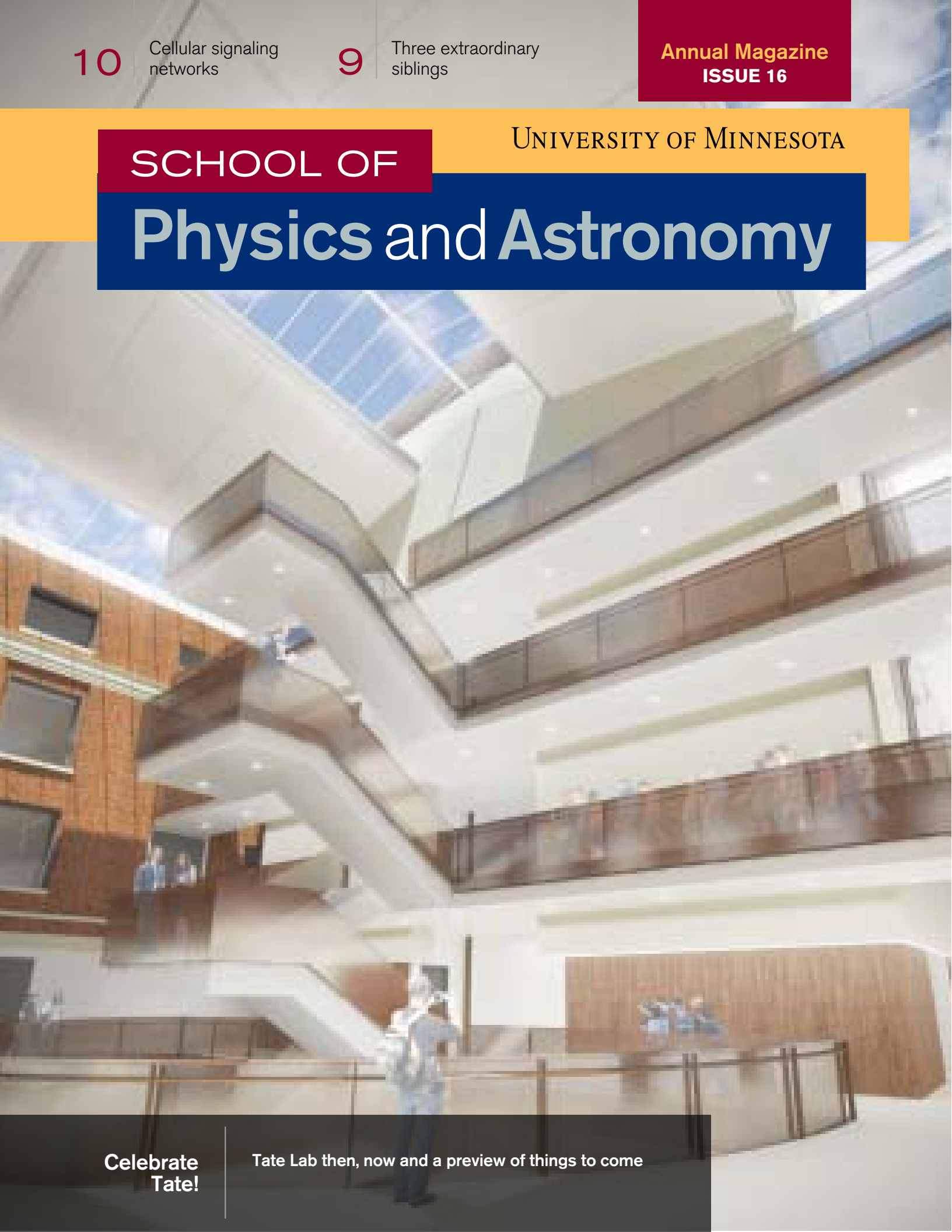
Annual Magazine
ISSUE 16

UNIVERSITY OF MINNESOTA

SCHOOL OF Physics and Astronomy



Celebrate Tate!

Tate Lab then, now and a preview of things to come

School Head
RONALD POLING

A letter from the Head of the School

On September 30, 2015 the College of Science and Engineering hosted the official groundbreaking ceremony for construction of the Tate Science and Teaching building (story on page 6). This is a $92.5M renovation and new-construction project that will bring many wonderful upgrades to the University's nearly 90-year-old headquarters for physics. Some of my favorite features are a beautiful atrium, a new entrance on Church Street, up-to-date astrophysics research labs, seminar rooms, modern lecture halls and teaching labs, and new education and outreach facilities. There will be offices for 35 professors of the School of Physics and Astronomy, their postdocs and graduate students, and dedicated space for the Minnesota Institute for Astrophysics and the W.I. Fine Theoretical Physics Institute. The Tate renovation has begun less than two years after the opening of the Physics and Nanotechnology (PAN) building, which is now the home for most of the School's experimental physics research labs, along with 25 professors and their groups. When Tate reopens in June 2017, it will also be the home of the School of Earth Sciences, consolidating programs and personnel now scattered among many locations on campus. Before construction could begin, the School had to move nearly 220 professors, staff members and graduate students, and all of our instructional activities out of Tate. We are temporarily spread over nine locations on the University's Minneapolis campus, which is certainly a challenge! I am extremely grateful for the cooperation and flexibility of so many of my colleagues.

There are many other exciting developments in the School during the past year. We have welcomed one new professor this fall. Lindsay Glesener, an experimentalist specializing in the sun, is our first new faculty hire in space plasma physics in more than 20 years. Her arrival brings the School's faculty size to 60, and we are especially pleased that the number of women among the School's professors has more than doubled in six years, from four to nine. We also currently have a search under way for an assistant professor in experimental condensed matter physics.

Among the School's many exciting recent research developments are the first physics results from the NOvA experiment, with its Far Detector Lab in northern Minnesota. Our faculty, postdocs and students played crucial roles in building the experiment, and they are now also leaders in extracting first results on electron-neutrino appearance and muon-neutrino disappearance.

School students and faculty members have received many honors in the past year, including the European Geosciences Union's Alfven Medal to Bob Lysak, the Julian Wess Award to Arkady Vainshtein, an A.P. Sloan Fellowship to Fiona Burnell, and a McKnight Land Grant Professorship to Rafael Fernandes. Four of our professors (Tony Gherghetta, Jim Kakalios, Roger Rusack, and Michael Zudov) were recently named Fellows of the APS, and two (Prisca Cushman and Marvin Marshak) have been selected as AAAS Fellows. Chick Woodward was elected Vice President of the American Astronomical Society. Undergraduate Chris Phenicie was awarded a national Student Physics Society Leadership Award. We congratulate all of them and thank them for making the School look good.

The School has thrived in so many ways in recent years, and I attribute our success mostly to the strong leadership and support of CSE Dean Steve Crouch. Steve has announced that he will step down from his position at the end of next summer. While I hate to see him go, that feeling is overwhelmed by appreciation of his vision to make CSE the best college in the University and his effectiveness in giving those of us who work with him the support and good counsel that we need to be successful in our jobs.

I would like to invite all of you to keep in touch with the School throughout the year. Everyone is welcome to take advantage of our still-vibrant program of colloquia and seminars, even while we are spread all over campus. I would especially encourage you to consider attending the very exciting MIfA/SPA Kaufmanis lecture "Supernovae Reveal an Accelerating Universe," which will be delivered by 2011 Physics Nobel Laureate Adam Riess on April 21, 2016. You can always find information about School events and news at our web site (www.physics.umn.edu). If you are curious about progress on the Tate renovation project, check out the cse.umn.edu/r/tate-webcam/

Thanks very much for your support of and interest in the School of Physics and Astronomy.

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SCHOOL NEWS

NOvA Experiment Announces First Results

The NOvA experiment announced its first results in August, 2015 after almost a decade of effort. The University of Minnesota is by far the largest university group in NOvA, which is the flagship experiment of the U.S. neutrino program.

Construction of the Far Detector Laboratory in Ash River, MN was led by Professor Marvin Marshak, and the assembly of the more than 11,000 far detector modules was led by Professor Ken Heller. In addition to our faculty and grad students, there were dozens of University staff members and more than 500 undergraduate students who contributed to the construction project.

Installation of the massive five-story far detector, one of the world's largest plastic structures, was completed nearly eighteen months ago and since then the collaboration has been operating the experiment and collecting data. The analysis framework was created by a team of graduate students and research associates led by Professors Dan Cronin-Hennessy, Ken Heller, Greg Pawloski and Ron Poling. To mark the rollout of the NOvA results, Pawloski and Research Associate Jianming Bian gave a seminar which included an introduction to the experiment, presentation of the muon- and electron-appearance measurements, and description of plans and prospects for NOvA and future neutrino experiments.

These initial results from the NOvA experiment represent only about 8% of the total data the experiment will collect over the next few years. Even with this small initial data set, Pawloski describes the results as possibly hinting at the ordering of neutrino masses and matter-antimatter asymmetry. NOvA is currently shut down for an upgrade to the beam accelerator at Fermilab, which recently set a record as the most powerful neutrino beam in the world. There will also be upgrades made to the detector during this period as well, allowing the experiment to take a larger data set in 2016.

Burnell receives Sloan Fellowship

Fiona Burnell has been selected as a 2015 Alfred P. Sloan Research Fellow in Physics. Burnell is one of 126 early-career scholars or "rising stars" to receive a $50,000 grant this year. The Alfred P. Sloan Foundation is a philanthropic, not-for-profit grantmaking institution based in New York City.

Kakalios receives award

The American Association for the Advancement of Science (AAAS) has named James Kakalios as the recipient of the 2014 AAAS Public Engagement with Science Award, recognizing "the unique ways he communicates the ideas and excitement of physics" and stimulates members of the general public to learn more about developments in science and technology that shape their lives."

2015 Undergraduate Scholarship Recipients

The Hagstrum Award: Quynh Nguyen, Kelly Stifter
The A. O. C. Nier Undergraduate Scholarship in Physics: Yijia Liu, Chris Phenicie
Harry and Viola St. Cyr Scholarship for Undergraduate Research: Lauren Schlenker
Edmond B. Franklin Scholarships: Melissa Bosch, Alexander Engel, Wenbo Ge, Brendon Jones, Luke Molacek, Joel Therneau
J. Morris Blair Scholarship: Kyle Crocker
Jeffrey Basford Scholarship for Undergraduate Research: David Bosch
Undergraduate TA Award: Kali Ask

Front row: Chris Phenicie, Quynh Nguyen, Kali Ask
Second row: Wenbo Ge, Brendon Jones, David Bosch, Melissa Bosch

Noireaux receives grant for international collaboration

Vincent Noireaux received a program grant from the Human Frontiers Science Program Organization (HFSPO). Noireaux is the Principal Investigator of the grant which will be shared with colleagues at Rockefeller University, Kyushu University, and Universität des Saarlandes. The team will split the $400,000 per year for three years for research on "complex mechanisms of living organisms." Noireaux and his collaborators will use the grant to study "protocells and minimal cells: evolution versus engineering." Noireaux's lab has developed an experimental platform to engineer a minimal cell by integrating molecular components. The ultimate goal of the project is to bring new information regarding self-replication of unicellular cells. The grant will support three graduate students at the U: Jonathan Garamella, Ryan Marshall and Mark Rustad.

Fernandes Named McKnight Professor

Rafael Fernandes was named a 2015-2017 McKnight Land-Grant Professor for his research, which "combines theoretical models and close collaboration with experimental groups to unravel the relationship between the microscopic behavior of quantum materials and their macroscopic properties."

Nolting wins NSF Fellowship

Chris Nolting, a first year graduate student in astrophysics, has been awarded a National Science Foundation Graduate Research Fellowship. The award is for three years of support. Nolting's fellowship was one of 11 awarded to the College of Science and Engineering this year. The NSF award will support Nolting's research with Professor Tom Jones to study the dynamics of the intra-cluster medium using the morphologies of the jets from active galactic nuclei.

Woodward made officer of American Astronomical Society

Chick Woodward was elected Vice President of the American Astronomical Society (AAS). The AAS is the major organization of professional astronomers in North America.

Four new APS Fellows

The list of 2015 APS Fellowship recipients includes four faculty from the School, bringing the total number of active faculty who hold APS Fellowships to 32.

Tony Gherghetta was named a Fellow of the American Physical Society "for contributions to theories of extra dimensions and supersymmetry, advancing our understanding of grand unification, supersymmetry-breaking and the fermion mass hierarchy."

James Kakalios was named an APS Fellow "for innovative efforts to engage the public in the excitement of physics through popular science books, general audience talks, and on-line videos that use examples taken from popular culture."

Roger Rusack was elected an APS Fellow "for leadership in the development of advanced photodetector systems used in the Higgs boson discovery and realization and exploitation of the electromagnetic calorimeter of the CMS experiment."

Michael Zudov was named a Fellow of the American Physical Society "for seminal experiments on nonequilibrium transport in high Landau levels of 2D systems, including discovery of microwave-induced resistance oscillations and zero-resistance states."

2015 Graduate Fellowship Recipients

Anatoly Larkin Fellowship: Han Fu
Hoff Lu Fellowship: Xiaoyu Wang
Leonard F. Burlaga Fellowship: Charles McEachern
Robert O. Pepin Fellowship: Adam Peterson
Aneesur Rahmen Prize: Xin Li, Abdul Naseer Malmi Kakkada
Outstanding TA Awards: Kali Ask, D'ann Barker, Chris Conklin, Sajna Hameed, Adam Hupach, Nick Mast

Front row: D'ann Barker, Charles McEachern, Chris Conklin
Second row: Adam Hupach, Xiaoyu Wang, Abdul Naseer Malmi Kakkada, Adam Peterson

Riess to Deliver Kaufmanis Lecture

Nobel Laureate **Adam Riess** will deliver the annual Kaufmanis Public Lecture on April 21, 2016. Riess will speak on the topic of "Supernovae Reveal an Accelerating Universe." Riess, who is a Professor at Johns Hopkins University and a member of the Space Telescope Science Institute won the Nobel Prize in Physics in 2011 for discovering that expansion rate of the Universe is accelerating, implying in the simplest interpretation, that the energy density is non-vanishing, even in the absence of any matter and radiation.

The Kaufmanis Lecture is presented in memory of beloved Professor of Astronomy Karlis Kaufmanis, bringing distinguished scientists to the campus to provide public lectures on the latest hot topics in research.

Cronin-Hennessy joins MU2E Experiment

Daniel Cronin-Hennessy has recently joined the Mu2e experiment at Fermilab. This experiment is searching for a muon converting to an electron, a so-called Charged Lepton Flavor Violation (CLFV) process. Such processes are effectively forbidden in the Standard Model of particle physics and if observed would indicate new physics.

The critical component of the experiment is a high precision straw tube particle tracker that will measure the electron's momentum. All electrons arising from the CLFV process will have a single momentum; therefore, the better the momentum measurement the better they will be able to reduce background electrons. Minnesota's group, led by Cronin-Hennessy, is developing the straw-tube tracker and will assemble and test key components during the detector assembly phase. Minnesota is in collaboration with groups from Fermilab, Rice University, Duke University, City University of NY and University of Houston.

Broadhurst retires

John Broadhurst began his Minnesota career as a visitor from the University of Birmingham in 1965, and returned as an Associate Professor in 1968. He ran the experimental program at the John Williams Laboratory, whose principal facility was an "Emperor" Van de Graaff accelerator of atomic nuclei. This was the site of almost all of the nuclear physics research at the University at the time. For the next 12 years, every experiment performed there depended on John's command of the physics and technology associated with high voltage nuclear accelerators.

Operation of the accelerator required expertise in a wide range of technologies: high-voltage (10MV) operation, electronics, ion sources, beam optics, particle detection, data acquisition, and target fabrication. John was a master of all these and the auxiliary technologies required to keep a $3 million (in 1965 dollars) machine running 24 hours a day. John developed techniques for controlling high-voltage sparks in the machine enclosure, methods that improved the reliability and stability of the beam. He also developed new algorithms for dealing with the rapid acquisition and analysis of data. Many of his innovations were adopted by high-voltage laboratories throughout the world.

After funding was pulled from this research, John continued to run the facility to meet local needs: ion-induced X-rays for non-destructive chemical analysis, radio-isotope production, semiconductor irradiation, and accelerator mass spectroscopy. Since these tasks did not require the unique capabilities of the Emperor, and could be done more cheaply elsewhere, it was not possible to support the facility with the revenue from these applications.

John's abilities enabled him to contribute to many other areas of physics: the Mossbauer effect, quantum optics, stellar seismology, the physiology of the way the brain processes sight and sound signals, and the use of implanted radio-isotopes to enhance the effectiveness of radiation treatment of cancers. This last research field requires knowledge of nuclear reactions, as well as an understanding of the response of living tissue to radiation. John is one of the few people in the world who have the necessary expertise in both fields.

John has a fabulous memory, and his accumulated experience can be called upon to solve an enormous range of technical problems. His colleagues have profited from his fund of knowledge and skill. Have a question about acoustics, aviation, automotive technology, building construction, computers (hardware and software) and computer control, electronics, electron microscopy, image processing, music, nuclear particle detection, nuclear fission, optics, photography, physiology, quantum optics, radio and television, vacuum technology, or welding? John probably knows the answer. And if the job requires hands-on manipulation, he will probably help you do it.

John's breadth of knowledge also enriched his teaching. His introductory courses showed students how physics impacts every aspect of their lives. He taught specialized courses for students preparing for careers in medical science, and a popular Honors Seminar drawing on his research in acoustics, music and signal processing in the brain.

For almost 50 years, John has been enriching the University with his deep understanding of physics, his creativity, his prodigious memory, his command of technology, his enthusiasm, and his willingness to help others. Though he is retiring from teaching, we hope he continues to enrich us, for many years to come.

Celebrate Tate!

THE PAST, PRESENT AND FUTURE OF

Tate Lab

University officials broke ground on the renovation of the Tate Science and Teaching building at a ceremony on September 30, 2015. The occasion marked the official beginning of the two-year renovation scheduled to be completed in fall of 2017 that will transform the 89 year old building into the joint home of the School of Physics and Astronomy and the Newton Horace Winchell School of Earth Sciences.

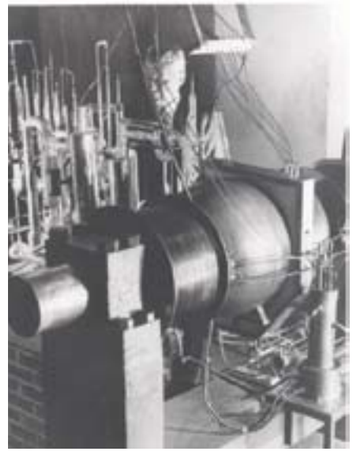
Originally designed by architect, C. H. Johnston, Tate Lab was built in 1926 with two additions in the 1960s. The renovation is being designed by Alliiance Architects, the firm that designed the Physics and Nanotechnology Building. The renovation will preserve the building's architectural character as part of the Northrop Mall Historic District.

Demolition of Church Street side of building which will accommodate the new entrance.

ABOVE: Groundbreaking September 30, 2015: From left: Donna Whitney Head, Newton Horace Winchell School of Earth Sciences, Ronald Poling, Head, School of Physics and Astronomy, Suzanne Smith, Assistant Vice President, Capital Planning and Management, Richard Beeson, Board of Regents, Eric W. Kaler, President, University of Minnesota, Steven Crouch, Dean of the College of Science and Engineering, Thomas Devine, Board of Regents, Abdul M. Omari, Board of Regents, Karen Hanson, Senior Vice President for Academic Affairs and Provost, and Michael D. Hsu, Board of Regents.

Feature Story
TATE RENOVATION

Tate Lab was recognized in 2012 as an American Physical Society site of historic importance for physics, specifically for the research of Alfred O. C. Nier. His use of mass spectrometry to isolate Uranium-235 is perhaps the most famous scientific discovery made in Tate Lab, one that played a key part in the building of the atomic bomb.



LEFT: John Tate in his lab. RIGHT: Al Nier in his lab.

Nier's adviser, John Tate helped him obtain funds to build the two-ton magnet and 5KW generator required to run his mass spectrometer. The instrument Nier used is now in the collection of the Smithsonian. Nier continued research with mass spectrometry in the building, improving the instrument so that it could be operated on elements throughout the periodic table without the cumbersome magnet and generator. He also tackled the problem of thermal diffusion with theorist and Nobel Laureate John Bardeen who was an assistant professor at the School from 1938-1941. The area that became the south elevator shaft was once occupied by the massive diffusion column needed for these experiments.

In 1933 John Williams began the first program in experimental nuclear physics, installing a kenotron set in room 78. Williams got a grant in 1937 to build the Van de Graaff accelerator located on the Church Street side of the building. The accelerator was in use until the mid-sixties, when it was decommissioned as the new accelerator facility that bore William's name, came on line. Emeritus faculty member Russell Hobbie was involved in the instrumentation, and the handling and analysis of data from the Van de Graaff. Hobbie was on hand at the recent groundbreaking ceremony for the renovation of the lab and commented that he would have a chance to get a last look at the Van de Graaff before it was removed to make way for the new entrance into the building.

Left: Construction of Van de Graaff accelerator. The metal sphere was part of the apparatus which generated static charge. RIGHT: Demolition of the Van de Graaff accelerator required special contractors to remove the metal sphere which was suspended under high tension.

Top left: Ed Ney in what was to become the space physics offices.
Lower left: Bill Zimmermann in his laboratory.
Lower right: Al Nier and Ed Ney in Tate Lab.

Emeritus Professor Paul Kellogg originally came to the School to do theoretical nuclear physics 1956, but found that the work being done by Ney and John Winckler to be more compelling. He was invited to head the Center for Cosmic Ray Data which was permanently housed in Minnesota. Kellogg recalls "the space age was just beginning, the radiation belts had just been discovered, and Ed Ney and Jack Winckler were doing work that interested me more."

When Emeritus faculty member William Zimmermann arrived in 1959 to join the program in low temperature physics, the School had recently acquired its first helium liquefier when he joined the School. He recalls that Nier and Ney were was still the dominant figures in experiment in the School at that time. Zimmermann describes the culture of the School in those days as being one of "do-it-yourself" with the expertise of physicists being very much supplemented by that of the machine and electronics shops.

When the Tate Science and Teaching project is completed in 2017, the building will include 29 teaching labs and five research labs for physics and astronomy courses and four teaching labs and 16 research labs for earth sciences courses. About 350 faculty, post-doctoral researchers, graduate students and visiting researchers will be housed in the building, and more than 2,000 students will take classes there each day.

MEET THE BOSCH SIBLINGS

David, Melissa and Nathan Bosch

Melissa, Nathan and David Bosch represent a rather unique situation in the history of the School--the first time three siblings have all been physics majors at the same time. The three are all seniors as of Fall 2015, though their ages vary (Nathan, David and Melissa are 19, 17, and 16, respectively). The story of how these three extraordinary young people all wound up in the School at the same time is one that shines a light on one of the University of Minnesota's most successful outreach programs called, Post-Secondary Enrollment Options (PSEO). The PSEO program is designed to allow high school students the chance to experience college course work for credit. Many motivated students end up beginning their college careers with a year or more of credit under their belts. In the case of the Bosch siblings, by the time they officially enrolled in 2014, they qualified as juniors.

The siblings were homeschooled by their parents Darrell and Paula from Maple Grove, MN. Starting around second grade, the siblings began courses of self-study which allowed them to move through the curriculum at their own pace. When the youngest, Melissa, was 12, they all enrolled together in a University calculus course. Not only did the three siblings share similar interests in math and science, but Melissa says that their age played a factor in taking courses together. The trio tended to gravitate toward math and engineering courses, but was not considering physics. "When I first started taking classes at the university via PSEO," Nathan says, "my interests lay in applied mathematics or electrical engineering. What's funny is that neither of my siblings had physics at the top of their major options either." The siblings agree that it was 1302, Introductory Physics for Science and Engineering, taught by C. C. Huang, that ended up drawing them all in. "It's a very intriguing course that demonstrates the purpose and approach of scientific exploration of physics, as well as how it gives rise to many questions - almost like a cliff hanger at the end of an episode," Nathan says.

David says that the elegance of physics attracted him. "I am inspired by the true beauty and complexity of nature, especially at the quantum level. I love the way that there is no one correct way to solve a physics problem and I am especially delighted when I can attack problems from a unique direction."

Not only have the trio stuck together in their coursework, but they have similar research interests as well.
David studies spin transport in ferromagnetic and semiconducting materials with his research adviser Paul Crowell. Melissa also works in Crowell's laboratory and did an REU in the summer of 2015 at University of Illinois at Urbana-Champaign in superconducting thin films.
Nathan is also interested in condensed matter physics and is working in Vlad Pribiag's laboratory.

Melissa was awarded the 2015 Edmond G. Franklin Scholarship and Nathan received the 2015 Jeffrey Basford Scholarship for Undergraduate Research.

Faculty Profile

ELIAS PUCHNER, Assistant Professor

CELLULAR SIGNALING NETWORKS

A group of researchers at the School of Physics and Astronomy are working to uncover how cells and their signaling networks detect and respond to stimuli. Elias Puchner is a new faculty member in the area of experimental biological physics. Through his research he intends to provide "a nano-scale view of cell communication." Puchner says,"I find the ability of a cell to act as a sensor absolutely fascinating. For example, chemotactic cells (those responsible for movement in response to chemical stimuli) can sense a gradient of molecules."

In general, cells process signals through networks, acting almost like electronic circuits to control the behavior of the cell in response to the signal it receives. In the case of chemotactic cells this means either moving toward helpful material like food or away from potentially hurtful material from the higher concentration of molecules.

Puchner's group currently consists of six members and brings together expertise from undergraduates, graduate students and postdoc Elizabeth Smith. The group is currently setting up a lab to do super resolution microscopy at the single molecule level. This is a fairly new technique that received the 2014 Nobel Prize in Chemistry. "The optical resolution of traditional microscopy is held back by the diffraction limit (about half the wavelength of light) which means that objects less than 200-300 nm cannot be resolved," he says. This is one of the biggest challenges of Puchner's research in that the molecular structures he studies are small (less than 80 nm or about 1000 times thinner than a human hair) and densely packed such that they can be located but not resolved with conventional optical microscopy.

Super resolution microscopy allows for visualization of these molecular structures by using pulses of light to sparsely switch individual fluorophores to their fluorescent state, allowing the user to localize their positions and to study structures much smaller than the diffraction limit. One specific way that super resolution microscopy achieves this activation of fluorophores is through photoswitchable dyes. These dyes allow physicists to finely tune the activation rate, allowing densely packed structures to be viewed. In addition, the motion of individual proteins can be tracked, resulting in dynamic insights into molecular processes.

The molecular biology portion of the new research lab will be equipped to grow and label cells so that they can be genetically manipulated for observation. The process will take genes from fluorescent corals and insert them into the yeast genome so that the cell will automatically produce the fluorescent coral protein attached to a protein of interest. Yeast cells have the advantage of growing fast, being robust and easy to genetically manipulate, with one further unexpected advantage: "It always smells like a bakery when you work with yeast cells." Eventually, Puchner will transfer these techniques to mammalian cells, which are more biomedically relevant. "We will start to investigate these processes in yeast cells, but obviously it is much more useful to study mammalian cells in order to study disease."

It is also possible to use cell activation mechanisms for therapeutic purposes. In his previous research, Puchner applied imaging techniques in immune T-cells to characterize a new type of receptor that can be externally switched on and off. Such remotely controlled therapeutic T-Cells could be extremely powerful in that they could be finely tuned by a drug and eventually be used in cancer therapy.

Puchner says that understanding how signal cascades are activated is a first step towards re-engineering and manipulating them. Being able to manipulate signaling processes opens up a range of possibilities, some of which sound like science fiction. "There are optogenetic tools that allow researchers to artificially cluster signaling proteins in various cell types by attaching cryptochrome proteins from plants. Structures in plants that sense blue light do so by condensing themselves. This action triggers directional growth towards the light source." Puchner says that they could conceivably cut out and amplify the light-sensitive condensing gene, take it to a different organism and it will condense in response to light, causing the proteins to cluster. "Since the activity of many signaling proteins is sensitive to their degree of clustering, we should be able to externally control the cell's behavior with light."

Alumni Giving
FELLOWSHIP

CHARITABLE INVESTMENT IN THE SCHOOL OF PHYSICS AND ASTRONOMY:

Contributions Make a Difference

Shannon Weiher

The next two years present a tremendous opportunity to engage our alumni, industry, and the community with the full renovation of the Tate Science and Teaching building. As a prominent building on the Northrup Mall, Tate Laboratory will be a showplace and important campus destination for the sciences.

The renovation project will create modern lectures halls, flexible classrooms and study spaces, and state-of-the-art research labs, while preserving the building's historic character. The theme of "science on display" is a guiding force in the project.

While much of the funding was secured by the State, the University and the College of Science and Engineering, we are fundraising to meet our total renovation goal. The fundraising campaign will ensure Tate Laboratory's flexibility for ever-evolving teaching and research methods. There will be prominent features in the building offering many levels of outstanding philanthropic naming opportunities.

A few of the renovation highlights include a new auditorium as a main location for public events, adjacent to the new Church Street entrance, the rooftop observatory with more space for public viewings of the night sky, and the four story atrium with skylight "illuminating" the research and teaching occurring throughout the building. As designs are finalized, we will share these naming opportunities. Gifts to support the Tate Science and Teaching building renovation may be directed to fund 20517.

To learn more about ways you can support the School of Physics and Astronomy, please contact Shannon Weiher.

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makingagift.umn.edu/onlinegiving/

Why We Give: Han Fu

Han Fu received the 2015 Anatoly Larkin Fellowship which is an award granted to a graduate student whose advisor is a member of the Fine Theoretical Physics Institute. Fu is a graduate student working with Professor Boris Shklovskii in the area of theoretical condensed matter physics. Fu and Shklovskii are studying the properties of strontium titanate (STO) which is a material used in high-temperature superconductors. "STO has very interesting properties for theorists and strong potential to be applied in technology as the base of devices," Fu says.

The group first studied the collapse of electrons in a donor cluster in STO, research which was published in *Physical Review B* in July 2015. Fu used the grant to extend this research in the summer of 2015 to look at further examples of unique phenomenon in STO. Fu said the research aims to understand the behavior of "doped STO" (STO grown to exhibit certain ferroelectric properties) to understand how it works for applications.

The fellowship was established in memory of Professor Anatoly Larkin and was endowed by a group of 43 donors made up of his former students and colleagues.

1957
Morton K. Brussel (Ph.D., Physics,1957) Congratulations to UMN physics/astronomy on its new digs! I am surviving in a pleasant retirement community with my wife Phyllis. I would enjoy hearing about classmates and faculty, circa 1950s: **Lowen**, **T.T. Scolman** (Ph.D. Physics 1956), **Holmgren, Stewart**, **A. Strickholm** (Masters, Biophysics, 1956), **Simmons**, **J. M. Rosen** (B.S. 1956), **Swenson**, **Famularo**, **R. Lovberg** (Ph.D. Physics 1956), **D.E. Young** (Ph.D. Physics, 1959); Professors **E.L. Hill**, **N. Hintz**, **J. Williams**, **W. B. Cheston**, **R.M. Eisberg**, **C. L. Critchfield**, **G. Freier**; and the old proton linac staff—**Tucker, Featherstone**. Physics appears now confronted with fundamental questions/problems.

1960
Donald Vierimaa (B.S., Physics,1960) I worked in aerospace, railroad, and trucking industries. I retired in 2000. Retirement is being like a kid, but with more options and no reprimands. I listen to CDs on science while driving and watch science programs on TV. I typically visit Minnesota each summer. I recently met two 90 year old swing dancers, a 95 year old downhill skier, and the oldest WAC, 107.5 (sounds like an FM channel).

1961
Earle Kyle (B.S., Physics,1961) I am teaching algebra, geometry, trigonometry, and space science (how to design a Mars colony) at Rochester Montessori School; and still a NASA Solar System Ambassador. My youngest son, Jonathan, is following my Apollo spaceship design footsteps with his new Ph.D. from Columbia. He designs rocket engine parts to supply the ISS and wants to go to Mars someday. Hope to see that happen soon. Meanwhile I am still doing design consulting in aerospace, nanotech, biomed, and STEM career development.

1962
Richard D. Platte (B.S., Physics, 1962) I retired in April to Myrtle Beach, S.C., after 51 years full time in national security, primarily intelligence (See Oct. '09/# 11). I visit the U yearly for football games and Golden Medallion.

1965
Dale E. Johnson (B.S., Physics, 1965) After 40 years teaching, doing research, and working in graduate administration in academia, I retired in 2014 and am currently living in Albuquerque, NM.

Carol H. Kern (M.S., Astronomy, 1965) I served under Willem J. Luyten as the only graduate assistant in the Astronomy Department from 1963 to 1965. My thesis was on "The Solar Motion of Faint Stars". Upon graduation moved to Brodheadsville, PA. I raised 3 children. I founded Western Pocono Community Library serving an area of 35,000. I still use Questar which I purchased while graduate student at UMN.

Darwin Throne (M.S., Physics, 1965) I joined HP in 1966 and developed atomic frequency standards and frequency counters. I am the founder of Handar, a manufacturer of data acquisition systems sold to TSI Inc. of St Paul, MN. I live in El Dorado Hills, CA with Sandy, my wife of 27 years.

1969

Gary H. Zeman (M.S., Physics,1969) Retired in 2012, except teaching in the IIT M.S.Health Physics program in Chicago. I also serve as a council member of National Council on Radiation Protection, Bethesda, MD.

1970
Aslam Khalil (B.S., Physics,1970) I have fond memories of my time at the University of Minnesota and as a high school student at Alexander Ramsey HS before that. My father received a PhD from the UofM and for a short time we were both students together at the university. From there my continuing journey has been a long trek. Anyone interested may check here: en.wikipedia.org/wiki/Mohammad_Aslam_Khan_Khalil

1973
James C Solinsky (M.S. Physics,1970, Ph.D., Physics, 1973) I am a Research Professor at ASU in Boone, NC. I achieved Status of IEEE Lifetime Member in 2015. I have several patents in my name: Facial Feature Evaluation Based on Eye Location, Determining Mammal Locomotion Movement, and Dynamic Knowledge Construction.

1976

Robert Furber (Ph.D., Physics,1976) I received my BA from Wesleyan and my masters from USC. I have several publications "Kepler accuracy model for co-periodic satellite separation extrema", Celestial Mechanics and Dynamical Astronomy, 2/'14; "The Future of Nuclear Power", Monthly Review, 2/'08; Letters: Phys. Today, 3/'08; Sky & Tel., 1/'12.

Allen Olson (B.S. Physics, 1976) I was promoted to Master of Properties TX Ballet Theater. In May 2015 Renaissance Magazine named my act, Smee and Blogg the Singing Executioners, in an article of the top 100 names in the business.

1977

Dean Sherrick (MS, Physics,1977) I am newly retired after 38 years in industry working at Sperry Defense systems, Control Data, and SIEMENS Control Systems within the utility industries. I went on to acquire PMI PMP certification and designed, built and delivered Simulation Systems to the US Navy and Computer Control Systems across the global and US domestic utility market. I was senior staff PM within Siemens.

CLASS NOTES

1981
James Babcock (Ph.D., Physics, 1981) My employers decided last year it was time for me to retire and they were right! Having a great time in San Diego biking, hiking, drinking wine, playing with cars, and going to the shooting club. I have also had the opportunity to fill in for staff in mechanical engineering at the University of California in La Jolla a couple of times. I enjoyed working with the students on their various senior projects, a bit reminiscent of grad school many years ago!

1987

Roger Wiens (Ph.D., Physics,1987) In addition to scientific papers, I recently authored a popular book on my team's unmanned space adventures, titled "Red Rover: Inside the Story of Robotic Space Exploration from Genesis to the Mars Rover Curiosity" (Basic Books, 2013).

1988

Jim Hamm (Ph.D., Nuclear Theory, Advisor: Ben Bayman, 1988) My wife and I had twin girls between my first and second quarters of graduate school, and a third daughter three years later. Now they are grown, and we have acquired two sons-in-law and have two granddaughters. For the past twenty-two years I have been the physics and astronomy department at Big Bend Community College, just about the smallest community college in Washington State. I have a happy and busy life, working, playing music, gardening, woodworking, and enjoying my wonderful family.

1993

Rodney Olson (B.S., Astrophysics, B.S., Physics, 1993) I teach high school physics and astronomy in Encino, CA and work on the NGSS with the NSTA and am helping the National Board for Professional Teaching Standards rewrite the physics certification test.

1994

Dave Thomas (B.S., Astrophysics, 1994) Currently employed as CEO of SJE-Rhombus, a 100% Employee Owned manufacturer of electronic controls with seven locations in the US and China.

1998
Bradford Hill (B.S., Physics, 1998) Ten years into teaching freshman and International Baccalaureate Physics I was selected for the Presidential Award for Excellence in Mathematics and Science Teaching and will be traveling to the White House to meet the President recognition.paemst.org/finalist_profile/33058.

2001
John Wayne Pint (B.S., Physics, 2001) I married my wife Penelope in February 2014 in Martinborough, New Zealand. We are expecting our first child together in September 2015 and are in the middle of a massive home renovation to make room. I am hoping that the little one will be ready to enroll at the U of M in the fall of 2033 (following my first son Eamon, who should be starting in the fall of 2027).

2002
Daniel Fisher (B.S., Physics, 2002) Married in 2001. I now have four sons (ages 11, nine, four, and one). I teach physics and middle school science at Providence Academy in MN. I am also pursuing an MSEE at the University of St. Thomas in St. Paul.

Azwinndini Muronga (Ph.D., Theoretical Nuclear Physics, Advisor: Kapusta, 2002) I am now President of the South African Physical Society (SAIP). www.uj.ac.za/EN/Newsroom/News/Pages/UJ-researcher-grows-up-using-the-sun.aspx

2003
Ricky Egeland (B.S., Physics, 2003) Our first child, Emilie Jane Egeland, was born on May 6th, 2015 in Longmont, CO.

2010
Richard Barnes (B.S., Physics, 2010) After my first start-up boomed and failed, I got a GRFP and did a Master's in Ecology at Minnesota. With DOE funding, I am heading to Berkeley now to start a Ph.D. with the Energy & Resources Group!

2011
Tom Kelley (Ph.D., Physics, 2011) I have been teaching physics at universities around Boston and am now a full-time lecturer in the physics department at Northeastern University.

2014
Michael McLaughlin (B.S., Physics, B.S. Astrophysics with honors, 2014) This past year I worked for UMN's Wesley Foundation, TA'd for AST 1001, and served with Minnesota MathCorps. This fall I will attend Claremont School of Theology for an M.A. in Religious Studies with an interfaith focus.

Michael (Mickey) Rush (B.S., Physics with Biological Emphasis, 2014) This fall I am moving to Boulder, CO to begin a Ph.D. project in biogeochemical modeling through the Department of Environmental Engineering - Hydrology and Water Resources.

BARBARA THOMPSON

What helped you decide to come to the University of Minnesota for your education? My undergraduate adviser had collaborated with several members of the faculty, which made me interested in the U of M. However, the visit to the department is what sold me. I was not sure which area I wanted to specialize in, and I liked the balance of research areas in the School of Physics and Astronomy and the regard that the faculty seemed to have for each other's expertise. Over the years I came to appreciate the difficulty of striking an appropriate balance between departmental priorities. The faculty demonstrated a commitment to graduate studies, and the then-current graduate students that I visited with seemed happy to be there. Compared to other programs, the U of M was very encouraging. I knew graduate school would be challenging, but there is no reason it can not be an enjoyable experience overall.

Who were your favorite professors? I was very grateful to the department faculty for their support - it is hard to isolate just a few, but I will try. Apart from my thesis adviser (Bob Lysak) and thesis committee chair (Paul Kellogg), there are several faculty members that I still look forward to seeing when I visit, even 20 years later. The list includes Ben Bayman, Hans Courant and John Broadhurst. It is beautiful how their love of physics permeates every conversation. They gave me a clearer picture of what life as a physicist could be like - intrigued by just about anything, and surrounded by peers who appreciate a good conversation, no matter how odd the topic (the odder the better!).

What were your favorite classes? I really enjoyed plasma physics, of course, and also statistical mechanics. It was fascinating how these systems worked. I also developed a love and respect for the history of science. Roger Stuewer and Roger Jones had a lasting influence on me, demonstrating that a greater understanding of how physics progress takes place can improve your ability to make a significant contribution in the future. I still participate in history programs both at NASA and at the National Air and Space Museum downtown. I was even chair of the NASA Goddard History Committee for a year!

Who was your adviser? My adviser was Bob Lysak, but he encouraged me to discuss my efforts with others because it allowed a more comprehensive understanding of the field. As a result, Yan Song, Paul Kellogg, John Wygant and Cindy Cattell served as surrogate advisers from time to time, and I am still grateful to them for their patience. I did not realize how demanding students could be until I had some of my own.

What were some of your favorite memories of your time while you were here? My favorite memories typically involve late nights studying or working in Tate Lab. Graduate students were there at all hours, and we would try the most ridiculous experiments just to blow off steam. Nearly every day, someone would manage to say or do something that would make me laugh until it hurt. Any time you needed a break, you could wander around and see what other people were doing - it was great learning about so many different research areas.

Do you have any humorous stories to share about your time at the School? So many memories! Most of them would be difficult to share without implicating people that I still count among my close friends. I shared an office for a while with someone who discovered "Air Laundry." He said you could save time and money if you lay out your clothes in the sunlight, because the radiation kills the funk. This was not remotely true.

Tell us about your career: Who or what influenced you to go into space physics? I have always enjoyed the study of fields and systems, and plasmas exhibit a wide range of behavior even in near-Earth space. Bob Lysak conveyed this during our very first conversation - the dynamic and highly variable nature of space plasmas. That, combined with his personality (who wouldn't want Bob as a thesis adviser?), made me think that space physics was the right choice for me. It is over 20 years later, and I have absolutely no regrets.

What was/are your favorite parts of your job? The research environment at NASA Goddard Space Flight Center is what I like most about my job, and it is what renews my commitment year after year, even when things get frustrating. There are so many avenues that facilitate the development of new projects and research topics. Innovation and creativity are encouraged, and the highest reward for being a capable and reliable employee is that other capable and reliable people choose to work with you.

Where did you grow up? What was the best part of growing up there? All over - Texas, Wisconsin and Ohio. The best part of growing up in multiple places is that you are less hesitant to venture to new places if that is where your interests take you.

What got you interested in physics? I started my undergraduate studies as a mathematics major, but what I liked most about math was the ability to communicate complicated systems and ideas using just a few symbols. I viewed it more like a powerful language than a tool or an abstract concept. Physics brought out what I thought were the most exciting elements of mathematics - the ability to express new ideas and open new frontiers. As I was explaining this to a friend (an economics major or something like that) I realized that I should major in physics as well as mathematics.

What are your hobbies? I read a lot. If reading could be a vice, I have it. I listen to books when I drive, I read books on my phone while I am at the supermarket, and sometimes I will lose sleep because I can not put a book down. I am not a good writer, but I am a pretty good editor. I get completely distracted when an author confuses regimen/regiment, gravely/gravelly, ordnance/ordinance, etc. I put this persnicketiness to good use serving as a contributing editor to Bitingduck Press, a publishing company started by my fellow alumni Jay Nadeau and Chris Lindensmith.

What are some of your beliefs on how to be successful? When I have been most successful, I think I can trace it back to two factors: persistence and flexibility. Those factors may appear to be contradictory, but they both play important roles. I don't like to accept failure, so I keep chipping away at a problem (persistence), but I try a variety of approaches and am not afraid to enlist others to help (flexibility). I have been involved in a wide range of activities (basic research, informatics, rocket experiments, spacecraft development, space shuttle payloads) because I am always open to learning new things. A project or idea may not seem attractive at first, but anything can be interesting when you learn enough about it.

What advice do you have for current students and recent alumni? I tell my students that the most important thing is to keep an open mind. Many of my peers have limited themselves because an opportunity did not come in the form or flavor that they were expecting. There are so many pathways to success - if you insist that every step to success must fit a particular expected and recognizable mold, your odds of moving forward are greatly reduced.

Is there anything else you would like us to know about you or your career? I consider it a huge privilege to make a living as a scientist. It is a wonderful career, and the benefits are compounded as you get older.

A semi-comprehensive list of my publications can be found at bit.ly/barbarathompsonpublications

Thompson (far right) and colleagues Lika Guhathakurta and Terry Kucera at an annual rite: the "Holi St. Patrick" party at NASA HQ and NASA Goddard celebrating Holi (the Indian "festival of colors") and St. Patrick's Day.

BILL HOLCOMB

What brought you to Minnesota for your Ph.D? Happenstance. I was doing my undergrad work at Ohio State. I was getting ready to graduate and was doing a little research. I had it narrowed down to three or four schools. Momentum had me headed toward Ohio State. I had already accepted a position there, but at the last minute Minnesota called and offered a fellowship so I took that.

Tell me about the research worked on with [your adviser] Woods Halley? My thesis was optical absorption in liquid argon, but my interests were really in random systems in condensed matter, alloys and many-body theory.

What was the best part of working on your research? I actually found graduate school to be easy. I worked very hard as an undergrad, taking graduate courses, so graduate school was the easiest part of my career. I can say that now. I would not have said it at the time. That would have been an invitation for more work to follow. I was here at the time of technological change. I started some of the calculations for my thesis on a Marchant calculator. It was a mechanical device with little gears and wheels, but later the machine shop--not the scientists-- got a Wang Calculator. It could add, subtract, multiply and divide. I asked the machinists nicely if I could use it and was able to do part of my thesis on the electronic calculator. It was much better than doing it by hand and slide rules were not accurate enough.

What were your favorite classes at the University? Those taught by Ben Bayman. I thought he did a masterful job of clearly and simply presenting the concepts. That is the standard I have held myself to.

What did you do after you finished your Ph.D? It was the post-Vietnam war, and a lot of my colleagues were not finding jobs. Woods helped me find a postdoc position at Oxford University in England for two years. That was great, mostly because of the people I met, though Oxford still had not really embraced the sciences. They were still hierarchically based in all their colleges. Coming back from Oxford, I got a half year's post doc at the University of Pennsylvania. I taught the rest of that year at Gustavus Adolphus, filling in for someone on sabbatical. From there I was an Assistant Professor at the University of Alabama for three years. I met some people, did a little bit of interesting work, but it was not really a good match for me being at a southern university. I left there and went to my first commercial job, a company called Computer Sciences Corporation (CSC), supporting NASA's Goddard Space Flight Center. I was the chief analyst and later ran a group responsible for the orientation of scientific satellites. I worked there for a few years and then did some software development for the intelligence community.

I went work at MITRE (a non-profit corporation that supports the intelligence community). They started me back at Goddard Space Flight Center where I was working on ground networks supporting the tracking and theta relay satellites system. It was the first major satellite relay system for scientific data. Its primary mission was to support the space shuttle. It also supported a lot of scientific satellites too. It's still up there in an upgraded form. It lasted longer than I did.

I moved around the company a lot. I supported an agency called National Photographic Interpretation Center. I moved to Boston for fifteen years, supporting classified air force programs. I moved back down to Virginia area. My final positions were Executive Director of National Intelligence Surveillance and Reconnaissance Programs. Later, I was Director of Special Programs. Now I am retired. I do have a consulting relationship with the company. I sometimes do program reviews or help mentor some staff a few days a year.

What else are you doing in your retirement? I am a very serious photographer. I am primarily a nature photographer. My interest in photography started when I was a graduate student. A little over a year ago, somebody asked me to do a show. It was the first time I seriously learned to do printing. It was forty years of learning how to photograph and a few weeks trying to develop the same level of skill in printing. One of the things I am doing now is having my images printed on metal. I like big images. My medium used to be slide shows. It is what I have done, actually since I was here [at Minnesota].

When you were at MITRE how did your physics background play into what you did? You could argue, superficially, not at all, but I tend to think about it differently. I think one should abstract the skills one has acquired from the domain one is applying them to. I would say that the skill I learned in physics was to clearly define and understand a problem, and generate solutions. Going back to Ben's model of teaching, I learned to communicate, reduce and explain in the simplest terms what I have actually done. Those are all skills I have applied in a variety of domains. I used to say a lot of what I do is just common sense. I have come to recognize that common sense is very uncommon.

Who or what influenced your decision to do physics? Back in high school in Zanesville, OH, I got interested in reading about relativity, so that influenced me. Throughout my career I have always looked around for something interesting that I would want to do more, but I never really found anything. It looked like I was focused, but I was constantly wondering maybe I should do mathematics. Maybe I was too conservative to change, but it worked out.

Tell us about your family? I come from a small family. I had a sister. My parents were from the Depression Era. My father never finished high school. He was a machinist--a bright guy with no formal education. I wish I had learned more from him than I did. Over the years I have gotten into woodworking and metalworking, but not soon enough learn it from him. My mother only finished high school. She read a lot, but had no secondary education. She was a housewife.

Was there anything that your parents did that helped you toward physics or a high school teacher? No, that was all on my own. I think my dad would have liked me to become an engineer, because the people he knew in the machine shop who were successful were engineers. He was not terribly supportive of my decision to go to graduate school. He had no concept of it in his world model.

What are some of your beliefs on how to be successful personally and professionally? It is learning to abstract your skills and apply them in a variety of domains and recognize that you can. Certainly for me, it was the focus on simplifying everything as much as possible and getting to the essence. I would not say I was a great communicator when I was [at Minnesota], but I came to realize that I was learning and teaching other people to communicate.

Do you think that being in the business world helped you communicate? It became necessary. It is really all about the people. Understanding people and how they think, is as important as it is to get them to understand what it is you think.

What advice do you have for current students and recent alum? Do not be pigeon holed by a title. I do not call myself a physicist. I did physics. I do not call myself a director, I am not a director. I fulfill a directing position. That is my job. Understand your skills your strengths, your interests and recognize that they can be abstracted and applied in a large variety of ways.

Laurence Cahill Jr., 1927 - 2013

Retired Emeritus Professor Laurence J. Cahill passed away September 12, 2013 at age 88 in Tucson, AZ. Cahill was born and raised in Maine, leaving to attend West Point. After graduating in 1946, he became a pilot in the air force. He was sent to the University of Chicago as part of his Air Force training where he met his wife Alice. The couple was married in 1949. He obtained a Ph.D. in Physics from the University of Iowa in 1958 for research specializing in the earth's magnetic field and related phenomenon. This research primarily involved recording measurements of magnetic field strength and direction with instruments launched on high altitude rockets and several of NASA's early earth orbiting satellites.

In 1968 he joined University of Minnesota to be Director of the Space Science Center and a professor of physics. He published numerous papers and articles in scientific journals, presented his research findings at many international conferences and enjoyed working with colleagues from many other institutions and countries. In 1971 he was elected a fellow of the American Geophysical Union. In 1987, a mountain peak - Mount Cahill in Palmer Land, Antarctica - was named for him in recognition for research conducted at the South Pole Stations during the 1970s. As an educator, he taught introductory and advanced physics to several generations of students and mentored numerous graduate students and research associates who went on to distinguished careers of their own. In 1995 Laurence retired to Tucson. He is survived by his sons Laurence James III, and Thomas (Kitty) and Daniel (Gwen Schwebel), and numerous grandchildren and great-grandchildren.

Al Knutson, 1933 - 2015

Staff member, Al Knutson died August 4th in a bike/car accident that occurred while he was commuting to work.

Knutson joined the School in1961 and ran the Electronics Shop for most of his career.

Steve Monson, a long-time friend and co-worker of Knutson, said at the memorial service, "Al worked in the School of Physics and Astronomy for 54 years. He helped literally thousands of professors and students, building, repairing, modifying and testing electronic circuits that they would bring to him from departments all over campus. He worked for the astronomy group in the beginning and then predominantly for the Space Physics Group, building and testing instruments that flew in space on satellites like Ulysses, Wind and STEREO; satellites that will be sending back data for many more years to come."

Knutson is remembered by his colleagues as being particularly spry and active. "Al loved sports," Monson said, "especially hockey, which he played his whole life. At the age of 82 he continued to play in a league at the National Sports Center in Blaine."

Knutson is survived by his children, Scott (Janel), Lynn (Kelly) Klein, Kevin (Jane), and Mark; nine grandchildren and three great-grandchildren; and siblings, Lucille, Robert, and Lois.

Erwin Marquit, 1926 - 2015

Erwin Marquit died on February 19, 2015 at his home in Minneapolis, at the age of 88. Erwin was born in 1926 in New York City, and was an alumnus of City College. He lived in Poland as a refugee from McCarthyism from 1951-1963, where he received his doctorate in Physics from the University of Warsaw.

Upon his return to the U.S., he worked as a Research Associate at the University of Michigan. After an assistant professorship at the University of Colorado from 1965-1966, he joined the faculty at the University of Minnesota where he remained until his retirement in 1999.

Marquit began his research career at the University working with Hans Courant on bubble chamber experiments. Over time Marquit gradually moved away from experimental high energy physics to pursue his interests in Marxist philosophy, a move which was difficult for the administration for the University of Minnesota to accept. Marquit was founder and editor of the Marxist Educational Press, which published over 35 books and the journal Nature, Society and Thought. In 1974 he ran for Governor of Minnesota on the Communist Party ticket. In the course of his career he worked at many prestigious institutions, including the Niels Bohr Institute in Copenhagen, the Humboldt University in Berlin and the Academy of Sciences in the German Democratic Republic (East Germany), where he had a long-term affiliation. He traveled the world with his wife of 46 years, Doris Greiser Marquit until her death in May 2014.

Marquit and his late wife, Doris Grieser Marquit funded a Scholarship at the University to recognizes exceptional promise in an African American or Native American physics major based on academic achievement. Henry Durer, the most recent recipient of this award said, "I am glad to have received a scholarship in recognition for my academic achievements and am thankful to have been, in particular, a recipient of the Marquit scholarship. I hope to continue to achieve academic success for my own sake and to show that the award was well given."

Brian A. Anderson, 1950 - 2015

Brian Arthur Anderson, 64, of Ely, passed away at his home Monday, October 19, 2015. Anderson worked for 23 years at the Soudan Underground Laboratory in Northern Minnesota. "He was an important member of the mine crew, helping build both the Soudan and MINOS detectors as well as keeping things operating smoothly," said William Miller, who was laboratory supervisor while Anderson worked at Soudan.

Anderson was born on November 30, 1950. He graduated from the University of Minnesota – Duluth with a degree in Geography in 1973.

Anderson married Ginny (Folz) Anderson on February 14, 1976. He worked for the U.S. Forest Service, as a steelworker at Minntac, as a carpenter, and at the University of Minnesota.

IN MEMORIAM

John D. Gould (B.S., Physics, 1950) 1927- May 13, 2015, patent attorney for 60 years. Gould graduated as valedictorian from Marshall High in Minneapolis in1945. He served in the navy as a radio technician for the final months of World War II. Gould married fellow Marshall High alumnus, Mary Ravlin in1951. After he finished his physics degree, he obtained his J.D. from the University of Minnesota Law School in 1953. In1954 he began working at Merchant & Merchant, (now Merchant and Gould) where he remained for 60 years, serving as managing partner, president and board chair. In 2000, Gould received the Professionalism Award from the Hennepin County Bar Association. In 2013, he was the recipient of the Minnesota Law Review's Distinguished Alumni Award. He served as president of the Minnesota Intellectual Property Law Association in 1997-98.

Elroy L. Hume (B.A., Physics, 1961) 1933- December 13, 2014, was born in Snohomish, WA. He worked for many years as an electrical engineer for General Electric. He served in the Army from 1954-1957, coming out a specialist second class.

Tung H. Jeong (Ph.D., Physics, 1962) 1931- May 4, 2015, was born in China and sold to a landlord's family as a baby. He and his adopted mother narrowly escaped the invading Japanese army, fleeing his village and hiding in caves until they reached Hong Kong. After World War II, he fled again- this time from the Chinese Communist Party. Jeong immigrated to the US, ending up in Amarillo, TX. Jeong was granted a full scholarship to Yale University. He earned his Ph.D. in nuclear physics at the University. Jeong pursued holography as a researcher, businessman, administrator, spokesman, and as teacher at Lake Forest College. Many of his students went on to build the hologram industry. With his wife, Anna, Jeong co-founded Integraf, an international distributor of holography supplies to schools, hobbyists, and businesses. He received the Robert Millikan Medal from the American Association of Physics Teachers, the Saxby Medal of the Royal Photographic Society of Great Britain, the Lifetime Achievement Award from the IHMA, and Fellow of the Optical Society of America. An avid violinist, he was a founding member of the North Suburban Symphony Orchestra in Lake Forest, IL.

Thomas T. Nieminen (B.S. Physics, 1970) 1943-November 30, 2014, was born in Minneapolis and grew up in Clouquet, MN where he graduated from high school in 1961. He served in the U.S. Navy. He graduated from the University with a bachelor's degree in physics with distinction. He left a sizeable endowment for physics student scholarships. He retired from Perkin-Elmer Corporation at age 38 and spent 36 years traveling.

K. Carl Nomura (M.S. Physics, 1949) 1922 - July 27, 2015, was born in a boxcar near Deer Lodge, MT. In 1942 he was sent to an internment camp for Japanese-Americans. Three years later the Supreme Court judged the interment policy unconstitutional. Nomura was released and went to college near Chicago. Nomura enlisted in the army. After his discharge, he enrolled at the University and earned three degrees in physics. For his Ph.D. he specialized in the physics of the solid state. The American Physical Society elected him a fellow in 1962. Later Honeywell's CEO sent him to Harvard for the MBA course for senior executives. He was in charge of the semi-conductor business with sales of a half-billion dollars per year, operations in seven countries and in charge of 7,000 employees. After 33 years at Honeywell, he retired a corporate senior Vice President and an officer of the company. In 1988 the Board of Regents of the University granted him their highest award given to an Alumnus: Distinguished Graduate/ Outstanding Achievement Award. In addition to scientific books and papers, Carl Nomura wrote three books including his autobiography, ***Sleeping on Potatoes.***

Jeffrey S. Parker, (Research Associate, 2004 – 2007), 1972 -February, 2015. At the time of his death, he was a Senior Scientist with Proctor & Gamble. Parker graduated from Middle Tennessee State University and received his Ph.D. from Florida State University in 2004. His thesis research was devoted to superconductivity, including the effect of magnetic impurities on the superconductor-insulator transition and the use of superconducting junctions to probe highly polarized magnetic materials. At Minnesota, Parker was a member of the Materials Research Science and Engineering Center, in which he carried out research on exchange bias in antiferromagnetic/ferromagnetic bilayers with Professors Chris Leighton and Paul Crowell. He mentored several graduate students and generously shared his expertise in materials physics with others.

Lawrence E. Williams (M.S. Physics, 1962) 1937 - July 17, 2014, retired from City of Hope National Medical Center in Duarte, CA after 33 years as an Imaging Physicist and Professor of Diagnostic Radiology. He was also an Adjunct Professor of Radiology at UCLA. He obtained his M.S. in Physics at the University, where he was a National Science Foundation fellow. His graduate research was in excited states of the mass-4 system. Williams devoted most of his research to tumor detection and treatment. He wrote about 250 publications on, and obtained a number of patents in nuclear imaging and radionuclide therapy. He wrote several books and was site reviewer for the National Institutes of Health. He was a member of the American Association of Physicists in Medicine, the Society of Nuclear Medicine, the New York Academy of Sciences, Sigma Xi, Society of Imaging Informatics in Medicine, and the Society of Breast Imaging. Williams received a lifetime service award from the American Board of Radiology. Among his most significant biophysical discoveries is the mass-law for tumor uptake as a function of tumor size. He was also co-discoverer of tumor targeting with liposomes. Williams developed a pair of indices for quantifying the ability of a radiopharmaceutical to permit imaging or therapy of lesions in animals or patients. He also demonstrated that radioactive decay must be considered inherently as one possible exit route in modeling analysis of radioactive drugs.

Find the physicists (and astronomers!)
Swing Space Map

One school, eight buildings, two years...

Several members of the School told us how they were getting along in their new digs:

Amundson Hall
"Our offices in Amundson are quite nice. The people in CEMS have been very gracious in giving us access to their copiers, scanners, and (most importantly!) the coffee room. Our offices are right next to their Combustion lab, and one of our neighbors has given us the advice, 'If you see everyone running out of the lab, follow them!!'" -Bob Lysak

Fraser Hall
"Outpost Fraser is up and running, and has quickly taken on the characteristics of a real home base. It's even starting to feel 'lived-in'. The building is actually very reminiscent of the old Tate; it's an odd, quirky layout, with lots of sharp turns and ill-conceived spaces. But it has a certain charm that can't be denied. My favorite part? The small grooves in the stone steps that were worn by the countless multitudes who shuffled their way up the stairs for in-person class registration during the pre-online days. -Kevin Roberts

West Bank Office Building (WBOB)
"Our space (in WBOB) is quickly growing on us and is starting to feel like it belongs to us. The biggest downside is being so far from campus but the building is nice and parking at WBOB is absolutely fantastic." -Meghan Murray

Williamson Hall
"The undergrad/grad office is enjoying some of the old bursar's toys: teller windows with bullet-proof glass, buzzers to unlock exterior office doors, and three, yes THREE safes. We love visitors from 'the surface' so please come do to say 'hi!'"
-Jennifer Kroschel

The more things change the more they stay the same:

Before the original building, Jones Hall was provided, physics was quartered in the Armory for three years (1899-1902), under the girl's gymnasium, sharing a space used for military drills. Some students complained they were unable to hear lectures with noise and piano music filtering in from above.