of vehicles—whether for land, sea, or air—are particularly interested in turbulence because it impacts the amount of friction produced as the vehicle moves, and thus has a direct bearing on energy efficiency. When the flow around a vehicle is laminar—that is, with molecules moving in an organized manner, like cars in separate lanes—friction is lower. Turbulent flows ratchet up the

FOR MORE THAN 20 YEARS,

Michael Pecht and his team at the Center for Advanced Life Cycle Engineering have been using artificial intelligence (AI) and machine learning techniques to help customers—ranging from Microsoft, Dell Computers, and General Motors to the Department of Defense and NASA—track the health of electronic components, energy systems, and other critical elements.

In many cases that includes detecting counterfeit parts that may have been introduced at some point in the supply chain, affecting the reliability and security of the system. The algo-

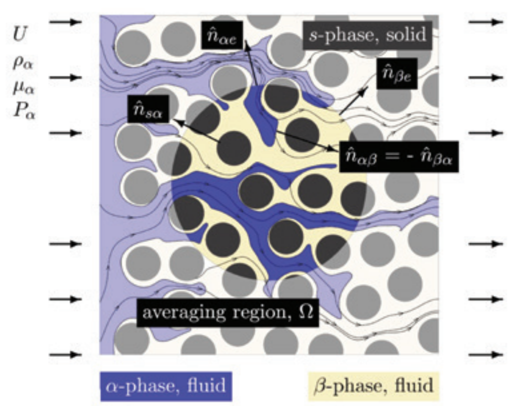
AN INTELLIGENT MACHINE CAN TRAIN ITSELF AND ALSO TEACH OTHER MACHINES.

level of friction, and thus the amount of power needed to keep the vehicle moving.

Advanced computing has been a game-changer in the study of turbulence, according to Larsson. In fact, even with smart supercomputers available, the mathematics used to describe these fields is still incredibly complex—so much so that the machines can still only deliver an estimate. But it's an estimate far more precise than anything that humans could come up with alone.

"It boggles the mind," Larsson said. "Even with the fastest supercomputer today, if we ask it to solve the Navier-Stokes equations in order to describe the flow around an airplane, it could run for a hundred years and still not solve it fully. The complexity is that great. What we can do, however, is use advanced computers to draw up turbulence models, which rely on simplified—yet reasonably accurate—versions of the equations."

"If the model is intelligently designed, then it gives you an accurate prediction. And often that's enough to bring about real engineering advances, while also reducing the need for full-scale testing," he said.



A GRAPHIC BASED ON SIMULATION RESULTS DEPICTS THE DISPLACEMENT OF A HYDROPHOBIC RESIDENT FLUID OF LOW VISCOSITY BY A HYDROPHILIC FLUID OF HIGHER VISCOSITY THROUGH A MICROSCOPE PORE SPACE—A PHENOMENON BEING STUDIED BY UMD MECHANICAL ENGINEERING ASSOCIATE PROFESSOR AMIR RIAZ WITH SUPPORT FROM THE DEPARTMENT OF ENERGY. TWO-PHASE FLOWS OF THIS KIND ARE TYPICAL OF OIL AND GAS RESERVOIRS, AS WELL AS SALINE CO2 STORAGE.

rithms developed at CALCE can hone in on the tell-tale idiosyncrasies that characterize an inauthentic component.

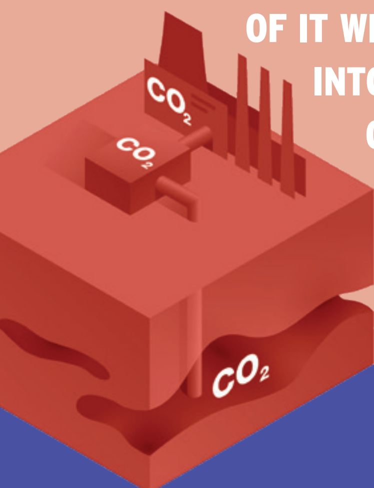
Now, CALCE researchers are applying their AI expertise to the subject of AI itself, by training machines to use pattern and keyword recognition to gauge where AI advances are taking place.

"It's an outgrowth of the work we've been doing on applying AI techniques at the component and system level," Pecht said. "Along the way, we began using AI to determine who is using AI, who is developing it. We use AI categorization methods to determine which countries are writing particular types of patents, which countries are doing advanced research in AI, and what kind of advances are happening in AI."

The team's findings suggest that China currently leads in many aspects of AI development, not only in the number of people working in the field and the breath of projects under way, but also in the implementation by government-run companies. The United States is a close second. Beyond these country-specific trends, however, CALCE researchers see evidence that interest in AI is becoming pervasive, with fields ranging from political science, agriculture, biology to linguistics making use of it.

"AI isn't just for computer scientists and engineers anymore," Pecht said. "No matter what field you're in, you're probably going to be involved with AI in some form or another."

> **"WE NEED TO BE ABLE TO PREDICT WHAT WILL HAPPEN TO THE SEQUESTERED CARBON—HOW MUCH OF IT WILL LEAK BACK OUT INTO THE ATMOSPHERE OVER TIME. AND WE CAN'T JUST WAIT A HUNDRED YEARS TO FIND OUT."**



ADDITIONAL MACHINE LEARNING-BASED RESEARCH AT UMD ME

Numerous faculty members at UMD's department of mechanical engineering are involved in research that leverages AI, machine learning, and advanced computing.

In addition to PETER CHUNG, MARK FUGE, JOHAN LARSSON, and AMIR RIAZ, they include department chair and Minta Martin Professor BALA BALACHANDRAN, Center for Risk and Reliability Director MOHAMMAD MODARRES, and City@UMD Director JELENA SREBRIC.







MODELING EVENTS OVER LARGE TIME SCALES

Some problems are not only inherently complex, but also difficult to address because they require experimental observation over a period exceeding the human lifespan. Carbon sequestration is one example. As part of the effort to reduce the amount of carbon produced by power plants, vehicles, and other atmospheric polluters, engineers have devised ways to collect the excess carbon and store it somewhere else—usually underground in a saline aquifer or oil reservoir.

Amir Riaz, associate professor of mechanical engineering at UMD, has conducted extensive research in this area. "With carbon dioxide levels having reached 450 parts per billion, and the level continuing to rise at a very high rate, there's a critical need to reduce our carbon footprint. Sequestration is one way to do that," he said.

"But we need to be able to predict what will happen to the sequestered carbon—how much of it will leak back out into the atmosphere over time," Riaz said. "And we can't just wait a hundred years to find out."

The solution? Use supercomputers to run numerical models that can provide a reasonably accurate description of how a physical system will behave over long periods of time. The models rely on partial differential equations that must be solved for time-steps that can range from a million to over a billion—and thus far exceed human problem-solving capabilities.

"You can't do this with pen and paper," Riaz said. "You'd have to write out a hundred million equations on the paper and solve each one at time, then set it aside, take another set of a hundred million equations and solve it, and then continue with the next cycle."

Not only can supercomputers handle such quantities of math, but they can be trained to troubleshoot the numerical models and assess the degree to which they are error-prone. All models comprise a set of computational nodes—that is, discrete nuggets of data—and the more nodes, the greater the accuracy. Engineers can use fast, powerful computers to track the rate at which errors decrease as more nodes are run, and thus determine how accurate the model is compared to other models.

Riaz's interest in numerical models—particularly as applied to multiphase flows, such as processes involving both air and water—has broad applications. Oil companies, for example, use such models in order to better predict where to extract oil and how many wells to put in. That leads to greater efficiency and lower costs. Riaz is also using similar methods to study a variety of other multiphase flow phenomena, from nucleate boiling on the International Space Station to aerosol dispersion of COVID-19.

"There's just so much more we're able to do now, thanks to advanced computing capabilities," Riaz said. "And as those capabilities continue to increase, for example through the emergence of nanocomputing, even more distant horizons will come within reach."

Q&A WITH PETER CHUNG

Professor Peter Chung directs the Laboratory for Computational Research in Science and Technology (CRSTLab), which specializes in the application of advanced computing technologies to practical engineering problems. Research conducted by Chung and his team at CRSTLab covers topics ranging from phonons to the detection of defects in materials. He is the co-author, with Sung W. Lee, of *Finite Element Method for Solids and Structures*, published this year by Cambridge University Press.

WHAT ARE SOME OF YOUR CURRENT AREAS OF RESEARCH?

Right now, there are two primary areas of focus for us. One is the use of machine learning in complex material design, and the other area is quasi-particle modeling, also of complex materials. From a material science perspective, there are simple materials—that is, materials that have rather a small number of atoms in the unit cell, such as silicon—and there are complex materials, with unit cells containing tens if not hundreds of atoms. These latter materials are very important for pharmaceutical research and drug discovery, as well as for agriculture and the food sciences. They're also often used in defense-critical materials.

HOW DO ADVANCED METHODS OF COMPUTING ASSIST YOU IN YOUR RESEARCH?

One of the methods we are pursuing is machine learning. Unlike traditional approaches to developing computational methods, machine learning does not require you to know everything there is to know about the science of a problem. It allows you to overcome some of the unknowns, and it provides a way of finding correlations.

The power of machine learning is that it's not limited to the computing ability of a human being working with a piece of paper. You can overcome unknown areas in order to build these long, tenuous bridges into the regime of the problem where you're really not comfortable with all the rules yet. It gives you something that you could use to make speculative discoveries, things that might give an experimentalist pause to say "that's interesting, I never thought of that before, maybe I should try and perform that experiment."

WHAT IS THE RELATIONSHIP BETWEEN MACHINE LEARNING AND SO-CALLED "BIG DATA?" WHAT HAPPENS WHEN THE DATA AVAILABLE ISN'T SO BIG?

One of our current projects involves training machines to handle exactly that kind of situation. We often hear it said that machine learning and artificial intelligence require massive amounts of data, and in some domains, the data is indeed plentiful. But in certain research areas, the amount of data isn't so abundant. How can the machine work with this less-than-optimal quantity of data and still be able to deliver meaningful results?

We're using different techniques to fuse data together, data that are otherwise incompatible with one another. We're also using mathematical techniques to transform these data sets into a common form that allows us to work with that combined set. And we're looking at approaches for using the more plentiful data in pharmaceutical research papers to see if we can learn the basic chemistry that's required for designing other classes of molecular materials. That's very exciting because we're doing something called transfer learning, where we're taking knowledge in one domain and transferring it into another.

YOU HAVE A NEW, MAJOR PROJECT STARTING SOON THAT INVOLVES NATURAL LANGUAGE PROCESSING. COULD YOU EXPLAIN WHAT THIS IS ABOUT?

We're interested in how computers can be taught to read documents and make sense of them. Our goal is for the machine to become the scientist's muse. Scientists spend countless hours reading academic papers and technical documents, of which there are hundreds and even thousands published each year. Presumably all these papers have information that's interesting or that could potentially contribute to one's knowledge about a given domain, but there's no way an individual human being can read all of them. So we're setting out to train the machine to read highly technical, highly esoteric documents and learn from them. Then the machine can provide new ideas or fill in gaps in understanding that scientists can investigate further in their own research. That's why we speak of the machines as being "the muse," because they're going to be inspiring the scientist to come up with new ideas, in perhaps very contrarian ways.

ARE YOU SAYING THAT SCIENTISTS CAN USE MACHINES NOT ONLY TO LOOK THROUGH DOCUMENTATION BUT ALSO TO BRAINSTORM IDEAS FOR THEM?

Exactly. It's not that intelligent machines are going to take over the world, as some people fear. But what AI will do is provide a workforce multiplier. We're going to be able to do by ourselves what used to take the efforts of ten, fifteen, a hundred, a thousand people to do. That in turn will increase our capacity and capabilities. It's all exciting to me and I hope to be able to contribute to it in some way and uncover the scientific foundations.

UMD Engineers Print a Soft Robotic Hand That Can Play Nintendo

The field of soft robotics, which centers on creating new types of flexible, inflatable robots that are powered using water or air rather than electricity, has sparked a growing interest. Unfortunately, controlling the fluids that make these soft robots bend and move has been difficult—until now.

In a key breakthrough, detailed in Science Advances, a research team led by UMD assistant professor of mechanical engineering Ryan Sochol has been able to 3D print soft robots with integrated fluidic circuits in a single step.

To demonstrate the impressive capabilities of such an approach, the team 3D printed a robotic hand that can not only play Super Mario Bros, but win.

The integrated fluidic circuit designed by the team allowed the hand to operate in response to the strength of a single control pressure. For example, applying a low pressure caused only the first finger to press the Nintendo controller to make Mario walk, while a high pressure led to Mario jumping. Guided by a set program that autonomously switched between off, low, medium, and high pressures, the robotic hand was able to press the buttons on the controller to successfully complete the first level of Super Mario Bros in less than 90 seconds.

The choice to validate their strategy by beating the first level of Super Mario Bros in real time was motivated by science just as much as it was by fun. Because the video game's timing and level make-up are established, and just a single mistake can lead to an immediate game over, playing Mario provided a new means for evaluating soft robot performance that is uniquely challenging in a manner not typically tackled in the field.

In addition to the Nintendo-playing robotic hand, Sochol's team also created terrapin turtle-inspired soft robots. The terrapin happens to be UMD's official mascot, and all of the team's soft robots were printed at UMD's Terrapin Works 3D Printing Hub.

Another important benefit of the team's strategy is that it's open source. The paper is accessible to anyone who wants to read it, and a link is provided in the supplementary materials to a GitHub with all of the electronic design files from their work.

"We are freely sharing all of our design files so that anyone can readily download, modify on demand, and 3D print all of the soft robots and fluidic circuit elements from our work," said Sochol. "It is our hope that this open-source 3D printing strategy will broaden accessibility, dissemination, reproducibility, and adoption of soft robots with integrated fluidic circuits and, in turn, accelerate advancement in the field."

At present, the team is exploring the use of their technique for biomedical applications including rehabilitation devices, surgical tools, and customizable prosthetics.

This research was supported in part by the Center for Engineering Concepts Development and U.S. National Science Foundation Award 1943356.

IMAGE: DAVE PLUNKERT

Srebric Engineers "Air Shield" as Mask Alternative

During the height of the pandemic, not all workers had the privilege of staying at home. Many continued to work long hours at factories, plants, offices, clinics, and hospitals, using masks to protect themselves from the risk of COVID-19.

Even today, personal protective equipment (PPE) is still a necessity for many employees, particularly in areas that have seen renewed outbreaks. Though masks are readily available these days, they also pose a significant downside: they're uncomfortable to wear, especially over an extended period of time.

As Margaret G. and Frederick H. Kohloss Chair in Mechanical Engineering Jelena Srebric explains, that has to do with the underlying physics. Masks, she says, "rely on the user's lungs to push air against the filtering surfaces. Over time, this places a lot of strain on the user and leads to discomfort."

For the past several months, Srebic and her team at the Center for Sustainability in the Built Environment (City@UMD) have been developing an easier-to-endure alternative, intended to benefit workers, who currently face the discomfort and inconvenience of wearing masks for hours at a time.

Their solution, dubbed Air Shield, involves equipping goggles with an airflow system that includes a micro fan and a high efficiency particulate air (HEPA) filter to catch airborne particles. The device also includes a sensor that measures micro pressure, CO_2, humidity, and temperature, allowing it to be calibrated for a tight but comfortable fit. The entire device can be sterilized with ultraviolet light at the end of each day of use.

The project is being funded by the Centers for Disease Control and Prevention (CDC), through a program that supports research designed to assist communities in responding to public health emergencies such as the COVID-19 pandemic.

Srebric, an internationally recognized expert on ventilation, has focused much of her research during the past year on responding to the public health challenges posed by COVID-19. Together with colleagues at the University of Colorado, she has been leading a study that identifies ways to resume live music performances, safely.

During the presidential election in 2020, she collaborated with University of Maryland public health professor Donald Milton in devising a simple, low-cost solution that can protect against virus transmission at debates and other public events. She has also helped develop air filtration systems for public transportation.

In addition to Srebric, the team working on the CDC-funded PPE project includes Milton, UMD mechanical engineering Assistant Research Professor Shengweu Zhu, and UMD civil and environmental engineering Professor Birthe Kjellerup.

30 YEARS OF RESEARCH AND INNOVATION

CEEE

With a mission that was prescient thirty years ago and of critical importance today, the Center for Environmental Energy Engineering (CEEE) leads the way in developing eco-friendly, yet economically feasible technologies in areas such as HVAC and refrigeration.

Two words sum up CEEE's philosophy: lean and green. In practice, that means designing energy conversion systems that use the least amount of material, are both highly efficient and cost-effective, and have minimal impact on the environment.

Directed by Minta Martin Professor of Engineering Reinhard Radermacher, along with co-directors Dr. Yunho Hwang and Dr. Vikrant Aute, the Center not only conducts a wide range of projects in collaboration with industry sponsors, but also runs a graduate-level educational program, aimed at nurturing the next generation of professionals in the field.

FOR MORE INFORMATION, VISIT CEEE.UMD.EDU

Discovering Beauty in STEM

MECHANICAL ENGINEERING STUDENT DEBUTS AS A NOVELIST WITH A STORY OF COLLEGE LIFE, STEM, AND BEAUTY.

While growing up, UMD student E. Ozie found herself choosing between two different paths: engineering and art. Now, with her debut novel, *The Beautiful Math of Coral*, she has found a way to unite them.

Published in April 2021, the novel—which Ozie describes as a tale of "love and college wrapped in science and humor"—recounts the experiences of Coral, a Nigerian-American, and Fernando, a Mexican-American, while majoring in STEM.

"My book is set in college and follows the story of two people who discover the beauty within art and STEM while also trying to figure out college and engineering together," she said.

A mechanical engineering major who transferred to the department internally this past fall, Ozie is a Northrop Grumman Diversity Scholarship recipient and a member of the Louis Stokes Alliances for Minority Participation (LSAMP) Transfer Connections program, and has served on the LSAMP STEM Club Board. As dedicated as she is to the discipline of engineering, she says the field is not as distinct from the arts as many imagine.

BUILDING ENERGY MODELS FOR RENEWABLE ENERGY PLANNING

A life-long love of complex problem solving has led Ph.D. student Pattanun Chanpiwat to dive headlong into the fields of mathematical modeling, statistical analysis, and machine learning to solve some of the toughest challenges facing the implementation of renewable energies.

"If we can create better models capable of integrating millions of variables to evaluate the investment and operation costs with the vast and complex data sets of various renewable and conventional energy technologies and storages to meet energy demand," explained Chanpiwat, "we can help both businesses and governments make better decisions in regard to both market and policy decisions."

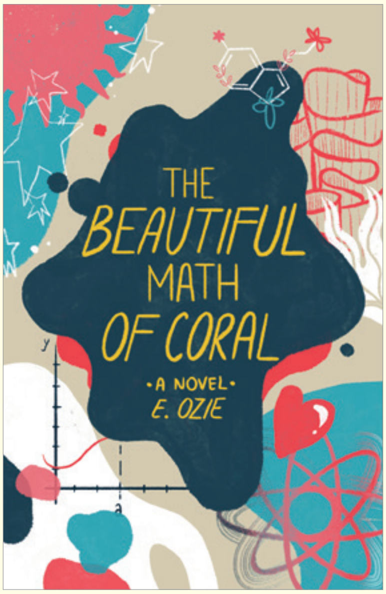
To address these issues, Chanpiwat explores green energy solutions not just from optimization models to improve efficiencies of the energy system, but also looking at market characteristics and physical and environmental constraints that could impact power production and distribution.

In 2019, Chanpiwat received the university's Harry K. Wells Fellowship from the Maryland Energy Innovation Institute. Established to support graduate students in sustainable energy generation and/or storage, the award—which includes a $20K stipend and $4K for equipment/travel costs—was a perfect fit with Chanpiwat and his research.

"This fellowship really was a seed to help me grow as a data scientist and mathematical modeler," he said. "It enabled me to have the time to build the market equilibrium model from the ground up, and dig into topics I otherwise might not have had the time to pursue."

The fellowship also enabled him to present his research at multiple conferences, including the 2020 INFORMS Annual Meeting and the 2021 Federal Energy Regulatory Commission's Technical Conference on Increasing Market and Planning Efficiency through Improved Software. In addition, the work and experience he accomplished during the Wells Fellowship primed him to be the perfect fit for two internships with the National Renewable Energy Laboratory (NREL) supporting the Regional Energy Deployment System (ReEDS)—their flagship capacity-planning model for the power sector.

"This model is used by the U.S. Department of Energy to simulate the evolution and operations of U.S. generation, storage, transmission, and end-use demand and associated technologies,"



"When most people think about science or mathematics, they don't think of the word 'beautiful,'" she said. "I wanted to show that there is an unconventional beauty in STEM."

In writing her novel, Ozie drew from her own student experiences. During a mechanics course taught by Keystone Instructor Jarred Young, for example, she became intrigued by two crucial concepts—moments and forces—and later interwove them into her narrative.

The Beautiful Math of Coral is also a story about struggle and belonging, with its characters navigating an academic field in which women and people of color have long been marginalized. As Ozie notes, "STEM is such a broad field, yet women, Black people, and Latinx people continue to be some of the most underrepresented groups in the U.S. STEM workforce."

The novel's broader message to readers is clear: "Everyone should know that they are all a part of the beautiful math of life."

he explained. "For example, if you want to achieve net zero greenhouse-gas emissions by the year 2035, this model helps you to explore the economic and environmental outcomes both immediate and long-term for the entire power sector given a variety of technological and policy scenarios."

As part of NREL's Economics and Forecasting Group, Chanpiwat worked as a power sector modeling and economic analysis graduate intern, helping develop GAMS representative models for temporal flexibility, both nationwide and for a subset of regions. Coming up with unique and novel techniques, he helped improve solution time while retaining temporal fidelity. He also explored temporal aggregation and distribution fitting methods to estimate the most-representative sets of days, weeks, and months.

Beyond his research, Chanpiwat served as a teaching assistant for several courses in the department, including Statistical Modeling for Product Process Development (ENME392). During that time, he leveraged his problem solving to help improve the course by supporting the implementation of the PrairieLearn platform. This new learning platform not only provided students with an adaptive and randomized assortment of statistical problems—that Chanpiwat helped develop—and providing real-time feedback to the students, it also helped reduce some of the course grading workload.

"In the optimization field you can make a real impact, not just with the innovations and solutions, but if you can make a greener world, and make things more efficient, it helps everyone," he said, looking ahead to future work. "I believe that decisions based on science and engineering are crucial for us to plan for a better future."

GRADUATE STUDENT AWARDS

Ann G. Wylie Dissertation Fellowship: **WEIPING DIAO**, **RUI XU**

Best Student Paper, ASME Dynamic Systems and Control Conference: **CHU XU**

Future Faculty Fellowship: **SAI ANKIT ETHA**, **MD. TURASH HAQUE PIAL**

IEEE Electronics Packaging Society Ph.D. Fellowship: **ABHISHEK DESHPANDE**

IPC Student Member Scholarship: **RISHABH CHAUDHARY**, **SURAJ RAVIMANALAN**

Link Foundation Fellowship: **GYEONG SUNG KIM**

Maryland Robotics Center/Amazon Lab126 Diversity in Robotics and AI Fellowship: **SARA HONARVAR**

Outstanding Graduate Assistant Awards; Best Teaching Assistant Awards: **WEIPING DIAO. SAI ANKIT ETHA**, **ALI TIVAY**, **SHAO-PENG CHEN**, **CHEN-MING HUANG**, **KESHAV RAJASEKARAN**

Outstanding Student Paper Award, IEEE Conference on Micro-electronics Mechanical Systems: **RUBEN ACEVEDO**

Philadelphia STLE Section Scholarship: **RISHABH CHAUDHARY**

Robotics Fellowship: **SARA HONARVAR**

Solar-Thermal Desalination Prize: **GYEONG SUNG KIM**

Three-Minute Thesis Award: **DUSHYANT CHAUDHARI**

2020 SER2AD Safety Challenge: **SERGIO COFRE-MARTEL**

UMD Roberta Ma Scholarship Award: **SURAJ RAVIMANALAN**

Willie M. Webb Reliability Engineering Fellowship: **CAMILA CORREA JULLIAN**

UNDERGRADUATE STUDENT AWARDS

A. James Clark School of Engineering Dean's Award: **ABIGAIL MEYER**

Academic Achievement: **KIERAN BARVENIK, WILLIAM GERST**

American Society of Mechanical Engineers Senior Award: **COLLIN KOBEL, TAQUI MAHMOOD**

Chairman's Award: **ANNINA COMMINS**, **SAM GIGIOLI**, **DANIEL KIRCHNER**, **JOHN LATHROP**, **KYLE PICHNEY**, **ABIGAIL MEYER**, **PETER MNEV**

Pi Tau Sigma Service Award: **PETER MNEV**

Pi Tau Sigma Memorial Award: **CAROLYN PAYNE**

Society of Automotive Engineers Senior Award: **YONATAN FERNEAU**

Society of Automotive Engineers Service Award: **NICHOLAS RABCHEVSKY**

IN CHALLENGING TIMES, ALUMNI RESPOND WITH GENEROUS SUPPORT

RECORD-SETTING MARYLAND PROMISE SCHOLARSHIPS

In 2020-2021, alumni established three Maryland Promise Program Endowed Scholarships with a preference for mechanical engineering students. All three gifts were matched dollar-for-dollar by the A. James & Alice B. Clark Foundation and the state of Maryland.

The total investment of $2.8 million—including matching funds—is currently the most money donors have directed to the Maryland Promise Program with the intention of supporting a single university department. These endowed scholarships will initially support up to 12 students.

DR. THEO AND SANDRA KEITH MARYLAND PROMISE SCHOLARSHIP

Dr. Theo Keith (M.S. '68, Ph.D. '71) and his wife Sandra established their Maryland Promise Scholarship to provide accessible learning opportunities to all students, regardless of background.

Dr. Keith is a Distinguished University Professor Emeritus at the University of Toledo and credits his education at Maryland with setting the foundation for his fulfilling 50-year career. He and Mrs. Keith wish to support students interested in a similar path but might not have the financial means to get there alone.

"It is our fervent hope that this scholarship will help to provide future mechanical engineering students access to an outstanding engineering education at the University of Maryland."

MICKEY DALE FAMILY FOUNDATION MARYLAND PROMISE SCHOLARSHIP

Dr. Bruce Dale (B.S. '64, M.S. '67, Ph.D. Purdue University '70) believes "education is something you never lose." This investment is "a gift for eternity since the benefits accrue to the student, the student's family, and their following generations."

Dr. Dale spent much of his career in the telecommunications industry, initially working for Bell Labs and ultimately Lucent Technologies as Vice President of their Wireless Communication Division. His global experience included managing a staff of 3,000 people and overseeing the installation of wireless high-speed internet networks.

This scholarship is named in honor of his late wife, Mickey Dale, who worked at the University of Maryland Global Campus and provided Dr. Dale with the support he needed to succeed.

ROBERT AND BARBARA COUCHMAN MARYLAND PROMISE SCHOLARSHIP

A generous bequest from **Robert (B.S. '59) and Barbara (B.A. '61, art history) Couchman** is a testament to their legacy—a love of learning—and the impact of their UMD education.

The two met while students at Maryland and were married for 56 years. "My father always emphasized how enriched our family life was because he had the opportunity to attend UMD and benefit from a college education," said their daughter, Elizabeth LaBarge.

A lover of both creative art and science, Mrs. Couchman went on to pursue mathematics at the University of Albany, and Mr. Couchman earned his M.S. at Union College. He worked at General Electric for 38 years, retiring as Manager of Steam Turbine Engineering. The endowed scholarship is a reflection of their passion, hard work ethic, and dedication to building a better society.

Amid the backdrop of the global pandemic in 2020-2021, the Department of Mechanical Engineering received an unprecedented level of support from alumni. Through three new Maryland Promise Scholarships, more than $250,000 in newly-established scholarships and fellowships, and additional contributions to existing student activities, Terps are ensuring the resiliency and success of future engineers.

DURBIN, KUTCHI SCHOLARSHIPS LAUNCHED; FIRST ROUSH FELLOWSHIP AWARDED

A good education can lay the foundation for a lifetime of success, and many University of Maryland (UMD) alumni point to their time, education, and experiences at Maryland as being a cornerstone of long and fruitful careers.

"My [UMD] mechanical engineering degree enabled a wealth of work and life experiences, and for that I am truly grateful," said Mark Kutchi ('82). "It allowed me to see the world and work on exciting projects throughout the U.S., Canada, Europe, Africa, and Asia."

Kutchi and others expressed their gratitude through generous first-time gifts that will help pave the way for tomorrow's students.

SEAN AND SARAH DURBIN ENDOWED SCHOLARSHIP IN MECHANICAL ENGINEERING

A native of Washington, D.C., **Sean Durbin ('93)** is part of an extended family of 11 Terps spanning three generations. His wife Sarah and their two sons also attended UMD, and Durbin values the versatility and solid foundation that his mechanical engineering degree provided in "learning how to learn."

"This merit-based scholarship is established with the hope that it will help strengthen the talent pipeline of mechanical engineers with technical skills and global perspectives," explained Durbin, who is currently the Executive Vice President of Europe, Middle East, and Africa (EMEA) for Linde, a global industrial gas and engineering company.

"It is a privilege to assist and reward students with strong potential in mechanical engineering."

MARK KUTCHI ENDOWED SCHOLARSHIP IN MECHANICAL ENGINEERING

"Setting goals, hard work, honesty, determination, truth, and remembering to have fun helped me complete my degree and set me up for numerous successful mechanical engineering career opportunities," said **Mark Kutchi ('82)**, an engineer with the U.S. General Services Administration.

Kutchi's endowed scholarship will provide need-based support for students in mechanical engineering with a preference for students coming to UMD from Prince George's County and the state.

"I hope this scholarship can provide deserving students assistance in achieving their mechanical engineering degree and enable a wide range of exciting career opportunities and life experiences, as my degree provided for me."

THE MARVIN ROUSH FELLOWSHIP IN RISK AND RELIABILITY

Dr. Marvin Roush was the driving force in establishing the department's Center for Risk and Reliability (CRR) and its original core curriculum. Since that time, CRR has trained more than 470 reliability engineers.

The Marvin Roush Fellowship was established in 2013 to support graduate students pursuing reliability engineering. "This fellowship pays tribute to Dr. Roush's incredible fortitude in starting this Center. It will help support the next generation of reliability engineers," said Dr. Mohammad Modarres, Nicole J. Kim Eminent Professor and Director of CRR.

Through contributions of more than 50 alumni and friends, the fund has now exceeded its $100,000 goal. Ph.D. candidate Andres Ruiz-Tagle, a student of Associate Professor Katrina Groth, was named the first recipient of the fellowship in Fall 2021.

» READ MORE ABOUT THESE DONORS AND THEIR SUPPORT AT go.umd.edu/medonors.

RECOGNITIONS

TIM ANDREADIS (B.S., physics '74, M.S., nuclear engineering '77, Ph.D., nuclear engineering '81) was awarded the lifetime achievement award from the Directed Energy Professional Society for his cooperative research efforts between the U.S. and U.K.

JOHN R. BERGER (B.S., civil engineering '84, M.S. '86, Ph.D. '90) was promoted to Senior Associate Provost at Colorado School of Mines.

ANUPAM CHOUBEY (Ph.D. '07) helped to develop the camera technology for NASA's Mars Rover Mission, which successfully landed the rover "Perseverance" on Mars on February 18, 2021.

JAY DE VENY (B.S. '91) took a new position as the Vice President of Vehicle Technology for Hyzon Motors. He is charged with opening the company's new Detroit Technology Center.

TODD HILL (B.S. '99) was promoted to Product Public Relations Manager at Subaru of America.

ALEX MEHR (Ph.D. '03) and his company, Retail Ecommerce Ventures, acquired RadioShack, Stein Mart and Ralph & Russo. They also launched the app Speakeasy.

SHEILA MORTAZAVI (B.S. '95) took a new position as Partner at Huag Partners.

CHIOMA "CICI" ONYEKWERE (B.S. '16) was selected to represent Team Nigeria in discus throwing events in the 2021 Olympic Games in Tokyo.

BALAJI PANCHAPAKESAN (Ph.D. '01) is a Fulbright U.S. scholar to India for 2021-2022.

MARK PAULUS (Ph.D. '11) received a 2021 Dr. Delores M. Etter Top Scientists and Engineers of the Year Award in the Individual Engineer category from the Assistant Secretary of the Navy (Research, Development, and Acquisition).

BO SONG (M.S. '06, Ph.D. '13) took a new position as Director of Quality & Reliability for Hardware Platform Solutions at Celestica.

Have News to Share?

Contact Heidi Sweely, Director of External Relations, at **hsweely@umd.edu**.

MECHANICAL ENGINEERING VISITING COMMITTEE

Jay De Veny (B.S. '91)
VICE PRESIDENT, VEHICLE TECHNOLOGY, HYZON MOTORS

Kathy Eberwein (B.S. '88)
CHIEF EXECUTIVE OFFICER, THE GLOBAL EDGE CONSULTANTS

Brian Gearing (B.S. '96)
PARTNER, CROWELL & MORING, LLP

Howard Harary
DIRECTOR, ENGINEERING LABORATORY (RETIRED), NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Steve Hogan (B.S. '85)
DEPUTY PRODUCT SUPPORT MANAGER, OFFICE OF THE SECRETARY OF DEFENSE

Roberto Horowitz
PROFESSOR, UNIVERSITY OF CALIFORNIA, BERKELEY

Asif Hussain (B.S. '94)
SENIOR VICE PRESIDENT, STRATEGIC BUSINESS DEVELOPMENT, SUMITOMO SHI FW

Bob Kaplan (B.S. '82)
SENIOR MANAGER OF PROPULSION SYSTEMS (RETIRED), BOEING COMPANY

Charley Kilmain (B.S. '85)
MANAGER OF MECHANICAL SYSTEMS, BELL

Maria Korsnick (B.S. '86, nuclear engineering)
PRESIDENT AND CEO, NUCLEAR ENERGY INSTITUTE

Nancy Margolis (M.S. '81)
PRESIDENT (RETIRED), ENERGETICS INCORPORATED

Michael Miller (B.S. '79, M.S. '84)
EXECUTIVE VICE PRESIDENT OF PROGRAMS, GENESIS ENGINEERING SOLUTIONS

Jim Moreland (B.S. '88)
EXECUTIVE DIRECTOR FOR STRATEGY, RAYTHEON TECHNOLOGIES (MISSILE & DEFENSE SYSTEMS)

José Reyes (M.S. '84, Ph.D. '86, nuclear engineering)
CO-FOUNDER AND CHIEF TECHNOLOGY OFFICER, NUSCALE POWER

Alex Severinsky
PRESIDENT, FUELCOR LLC

ToniAnn Thomas (B.S. '82)
INDUSTRY VICE PRESIDENT & GENERAL MANAGER, TERADATA

Kon-Well Wang
STEPHEN P. TIMOSHENKO PROFESSOR OF MECHANICAL ENGINEERING, UNIVERSITY OF MICHIGAN

David Wilson
PRINCIPAL VICE PRESIDENT, CORPORATE BUSINESS DEVELOPMENT, BECHTEL

EMERITUS MEMBERS
(*Deceased)

Aris Cleanthous (B.S. '96)
George Dieter*
G. Lee Lushbaugh, Jr. (B.S. '74)
T.G. Marsden (B.S. '87)
John Miller
Sheila Mortazavi (B.S. '95)
Hratch Semerjian
Sheldon Shapiro*
Susan Skemp
Tom Stricker (B.S. '89, electrical engineering)
Ward Winer
Manolo Zúñiga (B.S. '83)

"ASK ME ANYTHING" ALUMNI PANELISTS

An open mic series for current students to meet alumni and ask them anything about life and engineering.

FALL 2020

Derris Banks (B.S. '93)
TECHNOLOGY CENTER DIRECTOR, U.S. PATENT & TRADEMARK OFFICE

Alex Folk (B.S. '96)
SENIOR OPERATIONS ADVISOR, OFFICE OF ACQUISITION AND AGREEMENTS MANAGEMENT, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Rich Landa (B.S. '13)
DRIVE SYSTEMS TECH LEAD FOR H-1 HELICOPTER, BELL

Matt McTigue (B.S. '93)
SOLUTION ARCHITECT, DELTA RISK

Darian Nastvogel (B.S. '06)
PROGRAM MANAGER, GTM STRATEGY PLANNING AND OPERATIONS, VMWARE

SPRING 2021

Dan Diehl (B.S. '90)
PRESIDENT AND CEO, AIRCUITY

Kathy Eberwein (B.S. '88)
CHIEF EXECUTIVE OFFICER, THE GLOBAL EDGE CONSULTANTS

Alex Mehr (M.S., Ph.D. '03)
CEO, RETAIL ECOMMERCE VENTURES

Les Bookoff (B.S. '90)
PARTNER, BOOKOFF MCANDREWS

CAREER PATHS SPEAKERS

FALL 2020

Rob Boettcher (B.S. '11, M.S. '12)
MECHANICAL ENGINEER, SCHLUMBERGER

Tom Dougherty (B.S. '85, nuclear engineering)
PARTNER, LEWIS ROCA ROTHGERBER, HRISTIE LLP

Kiran Hebbar (M.S. '96)
CHIEF FINANCIAL OFFICER, ALLOY

Robin Morey (B.S. '89)
VICE PRESIDENT AND CHIEF PLANNING, OFFICER, EMORY UNIVERSITY

Matthew Wagenhofer (B.S. '96, M.S. '99, Ph.D. '02)
MECHANICAL, MATERIALS ENGINEER, MW FORENSIC ENGINEERING

Michael Wu (B.S. '94)
VICE PRESIDENT AND GENERAL MANAGER, SLEEP NUMBER LABS

SPRING 2021

Jay De Veny (B.S. '91)
VICE PRESIDENT, VEHICLE TECHNOLOGY, HYZON MOTORS

Phil Gouel (B.S. '01)
SENIOR DIRECTOR, CORPORATE STRATEGY, SOUTHWEST AIRLINES

Asif Hussain (B.S. '94)
SENIOR VICE PRESIDENT, STRATEGIC BUSINESS DEVELOPMENT, SUMITOMO SHI FW

Bridget Russell (B.S. '15)
QUALITY ENGINEER III, INTEGRA LIFESCIENCES

Sebastian Silvani (B.S. '95, M.Eng. '98)
RESEARCH ENGINEER - AUTONOMOUS VEHICLES, U.S. DEPARTMENT OF TRANSPORTATION

Dusty Tenney (B.S. '85)
PRESIDENT AND COO, BIOLIFE SOLUTIONS, INC.

2020-2021 DESIGN DAY JUDGES

Bailey Benedick (B.S. '19)
RESEARCH & DEVELOPMENT TEST ENGINEER, INTRALOX

Charles Clinton (M.S. '98)
VP OF ENGINEERING, MESO SCALE DIAGNOSTICS, LLC

Bruce Dale (B.S. '64, M.S. '67)

Jay De Veny (B.S. '91)
VICE PRESIDENT, VEHICLE TECHNOLOGY HYZON MOTORS

John Drager (B.S. '64)

Alex Folk (B.S. '96)
SENIOR OPERATIONS ADVISOR, OFFICE OF ACQUISITION AND AGREEMENTS MANAGEMENT, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Asif Hussain (B.S. '94)
SENIOR VICE PRESIDENT, STRATEGIC BUSINESS DEVELOPMENT, SUMITOMO SHI FW

Laleh Jalali (B.S. '89)
CO-FOUNDER AND SENIOR PATENT ATTORNEY, ALLIANCE IP

Alyssa Pacione
TALENT ACQUISITION RECRUITER, INTRALOX

Hala Tomey (M.S. '97)
MECHANICAL ENGINEER, JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

Curt Watson (B.S. '76)

David Wilson
PRINCIPAL VICE PRESIDENT, CORPORATE BUSINESS DEVELOPMENT, BECHTEL

Russell Werneth (B.S. '64, M.S. '68)
HUBBLE SPACE TELESCOPE OUTREACH ENGINEER, NASA

DESIGN DAY

Alumni SPOTLIGHT

ENGINEERING THE HYDROGEN VEHICLE REVOLUTION

ACROSS THE GLOBE, PEOPLE AND COMPANIES ALIKE ARE CONCERNED ABOUT ENVIRONMENTAL SUSTAINABILITY AND LOWERING THEIR CARBON FOOTPRINT. This is particularly true in vehicle manufacturing. As Vice President of Vehicle Technology for Hyzon Motors, Jay De Veny (B.S. '91) is at the center of the alternative energy revolution for heavy-duty commercial vehicles.

Hyzon Motors, which supplies zero-emission hydrogen fuel cell powered vehicles, went public this year (Nasdaq: HYZN) with $626 million in cash and a goal of producing 40,000 vehicles annually by the end of 2025. De Veny's job is to lead the development of Hyzon's Detroit Technology Center, where much of the innovation will take place. He's responsible for planning, coordinating, and executing the vehicles' production, ultimately meeting customers' performance requirements.

It's been a busy year for Hyzon, which was established in 2020 as a spinoff of the fuel cell manufacturer Horizon Fuel Cell Technologies. De Veny's been with the company since October 2020. In that short time, he's already finding ways to connect Hyzon with his alma mater. Among these initiatives, he has:

- Joined the department's Visiting Committee;
- Connected with fellow alumnus and Visiting Committee member José Reyes (M.S. '84, Ph.D. '86, nuclear engineering), Co-Founder and Chief Technology Officer of NuScale Power;
- Established an agreement to provide a Hyzon bus to NuScale Power for research purposes; and
- Explored possibilities for Hyzon to support faculty research.

Prior to joining Hyzon, De Veny spent 18 years at AxleTech, a manufacturer and supplier of drivetrain systems and components. Highlights included leading the Global Engineering team of 150 people and managing the integration of AxleTech's electric vehicle business into that of Allison Transmission.

De Veny is excited by what's ahead for Hyzon and zero-emission vehicles. "I'm motivated by learning every day, working alongside others with similar passions, and seeing this technology being commercialized. Hydrogen use for vehicles has been such a long time in development," De Veny says.

Up next, De Veny and his team will continue to validate and test Hyzon's vehicles, and develop creative options for refueling. Look for Hyzon buses to create more sustainable commuting in the next few years!

Balachandran Honored With ASME's Hartog, Lyapunov Awards

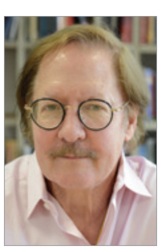
Minta Martin Professor and UMD Department of Mechanical Engineering Chair Balakumar Balachandran has received both the J.P. Den Hartog and Lyapunov Awards from the American Society of Mechanical Engineers (ASME). The double award, rare in the field, recognizes the scope and depth of Balachandran's activities as an engineer, researcher, and educator.

Established in 1987 by the ASME Design Engineering Division, the Hartog Award is considered one of the highest societal honors awarded in the area of dynamics and vibrations. Balachandran received the award in recognition of his efforts to advance the understanding of nonlinear vibrations through textbooks related to vibrations, and through research publications on nonlinear oscillations of mechanical and structural systems.

Meanwhile, Balachandran has also been honored with the ASME Lyapunov Award for lifelong contributions to the field of nonlinear dynamics, including his impactful research, education and training of researchers and/or practitioners, and leadership in advancing the corresponding field. He received the award during ASME's International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC-CIE) in August, during which he delivered the Lyapunov Award Lecture.

A faculty member at UMD's A. James Clark School of Engineering since 1993, Balachandran became chair of mechanical engineering in 2011. The publications that he has authored/co-authored include a Wiley textbook entitled *Applied Nonlinear Dynamics: Analytical, Computational, and Experimental Methods*, a Cambridge University Press textbook entitled *Vibrations*, and a co-edited Springer book entitled *Delay Differential Equations: Recent Advances and New Directions*. He is a Fellow of ASME and AIAA and a senior member of IEEE. He is a past recipient of the ASME Melville Award (2016) and the Hind Rattan Award (2015) bestowed by the NRI Welfare Society of India.

Balachandran has "continually impressed me with his dedication to the development and teaching of students through research and education," said Regents Professor, Glenn L. Martin Institute Professor of Engineering, and past president of UMD and the National Academy of Engineering C.D. (Dan) Mote, a previous recipient of the Hartog Award. "I have never known any other colleague with the commitment to put into practice so many activities and achieve the highest degree of success with his students. He is truly exceptional."



PECHT NAMED DISTINGUISHED UNIVERSITY PROFESSOR

Michael Pecht, professor of mechanical engineering at UMD and director of the Center for Advanced Life Cycle Engineering (CALCE) has been awarded the formal title of Distinguished University Professor by UMD. It is the highest appointment that the university bestows on a tenured faculty member.

Pecht is a Professional Engineer, an IEEE Life Fellow, a PHM Society Life Fellow, an ASME Fellow, an ASM Fellow, an SAE Fellow, and an IMAPS Fellow, and has served as editor-in-chief of *IEEE Access*, *IEEE Transactions on Reliability*, *Microelectronics Reliability*, and *Circuit World*. The author of more than 20 books on product reliability, development, use, and supply chain management, he has also written a series of books on the electronics industry in China, Korea, Japan, and India. In addition, he has written more than 700 technical articles and holds 11 patents.

He is the recipient of numerous honors and awards, including the IEEE Components, Packaging, and Manufacturing Award (2015) and the IEEE Exceptional Technical Achievement Award (2010) In 2008, he was awarded the highest reliability honor, the IEEE Reliability Society's Lifetime Achievement Award.

Srebric Named Margaret G. and Frederick H. Kohloss Chair in Mechanical Engineering

Professor Jelena Srebric has been selected as the inaugural Margaret G. and Frederick H. Kohloss Chair in Mechanical Engineering. Established through a generous gift from Margaret and Frederick Kohloss (B.S. '43), this endowed chair recognizes a faculty member who has not only made significant contributions in their field, but has also demonstrated entrepreneurial efforts and leadership in engineering beyond their field, and provides significant financial support for both research and educational endeavors.

Srebric is Director of UMD's Center for Sustainability in the Built Environment (City@UMD), which she helped establish with a mission to revolutionize the physical infrastructure system in cities. She recently served as Acting Associate Dean of Research for the A. James Clark School of Engineering.

Srebric and City@UMD are at the forefront of research aimed at improving multi-scale modeling of built infrastructure to provide reliable assessments of how these systems affect occupant populations, energy consumption, and associated CO2 emissions.

Frederick H. Kohloss started his own business in 1957, designing HVAC, plumbing, and electrical infrastructure for clients from architects to the military. Beyond the main office in Honolulu, Frederick H. Kohloss & Associates, Inc. had branches around the Pacific and the continental U.S. The firm was sold to Lincoln Scott in Australia in 1991. Kohloss also served as ASHRAE president and volunteered on standards committees throughout his career.

The Kohloss family members are very pleased with Professor Srebric's selection.

DeVoe Awarded Elkins Professorship

Don DeVoe, professor and associate chair of the mechanical engineering department, was awarded the Wilson H. Elkins Endowed Professorship for 2020-21 by the University System of Maryland (USM). He will receive $60,000 over two years to develop a platform that allows researchers to study hundreds of thousands of individual cell interactions, with greater efficiency and precision than is the case with current methods.

DeVoe recently received a $3.1M award from the National Institutes of Health to develop a microfluidic lab-on-a-USB-stick technology for rapid screening of antibiotic resistant pathogens from clinical specimens. The 5-year project will be performed in partnership with co-PI Ian White in the Fischell Department of Bioengineering and Dr. Anthony Sandler at the National Children's Medical Center in Washington, D.C.

GROTH WINS NSF CAREER AWARD

Associate Professor Katrina Groth, selected earlier this year for a National Science Foundation (NSF) Early Career Development (CAREER) award, is using the grant to support innovative research aimed at bridging the gap between probabilistic risk assessment (PRA) and prognostics and health management (PHM).

The former, applied typically to large-scale systems such as power plants, employs logic models to determine when, how, and why the system could fail. The latter, often applied to smaller systems such as pumps, depends on using sensors to monitor system status and flag any anomalies or breakdowns.

"There's a gray area between the two approaches, PRA and PRM, that we want to build out," Groth said. "Can we take things like sensors and apply them to a complex system, such as a power plant, that has a multitude of systems and involves a large number of personnel? Can we use the sensor data along with operational data and maintenance logs to arrive at better modelling, thus leading to improved decision-making? These are the kinds of questions I'm exploring."

GRAHAM TAKES THE HELM AS NEW CLARK SCHOOL DEAN

The UMD mechanical engineering community welcomes our new dean, Samuel Graham, Jr., who comes to UMD after a highly distinguished career at the Georgia Institute of Technology. An expert on electronics made from wide bandgap semiconductors, Graham formerly served as the Eugene C. Gwaltney, Jr. Chair of the George W. Woodruff School of Mechanical Engineering at Georgia Tech, in addition to multiple joint and courtesy appointments.

"I am honored to be appointed dean of Maryland's A. James Clark School of Engineering, a research powerhouse and home to world-class faculty, staff, and students," said Graham following his appointment. "I look forward to contributing to its legacy of excellence and leading the next generation of diverse Terrapin engineers poised to improve our world through innovations in technology."

PHOTO: STEPHANIE S. CORDLE

FACULTY RECOGNITION

Associate Professor **SIDDHARTHA DAS** was named a Fellow of the Institute of Physics, a leading, UK-based professional body and community of scholars. Meanwhile, Das and his students published papers detailing significant new nanochannel research in *ACS Nano* and *Journal of Fluid Mechanics*.

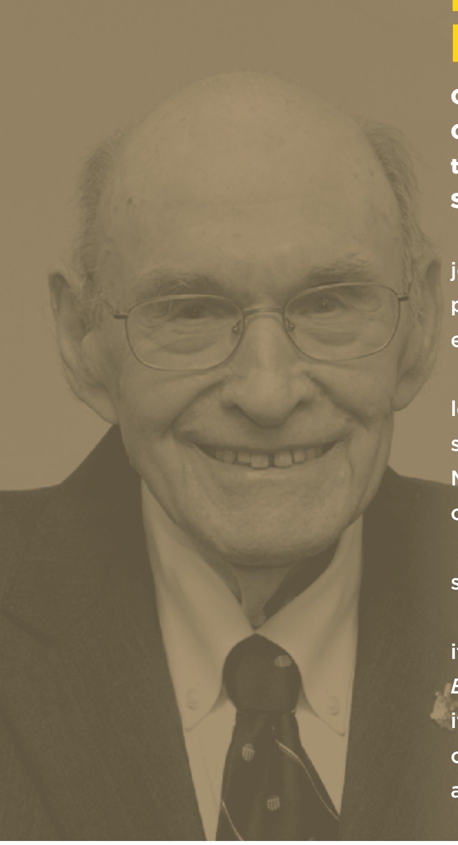
Assistant Professor **YANCY DIAZ-MERCADO** was awarded a grant of nearly $500,000 from the Office of Naval Research (ONR) for a project on developing collaborative strategies for multi-pursuer teams to capture fast evaders. The project is a collaborative endeavor between University of Maryland College Park, where Diaz is the PI, and The Johns Hopkins University Applied Physics Laboratory, with Co-PI Phillip Rivera.

Professor **STEVEN GABRIEL** is a co-PI on a $453K energy markets project funded by the Independent Research Fund Denmark. The project aims to assist Denmark in its goal of transitioning from fossil fuels to renewable energy.

Distinguished University Professor **ASHWANI GUPTA** was elected to membership of the European Academy of Science and Arts in 2021. He is also the recipient of the 2021 Dixy Lee Ray Award from the American Society of Mechanical Engineers for his contributions to fundamental and applied green combustion technology development now used worldwide in advanced industrial furnaces for energy savings and pollution reduction, including CO2 emission.

Mechanical Engineering Professor and Keystone Professor **BONGTAE HAN** was recently named a co-editor-in-chief of *Microelectronics Reliability*, one of the flagship journals in the field of semiconductor packaging reliability.

Assistant Professor **ELEONORA TUBALDI** published a paper, "Programming nonreciprocity and reversibility in multistable mechanical metamaterials," in the journal *Nature Communications.*



HONORING A LEGEND: REMEMBERING FORMER DEAN GEORGE DIETER

George Dieter, professor emeritus of mechanical engineering, Glenn L. Martin Institute Professor of Engineering, and dean of the A. James Clark School of Engineering from 1977–94, died Saturday, December 12, 2020 at the age of 92.

Dr. Dieter was a visionary who put the Clark School on its trajectory towards excellence: he believed in the school and saw its promise. He believed in its students, faculty, and staff and saw the energy they could bring to engineering.

Under his leadership, the Clark School's reputation for excellence grew and so did student enrollment. Dr. Dieter encouraged students to take part in national competitions, launched the Maryland Technology Enterprise Institute, and established a Board of Visitors, the first external advisory board for the college.

"Dr. Dieter is an institution. He is a foundation. He is a legend," said UMD President Darryll J. Pines.

Dieter wrote two seminal books: *Mechanical Metallurgy*, now in its third edition and a standard text used in the Clark School, and *Engineering Design* (co-authored with Linda C. Schmidt), now in its sixth edition. In 1993, he was elected to the National Academy of Engineering for "contributions to engineering education in the areas of materials design and processing."

A LIVING LEGACY

A new series, the "George Dieter Endowed Distinguished Lecture Series in Mechanics and Materials" will pay tribute to Dr. Dieter's legacy of learning, leading, and giving. The Clark School will host trailblazing academics and innovators to give inspirational talks about topics close to Dr. Dieter's heart.

To support and learn more visit **go.umd.edu/dieter-lecture-series**

BAR-COHEN, DISTINGUISHED UNIVERSITY PROFESSOR AND THERMAL PACKAGING PIONEER, PASSES AT 74

Avram Bar-Cohen, Distinguished University Professor in the Department of Mechanical Engineering, died Saturday, October 10, 2020. He was 74.

Bar-Cohen was an internationally recognized leader in thermal science and technology and a guiding force in the emergence of thermal packaging as a critical engineering domain.

"Avi was a beloved figure in his academic and professional communities," said Dr. Balakumar Balachandran, Department of Mechanical Engineering Chair and Minta Martin Professor. "He inspired his students and collaborators to constantly strive for greater contributions, and in the process, touched them with his warm heart."

Bar-Cohen's research, publications, lectures and short courses, as well as his U.S. government and professional service in the Institute of Electrical and Electronics Engineers (IEEE) and the American Society of Mechanical Engineers (ASME), helped create the scientific foundation for the thermal management of electronic components and systems.

REMEMBERING PROFESSOR LINDA SCHMIDT

Mechanical Engineering Professor Linda Schmidt passed on Friday, March 12, 2021. She was 62.

Dr. Schmidt joined the University of Maryland community in 1995 as an assistant professor, and over the course of her career, established herself as a leader in innovative engineering design research activities and teaching techniques.

Her efforts in the department were instrumental in creating the Design ME Suite—a workroom where students can hold group meetings and brainstorming sessions, and use a wide selection of construction tools and materials—which she directed since 1999. She was also instrumental in developing and teaching fundamental components of the department's design curriculum, especially, the junior-level course (ENME371) "Product Engineering and Manufacturing," and the senior capstone design course (ENME472) "Integrated Product and Process Development," out of which, the department hosts the showcase event Design Day.

Along with the late Dr. George Dieter, Schmidt co-authored *Engineering Design*, now in its sixth edition and considered a classic textbook for teaching principles in the design process.

Her dedication both to students and their education was recognized with a 2004 Outstanding Gemstone Mentor Award from UMD's Gemstone Program, the 2008 Fred Merryfield Design Award from the American Society for Engineering Education and, in 2014, the American Society of Mechanical Engineers made her a Fellow for her influential role in the development of the field of engineering design and lasting contributions to the field.

A. JAMES CLARK
SCHOOL OF ENGINEERING

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A robotic turtle, designed by researchers at Ryan Sochol's Bioinspired Advanced Manufacturing (BAM) laboratory and 3D-printed at Terrapin Works, is pictured near its biological counterpart at Brookside Gardens in Wheaton, MD. Sochol and his team have developed a process for 3D-printing fully-assembled soft robots in a single run. **Story on pg. 6.**

SAVE THESE DATES

UPCOMING EVENTS

OCTOBER 30: Homecoming (Maryland vs. Indiana)

NOVEMBER 1-5: International Mechanical Engineering Congress & Exposition (virtual)

DECEMBER 7: Fall Design Day

DECEMBER 21: Main Commencement

DECEMBER 22: College Commencement

MAY 10: Spring Design Day

MAY 20: Main Commencement

MAY 21: College Commencement

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