A new academic year is in full swing, and a growing Mines community is buzzing with excitement of new leadership, continued growth and the university’s promise to prepare students to be industry leaders.

"Welcoming the newest Hardrockers and having all of our students back on campus is one of the best days of the year," said Mines President Heather Wilson, D.Phil., who addressed students, parents, faculty and staff at various events during Welcome Week, her first since becoming university president in June. "We’ve been looking forward to this day for weeks!"

Enrollment is expected to continue to increase, with the official headcount tallied the tenth day of classes and made public by the Board of Regents several weeks later. Overall enrollment last fall increased 4.9 percent compared to the previous fall for a total of 2,424 students. Last year’s growth included a significant jump in new students – first-time freshmen, transfers and readmits – from 498 to 577, representing a 15.9 percent increase in this category.

New this year: The university has leased the privately-built Rocker Square II adjacent to campus for the entire year for occupancy by sophomores, who, along with freshmen, are required to live on campus. Rocker Square I opened a year ago and is occupied mostly by upper-class Mines students, though it is privately managed. The buildings hold nearly 250 people.

The School of Mines is developing a housing master plan proposal to address long-term needs, which will be presented to the Board of Regents this fall.

There is a renewed emphasis on community service this year. More than 400 freshman gathered Aug. 25 to give over 1,000 hours of cleaning, repairing, beautifying and feeding the community.

The proposed new student wellness and recreation center at the South Dakota School of Mines & Technology will move forward with a February groundbreaking thanks to a $2 million gift from alumnus Stephen D. Newlin.

The gift, combined with a $6.7 million tax students approved through increased fees, will allow the $8.9 million project to move forward. The new wellness and recreation center will be built adjoining the current King Center on the south end of campus and will provide more than 34,000 square feet of new or remodeled space.

Newlin is chairman, president and chief executive officer of PolyOne Corp., the world’s premier provider of specialty polymer materials, services and solutions. He graduated from the School of Mines in 1976, earning a bachelor’s degree in civil engineering.

"Steve Newlin’s generosity to the School of Mines and its students is both inspiring and humbling. I can’t thank him enough," said President Heather Wilson, D.Phil., who announced the gift to a group of about 400 students and their parents during a Friday morning convocation in the King Center’s gymnasium. The King Center has just one court, which is shared by Hardrocker athletics and intramurals teams alike for basketball and volleyball.

The new construction will add two basketball courts, a new group fitness room, a low level rock climbing wall, new student locker rooms and expanded cardio and weight training areas.

Newlin, who has been a major donor to the university over the years, including recently expanding the Newlin Memorial Scholarships endowment in the memory of Terry Newlin, recalls his student days when he and his friends needed a recreational outlet.

“When I was a student at the School of Mines we played basketball and other activities for exercise and fun, building lasting friendships along the way, although we didn’t often have a gym available,” said Newlin. “Student health and wellness is extremely important and provides the needed balance with academics to create the most impactful overall college experience.”

“I was impressed with the leadership shown by students to make this happen. I understand how they feel, and wanted to help them. The students deserve this,” explained Newlin, adding that he hopes the first pick-up basketball game in the new facility will be with some alumni friends vs. current students.

Students have been working on the project for three years.

“As students we are appreciative that an alumnus would give this generous
Two world-class particle physicists have been added to the South Dakota School of Mines &Technology faculty as it continues to expand and adds a Ph.d. program in physics.

The new physics Ph.D. program will serve the needs of the Sanford Underground Research Facility (SURF) in Lead, where scientists from around the world are conducting experiments in the search for dark matter.

The university’s unique physical proximity to groundbreaking experiments occurring nearly a mile below the Earth’s surface was instrumental in attracting top researchers to the new program.

Alberto Lemut, Ph.D., a physicist with Lawrence Berkeley National Laboratory in Berkeley, Calif., and Luke Corwin, Ph.D., an Indiana University physicist based at Fermi National Accelerator Laboratory in Batavia, Ill., will be the major players in the new doctorate program, along with Xinhua Bai, Ph.D., and Doug Wells, Ph.D.

“Our relationship with the underground facility in Lead is close and, with this expansion, we will be working to strengthen it even more,” said Mines President Heather Wilson, D.Phil.

The state’s first doctorate in physics was originally discussed in 1999, with a draft approved by the Board of Regents in 2009. Funding was approved by the Legislature only this past year, however.

Dr. Lemut’s research activities have primarily focused on experimental nuclear astrophysics. He has conducted in several deep underground cross section measurements at the Laboratory for Underground Nuclear Astrophysics (LUNA) facility. Most recently, he held the position of co-principal investigator for the Dual Ion Accelerator for Nuclear Astrophysics (DIANA) project at Lawrence Berkeley. He will continue his DIANA work at the Sanford laboratory in Lead.

Dr. Lemut earned both his doctoral and university degrees in physics at Universita degli Studi di Genova, Italy.

Dr. Corwin led the deployment of neutrino beam simulations for the NOvA neutrino experiment and was deeply involved in establishing quality control procedures and standards for the majority of the material in NOvA, a Fermilab experiment to study neutrinos, including the potential role that they played in the evolution of the universe.

He will continue his involvement with NOvA and pursue analyses of neutrinos from the beam generated at Fermilab and from natural sources. He will join the Long Baseline Neutrino Experiment, which will consist of the world’s most intense neutrino beam traveling hundreds of miles through the Earth’s mantle between the Fermilab outside of Chicago to the Sanford laboratory in Lead, a detector using liquid argon at Sanford and, possibly, a near detector at Fermilab.

At Fermilab, he was also a member of the MINOS collaborations, leading a project that has combined the results from beam and atmospheric neutrino data into the world’s best instruments.

Dr. Corwin earned his Ph.D. from The Ohio State University and his bachelor’s degree in physics from the University of Minnesota.

The university will add two particle physicists next year in a structured growth of the new doctoral program, which, thanks in part to its close ties with the Sanford laboratory, is poised to become a leader in particle physics research.

“The Sanford Underground Research Facility holds a promise to become one of the biggest underground particle physics laboratories in the world,” said Andre Petukhov, Ph.D., head of SDSM&T’s Department of Physics. “This world-class facility will create unmatched opportunity for our students, and we envision many start-up companies around this lab.”

Additionally, Rafal Oszwaldowski, Ph.D., with the State University of New York at Buffalo will replace a retired physics faculty member and lead the effort in semiconductor spintronics and modeling of low background semiconductor detectors at Sanford. He will join condensed matter physics research conducted by Dr. Petukhov; Robert Corey, Ph.D.; and Vladimir Sobolev, Ph.D.

Dr. Oszwaldowski also previously taught at N. Copernicus University in Torun, Poland, where he earned both his doctorate and master’s degree in theoretical physics. His primary research goal is to elucidate properties of dilute magnetic semiconductors and to develop quantitative approaches for various semiconductor nanostructures.

The new Ph.D. in physics will be offered at both the School of Mines and the University of South Dakota, with responsibility for course delivery shared between the two, as it has been for the past 15 years for the bachelor’s degree and four years for the master’s degree.

Photo courtesy of Matt Kapust, Sanford Underground Research Facility
Freshman service: 400 strong
Wilson named to Peabody Energy’s board of directors

South Dakota School of Mines & Technology President Heather Wilson has been appointed as a member of Peabody Energy’s board of directors.

“Dr. Wilson is an exceptional leader with a broad perspective on energy, mining and global affairs, who leads an institution that is bringing forth the next generation of mining talent,” said Chairman and Chief Executive Officer Gregory H. Boyce. “Her extensive expertise in global security, energy, strategy and technical intelligence will be of great value to Peabody’s platform.”

Mines President Wilson says the partnership is invaluable for the university, too. “Peabody hires our graduates and sends their employees to further their education with us in mining engineering, civil engineering, construction management, materials and metallurgical engineering and other subjects. We are one of the best universities in the country in these disciplines. Peabody is the largest private coal mining company in the world, and we think a closer relationship with them benefits the School of Mines.”

A former member of the U.S. House of Representatives, Wilson served 10 years in Congress, during which she was the senior member of the House Energy and Commerce Committee and chair of the House Intelligence Subcommittee on Technical and Tactical Intelligence. She previously held the position of Cabinet Secretary for the State of New Mexico Children, Youth and Families Department. Wilson also served as staff director of Defense Policy and Arms Control for the National Security Council and founded Keystone International, Inc., a company dedicated to international business development. She is a former U.S. Air Force officer.

Wilson earned a bachelor of science degree from the United States Air Force Academy and was a Rhodes Scholar at Oxford University, where she received master’s and doctoral degrees in international relations.

Peabody Energy is the world’s largest private-sector coal company and a global leader in sustainable mining and clean coal solutions.

Cryogenic and energy extremes topic of seminar

NASA researcher James E. Fesmire will present a public seminar, “Cryogenic and Energy at Extremes,” at 4 p.m. Wednesday, Sept. 11, in Room 204 West of the Classroom Building.

Fesmire, principal investigator and founder of the Cryogenics Test Laboratory at NASA’s Kennedy Space Center, will discuss broad notions on energy, temperature and power (heat flow). He will present specific examples of the control of thermal energy and its measurement under extreme environmental conditions.

Practical approaches for simulation in the lunar environment will be discussed, including high-performance applications such as aerogel blanket thermal insulation systems, refrigeration power for physics research and superconducting power cables.

Fesmire has worked in the field of cryogenics and low-temperature problem-solving for 30 years. His work has supported the space shuttle, the International Space Station, future moon and Mars exploration, experimental rocket programs, commercial space launch facilities, superconducting power, hydrogen storage and delivery, and a wide range of commercial and industrial applications.

In 2006, he was recruited to Cleveland-based PolyOne Corporation as chairman, president and chief executive officer, leading the company through a comprehensive transformation. Today, PolyOne is a $4 billion, leading global formulator of highly specialized solutions, and has grown its specialty operating income more than 25-fold under Newlin’s leadership.

Continued from page 2
Welcome Week
Students land summer internships at 165 employers in 34 states, three countries

The start of a new academic year brings summer to a close. Yet, despite dire warnings of bleak job prospects for millennials, South Dakota School of Mines & Technology students reported a healthy rate of summer internships at more than 165 employers in 34 states, Canada and Germany.

Companies ranging from the Fortune 500 set to smaller manufacturing and engineering firms hired SDSM&T students this summer, with 79 percent of those who sought co-op, internship or undergraduate research experience securing a position, at an average wage of $17.01, well above the federal minimum of $7.25.

Names of employers read like a who's who of industry leaders: Bobcat, Cargill, Caterpillar, Kiewit, LyondellBasell and Nucor, to name a few.

But students are also adding economic capital here at home. Thirty-three percent are working for more than 60 employers in 21 South Dakota communities, including Ryan Brown, a computer science junior from Sheridan, Wyo., who hopes to add another major – electrical engineering – this year. Brown previously conducted two co-ops at NASA and an internship at Rockwell Collins before landing his current internship in Rapid City at SymCom, a leader in electronic control and protection.

As Mines President Heather Wilson, D.Phil., says, “Three of four Mines students graduate with real world job experience in their field. It’s a valuable part of the world-class education we provide.”

Working in the research and development department at SymCom, Brown is focusing on control circuits and collaborates closely with two other Mines students, including Collin Eddy of Phoenix, Ariz.

Eddy is only a junior, but already embarking on his last year of undergraduate study, with plans to complete an accelerated master’s in electrical engineering and an MBA. Though this internship is his first at SymCom, he says he was surprised by the level of autonomy and responsibility he was given. “Most interns do stuff with testing. I didn’t expect to design products on my own.”

He’s currently designing a single product that will replace a multitude of others, a challenge he believes is essential for becoming an electrical engineer as he transitions from the classroom to the real world. “If you were to go to class, you would understand the fundamentals. But here, you put it on the test bench and see what happens.”

That type of crossover appeals to senior and triple-major Steve Gates, too, who not only lauds putting learning into practice but the benefit gained from seeing day-to-day operations at Raven Industries, as well. “It’s a good way to figure out how things actually work in a company,” said Gates, from Rapid City. And with the soon-to-be graduate completing degrees in computer science, computing engineering and electrical engineering, chances are companies vying for his attention won’t be in short supply – an experience shared by Mines alumni.

In fact, the most recent placement figures from the university’s Career & Professional Development Center show 98 percent of 2011-2012 graduates landing jobs in the field for which they studied with an average starting salary of $62,696 or going on to graduate school.

That’s where Sarah Pfenning, a chemical engineering major from Rapid City, would like to end up, either pursuing a master’s in chemical engineering or applying to medical school. Right now, she’s interning at a local forensics lab, detecting controlled substances for court evidence.

Though Pfenning has always had an interest in forensics, this internship has widened the scope of career possibilities. “I’ve talked with the blood alcohol guy and I’m taking a class with the sheriff about fingerprinting.”

Pfenning’s not alone in the public sector. A multitude of Mines students have landed internships at not-for-profit organizations and public agencies, including the Carnegie Natural History Museum, John Hopkins University Applied Physics Laboratory, U.S. Army Corps of Engineers and NASA.
Professor invited to present seminar in Serbia

Invited by Jovan Nedeljković, Ph.D., a research fellow in the department, Ahrenkiel first collaborated with Nedeljković at National Renewable Energy Laboratory more than 10 years ago and has maintained a steady working relationship since then. Ahrenkiel spoke on transmission electron imaging and diffraction of thin films and nanomaterials. “I hope the talk will aid in relating our capabilities and interests to grow further collaboration, which expands the opportunities and range of research topics available to my students and me.”

He added that “SDSM&T is able to perform high-resolution electron microscopy, which is not available within their research facility, on the various kinds of nanomaterials produced at Vinča. My group has benefited from the very interesting materials provided by the Vinča scientists for us to examine. These novel specimens are ideal for developing advanced characterization techniques, such as quantitative X-ray microanalysis, nanodiffraction and tomographic reconstruction, which are themselves excellent topics for graduate-student research.”

Mines welcomes new Army ROTC commander

The South Dakota School of Mines & Technology has welcomed a new Army ROTC commander who will lead some 120 cadets. Maj. Lynna Speier is the new commander of the Mount Rushmore Army ROTC Battalion, which started at the School of Mines in 1950 but also now encompasses satellite locations at Black Hills State University and Chadron State College.

Speier replaces Lt. Col. Oliver Hasse, who is retiring after 20 years of service in the Army. The Mount Rushmore Battalion saw the highest number of commissioned officers, 16, in the program’s history under Hasse’s leadership from 2009-2013.

The battalion expects around 120 cadets enrolled in ROTC as a class and participating in events at the three institutions this semester, with 36 cadets contracted, meaning they have “raised their right hand” and committed to serve the nation, according to Capt. Richard Cole of the battalion.

Speier arrived in late July from the U.S. Military Academy in West Point, N.Y., where she served as the G1 in charge of all personnel and assignment related material. She is an adjutant general officer (human resources). She has spent the majority of her career at Fort Hood, Texas, and has been assigned to Fort Leavenworth, Kan., and West Point, N.Y., and has served multiple deployments to Iraq and was also deployed to Bosnia-Herzegovina.

Speier’s awards and decorations include the Bronze Star Medal, Defense Meritorious Service Medal, Meritorious Service Medal with two Oak Leaf clusters, Joint Service Commendation Medal, Army Commendation Medal with three oak leaf clusters, Air Force Commendation Medal and Air Force Achievement Medal.

The Aug. 30 ceremony was an Army tradition, during which School of Mines President Heather Wilson, D.Phil., passed the guidon from the old to the new chain of command.

Toys meet tech in new art exhibit

The Apex Gallery at the South Dakota School of Mines & Technology launches fall semester with the exhibit “Some Assemblage Required” by artist Kyle Fokken, to run through Sept. 27.

Fokken weaves his fascination with vintage toys and mechanical objects throughout the exhibit, combining atypical elements to create captivating sculptures. Yet, upon deeper analysis, many of his seemingly whimsical adaptations of found objects take on a deeper meaning. Referencing greater issues in society and raising questions about long-held beliefs, Fokken’s attention to detail and his consummate crafting of the final product gives this work broad appeal.

Fokken grew up relatively poor in a small farming town where a “make do” ethic and aesthetic was instilled. Out of necessity he would rescue other children’s discarded toys and plastic models from the trash. However, he rarely stopped at a simple reconstruction. Rather he labored to give a fuller context to his found toys, enhancing their wear and tear and including them in historically correct dioramas.

His youthful reassembling was put on the back burner while he worked on his M.F.A. in ceramics and pursued various careers in arts education, administration and fundraising. With the support of his wife and family, he has returned to being a full-time artist. Over the past 10 years, his work has shown internationally and garnered awards, grants, commissions and rave reviews.

Deborah Mitchell, director of the Apex Gallery, says there will be an artist reception from 5-7 p.m. Friday, Sept. 13, during which Fokken will speak at 6 p.m.
Bioenergy scientist speaks

Jack Saddler, Ph.D., an internationally renowned scientist in the field of bioenergy and forest products biotechnology, will visit the South Dakota School of Mines & Technology for a public seminar from 4-5 p.m. today, Sept. 4, in room 106 of the Classroom Building.

A seasoned research scientist, Saddler has been involved for more than three decades in various global organizations that have advanced the world’s understanding of how woody biomass can be converted into useful fuels and chemicals.

The seminar will be geared to individuals and businesses with a particular interest in South Dakota-based biofuel industries.

School of Mines researchers and students will participate, as well as those from South Dakota State University, who will be linked via a live video broadcast from the Brookings campus. A question-and-answer session will follow. Mines and SDSU are members of the Center for BioProcessing Research and Development, which is based at the School of Mines.

Saddler is the endowed Professor of Forest Products Biotechnology/Bioenergy, former dean and forestry faculty member at the University of British Columbia. He is an original industry chair of the Natural Sciences and Engineering Research Council (NSERC) of Canada.

He is a fellow of the Royal Society of Canada, Canada’s highest recognition for scientists, and has received many other honors such as the International Union of Forest Research Organizations’ Scientific Achievement Award and the Charles D. Scott Award. Recently, Saddler received the prestigious 2009 Leadership Award, presented from Life Sciences British Columbia to those who have assisted in the creation and advancement of the broader life sciences communities.

Saddler has published more than 350 papers and several books, holds several patents and is a regular reviewer and advisor for agencies such as the U.S. Department of Energy, USDA, NSERC, World Bank and the Swedish Energy Authority. His influence also extends to the work of the United Nation’s Food and Agricultural Organization and the International Energy Agency in Paris, and he has acted as the Task Leader of the Liquid Biofuels network of IEA Bioenergy organization.

The Graduate Student Society (GSS) held its inaugural Kickoff Tour for 30 incoming and current graduate students on Aug. 24.

“The main purpose of this tour is to get the incoming students to interact with the current graduate students and learn more about their experience in SDSM&T grad school, show them the beauty of the Black Hills . . . and get them habituated with common places in Rapid City like grocery stores, downtown, etc.,” said Vinod Singh Amar, president of the Society and a Ph.D. student in the Department of Chemistry & Biological Engineering.

Amar noted it’s often difficult for graduate students to attend social events because of their coursework and research obligations. He attributed the event’s success to GSS’s understanding of the students’ common interests and concerns and the support of the Student Association and Office of Graduate Education.

Due to the positive student response, GSS plans to organize a tour every semester following graduate orientation, with the hope of fostering a greater sense of community among graduate students while attracting more prospective students to the School of Mines.

And that’s just one offering in a busy year ahead. With a majority of graduate students involved in diverse fields of research at the university’s state-of-the-art facilities, the Society is organizing an in-depth safety workshop series to be held this fall.

GSS will also hold a Graduate Research Expo during career fair day, aimed at connecting graduate students with employers, and is planning a virtual open house for prospective students.

But his first priority remains recruitment. “We are constantly looking for more graduate students to join us and support us as we move forward.”

The Graduate Student Society serves as a liaison to university administration and a platform for current and prospective students of all disciplines to bond through common issues and provide updates on recent policies.

More photos at flickr.com/photos/sdsmt

Mines team third nationally

A civil and environmental engineering team at the School of Mines placed third nationally in the PCI Engineering Design Competition, taking home a prize of $1,500. The seven-person team fabricated and tested a precast, prestressed 20-foot-long concrete beam.

Prizes are awarded to the top three in each zone in consideration of efficient design, highest load capacity and other categories. The Mines team placed first in Zone 3.

M.R. Hansen, Ph.D., a retired professor in the Department of Civil & Environmental Engineering, served as the team’s faculty advisory. Brian Jenner at Montana Prestressed Concrete (Cretex West) acted as the PCI producer.

Team members included Kody Heller, Platte; Steve Barnett, Sioux Falls; Madisen Lane, Fort Collins, Colo.; Dusty Daniels, Sheridan, Wyo.; Molly Pruess, Lincoln, Neb.; Zach Grapentine, Belle Fourche; and Matthew Henderson, Mason City, Iowa.
The Hardrocker Formula team and the biometric payment system the School of Mines has been testing this year got an all-star boost with a campus visit by movie star Antonio Banderas and Dutch entrepreneur and racecar enthusiast Klaas Zwart.

Mines President Heather Wilson welcomed the celebrity duo before a packed-house news conference in Hoven’s Hub in the Surbeck Center on Aug. 13. Banderas, who is the new spokesperson for Nexus Smart Pay, which is backed by Zwart, shopped in the Miner’s Shack, purchasing a cup of tea with the swipe of his finger before signing autographs and posing for photos with fans.

Following a private luncheon for the entourage, Banderas and Zwart engaged with members of the Hardrocker Formula racecar team, each taking the student-built car around a mock race track set up behind the King Center.

Zwart is a Formula 1 enthusiast who has built his own racing resort in Marbella, Spain. He visited the SDSM&T campus last September, spending time with Mines’ own Formula race team. Some of those students are participating in the biometric pilot program.

Banderas is an international film actor who has starred in the “Zorro” series, “Philadelphia,” “Interview with the Vampire,” “The Mambo Kings,” “Frida” and “Spy Kids.” His is the celebrity voice of the Puss in Boots character on the “Shrek” animated film series.

The biometrics system is operated by Nexus USA, a subsidiary of Spanish-based Hanscan Identity Management, which is owned by entrepreneur Zwart.

The School of Mines made international headlines earlier this year with the announcement it would become the first to test life as a biometrics campus using foilproof Biocryptology® that goes beyond a fingerprint to read multiple layers into the skin and detect hemoglobin in the blood. The patented technology on the back end turns each finger scan into a series of valueless numbers that change every time the finger is introduced. Data encryption ensures security, as the numbers can't be reproduced in a meaningful way, not by merchants, law enforcement, hackers or even Nexus Smart Pay.

The company looks for the biometrics program to one day lead to a cashless society.

The Nexus Smart Pay pilot program was initially tested by 50 students and four faculty members at two locations on campus and has been expanded to allow all students, staff and faculty members to enroll.

Consumers deposit money into an account, with which they associate their biometric data and pay for goods with a simple scan of the finger, no cash, credit, debit or ID cards or pin codes necessary.

More photos at flickr.com/photos/sdsmt
Ten students, ten weeks, one mission: develop security printing and anti-counterfeiting technology (SPACT) to make forgery a nearly impossible crime.

Undergraduates from around the country immersed themselves this summer in the endeavor through a National Science Foundation Research Experience for Undergraduates (REU) site focused on SPACT at the South Dakota School of Mines & Technology.

“Research projects range from security printing of covert anti-counterfeiting markings on pharmaceutics to the forensic analysis and authentication of Native American arts and crafts to the development of new encoding and recognition techniques for biometric security applications,” Grant Crawford, Ph.D., principal investigator of the REU site and assistant professor in the Department of Materials & Metallurgical Engineering, explains. And the students’ motivations vary as widely as their research.

Sophomore Sierra Rasmussen hails from Missouri S&T in the metallurgical engineering department, but her father studied a little closer to home. A School of Mines alumnus, he encouraged Rasmussen to apply. She excitedly complied. Now, she works with silver nanoparticles, printing them into the shape of a QR code antenna.

Students have also printed QR codes which are invisible under ambient lighting conditions but readable with a near infrared laser and were scanned using a smart phone. QR codes, which traditionally fall under the purview of information sharing, have opened a whole new domain of security applications.

Mines researchers have even successfully deposited codes onto high bond paper and glass to demonstrate possible covert and forensic security printing applications, as the features remain unseen to the naked-eye at low concentrations of nanocrystals.

A junior at Mines, Domingo Tamayo's father played an important role in his decision, too.

“My father works with the Smithsonian,” Tamayo said, adding he grew up at the intersection of research, history and cultural development. But the real spark came when he discovered an intersection of his own, as past and present collided.

Tamayo is from the Rosebud Reservation, with deep roots in Native American culture, a tie he maintains at the university. He’s been elected this year’s president of Mines’ American Indian Science & Engineering Society. But he's also a physics major with an insatiable thirst for scientific discovery.

And so he embarked on a historical mystery, preserving the past through today’s hi-tech tools. Holding a medicine pouch that’s 70 to 100 years old, Tamayo explains that it was originally an attachment to a bustle, a bundle of feathers given for war deeds and acts of bravery – knowledge gained thanks to the expertise of The Heritage Center at Red Cloud Indian School. Out of respect for the individual, he didn’t want to open the pouch. His curiosity for its hidden contents, however, remained unquenched. Using a Micro CT scanner and noninvasive analyzing techniques, he set to unraveling history's mystery.

With a click, a multicolored 3D image appears on the screen, slowly rotating, mesmerizing its viewers. There appear to be two rings. Tamayo says that an x-ray fluorescent analyzer measured a huge spike in copper, revealing the rings’ makeup. Then another image appears, a bundle of strands curved along the vessel’s interior. “We think it’s a plant. But we’re not sure. It’s too thick to be human hair,” Tamayo muses, eager to learn more.

Like Rasmussen and Tamayo, site students were selected from a national pool representing a wide range of science and engineering disciplines. “The key principle of the site focuses on bringing together multiple science and engineering disciplines for a common goal of developing new anti-counterfeiting technology. The ongoing collaboration of site research faculty – from the University of South Dakota (USD), South Dakota State University and SDS&M&T with backgrounds ranging from biochemistry to electrical engineering – provides a collaborative foundation for the REU site. For instance, materials chemists at USD are synthesizing up-converting nanoparticles to be incorporated into new formulations of security ink by engineers at SDS&M&T and subsequently printed using advanced manufacturing technology.”

Even as summer fades, the mission remains clear, leaving students secure that their ideas will have impact – and that impact will leave the public a little more secure.