Universities meet Laboratories

at the

US Particle Accelerator School

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Partnership in education is essential

Three principal partnership options

1. Regional university partnerships
   a) John Adams Institute, Cockcroft Institute, Scottish University Programs in Accelerators
   b) Center for Bright Beams & GEAR
2. Regional Accelerator Schools
   a) The U.S. Particle Accelerator School
   b) The CERN Accelerator School
   c) Newer schools: Korea, Mexico, Scandinavia
3. Hybrid programs
   a) USPAS degree programs, JUAS in Europe

Option 1: Regional university partnerships
Center for Bright Beams

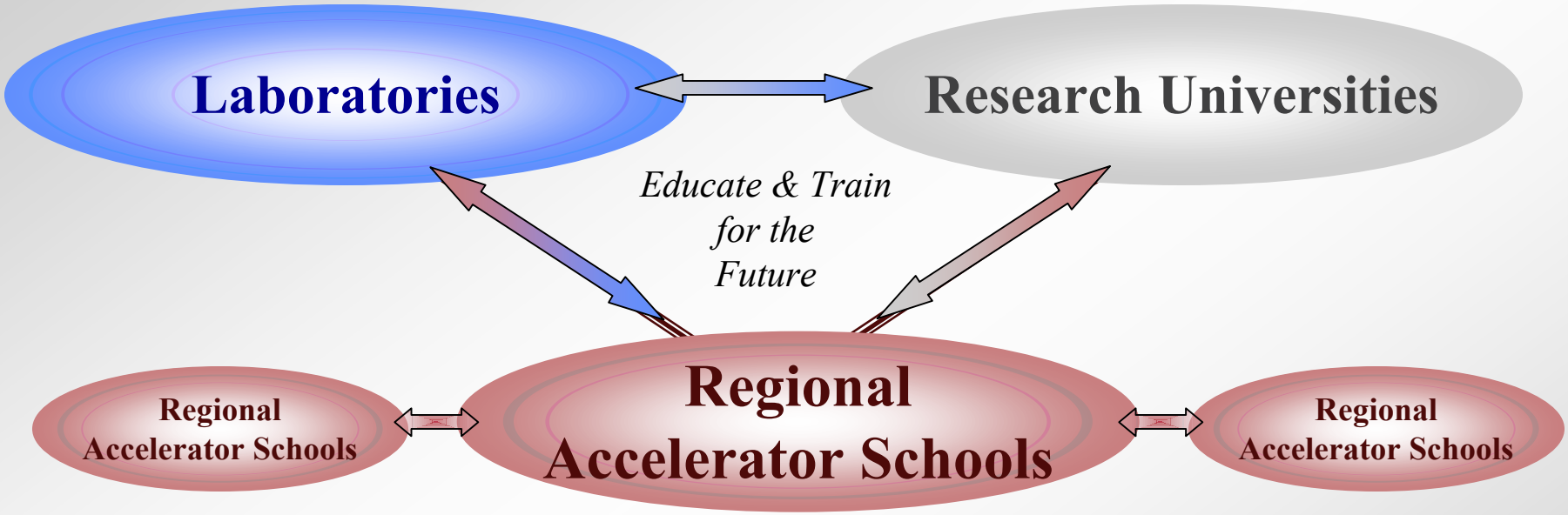
- New NSF Science and Technology Center led by Cornell
  - Collaboration with 10 universities & 3 national labs from the US & Canada.
- Mission: Increase electron beam brightness by up to 100 x
  - Three lines of research
    - beam production, storage and transport, beam acceleration
- Strategy: Use an interdisciplinary team to build first principles understanding
- Includes an educational component
  - Primarily high schools and undergraduate
  - Ties to USPAS

Graduate Education in Accelerator Research
aims to increase PhD students in accelerator physics

- Cornell invites doctoral students *from all universities* to carry out their thesis research at Cornell.
  - Students spend up to 2 years at Cornell doing research supervised by one of its accelerator faculty
    - They work on a topic of interest to home & Cornell faculty member
    - GEAR is open to European students
  - The student's home faculty advisor can also participate in the research
  - Before starting research at Cornell, the student is expected to *take prerequisite courses at the home institution* and *attend the USPAS*
- GEAR provides an opportunity that is rarely available
  - In-depth supervision by Cornell accelerator faculty
  - Extensive & deep interaction with the accelerator or device targeted by their research
- Up to 2 GEAR students will work alongside Cornell's doctoral students in accelerator physics.

Contact: Georg Hoffstaetter <georg.hoffstaetter@cornell.edu>

Option 2: Regional accelerator schools



The US Particle Accelerator School
has granted more graduate-level academic credit
in accelerator science & technology
than any university in the world

Major US universities rely on USPAS
as an essential partner to educate their students

- USPAS courses must be academically rigorous
  - Courses are vetted by host and partner universities
- Universities with strong graduate programs in accelerator physics provide the largest student attendance at USPAS
  - Only Cornell, MSU, UCLA, & Stanford have strong faculty lines (> 2 tenure track professors)

Accelerator-based science needs several more such universities

to assure an adequate, well trained professional workforce

- Universities with research accelerators
  - Emphasize innovation in accelerator science
  - Promote undergraduate awareness through student jobs
    - MSU - 50 UGs annually; Cornell - 60 UGs annually
  - Offer exciting, hands-on opportunities to engineering students
  - Encourage student experimentalists to learn about accelerators

USPAS Degree Program
will move from Indiana to ODU

University of Ljubljana
FACULTY OF ECONOMICS

Master of Science
in
Beam Physics and Accelerator Technology
from
Indiana University & USPAS

12 M.S. degrees awarded

8 Students are currently enrolled in program

Requirements: 30 Credit Hours with grade point average of B or above

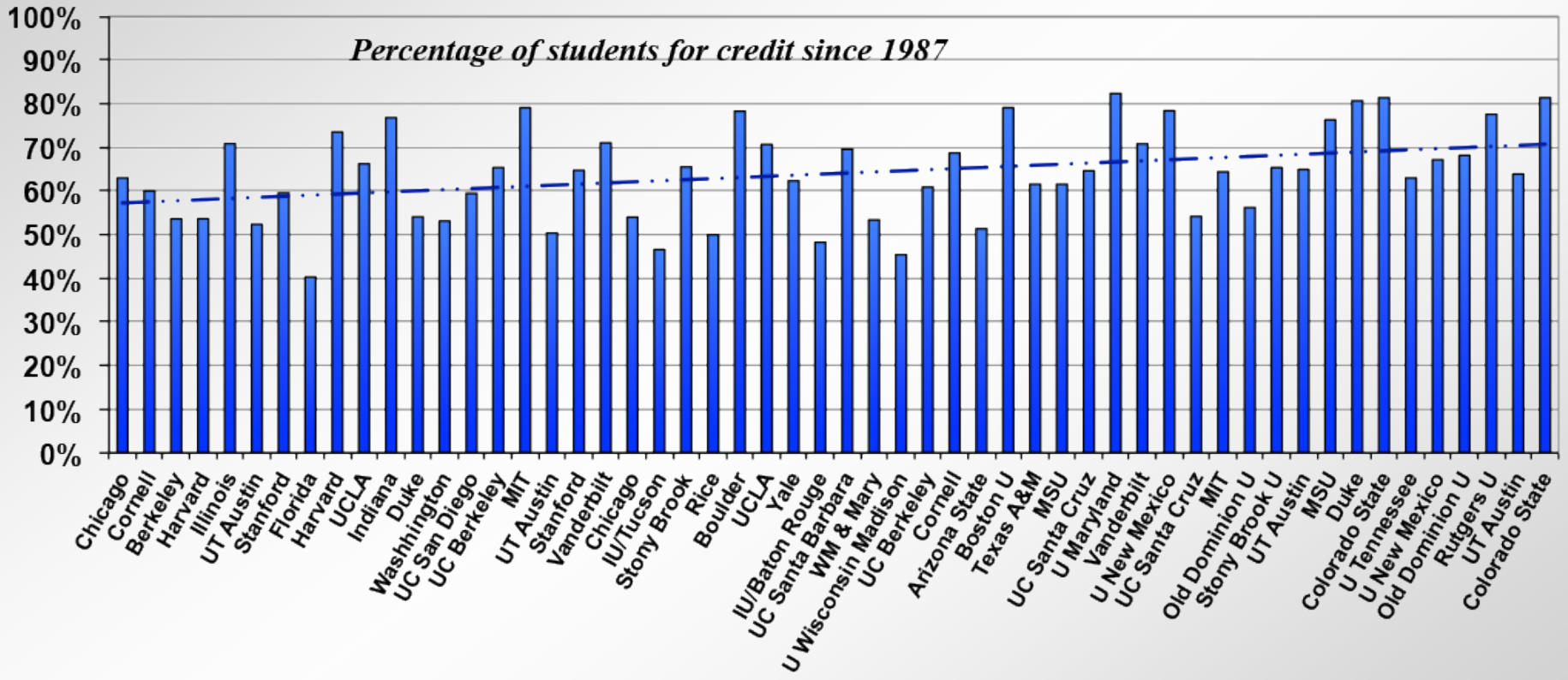
* Attendance at USPAS course counts as IU residence on campus
* IU/USPAS Courses

* Master's Thesis (3 - 9 credits)

* Final Examination or oral defense of thesis

Obviously academic credit is essential to a degree program

Academic credit is the hallmark of USPAS
>2/3 of students now take courses for credit



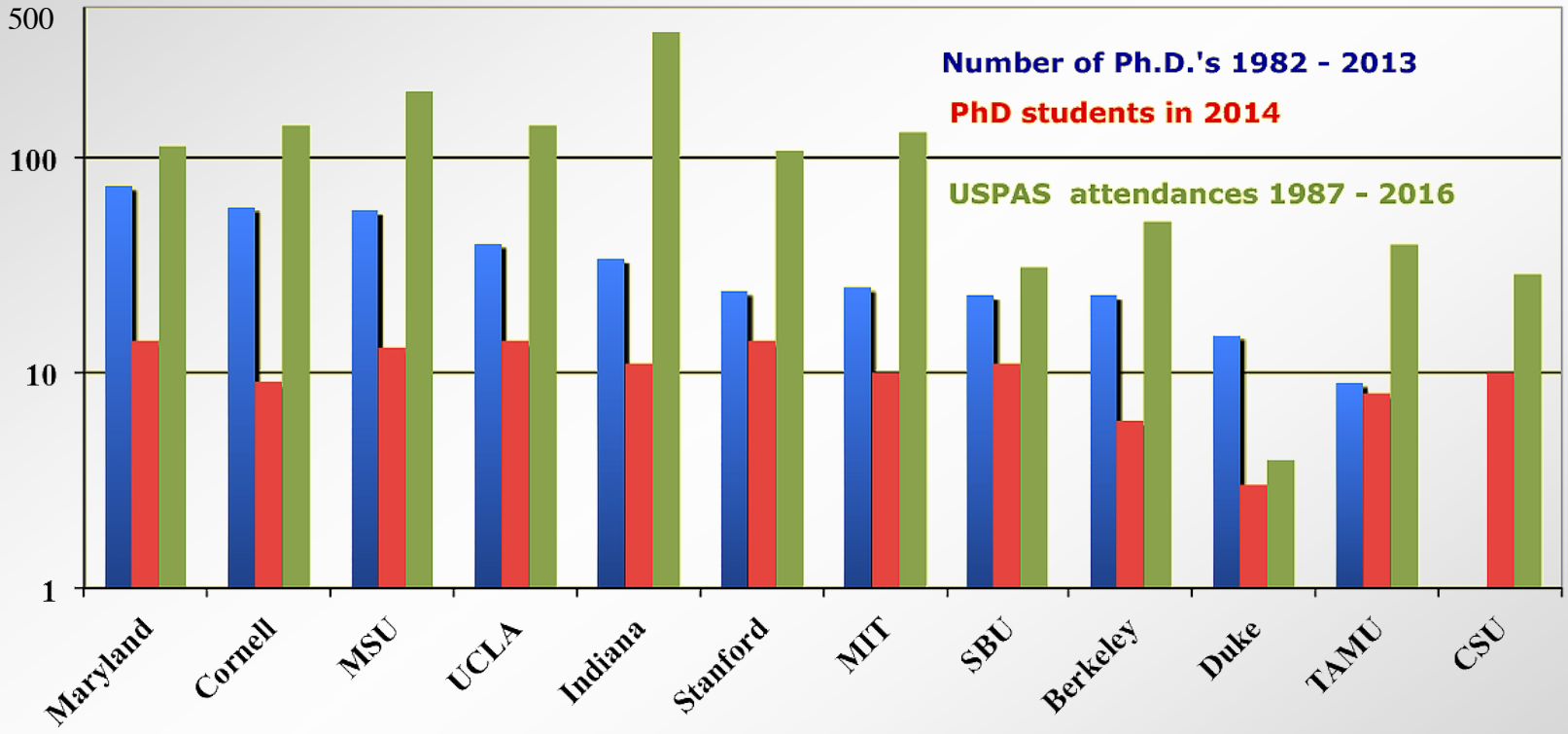
Moves toward a deeper academic presence

- Under the leadership Prof. Jean Delayen, Old Dominion University (ODU) is establishing a USPAS-affiliated Ph.D.
  - First step: all USPAS courses will be co-listed as ODU courses
  - Second step: ODU Masters program
  - USPAS Director is an Adjunct ODU Physics faculty
- Stony Brook, MSU & MIT grant direct credit for USPAS courses
  - MIT now has a "flexible major" in accelerator physics
- Cornell is also exploring co-listing all USPAS courses
- Un. of Chicago is considering co-listing undergraduate "Fundamentals" & graduate "Accelerator Physics"

US labs & universities rely on USPAS
to build the workforce of the future

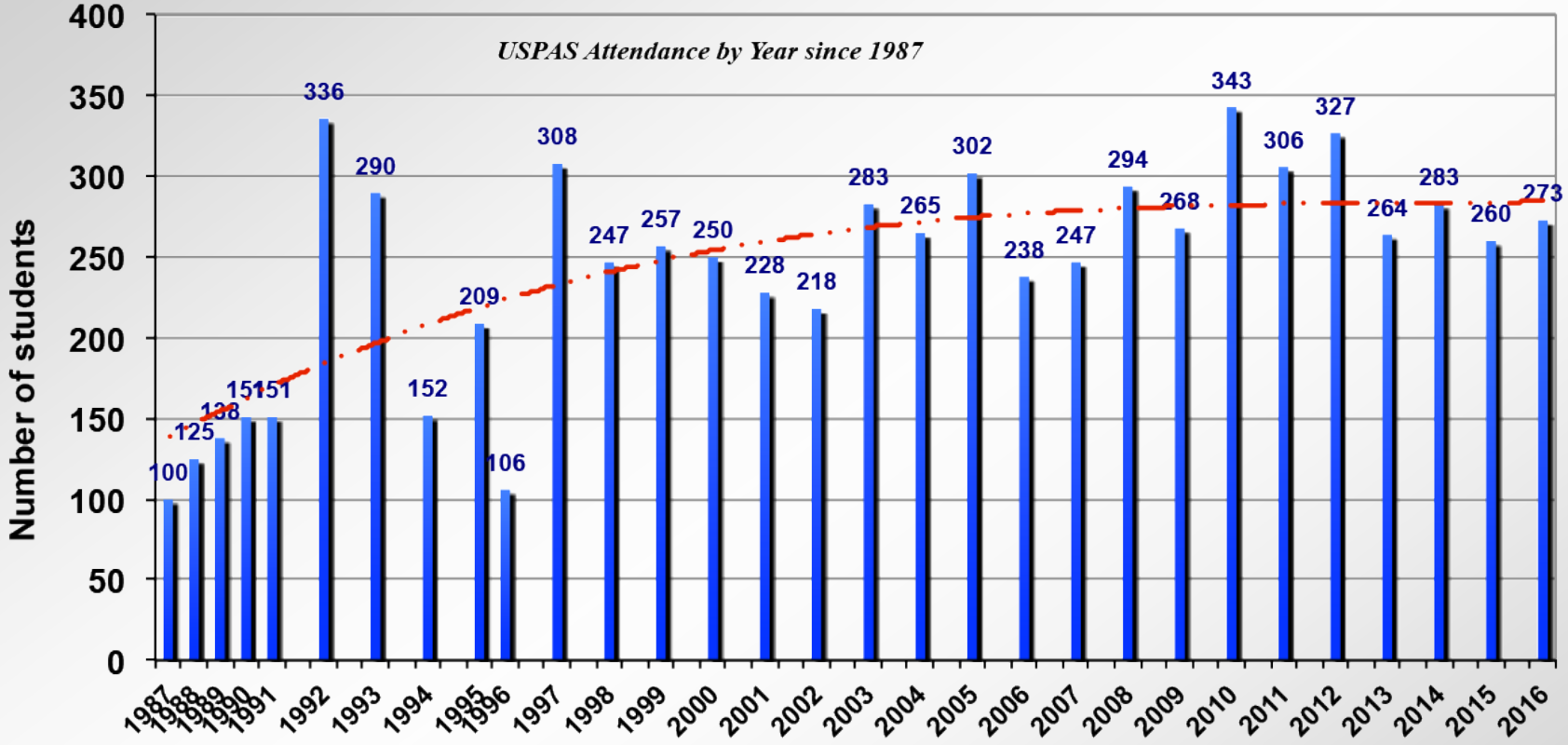
- Universities with strong graduate programs in accelerator physics provide the largest student attendance at USPAS
- 2 schools annually hosted by a major research university
  - 8 intensive university courses run in parallel
    - (45 contact hours in 2 weeks)
  - Mentored & graded homework, final exams and/or projects
  - Balanced curriculum: physics v. engineering, lectures v. hands-on
- Typical attendance per school ~ 135 - 140 students
  - Scholarships are available for matriculated, for-credit students
  - Workload for for-credit students during our courses > 8 hour/day

Universities with strong accelerator programs send the most students to USPAS sessions



The universities expect their students to earn credit

USPAS attendance in academic sessions



~300 students per year is a natural plateau with 2 sessions per year

Having more than 150 per sessions usually incurs difficult logistical issues.

An additional annual session would require increased office staff.

USPAS has a broad impact in our profession

- 50 university-style schools with >4000 individual students
- ~2000 work in the field of accelerator science or accelerator-based science
- ~250 have become intellectual leaders in their field
- >160 USPAS instructors have taken USPAS courses
- 26 USPAS graduate students have become USPAS instructors
- 23 have become DOE program or Site Office managers

In FY15:
30-year retrospective review by DOE/HEP

- Required by Office of Management and Budget
  - All aspects of the School were examined
- "USPAS very effectively delivers both training and workforce development … The USPAS program is *of high quality and remarkable breadth*"
- the *laboratory members* of the [USPAS] Consortium uniformly commend the value of USPAS, and *all attest that USPAS is vital for development and training of their laboratory workforce*.
- "The management structure of USPAS, with a Board of Governors, Curriculum Advisory Committee, and Director and staff is appropriate. The *structure and management team are effective*. The USPAS program is cost effective. "

Despite "getting an A," a large change was mandated by DOE

Major changes in USPAS governance

- Ends USPAS "ownership" by the U.S. accelerator community
- Consortium of labs no longer directly fund USPAS sessions
  - Consortium no longer chooses the USPAS Director
- USPAS becomes a Fermilab program funded by DOE OHEP
  - Makes Fermilab Director fully responsible for the USPAS
  - USPAS Director *must be* a Fermilab employee
    - Will be reduced to a half-time position
  - No other direct funding is permitted
  - USPAS lab collaboration still funds the participation by their staff as instructors *and their affiliated students*
  - An Advisory Council of the collaboration provides guidance related to curriculum & operational details
- This change was accompanied by a substantial cut in total funding for FY16 - FY18 (and likely beyond)
  - Funds for sessions reduced by 30%

Consequences of changes in governance: New policies & procedures to control costs

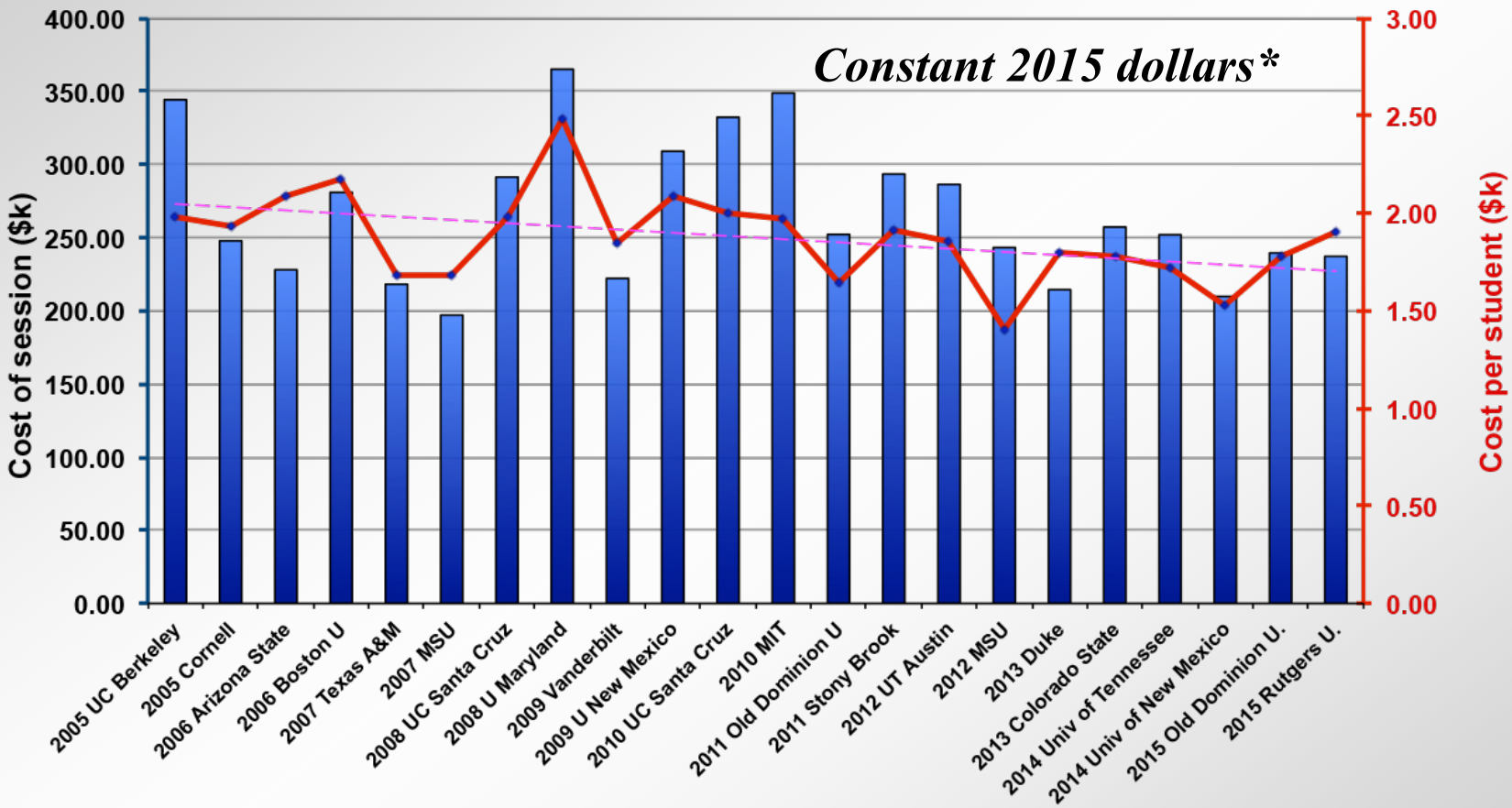
- Reduce number of courses in parallel from 8 to 6 per session
- Reduce scholarships by 30% based on proven fiscal model
  - USPAS Collaboration labs must pay for their affiliated students
  - No scholarship support for post-docs
  - Reduced percentage of foreign scholarships
    - Primarily affects students from non-visa waiver countries
- Session venues will be primarily in third tier cities
  - All hotel contracts must be at the US government rates
- Reduce computer rentals for classrooms
  - Via increased use of computer lab
- Reduce other expenses
  - Emphasize using USPAS Collaboration instructors
  - Strongly limit costs of A-V rentals, coffee breaks, etc.

Expected consequences of new governance

- Average attendance is likely fall by ~25% ↓
- University vs. national lab demographics will likely change ↓
- Frequency of offering important specialty courses will decrease
  - Still offer the undergrad & graduate introductions every session
  - Coordination with CAS is more important than ever
- Outreach to developing countries will diminish ↓
  - We will continue collaborations with new regional schools using legacy funds
- We will continue to promote the Joint International School
  - USPAS, CAS, KEK, & Budker ⟷
    - Next session in Japan in October 2017

For FY17 the logistics of implementation are an experiment

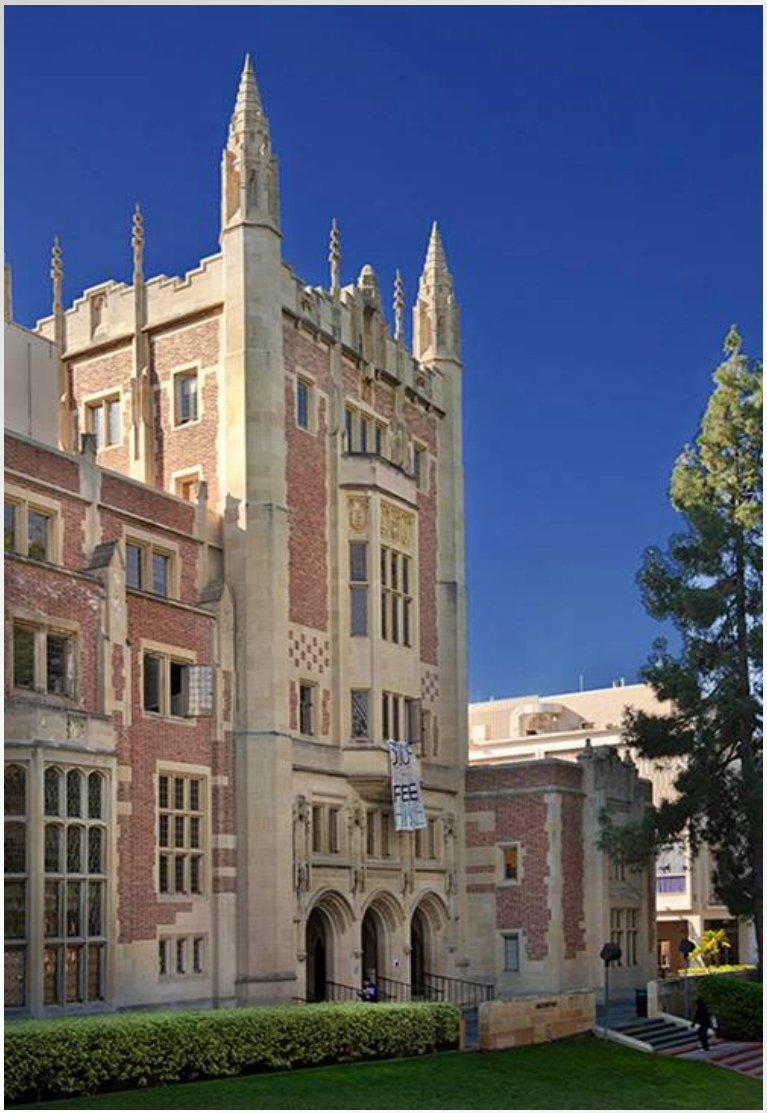
Declining real costs of USPAS sessions (2005 – 2015)



Cost control receives the continual attention of the USPAS Director & Office Manager

* *Inflation rates are based on Consumer Price Index as reported by the U.S. Bureau of Labor Statistics*

National laboratories cannot replace the principal role of research universities



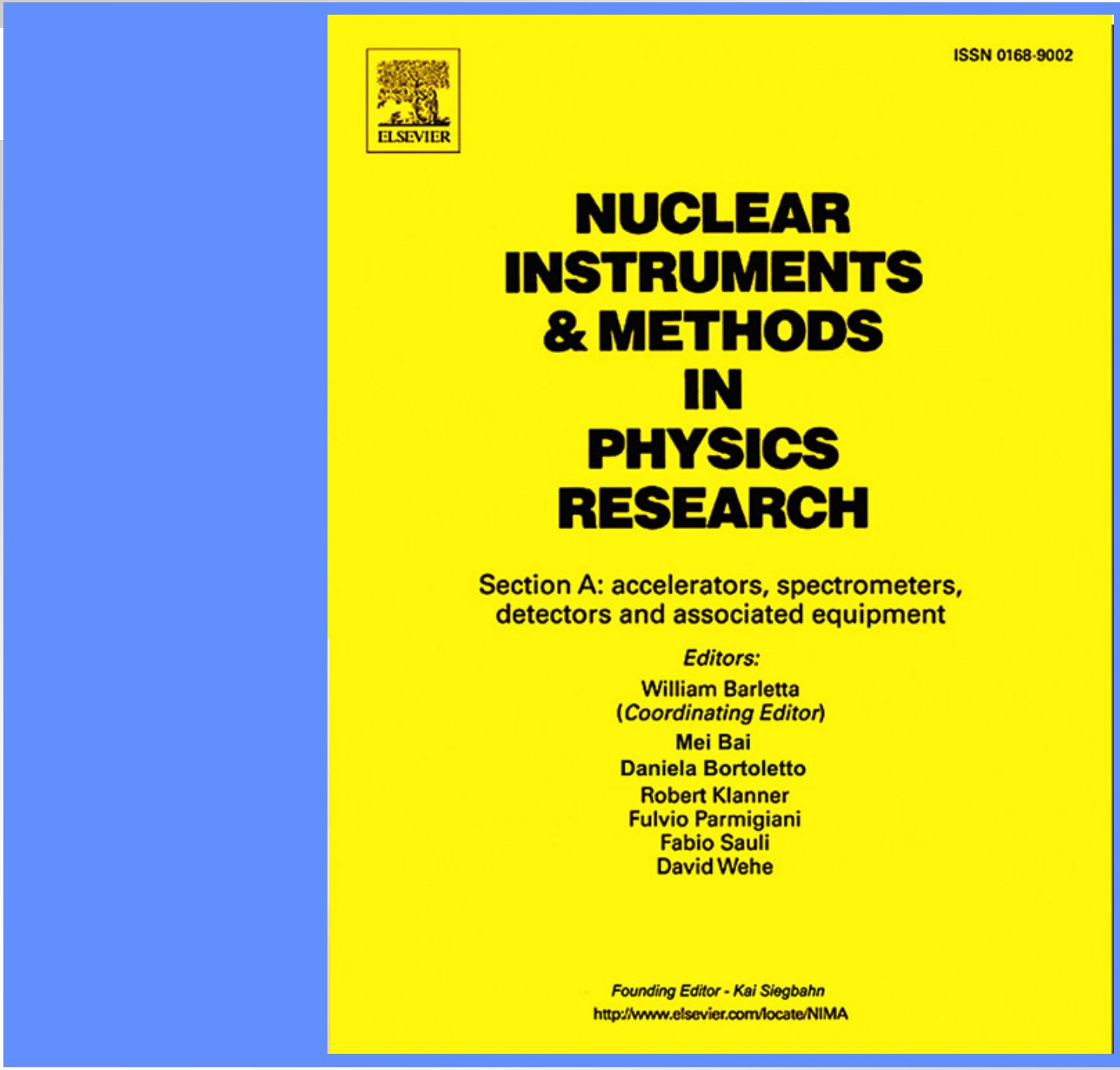
- Talented undergraduates must become aware of the intellectual challenge & excitement of our field
  - A particular challenge with respect to interesting engineering students
- Top undergraduates expect to study at a great university
- Graduate students *should* spend a large fraction of time on campus during their first couple of years
  - An education at a great lab is not an education at a great university

We must continue to build the presence of accelerator science & engineering on campuses

Our students will be the future leaders of our field

University of Ljubljana
FACULTY OF ECONOMICS

Anna Grasselino just won the 2017 USPAS prize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Changes at NIM-A

- We have a new publisher
  - Dr. Chiara Farinelli, HEP experimentalist
- We have added 2 new editors
  - Prof. Daniela Bortoletto, U. Oxford, HEP experimentalist
  - Prof. Mei Bai, FzJ & University of Bonn, accelerator experimentalist
- Changed one editorial assignment
  - Dr. Fabio Sauli becomes special issues editor
- New managing editor (1/2 time) for proceedings
  - Dr. Viviana Litizia
- Retain hard copies for the present
  - Retain volume structure, but pdf's of papers are available before issues are complete

Editorial changes:
Shift areas of coverage & raise quality

- Eliminate fission reactor & isotope separation papers
  - Exception for reactor instrumentation
- Restrict Monte Carlo papers
  - Exception for major research instruments & highly novel concepts
  - Papers should include experimental test data
- Transfer dosimetry & beam interactions with matter to NIM-B
- Increased emphasis on synchrotron radiation & X-ray optics
  - Associated with the Siegbahn Prize
- Decreased the number of proceedings issues
  - Emphasize core constituencies & their meetings
- More special topical issues (invited) & invited review papers
  - Includes Virtual Special Issues
- Generally, we have increased rejection rate

General areas of concern

- How to react to “Open Access” and “Open Data” mandates
  - We offer Gold Open Access
  - We participate in SCOPE3
- How to decrease time to publication (doi issued)
- How to serve scientists in developing countries without lowering standards
- Detecting plagiarism including double publications
  - We routinely use CrossCheck (iThenticate)
  - All editors are enrolled with Committee on Publication Ethics
  - How to handle cases of academic misconduct

Publication of our work in accelerator science & technology

Developing our journals
for accelerator physics and technology

A discussion led by

William Barletta (NIM-A) & Frank Zimmermann (PRAB)

Option 1: Publish in peer-reviewed journals for accelerator-related papers

- Prestige journals (multi-discipline):
  - Nature (mostly for "advanced acceleration")
  - Science (mostly for "advanced acceleration" & FELs)
- High impact physics journals
  - Physical Review Letters, Reviews of Modern Physics, Reviews in Physics
- Most commonly used
  - Nuclear Instruments and Methods - A, Physical Review - Accelerators and Beams
- IEEE Transactions (derived from accelerator conferences)
  - Applied Superconductivity, Nuclear Science
- Other venues
  - J. Inst., J. Plasma Physics (JPP), J. Synchrotron Radiat. (Light sources), J. Vac. Sci. Technol., NIM-B, Rev. Sci. Inst., Science Reports (multi-discipline)
- Specialty
  - Reviews of Accelerator Science and Technology (by invitation, final issue in press)

How could these journals serve us better?

- Mostly for NIM-A and PRAB
  - Increase rejection rates to improve average quality?
  - Decrease time to publication?
  - Decrease time to issue doi (digital object identifier) for quick citation?
  - *Why would these changes make a difference to you?*
- Are you willing to pay a premium price to publish in a prestige journal (i.e., Nature or Science)? Would you accept embargo until publication?
  - *Why?*
- Do you favor open (public) review on the web rather that conventional anonymous peer review?
- PRAB was an experiment as one of the very first Open Access journals.
  - Should our community try another new experiment in publications?

Option 2: Non-peer reviewed publications

- JaCOW proceedings
  - FEL Conference, IPAC, Linac Conference, NAPAC
- Other conference proceedings
  - Cyclotron, Ion Beam, Advance Accelerator Conferences
- Should some of these have "light peer review?"
  - What would "light peer review" mean?
  - Would it be useful? To whom? Why?
  - What would be the cost?
  - How would it affect copyrights?
  - How does it affect self-plagiarism & double-publication ethics?
  - Who should the publisher be? Commercial or professional society?
    - IOP (UK) is doing a trial

Option 3: Rely on the arXiv.org
Do you get more professional credit for peer-reviews ?

- Do you submit papers first to the arXiv before sending to a journal?
  - If so in which subject area? *Physics* or *HEP-Experiment*
  - *Physics* includes: Accelerator Physics; Atmospheric & Oceanic Physics; Atomic Physics; Atomic & Molecular Clusters; Biological Physics; Chemical Physics; Classical Physics; Computational Physics; Data Analysis, Statistics & Probability; Fluid Dynamics; General Physics; Geophysics; History & Philosophy of Physics; Instrumentation & Detectors; Medical Physics; Optics; Physics Education; Physics & Society; Plasma Physics; Popular Physics; Space Physics
- Should arXiv have a separate section just for Accelerator Physics & Technology?

Option 4: Should we have a new journal for accelerator science / technology?

- Certain classes of technical work don't clear the threshold for our most commonly used journals
  - Papers from developing countries often are in this category
- Should there be a place for publishing new implementations of standard technology - often with minor modifications?
  - Elsevier started a multi-discipline gold open access journal, Methods X, for that purpose.
    - Publication fee is $500. The papers do get a real peer review
  - The researchers do need to get some credit in their own institutions and from their own funding agencies
- Are there other types of work that would benefit from a new journal?
- Should computational accelerator science have its own journal?