

Second International Conference on  
Technology and Instrumentation in Particle Physics  
June 9-14, 2011

# TIPP 2011

Closing Remarks  
Ted Liu (FNAL)



## Something written by Bill Foster in late 90s

### Commissioning Manpower Issues:

For years we've promoted the talkers,  
The PAW-pounding wizards and gawkers,  
But the true worthy man,  
When the parts hit the fan,  
Are glitch hunters and problem stalkers.

Later this was on the back of a CDF trigger board





# Closing Remarks

- What is this conference really about ?

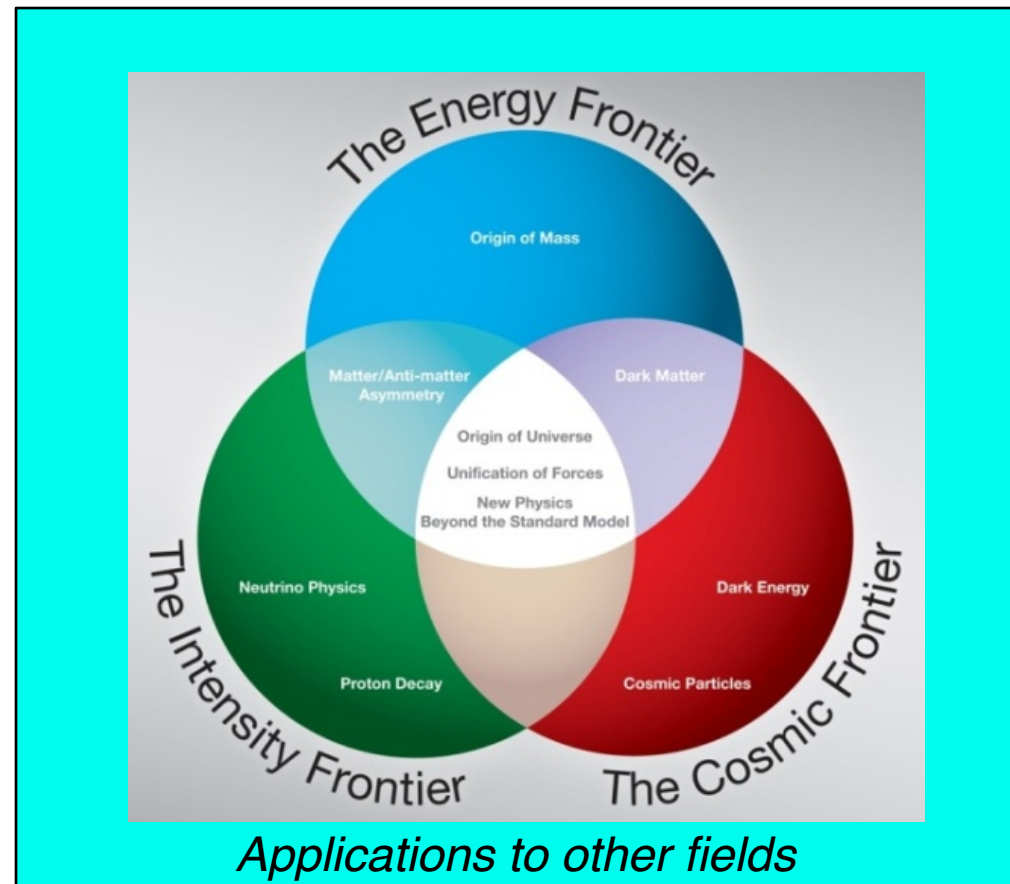
## A story from graduate school days

- Long ago, a young theoretical physicist (later famous) had real trouble finding a girlfriend for a *LONG* time. Very frustrated, he went to Hans Bethe for advice
- Hans listened carefully to his complaints, then said (with his strong German accent):

*Young man, if the cross section is sooooo low,  
increase the luminosity !*



*For the experimentalists,  
we have a similar problem...*



This conference is about what people would do under the influence of passion:

# Our approach for soliciting abstracts/talks for TIPP 2011

- The conference is not about beauty-contest type of talks
- Talks should start with science motivations, then
  - ↘ focus on the challenges
  - ↘ how the experiment overcame the challenges
  - ↘ experiences in designing & building, lessons learned
  - ↘ in particular, what challenges still struggling to overcome
  - ↘ and focus on ideas on how to break the barriers (*innovation*)
- More about confession than beauty-contest

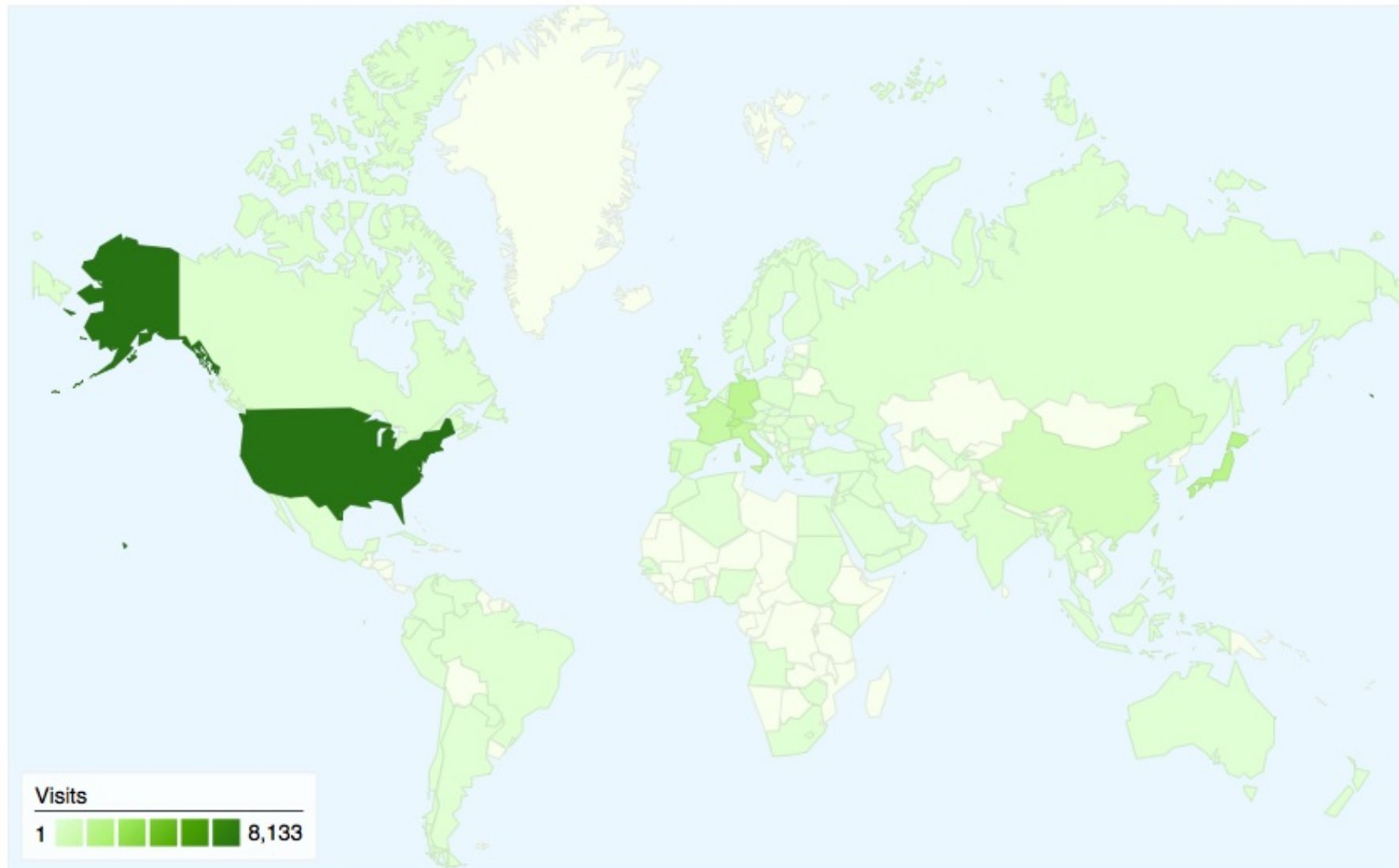
People seem to like this approach ...

TIPP 2011 received 450 abstracts:  
350 oral presentations, 80 posters



# TIPP 2011 website visits from the world

Dec 20, 2010 - Jun 7, 2011  
Comparing to: Site



19,694 visits came from 96 countries/territories

# TIPP 2011 site visits vs countries/territories

## Dec. 20, 2010 to Jun 6, 2011

|                    |              |                  |           |
|--------------------|--------------|------------------|-----------|
| 1. United States   | <b>8,042</b> | 22. Greece       | <b>61</b> |
| 2. Switzerland     | <b>1,746</b> | 23. Ukraine      | <b>48</b> |
| 3. Japan           | <b>1,718</b> | 24. Belgium      | <b>43</b> |
| 4. Germany         | <b>1,521</b> | 25. Mexico       | <b>41</b> |
| 5. Italy           | <b>1,231</b> | 26. Norway       | <b>38</b> |
| 6. France          | <b>1,096</b> | 27. Turkey       | <b>32</b> |
| 7. United Kingdom  | <b>819</b>   | 28. Iran         | <b>30</b> |
| 8. China           | <b>567</b>   | 29. Slovenia     | <b>30</b> |
| 9. Portugal        | <b>526</b>   | 30. Philippines  | <b>30</b> |
| 10. Spain          | <b>289</b>   | 31. Brazil       | <b>27</b> |
| 11. Canada         | <b>170</b>   | 32. Pakistan     | <b>25</b> |
| 12. India          | <b>155</b>   | 33. Bangladesh   | <b>23</b> |
| 13. South Korea    | <b>148</b>   | 34. Taiwan       | <b>20</b> |
| 14. Netherlands    | <b>107</b>   | 35. Australia    | <b>19</b> |
| 15. Russia         | <b>106</b>   | 36. (not set)    | <b>18</b> |
| 16. Poland         | <b>103</b>   | 37. South Africa | <b>16</b> |
| 17. Czech Republic | <b>101</b>   | 38. Argentina    | <b>16</b> |
| 18. Austria        | <b>96</b>    | 39. Saudi Arabia | <b>13</b> |
| 19. Finland        | <b>71</b>    | 40. Nigeria      | <b>13</b> |
| 20. Romania        | <b>69</b>    | 41. Israel       | <b>12</b> |
| 21. Sweden         | <b>64</b>    | 42. Hungary      | <b>11</b> |
|                    |              | 43. Singapore    | <b>11</b> |
|                    |              | 44. Hong Kong    | <b>10</b> |
|                    |              | 45. Egypt        | <b>9</b>  |
|                    |              | 46. Armenia      | <b>7</b>  |
|                    |              | 47. Indonesia    | <b>6</b>  |



# Planning for the parallel sessions:

The challenge with 350 oral presentations: 9 parallel sessions running at the same time (max capacity reached)

| Session                              | Chicago Ballroom 8 (Max 175: class+theater) | Chicago Ballroom 9 (Max 175) | Chicago Ballroom 10 (175) | Ontario (~110 theater) |
|--------------------------------------|---|------------------------------|---------------------------|------------------------|
| Thu 9 <sup>th</sup> / 14:00 – 15:30  | Other Colliders Overview                    | Astrophysics and Space       | Semiconductor             | Calorimetry Overview   |
| Thu 9 <sup>th</sup> / 16:00 – 18:00  | LHC Overview                                | Astrophysics and Space       | Semiconductor             | Calorimetry            |
| Fri 10 <sup>th</sup> / 14:00 – 15:30 | Exp. Det. System I (short talks)            | Semiconductor                | Dark Matter               | Gaseous Detectors      |
| Fri 10 <sup>th</sup> / 16:00 – 17:30 | Silicon lecture to 7pm                      | Photons                      | Dark Matter Overview      | Calorimetry            |
| Sat 11 <sup>th</sup> / 8:30 – 10:30  | Silicon & pixel Overview                    | Photons                      | Astrophysics and Space    | Calorimetry            |
| Sat 11 <sup>th</sup> / 11:00 – 12:30 | Astrophysics Overview (extended to 1pm)     | Photons                      | Semiconductor             | Calorimetry            |
| Sat 11 <sup>th</sup> / 14:00 – 15:30 | Future Colliders Overview (extended to 4pm) | Photons                      | Semiconductor             | Calorimetry            |
| Sat 11 <sup>th</sup> / 16:00 – 18:00 | Exp. Det. Syst. II (short talks)            | Photons                      | Semiconductor             | Calorimetry            |
| Mon 13 <sup>th</sup> / 14:00 – 16:00 | Exp. Det. Syst. III (short talks)           | Photons                      | Semiconductor             | Astrophysics and Space |

| Erie (~130 theater)        | Mayfair (~100 theater) | Superior A (~100)       | Huron (~90 theater)               | Superior B (~100 theater)         |
|----------------------------|------------------------|-------------------------|-----------------------------------|-----------------------------------|
| Gaseous Detectors          | Trigger and DAQ        | Detectors for Neutrinos | Instr. for Medical, Biological... | MDI and Beam Instr.               |
| Front-End Electronics      | Trigger and DAQ        | Detectors for Neutrinos | Instr. for Medical, Biological... | Particle ID                       |
| Front-End Electronics      | Trigger and DAQ        | Neutrinos Overview      | MDI and Beam Instr.               | Instr. for Medical, Biological... |
| Front-End Electronics      | Trigger and DAQ        | Neutrino lecture to 7pm | MDI and Beam Instr.               | Instr. for Medical, Biological... |
| Front-End Electronics      | Trigger and DAQ        | Detectors for Neutrinos | MDI and Beam Instr.               | Gaseous Detectors                 |
| Particle ID                | Trigger and DAQ        | Detectors for Neutrinos | MDI and Beam Instr.               | Gaseous Detectors                 |
| Front-End Electronics      | Trigger and DAQ        | Detectors for Neutrinos | MDI and Beam Instr.               | Dark Matter                       |
| Electronics lecture to 7pm | Trigger and DAQ        | Detectors for Neutrinos | Gaseous Detectors                 | Dark Matter                       |
| Gaseous Detectors          | Trigger and DAQ        | Detectors for Neutrinos | MDI and Beam Instr.               | Dark Matter                       |

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## Overall Program

Silvia Amerio, INFN (Scientific Secretary)

Marcel Demarteau, Argonne National Laboratory (Co-Chair)

Ted Liu, Fermi National Accelerator Laboratory (Co-Chair)

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## Local Organizing Committee (USA)

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Nancy LaRue (Argonne)

Ronald Lipton (Fermilab)

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Cynthia Sazama (Fermilab)

Constance Vanni (Argonne)

Bob Wagner (Argonne)

Suzanne Weber (Fermilab)

Manfred Wendt (Fermilab)

Peter Wilson (Fermilab)

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Ko Nishikawa (KEK, Japan)

David Nygren (LBNL, USA)

Veljko Radeka (BNL, USA)

Yifang Wang (IHEP, China)

# TIPP 2011 Track Conveners

- Experimental Detector Systems (Cattai, Ariella & Haba, Junji)  TIPP 2009 chair
- Calorimetry (Repond, Jose & Takeshita, Tohru)
- Gaseous Detectors (Colas, Paul & Kobayashi, Makoto)
- Particle Identification (Iijima, Toru)
- Photon Detectors (Mirzoyan, Razmik & Nakaya, Tsuyoshi)
- Semiconductor Detectors (Collins, Paula & Riedler, Petra)
- Dark Matter Detectors (Hall, Jeter & Hoffman, Kara)
- Detector for Neutrino Physics (Ereditato, Antonio & Soderberg, Mitchell)
- Astrophysics and Space Instr. (Kusaka, Akito & Siegmund, Oswald)
- Instr. Medical, Biological/Materials (Chen, Chin-Tu & Weilhammer, Peter)
- Front-End Electronics (Arai, Yasuo & Walder, Jean Pierre)
- Trigger&DAQ (Paoletti, Riccardo & Wickens, Fred)
- MDI & BI (Wendt, Manfred & Burrows, Philips)



## The art of conference/party planning





# TIPP 2011 Local Student Team (The little "Red Army") ---- scientific secretary assistants



The captain  
Michelle Prewitt



Scientific secretary Silvia Amerio & her husband







## ***TIPP 2011 Plenary Speakers (Preliminary Schedule)***

*Thursday (June 9<sup>th</sup>):*

*08:30 – 09:00: Opening Speech (Marcel Demarteau, ANL)*

*09:00 – 09:45: Keynote Speech (Bill Brinkman, DOE Office of Science)*

*09:45 – 10:30: Extremes of Electronics (Kerry Bernstein, IBM)*

*11:00 – 11:45: LHC Detectors:Marvels of Technology (Sergio Bertolucci,CERN)*

*11:45 – 12:30: Detectors for Cosmology (John Carlstrom, UChicago)*

*Friday (June 10<sup>th</sup>):*

*08:30 – 09:15: Neutrino Physics and Detectors (Yifang Wang, IHEP)*

*09:15 – 10:00: Direct Dark Matter and Detectors (Prisca Cushman, Minnesota)*

*10:30 – 11:15: Indirect Dark Matter and Detectors (Jim Buckley,Washington)*

*11:15 – 12:00: Rare Decay Experiments (Yoshi Kuno, Osaka)*

*Monday (June 13<sup>th</sup>):*

*08:30 – 09:15: Detectors for Nuclear Physics (Susumu Shimoura, Tokyo)*

*09:15 – 10:00: Double Beta Decay (Andrea Pocar, UMass)*

*10:30 – 11:15: Gravitational Wave Detection (Sam Waldman, MIT)*

*11:15 – 12:00: Synchrotron / X- Ray Applications (Klaus Attenkofer, ANL)*

*Tuesday (June 14<sup>th</sup>):*

*08:30 – 09:15: Detectors for Future Colliders (Hitoshi Yamamoto, Tohoku)*

*09:15 – 10:00: DAQ and Triggering (Wesley Smith, Wisconsin)*

*10:30 – 11:15: Applications outside of HE (Patrick LeDu, CEA Saclay)*

*11:15 – 12:00: Special Speech:*

*Applications of Analog Circuit Design to Life as a Scientist in the  
United States Congress*

*By G. William (Bill) Foster, fmr. Rep. U.S. Congress – (IL-14)*

*12:00 – 12:30: Closing Speech (Ted Liu, Fermilab)*





## Plenary sessions

# Outline

UHE Cosmic Rays: Ultimate messengers from the highest-energy Univers  
- Extreme experimental challenges! Pitiful rates...

## Question:

- What are the messengers?
- What are the sources?
- Acceleration? Maximum energy?
- Highest-energy physics?
- Each presents a unique set of challenges...

## Observables:

- Composition ( $Z_e$ ,  $\nu$ ,  $\gamma$ )
- Arrival directions
- Energy spectrum
- Air shower properties

Current (recent) experiments

- (AGASA), (HiRes), Telescope Array
- Auger

Results: disagreements, surprises

Future prospects

2



it is at this point in time that we came up with the idea to use VLSI technology to solve the pattern recognition problem and reconstruct tracks in the detector in a very short time

October 1988: paper, pencil, eraser...



The EDRO board connected to the Associative Memory: a "Baby" FastTracker processor for the ATLAS experiment

A. Annovi, M. Beretta, V. Bevacqua, F. Cervigni, E. Crescioli, L. Fabbri, P. Giannetti, F. Giorgi, D. Magalotti, A. Negri, M. Piendibene, C. Sbarra, C. Roda, M. Villa, R.A. Vitillo, G. Volpi



### Pile-up at LHC/HL-SLHC

$10^{33} \text{ cm}^{-2} \text{ s}^{-1}$   
(now)

$10^{35} \text{ cm}^{-2} \text{ s}^{-1}$   
(2x HL\_LHC)

2<sup>nd</sup> International conference on Technology & Instrumentation in Particle Physics

## TIPP 2011

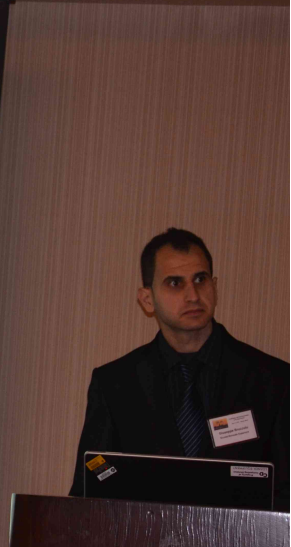
June 9-14, 2011 Chicago, IL

### Design & Studies of $\mu$ -strip stacked module prototypes for tracking at S-LHC

Giuseppe Broccolo<sup>(1,2)</sup>, Jacopo Bernardini<sup>(1,2)</sup>, Roberto Dell'Orso<sup>(1)</sup>, Francesco Fiori<sup>(1,2)</sup>, Alberto Messineo<sup>(1,2)</sup>, Fabrizio Palla<sup>(1)</sup>, Piero Giorgio Verdinì<sup>(1)</sup>

SCUOLA NORMALE SUPERIORE PISA UNIVERSITÀ DI PISA INFN<sup>(1)</sup>, Scuola Normale Superiore<sup>(2)</sup>, University<sup>(3)</sup> of Pisa INFN Istituto Nazionale di Fisica Nucleare

on the behalf of the CMS collaboration at CERN



### Pattern recognition for tracking is naturally a task in 3D

road

track

Each Vertical Column: All the circuitry necessary to detect one road.

Goal: For a 3-dimensional detector, find the intersection of the detector layers.



## Parallel sessions



The Pursuit of  
**Ultimate  
Performance**

JADE<sup>DESY</sup>  
TRISTAN<sup>KEK</sup>  
OPAL/LEP<sup>CERN</sup>  
ZEUS<sup>DESY</sup>  
KTeV<sup>FNAL/KEK</sup>  
CDF upgrade<sup>FNAL</sup>  
KLOE INFN FRASCATI  
HERA-B<sup>DESY</sup>  
B-FACTORY<sup>KEK</sup>  
LHC<sup>CERN</sup>

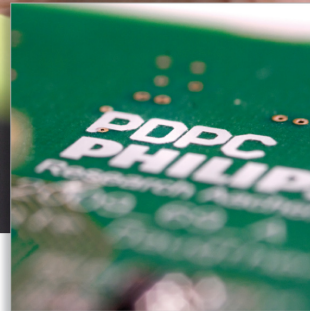
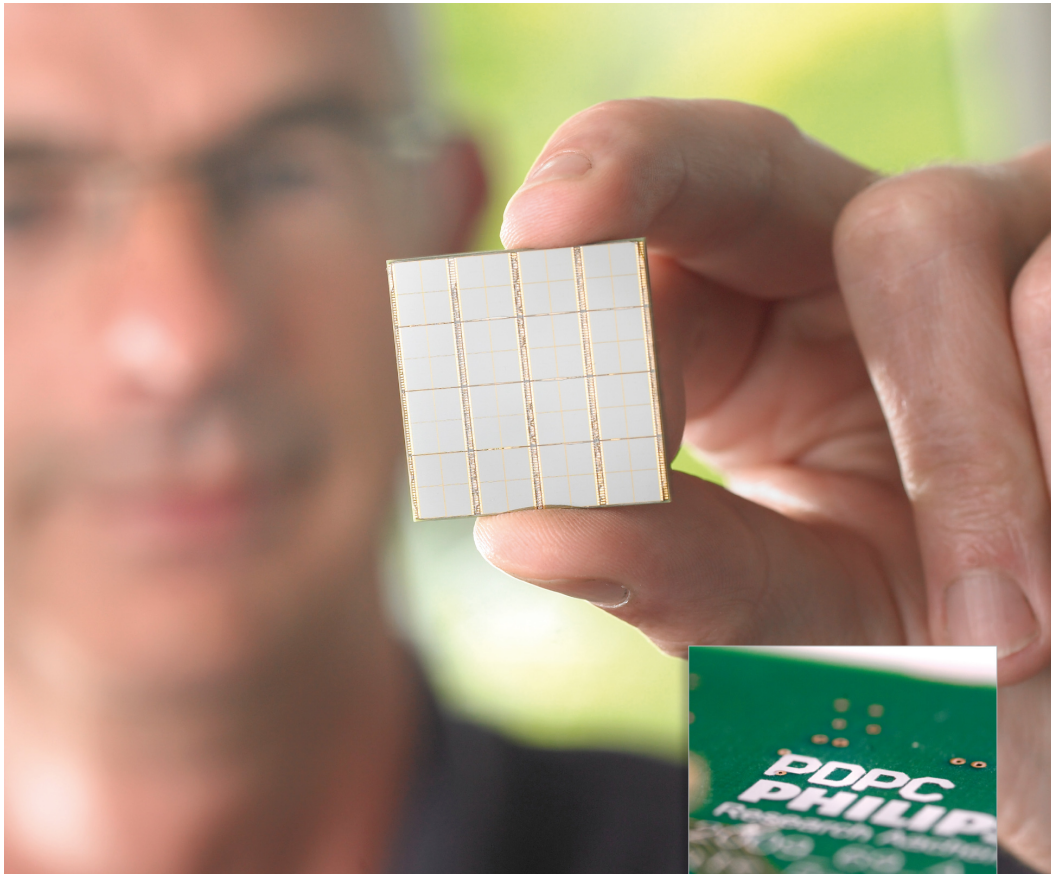
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We will present our digital silicon photomultiplier technology and its specific application benefits in our talk

## Photon Counting with arrays of fully digital SiPMs – performance data, applications and comparison to analogue SiPM's

by Dr. York Haemisch on June 10th, 04:00 p.m.

You are invited to further discuss with us the opportunities of this breakthrough technology at our booth in the industrial exhibition area.

[www.philips.com/digitalphotoncounting](http://www.philips.com/digitalphotoncounting)

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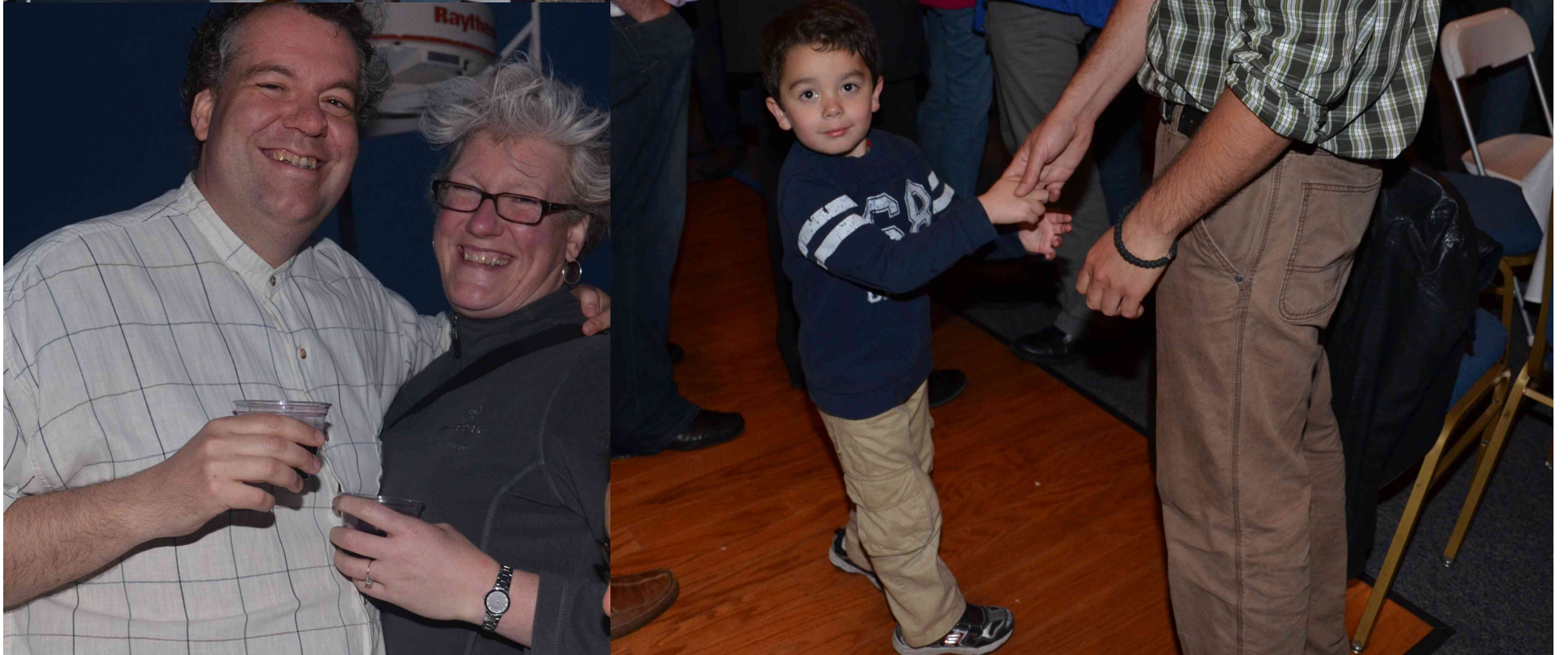
## Digital Photon Counting of Chicago on the dinner cruise























# Closer collaboration with industry will become ever more important in the future

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## Gold Sponsor Exhibitors

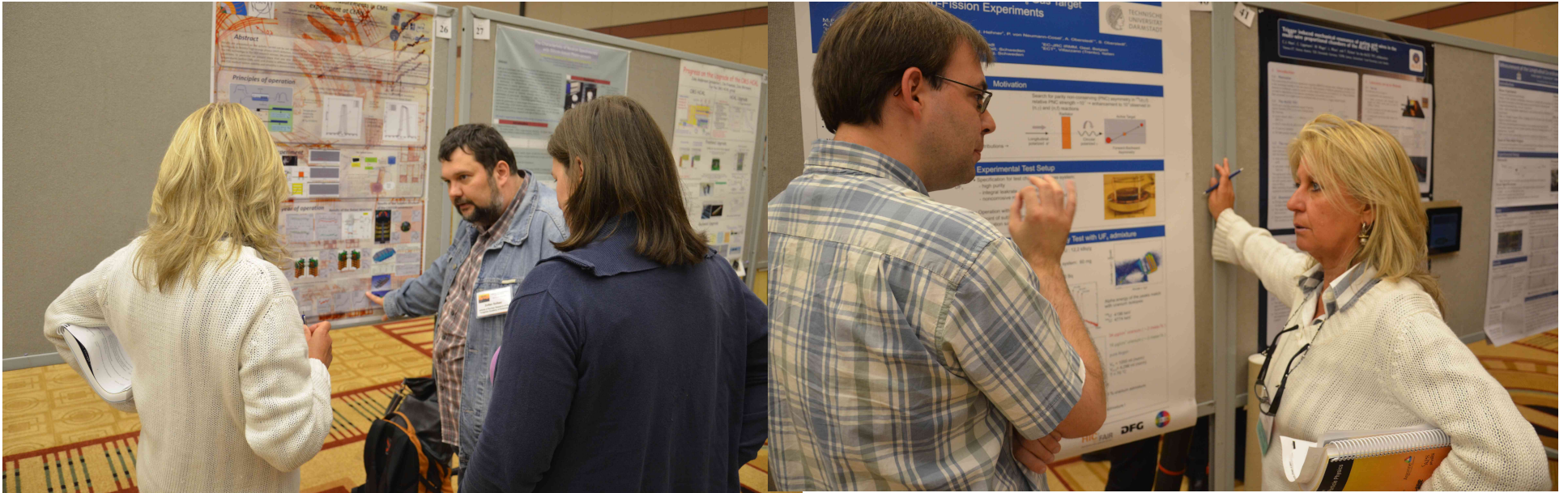
**HAMAMATSU** **PHILIPS**

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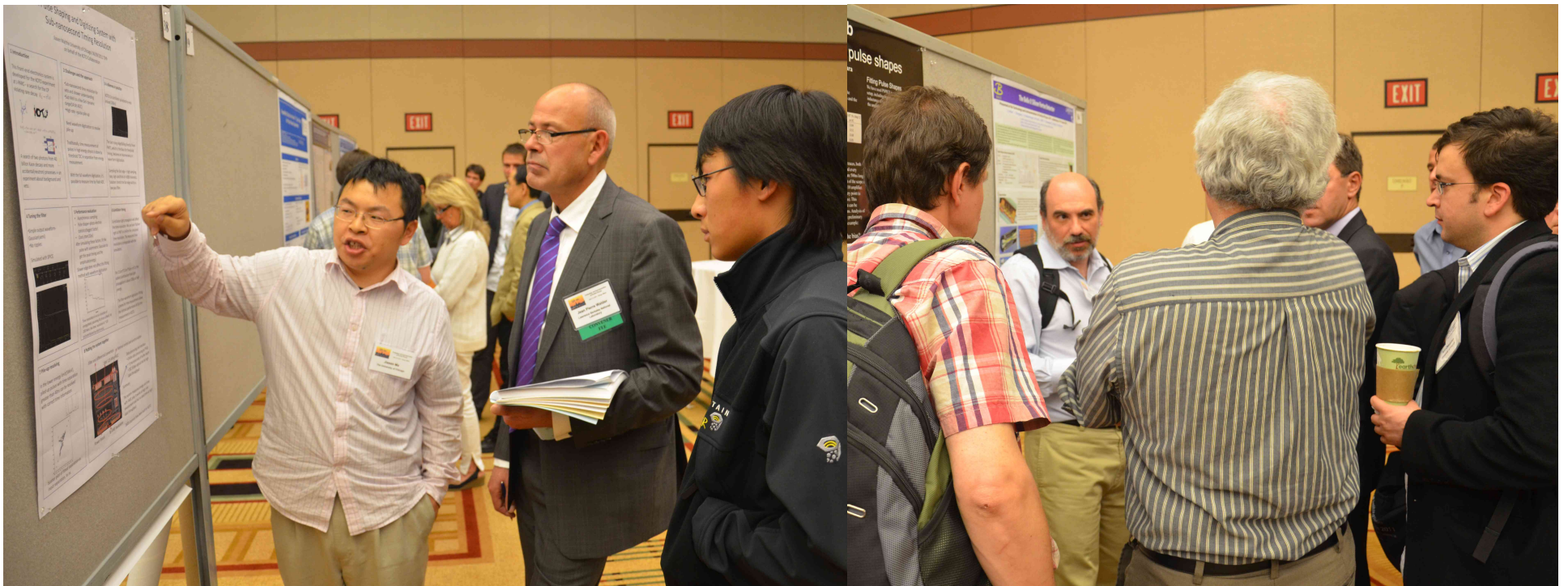
## Standard Sponsor Exhibitors







## Poster Sessions







# Best Poster Awards

- ID 65: “Readout ASIC and electronics for the 144ch HAPD for Aerogel RICH at Belle 2” (Shohei Nishida, KEK)
- ID177: “Verification of focusing system for Time Of Propagation counter” (Yoshinori Arita, Nagoya University)
- ID 267: “Trigger Induced mechanical resonance of gating wires in the multi-wire proportional chambers of the ALICE-TPC” (Christian Lippmann, GSI)



## TIPP 2011 proceedings will be published in Physics Procedia - Elsevier



- Dedicated online issue on ScienceDirect, freely available worldwide.
- Deadlines:
  - Paper/manuscript submission by **Sept. 15<sup>th</sup>, 2011**
  - **No exception to this: no paper will be accepted after this!**
  - Proceedings ready for publication by Jan. 15<sup>th</sup>, 2012
- Page limits (for up to ~ 440 papers):
  - 10 pages: plenary talks, overview parallel talks (30 mins)
  - 8 pages: standard parallel talks (20 mins) + 3 Best Posters
  - 6 pages: posters
- Templates available on Physics Procedia web site
  - They receive the final PDF version of all papers/preface etc
  - Crucial for ALL authors to follow/use the official templates



## This afternoon: Satellite meeting on 3D technology

| 6/14/2011 2pm | Speaker Name                     | Presentation Title  |
|---------------|----------------------------------|---|
| 2pm-2.25pm    | Paul Franzon, NCSU, USA          | Flavors of the 3D-IC technology and where it is applicable                |
| 2.25pm-2.50pm | Hans Gunther Moser, MPI, Germany | 3D technology developments in Europe and European Union supported efforts |
| 2.50pm-3.15pm | Masahiro Aoyagi, AIST, Japan     | Japanese 3D status  |
| 3.15pm-3.30pm | Ray Yarema, FNAL, USA            | TSV revolution and Fermilab's MPW experience                              |
| 3.30pm-3.45pm | INFN, IN2P3, DoE                 | testimonial/application talks   |
| 3.45pm-4.25pm | Q&A + panel discussion + coffee  |   |
| 4.25pm-4.50pm | Yasuo Arai, KEK, Japan           | SOI technology for monolithic and 3D integrated detectors                 |
| 4.50pm-5.15pm | Craig Keast, MIT-LL, USA         | 3D-IC enabler of advanced focal planes                                    |
| 5.15pm-5.40pm | Bob Patti, Tezzaron, USA         | 3D-IC for real chips and prospectives                                     |
| 5.40pm-5.55pm | Zvi Or-Bach, MonolithIC 3D       | The Monolithic 3D-IC  |
| 5.55pm-6.20   | Q&A + panel discussion + tea     |   |
| 6.20pm-6.30pm | 3D-IC workshop conclusions       |   |
|               |                                  |   |

# Steve Chu on *innovation*

- Innovation adds immensely to the wealth of society
- At the heart of Innovation is research and development
- And at the heart of that is science
  - *TIPP is at the heart of basic science*
  - *We have an excellent story to tell, as we have done this week!*
  - **“The sole end of science is the honor of human mind” – Carl Jacobi**

## The next TIPP ?

The next TIPP will be in 2014. C11 (the Commission of Particle and Fields) is looking for proposals from European sites, and make a site selection at the C11 meeting in Mumbai on Aug. 21, 2011. Note that TIPP will be on a 3 year cycle after TIPP 2011, this means that it will be in Asia again in 2017...



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Technology and Instrumentation in Particle Physics  
June 9-14, 2011

Have a nice trip home,  
See you at next TIPP!



Sheraton Chicago Hotel and Towers, Chicago, IL