UC **SANTA BARBARA**

Kavli Institute for Theoretical Physics

Newsletter

Fall 2020 www.kitp.ucsb.edu

CARTER HIYAMA

Lars Bildsten

The banner image shows the excellent KITP staff during a weekly staff meeting on Zoom. Led by our most able and always spirited Chief Administrative Officer, Lisa Stewart, KITP's staff have gone above and beyond over the last eight months to keep KITP front and center for the international physics community. One of them, Lori Staggs, is highlighted on the back page of this issue. Written by KITP staff member Susie Groves, it's a wonderful story that also highlights some local history.

KITP's ability to pivot to the online world has led to increased opportunities for physicists. Our reunion conferences this Summer had an average of 140 scientists in attendance for each event, and allowed for nearly 1,200 scientists to participate from 45 different countries! We just completed six additional conferences in October that were initiated by KITP postdocs. These activities are in addition to our continued delivery of KITP programs via Zoom.

KITP has been hosting Writers-in-Residence for over a decade. Supported by the Kavli Foundation, we sponsor writers to spend time at KITP interacting with our visiting scientists. Just before the pandemic, we were hosting Prof. Brandon Brown from University of San Francisco. He gave a great talk to our visitors about his experience in science communication and, upon departure, wrote a piece that you can read on page 2. Thanks Brandon for your wonderful contribution and very touching story of mentoring as well as capturing the transition at KITP to the time of the pandemic.

Art has been prevalent at KITP for nearly two decades due to the inspiring work of KITP's Artist-in-Residence Jean-Pierre Hébert. You will find the full story on Page 5. Jean-Pierre has also been creating the much loved KITP holiday cards for over a decade and was instrumental in obtaining new works of art for the Charles T. Munger Physics Residence, enhancing the stays of all of our visitors.

KITP's postdocs are an integral part of the science going on here. We saw the departure of seven this Fall. Many went on to hold another postdoctoral fellowship: Evan Bauer (Astrophysics) is at Harvard, Benny Tsang (Astrophysics) is at UC-Berkeley, and Chris White (Astrophysics) is at Princeton University and the Flatiron Institute. Others took up junior faculty positions around the world, Chao-Ming Jian (Condensed Matter) is at Cornell University, Thomas Kupfer (Astrophysics) is at Texas Tech, Ken Van Tilburg (Particle Physics/Astrophysics) is at NYU and the Flatiron Institute and Huajia Wang (High Energy) is at the Kavli Institute for Theoretical Sciences in Beijing.

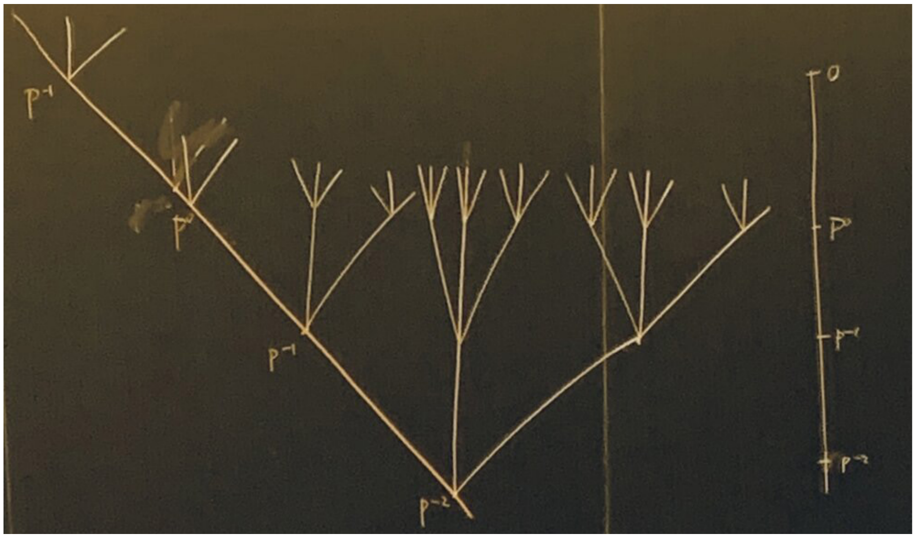
We have nine new postdoctoral scholars who arrived this fall. In astrophysics, we have Chad Bustard from University of Wisconsin, Madison, Nir Mandelker from Yale University, and May Pedersen from KU Leuven, Belgium. In high energy physics we have Grant Remmen from UC Berkeley and Josephine Suh from Caltech, while in condensed matter we have Wenjie Ji from MIT, Jong Yeon Lee from Harvard, and Urban Seifert from TU Dresden. We also have a new biophysicist, Nick Noll, from Biozentrum, Basel, Switzerland.

Our postdocs are very productive during their time with us. On page 3, you will find an article summarizing a research project led by Xiao Chen, now an Assistant Professor at Boston College. With his collaborators, he carried out an intriguing study of how spins interact when forced to be on an unusual Kagome lattice. Our postdocs also collaborate with each other, and on page 7 you can read the article about the work of Sean Ressler and Chris White on large-scale computations meant to increase our understanding of how gas that leaves stars near the center of our galaxy ends up getting near, and eventually into, the super-massive black hole that resides there. The observational proof of the existence of this black hole was acknowledged in October 2020 with the awarding of the Nobel Prize in Physics to Reinhard Genzel (MPE-Garching and UC Berkeley) and Andrea Ghez (UCLA). I was very happy to see their remarkable accomplishments so aptly recognized, and equally excited to see Roger Penrose (Oxford) also acknowledged for his highly impactful theoretical work on black holes.

In my Spring 2020 newsletter I highlighted the need to reconstruct a large amount of Kohn Hall due to the 10,000 gallon flood. That project is now wrapping up and I will write the full story for the Spring 2021 Newsletter, as by then we should be back in Kohn Hall!

- Lars Bildsten, KITP Director

Gravity in the Time of Corona



Branching diagram from a chalkboard at the Kavli Institute for Theoretical Physics in February, 2020

BRANDON R. BROWN

KITP Writer-in-Residence, Brandon R. Brown

Just over twenty years ago, a physics major approached me after class and said he had a non-physics question. Carlos, a bright, young man from Texas, had trekked to San Francisco for his college experience, pulled by our Jesuit university's call to nudge, cajole, or push the world toward a more humane future.

"Dr. Brown? I like physics, and I definitely love your class." He was ever polite, that kid. "But what does it mean for *people?* When can you see it changing people's lives?"

At the time, at age thirty, I grappled with similar questions. I set down my stack of papers. "Physics has to take the long view," I said. "Like, those physicists who once figured out how a semiconductor works, for no obvious reason? Nearly a century later, the world is transformed by computers and sharing information. That's the best case. But then some studies won't have much impact at all."

I tried to summarize, not proselytize. "It boils down to whether or not you think it's good and natural for us to learn as much as we can about the universe. And whether you believe that journey will do more good than it does harm."

Carlos thought about this and wrinkled his brow. "I hear that," he said. "I think I want to see something more direct though." We talked about a change of major and what that would look like. He said he'd think it over. After shaking my hand – those innocent days – he left the lecture hall, and soon thereafter, he left the major with all my respect intact.

I recently thought of Carlos and his question again as I stood on a brittle bluff marking the edge of the KITP. You can look over miles of the Pacific Ocean, but it's not as romantic as you would think. A chain-link fence keeps you back from the edge, and signs warn: "Cliffs undercut by erosion." Just like Carlos's question still gnaws at me, the metaphor of that cliff was only getting more obvious by the day. By late February 2020, we knew the new coronavirus had much greater ambitions than Wuhan, though it still felt like a distant abstraction, just one of many mathematical conjectures. I was visiting the Institute as a "writer in residence" and aiming to chronicle a band of string theorists and black hole wranglers. An ivory tower of brilliant but abstract geniuses sits literally steps from an encroaching, rising ocean. All the beautiful chalkboard diagrams and equations could someday be undercut by rising sea levels chewing the Institute's foundations. What would Carlos say about my talented physics colleagues working away in there? Especially now, in a pandemic.

As I kept taking notes from the leading mathematical edge of physics, I had to ask Carlos's question again in a less polite way: *what good is this?* Many of my biology pals are working around the clock, drawing and quartering the novel coronavirus, looking for weaknesses they can cleverly attack with drugs. Meanwhile, some of us are supposed to keep contemplating parallel universes, branching this way and that in lines of chalk? There's just one universe right now, isn't there? The one where doctors and nurses branch a single ventilator to support multiple sets of besieged lungs.

I've often thought about theoretical physics and other abstract pursuits by viewing humanity as a sort of multi-celled organism. We can't all be immune cells, protecting humanity from infection. Maybe theoretical physicists are a certain part of the brain matter, and maybe someone like myself, more of a communicator, is a nerve cell relaying signals from the brain to other parts of society's body. When attacked by disease, a brain cell or a nerve cell can't really uproot to join a fight in aching lungs. They can just do their jobs. And on cue, I open an email this morning from a theoretical physicist I'd met in Santa Barbara. In his email, there's no mention of pandemic – just some follow-up about gravity and quantum theory. The show must go on, each cell to its purpose.

Going back to my talk with Carlos, I think of the long game again. Those biologist friends of mine, working feverishly on coronavirus drugs? They're definitely using semiconductors for their daily online research meetings. In fact, as the world tries to keep lurching forward during lockdown, doctors can see patients, relatives can see newborn nieces, and grieving families can attend cremation rites, all through digital connections. Those are built on esoteric

Carlos Menchaca, far from his student days, still working to solve problems

work of the 1930's and 1940's, when a few physicists drew their blinds against economic collapse and global war, scrawling away with pencil and paper. That's when quantum theory, just a toddler, first cracked the code of semiconductors.

Looking to the *next* century's pandemic, who's to say that today's crazy ideas for "quantum gravity" won't have produced better tools, maybe a new type of microscope to dissect the next virus, or a revolutionary clean energy to keep hospitals running. Even in the moments this kind of long view makes sense, I admit it provides only cold comfort to the here and now.

These days, I'm not really in touch with Carlos Menchaca, the student who changed his major. One isn't really in touch with the New York City council member, unless you're a fellow city official or one of his constituents in District 38. But I follow him online. These days, he's sharing COVID-19 resources on Facebook, trying to reach every segment of his district, in every language, with extra efforts for the most vulnerable. I don't pretend that my attempt at an honest answer helped Carlos find this path – I don't think anything would have altered that kid's drive. But I'm grateful that his after-class question sticks with me. I hope that question can always keep people like me less comfortable than we'd otherwise be, as we cherish all those focused on the urgent now.

Post-script: After many years, I have just exchanged messages with Carlos; he actually liked a song I posted on Facebook, of all things. On reading the essay, he says he loves that "we are both holding that question close." Despite his long daily work to effect change, he still likes to pull back for the big picture as well. He says he routinely looks at NASA-provided views of the Earth from space before he goes to bed. Thank you, Carlos, for all these perspectives. Much respect, as always.

- Brandon R. Brown, Professor and Chair of Physics and Astronomy, University of San Francisco and KITP Writer-in-Residence

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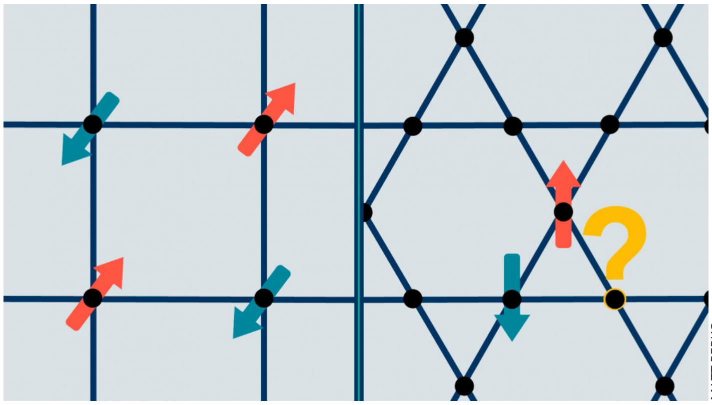
Spinning Up a Solution for Spin Liquids

Physicists model an exotic phase of matter in an attempt to solve a decades-old debate

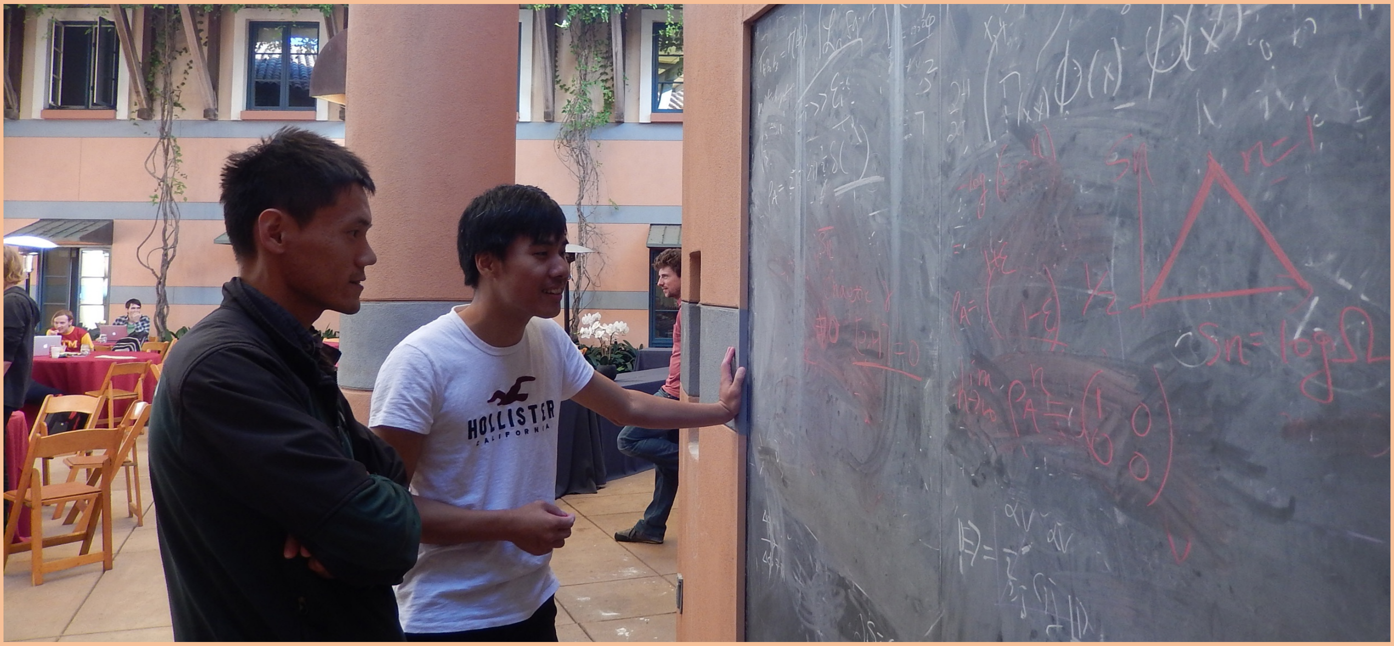
For decades physicists and mathematicians have debated about the behavior of a particular kind of exotic matter. Now, a team of physicists including Xiao Chen, an associate specialist at the time at KITP, now an assistant professor at Boston College in Massachusetts, have gleaned new insights into this phenomenon. Their findings appeared in the journal Science Advances in Fall 2018.



Magnetic flux through a Kagome cylinder. The spins of particles on an antiferromagnetic square grid align nicely (left). In contrast, the particles' ideal pattern is frustrated by the geometry of a Kagome lattice (right)

Particles have a property called spin. It's responsible for the magnets we use on our refrigerators and in our hard drives. It also lends itself to some interesting, and potentially useful physics. You can visualize spin as an arrow pointed up through the axis of a tiny spinning ball. In some materials, neighboring particles prefer to orient their spins opposite each other, like a sheet of magnets aligning themselves north to south. This is easy to accomplish in simple grids, like a checkerboard; however, more complex ones foil such an easy solution.

In square lattices, four particles sit in each cell, so two can spin one way, and two the other. But this picture fails in certain cases. For



KITP

Xiao Chen and UC San Diego graduate student Tsung-Cheng Lu contemplate a blackboard equation during a conference on quantum information at KITP

instance, in a lattice of six-pointed stars, called a Kagome, the cells are triangular. The odd number of particles per cell keeps the system from settling into a stable pattern. In these materials, the quantum fluctuations never stop flipping the particles' spin directions. Scientists call this a spin liquid, because it never "firms up."

Although quantum spin liquids don't settle into a conventional order, they do take on a specific type of behavior. The problem is that, for the Kagome lattice, different models yield two different behaviors, and scientists and mathematicians have debated for decades over which is the true ground state. The study by Chen and his colleagues W. Zhu of Los Alamos, Y.C. He of Perimeter Institute, and W. Witczak-Krempa of University of Montreal has shed new light on this quantum quandary.

The two possible phases behave rather differently. The first possibility is called a Dirac spin liquid, and it is quite sensitive to perturbations, which change the system's global correlations. The other possibility is called a topological spin liquid, and its dynamics are resilient to small changes.

The team calculated the behavior of the spin liquid using a Heisenberg model, a method physicists use to represent a system's energy. Next, they set up a numerical simulation to run an experiment.

In contrast to traditional measurements, the team computed a quantity called entanglement entropy. This concept quantifies the non-local correlations in quantum systems with many parts. They simulated a magnetic field passing through a cylinder whose surface was made of a Kagome lattice. Both the equations and the simulation revealed a system that was highly sensitive to changes in the magnetic flux, indicative of a Dirac spin liquid.

"I'm actually surprised that the simulation fit so well with the formula, to be honest," said Chen. The data from the model almost perfectly aligned with the curves generated by the equations for the entanglement entropy.

The theoretical results bolster the case for those who suspect the system is a Dirac spin liquid, however they don't close the debate. If this task were baking a dessert, you could say Chen and his collaborators created the recipe. Performing the experiment in real life would provide conclusive evidence. Unfortunately, this would be a tough cake to bake.

"One difficulty is threading the magnetic flux through the cylinder," Chen said. "Another difficulty is the entanglement entropy: It's an important concept, but it's very hard to measure experimentally. You can only measure it for a very simple, few-body system," he added. Chen does think the experiment would be quite illuminating if done successfully.

Spin liquids are both theoretically fascinating and possibly practical. For instance, spin liquids can have bubbles in them, like ordinary fluids. These are localized objects; they have an identifiable position and can move around, said Professor Leon Balents, the leader of the research group at the KITP to which Chen belonged. We can think of these bubbles as particles, and in quantum spin liquids they behave like quantum particles. Surprisingly, these bubbles behave like particles of matter, called fermions. They even interact in a way that mirrors the interactions between matter via the fundamental forces.

Chen and his colleagues are excited to apply their method to investigate the properties of other systems. "It's a good method," Chen said. "And there are a lot of 2D strongly-correlated systems, so we'll use the same setup to explore the low energy properties of these systems."

This research was supported by the Gordon and Betty Moore Foundation's Emergent Phenomena in Quantum Systems Initiative, grant GBMF4304, to the KITP.

-Harrison Tasoff, Science Writer, UC Santa Barbara Public Affairs

An Artistic Dimension

KITP's longtime artist in residence complements scientific inquiry with artistic creativity

An air of subdued curiosity permeates Kohn Hall, the building that hosts KITP, where researchers from around the world seek to decipher the universe's mysteries.

Adding to this rarified atmosphere are the many works of art adorning the building's interior. Their abstract designs and shapes hint at an underlying pattern known solely to the artist himself. These intriguing works are the product of a collaboration between KITP and artist Jean-Pierre Hébert, who has served as the institute's artist in residence for over 15 years.

"I was introduced to Jean-Pierre, and I fell in love with his work," said David Gross, a Nobel laureate in physics who was the director of the institute at the time. "With his mind, his imagination, his creativity and the things he was trying out."

The journey that led Hébert to that auspicious meeting in 2003 began in his childhood home of Vence, France, a small town set in the coastal foothills of the Maritime Alps. The region was a hub of the modern art movement, counting among its residents such luminaries as Marc Chagall, Henri Matisse and Pablo Picasso.

And Hébert was fortunate enough to have a close friend who owned one of the fine art galleries in town. The space showcased pieces from titans of the early 19th century as well as work from artists who were not classically trained. "I had open access to the gallery, to the reserve," Hébert recalled. "I could go there whenever I wanted. I could touch everything."

In college, he developed an interest in computers and landed a summer internship at IBM's Paris office, located in the city's famous Place Vendôme. The company hosted the first IBM mainframe in all of Europe, according to Hébert.

The internship proved a formative experience, and soon Hébert was joining the French Army's Center for Operational Research after being conscripted into the military. After his service was over, he became a software consultant.

Hébert pursued his artistic passions throughout his time as a computer scientist. However, his penchant for algorithmic art arrived later, at the convergence of artistic inspiration and technological innovation.

One day, as he perused an IBM brochure, he came across the work of Anni Albers, an artist, printmaker and weaver. "She was making art from geometry," he said, "and I decided to explore the process."

And advances in computing now made this a possibility. Until that point, Hébert had worked on mainframes, and couldn't afford to use computer time for artwork. But, by 1974, Hewlett-Packard had introduced smaller computers ideal for this pursuit. Hébert bought one and set to work.

Many of his first pieces were grids and fractals, as the computer software allowed him to create precise patterns that would be difficult to achieve by hand. "But symmetry is boring," Hébert remarked.

MATT PERKO

Jean-Pierre Hébert stands in his parlor next to one of his plotted art pieces

For the better part of two decades, Hébert essentially worked blind. Computer monitors weren't good enough to render his drawings, so he didn't know precisely how they'd turn out until he plotted them. Even after decent monitors became available in the late 1980s, the displays were mostly for code. They couldn't capture the nuances present in the finished work for quite some time.

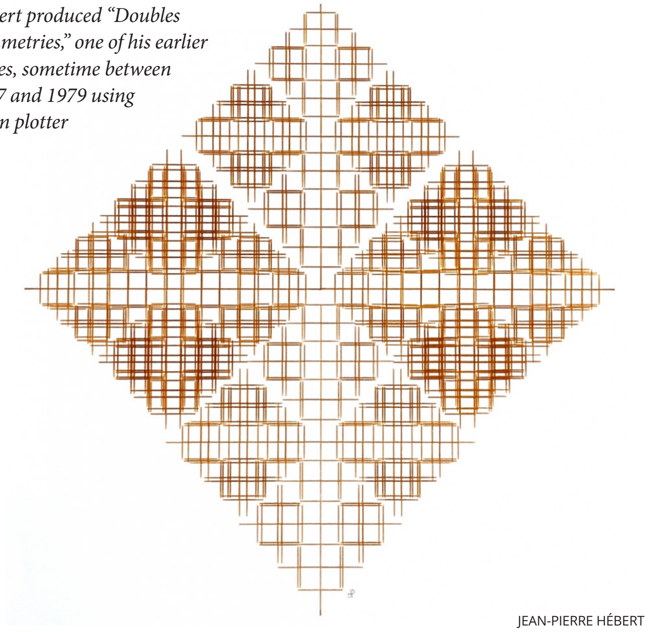
Around this time Hébert and his wife first visited Santa Barbara on business. The couple fell in love with the sunny, beach-side city and moved here from Paris in 1985.

Inspiration struck one day while Hébert was walking along the harbor later that year in Santa Barbara. He noticed the reflections of ships in the water. The rippling of the water transformed the stiff, orderly masts into dynamic patterns that flowed upon its surface.

"If the line is alive, the drawing will be beautiful," Hébert said, referencing artist and poet Jean Cocteau. From then on, all of his pieces were dynamic and lively.

By 1989, Hébert had mostly left the consulting industry to pursue his art full-time. That year he held his first public art show in the very gallery his friend owned back in Vence. Later that same year, he exhibited at the SIGGRAPH conference in Boston, Massachusetts. The organizers loved his artwork, and he became a reoccurring artist at the group's annual conferences. In 2012, ACM SIGGRAPH conferred Hébert with the Distinguished Artist Award for Lifetime Achievement in Digital Art.

A confluence of events brought Hébert and David Gross together in 2003 to begin what would become a fruitful partnership. Hébert,



Hébert produced "Doubles Symmetries," one of his earlier pieces, sometime between 1977 and 1979 using a pen plotter

JEAN-PIERRE HÉBERT

now a full-time artist, was holding a show in the former Monlleo gallery in Santa Barbara. KITP had just finished the west wing expansion of Kohn Hall, and Gross had rediscovered funds set aside to provision the building with artwork and décor.

Gross entrusted two local artists, Marcia Burtt and Beth Westen, to seek out promising work for the institute, and they approached Hébert at his show.

"I liked him, and I liked his art," Gross recalled of his first meeting with Hébert. "I was really impressed with his story — how he came from programing with an interest in art to become a full-time artist — and with the complexity and beauty of his drawings."

The institute purchased several of Hébert's drawings to display in Kohn Hall, and Burtt suggested that Gross invite Hébert to join KITP as the artist in residence.

Dozens of Hébert's pieces adorn the corridors of Kohn Hall, but his influence on KITP extends beyond merely what is visible. Hébert has organized workshops for the visiting fellows as well as exhibitions featuring his work and that of other artists working with mathematics and computers. "He just adds a dimension to KITP that doesn't exist most places," said Gross.

Hébert's most iconic contribution to KITP is likely Ulysses — otherwise known as the sand machine — a concept he had been working on since 1998. The installation consists of a mahogany base, constructed by local furniture builder Victor DiNovi, and a hidden programmable device conceived by Hébert and designed and built by UC Santa Barbara engineer David Bothman.

Ulysses features a steel ball that travels across a table of sand leaving mesmerizing patterns in its trail. Each new pattern overwrites the last as the ball continues on its Zen-like journey indefinitely. Though it travels, it has no destination; and while it covers much distance, it never leaves the confines of its table.

"I just loved it," Gross recalled. "It's beautiful, extremely clever, and extremely original. You never grow tired of watching it."

Hébert has also drawn inspiration from his relationship with the institute and the scientists therein. "It has been quite important for me, and for the development of my work, to be artist in residence at KITP," he said. "It has been subtle, but it has been permanent."

Hébert has attended a number of programs, conferences, and talks that KITP hosts. He fondly recalls one about granular materials and aggregates, which gave him an opportunity to talk to physicists about sand movement, like that in Ulysses.

"The conversations with the physicists influenced me, certainly, there is no doubt," he said. "Each of these contacts was provoking thoughts, and this resulted in new work being created."

The Héberts' relationship with UC Santa Barbara extends beyond Jean-Pierre's position at KITP. All of their children earned their degrees at the university. Their eldest, François, earned a bachelor's degree in physics from the College of Creative Studies and continued on to receive his doctorate at Cornell. He currently researches black holes as a Caltech postdoc working with the LIGO group.

Their daughter Marie studied violin at the UCSB, and is now a professional violinist, both teaching and performing. Daughters Anne and Claire Alice followed in their brother's footsteps, also earning physics degrees at the College of Creative Studies. They are now pursuing their doctorates at Harvard and Stanford.

Of all of his accomplishments, Hébert is most proud of his initial genius in choosing to explore a new type of art. "I've done this drawing and that drawing, but they are all drawings, not ideas," he said. "It was the idea of using the computational power of a computer to make a drawing that started everything."

And his relationship with KITP seems to have left its mark. "It's difficult to quantify," he said, "but I think looking at the portfolio shows very loudly how this happened."

- Harrison Tasoff, Science Writer, UC Santa Barbara Public Affairs

MATT PERKO

Ulysses, also known as the sand machine, currently resides on the first floor of Kohn Hall

A* Model

Physicists' innovative model provides insight into the behavior of the black hole at the center of our galaxy

KITP, CHRIS WHITE

KITP Postdocs Sean Ressler and Chris White

Like most galaxies, the Milky Way hosts a supermassive black hole at its center. Called Sagittarius A*, the object has captured astronomers' curiosity for decades. And now there is an effort to image it directly.

Catching a good photo of the celestial beast will require a better understanding of what's going on around it, which has proved challenging due to the vastly different scales involved. "That's the biggest thing we had to overcome," said Sean Ressler, a postdoctoral scholar at KITP, whose paper in the Astrophysical Journal Letters investigated the magnetic properties of the accretion disk surrounding Sagittarius A*.

In the study, Ressler, fellow KITP postdoc Chris White (now at Princeton University), and their colleagues, Eliot Quataert of Princeton University and James Stone at the Institute for Advanced Study, sought to determine whether the black hole's magnetic field, which is generated by in-falling matter, can build up to the point where it briefly chokes off this flow, a condition scientists call magnetically arrested. Answering this would require simulating the system all the way out to the closest orbiting stars.

The system in question spans seven orders of magnitude. The black hole's event horizon, or envelope of no return, reaches around 4 to 8 million miles from its center. Meanwhile, the stars orbit around 20 trillion miles away, or about as far as the sun's nearest neighboring star.

"So you have to track the matter falling in from this very large scale all the way down to this very small scale," said Ressler. "And doing that in a single simulation is incredibly challenging, to the point that it's impossible." The smallest events proceed on timescales of seconds while the largest phenomena play out over thousands of years.

This paper connects small scale simulations, which are mostly theory-based, with large-scale simulations that can be constrained by actual observations. To achieve this, Ressler divided the task between models at three overlapping scales.

The first simulation relied on data from Sagittarius A*'s surrounding stars. Fortunately, the black hole's activity is dominated by just 30 or so Wolf-Rayet stars, which blow off tremendous amounts of material. "The mass loss from just one of the stars is larger than the total amount of stuff falling into the black hole during the same time," Ressler said. The stars spend only around 100,000 years in this dynamic phase before transitioning into a more stable stage of life.

The incredibly strong solar winds are visible in Ressler and White's simulation of the Wolf-Rayet stars orbiting Sagittarius A*.

Using observational data, Ressler simulated the orbits of these stars over the course of about a thousand years. He then used the results as the starting point for a simulation of medium-range distances, which evolve over shorter time scales. He repeated this for a simulation down to the very edge of the event horizon, where activity takes place in matters of seconds. Rather than stitching together hard overlaps, this approach allowed Ressler to fade the results of the three simulations into one another.

"These are really the first models of the accretion at the smallest scales in [Sagittarius] A* that take into account the reality of the supply of matter coming from orbiting stars," said coauthor White.

And the technique worked splendidly. "It went beyond my expectations," Ressler remarked.

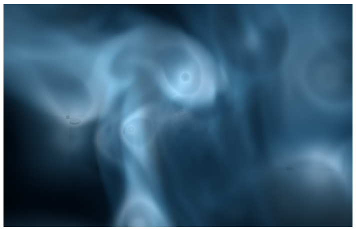
The results indicated that Sagittarius A* can become magnetically arrested. This came as a surprise to the team, since the Milky Way has a relatively quiet galactic center. Usually, magnetically arrested black holes have high-energy jets shooting particles away at relativistic speeds. But so far scientists have seen little evidence for jets around Sagittarius A*.

"The other ingredient that helps create jets is a rapidly spinning black hole," said White, "so this may be telling us something about the spin of Sagittarius A*."

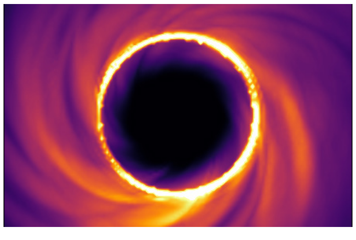
Unfortunately, black hole spin is difficult to determine. Ressler modeled Sagittarius A* as a stationary object. "We don't know anything about the spin," he said. "There's a possibility that it's actually just not spinning."

Ressler and White next plan to model a spinning back hole, which is much more challenging. It immediately introduces a host of new variables, including spin rate, direction and tilt relative to the accretion disc. They will use data from the European Southern Observatory's GRAVITY interferometer to guide these decisions.

The team used the simulations to create images that can be compared to actual observations of the black hole. Scientists at the Event Horizon Telescope collaboration — which made headlines



*The incredibly strong solar winds are visible in Ressler and White's simulation of the Wolf-Rayet stars orbiting Sagittarius A**



A simulation of light emission around Sagittarius A as gas spirals inward over the course of around 53 hours*

SEAN RESSLER AND CHRIS WHITE

in April 2019 with the first direct image of a black hole — have already reached out requesting the simulation data in order to supplement their effort to photograph Sagittarius A*.

The Event Horizon Telescope effectively takes a time average of its observations, which results in a blurry image. This was less of an issue when the observatory had their sights on Messier 87*, because it is around 1,000 times larger than Sagittarius A*, so it changes around 1,000 times more slowly.

"It's like taking a picture of a sloth versus taking a picture of a hummingbird," Ressler explained. Their current and future results should help the consortium interpret their data on our own galactic center.

Ressler's results are a big step forward in our understanding of the activity at the center of the Milky Way. "This is the first time that Sagittarius A* has been modeled over such a large range in radii in 3D simulations, and the first event horizon-scale simulations to employ direct observations of the Wolf-Rayet stars," Ressler said.

Ressler and White were supported by the Gordon and Betty Moore Foundation and the Simons Foundation.

- Harrison Tasoff, Science Writer, UC Santa Barbara Public Affairs

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Behind the Scenes

Financial Assistant Lori Staggs Makes Focusing on Science Easy at KITP

SUSIE GROVES

Lori at work in KITP's Kohn Hall

Lori Staggs, KITP's Financial Assistant, joined KITP in 2013 from the UCSB Business & Financial Services Department, where she worked for three years. Prior to that, she had worked for 34 years at Santa Barbara Bank & Trust in their commercial leasing department.

At KITP Lori handles travel and reimbursements for employees and visitors, including program and conference participants, and KITP's graduate fellows. She especially enjoys helping scientists and their families get the financial assistance they need to ensure a productive stay, maximizing their opportunity to focus on science while at KITP. She explains, "I want to make the financial process as easy as possible so they can concentrate on the real reason they're here: science."

Lori loves meeting international visitors and hearing the music of myriad foreign languages in our hallways. She has many fond memories of meeting distinguished physicists, and is proud to support KITP's mission of facilitating productive and sustained scientific collaboration.

Lori is an enthusiastic team member, and wears many hats in support of her fellow staff. She often pitches in during conferences when KITP's Conference Coordinator Claudia Gutierrez needs an extra hand, and she also helps our Visitor Services Assistant Bibi Rojas to welcome guests, distribute espresso pods, and set up afternoon cookie breaks. Lori is also in charge of our celebrated KITP barbecues at Goleta Beach, which bring together program visitors, KITP faculty, postdocs, grad fellows and staff twice a year for good food and a friendly soccer competition refereed by the whistle-blowing KITP Director.

Outside of worktime, Lori keeps busy with her extensive family, most of whom live locally. She grew up in Goleta, which is where her family landed from Minnesota when her father took a job as a UCSB police officer. "Our first home here was on Trigo Road in Isla Vista," She tells me of her childhood, "And we used to build campfires on the beach and spend the night there under the stars."

Lori attended Dos Pueblos High School, where she met Jim Staggs, her high school sweetheart and husband of 46 years. In addition to a son, two daughters, and ten grandkids, they welcomed their first great grandchild into the world this May! Lori's avocations include gardening, cooking, reading, spending time at the beach, and enjoying her grandchildren. KITP is proud to have Lori as a valued member of our team.

- Susie Groves, Assistant to the Director, KITP

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