

# THE CREATION OF THE PAC CONFERENCE SERIES\*

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## Abstract

After much discussion in the early 1960s, the first Particle Accelerator Conference (PAC) was held in 1965 March at Washington, DC, using a particular format that the organizers determined should lead to a successful conference. In addition to focussing on all types of accelerators, the conference was organized to provide an environment for engineers, technologists, physicists and users/operators to interact and share information within an informal arrangement that promoted discussion and sharing information. The first conference was so successful that 50 years later we are using many of the concepts and procedures employed in the 1965 PAC, with improvements that have been added over the years. The initiation, development and operation/management of the successful PACs up to this 50<sup>th</sup> anniversary in 2015 are described in the following sections.

## EARLY “TIMES”

With the advent of many accelerators being built and in operation in the USA, Europe and the Soviet Union, it was decided in the late 1950s to establish the International Conference on High Energy Accelerators – HEACC with sponsorship from the International Union of Pure and Applied Physics (IUPAP). Initially HEACCs were held every two years, but in 1971 this was changed to every three years. As an indication of the international nature of HEACCs, the 2<sup>nd</sup> was held at CERN in 1959, at BNL in 1961 and at Dubna in 1963. The author had the privilege of chairing the 16<sup>th</sup> HEACC in association with PAC’95 at Dallas, TX in March 1995. As chair, he worked with A.N. Skrinsky [1], Novosibirsk, Russian Federation for financial support from IUPAP to cover the costs for selected individuals to attend the conference from regions unable to provide funds for their attendance.

There are many excellent papers in the published records of this conference series, and several individuals in the accelerator community are investigating the possibility of having these conference records available through the popular Joint Accelerator Conferences Website (JACoW) [2].

Around 1960, the Institute of Electrical and Electronics Engineers (IEEE)<sup>1</sup> became more involved in various aspects of particle accelerators and their evolving technologies, especially for research and applications. For several years, the Technical Committee on Plasmas and the High Energy Physics sections of IEEE’s Nuclear Science Group (precursor to the present IEEE-NPSS (Nuclear & Plasma Sciences Society)) was investigating ways to bring together individuals and teams interested in

the technical and scientific aspects of particle accelerator design, engineering, construction, management and operations. At that time, there existed no opportunity for such accelerator specialists to forgather at one meeting covering all of these interrelated topics.

## RATIONALE

Around 1963 a number of accelerator specialists felt that HEACC was becoming more of a dialogue between the high-energy facility designers and users. Because of this nature, they felt that an interdisciplinary conference (engineering/scientific) would complement the HEACC conference series, rather than create a conflict with it.

At the American Physical Society (APS)<sup>2</sup> meeting in Washington, DC in 1964, Louis Costrell [3,4], James E. Leiss [5,6] and H.W.(Bill) Koch [6,7] of NBS approached Robert S. Livingston [8] of ORNL regarding their desire to co-sponsor a particle accelerator meeting, using the decades old Scintillation Counter Symposium as a model for success. To achieve this interdisciplinary approach for the conference, with timely sharing of data/information, with ample time for discussion and with dissemination of important recent results, the program was organized to cover a large expanse of interests. In order to assist the broad accelerator community with the rapid development of scientific and technological advances, the following elements were considered important for success:

- To appeal to both scientists and engineers.
- To discuss the design of all sizes and types of accelerators, from the smallest to the largest.
- To include accelerators of both heavy and light particles.
- To review problems at both the input and output of the accelerator.
- To encourage participation of those who operate and build accelerators.

## General Conference Layout

Many of the ideas and arrangements made for the first Particle Accelerator Conference (PAC) held in 1965 at the Shoreham Hotel in Washington DC have continued for the past 50 years, with some being modified to fit changes that have occurred within that timeframe, as described in later sections.

<sup>1</sup> IEEE is the world’s largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity with >426,000 members in > 160 countries (~30% student members); >50% outside USA.

<sup>2</sup> APS is a non-profit membership organization working to advance and diffuse the knowledge of physics through its outstanding research journals, scientific meetings, and education, outreach, advocacy, and international activities with >51,000 members throughout the world.

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Arrangements considered necessary for hosting a successful conference, allowing for adequate interactions between attendees included the following:

- Hotel large enough to provide adequate space and equipment for lecture halls, as well as enough sleeping rooms for the participants.
- Program Committee who arrange for:
  - invited oral presentations covering technology, science and engineering that would attract high interest from the attendees.
  - selection of the contributed oral presentations from the abstracts submitted.
  - plenary sessions on the first session of the conference and last session of the conference.
  - parallel sessions at other times.
  - time for questions and discussions after each talk.
  - large open area between adjacent presentation rooms for coffee in both the AM and PM, thus allowing for mixing and continued discussions.
- Banquet held prior to the last day of the conference, with companions invited.
- Special banquet speaker and/or local entertainment.
- Space available in hotel for satellite meetings.
- Timely publication of the conference proceedings.

Official organization of the first PAC began with a meeting of the Program Committee (PC), {now called a Scientific Program Committee (SPC)}, at NBS (now NIST) in June 1964 with fifteen individuals from USA laboratories and institutions involved in various accelerator activities [9].

## HISTORY

Based on the efforts and attention spent on conference details by the first PAC'65 committees, the PAC series of conferences has been very successful over the past 50 years, and has provided a very important service in providing all accelerator practitioners a free archive of the latest R&D, operations and related technical advances in a timely manner. Posting of the proceedings on JACoW was an important step forward of great importance for all involved in the accelerator-related art.

Planning, management and operation of the PACs has always been the responsibility of the PAC Organizing Committee (PAC OC), using the PAC'65 methodology.

As can be seen in Fig. 1, attendance at the PACs over the years has been very good, until 2012 when the US government increased restrictions on travel to conferences. The first three PACs were held at the Shoreham Hotel in Washington, DC. After PAC'71 in Chicago, IL, the PACs began the country rotation of west, east, mid-country, west, etc. A site selection requirement was to be in a city close to a large accelerator facility, allowing visits to the installation and permitting good participation from those in the immediate vicinity. Twice, as can be seen for 1995 and 2003, a PAC was held not following the site selection requirement, with a noticeable drop in attendance.

In the figure the square red markers show the PACs that were held mid-country. A linear fit to the data shows an increase in attendance over the years, while a polynomial fit to the data shows the peak in attendance in the late 1990s with a dip around 2010. The first two PACs were chaired by Robert S. Livingston. Of the 27 PACs held in North America, the only other individuals who chaired a PAC twice were Sam Penner (NIST), Mike Craddock (TRIUMF) and the author. The registration fee for PAC'65 was \$16; it took until 1991 to have the fee increased by ten times to \$165, and another 25 years to have the fee increased to close to \$600.

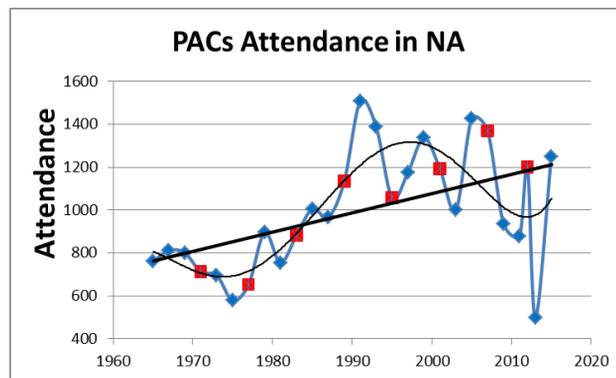


Figure 1: Attendance at PACs versus year held. Notice that until 2012, all of the PACs were held in odd years.

The different contribution types at the PACs are shown in Fig.2 with interesting features. Because of the many submissions from which to select the contributed oral talks, and author requests, publication-only was allowed until 1990. Note that the contributed orals have averaged about 85 over the years and that the invited talks averaged ~ 25 until the 1980's, increased to ~ 70 until the 2000's, increased to ~ 120 until 2010 and then decreased to ~ 60. Talk numbers are based on the session numbers available for presentations; hence based on the number of parallel sessions and the number of days for the conference.

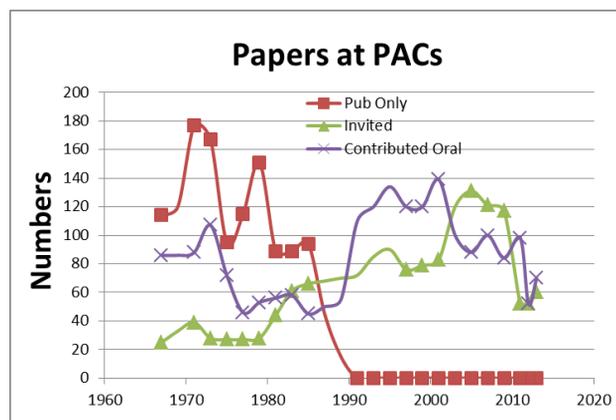


Figure 2: Papers at the PACs, including invited talks, contributed orals and publication only.

Because of the success of utilizing posters for sharing and releasing information at other meetings, the PAC OC decided to adopt the poster option at PAC'75 in the DC Shoreham hotel. Based on the success of the PAC poster sessions shown in Fig. 3, the LINAC conference also adopted this method in 1979. Also shown is the change in the publication-only option, which was no longer allowed after 1990. The poster option blossomed as a convenient means of sharing and discussing information, averaging about 1200 posters from the 1990s, at the same time that the publication-only option was being eliminated. Based on success of the poster session option and the number of abstracts being submitted, around 1990 the PAC OC decided to have two separate poster sessions per day – one in the morning and one in the afternoon, being held concurrently with the parallel sessions. Eventually the PAC PC instructed authors of poster papers to 'man' their poster for the specified hour and not to just post a copy of their written submission for the conference record.

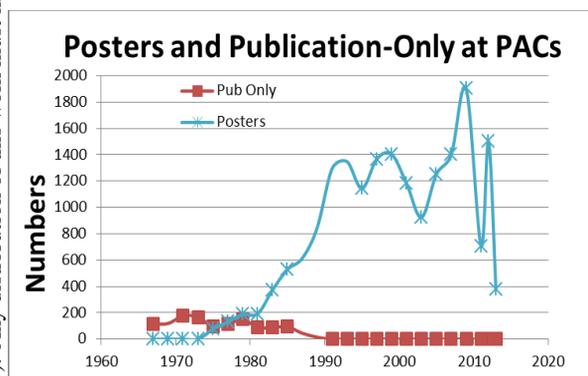


Figure 3: Papers at the PACs in the poster and publication-only categories.

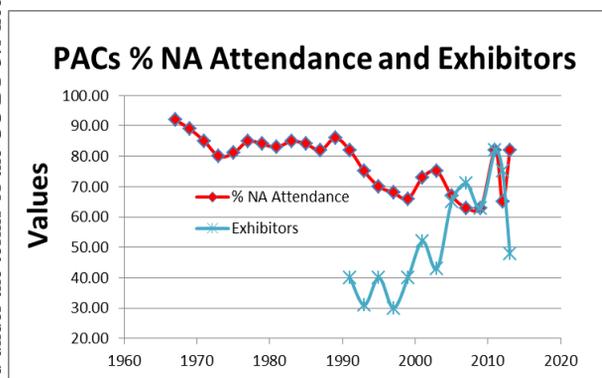


Figure 4: Attendance at the PACs in percentage of those from North America (NA) and the number of industrial exhibitor booths at the PACs.

Figure 4 shows that from 1965 to 2009 the percentage of PAC participants from North America (NA) decreased from 90% to almost 60%, indicating the international interest in the popular PAC series. With the advent of the

IPAC series this has changed back to about 80%, except remaining close to 60% for the IPACs held in NA.

The figure also shows the doubling from 40 in number of industrial exhibitors, except for NA-PAC'13 which was the first PAC held under the North American series, NA-PAC; this series continues in the USA separated by 18 months from the IPACs held in NA. Mixing the industrial exhibitor booths with the posters and the coffee breaks provided a winning situation for everyone. As electronic systems developed, the PACs introduced the internet café and ensured that there was no wi-fi in presentation rooms.

### Conference Format Changes

The duration schedule for the PACs started with a three day period, which lasted until PAC'85 when the period was increased to four days and then to five days for PAC'95 and beyond. After much PAC OC discussion the periods were increased based on the number of abstracts being submitted, and the concern over multiple parallel sessions combined with poster sessions making it difficult for participants to use the PACs for their best benefit.

The number of parallel sessions were two until after intense PAC OC discussion increased the number to three for PAC'71 and beyond, except for specific reasons being only two at PAC'85, PAC'87, PAC'89, PAC'91, PAC'11 and NA-PAC'13. Today the number of sessions is determined by rounding up to the nearest integer value the expression  $N_{att}/500$  where  $N_{att}$  is the expected number of attendees in the submitted draft conference budget.

### The 1960's

The first three PACs held in Washington, DC were considered a big success associated with attendance and feedback from the accelerator community. To indicate that the world does not change that much for those in the accelerator business, three quotes follow – the first two from PAC'65 and the third from PAC'69:

- “We have thus a situation where specialization is taking over, and the success of an accelerator's operation depends on working out effective cooperation among builders, operators, experimentalists, data reducers and theorists.”
- “To achieve public understanding, as well as to improve general comprehension of the methods and aims of high energy accelerator physics, better communication of the technical community with laymen is essential.”
- “This has been a year of limited budgets, particularly for travel, and the Organizing Committee for the 1969 Particle Accelerator Conference was a little nervous about the result as far as attendance would be concerned. These fears were not justified; the 1969 Conference was just as successful as were those in 1965 and 1967.”

### The 1970's

Three parallel sessions were introduced at PAC'71. PAC'71 also introduced a 'papers-in-progress' electronic

system for all three parallel session rooms to indicate which papers were currently being presented in the three session rooms. Poster sessions were introduced at PAC'75.

### *The 1980's*

Conference publications in IEEE Transactions of Nuclear Science were changed to a conference record, so they were not of the same nature as for previous PACs.

After much discussion in Europe, the first EPAC was held in 1988 in Rome, using some of the format developed for the successful PAC series. They held conferences in the even years so as not to conflict with the odd numbered years for the PACs.

### *The 1990's*

In 1990 the Division of Physics of Beams (DPB) was formed within APS, and discussions began between APS, APS-DPB and IEEE-NPSS regarding co-sponsoring of the PACs which to-date were only sponsored by IEEE.

In 1993 APS and IEEE agreed to co-sponsor PACs with a Memorandum of Understanding (MOU) signed by APS, APS-DPB, PAC OC and IEEE-NPSS. Within the agreement APS and IEEE agreed to share finances equally and agreed that the PAC OC would continue to be the governing body over PACs.

In 1994 at EPAC'94 in London a reciprocity agreement was signed by the PAC OC Chair and the EPAC Chair allowing PAC and EPAC to exchange resources and work together for the benefit of both conferences series.

In 1995 PAC OC decided that the only poster papers that would be published in the proceedings were those that were manned for the required time during the poster session.

In 1995 PAC OC decided that the awards portion of the banquet would be moved to a separate Awards Session held the afternoon prior to the banquet. This would then permit time for the awardees to give presentations describing their significant contributions.

In 1998 after much discussion within Asia, the first APAC was held in Japan, with planning for a three year cycle.

In spring 1998, a USA member of ICFA (International Committee for Future Accelerators established in 1976 by IUPAP) sent a letter to the DPB Chair and the two next PAC Chairs suggesting that the USA re-examine its PAC schedule to consider a three year cycle between PAC, EPAC and the APAC, while ensuring an 18 month schedule for conferences in the USA by adding a national PAC-style that would continue to benefit young people.

In 1998 DOE began considering conference banquet costs as unallowable costs in travel claims.

### *The 2000's*

In 2004 the cost for the banquet was included in the registration fee.

PAC'05 hosted the first Teacher's Day on Wednesday, providing high school science teachers an opportunity to interact with accelerator professionals and to actually use

some hardware for interesting science and engineering demonstrations.

In 2007 the PAC OC decided to introduce reduced registration fees for retirees, students and members of the professional societies IEEE, APS and EPS-AG. They also decided to rename the Awards Session as the Louis Costrell Awards Session in memory of the person who played significant roles in initiating the PACs, as well as maintaining their capabilities over the years. It was also agreed that no room rental fee would be charged to satellite meetings held within the conference venue.

At PAC'07 the Women in Science and Engineering (WISE) reception was introduced for assisting networking and sharing experiences.

At PAC'07 the popular Student Poster Session was introduced on Sunday afternoon, with awards for the best student posters.

The PAC OC met at PAC'07 and agreed to join Europe and Asia in forming the IPAC series with an IPAC in North America once every three years and with an interspersed national conference series NA-PAC to be held within 18 months of each North American IPAC.

The PACCC (PAC Coordinating Committee) met at PAC'07 and agreed to have the first IPAC in Kyoto, Japan in 2010, the second in Valencia, Spain (later changed to San Sebastian) and the third in NA at a TBD location (later decided to be New Orleans). Because of advanced planning and signed contracts, the last EPAC would be EPAC'08 in Genoa and the last PAC would be PAC'09 and PAC'11, to be followed by the NA-PACs in NA.

In June 2007 a reciprocity agreement was signed by EPAC, PAC and APAC allowing for the exchange of resources and sharing information.

A meeting at CERN in December 2007 on IPAC led to the agreement that each of the three regions (Europe, NA and Asia) would follow their rules for hosting, operating, planning and managing the IPAC held in their region.

### *The 2010's*

In 2010 the first IPAC was held in Kyoto, Japan.

In 2011 APS-DPB decided to offer child-care support for PACs attendees, employing APS resources to help vet and determine selections.

At PAC'11 one-hour tutorials were introduced for every morning sessions other than Monday, a component that will continue in the NA-PAC series.

Dedicated sessions for medical applications and for industrial applications were introduced at NA-PAC'13, components that will continue in the NA-PAC series.

In 2015 it was decided that as part of the NA-PAC series of conferences, a minicourse segment would be considered for the weekend prior to or after the conference. Such courses have been successful at other IEEE sponsored conferences and could assist with training and/or retraining.

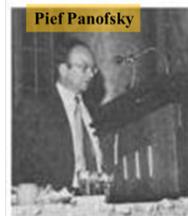
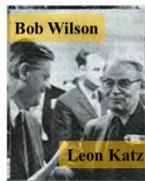
After discussion and iteration, an IPAC MOU was approved by each region and officially signed at IPAC'15.

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With interests in ensuring complete world coverage for the three regions within the IPAC community, after two years of discussion and iterations, incorporation of South America, Central America and Mexico within the PAC OC membership was agreed to by the PAC OC in 2015, which only included the USA and Canada in the past. In doing so, the PAC OC Bylaws now are for the Americas not just North America.

### Historical Pictures from the '60s and Early '70s

To show some of the early conference interactions, a few pictures from PAC'67 to PAC'73 are shown below.



## CONCLUSIONS

The PACs have provided an important means for communicating and sharing information of importance to the entire accelerator community including engineers, physicists, scientists, technologists, users, operators, students, industrial and medical applications staff and those employing accelerator-related technologies. The success of the PACs can be seen in the attendance numbers and the references to the published conference records.

## ACKNOWLEDGMENT

Some of the information in this report was gleaned from the PAC Conference Proceedings opening pages (Foreword, Editor's Note, and Committees) available on <http://www.jacow.org/index.php?n=Main.Proceedings>.

The rest of the information is based on the author's notes from PAC meetings and his interpretation of events over the years. Some IPAC'15 data was not available at the time of writing this report.

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