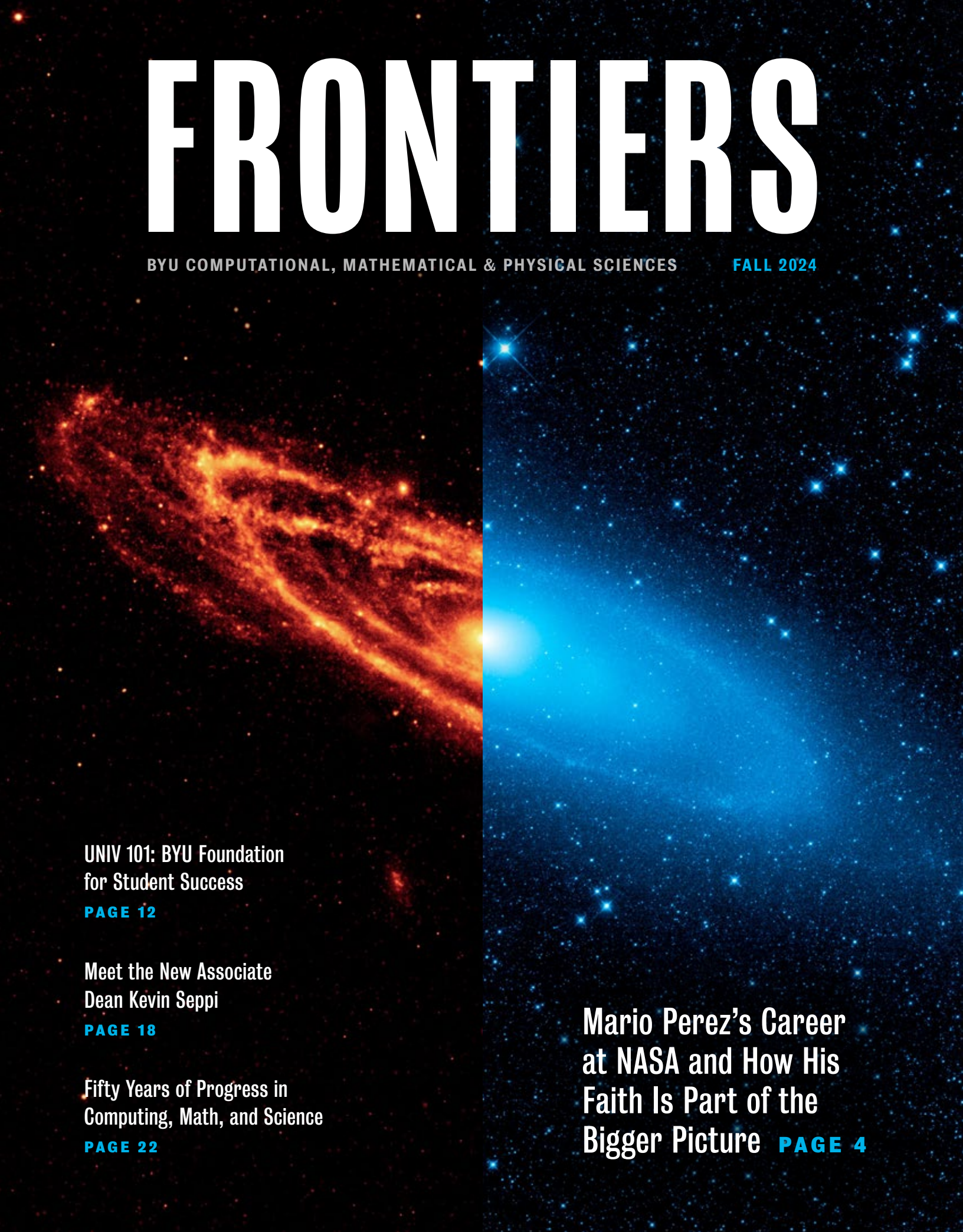
FRONTIERS

BYU COMPUTATIONAL, MATHEMATICAL & PHYSICAL SCIENCES FALL 2024



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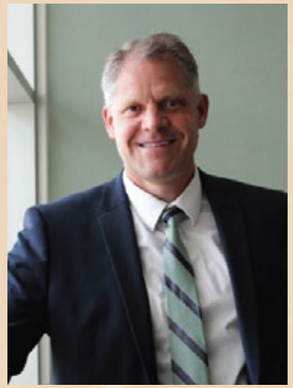
2024

Panelists Phil Low, Carlos Martins, and C. Shane Reese at the fiftieth anniversary gala (see page 22).



Dear alumni and friends,

Thank you for joining us in celebrating the college's fiftieth anniversary over the past year. The college is what it is today in large part because of you.

This magazine issue recognizes one of our college's alums, Mario Perez, who was a 2024 BYU Distinguished Alumni Award recipient alongside Steve Young, Sharon Eubank, and other individuals. They were recognized for their service to their profession, community, or nation and to Brigham Young University or The Church of Jesus Christ of Latter-day Saints.

President Spencer W. Kimball prophesied BYU would become an "educational Everest." Just as Mount Everest is the highest mountain, BYU can strive to offer the highest level of education for students. As we set our sights on the future, our college is focused on three key deliverables. The first is to provide the best classroom education available in science and math. Our professors are focused on perfecting our curriculum and staying abreast of best teaching practices. Our second key deliverable is to provide the best experiential learning opportunities available. Research has shown that having at least one experiential learning experience substantially improves life outcomes. We are committed to providing at least two of these experiences for every student. Finally, we aim to provide the best career and educational advisement and networking opportunities to the students.

The advice and mentoring in this final deliverable comes not only from faculty and staff but also from generous alumni. We simply cannot advise and support all 3,000 students enrolled in the college without the help of our incredible alumni. You can be part of our vision and lend your support through BYU Connect, which connects students and alumni mentors. Learn more at alumni.byu.edu/byuconnect.

The college's new assistant dean for external relations, Monte Marshall, will help us maximize our efforts to guide and empower students in their educational and career paths. He is here for you, our alumni and friends, and can be contacted via email at monte_marshall@byu.edu or at the college office at (801) 422-2674.

Thank you for being an integral part of the College of Computational, Mathematical, and Physical Sciences and of BYU.

Sincerely,

Grant Jensen

Grant Jensen, *Dean*
BYU College of Computational, Mathematical, and Physical Sciences

COVER PHOTO COURTESY OF NASA/JPL-CALTECH/UCLA; INSIDE FRONT COVER PHOTO BY JOEL GARCIA; RIGHT PAGE PHOTO OF SATURN COURTESY OF NASA AND E. KARKOSCHKA (UNIVERSITY OF ARIZONA)

FRONTIERS

FALL 2024

BYU COLLEGE OF COMPUTATIONAL, MATHEMATICAL & PHYSICAL SCIENCES

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FRONT COVER *Images from NASA Wide-field Infrared Survey Explorer of the Andromeda galaxy spiral.* **BELOW** *Saturn in Ultraviolet Light taken by the Hubble Space Telescope.* **BACK COVER** *Chemistry students in Ryan Kelly's lab (see page 10). Photo by Joel Garcia.*

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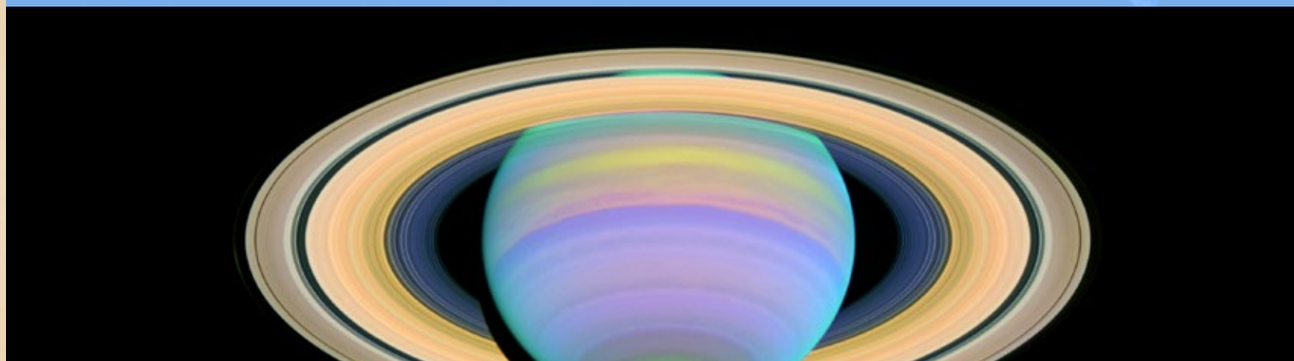


An Unexpected Path to

BY CANDICE L. MACFARLANE

BYU Alumnus Mario Perez on a Career at NASA and How Faith Is Part of the Bigger Picture

Dr. Mario Perez, a recipient and honoree of the BYU 2024 Distinguished Alumni Award, did not grow up dreaming of working at NASA or watching astronauts fly to space. In fact, his path to NASA was unpredictable.

Upon college graduation, most astrophysics students go overseas or to another university to work in a postdoc position. However, as Perez was finishing his doctorate in physics and astronomy at Brigham Young University, he did not see a clear path forward. He had been offered a position working with a Latter-day Saint professor at the University of Indiana and another position doing postdoc work in South Africa.

Perez knew that these postdoc positions would focus on training and learning and would not pay very much, and he had to consider how to provide for his wife and two kids—with another baby on the way. Although the position in South Africa seemed exciting, he needed a more stable option. “My wife was pregnant and very wise,” Perez recalls. “She said, ‘No, Mario. You need to get a job with health benefits.’” At that time, pregnancy was considered a pre-existing condition, so it was often difficult to find a job that offered health benefits and would cover it. Seeking better options, Perez took a bus from Provo, Utah, to Kansas City, Missouri, to attend an American Astronomical Society meeting. At the job center there were

LEFT Perez in front of the The Pillars of Creation image from NASA’s James Webb Space Telescope taken with the Near-Infrared Camera (NIRCam).

many opportunities to interview with different recruiters. "I signed up for one at NASA, and one of the first questions I asked the scientist interviewing people was, 'Do you offer health benefits?'" She said yes, so he asked if they excluded any pre-existing conditions. She said that she didn't think so. "That's how I got [to NASA], because of the health benefits," he says. "I really needed a solid job, and NASA gave me that opportunity."

Perez had earned his bachelor's and master's degrees in electrical engineering and then attended BYU for a PhD in physics and astronomy. He started working at NASA in July 1988, and his wife, Denise Condie-Perez, had their baby in October of that year, only three months later.

Looking back at the path that led to where he is today, Perez acknowledges, "Life is often more like a random walk. We have all these plans, but life's not linear and not perfect. However, it's incredibly worthwhile."

An Ambition for Space

While he didn't aspire to work at NASA, Perez's interest in astrophysics began at a young age in his native Chile. "I belong to the generation of people who saw Neil Armstrong land on the moon." He recalls having newspaper clippings from the months before, during, and after the moon landing and remembers all the publicity surrounding space activity, rocket exploration, and discovery. Experiencing the excitement around the moon landing as a kid and realizing "that there were other worlds you can visit and explore" made him want to extend his own horizon.

While Perez and his generation of astrophysicists, physicists, and engineers were motivated by the moon landing, they weren't clamoring to be astronauts themselves. "It was more that I had an intellectual ambition for space, the universe, and the big ideas," he shares.

In addition to his fascination with the moon landing, Perez was drawn to the idea of the Creation, that combination of science and faith. He especially loved reading the Creation story in Genesis—the depiction of how the universe, the galaxies, the planets, and the stars were formed. "Knowing that there was an order in the universe attracted me."

Perez has loved having a front seat to the many discoveries that have been made over the course of his career, particularly those that show the universe had a beginning and that the Creation indeed took place. "At the time of Albert Einstein in the 1950s, Fred Hoyle and others were promoting a static universe, the universe with no beginning and no ending," he says. "Then other measurements came about, and now we have a universe that has aged 13.7 billion years. To me, this shows that Genesis was not wrong."

MARIO PHOTOS COURTESY OF MARIO PEREZ; PILLARS OF CREATION (PAGE 4 & 5) & SAGITTARIUS C COURTESY OF NASA, ESA, CSA, STSCI, SAMUEL CROWE (UVA)

Not Just Astrophysics

Since he began working at NASA Headquarters in 1988, Perez's job has evolved. He currently serves as the astrophysics chief technologist within the astrophysics division at NASA headquarters in Washington, DC. His key responsibility is to engage the community in doing NASA's experimental research. While he is responsible for a sizeable amount of NASA astrophysics funding, Perez says the message of what NASA needs is more powerful than the funds it awards. NASA needs the public's investment and help and is "often surprised by the public's ingenuity and creativity."

At NASA, Perez has helped detect hundreds of potential planets, develop key technologies for upcoming NASA flight missions, and, most importantly, identify technology gaps. "A technology gap is the difference between what we have right now, or what is the state of the art, and what we need to develop," Perez says. "I work with the building blocks of future NASA missions. Soon, these building blocks will include emergent technologies such as quantum sensors, metamaterials, photonics devices, nanofabrication, artificial intelligence as applied to technology designs, and other innovative approaches."

Perez also has the responsibility to be fair in providing funding to the institutions that are going to advance and narrow those gaps. "We need to be careful because that is taxpayers' money, and we need to be good stewards of that funding. My responsibility is to be fair, unbiased, careful, and cautious with the investments and to make sure to get the best return." Perez sees this stewardship as similar to a bishop's stewardship over tithing and fast offering funds.

More Than Astronauts

"One of the common misconceptions about working at NASA is believing that we all work with astronauts," Perez says. "I work in an area that has nothing to do with astronauts; I work with robotic applications. Robotic exploration is easier, cheaper, and less risky." Another misconception about NASA is that it is a monolithic organization—it's not. There are many different areas: economics, communications, writing, photography, accounting, human resources, and many other fields. "But everyone who works here is passionate about the mission of NASA." Perez says.

LEFT Perez visiting the W.M. Observatory in Kamuela, Hawaii. **ABOVE** Sagittarius C, the James Webb Space Telescope's NIRCam reveals a 50 light-years-wide portion of the Milky Way's dense center. **RIGHT** Perez at the American Astronomical Society.

Part of the mission of NASA is to share its discoveries. Every piece of data it captures and every image from its several hundred satellites is available to everyone—not only to United States taxpayers but to the whole world. Everyone can benefit from the knowledge, and it becomes property of the human family. "To me, that is moving and powerful," Perez says. "Pretty much like the gospel. We want everyone to know, and we want them to know for free. NASA doesn't charge anything to anyone." Beautiful images of space taken by expensive and elaborate NASA telescopes are available on the NASA website, and downloads are free. "Friends and foes can download them," Perez says. "NASA doesn't care. Isn't that beautiful? To me that is so moving that everything NASA has is public, open, and free."

A Passion for Science and Religion

In April 2016, Perez attended a BYU Management Society talk in Washington, DC. The presenter, Harvard business professor Clayton Christensen, said something powerful that had a profound impact on Perez. "We have covenants in the Church that we make when we get baptized, receive the temple endowment, and enter into temple marriage, but those are global covenants," Perez says. "However, Christensen was talking about personal covenants—about making your own covenants with the Lord, and I decided that was a great idea." According to Perez, Christensen went on to say that he made the covenant of becoming a witness, and he called himself to be a missionary for the rest of his life. Christensen said that even when teaching about business, if you talk with the Spirit, it can touch the hearts, minds, and spirits of listeners. Perez decided that he wanted that gift too and that he had to be a witness. As a result, whenever he gives firesides or talks, Perez uses both science and religion. "It is powerful because I mention concrete things that people can read, ponder, and research, and then I add my testimony of the gospel and of Jesus Christ."

Perez's decision to invite the Spirit into his everyday life and his career has added to his passion for what he does. "The element that makes any career is to have passion and know what you really feel moved by," Perez says. "If you follow that passion, you're going to be very good at it, and you're going to be a naturally good student and worker."

When he was ten years old, Perez's family joined The Church of Jesus Christ of Latter-day Saints. Because he had skipped kindergarten, Perez finished high school when he was sixteen and went straight to college. When he was nineteen and old enough to serve a mission, he already had three years of college completed and was ready to graduate. Perez graduated and chose to continue his education for another two years to get a master's degree and then serve his mission. "So, I served my mission when I was a little bit older, and to me it was the right time," he says. "I had so many wonderful experiences." He served faithfully in the Chile Osorno Mission. However, he was highly criticized for his choice. Many of his friends and family members thought it was a waste for him to set aside six years of higher education and his work as an electrical engineer to go do something for two years without pay, but Perez was grateful for the opportunity to serve. His mission gave him focus, and when he came home, he realized that he wanted to get his doctorate and work in physics or astrophysics.

ABOVE NASA's James Webb Space Telescope captures a tightly bound pair of actively forming stars, known as Herbig-Haro 46/47 (NIRCam Image). **RIGHT** Perez with his family in front of the LDS Washington D.C. temple.

HERBIG-HARO 46/47 COURTESY OF NASA, ESA, CSA

Perez's mission helped in other ways as well. Many people in Perez's field struggle with human relationships and connections, which is why stereotypical characters like Sheldon Cooper in *The Big Bang Theory* are popular in the media sphere. However, Perez feels like an exception and credits his mission for "humanizing" him. "Since I was a little bit older when I started my mission, I was made branch president in the first place I opened and was there for ten months," Perez says. "Then the mission president asked me to open a second city, and I was there for eight months. So, I effectively became the branch president there too. Those experiences taught me human empathy." Perez says his service in the Church has been a tremendous advantage professionally with public speaking, social sensitivity, and understanding of life circumstances.

In addition to all he learned on his mission, Perez acknowledges the uniqueness of his experience at BYU. He says having an environment that can celebrate both reason and faith is unique. "Many other universities only celebrate the secular. In the secular, you find a lot of activities that become substitutes of the gospel," he says. Perez believes things like sports, hobbies, and secular associations are often used as substitutes for the connection, community, and purpose found through the gospel. "But those substitutes are superficial and aren't the same as the connections provided by the gospel. It's just not as deep," he says.

While faith crises can be common among disciple-scientists, Perez has kept a constant faith throughout his life. "To me, that's been a blessing," he says. "Pride is the sibling of being smart and educated, so we have to be careful with that. Being smart, really educated, and humble is a hard combination. However, I know it's possible because I know a lot of very smart people that are truly humble, spiritual, and teachable."

Dr. Mario R. Perez resides in Oakton, Virginia, a suburb of Washington, DC. He is a widower and was married for thirty-eight years to the late Denise Condie-Perez, who passed away in August 2020 due to complications of breast cancer. They have four children and eight grandchildren living across the country.

THE FUTURE OF PROTEOMICS

Advancing Cancer Research One Cell at a Time

What makes a cancer cell different than a healthy cell? This seemingly simple question is at the heart of the work of thousands of scientists around the world who study the complexities of cancerous growth and potential treatments.

By looking at proteins within a single cell, Ryan Kelly, BYU professor of chemistry and biochemistry, is making impactful scientific advances. Kelly and his BYU lab students' work focuses on these two questions: What proteins are present in a biological system? How much of each of these proteins is present?

Traditional research methods involve taking a large sample of cells, mixing them together, and then measuring the proteins. Kelly likens this to taking a new device, like an Amazon Echo, putting it in a blender, and then measuring the components in the resulting mixture; you might be able to determine the percentage of plastic, rubber, and silicone in the mixture, but it doesn't reveal how all the different materials worked together to create the device. It would be pretty difficult to reverse-engineer the device simply by looking at one that has been blended up.

Many cancer and biochemical research approaches use the blending method. For example, scientists will take a tumor sample, blend it up, and measure the proteins in it. This gives researchers an average of all the different cells and cell types. While it offers many insights, a lot of information is lost in the process.

That is where Kelly's research comes into play. He and his students look at one cell at a time and measure the unique proteins within it. "We first isolate individual cells into their own miniaturized test tube that holds a few billionths of a liter," Kelly explains. "Chemicals and enzymes are added to enable us to pull out the proteins from the cell, and these are analyzed using specialized mass spectrometers."

Gathering information on the function and prevalence of the proteins in the cell gives researchers a more nuanced understanding of the cell, its composition, and its interactions with other cells. "Tumors contain many different cell types that are specifically arranged to carry out their function," Kelly explains. "By studying proteins within tumors one cell at a time, we can potentially map out how tumors and precancerous lesions are structured to develop improved therapies. This spatial information is lost when proteins from a whole biopsy are mixed together."

TOOL DEVELOPERS

New analytical instrumentation and methods mean that researchers no longer require thousands or millions of cells to do this work—they can use just one. "We can track the original spatial organization of those cells," Kelly says. "And we can identify trace components." He compares this to eating a single blueberry on its own versus drinking a strawberry smoothie with a single blueberry mixed in; it is much easier to taste the blueberry flavor in isolation. "Rare cells get completely washed out when you do a bulk-scale analysis," says Kelly. "So we are focusing on measuring the cells in a biological system one at a time."

Kelly and his team function as "tool developers," which enables other scientists to use Kelly's new methods to improve their own work. As an analytical chemist, Kelly develops methods to measure molecules. "We invented highly sensitive sample preparation techniques that have enabled us to study more proteins from five hundred times smaller samples than was previously possible," Kelly says. "We have also developed fast and highly sensitive separation techniques that allow us to analyze single cells and other small biological samples much faster than was previously possible." This multidisciplinary work, a mix between chemistry and engineering, paves the way for environmental and biomedical scientists to do new kinds of research.

"Cancer biologists don't necessarily want to think about the tools and instrumentation," Kelly says. His work allows them to skip over the "how" of the instrumentation and focus on the "why" of a cancer cell's change.

Kelly's lab has received funding from the National Cancer Institute to support its focus on creating tools for improved cancer research. These tools include robotics that pick cells up and separate them to be analyzed individually by mass spectrometers.

Single-cell proteomics, a scientific field that gained its footing in 2018, has come a long way in just a few short years. Kelly's work focuses on reducing the sample requirements for proteomic measurements. Now, instead of needing a million cells, scientists can quantify thousands of proteins from one cell. And where they could previously look at twelve cells per day, now they can look at up to nearly a thousand per day. "The frontiers just keep expanding," Kelly says.

MORE THAN A PROFESSOR

Kelly received his PhD from BYU in 2005 and spent thirteen years working at Pacific Northwest National Laboratory before coming to BYU in 2018. Because of his experience as a student, Kelly says he felt drawn to apply to BYU when the opportunity arose because he wanted to be a part of the great mission of the university. "While my research program carried over from my thirteen years working at Pacific Northwest National Laboratory, teaching was all new to me," he says. "I have found teaching to be extremely enjoyable and rewarding."

PHOTOS BY JOEL GARCIA

ABOVE Chemistry student in Kelly's lab. **BELOW** Kelly (center) with his biochemistry students.

AWARDS RECEIVED SINCE COMING TO BYU IN 2018

2019 Georges Guiochon Faculty Fellowship, presented at HPLC 2019, Milan, Italy

2020 HTC Innovation Award, sponsored by LCGC Europe and presented at HTC–16, Ghent, Belgium

2023 Early Career Scholarship, Brigham Young University

2023 Early Career Scholarship, College of BYU Physical and Mathematical Sciences

In his time at BYU, Kelly has seen how the principles of learning the gospel are like learning the principles of science, as both require the highest quality effort. And he says both in science and the gospel, the ultimate pursuit is truth. "Ultimately, when you are studying science, you are studying the laws of God," he says.

During his time at BYU, Kelly has patented equipment designed by his lab, which is distributed through his startup company, MicrOmics Technologies. His small business focuses on providing researchers around the world with modern, emphasis-specific equipment.

Kelly's lab at BYU has received $8.5 million in external research funding during the past six years, in addition to $2.5 million that has been awarded to his startup company that is commercializing technology from the lab. While he devotes many hours to his lab and his company, Kelly has found time to contribute to sixty publications, which have been cited thousands of times, since he joined the BYU faculty in 2018.

Between all the demands of his work in the lab and his small business, Kelly still finds time for his family and his faith and has seen the Lord's hand in balancing his new role as bishop with his work life. "I love how the Lord provides a means for us to accomplish what we're called to do," he says. "I thought my life was already full with the joyous but endless responsibilities of teaching and research while also being there for my family." He continues, "I find that everything seems to work out."

ESTABLISHING A FOUNDATION FOR NEW STUDENTS' SUCCESS

BY SARAH BARTOLINI MAJC

BYU's new general education class—UNIV 101: BYU Foundations for Student Success—is making students' first semester the most positive experience intellectually, emotionally, socially, and spiritually.

The nation's college students are facing an epidemic of loneliness, which can affect their physical and mental states and academic performance. UNIV 101 was created to address this problem at BYU. The small sections, with a maximum of twenty-five students per class, require the sacrifice of dozens of professors to provide the three hundred classes needed to allow all incoming students to take the course.

What Is UNIV 101?

At its most basic level, UNIV 101 is a required course that first-year students take during their first semester, and it is taught in small sections by full-time faculty and a peer mentor. But what is the class actually like? Two professors and eight students share their experiences.

Sarah Olson, a student who took the course in winter 2024, says the class was "a foundation" that helped her understand how to navigate BYU and the college experience. "It gives us skills we need and provides a support system as we go through college," she adds.

Annabelle Ward learned a lot about the college experience and about the great people on BYU campus. "I was able to make a lot of friends in my class, and that has been one of the best parts about it," she says. "I learned a lot about how I interact with other people." Ward is not the only one. Steven Schwartz describes the class as "an opportunity to learn what it means to be a BYU student." He says it helps answer these questions: What kind of student do I want to be? How do I want to go about my education? How do I set goals and form friendships? And how do I make the college experience more enjoyable?

The general education website says that UNIV 101 "is designed to help [students] understand the unique mission and purpose of BYU, connect with other students and faculty in meaningful and lasting ways, and make the most of [their] BYU experience."

Professor Jennifer Nielson, associate dean of the College of Computational, Mathematical, and Physical Sciences, helped design the course and taught one of the inaugural sections. She says a lot of people see this class as the kind of student success course that many universities offer, but UNIV 101 feels like so much more to her. "The class is structured to have about twenty students in it," she explains. "You really create this community. And there was a deliberate choice made so that students come from all different backgrounds and majors, so it's like this little cosmos—this little universe in which you're learning how to talk to people who are not the same as you."

When asked what the actual class looks like, Nielson laughs, saying it was different every day. Nielson would often share her passion for organic chemistry while making meaningful connections to everyday student life. "One of the experiments the class really liked was memory wire," she says. "Memory wire is a metal alloy that 'remembers' a shape if the shape is formed at a high temperature. Then, whatever happens to the wire, if you put it back in some heat, it returns to that original shape. Of course we made it into a Y." After the fun experiment, they discussed resilience and what happens when the

LEFT Professors Jennifer Nielson and Bryan Morse with their UNIV 101 class in the anechoic chamber in the Eyring Science Center.

pressure gets high on students. "Asking who you are at your core is one of the things you need to practice right away because you are learning so many things when you first start college that it's easy to get swayed one way or the other, and the idea is to find out what's actually true," Nielson says. "Ask good questions, even about our faith, but then come back to the Savior. It's just like that idea of no matter what happens, you always come back to the Y."

Nielson and Bryan Morse, professor of computer science, co-taught the course. They always aspired to make class interactive and memorable, and their goal was to help students learn through personal experience and to foster an environment where meaningful discussions could take place. "We tried to model that through class interaction in a way that would hopefully carry into other classes," says Morse. "One of the parts built into the schedule is a day when we did not hold class. We held office hours, and students would set up appointments. The whole idea was to help them get over that hurdle of going to their professors and just talking with them," he shares. "So, we set up appointments, and they all came."

A Unique Mission and Purpose

According to the BYU mission statement, "the mission of Brigham Young University—founded, supported, and guided by The Church of Jesus Christ of Latter-day Saints—is to assist individuals in their quest for perfection and eternal life." The Aims of a BYU Education supports this, outlining that a BYU education should be "spiritually strengthening, intellectually enlarging, and character building, leading to lifelong learning and service." Morse explains that the curriculum for UNIV 101 is deeply rooted in the historical documents of BYU, including devotionals and general conference talks. However, the class is not simply about readings. Nielson and Morse encouraged meaningful class discussions in connection to the topics read. Having students from a variety of majors in each class gave way to interesting and productive discussions.

For example, the class helped Drew Haslam recognize how his personal goals for his education and career can be part of the vision that Heavenly Father has for him. Haslam recounted a class field trip to the *Education in Zion* exhibit in the Joseph F. Smith Building that drove home to him why education is so important to Heavenly Father. As Haslam was walking around, he noticed that the exhibit was divided into two sections: one side covered Church history and the other focused on BYU history. "But both were talking about why education in the Lord's kingdom is so important," he says. "I wasn't expecting some profound revelation or anything while taking this random new freshman class, right?" Haslam says with a laugh. "But it really was profound. It made me feel very appreciative and a lot more understanding of how important it is that I am at BYU."

For Ward, learning more about the history of BYU was an important reminder that "this is a place where spiritual growth is supposed to happen." Kale Bybee agrees, sharing insights he gained from the class centered on the Atonement of Jesus Christ and what it means to be a disciple-scholar. Bybee learned that although he makes mistakes, he can rely on Jesus Christ every step of the way to become who God wants him to become. Bybee is confident that he will be strengthened by this knowledge going forward: "I won't have the fear of failure. I'll learn from mistakes and use the Atonement of Jesus Christ to continue growing." According to Nielson, this is the goal—for the students to learn and to become not only amazing scholars but powerful disciples too.

The students continued to learn this lesson in new and wonderful ways throughout the course. As mentioned before, there was a beautiful diversity in class, with students from different majors, nationalities, and religious backgrounds. One student who was not a member of The Church of Jesus Christ of Latter-day Saints had started meeting with the missionaries before the semester began. About a month into the semester, he decided to get baptized; he invited the entire class to his special event. Morse said a lot of the class members came, and

LEFT Nielson invited the students in her UNIV 101 class to dinner at her home.

ABOVE Morse with students from his UNIV 101 class.

TOP OF PAGE 16 COURTESY OF MATHILDE OSCARSON; OTHER PHOTOS COURTESY OF ASSOCIATE DEAN JENNIFER NIELSON

the student even asked him and Nielson to give talks at the baptism. "That was a real honor, getting to be there and seeing the support he had," says Morse. "Most of our class came out for it, and this is a set of students giving up part of a Saturday to come to campus for this event and to support him. It was wonderful to see that." Both professors, however, want to make sure they are not claiming any credit for this wonderful experience. Nielson clarifies that this is simply one of the beauties of the class—people are there for each other. She says they saw "in a very poignant way" that the student made his decision and then his classmates supported him.

Adapting to Student Needs

Morse knows that the students coming to BYU are "hungry to learn," and the curriculum allows for room to respond to students' questions or concerns. Toward the end of the semester, one of the students raised a hand in class and asked, "How do I know when my finals are?" Morse responded by setting aside his plans for the class discussion in order to clear up any misunderstandings about finals, how they are scheduled, and how to study for them.

Nielson stresses the importance of acquainting the students with the available resources and how to use them. Instead of the class being a type of question-and-answer session, the students were introduced to the resources and told where and who to turn to when they have questions. Nielson says that although they had many amazing conversations, she always aspired to make the discussions interactive and practical. "If we were learning about a new resource, we would tell them, 'Get out your computer. Look it up.'" Olson was incredibly relieved to learn about all the resources made available to students. "It is quite cool how much support this university gives its students physically and mentally," she says. "There is always someone to help you."

The curriculum includes assignments called "discovering campus," which require students to do things across campus. They had to participate in a sporting event, an academic event, and a cultural event. But it was not as simple as that; students were required to attend these activities with their classmates. "You go with some students from the class, so it's really nice to get to connect while doing those assignments," says Bentley Messenger. This was such an amazing opportunity for the students to socialize, but it also pushed them to look for the many intellectually enlarging experiences available on campus.

Nielson fondly remembers an occasion when Arthur C. Brooks, an acclaimed American author, came to give a seminar on happiness. The event was mentioned in the class's group chat, and five students ended up going with the professors. Brooks finished his seminar by addressing the audience and telling them if they wanted to do something with what they have learned, they should go and teach someone else. "So we just turned to the students," says Nielson, "and asked, 'Do you want to teach a class? It aligns perfectly with the reading.'" The students accepted. And according to Nielson, their lesson went beautifully. "That is core to education," Nielson says proudly. "We think learning is when we as the professors throw you the ball and you catch it. But that is not learning. You have to throw it back." Having students actively listen to and learn the course material, apply it to their own lives, and then share it with others is what BYU is all about. Nielson is sure the experience of attending the seminar and teaching it to their peers will stay with not only the five students who went but also the ones who got to hear about it in such a unique and loving way.

Thinking Outside the Box

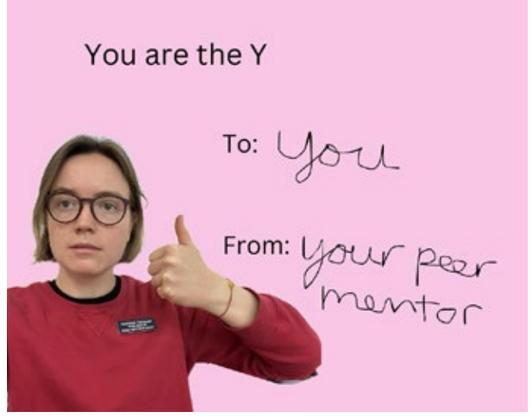
All these learning opportunities were seen as a plus from the students' perspectives. Bybee was so grateful for the professors and their drive to think outside the box. He says it was apparent that the professors wanted to use the class to help students, which helped him as he strived to apply more of the material to his own life. Bybee advises future UNIV 101 students to "really apply it—not just in their school lives but in their lives as a whole."

One student even declared a minor because of a connection he made in the discovering campus assignment. Isaac Moll and his classmates were trying to find out what to attend as part of the cultural activity. "I served my mission in Hong Kong," he says, "so I decided to go with some people to the Chinese home evening here at BYU." Moll had a lot of fun at the event, saying, "I don't think I would have gone if I wasn't in this class, and I'm thankful for the opportunity to have met new people and to immerse myself in the culture that I love." After that experience, Moll decided to pursue a minor in Chinese.

While the class is incredibly interactive, there is more to it than just fun experiments and field trips. The students and professors devoted their time first to talking about lifelong service and then to actually putting their "shoulders to the wheel." Nielson's class once talked about helping people while making mats for the organization Stitching Hearts Worldwide, which distributes mats made from plastic grocery bags to people who have been displaced so they can have something to sleep on. Nielson proudly says that although they were having fun while making the mats, they also got quite a few done because "students at BYU know how to work hard."

Both Nielson and Morse fondly remember a time when the class united to help a fellow student in need. Due to an unfortunate accident, one of the students dislocated her elbow and needed surgery. On the class's group chat, the injured student asked if anyone would be willing to drive her back from her surgical appointment. "The student had multiple people volunteer," says Morse. Two days after her surgery, the student texted in the group chat and asked if anyone would be willing to come hang out. Nielson reports, "A bunch of them just went over, and they all watched a movie together."

This was one of the core purposes for this class. "What would it be like if every single first-year student, in their very first semester, had that kind of built-in support system and could say 'I need this' or 'I have this question' or 'I need somebody to help with some particular thing,' and they knew who they could reach out to?" Morse poses. "I mean, yes, they have their roommates. Hopefully they have their wards, but in many cases, it takes time to develop those kinds of structures within a ward," he says. "They all had each other, and there were many other stories about how they just relied on each other throughout the semester."



ABOVE UNIV 101 peer mentor Mathilde Oscarson's Valentine to the students in her class.

Making Connections

The first semester of college is often especially difficult for first-year students, many of whom have never been to BYU campus before the start of the semester. Morse believes that UNIV 101 provides "a chance for the students to connect with each other." James Smart agrees and credits the relaxed class atmosphere and the fun assignments around campus with helping him make good friends: "It's been fun not only to go explore the events but to do it with the other classmates."

Morse and Nielson used a substantial chunk of their class time to foster connection between students by beginning each class with two student introductions. "We had twenty students in the class," Morse says, "so that took us through about five weeks of the class." And it worked. The students created a group chat to keep up with class assignments, and the chat quickly became a place of love, caring, and acceptance. Nielson shares how on the day when one of the students turned eighteen, she proudly posted into the group that she was finally able to donate blood, which she lamented not being able to do at the beginning of the semester while still seventeen. "BYU is a space that is not like the world out there," Nielson says. "Yet if we can learn how to take care of each other, we can become amazing scholars and also disciples. This is a great way to start your university experience."

Ward's UNIV 101 class was on Tuesdays at nine o'clock in the morning, which is before BYU's weekly devotional. "We went to devotionals together as a class," she says. "It was a good opportunity because I don't know that I would have gone every time otherwise, but I really loved being able to go to the devotionals and forums with my class." Ward remembers that in one of their first class periods, Nielson told them that, because they were all first-year students, they probably did not know many people on campus yet. She then challenged them to look at the people around them: "They're your friends and they're your family now," she said. Ward was grateful for this perspective. "I just love the feeling of community the professors tried to make at the very beginning," she says.

Ward isn't the only one. Students were happy to compliment how quick to help their professors were. Smart specifically noticed how the professors would seek their perspective about what he and his classmates were going through. "This course hasn't just been about getting assignments done. Every class, we sat down and talked." Smart and his classmates would discuss with the professors what they were going through, how an assignment helped them, and what they wanted to learn more about. "Professor Nielson invited us to her home for dinner," says Schwartz, which he describes as one of the coolest experiences of the semester. "I feel like my teachers really inspired us to form friendships with one another and to work together in class and outside of class," he says. "It was a fun opportunity to do something that I would not normally be able to do as a college student, to go to someone's home, have a home-cooked meal, and just have some really good quality time with my friends."

More Than a Mentor

An important aspect of UNIV 101 is the peer mentor. Morse made it clear that the mentor was not responsible for any of the grading or assessments and was not a teaching assistant in the traditional sense; the peer mentor's focus was assisting the students. Nielson describes a peer mentor as a "student who is a little farther on the road" and who can offer advice: the successes, the things they loved, the pitfalls. Neither of the professors could praise their fantastic peer mentor enough. "She reached out frequently," says Nielson. "She was funny. She would send the students a meme, or she'd do the kind of goofy things that when professors do them, the students feel like you are trying too hard; but when the peer mentor does it, it is completely normal. I appreciated that."

The peer mentor was also amazing in the group chat, sending timely announcements about assignments and other class activities. She would be available to students, assisting them in brainstorming for their class assignments and projects, but she would do so in an interactive way, guiding the students to come to their own solutions instead of simply giving them an answer. As such, she was key in practical learning. She also acted as a mediator between the students and the professors; when the students felt more comfortable coming to her with questions or concerns, she could—with the students' consent—report back to the professors and help them adapt to the students' needs. The professors and the peer mentor met weekly. "We'd meet and say what went well. Then we would ask 'Who needs help?', 'What should we do next week?', and 'How should we think about the activities?'" says Nielson. "She was frequently reminding us of stuff and making suggestions about what would work for the students." Nielson recognizes that, to some students, professors are, if not older, at least scarier than peer mentors. "Oftentimes, she had a more direct connection than we did, even though we were trying to be available and we invited students to come see us whenever they could."

Make the Most

While the experiences of Nielson, Morse, and the students demonstrate the benefits of this class, it can be seen as an added burden to the students' courseload. "The first thing you need to know is that this class will not add to the general education requirements," Nielson explains, because there are several general education courses that it can be substituted for if students are concerned about the load of a two-credit class. However, Nielson reminds the students of the interdisciplinary beauty and personal enrichment of general education classes. "You'll get some real gems out of your GE courses," she continues, "and for UNIV 101, that is definitely true." But Morse and Nielson agree that UNIV 101 is what students themselves make it, so they should make the most! FR

S U C C E S S

Introducing New Associate Dean Kevin Seppi

ARTIFICIAL AND SPIRITUAL INTELLIGENCE

“When I was a BYU student and first dating my wife, I told her that I wanted to return to BYU to be on the faculty at some point,” says newly appointed Associate Dean Kevin Seppi. “It was always in my heart to return.”

A computer scientist with a robust career, Seppi is grateful to focus on the intangible—preparing students to go out and change the world as scientists, technologists, and good people who serve their families and communities.

DUAL HERITAGE OF FAITH AND SCIENCE

Faith and science work hand in hand for Seppi. His scientific research strengthens his faith, and his faith empowers his research. He sees both his research and his faith as key components of the pursuit of truth. “Part of what we were meant to do on this earth is learning and figuring things out,” says Seppi. “I wouldn’t have the secular knowledge that I have without the spiritual knowledge and support I got while here at BYU.” His faith drives his belief in the importance of BYU providing a strong academic foundation for every student.

Seppi’s commitment to learning and education is reflected in one of his favorite quotes from Church President Lorenzo Snow: “In this system of religion that you and I have received there is something grand and glorious, and something new to learn every day, that is of great value. And it is not only our privilege but it is necessary that we receive these things and gather these new ideas.”[1] Snow also said: “The whole idea of [the Church] is improvement—mentally, physically, morally, and spiritually. No half-way education suffices for the Latter-day Saint.”[2]

At BYU, Seppi believes this means providing an excellent, rigorous education for students in their disciplines. “Our

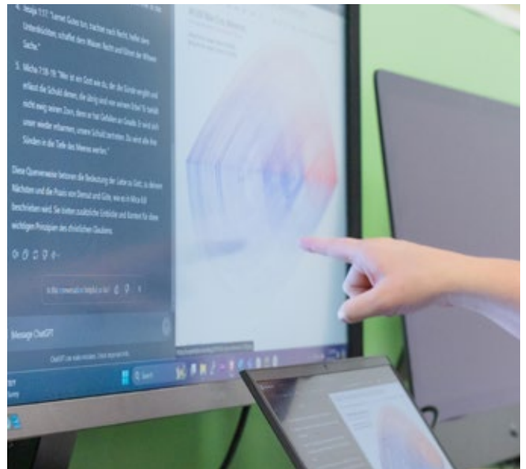
ABOVE Associate Dean Kevin Seppi with PhD student Courtni Byun.

purpose is to help our students in their 'quest for perfection and eternal life,' and education is a key component," says Seppi.[3] "I'd like students to come to BYU and feel they didn't get a halfway education—that they got the very best we could give them."

THE NEXT GENERATION OF LEADERS

To provide the best opportunities for students, Seppi seeks to encourage impactful faculty research. "The purpose is the students," says Seppi. Whether a student is a statistician or chemist, Seppi believes they can make meaningful contributions to the world through scientific discoveries or innovative technology. "We could do play research, little projects of no importance that students could work on, but that's not what we're about at BYU. We're doing meaningful work," says Seppi. "Excellent faculty research projects provide tremendous learning opportunities for students, so we should continue to elevate our research."

Research should be both impactful and student-centered, and faculty should select projects that heavily involve students—including undergraduates. Seppi believes that students can meaningfully contribute to emerging fields like artificial intelligence (AI) and sees them doing it in his research lab. His PhD students, Piper Vasicek and Courtni Byun, are exploring how to improve and utilize AI. For instance, Byun is researching AI hallucinations, a term that describes when generative AI produces faulty results like inaccurate data and images that don't make sense. These hallucinations can occur for many reasons, including weaknesses in the AI algorithms. The team has made significant progress, from discovering some causes to finding possible solutions to prevent them.



Vasicek's research focuses on how AI can automatically generate footnote-like additional information to support an existing text. She's focused on the dichotomy of adding this key information without detracting from the flow of the original narrative. Footnotes can be disrupters, so the main challenge is striking the balance between the helpfulness of additional information and the interruption in the reader's focus on the main text.

Seppi hopes students won't just be contributors; he also wants them to be leaders in their careers. "We want them to be prepared enough that they can walk into a room and be leaders—in a secular way but also in a spiritual way, so people recognize them as good people trying to do good things," Seppi says.

Seppi is a proud advocate for student-centered research and is grateful for all the generous donations from alumni who make it possible. Donations to the college directly support hundreds of students every semester and provide them with meaningful research experience. "If a student wants to pursue research with a faculty mentor in our college, they now can thanks to donors," Seppi says. "It's really exciting when you see students who have never seen themselves as researchers, and it suddenly just blossoms in them."

THE WINDING ROAD BACK TO BYU

A computer scientist by training, Seppi had a robust industry career before returning to BYU to fulfill his dream of joining the BYU faculty. After completing his bachelor's at

PHOTOS COURTESY OF KEVIN SEPPI

ABOVE Seppi with his PhD students, Piper Vasicek and Courtni Byun.

BYU, he began working in the software industry. His work covered a spectrum of topics, everything from developing the back end of multimedia software to working in mergers and acquisitions. He earned his master's degree part-time while working and later earned his PhD at the University of Texas with the support of IBM, his employer.

Despite being a computer scientist, Seppi completed his PhD under a Bayesian statistician advisor. For his dissertation, he applied Bayesian decision theory to the problem of database query optimization. While a seemingly innocuous choice at the time, it would later help Seppi when he decided to return to BYU. In the early 2000s, the discipline of AI shifted toward probabilistic approaches, particularly using Bayesian statistics. Seppi's PhD work from years prior had uniquely prepared him to jump from industry right into academic research. Seppi sees this as a direct blessing from God. "I was blessed that it came into my heart that I needed to go back to BYU and be a faculty member at the right moment," says Seppi. "If I returned five years earlier, it would have been hard to get research off the ground, and if I had come ten years later, that AI research wave would have already passed."

HOPE IN BYU'S FUTURE

Reflecting on the significant progress the college has made, Seppi notes the incredible growth in just the past ten years: "We have about a ten percent increase in faculty and about two and a half times more students." But for Seppi, it's less about the numbers and more about helping BYU students, many of whom are interested in majors in science and technology. While Seppi is proud of what he has accomplished in his career and at BYU, he is also excited about the new wave of faculty and staff who have joined the university; he acknowledges that the recent BYU hires are already way ahead of where he was at the same point in his career.

Just as his dream to return as a faculty member began when he was a BYU student, Seppi hopes that he and the rest of the faculty might even inspire a few current students to one day return to BYU as faculty members. Seppi was blessed with supportive faculty that helped him find his way, both spiritually and temporally. It is his wish to have the students feel the same about him—to feel his love and his desire to help them "go forth to serve."

NOTES:

1. Lorenzo Snow in *Sixty-Eighth Annual Conference of The Church of Jesus Christ of Latter-day Saints*, Deseret News Publishing Company, Apr. 1898, 13.
2. Lorenzo Snow, "'Mormonism' by Its Head," in *The Land of Sunshine* XV, ed. Charles F. Lummis (Land of Sunshine Publishing Co, 1901), 257.
3. Quoting from the Mission of Brigham Young University (4 Nov. 1981).

A LIGHT THAT IS ENDLESS

Shining a light on fifty years of progress in computing, math, and science

"We value the pursuit of truth in all kinds of forms: spiritual truth or understanding chemistry, math, computer science, or whatever it might be," says Bryan Morse, computer science faculty member and former associate dean. This sums up the aims of the College of Computational, Mathematical, and Physical Sciences over the past fifty years and its vision for the future.

A NIGHT TO REMEMBER

Alumni, faculty, staff, students, and friends of the college gathered at the fiftieth anniversary gala to conclude the college's yearlong celebration of this notable milestone. Throughout the year, the college focused its celebrations on the anniversary theme, "A light that is endless" (Mosiah 16:9). The theme reflects the BYU community's commitment to emulate the Savior as we strive to emit a unique light for the benefit of the world.

ABOVE Dean Grant Jensen and Associate Dean Jennifer Nielson joined the panelists at the college's anniversary celebration.

In his opening remarks at the gala, Assistant Dean Monte Marshall shared the university's and college's ongoing pursuit to be world class and faithful. He also introduced two important goals the college has set: to perpetually fund fifty student research positions every year through fundraising and to increase the mentorship program by five hundred mentors through BYU Connect.

Dean Grant Jensen listed three deliverables the college needs to give students in order to meet these goals and continue the success the college has experienced over the past fifty years: (1) offer a classroom education second to none, (2) provide out-of-class activities that students need to advance their careers, and (3) ensure that students have the advice and mentoring they need to make the right decision at each point in their college education.

PAVING THE PATH TO EVEREST

The college wouldn't be where it is today, fifty years after its creation, without the students. "In terms of maturity, effectiveness, and goodness, they stand in a class by themselves—truly the best in the world," Jensen says of BYU's students. He believes they are proof that BYU is unwaveringly becoming the Everest of education President Spencer W. Kimball prophesied the university would become.

"We are already becoming the Everest of education in many fields and are rapidly approaching it in others," Jensen says. And examples abound. Our animation program is world renowned and has won twenty College Television Awards and six Student Academy Awards. Our applied and computational mathematics program received the prestigious 2024 Exemplary Program Award from the American Mathematical Society.

The college also has the only math education department in the country, and BYU has received the PhysTEC 5+ Club award for the physics teaching program every year since 2013, the only university to win the award every year for the last ten years. BYU offered one of the first undergraduate statistics degrees in the country and continues to be known as one of the best universities for preparing statisticians for PhD programs. The actuarial science program received the highest university recognitions from the Casualty Actuarial Society and the Society of Actuaries, making BYU one of only five universities in the world with both distinctions.

Other notable accomplishments for the college include the Putnam math team's rank in the top twenty-five, something BYU's team has accomplished every year for the past eight years, and the computer science teams' first- and second-place rankings in regional programming competitions, with one team going on to the World Finals and placing eleventh.

PANELIST PERSPECTIVES

As part of the gala celebrations, three alumni panelists—Phil Low, C. Shane Reese, and Carlos Martins—shared their experiences being part of the college during their student years at BYU and their thoughts on the college's role in the future of science and technology.

Phil Low, who received his bachelor's degree from BYU in chemistry, has dedicated more than forty-five years to designing targeted imaging and therapeutic agents for human diseases. His work, encompassing 500 scientific articles and over 360 patents and patents pending, has led to three FDA-approved cancer drugs in the last three years, with five more in clinical trials. Low reflects on the role and responsibility of students:

> There are a lot of institutions on this planet that prepare people professionally for achieving what their academic discipline demands, but there aren't a lot that can also provide and support development of character: people that are honest and kind, generous, willing to forgive, willing to say "I'm sorry," and choosing to judge not—the Christian principles we all value. What we really need are role models out there that are really successful and also very good. If we can have that, I think we can lift society.

C. Shane Reese, who studied statistics for his bachelor's and master's degrees at BYU, is the fourteenth president of Brigham Young University. Before becoming the university's president in 2023, he was part of the statistics faculty and served as dean of the College of Computational, Mathematical, and Physical Sciences and then as academic vice president. Reese echoes Low's sentiment:

> As a university, we're going to be more successful because of our spiritual mission, not in spite of it. We're going to be successful. We're going to be unique. We're going to be distinct in the sphere of higher education because of our spiritual mission, because we are committed to teaching Christian values and the truths of the restored gospel of Jesus Christ. That has to be the hallmark of a Brigham Young University education. So what can we learn from our last fifty years that we think will carry forward in our next fifty years? It is in fact that we lean in heavily, that we double down on that commitment to our spiritual mission that supports and strengthens our academic mission.

Carlos Martins, a BYU graduate in computer science and statistics, is a leading businessman in his home country of Brazil. There, he founded Wizard Language Institute, the largest chain of language schools in the world. The institute has three thousand locations, serves one million students each year, and generated fifty thousand jobs. Martins reflects on his time as a student at BYU and the things he learned that set him up for success in the future: "Discipline, the ability to plan, and goal setting for the future is the combination essential for anyone who seeks success."

CELEBRATING THE FUTURE WITH FAITH

As the college looks toward the future, its uniqueness will continue to set it apart. "The thing that makes the whole academic endeavor at BYU so unique is that sitting in front of you is a student who is committed to learning not only by study but also by faith," Reese says. "They want to expand their mind, but they also want to expand their spirit."

The College of Computational, Mathematical, and Physical Sciences sends students out into the world each year, and the faculty and staff work hard to provide a well-rounded, Christ-centered education. The fruits of their efforts can be seen in the success of the gala panelists and the college's recent graduates. "We are preparing scientists that the world needs," says Associate Dean Jennifer Nielson.

PHOTO BY KYLAND OCHSENBEIN

Math the World

A MATH PROJECT BRINGING REAL-LIFE CONTEXT TO MATH

"When will I ever use this?"

Math the World is on a mission to answer the age-old student question "When will I ever use this?" The Math the World YouTube channel, created by BYU mathematics professor Doug Corey and a team of students, bridges the gap between theoretical math and its real-life applications. The channel's videos take everyday questions and harness the power of mathematical modeling to provide insightful and meaningful answers. The channel's creators are not just mathematicians but also math educators; they know the material, how to teach it, the common pitfalls students make, and the pedagogy needed to help empower other teachers!

Calculating the perfect bottle flip and understanding how much force is behind a penny dropped off a skyscraper are just some of the real-world dilemmas that Math the World answers. The video with the most comments answers the question "What is the optimal angle to unfold a paper condiment cup to maximize the amount of sauce it holds?" It generated over one thousand comments and has spurred two follow-up videos to answer related questions that viewers asked. The channel's most viewed video is about how Corey used calculus to beat his own children in Mario Kart. It has over half a million views!

How I Used Calculus to Beat My Kids at Mario Kart

+500K VIEWS

The Optimization Problem No One Cares About But

CHANNEL STATISTICS

+31K
SUBSCRIBERS

+50
VIDEOS

+2M
TOTAL VIEWS

7 VIDEOS WITH
+100K
VIEWS EACH

← VISIT MATH THE WORLD'S CHANNEL

IN THE COLLEGE

SCIENCE SPOTLIGHT

ACME Exemplary Award

Over the last ten years, BYU's applied and computational mathematics emphasis (ACME) has continued to grow and garner recognition for its achievements. In October 2023, the American Mathematical Society (AMS) announced BYU's program as the 2024 Exemplary Program recipient.

This award, which was established in 2004 and has been presented since 2006, recognizes a department with an unusual or particularly effective program that adds value to the mathematics community or broader society. BYU's ACME program helps students apply math and computer science in new ways, according to Paul Jenkins, ACME professor and mathematics department chair. "When we started the ACME program, we wanted to give better opportunities to our students, to provide an education in applied mathematics that's much more modern," Jenkins says.

BYU math professor Jeff Humpherys realized that many math-loving students were leaving the major because they didn't see rewarding jobs in the discipline. He also saw that many math alumni had rewarding jobs using math but weren't using the math taught in the traditional major. In response to these circumstances, Humpherys came up with the idea for the BYU ACME program. This new undergraduate program in applied and computational mathematics would modernize the math major and better integrate it in the broader STEM community by focusing the curriculum on mathematical analysis, algorithm design, mathematical modeling, and interdisciplinary study. The program's first cohort, in 2013, had fifteen students. Since then, ACME has attracted many new students into mathematics. It now graduates about sixty students per year, and these graduates go on to rewarding jobs and graduate studies in both pure and applied mathematics, as well as other STEM fields.

PAGE 26 PHOTO COURTESY OF PARKER FELLOWS; PAGE 27 PHOTO COURTESY OF ROBERT RICHARDSON

Statistics Department Hosts Data Analysis Competition

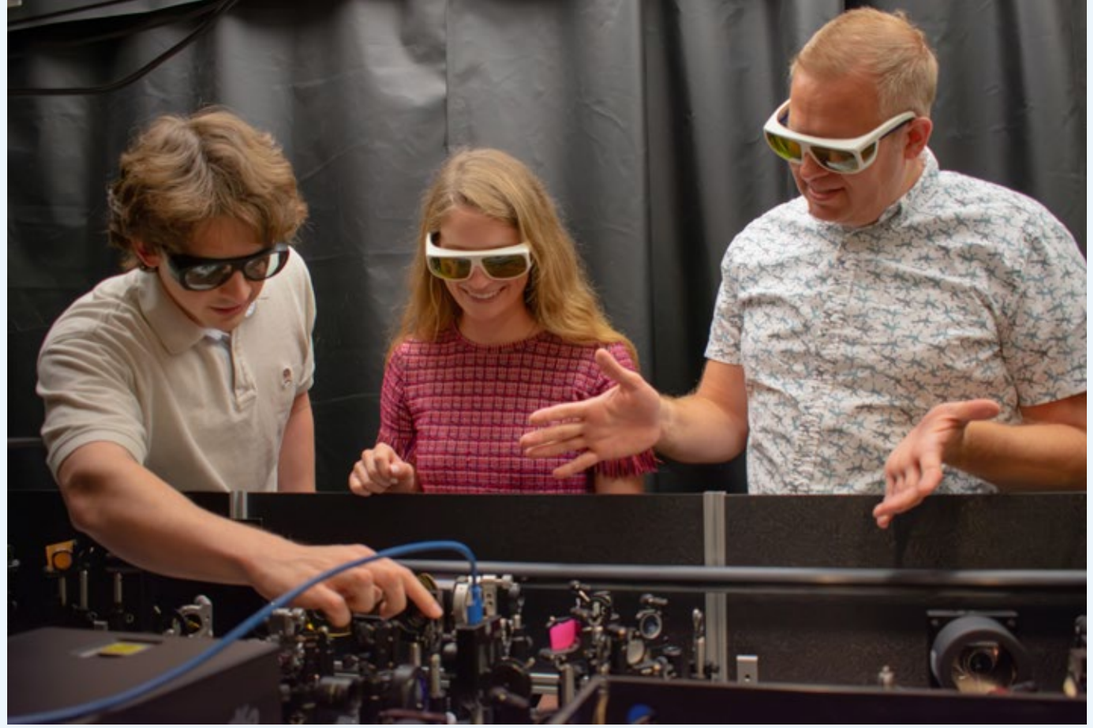
The BYU Statistics Department hosted a data analysis competition, which Robert Richardson, associate professor of statistics, hopes will become an annual tradition. Case study competitions allow students to apply broad concepts they learn in classes to a specific, often nonstandard situation. The competition presented a specific business problem that students responded to by preparing data to use to answer the problem and then using data analysis tools to justify the answer.

Eighty students participated in the competition. The students received a prompt several weeks in advance and had to prepare five slides with their solution to the problem, which they presented in a ten-minute session at the competition. Local industry professionals were brought in as judges and used a rubric to grade the presentations based on the students' approaches to the problem, justification of their solutions, and overall presentation.

"I was very impressed with the students in the Statistics Club who took ownership of the event and helped plan and administer everything," says Richardson. "Those are the students that future employers will be able to trust with big responsibilities."

Richardson continues, "In our classes, students learn about a method and then get to practice it through homework, a lab, or a test; the students aren't surprised about what they are expected to do because they just learned it." These competitions, however, act in stark contrast to the typical model of learning because students are given very little direction. Instead, they receive "a bunch of messy data sets and a problem to solve," says Richardson. When students can work with the bare minimum to manifest solutions while clearly communicating and justifying their process, industry professionals quickly recognize the value these students can bring as potential future employees.

Events such as the data analysis competition provide BYU students opportunities to bring theoretical knowledge into practical everyday situations and prepare for a professional career. "This is a very scalable experiential learning opportunity that many students can participate in without a huge load on faculty resources and without an unrealistic time commitment from the students," Richardson says. With all the benefits that come from it, he hopes students participating now will return in five to ten years, skilled and equipped to serve as mentors to the next generation of bright minds.



$1.25 Million Grant for Professor Jeremy Johnson

The Gordon and Betty Moore Foundation has named BYU chemistry and biochemistry professor Jeremy Johnson as a member of the third annual cohort of Experimental Physics Investigators to achieve remarkable physics insights and open new frontiers. This new cohort of nineteen researchers will each receive a five-year, $1.25 million grant to enable them to pursue their research goals and try new ideas.

"This initiative is designed to support novel and potentially high-payoff projects that will advance the field of physics but might be hard to fund through traditional funding sources," says Theodore Hodapp, program director for the initiative. "We are delighted with the variety of ideas and projects this year's cohort represents."

The initiative provides flexible funding to pursue imaginative research ideas, allowing the investigators to explore uncharted areas and advance the scientific understanding of the natural world. Specifically, Johnson's research primarily focuses on chirality. Chiral structures are mirror images, like right and left hands. Chirality affects many aspects of our lives, from the way we use tools such as scissors to the biomolecules that make life possible. In fact, crystal chirality directly impacts the attributes of materials, such as magnetic states. Getting control of crystal chirality creates a new "knob" to change the properties of materials.

"Jeremy's research is transformative," says Grant Jensen, dean of the BYU College of Computational, Mathematical, and Physical Sciences. "I'm excited to see the forthcoming discoveries and how they will change the world. We're proud that this research merited the attention of the Gordon and Betty Moore Foundation, which is sponsoring this project."

Johnson will examine how laser light can intentionally alter and control crystal chirality and associated properties. For example, he will study how non magnetic materials can be made magnetic by using light. These fundamental studies will elucidate how materials controlled with light can act as ultrafast switches, which may lay the foundation for future high-speed computational devices.

"My favorite part of being a professor is working with students and making fascinating discoveries," says Johnson. "This funding from the Moore Foundation will expand our research capabilities and enable BYU students to learn how light can control material properties for transformative new applications."

PAGE 28 PHOTO COURTESY OF DESIRAE REES; PAGE 29 PHOTO COURTESY OF BYU PHOTO

Michael Dorff Receives Most Prestigious Award for Distinguished Service to Mathematics

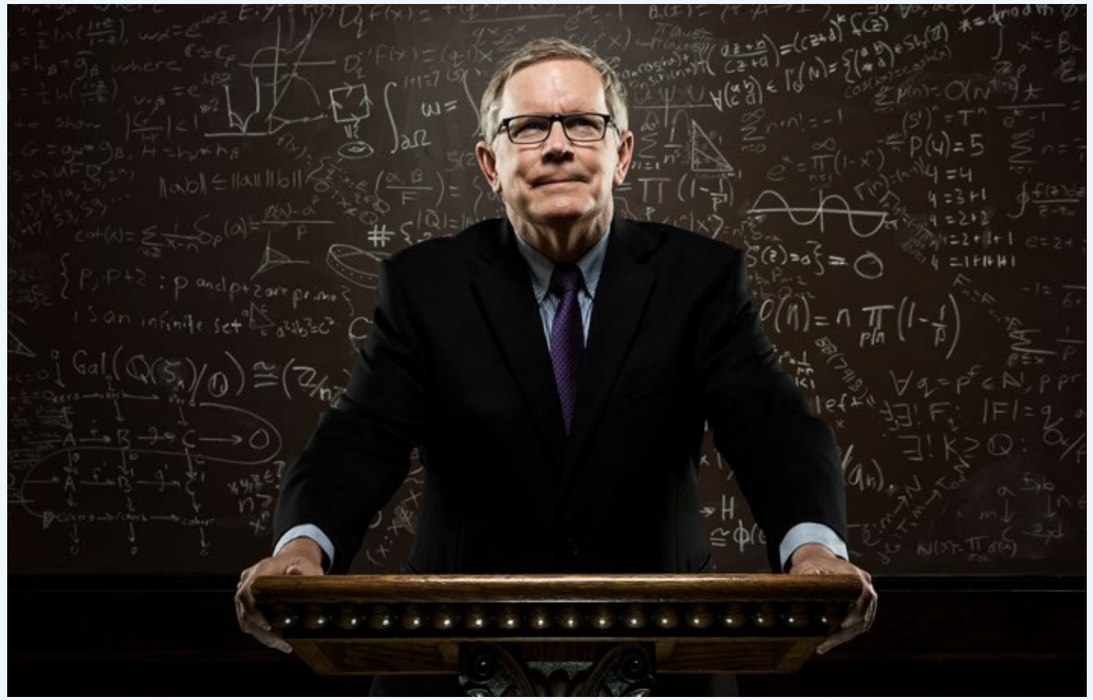
The Mathematical Association of America (MAA) has awarded Michael Dorff, professor of mathematics, the Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics, the most prestigious award of its kind. According to the MAA, "This award honors individuals who have made extraordinary contributions to mathematics and significantly and positively influenced the field of mathematical education on a national scale."

Dorff is a former president of the Mathematical Association of America (MAA). He earned his PhD from the University of Kentucky, and he co-directs the MAA Preparation for Industrial Careers (PIC) in Math program and is the founder of the Center for Undergraduate Research in Mathematics (CURM).

"I served as Michael's associate chair for four years and learned an immense amount about service, teaching, and leadership through his example," says Paul Jenkins, mathematics department chair. "He loves his students, BYU, mentoring, and mathematics, and he tirelessly promotes them all."

This MAA award is given once a year to a person who has led a life of service to the mathematics community. Dorff says that this recognition means a lot to him as well as to the college and the university, as he is being recognized for the service he offers and the positive changes he makes in the world.

Jenkins says Michael's influence on the worldwide mathematics community has been transformative. "He is one of the biggest promoters of mentored undergraduate mathematical research anywhere and has created multiple successful programs to train faculty across the country to better help their students," says Jenkins. "His work with CURM, PIC, the MAA, and Transforming Post-Secondary Education in Mathematics has strengthened the mathematical community for many years, and I am delighted to see him receive this prestigious recognition."



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