A History of ICANS

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Abstract

This paper sketches a timeline of events that led to the formation of the International Collaboration on Advanced Neutron Sources, ICANS, lists the meetings of the ICANS that have taken place since the founding, records the number of attendees at each meeting, shows the trends of neutron source developments since Chadwick's discovery of the neutron, recalls significant quotations from the leaders of early ICANS years, and represents ICANS as a tree, springing from its early roots into many laboratory and institutional branches, spawning special interest offshoots, surrounded by related organizations, and hovered over by a flock of publications. It is the transcript of the conference banquet-dinner talk on 7 March 2012 at the restaurant *Familia Weiss*, downtown Bariloche, Argentina.

1. Early Events

1968

In May, 1968, after cancellation of a major research reactor project, A^2R^2, Robert Duffield, then director of Argonne National Laboratory, commissioned the Committee on Intense Neutron Sources, a "What should we do now?" group. Seventeen scientists, mostly from Argonne, took part. In April 1969, after surveying many prospects and proposals and bringing together several new technical prospects, one of which was a high-emissivity H^- source enabling a 500-MeV injector Booster accelerator to increase the proton beam power of the 12-GeV Zero Gradient Synchrotron (ZGS). CINS reported that objectives for a neutron facility should be toward a proton-driven pulsed neutron source.

1971-2

I took a sabbatical leave from my University of Michigan position to Argonne National Laboratory, where O. C. Simpson, SSS division director, urged me and allowed me to test a beryllium-reflected, decoupled moderator. I piled up Be blocks left over from the A^2R^2 project, borrowed calibrated fast neutron sources, and learned track-etch particle counting. The idea increased the beam from the moderator substantially and made the pulsed spallation source idea more attractive.

1973

By 1973 ideas had evolved for a proposed 500-MeV injector-booster for the ZGS to be used part-time as a pulsed spallation neutron source. We called it ZING, the ZGS Intense Neutron Generator (acknowledging the Canadian ING proposal). The 1973 Workshop on Applications of a Pulsed Spallation Neutron Source attracted about 40 international scientists. Motoharu Kimura attended and became convinced of the ZING concept. He urged us to build a prototype, stayed

on to assist in its design, and brought his protégé Noboru Watanabe to design a powder diffractometer. We called the prototype ZING-P.

1974

Argonne built the ZING-P prototype and operated it until 1975, successfully demonstrating the concept on a low-power 200-MeV accelerator system, a prototype of the 500-MeV Booster, adapted from a disused 2-GeV electron synchrotron at Cornell University. ZING-P operated at intervals for two years, confirming neutron-beam intensity and moderator performance estimates and even producing meaningful scientific data. It had two vertical neutron beams and a lead-brick target.

1975

In October 1975, the Workshop on Uses of Advanced Pulsed Neutron Sources took place to survey instrument concepts and scientific applications. About 110 people came and addressed nine topics in separate sessions. Cliff Shull joined the panel.

1977

Argonne completed the more powerful ZING-P' prototype operating on the 500-MeV ZGS Booster synchrotron. Now having three more beams (horizontal), W and clad-^{238}U targets, we carried out moderator and target tests and operated several neutron scattering instruments. A user program started, bringing visitors and more science. ZING-P' operated until 1980.

Frequent visits from outsiders developed informal contacts and shared ideas and information.

Argonne developed a proposal for an 800-MeV, 0.5-mA High-Intensity Synchrotron, dropped the name ZING, and called it IPNS. That never gained funding (in the US) but the first phase became IPNS.

2. The Founding of ICANS

In October, Rex Fluharty (Los Alamos), I (Argonne), Leo Hobbis and George Stirling (Rutherford), and Motoharu Kimura (Japan) saw the need for a forum for meetings at which to share information on accelerators, neutron sources, and scattering instrumentation and to arrange interlaboratory collaborations. We defined the operating principles of the organization, originally called LARJ, but eventually and more inclusively, we called it ICANS.

Born of the earlier workshops, the first meeting, ICANS-I, took place at Argonne 11-15 December 1977. About 30 people attended. After a few plenary presentations on the first day, participants split into two working groups: Accelerators and Target Systems. After two days, the working groups reported their findings, which became the first ICANS proceedings—ICANS I and II were simply typed-up working group reports. Later proceedings, in the form of laboratory reports and all eventually recorded on CDs, were shared among the participants.

3. ICANS Meetings

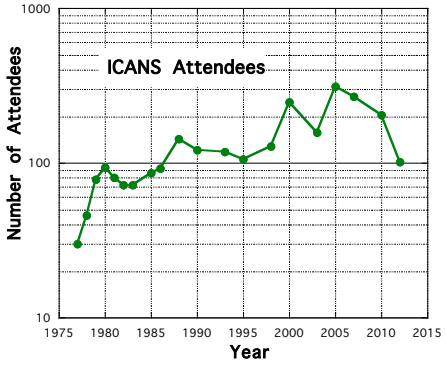
The earliest ICANS meetings were workshops, as the predecessor gatherings had been. Meetings took place at first yearly and, gradually biennially. Attendance grew until now, when it has averaged 200-300. Early meetings took place in host-laboratory offices and conference rooms. Eventually they spilled over into host-institution conference facilities, and most recently, into commercial conference facilities with inspiring surroundings. And the format has tended toward

that of other scientific conferences, mostly presentations in parallel sessions, with less workshop activity. We return to greater emphasis on workshop sessions, as in ICANS XX. The table recalls the past ICANS meetings.

ICANS Meetings

Meeting	Location	Hosts	Dates
ICANS I	Argonne National Laboratory	ANL	12-15 December 1977
ICANS II	Rutherford Laboratory	RAL	10-14 July 1978
ICANS III	Los Alamos Scientific Laboratory	LASL	19-22 March 1979
ICANS III 1/2	Rutherford Laboratory	RAL, KEK	?
ICANS IV	National Laboratory for High Energy Physics, Tsukuba	KEK	20-24 October 1980
ICANS V	Kernforschungs Anlage, Jülich	KFA	22-26 June 1981
ICANS VI	Argonne National Laboratory	ANL	28 June-2 July 1982
ICANS VII	Chalk River Nuclear Laboratory	CRNL	13-16 September 1983
ICANS VIII	Keble College, Oxford	RAL	8-12 July 1985
ICANS IX	Swiss Institute for Nuclear Research	SIN	22-26 September 1986
ICANS X	Los Alamos Scientific Laboratory and Argonne National Laboratory	LANL & ANL	3-7 October 1988
ICANS XI	Tsukuba, Japan	KEK	22-26 October 1990
ICANS XII	Cosener's House, Abingdon, UK	RAL	24-28 May 1993
ICANS XIII	Weinfelden, Switzerland	PSI	11-14 October 1995
ICANS XIV	Starved Rock, Illinois	ANL	4-19 June 1998
ICANS XV	Tsukuba, Japan	KEK & JAERI	6-9 November 2000
ICANS XVI	Neuss, Germany	KFA	12-15 May 2003
ICANS XVII	Bishop's Lodge, Santa Fe, New Mexico	LANL	24-29 April 2005
ICANS XVIII	Dongguan University, Dongguan City, China	CAS	26-29 April 2007
ICANS XIX	Grindelwald, Switzerland	PSI	8-12 March 2010
ICANS XX	Bariloche, Argentina	CNEA	4-9 March 2012

Altogether, the ICANS *Proceedings* comprise more than 10,000 pages of reports and workshop discussion summaries.

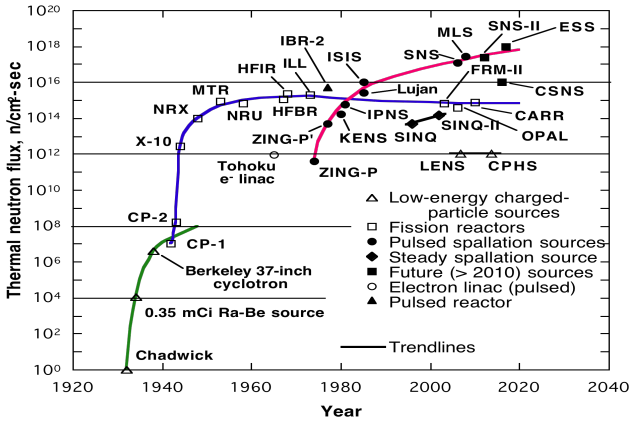


4. ICANS Attendance

The number of attendees at ICANS meetings has increased over the years, partly because the number of facilities and institutions has increased and partly because the scale of the projects and facilities has increased. Although those who took part expressed great enthusiasm for the ICANS XX program and venue, attendance fell short of the trend because, unfortunately, the governments supporting several major participating laboratories restricted scientific travel.

5. Development of Neutron Sources

In 1968, Robert Brugger compiled the earliest of these figures that represent the development of neutron sources, showing the peak thermal neutron flux available as a function of time. The figure shows a recently updated version of the Brugger plot.



Neutron sources have evolved since Chadwick's discovery in 1932 to the high-flux reactors and high-power spallation sources of today.

6. Some famous quotations

- Rex G. Fluharty (1919-1985), one of the Founders of ICANS:
  In 1967, during a seminar at Ann Arbor, a member of the audience awoke at the end of Fluharty's presentation on prospects for cold neutron moderators to ask, "What happens if you lower the temperature?" He had been sleeping.

  Rex answered, **"That's what I've been talking about."**

  It was an understatement. Although it was early years for cold moderators, Rex had, I knew, been working on cold moderator ideas, mostly solid methane, for several years before then. By now, cryogenic moderators of methane and related substances have become standard materials in intermediate-power pulsed neutron sources.

- Lots of interesting applications and instrument ideas came to light in the 1973 Workshop.

Motoharu Kimura (1908-1996), one of the ICANS Founders, a distinguished Japanese physicist and the proprietor of one of the highest-intensity electron-bremsstrahlung pulsed neutron sources, the Tohoku linac:

After that workshop, Kimura made the exceedingly important suggestion,

"You must build a prototype."

This remains an important guide in many other connections.

- Yoshikawa Ishikawa (1930-1986), one of the most vigorous members of the world community of neutron scientists and one of the pioneers of our field not only in Japan but also in the world at large:

  In the era of contention about the role of pulsed sources in relation to reactor neutron sources, said,

  "**Every neutron, good neutron."**

  Of course, we have to reject background neutrons.

- Walter Fisher (1939-2008), pioneer of the steady spallation neutron source SINQ at PSI (then called SIN), Switzerland:

  Wrote, in the proceedings of ICANS III,

  "As a result of a symposium on applications of a [spallation] source (held at SIN April 1978), we came to the conclusion that a continuous version exploits the capabilities of the SIN accelerator system optimally."

  Not as pithy a remark as the others, but exceptionally significant, as we know today.

- Another who may not wish to be identified, but whose initials are WGR, said,

  "**Real men do Spallation."**

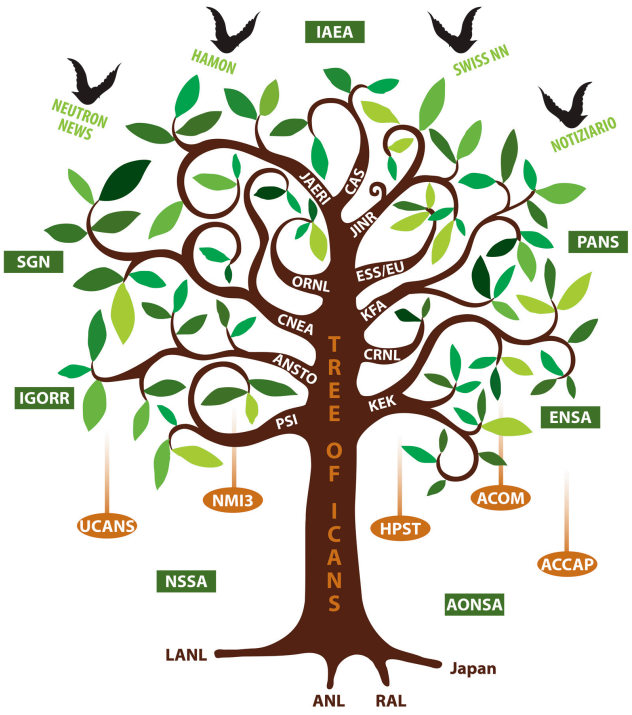
  I say, "**So do real women."** And also he has said,

  "I'm not against cannibalism."

  I reinforce this latter idea to the effect that we all have benefitted from using abandoned accelerators, disused buildings and infrastructure, left-over shielding materials, inherited detectors, second-hand instruments and components, and more. Such cannibalism usually saves time and money (be careful here, it's not always true).

7. THE TREE OF ICANS

ICANS has grown from its roots in 1977 into a spreading tree with many branches, many fruits, many related organizations, and many hovering periodical-birds. The figure shows this as the TREE OF ICANS.



The Tree of ICANS.

Conclusion

It seems clear that ICANS will continue to serve the scientific community as the wellspring of collaboration on advanced neutron sources. It will be important to maintain the close sense of community, personal acquaintances, and cooperative efforts that have helped to advance neutron source technology and scientific applications.

Together, we have become the WeCANS.

Acknowledgements

I thank Renee Carlson, Argonne CEP Creative Services and Production Division, for her artistry in rendering the Tree.