

Particle Theory Group

Zoltan Ligeti

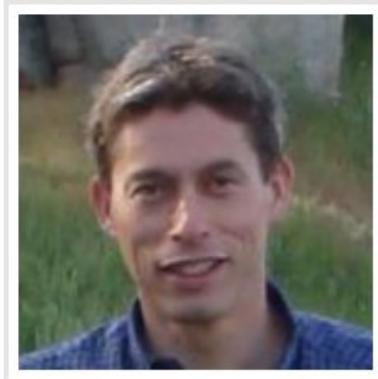
(ligeti@berkeley.edu)

March 24, 2017

Who we are



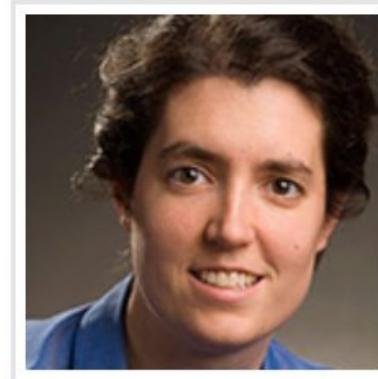
Christian Bauer



Zoltan Ligeti



Michele Papucci



Kathryn Zurek

Who we really are: BCTP



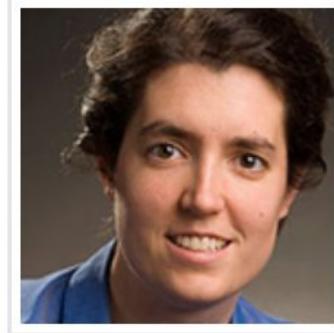
Christian Bauer



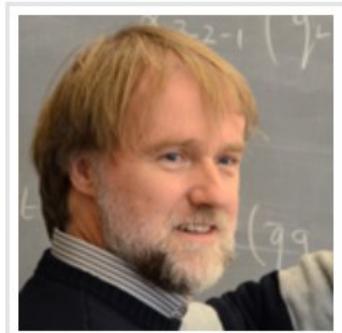
Zoltan Ligeti



Michele Papucci



Kathryn Zurek



Lawrence Hall



Hitoshi Murayama



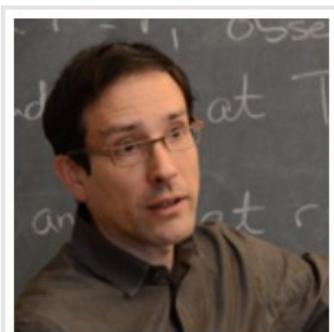
Yasunori Nomura



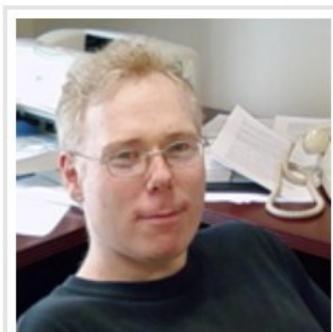
Surjeet Rajendran



Mina Aganagic



Raphael Bousso



Ori Ganor



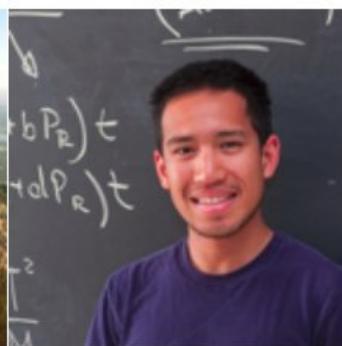
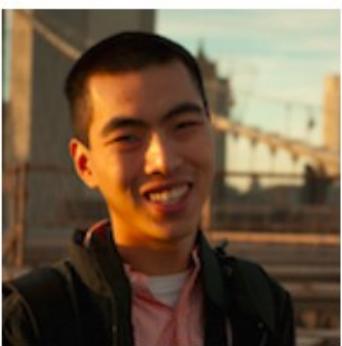
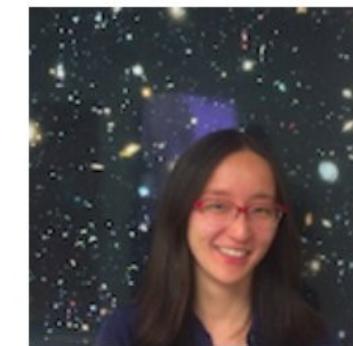
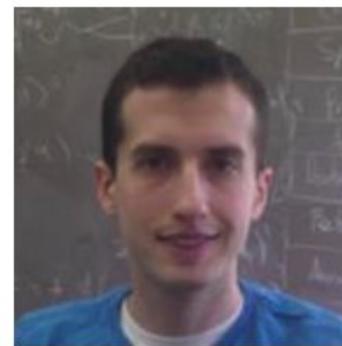
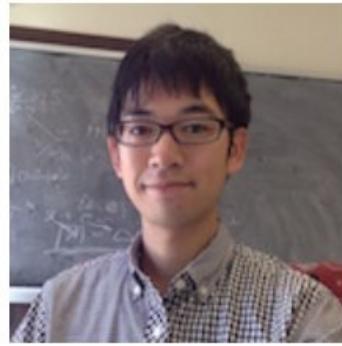
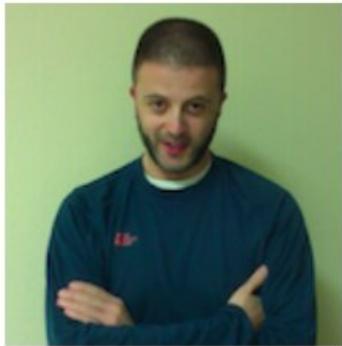
Petr Hořava

+ postdocs

+ students

+ visitors

BCTP postdocs



10 in particle theory, one of the largest & best in the country + graduate students



What we do

- Those of you who attended the BCTP open house yesterday heard a lot already...
- We are leaders in many areas of particle theory
- Our research interests evolve depending on what are the most relevant questions to address at the moment — “what’s exciting”
- Each of us has his/her own way to approach problems — Important for you to be exposed to many different ways of doing physics in a large and diverse group
- Students and postdocs are free to collaborate with anyone (encouraged!)

Some research interests (random order)



Effective field theories applied to various problems (flavor physics, jet physics, DM, cosmology, ...)

Precision calculations in the Standard Model

Flavor physics, constraints on new physics from low-energy experiments

Collider physics — both SM measurements and BSM searches

Electroweak scale BSM model building / Higgs phenomenology

Dark matter model building

Dark matter searches (both in direct detection and indirectly with particle astrophysics)

Early Universe particle cosmology

Neutrino physics

Inflationary models

BCTP particle theory

- LBNL is the National Lab with the strongest connection with a close-by University (much more so than SLAC–Stanford)
- In BCTP we operate as a single group (spend Mon/Tue on campus, Wed/Thu at LBL, seminars split between campus and LBL accordingly)
- Closeness to extensive experimental programs, many in-depth interactions (joint seminars & workshops, can ask/provide advice, ...)
- Particle theory graduate students exposed to broad spectrum of experimental research at LBL, can become important part in shaping careers
- Experimental graduate students have the whole theory group (LBL+Campus) for advice on theoretical aspects of their research (just walk down the corridor or catch someone at the espresso machine...)

Theory – experiment connections



- Logistics at LBL makes it extremely easy for theorists and experimentalists to interact on a daily basis
- Regular & informal ATLAS–Theory lunches (often with talk to trigger discussions)
- Many of us provide theoretical advice to ATLAS, dark matter detection experiments, neutrinos, flavor physics experiments, PDG
- In the past some of these resulted in direct involvement in experiments (Cahn, Hinchliffe, Murayama)

Hitoshi taking shifts in KamLAND →



My personal views...

- After Higgs discovery, situation may resemble around 1900 — we don't understand a “few” things (a lot left for you!) ⇒ may see revolutions, but no guarantees
(Michelson 1894: “... it seems probable that most of the grand underlying principles have been firmly established ...”)

Dark energy — cosmological constant?

Dark matter — vast parameter space; only interact gravitationally?

Baryon asymmetry — originates at very high scales?

Neutrino mass — Majorana or Dirac? (lepton number viol.?)

Strong CP problem — axion?

Flavor parameters and hierarchies — very high scales?

Leave no stone unturned — explore to the fullest what technologies allows

- Farther from lamp post: e.g., new LHC searches, new DM or axion param' space
Study known particles more precisely: e.g., Higgs couplings, B physics & CP viol.
- Historically, the combination of both approaches proved most fruitful
Most of us tend to work on a combination of both type of questions

If you stay with the theory group...



- We are available for discussions
 - more details of research
 - any questions you may want to ask
- Meet with theory postdocs who are in town
 - their research
 - collaborations
 - interactions with students and faculty
 - why they chose to come to LBL/UCB
 - any questions you may have

p.s.: check out one of our interaction areas with THE VIEW

Thank you, and...

Congratulations !!!