2016 SSI CONTEST

The Question

" What discovery made during the next 5 years would do the most to advance the field of high energy physics and why ?"

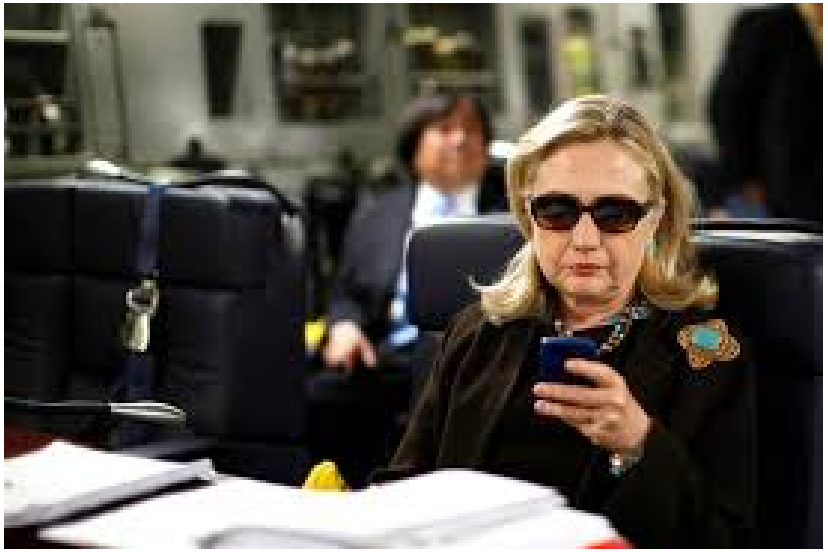
Many interesting entries…
some from non-attendees …

Sample Entries

Donald Trump

I will make HEP great again ! I will demand the discovery of new physics beyond the Standard Model & make CERN pay for it. I will bring back the 750 GeV di-photon resonance, I will build Domain Walls & I am the only one who can do this!

Sample Entries



Hillary Clinton

The discovery of Dark Matter is presently our greatest challenge as searches have so far failed & we need to look everywhere possible. I will check my email servers for any hints of Dark Matter hiding there.

Allison Reinsvold Hall

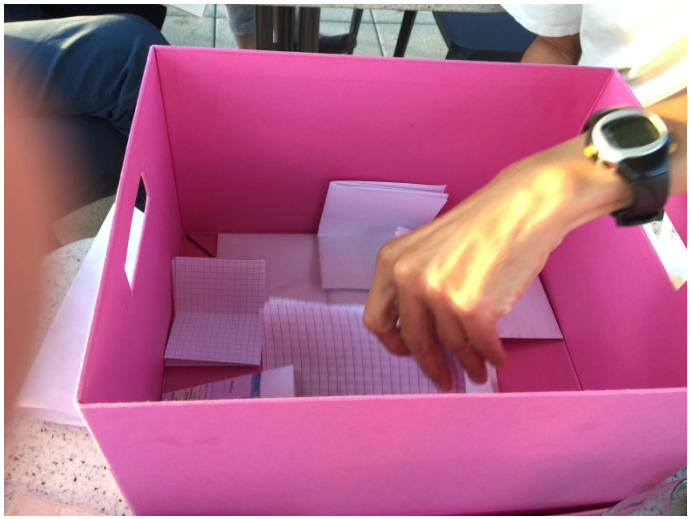
SSI 2016

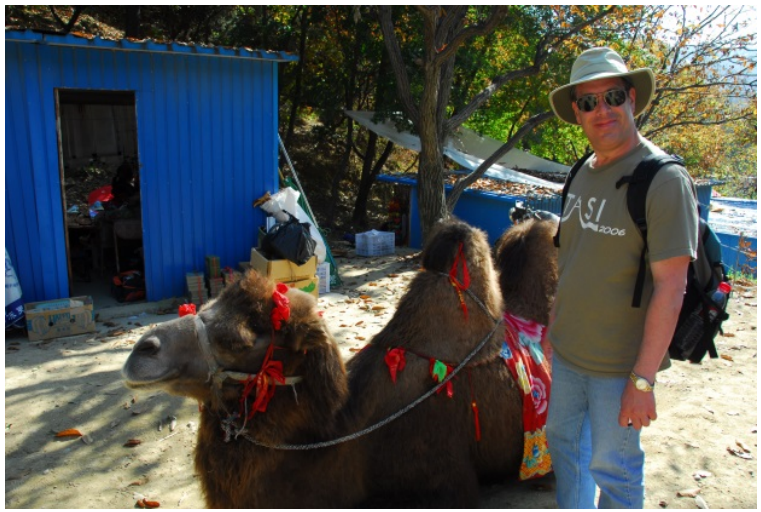
Sample Entries

The discovery that would most advance particle physics during the next five years is . . .

A letter from the Illuminati, disclosing the location of 50 billion dollars to be entrusted to the five greatest particle physicists in the world, as determined by a Hunger Games style battle of the minds, where scientists must use their moral compasses, leadership skills, physical insight, and technical knowledge to avoid elimination.

A Panel of Distinguished Experts





Honorable Mentions

Christian Weber

What discovery made during the next 5 years would do the most to advance the field of high energy physics and why ?

Anything that makes the next big collider much cheaper.

Weather we make a new discovery at the LHC within the next 5 years or not, we will want a more powerful collider. Be that a lepton collider to measure Higgs Couplings to increased precision, a hadron collider to search for particles at ten-times the LHC energy. Even if we discover evidence of new physics at the LHC or HL-LHC, we will want to follow up with an improved machine to fully understand this new sector.
This physics discovery might happen within proposed time-frame, but we will begin entering the phase of diminishing returns in terms of integrated luminosity for the current LHC energies within the near future.
As such i don't see the biggest possible advancement to the field in a physics discovery - as desirable as it might be - but in anything that will make the next big particle collider much cheaper to build and operate.
Specifically two variations on that theme come to mind
Discovery of a new type of high temperature super conductor with properties that make it cheap, able to carry very large currents at high field strengths with relaxed cooling requirements, and make it easy to incorporate it into an accelerator grade magnet. And secondly a technology of accelerating particles orders of magnitude quicker than currently used rf-cavities.

The Contest Question
by Huan-Hang Chi
@ SLAC

Anything related to Gravity, say

① graviton, either the massless one or the excited massive KK states, something like the TSO GeV stuff.

② Renormalizable theory of quantum gravity found, not string theory;

③ extra dimensions discovered, from small-scale inverse-law experiment or unexpected missing energy in Colliders;

④ using quantum gravity to cure the Naturalness problem;

⑤ deeper understanding of dark energy, in terms of quantum gravity.

The Winner !

DAVID GERICK
Heidelberg University

"What discovery made during the next 5 years would do the most to advance the field of high energy physics and why?"

The discovery of one or more particles with spin greater 2. This would shake up the fundamental structure of particle physics as we now it today, since particles with spin greater than 2 are not implementable in QFT. Therefore, theories like string theory or Regge theory would open the gates for even higher spin configurations and with it many new possible particle discoveries that could explain DM, for example.

2016 SSI Projects

6 Teams on 6 Projects

→ 17:45 **Projects: Project Presentations** — Kavli Auditorium

Project list | Project teams

14:45 **Team 3: Vector-Like Quarks** — 20m

Speaker: Harikrishnan Ramani (Yang Institute Of Theoretical Physics)

15:10 **team 4: 3.5 TeV Z'** — 20m

Speaker: Allison Reinsvold Hall (University of Notre Dame (US))

15:35 **team 6: Type-I See-Saw Model** — 20m

Speakers: Kyle James Read Cormier (University of Toronto (CA)), Yu Heng Lin (National Tsing Hua University), Zihao Yu (Univ. Illinois at Urbana-Champaign (US))

15:55 **Afternoon Break** — 20m

16:15 **Team 12: Beam Telescope** — 20m

Speakers: Lingxin Meng (University of Liverpool/Universite de Geneve), Natascha Savic (Max-Planck-Institut fur Physik (DE))

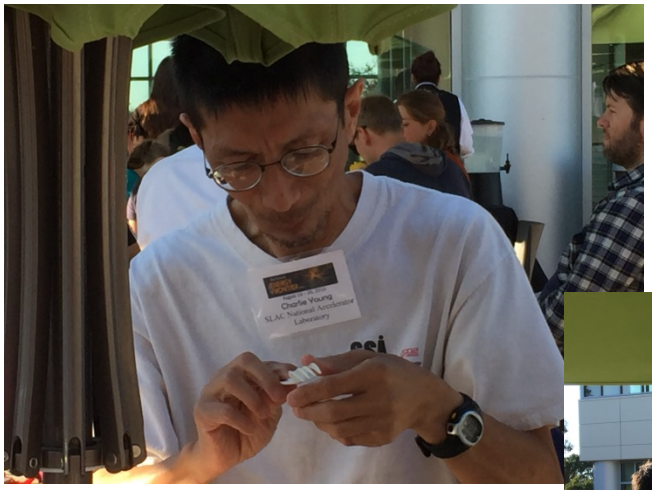
16:40 **Team 14: High Resolution Timing Detector** — 20m

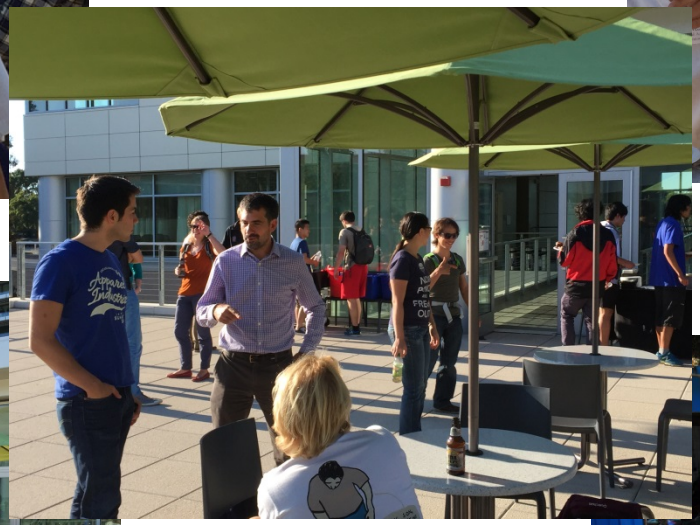
Speakers: David Gerick (Ruprecht-Karls-Universitaet Heidelberg (DE)), Gabriele Sabato (Nikhef National Institute for subatomic physics (NL)), Jacco Andreas De Vries (Nikhef National Institute for subatomic physics (NL)), Laurent Dufour (Nikhef National Institute for subatomic physics (NL))

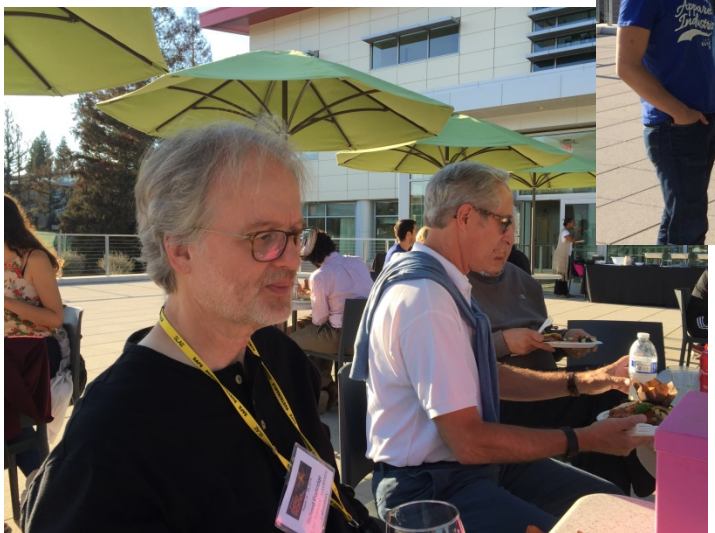
17:05 **Team 15: Jets and Machine Learning** — 20m

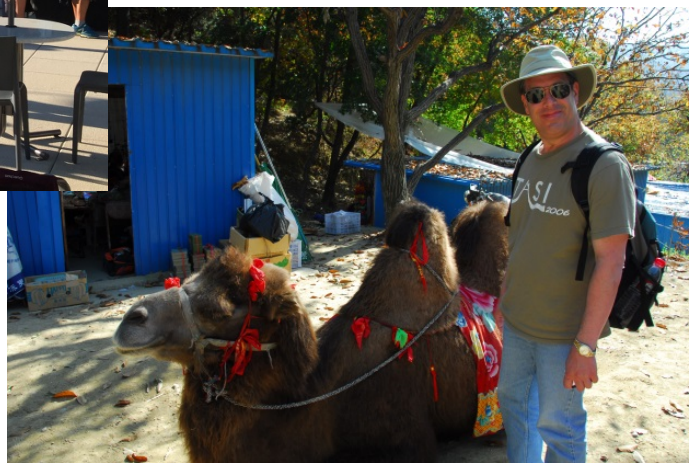
Speaker: Johan Sebastian Bonilla (University of Oregon (US))

The Panel of Distinguished Experts Called Back into Service…









Much Work Was Done & Interesting Ideas Were Presented…

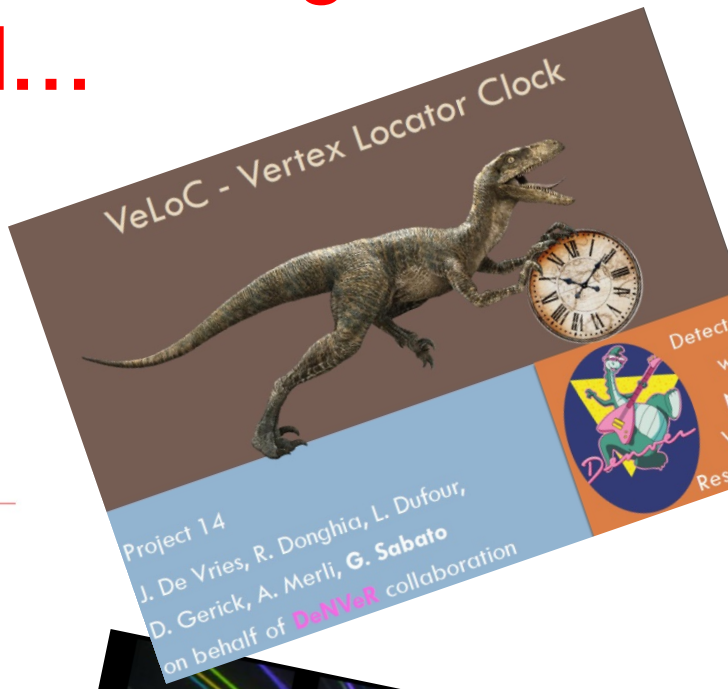
Type-I See-Saw Neutrino
at the Energy Frontier
SSI 2016

Optimization of Telescope planes spacing

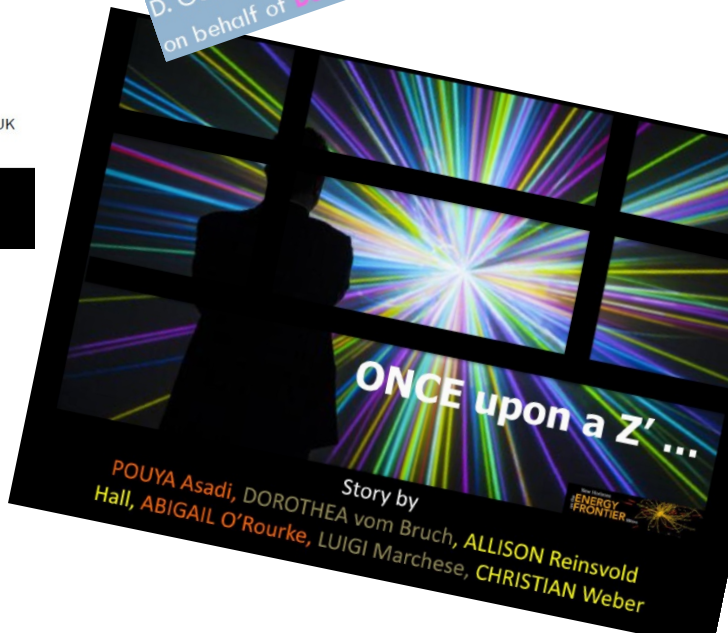
to achieve best sensor spatial resolution

M. Braziskas[1], E. Brianne[2], A. Ducourthial[3], M. Gabriel [4], S. Kohani [5], L. Meng [6], N. Savic [4]

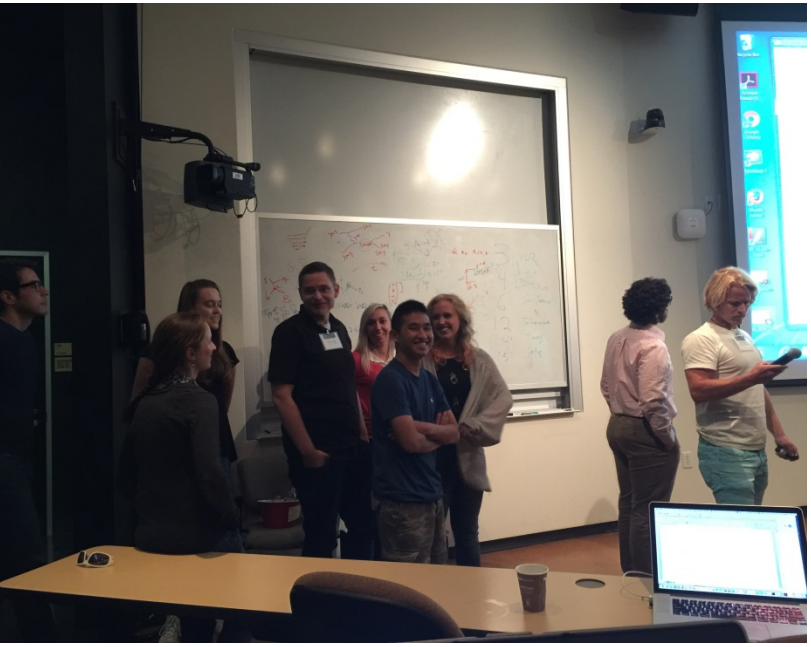
1 CSU Fresno, Fresno, USA
2 DESY, Hamburg, Germany
3 Laboratoire de Physique Nucleaire et de Hautes Energies (LPNHE), Paris, France
4 Max Planck Institute for Physics (MPI), Munich, Germany
5 New York University (NYU), New York, USA
6 University of Geneva (UNIGE), Geneva, Switzerland/University of Liverpool (UoL), Liverpool, UK



ector Like Quarks
and
where to find them
A case study by …
ennedy (UCR)
eter (Stanford)
L. Li (UCD)
J. Vasquez (Yale)
H. Ramani (YITP)
H. Xiao (Tsinghua)
Presentation at the SLAC Summer Institute 2016
SSI



The Winner !



Jets
&
Machine
Learning

SSI 2016 Student Project

Johan Bonilla, Chen-Hsun Chan, Nicole Hartman, Michela Paganini,
Juska Pekkanen, Heather Russell, David Sosa, Savannah Thais, Markus Zinser