The sociology of collaborations

- www invented to solve the problem of the future LHC
- “territory” and dividing up the pieces of a detector, e.g., tracking system
- Fermilab crystal dual-readout - a cubic meter
- structure of a group - org charts - Steinberger, amorphous to centralized to hierarchical.
- software and simulation - first complete view of a big detector. Very powerful for understanding correlations and dependences - seldom as valid as claimed - hadronic calorimetry - validation procedures - software and conflicts
- international and cultural aspects

- www invented to solve the problem of the future LHC

Big detectors require communities of physicists, engineers, and management and support staff, and require 10-15 from concept to working detector. Except for physics, none of these skills we learned in school.

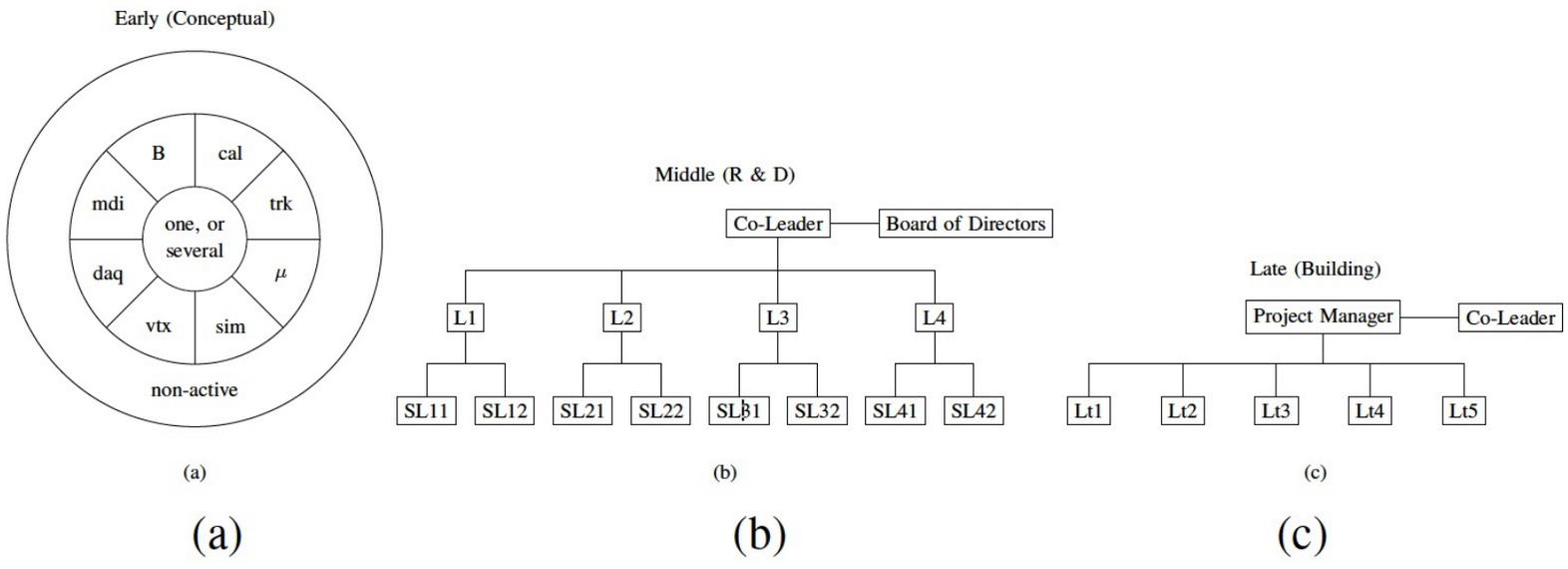
- “territory” and dividing up the pieces of a detector, e.g., tracking system

The pressures for funding and keeping people on board sometimes led to dividing, for example, the tracking system into several parts, each to be worked on by a separate group. This was each group can go to its funding agency with a claim to territory.

- Fermilab crystal dual-readout - a cubic meter

After the success of DREAM at CERN, a Fermilab person wanted to improve on it with a pure-crystal calorimeter, and wanted $5M from the lab to buy these crystals. It would have been a failure (Wigmans' advice). In contrast, DREAM/RD52 understood these issues from a small scale, using one or up to seven crystals.

- structure of a group - org charts - Steinberger, amorphous to centralized to hierarchical.



(a) (b) (c)

- software and simulation - first complete view of a big detector. Very powerful for understanding correlations and dependences - seldom as valid as claimed - hadronic calorimetry - validation procedures - software and conflicts

- simulations are critical to assembling and understanding the functioning of a whole detector.
- main problem: is it correct? Answer: seldom. Mimicry. CPU time. And, in the case of hadronic calorimetry, almost never.
- the “hypothesis” in an experiment is sometimes only made quantitative by a detailed simulation of the whole experiment.

- hadronic calorimetry - validation procedures. How do you know that the π^0 production is correct?

1. The measured non-linearity of the π/e response ration vs. particle energy

2. the measured p/π response ratio

3. the shape of the response function is Gaussian for incident p and non-Gaussian for incident π

4. the energy resolution differs by 20% (p better than π)

- hadronic calorimetry - validation procedures. How do you know that the simulation of slow neutrons is correct?

1. the energy resolution for electrons and pions vs. energy
2. … and with varied absorber-hydrogen ratios

- international and cultural aspects

Herwig Schopper wrote5) “To my knowledge, CERN is the only laboratory created to foster science and international collaboration,” and one might say that, in the beginning, “international” mostly meant European as it emerged from the economic devastation of World War Two. But a good idea cannot be confined, and CERN quickly became a truly international laboratory. The first Director-General and a prime mover of international collaboration was Eduardo Amaldo6), followed by Victor Weisskopf.

Jean-Pierre Delahaye: “I have personally been convinced during my whole professional life of the great advantages and the increasing necessity of International Collaboration. This is one of the main reasons why I work at CERN. As many of you know,
CERN was created in September 1954 not only to perform high-energy physics research,
but also to allow people from different nationalities who fought each other during the first and second world wars to work together in order that such horrors never happen again. The visionary scientists like Louis de Broglie, Eduardo Amaldi, Lew Kowarski, Niels Bohr and others who promoted the idea, were convinced that by working together, people from different nationalities would not only get to know and appreciate each other better, but they would realise that “good guys” and “bad guys” exist in every country and nationality, with a proportion of each corresponding to a constant of mankind. Demonstrating the universality of this constant could constitute an interesting thesis in sociology.” 7)

Robert Wilson On the other side of the Atlantic was a nation barely scathed by war that, throughout its large populace, had little interest in international collaboration. Out of the Manhattan Project and its destruction of Hiroshima and Nagasaki came many physicists convinced that “the same kind of thinking” was not working very well, and one of these was Robert R. Wilson who built Fermilab ahead of schedule and under budget, and doubled its energy with superconducting magnets. He was courageous in the political arena as well, and a hero among young people for this exchange with Senator John Pastore before the Congressional Joint Committee on Atomic Energy for funding of $200M for the new “Fermi National Accelerator Laboratory”:

Pastore: Is there anything connected in the hopes of this accelerator that in any way involves the security of this country?
Wilson: No sir; I do not believe so.
Pastore: Nothing at all?
Wilson: Nothing at all.
Pastore: It has no value in that respect?
Wilson: It only has to do with the respect with which we regard one another, the dignity of men, our love of culture. It has to do with those things. It has nothing to do with the military, I am sorry.
Pastore: Don’t be sorry for it.
Wilson: I am not, but I cannot in honesty say it has any such application.
Pastore: Is there anything here that projects us in a position of being competitive with the Russians, with regard to this race?
Wilson: Only from a long-range point of view, of a developing technology. Otherwise, it has to do with: Are we good painters, good sculptors, great poets? I mean all the things that we really venerate and honor in our country and are patriotic about. In that sense, this new knowledge has all to do with honor and country but it has nothing to do directly with defending our country, except to make it worth defending.

Andrew Sessler and Edmund Wilson In Engines of Discovery: A Century of Particle Accelerators, Sessler and Wilson [6] write

“The endeavor of building these machines then brings together young people from many nations. It teaches them that - in a world where reason is the ultimate test of validity for any new idea, and where politics must therefore by subservient - there need be no barrier between nationality, race or creed.
In the formation of this community of scientists, the prejudices which separated the warring states of Europe were the first to crumble. Those who came to CERN in the 1950s immediately shed the propaganda which had clothed their thinking for a decade. Even during the darker days of the cold war, scientific contacts with Russia were maintained in the field of accelerators and particle physics. As Europe has unified and the iron curtain has fallen, new states have looked to particle physics research for their first tentative step towards a broader political union.”

Takeo Kawamura More recently, Takeo Kawamura of the Japanese Diet gave a talk at the TILC08 meeting9)

“In the history of civilization, human beings have been nurtured by culture and art, and we are pushing the boundaries of science with the mind challenging the mystery of nature and life. We feel satisfied when the desire to know or learn is fulfilled, feeling a sense of high contentment or spiritual richness. And when we feel spiritual richness, we will have a sense of happiness being a human, making us feel grateful to be born in this world.

In the Japanese constitution, it declares [our] will to hold an honorable position in international society. It think it is time for us to put our effort into becoming the world’s top nation in spiritual richness. And the spiritual richness derived from science must rank with that from culture and art. The nation’s maturation is no longer measured only by economic indicators such as GDP. We have new indicators to measure a nation’s maturation such a GNH (Gross National Happiness). Now we should regard basic science as one of these indicators.”

Physics “benchmarks”