



BERKELEY CENTER FOR  
THEORETICAL PHYSICS

A photograph of Professor Lawrence Hall, a man with a beard and brown hair, wearing a black and white striped sweater. He is standing in front of a chalkboard filled with physics equations and diagrams. He is holding a piece of chalk in his right hand and pointing towards the board. The chalkboard contains various mathematical expressions, including vector equations, matrix-like structures, and particle symbols like B and C. The overall scene is a lecture hall setting.

# *What Does It Take to Solve the Mysteries of the Universe?*

**Professor Lawrence Hall** teaches the students of Physics 233A (a.k.a. The Standard Model of Physics) about the Higgs mechanism, or how the  $W$  particles get their mass from the Higgs.

# It Takes People...

The Berkeley Center for Theoretical Physics (BCTP) was founded at the turn of the millenium with the goal of bringing together the greatest minds in theoretical physics to collaborate on some of the most pressing scientific questions about the Universe. Housed atop historical LeConte Hall on the Berkeley campus and closely affiliated with Lawrence Berkeley National Laboratory (LBNL), the BCTP is at the forefront of particle theory, string theory and cosmology. Furthering our understanding of matter, spacetime and the Universe, or more specifically quantum gravity, string theory, dark matter, neutrinos, the Higgs Boson, and the multiverse, is at the heart of the BCTP's work.

The key to progress and discovery within the BCTP is its people. At the core are the **faculty**, whose careers are distinguished by revolutionary contributions to frontier research, and by the teaching and mentoring of students. They, along with outstanding **post-doctoral fellows**, who play tremendously important roles in collaborations, both national and international, must be recruited and more importantly, retained. And **graduate students**, who find themselves joining the country's top-ranked physics graduate program, need financial support and mentoring in order to meet the rigors of this program.



*"The open interaction areas of the BCTP serve as our theoretical laboratory. In this space, our faculty, post-docs, grad students and visitors share the intensity, joy and excitement of scientific discovery. It is this interactive atmosphere that makes the BCTP so special and successful—it draws everyone in and creates the systematic opportunity for surprising discoveries."*  
~Professor Petr Horava, BCTP Director (above)





Professor Hitoshi Murayama *discusses the number-phase uncertainty principle in a class on quantum field theory.*



Professor Mina Aganagic *spends time with her graduate student, Kevin Schaeffer*



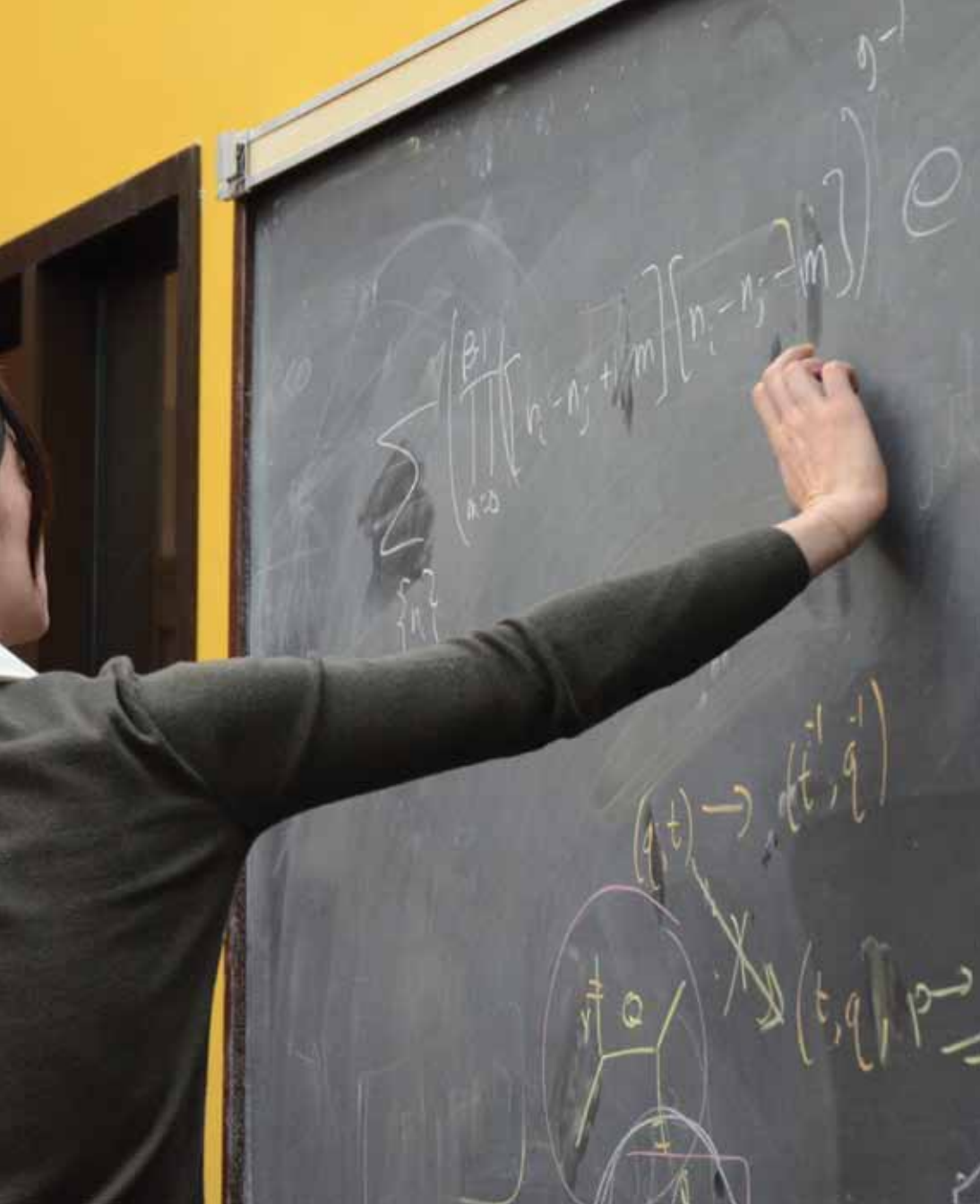
## It Takes Creativity...

Expensive equipment is for experimentalists; theorists need loads and loads of chalk (and maybe a laptop or two) both to do their work and to teach. New theories and new equations, mathematical predictions, and attempts to unify existing theories are all worked out on the blackboard—and often discussed in groups—before they find their way into a lecture or a scientific paper.

Teaching and research occur in tandem and often in front of a blackboard. Of course, graduate students learn the basics in traditional classroom settings, as well as alongside their advisors in active research. At any given time, you can walk into the BCTP and find groups of people—students and their faculty mentors, professors with other professors, students and postdocs—huddled around blackboards where they illustrate and discuss established concepts and new ideas.

**Faculty, post docs and students in the BCTP are currently working on the following cutting-edge areas of research in modern physics:**

- Cosmology and the early universe
- String theory
- Phenomenology beyond the standard model
- Probing the standard model
- Quantum field Theory
- Quantum Gravity
- Topological Strings
- Energy research



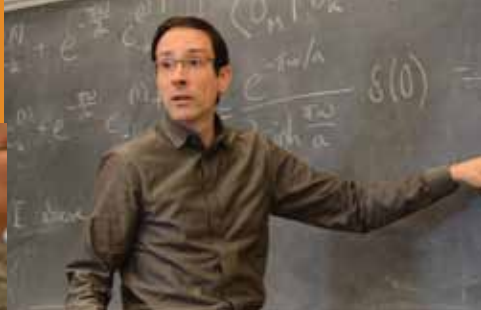
*Christian Bauer, a physicist at Lawrence Berkeley National Lab (LBNL) and a member of the BCTP, was awarded the 2011 Presidential Early Career Award for Scientist and Engineers.*



## ...& Collaboration

Our faculty, post-docs and students travel to places as distant as the Large Hadron Collider (LHC) in CERN, Switzerland, and visitors to the BCTP come from all over the world. 2011 proved to be a great year for producing data at the LHC, and our theorists are analyzing heaps of it that may prove the existence of the Higgs Boson, or get us closer to understanding dark matter. An ongoing collaboration and exchange of faculty and students exists with the Kavli Institute for the Physics and Mathematics of the Universe at the University of Tokyo where Cal Professor Hitoshi Murayama is Director.

Key to the success of the Center is the ability to bring visitors to Cal and to send both faculty and students to other institutions to participate in research. Our faculty log many, many miles in the air for good reasons—because physics is very much a team sport!



*"Post-docs and grad students help me in my work by forcing me to sharpen questions, to turn vague instincts into well-formulated problems and calculations. They surprise me with their insights and by learning a subject more deeply than I know it, they teach me things."*

~Professor Raphael Bousso



# It Takes YOU.

The University of California, Berkeley is one of the finest universities in the world, and the physics graduate program was recently ranked by the National Research Council at the very top. To maintain this stature, to retain our top-notch faculty and to attract the best and brightest students—in the face of drastically reduced state funding—we must join public funding with private philanthropy.

Funding people—and their resulting collaborations—is the priority for the Berkeley Center for Theoretical Physics. Following are a few ways to make a difference:

- **Graduate Student Fellowships.** If we want the best students, all of whom contribute immensely to the BCTP's research, at Berkeley, we must offer graduate support that is competitive with that of our private university peers. Surveys show that students opt for Cal 75% of the time, when their financial package is more or equivalent to that of their non-UC offer. We invite you to make a difference by adding to or establishing a fellowship. Named graduate fellowships can be endowed at \$500,000.

- You can contribute to the existing **Benjamin Lee and Julius Wess Fellowship in theoretical physics**. Named for two renowned theorists, this endowed fellowship helps support students in the BCTP and will do so in perpetuity.

- **Postdoctoral Fellowships.** Postdocs are hired as staff members and as such, they draw a competitive salary and benefits. It generally costs about \$100,000/year to employ a top-notch postdoc. A great deal of funding for postdocs comes from outside the University, from the National Science Foundation (NSF) for example, but private funding is playing more and more of a role in supporting these key research positions.

- **Faculty.** Attracting and keeping the outstanding professors of the BCTP is extremely important. This can be done in many different ways: private gifts for endowed chairs, endowed faculty funds and other types of faculty support help with salaries, travel, and research. Fellowships for grad students and post-doctoral fellows also help us attract and retain faculty because our professors want to be where the best students are – here at Cal!



*"UC Berkeley is one of the greatest universities in the world, and the Physics Department is one of its crown jewels. It has been both exciting and gratifying to support the BCTP from its beginning. In these challenging times, I know that I am making a difference in some of the most important research being done today."*  
~Doug Tuttle, '79

*Pictured at left are Graduate Students Michael Girard, Mark Strother, and Jaquelyn Brosamer*



PHOTO: EVENTS, INK

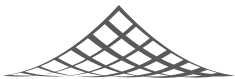
*The BCTP Tahoe Summit, hosted by supporters Doug Tuttle and Lynn Brantley, brought faculty, post-docs and grads together to present and discuss their latest research. It is now an annual event.*

If you are interested in learning more about the BCTP, its research and its funding needs, we encourage you to contact us. We thank you in advance for valuing science and education!

There are several ways to donate to the BCTP:

- Use the enclosed envelope for donations by check or credit card. Remember to make the check out to "UC Foundation."
- Go online to <http://ctp.berkeley.edu/>. On the homepage, you will find a "Donate to the BCTP" button that will take you directly to an online giving page for the BCTP.
- To establish endowments, contribute to fellowships or discuss the best ways to direct your generosity, please contact the department for guidance and ideas:

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