Kavli Institute for Theoretical Physics
UC Santa Barbara

www.kitp.ucsb.edu

Newsletter

Spring 2017

KRISTI NEWTON

JAKUB OSTROWSKI

Lars Bildsten

We housed our first physicists and their families in the Charles T. Munger Physics Residence on January 1, 2017. The image above is of Charlie Munger, Fred Gluck and me walking down the Hall of Flags. Those flags represent the nationalities of KITP's visitors staying in the Munger Residence and are a stunning visual representation of our international reach. This accomplishment, plus KITP's lasting impact on science discovery, is what we emphasized at our recent Site Visit to the National Science Foundation where our grant renewal is under consideration. The NSF represents more than 75% of our yearly support and is a key partner in our goals of international collaborative research at the intellectual frontier.

Our 3-month programs are the hallmark of KITP and lead to over 1,000 scientists a year visiting for long periods. On page 2 you will find KITP participant Zohred Davoudi's article describing the science undertaken by the Fall 2016 program on "Frontiers in Nuclear Physics", which was well timed for the field. KITP postdocs are with us for about three years and are offered complete freedom to pursue their own research. We highlight, on page 3, the large supercomputer simulations of the outer layers of massive stars being led by KITP postdoc Yan Fei Jiang and former KITP postdoc Matteo Cantiello. Too bad we can't show movies in the Newsletter!

We continue to host Public Lectures, Chalk Talks, and Cafe KITP events so that our Santa Barbara community learns more about the frontiers of physics. One of our recent talks was by KITP visitor Nigel Goldenfeld from the University of Illinois at Urbana-Champaign. He spoke about the origin of turbulence in fluids, a long-standing problem that was the focus of a KITP program in winter 2017. Stephanie Pernett, a third year UCSB undergraduate student studying mechanical engineering, attended the talk and spoke at length with Nigel afterwards. This resulted in an article she wrote for the Daily Nexus, UCSB's student newspaper that appears here on page 5.

The faculty at KITP continue to receive recognition for their research. The highlights this year include the election of David Gross to the Russian Academy of Sciences and an honorary doctorate degree from the Chinese Academy of Sciences (page 4). Joe Polchinski received the very prestigious Breakthrough Prize in Fundamental Physics (page 6), allowing him the opportunity to meet both high-tech moguls and celebrities! I was also very honored to receive the Dannie Heineman Prize for Astrophysics (page 7).

We continue to enhance our visitors' experience further. Beginning in January of this year, we established an agreement with the Campus Daycare Center to provide care for children of our visiting scientists. This comes as a huge relief to our visitors, as finding reliable child care is a challenge for their short stays. Thanks to the Munger Trust for funding the first three years of this new program.

We have also had a few recent staff transitions. Many of you know Laura Lambert, KITP's Development Officer of a few years, decided to stay in Austin, Texas after a one year stint away. I have now recruited Kristi Newton to the KITP as our new Development Officer. Kristi is rapidly working to understand KITP, meet all of our strong supporters and reach out to new people. Kristi and I just returned from two days of meetings in Manhattan, where we made contact with both old and new Friends of KITP. Viena Zeitler, my long-time assistant, has moved to a new position on campus. She kept me running smoothly in my first five years as Director, and I will miss her daily joyful presence!

In closing, I am very pleased to report that, not only did we open the Munger Residence on time, we also came in under budget! This is a testament to the strong collaborative relationship that Charlie Munger forged between the KITP team, the University and our contractor, the Towbes Group. Our success was bittersweet, as Michael Towbes passed away on April 13, 2017. Michael was a long time supporter of the KITP, UCSB, and the broader Santa Barbara community. He will be missed by many.

– Lars Bildsten, KITP Director

Nuclear Physics in the Spotlight

From exploring nature's most extreme environments to testing its most fundamental symmetries

Nuclear physicists headed to the KITP in the fall of 2016 to participate in an exciting program on the "Frontiers in Nuclear Physics", along with a conference on "Symmetry Tests in Nuclei and Atoms." With new theoretical understandings, advances in technology and a vibrant experimental program, addressing some of the extremely challenging questions in nuclear physics is now a reality. Nuclear systems constitute the core of the ordinary matter in the universe, from stars and supernovae to chemical elements and living organisms. Furthermore, with a great interest in unraveling the mystery of neutrinos, dark matter and other new physics possibilities, progress in nuclear physics is crucial for the success of a large number of experimental programs. Nuclear physicists are moving in on being able to predict, with certainty, the Standard effects.

Protons and neutrons, collectively called nucleons, of which the nucleus of an atom is made of, are themselves formed by elementary particles called quarks and gluons. The quantum field theory that describes the quarks and gluons and their interactions is called quantum chromodynamics (QCD). At the heart of the complexity inherent in these entangled systems of nucleons is that QCD is nonperturbative at most relevant energy regimes. In other words, the interactions can be very strong and no expansion in a small interaction coupling can correctly obtain the properties of the system. It is a highly complex problem to construct even a single nucleon out of its QCD constituents. For instance, the important question of how the nucleon's mass and spin emerge from a QCD description is yet to be fully understood, but rapid progress is being made using the numerical technique of lattice QCD. When a collection of protons and neutrons are considered, complexity of the problem is greatly increased, posing further difficulties to the theoretical calculations.

Lattice QCD is the method of solving QCD by a probabilistic sampling of the quantum trajectories of the system. It offers the promise of, and has an established success in, showing how nucleons emerge from fundamental interactions. Computational resources are becoming significant as we head towards the exascale era, promising more precise calculations of complex systems in the near future. Large systems of nucleons, however, will likely not be amenable to direct lattice QCD methods. For example, a QCD description of the 76Ge isotope requires considering (naively) 10^{373} possibilities for quantum correlations in a complicated background of vacuum fluctuations! Germanium, through its potential neutrinoless double-beta decay mode, is a popular isotope in experiments that are searching for the violation of lepton number in nature, and can unravel the mystery of the neutrino mass. To make conclusive statements about the underlying new physics, phenomenological modelings must be superseded with a combination of first principles QCD calculations and nuclear many body techniques. However, with lattice QCD calculations of light nuclei presently at early stages, and calculations of more complex systems not imminent, what is the path forward? One way to proceed is to construct effective descriptions of few nucleon interactions, constrained by experiments or by solving the underlying theory, and utilize them in modern nuclear many body calculations formulated in terms of nucleons. Illuminating aspects of this critical path was at the core of intense and productive discussions at the KITP.

The strength and novelty of this program was to bring together nuclear theorists that had focused on different steps of the ladder that starts from QCD and progresses towards many body descriptions of heavy nuclei. A focus of this meeting was to understand how to connect different levels of the ladder so that no uncontrolled errors due to the lack of knowledge of the underlying interactions at the bottom would plague quantities of great interest at the top. Exciting progress occurred in several topics, including the mysterious role of gluons in nuclear structure relevant for an Electron Ion Collider, the theory opportunities for the Facility for Rare Isotope Beams and its impact on our understanding of explosive astrophysical environments, the equation of state of neutron stars including its role in gravitational wave observations, the electric dipole moment of atoms and nuclei in the search for broken time reversal invariance in nature, the neutrinoless double-beta decay in nuclei and its link to new physics, and reaction theory for an intellectual investigation of the anthropic principle and practical applications for energy production facilities. This program marked the start of a new era in the continual pursuit of underpinning nuclear physics with the Standard Model, and opening the door to the explorations of physics beyond it.

~ Zohreh Davoudi is a postdoctoral research associate at the Center for Theoretical Physics at MIT and was in residence at the KITP for this program.

Z Davoudi

Nuclear Physicists happily disagreeing on hard problems! From left to right: M. Wagman (Institute of Nuclear theory), M. Savage (Institute of Nuclear theory), B. Tiburzi (CUNY), W. Detmold (MIT) and P. Shanahan (MIT)

Z Davoudi

Pianist, Prof. Young-Hyun Cho of the University of Texas Arlington, performing a solo piano recital featuring works by Chopin and Mussorgsky at Kohn Hall.

Photo from: http://nuclear16.wikispaces.com/social+activities

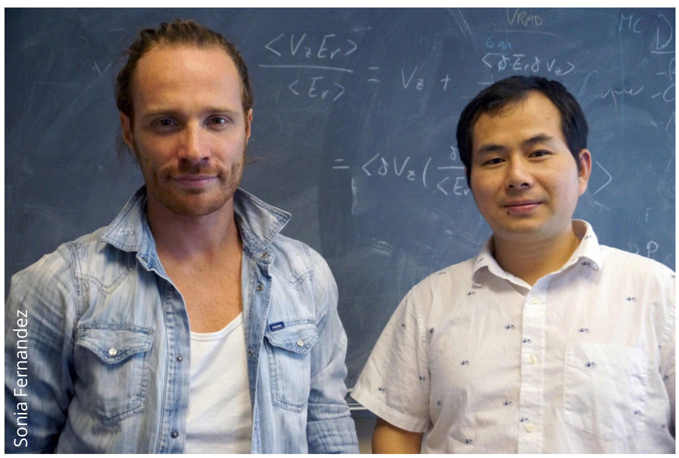
Stellar Simulators

Astrophysicists at KITP will use a supercomputer to explore the driving forces behind mass loss in massive stars

It's an intricate process through which massive stars lose their gas as they evolve. And a more complete understanding could be just calculations away, if only those calculations didn't take several millennia to run on normal computers.

But astrophysicists Matteo Cantiello and Yan-Fei Jiang of UC Santa Barbara's Kavli Institute for Theoretical Physics (KITP) may find a way around that problem.

The pair were awarded 120 million CPU hours over two years on the supercomputer Mira — the sixth-fastest computer in the world — through the Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program, an initiative of the U.S. Department of Energy Office of Science. INCITE aims to accelerate scientific discoveries and technological innovations by awarding, on a competitive basis, time on supercomputers to researchers with large-scale, computationally intensive projects that address "grand challenges" in science and engineering.



Matteo Cantiello and Yan-Fei Jiang

"Access to Mira means that we will be able to run calculations that otherwise would take about 150,000 years to run on our laptops," said Cantiello, an associate specialist at KITP.

Cantiello and Jiang will use their supercomputer time to run 3-D simulations of stellar interiors, in particular the outer envelopes of massive stars. Such calculations are an important tool to inform and improve the one-dimensional approximations used in stellar evolution modeling. The researchers aim to unravel the complex physics involved in the interplay among gas, radiation and magnetic fields in such stars — stellar bodies that later in life can explode to form black holes and neutron stars.

The physicists use the grid-based Athena++ code — which has been carefully extended and tested by Jiang — to solve equations for the gas flow in the presence of magnetic fields (magnetohydrodynamics) and for how photons move in such environments and interact with the gas flow (radiative transfer). The code divides the huge calculations into small pieces that are sent to many different CPUs and are solved in parallel. With a staggering number of CPUs — 786,432 to be precise — Mira speeds up the process tremendously.

This research addresses an increasingly important problem: understanding the structure of massive stars and the nature of the process that makes them lose mass as they evolve. This includes both relatively steady winds and dramatic episodic mass loss eruptions.

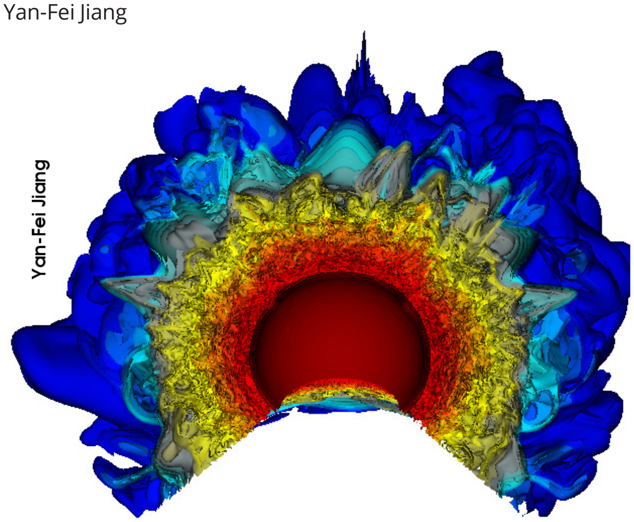
Called stellar mass loss, this process has a decisive effect on the final fate of these objects. The type of supernova explosion that these stars undergo, as well as the type of remnants they leave behind (neutron stars, black holes or even no remnant at all), are intimately tied to their mass loss.

The study is particularly relevant in light of the recent detection of gravitational waves by the Laser Interferometer Gravitational-Wave Observatory. The discovery demonstrated the existence of stellar mass black holes orbiting so close to each other that eventually they can merge and produce the observed gravitational waves.

"Understanding how these black hole binary systems formed in the first place requires a better understanding of the structure and mass loss of their stellar progenitors," explained Jiang, a postdoctoral fellow at KITP.

This work is in collaboration with KITP Director Lars Bildsten and UCSB physics professor Omer Blaes as well as two theorists from other institutions, Eliot Quataert of UC Berkeley and Jim Stone of Princeton University. The research is partially supported by the Gordon and Betty Moore Foundation and its implications will extend to broader fields of stellar evolution and galaxy formation, among others.

~ Julie Cohen, UCSB Public Affairs & Communication



Density structures of the outer envelope for a 80 solar mass star as calculated by the 3D radiation hydrodynamic simulations. The turbulence is driven by the large luminosity passing through the region where the iron opacity peak is located.

International Kudos

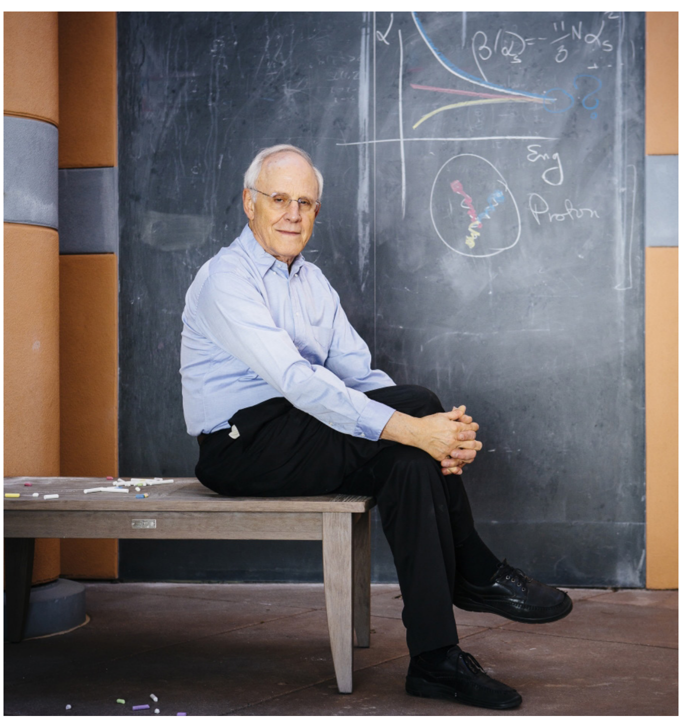
Science academies in China and Russia recognize Nobel laureate David Gross for his continuing work in theoretical physics

In 2016, the University of Chinese Academy of Sciences awarded Gross an honorary doctorate degree, an event so rare in that country that it requires government approval. And more recently, the Russian Academy of Sciences confirmed Gross as a foreign member and awarded him the Medal of Honor in recognition of his "outstanding and fundamental contributions to quantum chromodynamics." Gross shared the Nobel Prize in physics with David Politzer and Frank Wilczek for their work in that field. Quantum chromodynamics is the theory of the nuclear force that holds quarks together and binds them inside protons and neutrons.

"It is wonderful to see David recognized for his groundbreaking work and his continued impact on theoretical physics around the world," said Lars Bildsten, KITP director. "David is a strong advocate for the value of physics as a pillar in fundamental research, and I look forward to his future term as president of the American Physical Society." (Gross just began a four-year term at the APS, where he is currently vice president.)

Gross has longtime scientific ties to both China and Russia. Since winning the Nobel in 2004, he has worked with Chinese physicists to improve the country's Institute of Theoretical Physics and has been an adviser to a project that will build a supercollider at least twice the size of the Large Hadron Collider in Switzerland.

When the Soviet Union still existed, Gross was a frequent visitor. Last year, he was invited to the Joint Institute for Nuclear Research in Dubna, outside of Moscow, to mark the building of a new heavy-ion accelerator that will be able to create quark matter.



ELENA ZHUKOVA FOR UCOP

Nobel laureate David Gross

"I did my original work formulating the theory of these quarks and quantum chromodynamics, which is well-tested in many regimes," said Gross, who is a permanent member of the KITP and its Chancellor's Chair Professor of Theoretical Physics. "Dubna is going to create an intense heavy-ion beam — with less energy and lower temperature than the Large Hadron Collider but denser — so they can probe a different regime of the physics of this quark matter, one that potentially could be very interesting."

Gross received his bachelor's and master's degrees from Hebrew University in Jerusalem in 1962 and his doctorate from UC Berkeley in 1966. A junior fellow at Harvard University before moving to Princeton University, he joined UCSB in 1997 as director of the KITP, where he served until 2012.

In addition to the Nobel Prize, Gross' many honors and awards include the J.J. Sakurai Prize for Theoretical Particle Physics from the American Physical Society; a MacArthur Fellowship; the Dirac Medal from the International Centre for Theoretical Physics; the Oskar Klein Medal of the Royal Swedish Academy of Sciences; the High Energy and Particle Physics Prize from the European Physical Society; and the Grande Médaille D'or de l'Académie des Science, France.

Gross has delivered lectures around the world and holds numerous honorary doctorates and professorships. He has written hundreds of articles as well as conference proceedings and book chapters.

~ Julie Cohen, UCSB Public Affairs & Communication

Turbulence Mixes Up Particles and Physicists

The flows can be found everywhere

Hearing the word "turbulence" evokes images of bumpy airplane rides and stormy nights. While it does make passengers and potential air travelers nervous, the physics behind it is yet to be completely understood.

Nigel Goldenfeld, a physics professor at the University of Illinois at Urbana-Champaign (UIUC), director of the NASA Astrobiology Institute for Universal Biology and leader of the biocomplexity group at Carl R. Woese Institute for Genomic Biology, spoke about why turbulence is difficult to examine and what it would mean to solve this mystery during one of KITP's public lectures.

According to Goldenfeld, turbulence is the last great unsolved problem of classical physics. This seemingly random, unpredictable motion of fluids is pervasive and completely familiar to most.

Turbulence governs the speed at which rivers flow and the air drag as you drive your car; it is the bane of air travelers. Turbulence can kill by causing arteries and aneurysms to burst. Turbulence makes stars twinkle. Its random but structured patterns have inspired artists and scientists alike.

Courtesy of aviationknowledge.wikidot.com

The plane above is creating turbulence; the sudden speed of the plane disturbs the air flow and vortices occur. If another plane were behind it that plane would experience the effects of turbulence.

So, what, if anything, can theoretical physics tell us about turbulence? To Richard Feynman — an American theoretical physicist known for his path integral formulation of quantum mechanics and more notably for his contribution in the development of the atomic bomb — absolutely nothing.

Goldenfeld, however, believes that some progress has been made regarding turbulence and, to explain his reasoning, Goldenfeld broke down turbulence into a simple example.

"The simplest form of the problem is to take a pipe that is very long and push water through it at high speed. To push a given amount of water through that pipe, how much pressure is needed? No one can analyze it from first principles and the properties. If the water flows very slowly, or if we use a thick, goo-like honey, then we can [analyze] it nicely," he said.

What makes this simple example difficult to solve is when physical formulas that have been used for hundreds of years, such as Newton's laws of motion, are applied.

According to Goldenfeld, when you apply Newton's second law of motion (that the force on an object is equal to its mass multiplied by its acceleration) to every particle in the fluid, the problem becomes complex.

If all the particles in the fluid were to move in uniformity, then the problem simplifies to the pipe with steady water flow.

"This is called laminar [flow]. This is just flowing steadily, deterministically, predictably, no surprises," Goldenfeld said.

Once the fluid is disturbed, it becomes turbulent.

"The fluid particles start to go off in different directions, and how far they go depends on their velocity, and that depends on their acceleration. So you can't predict in advance where they will go, because you have to know how they accelerated to get there," Goldenfeld said.

The once-uniform motion of the fluid particles are now moving randomly and moving farther apart as their accelerations differentiate.

While the fluid particles may seem chaotic, Goldenfeld explains that that term does not properly describe the fluid.

Chaos is one particle, or one system, that behaves badly in time, such as a double pendulum. However, turbulence is many particles acting in both space and time. The structure of a double pendulum is simplistic, while the structure of a disturbed fluid is complex.

Most think that turbulence is something experienced while in an airplane or seen in a fluid, but as Goldenfeld points out, our blood flow is at the point between laminar and turbulent flow, so anything that could potentially disturb that flow may be fatal.

Turbulence is also seen in ecosystems. When there is a balance between prey and predators, it can be seen as laminar as there are no sudden changes, but introducing a disturbance may drive the ecosystem to extinction analogous to turbulence.

For a topic that is involved in every aspect of living systems, turbulence still has yet to be fully understood. The solution is so sought after that the Clay Mathematics Institute is offering a million-dollar prize for the person or group that solves the Navier-Stokes equations, equations that describe the motion of viscous fluids.

As of now, the problem of turbulence is not solved, but according to Goldenfeld, physicists understand it more now than back in Feynman's day.

~ *Stephanie Pernett, UCSB Daily Nexus*

Another Major Breakthrough

Joseph Polchinski wins prestigious 2017 Breakthrough Prize in Fundamental Physics

Awarded for his transformative advances in quantum field theory, string theory and quantum gravity, distinguished UCSB physicist Joseph Polchinski won the prestigious 2017 Breakthrough Prize in Fundamental Physics, which recognizes major insights into the deepest questions of the universe. Polchinski, a permanent member of the KITP and the Pat and Joe Yzurdiaga Professor of Theoretical Physics, shares the award and $3 million prize with Harvard physicists Andrew Strominger and Cumrun Vafa. They and other recipients of the 2017 Breakthrough Prizes were honored during a gala ceremony with prize founders Sergey Brin and Anne Wojcicki, Yuri and Julia Milner, and Mark Zuckerberg and Priscilla Chan.

"It has been a privilege to spend my career studying fundamental physics, and a joy that I have been able to add new ideas to this subject, including D-branes, the string multiverse and the black hole firewall," said Polchinski. "The wonderful environment of UCSB and the KITP, and the excellent colleagues here, have contributed much to this continued success. It is an honor to receive the Breakthrough Prize for this work, and to share the recognition with UCSB and KITP."

"We could not be more proud and pleased for this extraordinary honor for our colleague Joe Polchinski," said UCSB Chancellor Henry T. Yang. "His research has had a profound impact on our understanding of the universe. As one of the pioneers of the field of string theory, Professor Polchinski has demonstrated tremendous creativity and insight not only in discovering new scientific truths, but also in communicating these complex ideas in a highly accessible and inspiring way."

String theory posits that the building blocks of reality are tiny vibrating 'strings.' Polchinski showed that if you mathematically shrink the space around one class of strings, the space is forced to 'bounce back' — that is, to expand again into a larger volume. Only now it's no longer empty but, rather, a 'D-brane,' a multi-dimensional structure that contains what we normally think of as particles, localized as points on a surface of the brane. That major discovery by Polchinski was one of the ingredients in the holographic principle: the notion that the 3D universe we seem to live in is in fact a 2D projection onto one surface of a vast multidimensional structure.

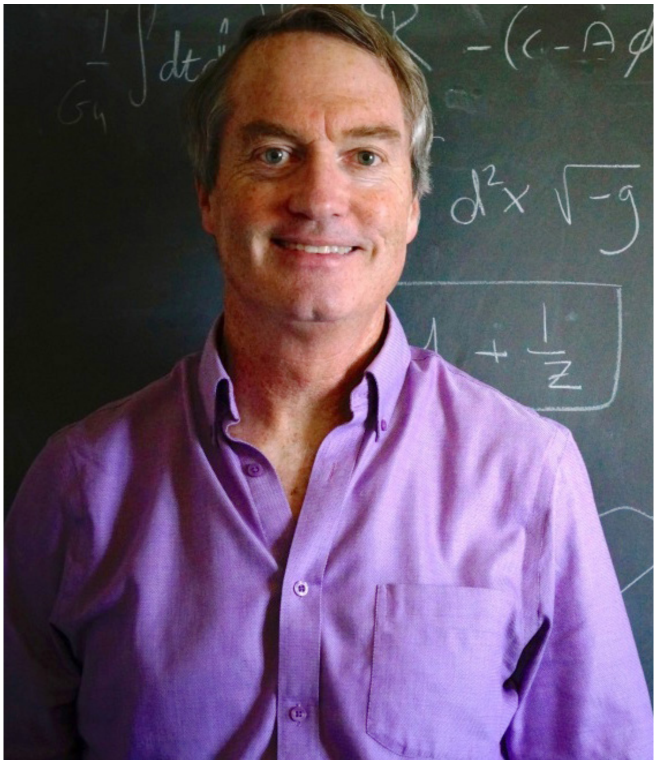
Polchinski has recently developed another big idea, deriving from the principles of quantum mechanics, known as 'firewalls' — blizzards of high-energy particles around black holes. The existence of firewalls would signal a fault line in the foundations of physics: At least one of the two superstar theories of modern physics — relativity theory and quantum theory — would have to be incomplete at a fundamental level.

UCSB theoretical physicist David Gross, winner of the Nobel Prize in Physics in 2004, said of his KITP colleague, "Joe Polchinski's deep insights and discoveries, from branes to black holes, have inspired theoretical physics for the past decades. He is a jewel in the crown of the KITP and UCSB."

"I can't think of anyone more deserving of this recognition than Joe," said Lars Bildsten, director of KITP. "Not only is he a remarkably brilliant physicist, he is also a wonderful colleague. His excellent mentoring of graduate students and postdoctoral fellows is legendary in the field, and has allowed Joe's insights and impact to spread across all of theoretical physics."

Among his many honors, Polchinski has held a Hertz Foundation Graduate Fellowship, a National Science Foundation Postdoctoral Fellowship and an Alfred P. Sloan Fellowship. He was elected a fellow of the American Physical Society in 1997 and of the American Association for the Advancement of Science in 2012. Polchinski is a member of the American Academy of Arts and Sciences and of the National Academy of Sciences. He is the recipient of numerous awards, including the American Physical Society's 2007 Dannie Heineman Prize for Mathematical Physics; the 2008 Dirac Medal of the International Center for Theoretical Physics, Trieste; and the Physics Frontiers Prizes in 2013 and 2014. Polchinski earned his Bachelor of Science in physics from the California Institute of Technology in 1975 and his Ph.D. in physics from UC Berkeley in 1980. After two-year stints as a research associate at the Stanford Linear Accelerator Center and at Harvard, he joined the faculty at the University of Texas at Austin in 1984 and moved to UCSB in 1992.

~ Shelly Leachman. UCSB Public Affairs & Communications



SONIA FERNANDEZ

Joseph Polchinski

Inspiration in the Stars

Lars Bildsten wins the 2017 Dannie Heineman Prize for Astrophysics

Looking to the stars for inspiration, astrophysicist Lars Bildsten favors astrophysical problems where copious amounts of data allow for new insights and quantitative measurements.

It's a winning approach — one that has earned him the 2017 Dannie Heineman Prize for Astrophysics, awarded jointly by the American Institute of Physics and the American Astronomical Society. Bildsten has been recognized "for his leadership and observationally grounded theoretical modeling that has yielded fundamental insights into the physics of stellar structure and evolution, compact objects and stellar explosions."

"We are so proud that Professor Bildsten has been recognized among the most brilliant stars in astrophysics," said UCSB Chancellor Henry T. Yang. "This high honor celebrates his outstanding research and tremendous impact in his field, specifically in the area of theoretical astrophysics of stellar evolution and explosion. Our campus is beyond fortunate to have such a physics giant leading our Kavli Institute for Theoretical Physics."

"The Heineman Prize is a major recognition in the field of astrophysics, so it was very satisfying to be acknowledged by peers for my work," Bildsten said. "I draw inspiration both from observational data, where rich, unexplored treasures exist, and from an excellent group of graduate students and long-term collaborators who push me in new directions."

As a stellar astrophysicist, Bildsten is now exploring the lifespan of binary stars, systems consisting of two stars — one more massive than the other — orbiting around each other. The star with the larger mass burns its fuel more rapidly than does the lower-mass star and becomes a red giant. This expansion in radius eventually leads to mass transfer to the lower-mass star. "Sometimes the tides are big enough that material gets pulled off and added on to the lower-mass star, creating mass exchange," Bildsten explained. "That mass transfer can lead to many, many different types of astrophysical outcomes that we are exploring. Sometimes it leads to rapid variability as the matter tries to spiral its way down onto the compact object. That's when we find the objects as variable stars in the sky.

"Other times, mass transfer adds enough material to cause the star to undergo a rapid thermonuclear transition in a matter of minutes," Bildsten continued. "Then we get a supernova that is brighter than the galaxy it's in for a month. The possible outcomes from mass transfer are so diverse that any you can understand better is great progress."

For the last five years, Bildsten also has been involved with the Palomar Transient Factory, a Caltech led observational collaboration. Bildsten's prime interest has been interpreting its observational data when puzzles appear. For example, using information from the survey, he and Dan Kasen, a professor at UC Berkeley, developed a model to explain supernovae 100 times brighter than normal. The challenge was identifying the new energy source for these supernovae, which they hypothesize to be the rapid loss of rotational energy of a newly formed and highly magnetic neutron star.

"This is the only existing hypothesis for how this ultrabright phenomenon occurs," Bildsten said. "But we didn't have the idea randomly; we drew inspiration from the observations."

In the near future, Bildsten will be working with the Zwicky Transient Facility, a project led by Caltech professor Shri Kulkarni, which will examine the northern sky many times per night. This increased frequency will allow astronomers to both detect supernovae soon after they explode and find those that may last for only a few nights.

"If you're looking every four hours during the dark time, you'll see things that weren't there the night before," Bildsten said. "So that is going to lead to different types of data that we haven't had before."

~ Julie Cohen, UCSB Public Affairs & Communication

JAKUB OSTROWSKI

Lars Bildsten

TONY MASTRES

TONY MASTRES

Charles T. Munger

TONY MASTRES

MIKE GRAHAM

TONY MASTRES

MIKE GRAHAM

LOUISE PARSONS CHINI

"We loved staying at the KITP Residence. It is a really amazing building with so many nice features and it has definitely felt like our "home" over the last few weeks. The children love going down to the play-room every day (see picture) and they enjoy hearing people playing on the pianos. We have plenty of space in our apartment (the kitchen is larger than our kitchen back home!) and we have also enjoyed using the common areas downstairs." Dr. Louise Parsons Chini, KITP Visitor and Research Assistant Professor of Geographical Sciences at the University of Maryland.

The Charles T. Munger Physics Residence officially opened on January 1, 2017 and is always full. The Residence is designed as a premier living and casual collaborative environment for KITP's visiting scholars and was made possible thanks to a $65,000,000. gift from Charlie Munger.

Kavli Institute for Theoretical Physics
University of California, Santa Barbara

Engaging with KITP

There are many ways to contribute to the life of KITP. We urge you to become involved by:

- **Becoming a Friend of KITP**
- **Attending a public lecture or Café KITP event**
- **Making a Philanthropic Gift**

To do so, call (805) 893-6307

or visit our website at www.kitp.ucsb.edu/support-kitp.

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