



■ Member

■ Proposed Member

### ACFA members:

- Australia
- Bangladesh
- People's Republic of China
- India
- Indonesia
- Japan
- Republic of Korea
- Malaysia
- Pakistan
- Singapore
- Taiwan
- Thailand
- Vietnam
- Philippines

Total population of ACFA members:  
3,331,500,000

Portion of world population: 52.4%

Source: ACFA

# ASIAN COMMITTEE FOR FUTURE ACCELERATORS

Powerful economic growth drives this region's development as a center for particle physics. **By Mike Perricone**

Few parts of the world would relish a revisiting of conditions from nearly 200 years ago. For Asia, approximating the past could be the key to the future.

The Milken Institute in Los Angeles, founded by renowned financier and philanthropist Michael Milken, holds an annual economic conference of international business leaders to assess the global market outlook. At the April 2006 conference, Milken himself envisioned the future of an Asia re-assuming its early 19th-Century global status.

"By 2030, Asia will be 58% of the world's GDP [Gross Domestic Product]," Milken said. "By 2050, China will be the largest economy, with 44.5% of world GDP vs. 35% in the US. India will be at 28%. India's and China's economies were [comparatively] much larger in 1820 than they are today. Back then, China was 29% of the world [GDP] and India was 16%. The U.S. has been the unbelievable success story of the world since then. But 2050 will look a lot more like 1820."

In citing economic growth to build its case as the focal point for world-wide particle physics in the coming decades, the Asian Committee for Future Accelerators already has an argument that no other region of the world can match. But there is another compelling argument: the 13 members of ACFA already represent more than 3.3 billion people, or more than 52 percent of the entire world's population.

The strength in numbers is not lost on the Chair of ACFA, Shin-ichi Kurokawa, Deputy Director of the Accelerator Laboratory at Japan's High-Energy Accelerator Research Organization (KEK). Neither is the strength of Asia's desire to host the proposed International Linear Collider, the multinational, multi-billion-dollar discovery machine, which supporters hope to build in one of three regions (Asia, Europe, or the Americas) and begin operating around 2020.

ACFA, together with KEK and the Japan Association of High Energy Physics (JAHEP), issued a "roadmap report" for an Asian linear collider project. The report was made public in February, 2003 at the ACFA Linear Collider Symposium in Tsukuba. ACFA's members made clear at their 2004 Plenary Meeting in Kolkata, India that their goal was to host the proposed International Linear Collider. Their statement from that meeting reads in part: "ACFA reconfirms the importance of hosting ILC in Asia, which will make high energy physics and accelerator science truly global."

As ACFA chair through 2006, Kurokawa agrees. "ILC is the most important future high-energy project for Asia," he says. "Asia has a good potentiality to be the host of ILC, with its great accumulation of talented people and the largest GDP in 2020 among the three regions. Asia should play an important role in establishing a real global ILC. Asian industry has a good



capability of constructing ILC with good quality control and a possibility of cost reduction.”

Serving concurrently as Chair of the International Linear Collider Steering Committee through July 2007, Kurokawa also strives for balance within the three-region structure of the efforts in ILC design and research-and-development. “The coming years will be crucial towards the realization of ILC,” he says. “As ILCSC Chair, I will try my best to be as fair as possible and to realize the truly global ILC. I believe that the time is ripe for us to realize the truly global ILC. Let us collaborate, by overcoming differences among ourselves and among regions, for the realization of ILC.”

### ‘Remarkable progress’

ACFA marked its 10th anniversary in April 2006. Zheng Zhipeng, then-Director of IHEP Beijing, and Hirotaka Sugawara, then-Director General of KEK, held an informal meeting at Beijing in August 1995, to discuss a new organization for strengthening cooperation throughout Asia in accelerator-based science. The first Plenary ACFA meeting was held on April 8-9, 1996 at PAL (POSTECH/Pohang/Korea), where a charter was approved.

“When ACFA was established in 1996, accelerator-based science in Asia had made remarkable progress,” says current ACFA member Chuang Zhang of IHEP Beijing. “Considering the development pace and the increasing role of accelerator-based science in the future, ACFA was a timely development, to discuss and practice the means of further promoting accelerator-based science together in Asia.”

At that time, there were already two  $e^+e^-$  colliders in Asia: BEPC in China at IHEP-Beijing, and TRISTAN-KEKB at KEK in Japan. There was also a proton synchrotron (PS) in Japan. ACFA’s establishment document listed several electron storage rings being used as light sources: BSRF and HLS in China; the Photon Factory and SPring8 in Japan; PLS in Korea; TLS in Taiwan, and INDUS in India. Another storage ring was being planned in Thailand: the Siam Photon Source, based on a 1.0 GeV synchrotron donated by the Japanese. In addition, the web site for the world’s light source facilities (lightsource.org), currently lists some 25 light sources operating in Asia—accelerators with ready applications beyond physics, in the biosciences, medical research, chemical and environmental sciences, agriculture, minerals exploration and analysis,

materials science and engineering, forensics and even archeology.

### Surging economies

As Zhang aptly described the “remarkable progress” in Asian accelerator science, the same description holds throughout the economies of Asia. China is not the sole source for Michael Milken’s view of Asia holding the majority of the world’s GDP by 2030, or of Kurokawa (as ACFA Chair) using the region’s GDP as a selling point to host the proposed ILC.

The World Factbook, a standard international reference (produced by the US Central Intelligence Agency), lists South Korea’s GDP as 16th in the world for 2005, within reach of Spain, Mexico and Canada. South Korea’s LG Economic Research Institute says the country’s per capita income should approach \$21,000(US) in 2007; in 1963, it was roughly \$100(US). A founding member of ACFA, South Korea has enjoyed a marked expansion of accelerator science through the collaboration—with strong capabilities for ILC research and development, especially in superconducting accelerator cavities.

“Through ACFA activities, Korean scientists have actively participated in accelerator-based research, and we would like to contribute our resources in ILC construction and detector development,” says Won Namkung of the Pohang Accelerator Laboratory, who is also the Chair of the Asian Linear Collider Steering Committee. “There is a cryogenic plant at PAL for R&D on Insertion Devices, and we are now developing an SC Landau cavity [which reduces beam spread] for the PLS Storage Ring. At this time, we are going to use this cryo system for ILC R&D.” Namkung also points to a large cryo plant for the nearly completed KSTAR superconducting Tokamak fusion reactor. “We may utilize this plant for SC cavities, if it is required,” he says. “There is also a development plan for SC cavities for an intense proton accelerator [in Geongju].”

Similar to that in Korea, Taiwan’s economic growth has reportedly averaged some eight percent annually through three decades. Singapore’s uneven economic growth has been an exception to the rule. But the Singapore government encourages high levels of saving and investment through its compulsory Central Provident Fund, combining retirement security, medical insurance, education accounts and other investments. And Singapore spends 21 percent of its annual budget on education.

## Inviting India

With eight percent annual growth, India is pressing Japan for third ranking on the world GDP list, and the national attitude resembles boosterism. India's Minister of Commerce and Industry, Kamal Nath, told the November 2005 India Economic Summit that the nation will "exploit the potential to transform the world economy" to the fullest. Pointing toward the India Economic Summit in 2010, he declared: "International studies predict that when we gather here in 2010, India will be rubbing shoulders with the largest economies of the world."

Support for science is strong at the top. Indian President Dr. A.P.J. Abdul Kalam, an aeronautical engineer by training, was Project Director for India's first Satellite Launch Vehicle (SLV-III), which successfully injected the Rohini satellite into near earth orbit in July 1980. Addressing the XV International Conference on Computing in High Energy and Nuclear Physics (CHEP06), held in Mumbai in February 2006, President Kalam set India on a mission to develop robust and long-lasting computer technology.

"The lifetime of the computer of latest architectures is less than five years," President Kalam said. "Within a period of ten years, the storage medium and the format also change. I am sure with the best brains from India and international organizations assembled here, we would be able to find a long lasting solution to this problem. Your discussion results will be useful to the whole world of information scientists and physicists."

A significant contributor to the CMS and ALICE detector collaborations for the Large Hadron Collider at CERN, India has had a more limited participation in ILC, working in detector and basic physics areas such as data analysis and simulations. But that is changing to include accelerator contributions, at least in part as a result of the Linear Collider Workshop held at Bangalore in March 2006.

On their way to Bangalore, a delegation including ILC Global Design Effort director Barry Barish, and laboratory directors Jonathan Dorfman of SLAC, Pier Oddone of Fermilab and Albrecht Wagner of DESY, met with President Kalam and discussed both the science goals and possible applications of the ILC. Oddone noted that a visit to the Inter-University Accelerator Center in Delhi displayed the facilities to develop superconducting RF cavities, "including electron beam welding and electropolishing facilities that are state of the art."

Says Amit Roy, ACFA member and Director of Inter-University Accelerator Center: "The urging of international colleagues, of whom a large fraction are from the US, has resulted in getting the accelerator physicists involved. And especially the visit of a strong US team during March 2006 has generated good support for LC activities from funding agencies." While there was some suggestion of India preparing a site proposal to host the ILC, Roy explains: "At this moment, there is no plan for such a proposal. This question has only been informally discussed at the time of the Linear Collider Workshop at Bangalore."

## Eyes on more than one prize

The surging economies of Asia, and the expanding accelerator capabilities, make the region a formidable competitor for siting the proposed ILC. But if the ILC is the grand prize for the future of global particle physics, it is not the only prize worth seeking, in Kurokawa's vision as Chair of ACFA.

"It is important to strengthen the activities of accelerator sciences in the Asian region," Kurokawa says. "Our collaborations are not only for the ILC. We would like to establish strong ties between Asian countries in every field of the accelerator sciences, covering high-energy physics, accelerator physics, synchrotron-radiation and spallation neutron sciences."

Promoting those strong ties, Kurokawa has been coordinator of the China-Japan collaboration on accelerator sciences, initiated in 2000 with support from JSPA (Japan's equivalent of the US National Science Foundation) and China's Academy of Sciences (CAS). Korea joined in April 2005, and India in April 2006. In addition, the Asian Particle Accelerator Conference was established by ACFA in 1998, and meets every third year.

Kurokawa also sees the need for expanding the field beyond the region's current leaders. "It is also of great importance to start collaborations with Asian countries that have good potentialities, but where accelerator sciences have been less developed, such as Vietnam, Thailand, the Philippines, Pakistan, Bangladesh, Indonesia and Australia," he says. "To exploit potentialities of Asian countries in accelerator sciences is one of the most important jobs of ACFA."

The world will be watching, especially the world beyond Asia.