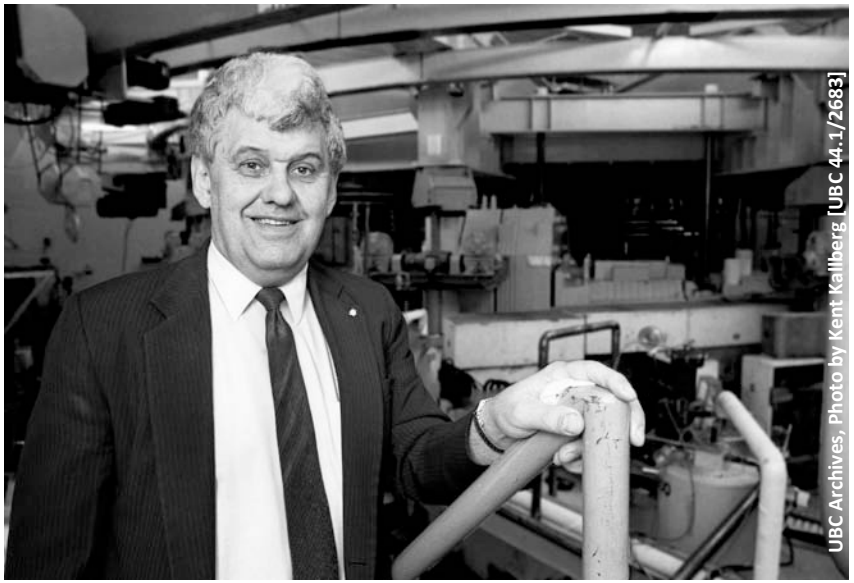
ERICH VOGT:
A CHAMPION FOR PHYSICS



M.K. Craddock
(University of British Columbia and TRIUMF)

CAP Congress, Sudbury, Ontario, 19 June 2014

TWO MAJOR ACHIEVEMENTS

Erich made two major contributions to science in Canada, through:

- **His inspiration of generations of students to take up physics**, clocking up more than 40 years of teaching.
- **His crucial role in the creation and development of TRIUMF**,
  - leading the initial funding campaign
  - then guiding its evolution from a regional to a fully national lab
  - with international connections and commitments.

In both cases it was **his ability to champion a cause effectively** that was crucial to success.

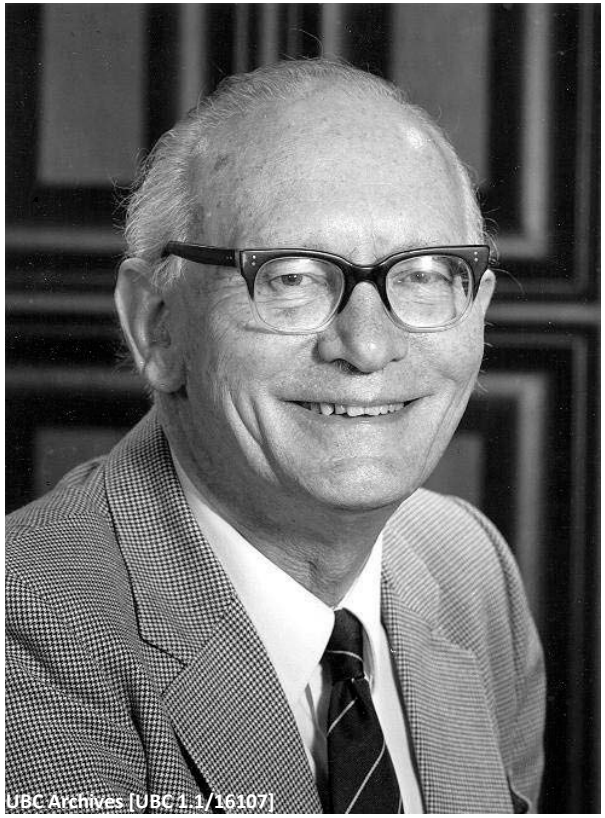
This talk will focus on TRIUMF,

- particularly the early years
- and then his later efforts on behalf of KAON.

THE TRINITY

Three people were crucial to the creation of TRIUMF:

- John Warren, who created the UBC Nuclear Physics Group
- Reg Richardson, who allowed his UCLA cyclotron design to be used
- Erich Vogt, who championed the cause with government



John Warren

Reg Richardson

Erich Vogt

UBC BEFORE TRIUMF

John Warren arrived in 1948 with a mandate from Gordon Shrum to build a **3-MeV Van de Graaff**, and create a Nuclear Physics Group.

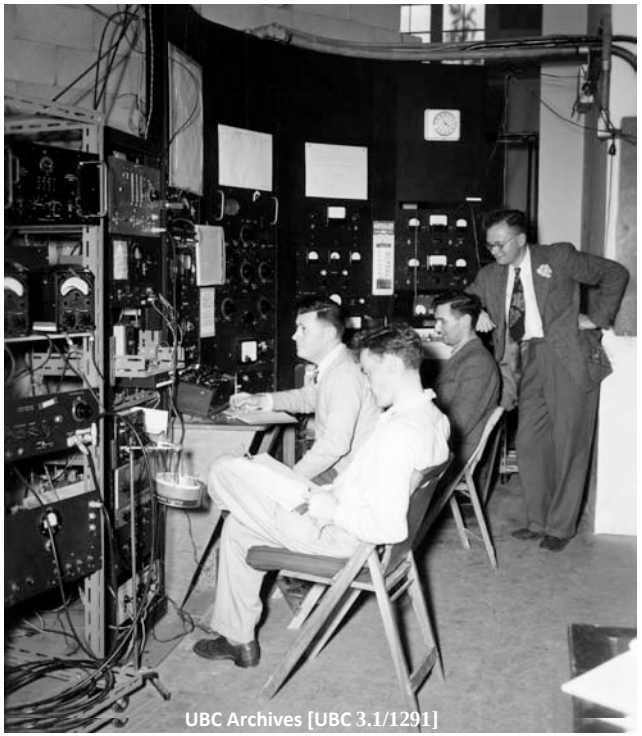
Home-designed and built, the Van de Graaff came into operation in 1951, the first particle accelerator in western Canada.

Under John's inspirational leadership the lab prospered, and by the early 1960s more than 50% of Canada's nuclear physicists were graduates of UBC.

But UBC was being overtaken by higher energy accelerators at other Canadian universities (McGill, Queen's, Saskatchewan, McMaster).

John's ambition was to move into particle physics, but a 1959 proposal for an 7-GeV proton synchrotron at UBC was rejected.


UBC Archives [UBC 3.1/401-1]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TRIUMF IS CONCEIVED

By 1964 the NP Group had grown to 10 faculty and rather more graduate students, with some people favouring a **particle-physics** project, and others one for **nuclear physics**.

But affordability was the key, and at a meeting in May 1965 the group unanimously decided to push for a **meson factory** – offering interesting physics to both factions – and to chemists and medics:

- Proton and neutron scattering
- Proton- and neutron-induced nuclear reactions
- Pion-nuclear scattering and reactions
- Pion and muon rare decay modes
- Studies of novel radioisotopes
- Nuclear and muonium chemistry
- Biological and medical irradiation by protons, neutrons and pions.

Nuclear physicists and chemists at UVic and Simon Fraser agreed to take part and the acronym **TRIUMF** was adopted:

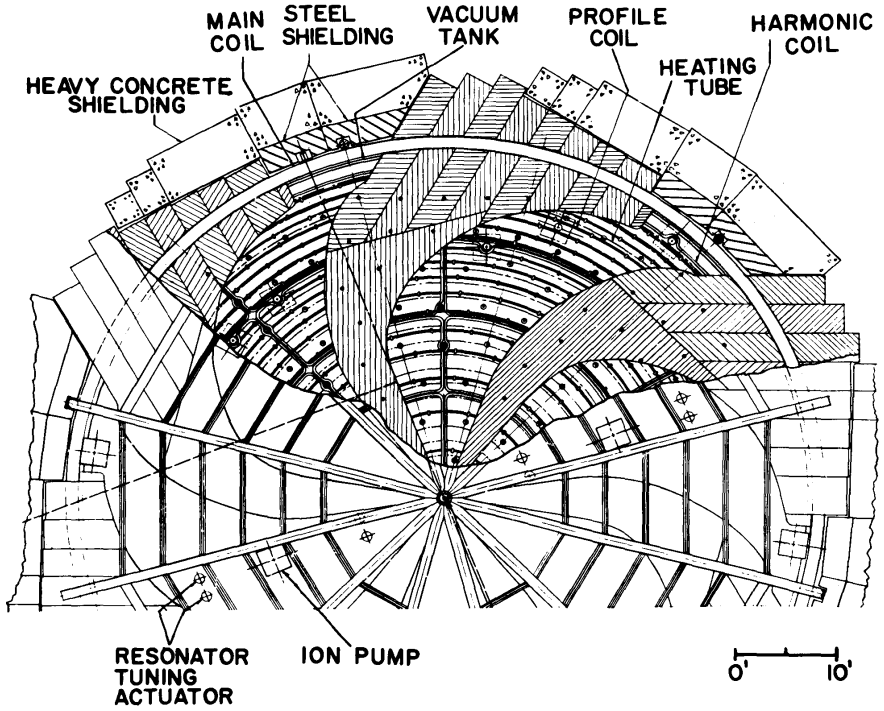
TRI-University Meson Facility

RICHARDSON CO-OPTED

Several 500-800 MeV meson factory designs were extant (2 linacs, 1 FFAG, 1 H^- and 2 p cyclotrons).

We favoured the 6-sector H^- cyclotron designed by Reg Richardson for UCLA for its versatility and flexibility:

- multiple extracted beams
- variable beam energy
- 100% duty factor.



Reg was the foremost authority on cyclotrons, and had been responsible for breaking Bethe's supposed 8-MeV limit for cyclotrons by building:

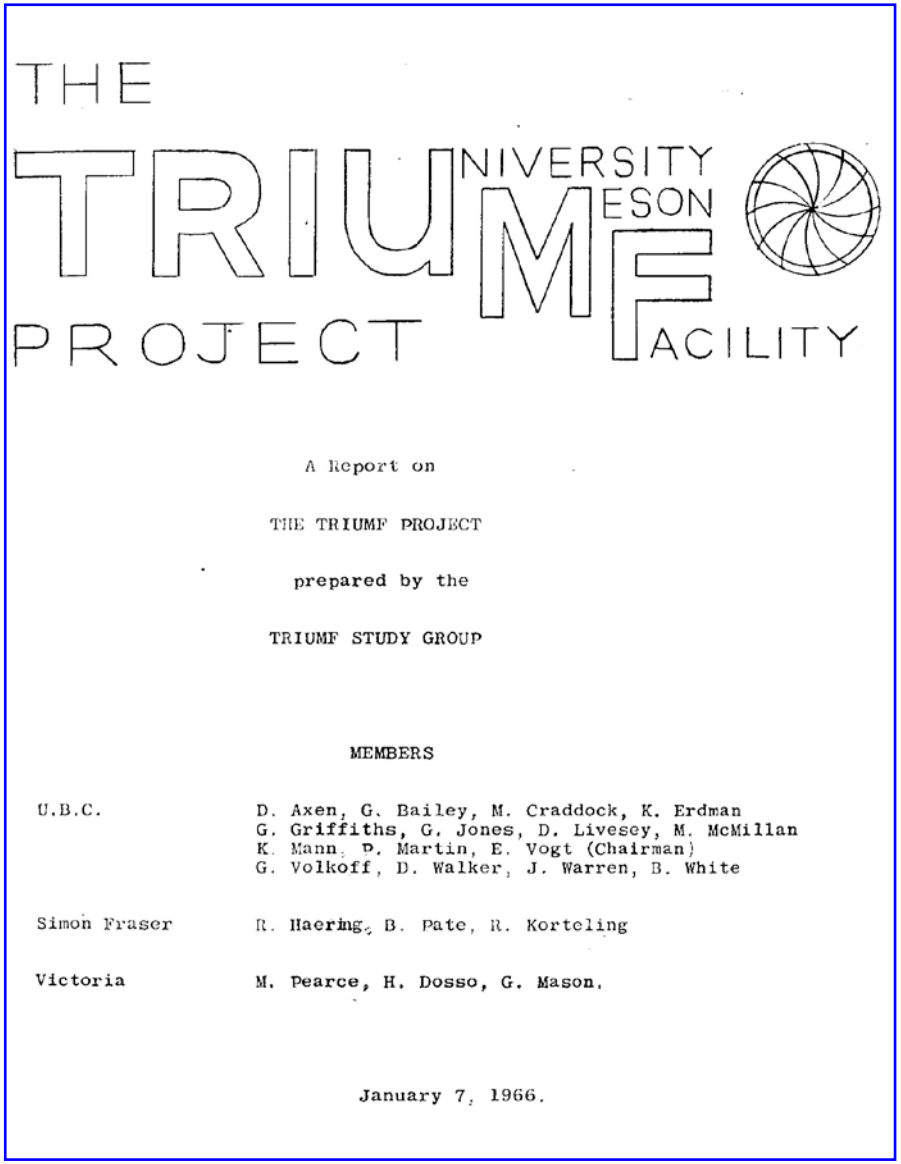
- the first synchrocyclotron (1946) and
- the first sector-focused cyclotron (1950).

Also he was originally Canadian with a summer home on Galiano Island nearby, where the UCLA design was conceived. But the US had decided to fund a linac at Los Alamos instead - so he was only too happy to have his baby built at UBC!

ERICH LEADS THE CAMPAIGN

In August 1965 Erich Vogt joined UBC after 9 years at Chalk River, and, standing in for John Warren (absent on a year's sabbatical in Europe), chaired the TRIUMF Study Group in preparing an application for a year's funding to produce a design proposal and cost estimate. Erich was kept busy chasing dilatory contributors.

The application was successful and in April 1966, we received a grant of $100,000.



THE TRIUMF PROJECT

UNIVERSITY MESON FACILITY

A Report on

THE TRIUMF PROJECT

prepared by the

TRIUMF STUDY GROUP

MEMBERS

U.B.C.	D. Axen, G. Bailey, M. Craddock, K. Erdman G. Griffiths, G. Jones, D. Livesey, M. McMillan K. Mann, P. Martin, E. Vogt (Chairman) G. Volkoff, D. Walker, J. Warren, B. White
Simon Fraser	R. Haering, B. Pate, R. Korteling
Victoria	M. Pearce, H. Dosso, G. Mason.

January 7, 1966.

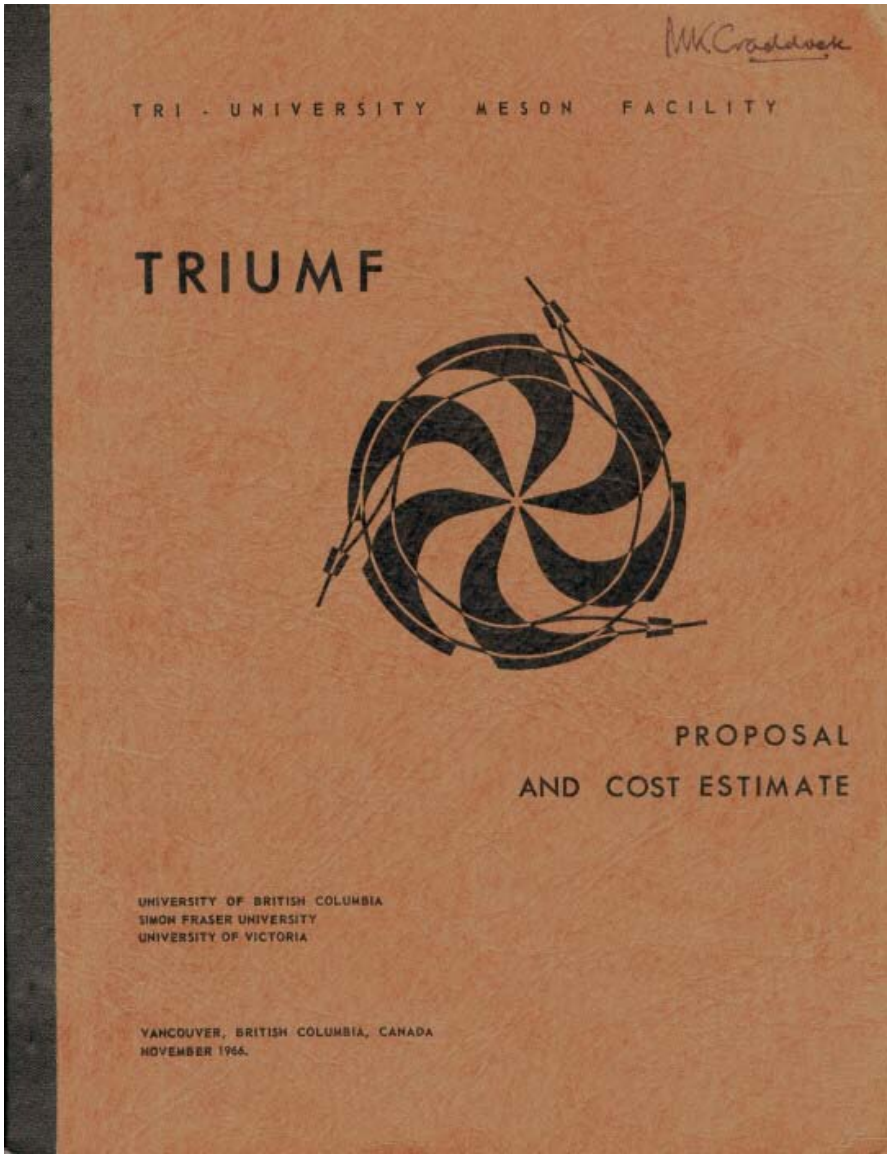
ERICH'S KEY CONTRIBUTIONS - I

The first of these was **experience in writing a major technical proposal** – in his case that for AECL's 1-GeV 65-mA Intense Neutron Generator (ING).

Our proposal benefitted greatly from UCLA's earlier work, but was no trivial reproduction. In particular, Erich led a thorough revamp of the scientific case to match the anticipated interests of Canadian scientists.

UCLA had already scaled their design, originally 700 MeV, down to 550 MeV - but even 550 MeV was deemed too expensive for Canada, so we settled for 500 MeV. And initially there would only be one experimental area, not two.

The proposal came out December 1966.



ERICH'S KEY CONTRIBUTIONS - II

Erich brought two more important attributes to the campaign:

- **a close knowledge of the eastern establishment**
  - both scientific and governmental
- **his political skill and persuasiveness**, based on diplomacy, an infectious enthusiasm and considerable self-confidence.

These skills were extensively deployed in 1966-7 as negotiations with Ottawa were largely delegated to Erich – and were much needed, because the cost was estimated at $19 million (≈M$130 today), greatly exceeding any previous university research project.

Fortunately two strong supporters were secured:

- George Lawrence, President of the Atomic Energy Control Board
- Jean-Luc Pépin, Minister of Energy, Mines and Resources

Erich explores the newly-cleared site
- leaping tall buildings would come later

MISSION ACCOMPLISHED!

Federal approval was announced in April 1968, with the universities (now including Alberta) funding the civil construction portion. A year later, to mark TRIUMF's birth, a scion of Isaac Newton's apple tree was jointly planted by Minister Pépin and the Director, John Warren.

Erich served as Associate Director both to John and his successor, Reg Richardson. The cyclotron came into operation in December 1974 - to much local rejoicing....

...and was opened formally in 1976 by Prime Minister Trudeau, here being introduced by Erich, by then Vice-President of UBC and Chairman of the Board of Management.

KAON I

The success of π-meson factories led in 1976 to suggestions in the US that K-meson factories might be even more exciting, perhaps even with Nobel Prize potential for experiments on:

- CP violation
- Antiprotons
- Neutrinos.

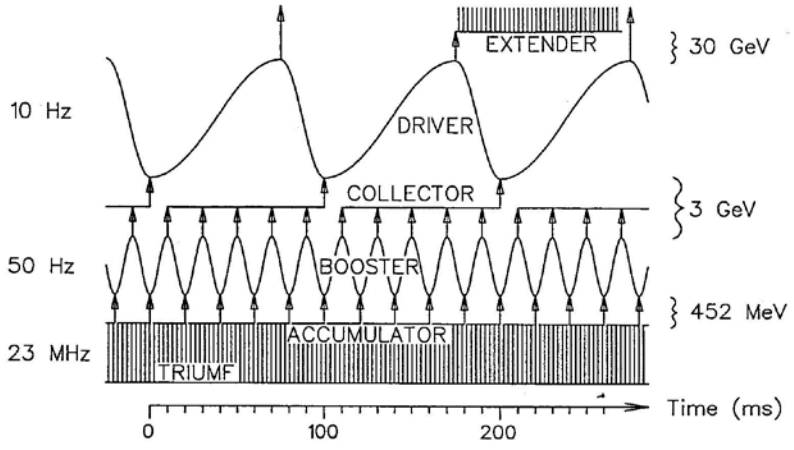
Reg Richardson reacted by outlining a design for a TRIUMF kaon/antiproton factory (based on adding 10- and 30-GeV synchrotrons) at the TRIUMF Users' Group meeting in late 1976. This generated a lot of interest and the Beam Dynamics Group and I began to study accelerator designs in more detail.

Then in 1979 we organized a Kaon Factory Workshop to discuss both experimental and accelerator possibilities, attracting >700 attendees.

Though back full-time at UBC, Erich was a strong supporter of these initiatives – and this certainly made him a popular candidate among the TRIUMF community when the Directorship became vacant in 1981.

KAON II

Once appointed Director, Erich created a divisional organization and gave more priority to kaon factory studies.



Matching the cw cyclotron beam to pulsed synchrotrons of 3-GeV and 30-GeV was a challenge, but we found a viable solution:

- by adding intermediate storage rings
- and in 1985 submitted a detailed proposal
  (greatly helped by technical advice from CERN, Fermilab, KEK, RAL, etc.)
- under the acronym **KAON** (**K**aon-**A**ntiproton-**O**therhadron-**N**eutrino).

NRC & NSERC set up joint Review Committees, who pronounced:

- "very strong scientific case - technically feasible - excellent site - but only fundable with disruption of excellent on-going Canadian research".

Erich was again our champion, but this time found Ottawa decidedly cool.

The assumption of a fixed science budget always provoked his scorn:

"Our spend on Subatomic Physics is <40% that of US/Europe in %GDP/head. How can it ever be increased except by proposing world-leading projects?"

KAON III

But while Ottawa was cool, the BC government was very receptive:

- commissioning an economic benefit study
- offering to pay for the civil construction
- persuading Ottawa to send a delegation to explore international funding (in which Erich was main spokesman), and when this showed great promise:
- securing Ottawa's agreement to a jointly-funded $11M "Project Definition Study" (PDS) to resolve design uncertainties & better determine the cost.

Erich's crucial converts were **Stan Hagen**, Minister of Advanced Education in BC (and soon of Economic Development) and his aides Jim Rae and Phil Gardner.

Erich with Stan Hagen

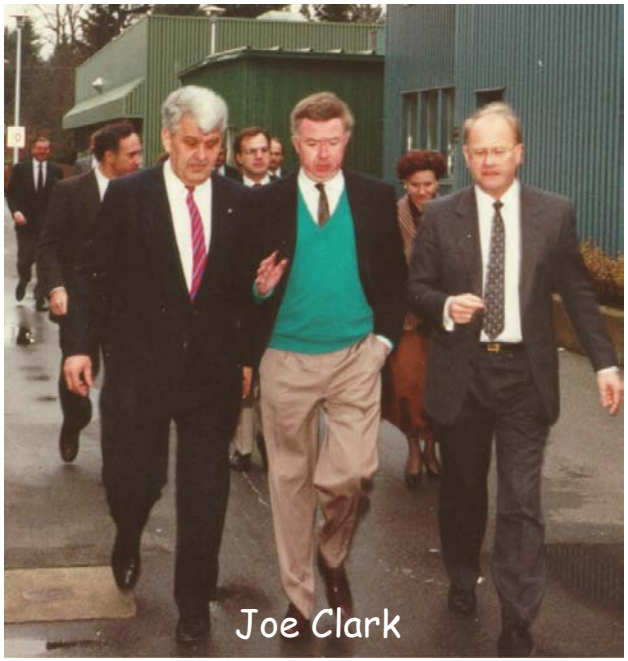
The KAON PDS (1989-91) enabled:

- hardware studies of novel components to be intensified and their performance confirmed;
- a series of workshops to be organized in Germany, Italy, USA & Japan to gauge what interest foreign scientists would have in KAON experiments.

KAON IV

Erich meanwhile was indefatigable in his campaigning at home and abroad:

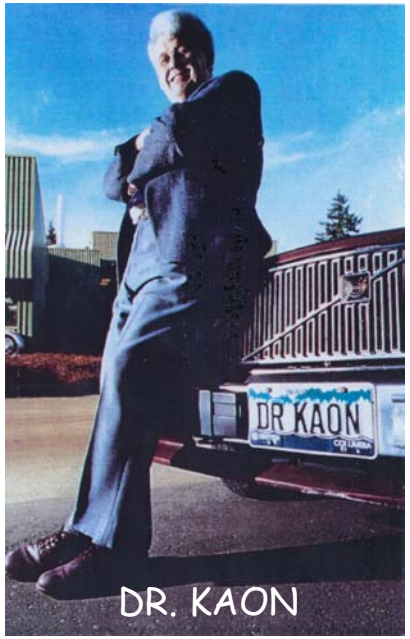

Minister Winegard


Joe Clark

Cecil Green.


PM Kaifu of Japan

Kim Campbell



DR. KAON

KAON V

In the US, the DoE/NSF NSAC committee, facing 3 kaon factory proposals (from Los Alamos, Brookhaven & TRIUMF), had set up a review, chaired by Herman Feshbach. This recommended a contribution of US$75M (C$100M)

- a notion endorsed by NSAC (and later DoE) and described in NSAC's 1990 Long-Range Plan as "extremely cost-effective".

May 1990: PDS Reports published

Cost Estimate $708M

Sept 1990: BC promises 1/3: $236M

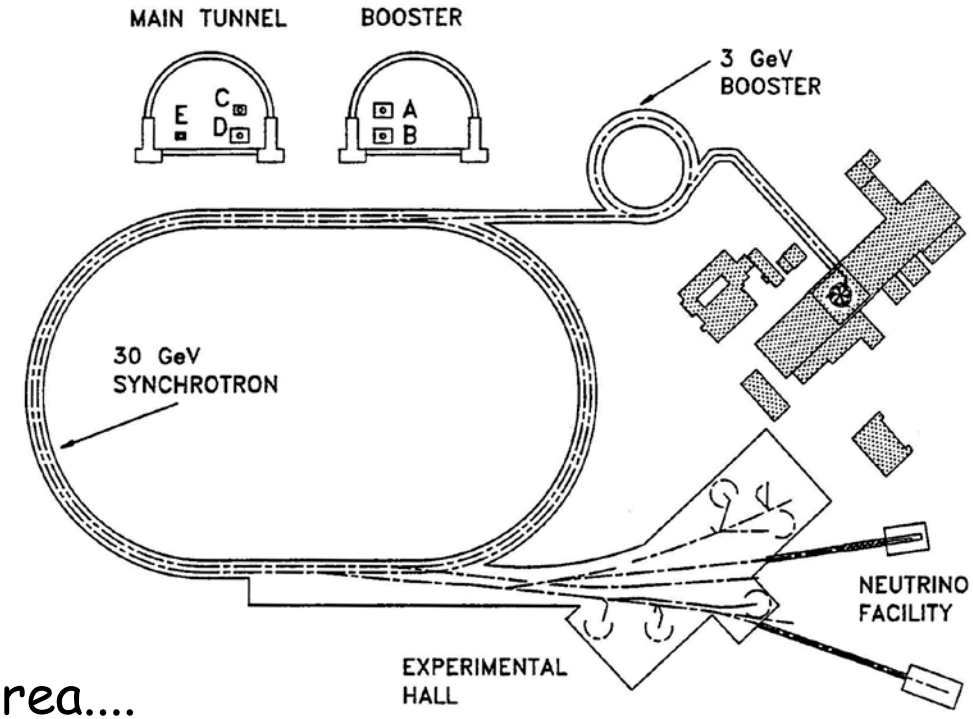
Sept 1991: Canada " " " 1/3: $236M

+ by 1992: Germany: $30M approved

Italy: $30M commitment

Japan: $60M expected

+ France, UK, Israel, S. Korea....



- a great tribute to Erich's unremitting efforts abroad!

All seemed rosy! But.....

KAON – FINALE

Jan 1993: US Democrats take over from Republicans

Sept 1993: KAON Participation Panels (KP^2) formed in US, DE, EEC, F, I, J, SK
- to choose technical packages for contributions in kind

Oct 1993: SSC cancelled

Nov 1993: Kim Campbell's Conservatives defeated by Paul Martin's Liberals

Jan 1994: KP^2 Meeting

Feb 1994: Federal cost-cutting budget – **KAON cancelled**

Dec. 2000: Japan approves J-PARC (50 GeV x 20 μA) for ~ US$ 1,335M

Erich's verdict

"It's so important, that the thing we were going to build in Canada is just now being completed in Japan — We could have been a decade ahead of everybody in the world in this — It's just a pity we couldn't lead it and reap the benefits from it." (CBC, 2008)

"An example of Canada's Bronze-Medal mentality regarding science".

KAON LEGACY

The expertise developed by TRIUMF physicists and engineers in designing and modeling KAON synchrotron and beam-line components has enabled them to make important contributions to accelerator projects both at TRIUMF and abroad in support of Canadian subatomic physicists:

- **SSC:** the novel magnet lattice for the KAON Booster, designed to avoid crossing transition, was adapted for the 11-GeV Low-Energy Booster.
- ***Brookhaven:*** the KAON K0.8 charged kaon channel was built as LESB3 at the AGS and used for the E787 and E949 rare kaon decay experiments.
- ***J-PARC & T2K:*** muon-, kaon- and neutrino-production targets; proton beam lines; μ & K channels; beam instabilities and their control; kickers.
- ***CERN-LHC:*** the $30M Canadian contribution involved the LHC, SPS, PS & PSB: construction of magnets, power supplies, rf & kicker components, and beam instrumentation; collimation straight design & other beam dynamics.
- ***SLAC:*** pulse-forming networks for the NLC damping rings.
- ***General:*** the computer code ACCSIM is now used world-wide.
- ***ISAC:*** ion-production targets, remote handling.