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The membership of C11 is distributed broadly geographically and represents scientists at major laboratories as well as research universities.

IUPAP Sponsored Conferences 2003 - 2008

C11 normally only supports one conference per year the International Conference on High Energy Physics in even years and the International Symposium on Lepton- Photon Physics in odd years. These meetings are generally regarded as the premier meetings in the field. The most recent conferences were

- 2003 LP-03 Fermilab, Batavia, USA, August 11-16, 2003.
- 2004 ICHEP-04 Beijing, P.R.China, August 16-21, 2004.
- 2005 LP-05 Uppsala, Sweden, June 30 – July 5, 2005.

Future conferences are planned for

- 2006 ICHEP-06 Moscow, Russia, July 26 – August 2, 2006.
- 2007 LP-07 Daegu, Korea, August 13 – 18, 2007.
- 2008 ICHEP-08 Philadelphia, USA, July 30 – Aug. 6, 2008

IUPAP GA-2005 Review of Conference Formats

In 2001 and 2004, C11 drafted guidelines for the scientific programs of the LP and ICHEP conferences. While both conferences cover almost all of the field of particle physics, their emphasis is slightly different. As the name indicates, the Lepton Photon Symposium focuses more on photons, leptons, and hadrons interactions. Heavy ion interactions are not usually covered. The program should emphasize current activities and recent results. Future developments in detector, accelerator, and computation techniques are considered important, though it should be recognized that, with the exception of some aspects of computing, the future changes very slowly, and thus annual reports in all areas might not be that interesting. In recent years, astrophysics and cosmology have been given more exposure, with emphasis on phenomena that lead to the observation of high energy particles. Organizers are encouraged to be selective and assure a balance between experiments and theory, recent and future developments. The program of previous years should not be a template for the years to come!

While the ICHEP series devotes half of the program to parallel sessions, the LP Symposium only has plenary sessions. To give more emphasis on recent results, the organizers are encouraged to arrange more topical talks, in addition to review talks covering past and current development of broader topics. It might be very interesting to arrange for a few topical sessions, with shorter talks on new developments. Such talks on specialized topics could provide opportunities for younger speakers.

There is concern that these large international conferences attract fewer and fewer participants. The tremendous development of communication tools has made it less attractive to attend these meetings. Collaborations are so large and set their own broad

physics program that interest in other developments has somehow dwindled. To foster larger ttendance, especially by younger scientists, C11 recommends that organizers

- invite younger, active scientists to the program advisory committee, replacing the traditional list of honorary members (laboratory directors and Nobel laureates who should of course be encouraged to attend the conferences), and
- organize special events for younger participants, for instance poster sessions, as introduced at LP03.

As the conferences are now hosted in many locations in different countries, most of the hosts have never organized a conference of this kind, and some may not have broad expertise in the field. Thus C11 strongly encourages the organizers to carefully select the members of the International Program Advisory Committee and consult and interact repeatedly with them. In the future, C11 may decide to take a stronger role in the planning of the program of these conferences.

Formation of a C11 Working Group in Authorship

As HEP Collaborations supporting major experiments grow, there is increasing concern about authorship of scientific publications. It is widely realized that a straightforward extension of the current practices to much larger collaborations may not be recommendable, because

1. they do not appropriately credit those who have contributed most,
2. they do not allow others to identify those most knowledgeable about the results, and this hampers scientific discourse, and
3. they lead to absurd publication and citation records.

Members of C11 have discussed these issues and agree that it would be desirable to find ways of improving the current situation. C11 has formed a Working Group that is charged to examine the various types of publications, specifically physics analyses in reviewed journals vis-a-vis technical publications with more restricted authorship, to survey the current practices for the selection of authors, and to examine the impact of the current practices and their potential future variants. The working group is composed of members of C11and representatives of the major collaborations, both from universities and laboratories. The group has prepared a report which summarizes the findings and outlines alternatives to the current practices. This report has been made public and is being reviewed by the various national HEP communities and large collaborations, and a questionnaire is being prepared to sample the response from the community. This might lead to the formulation of guidelines or recommendations.

Recent Developments and Plans for the Future of Particle Physics

In the past thirty years, the lasting achievement in particle physics has been the formulation of the Standard Model that describes the fundamental constituents of matter and their interactions with unparalleled precision. However, this theory is not an end to itself. It is known to be incomplete, has too many arbitrary parameters, and it is mathematically inconsistent at the TeV energy scale. In fact, experiments of the last decade have revealed that

- new fundamental particles should exist just beyond the reach of current accelerators. These particles may be manifestations of new dimensions of spacetime, new quantum dimensions, or something else, more radically different;
- neutrinos have mass and thus may resemble quarks more than we anticipated;
- unidentified dark energy pushes the universe to expand at an increasing rate, and cosmic accelerators beam ultra-high energy particles to earth; and that
- only five percent of the universe is made of the normal visible matter described by the Standard Model and the rest consists of dark matter and dark energy whose fundamental nature is a mystery.

Thus we are looking for a theory that explains the mysterious new scientific landscape but incorporates the features of the Standard Model. Powerful tools exist to study these new phenomena. Astrophysical observations can explore the parameters of the universe. With very high energy particle accelerators we can now approach the conditions that are similar to

those at the very beginning of the universe, giving us means to search for dark matter and dark energy in the laboratory.

Realizing these fundamental and revolutionary developments of our view of the universe, the high energy communities in various parts of the world have charted roadmaps for future research in particle physics. They have identified the exploitation of the following current and soon to be completed facilities as the primary goals for the near future:

- At the energy frontier, experiments at proton colliders, the Tevatron in the US to be followed by the LHC in Europe, are aiming to probe for physics beyond the Standard Model, by creating the particles and forces of the early universe. The discovery of new particles and new symmetries might reveal the nature of dark matter and potentially provide a link to the origin of dark energy.
- Precision measurements of QCD couplings and the proton structure are being performed at the HERA electron-proton collider at DESY in Germany,
- The physics of heavy flavours of quarks are being studied at the B Factories at Tsukuba in Japan and at Stanford in the USA, and also in the future at the LHC at CERN. BES II in Beijing will become the only e+e- facility to explore charm particles and τ leptons near threshold. Searches for exceedingly rare kaon decays will continue at much higher intensities at the J-Parc in Japan. These studies should help us understand the limits of validity of the Standard Model and why there are so many different particles.
- Long baseline experiments with beams from Fermilab and CERN and in the future from J-Parc in Japan, will further explore neutrino mixing and masses, and assess the potential for CP violation in neutrinos. These facilities will be enhanced by upgrades of the proton sources to much higher fluxes. The measurements will be complemented by experiments exploiting the neutrino flux near nuclear power stations in France, the US, Japan, and China.
- Non-accelerator neutrino experiments, Super-Kamiokande and SNO in Canada, Borexino in Europe will continue, while larger underground detectors are being planned for the exploration of rare phenomena such as proton decays and neutronless double beta-decay. The proof of the existence of these rare processes would have far reaching consequences for our understanding of matter and anti-matter.

For the longer-term future, there is now general agreement among particle physicists that the next large accelerator facility should be a linear electron-positron collider with energies of 0.5 to 1 TeV in the center of mass. However, it is widely recognized that the number of experimental facilities at accelerators is shrinking rapidly. The so-called fixed-target experiments with a multitude of beams of different particles and different energies are being terminated worldwide. Larger and larger storage rings with one of two experiments operating at the energy frontier or smaller facilities providing laboratories for specialized high rate and high precision experiments have taken their place.

Particle physics is in the midst of a great revolutionary change. Recent data and ideas are challenging long-held assumptions about matter, energy, space and time. Theorists have found a way to reconcile gravity with quantum physics by producing all forces and particles as different vibrations of a superstring. It implies supersymmetry and introduces at least seven extra dimensions beyond the familiar four of space and time.

These new ideas are pointing to new experimental approaches, both at high energy accelerators as well as by astrophysical observation. Particle physicists are realizing that their field of expertise is well suited to address these questions and that presentand future technology will most likely lead to discoveries. To realize these opportunities, a joint effort across disciplines and collaboration of the world community would be very beneficial, if not critical.

ICFA and the International Linear Collider

C11 has sponsored the International Committee for Future Accelerators (ICFA) since 1976. The 16 ICFA members are selected from all regions using accelerators, most of the directors of major laboratories are members of ICFA; the chair of C11 serves as an ex-officio member of ICFA. ICFA is charged to promote international collaboration in all phases of the design, construction, and exploitation of very large

high energy accelerators. The term of the current chair, Jonathan Dorfan of SLAC, will end this year, Albrecht Wagner of DESY will succeed him for a three-year term.
There is consensus that given the size and complexity of a high energy linear collider, only one such facility should be built worldwide, jointly by communities in Asia, the Americas and Europe. The various regions or laboratories are expected to share the responsibility for the construction, operation and maintenance. With the rapid growth in communication and networking, data and software can be readily shared and remote collaboration and operation are possible. ICFA has been helping to guide international cooperation on the Linear Collider since the mid 1990's.

- In February 2002, ICFA formed an International Linear Collider Technical Review Committee (ILC-TRC) to assess the present technical status of development and potential for meeting the advertised parameters at 500 GeV c.m. energy of the Linear Collider designs at hand, and to establish for each design a list of R&D tasks.
- In 2002, ICFA formed the Linear Collider Steering Committee to promote the construction of an Electron-Positron Linear Collider through worldwide collaboration. Most of the15 members are drawn from ICFA and the regional LC steering committees in Europe, Asia and the America. Under the chairmanship of M. Tigner of Cornell University the ILC-SC has given particular attention to the science, technology development and organization of the LC project. With the special emphasis on outreach, the ILCSC fostered the formation of the Interactions Group which now has participants from of 15 laboratories around the world. Their press releases and web postings have become a major resource for the community.
- In early 2004, the ILCSC created the International Technology Recommendation Panel (ITRP) under the chairmanship of Barry Barish of Caltech to recommend the choice between the two RF technologies under study, the superconducting or the other warm copper cavities. This group of very experienced members of the community, not accelerator experts, spent six months to assess the situation and on August 19th 2004 reported its recommendation: superconducting rf technology. This decision, while not uncontroversial, was accepted by ICFA and the HEP community. This recommendation was made with the understanding that the choice was for the technology, not a specific design. The final design is to be developed by a team drawn from the combined warm and cold linear collider communities, taking full advantage of the experience and expertise of both.
- In March 2005, ICFA appointed Barry Barish to head the Global Design Effort (GDE) for the ILC. i.e. a coordination of the regional design efforts towards the Conceptual Design Report and common Cost Estimate in the course of the next two years. The Technical Design Report and a site selection are expected to follow and be completed by 2009. A Memorandum of Understanding was signed my 11 laboratories in March 2005, specifying the goals and plans for the GDE. Government agencies, OECD and other international organizations are following these developments closely. It is hoped that the funding will be available to allow the pursuit of these exciting goals.
- Since 1998, the Worldwide Study of the Physics and Detectors for Future e+e- Linear Colliders (WWS) has played a key role in organizing the global efforts on physics and detectors for the ILC. The WWS coordinates the work of the three regional studies and organizes annual Linear Collider Workshops (LCWS). The leaders of the WWS have been invited to join the GDE since the ILC design will need to closely integrate the accelerator with the detector plans and requirements. The WWS has received more than 2700 signatures in support of the linear collider, a very strong and important statement of community support for the ILC.

  In summary, ICFA has played a critical role in the world wide development of accelerators and most recently in the promotion of world wide collaboration on the ILC. But, like the rest of the high energy physicists, ICFA will be looking into the longer term future of accelerator-based science and will be assessing its potential
  future role in the more global and interdisciplinary scientific effort to gain a totally new understanding of the nature and origin of the universe.