“Science: A Global Endeavor”

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Vice President
American Physical Society

On the Occasion of the First Joint Session
of the Chinese and American Physical Societies
Guangzhou, China
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My Talk Today

Three Personal Lessons in the Globalization of Physics (and what they teach us)

• As a Researcher in Superconductivity:
  \textit{Small-scale laboratory physics is already international}

• As Vice President of the American Physical Society:
  \textit{Physical Societies increasingly operate in an international ecosystem}

• As Board Chair of Associated Universities, Incorporated (Non-profit organization overseeing the Atacama Large Millimeter Array for US National Science Foundation):
  \textit{Mega-scale facilities are essential going forward but we must learn to deal with the complexities}
Small Science is International

Perspectives From My Own Research
The Search for Higher Temperature Superconductors

My last three students: A projection of the future

Distribution of group publication authorship (last 15 years)
# Small Science is International

## Geographical Distribution for My Group Over the 15 Years

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Lessons Learned

One cannot overestimate the value of intimate interactions between our young scientists

Scientific enrichment
Cultural understanding
Colleagues for life
Wise leaders for the future
APS Membership is International

More than 20% of our members live outside the US and the number is growing
APS Journals are International

Geographical distribution of 2011 APS Journal receipts, published articles and referees used

- Published
  - Pacific Rim: 12%
  - Japan: 7%
  - Indian Subcontinent: 2%
  - M. East & Africa: 3%
  - N. America: 28%

- Received manuscripts
  - Pacific Rim: 19%
  - N. America: 24%
  - Japan: 7%
  - Indian Subcontinent: 4%
  - M. East & Africa: 4%
  - L. America: 4%
  - Europe: 38%

- Referees
  - Pacific Rim: 5%
  - Japan: 5%
  - Indian Subcontinent: 2%
  - M. East & Africa: 2%
  - N. America: 35%
  - L. America: 3%
  - Europe: 49%
GOAL ONE: To Better Serve the Members

Objective #3: International Engagement – Attract and serve increased numbers of international members.

- Involve more international members in APS governance, committees, and unit leadership.
- Expand APS information and services directly relevant to the needs of non-US members.
Lessons Learned

We are evolving in an international ecosystem

Multiple Society Memberships
Bilateral Agreements/Reciprocal Agreements to Foster Interaction
International Assemblies of Physical Societies
Joint Sessions
On-Line Meetings?
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•
•
Global Facilities

Mega-scale Projects --- ITER

Goal is to produce a self-sustaining fusion-heated plasma
Global Facilities

ALMA Project

Atacama Large Millimeter Array of 66 Telescopes

Artist’s Rendition
Global Facilities

Mega-scale Global Projects --- ILC

International Linear Collider
Global Facilities

ALMA as a Case Study in Complexity

- Expensive – $1B
- International – Europe (ESO), US (AUI/NRAO) and Japan + Canada and Taiwan, with site provided by Chile
- Complex Governance – One joint observatory (JAO), with an international board (ALMA Board) but three Executives
- Complex Finances – ESO funded under an ongoing treaty, US funded by fixed NSF appropriations, some contributions in kind
- Complex Personnel Management – Foreign nationals and Chilean workers (some unionized) governed by Chilean law

Not to mention the technological complexity of the facilities themselves
Still at the End of the Day It is the Science that Matters

*Operations: Early Science is Beginning*

- Roughly reflects observing time allocations plus open-skies contribution
- 1. Cosmology and high redshift universe
- 2. Galaxies and galactic nuclei
- 3. ISM, star formation, and astro-chemistry
- 4. Circumstellar disks, exoplanets, and solar systems
- 5. Stellar evolution and the Sun
Lessons Learned

Going Forward Global Facilities Will Require:

• Science Diplomacy – A compelling scientific case internationally
• National Diplomacy – Finances and site selection, national interests
• Solid Engineering and Costing – Often large, state of the art and need for good costing and responsible contingency
• Effective Governance and Management – Must deal with multiple national players at every level
• Must be Sensitive to Scientific Culture – Global facilities are not businesses, but they must be run in an (international) business like way

Oversight by scientist themselves is essential
“Science: A Global Endeavor”
So where are we?

- The transition to a truly global physics enterprise is inexorably under way
- Our task now is to maximize the benefit to science and humankind