

# It is the spirit that counts - people at and around CERN -

Herwig Schopper

at the occasion of the 60<sup>th</sup> anniversary of  
CERN

CERN Colloquium, 16. September 2014

**Thanks to John Ellis and Horst Wenninger for presenting excellently the scientific and technological achievements in the LEP I area**  
**and thanks to Rolf Heuer for agreeing to this meeting**

**I want to talk mainly about aspects usually neglected and not recorded in any minutes:**

**human behaviour and relations,**  
**which are equally important for success**

**was asked to talk in particular about LEP approval experience maybe useful for future projects**

# Anniversaries at CERN

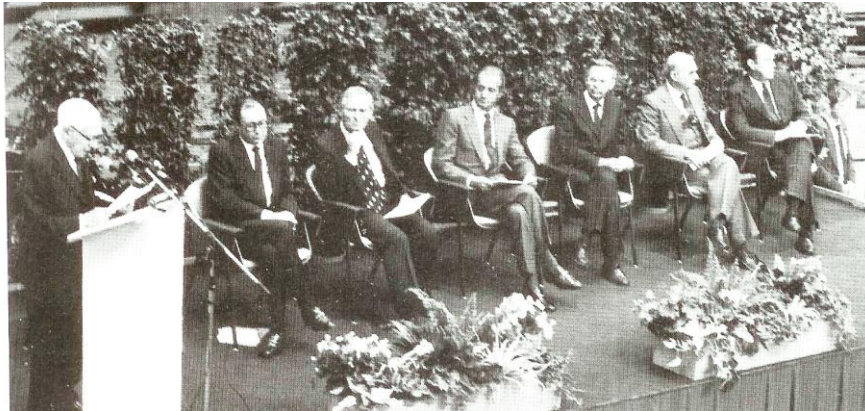
CERN seems to count in 30 system

**30<sup>th</sup> anniversary of CERN in 1984 with Isidor Rabi**

**This year**

**60<sup>th</sup> anniversary of CERN**

**90<sup>th</sup> anniversary Schopper**



**30<sup>th</sup> anniversary of CERN**

**Rabi, Aubert(CH) ,Merrison, Juan Carlos I, Schopper, Curien(F), Brooks (UK)**

give me a few minutes to explain

## How I got into High Energy Physics via Nuclear Physics

**1950 Fellowship by Swedish Foreign Ministry:**  
(one of the first German scientists allowed to leave Germany)

1 year with **Lise Meitner**

at Techniska Högskola Stockholm

introduced me to beta decay

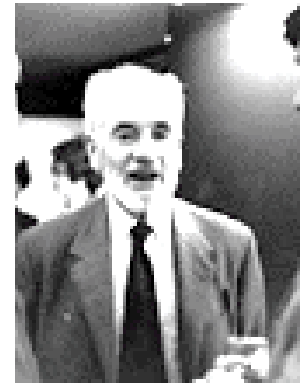
**Many discussions about women in science and  
being Jewish**

when working with O.Hahn in Berlin in the 1930ies



**In 1956 fellowship** for 1 year at  
**Cavendish Lab** at Cambridge, UK  
with **O.R.Frisch**

(with L.Meitner explanation of nuclear fission)



Frisch sent me to Colloquium at Harwell in December 1956

**Chairman W.Pauli, speaker A.Salam**

**'Two- component neutrino theory'**

**After rumours of Wu-experiment Pauli's apologies to Salam for discouraging him to publish**



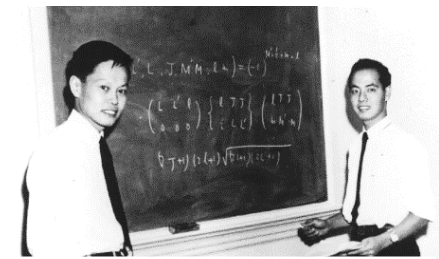
With C.S.Wu

**Do not trust authorities,  
even by the name of W.Pauli**

**I learned about P-violation**

**Did rapidly  $\beta$ - $\gamma$  circular polarisation correlation**

**Considered unfeasible by Lee and Yang**



T.D.Lee and C.N.Yang

# One more fellowship

After 1957 decision to build DESY at Hamburg  
W.Jentschke suggested to me to spend one year  
1960/61 at Cornell University with **R.R.Wilson**  
to learn electron scattering at round machine

## First meeting with Bob

**Lab - Directors are not semi-gods  
but easily accessible colleagues**

Physicists had to operate synchrotron and experiment  
**Bob** cutting the edge of synchrotron magnet

Bob was artist, high rise building, founder of Fermilab



# My first visit at CERN

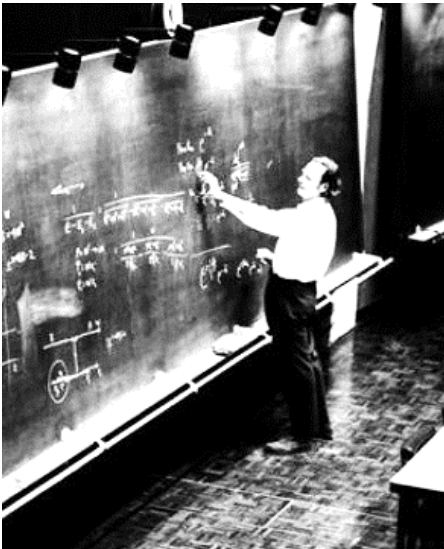
## Rochester Conference at CERN July 1958.

Session Fundamental theoretical ideas

Heisenberg's talk on 'great unification'  
'World Formula'

Chair. **W.Pauli** (died December 1958)

**"There are no new fundamental ideas,  
M. Heisenberg please take the floor"**



**First meeting with R. Feynman**

**His suggestion: lets go to Bata Clan  
Study psychology of partners**

# Getting to know CERN as a physicist

Invited to spend one year at CERN 1964/65

**Pion production with Arne Lundby ,**  
Norwegian accepts German!  
(P.Carlsson, D.Hartill, Yu.Galaktionov, et al)  
**got to know spirit of international  
collaboration in a CERN group  
(family)**





## Later CERN experiments with Karlsruhe group

**1966 Neutron scattering on p and nuclei**

**Development of STAC (MC optimized)**

(SamplingTotalAbsorptionCounter  $\leftrightarrow$  hadron calorimeter,

Laughed at since not competitive with magnetic spectrometers,  
became important for colliders to cover large solid angle

**Minister Riesenhuber, chemist  
visits UA1**



**experiments 1966/67 at PS, ISR,  
and Serpuchov**

(First sit-in strike of students on Soviet soil)

Where are thermometers?

# Getting to know the administration of CERN

Followed Peter Preiswerk (member of first Council)  
as **NP Division leader 1970/73**



## My Bosses as **Scientific Directors**

**G.Cocconi** followed by **J.Steinberger**

did not like their administrative jobs, preferred to work with their groups

For scientist the **scientific reputation**  
**more important than hierarchical positions**



Mervin Hine  
(Gray eminence)

Zilverschoon, Johnson

# DG 1981-88

## Appointment procedure in 1980

Difficult, 11 country yes, one against

No overruling!

Procedure to get unanimity and *Keep face!*

Interview in CC on February 1980

### Main tasks:

- get LEP approved and built
- Unification of CERN I and CERN II

**Unanimous Decision**

**C. President Jean Teillac**



Paul, Stafford, ?, van Hove, HS, Teillac, Anderson, Adams

**Hope that solidarity among Member States will continue in spite of their increasing number**

# The LEP proposals

LEP Study	Beam energy GeV	Circumferenc km	Cost MCHF	Year	Comment
LEP 100	100	50	Too high	1976	
Blue Book	70	22	?	1978	Refused by SPC
Pink Book	86 (130)	30.6	1300	1979	(sc Rf cavities)
Pink BookRev	same	same	950	June 1980	No new injectors
Green Book	50 (100)	26.7	910	1981	My proposal

Pink book proposed by J.Adams and L.van Hove

After my appointment: Very good Cooperation with outgoing DGs

Common proposal to Council in June 1980

Pink Book revised, using existing machines as injectors

-> cost reduced,

-> participation of all Member States in LEP (Basic programme)

**'no MS voting against'**

Cost still too high to get agreement of all MS

Green Book 1981, but before.....

# Main problem: Circumference of tunnel ??

**Geological problems under Jura:**

**G.Lombardi: 'Reduce size and move out of Jura,  
or let others build the tunnel'**

**Advise from two respected colleagues:**

**Avoid mountains -> 23 km**

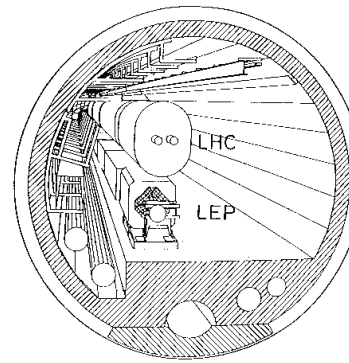
*J.Adams: "it seems to me that your choice now is either to battle on with the 27 km circumference LEP .....a serious risk of delays and overspending on the project, or to go flat out for a smaller LEP which would avoid all these problems."*

*C.Rubbia: "---I believe however that one should go further and avoid the mountain completely. This corresponds approximately to a new circumference of 23 km..... I would strongly advocate that one takes the fastest and safest solution of remaining under flat land..".*

Difficult decision :  
23 km sufficient for e+e-  
Choice of 27 km  
only in view of LHC  
(SSC was progressing in USA)  
8 km still under Jura  
on inclined plain

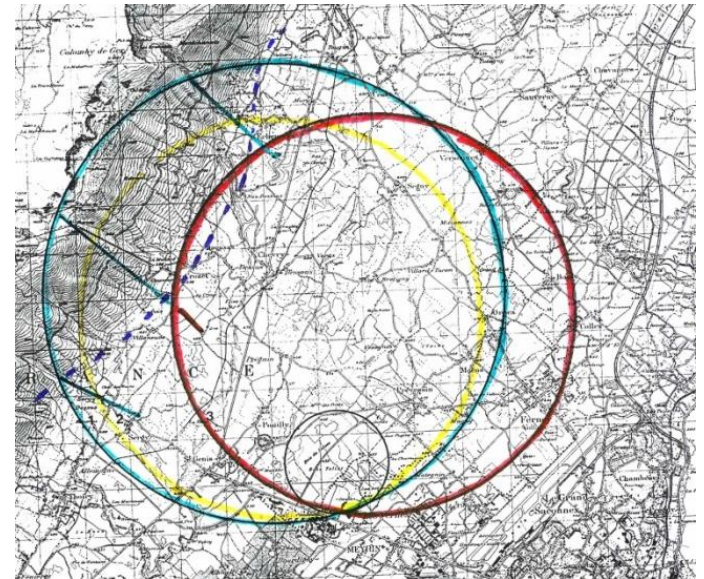
Position of LEP:  
Lonely secrete decision,  
no committee recomendations

Price to pay:  
Water in tunnel,  
LEP one year delayed



LARGE HADRON COLLIDER  
IN THE LEP TUNNEL

LHC discussions had  
started



# Final proposal

Green Book, Submitted to Council June 1981

## Conditions:

- **stripped-down LEP 1** (minimum for Z production)
- LEP evolving machine (LEP I, LEP II, **LHC**)
- Only 4 interaction regions (instead of 8)  
**and first time at CERN:**
- **Constant budget** Investment for machine CHF 910 million  
**with no contingency – time is contingency**
- **no funds for experiments!** (revolution at CERN)  
**Users would have to find funds**  
only CHF 20 million for experiments infrastructure

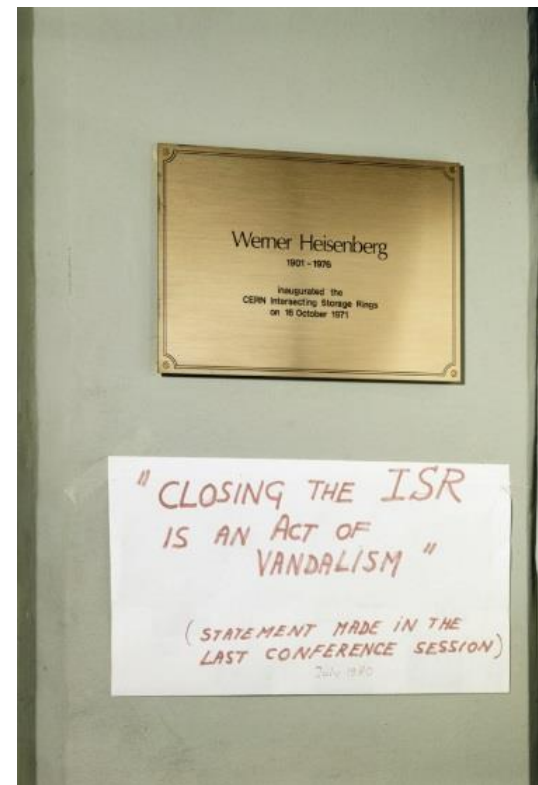
# Consequences of budget limitations

- **ISR stopped in 1983 (only p-p collider in the world)**
- **BEBC (Big European Bubble Chamber) closed down**
- **Most of PS and SPS fixed target programme (West Hall) stopped or reduced**
- **SC-ISOLDE operation hours cut by 30%**
- **Accelerator research concentrated on sc rf cavities and sc magnets**

**Lost many friends,  
most came back**

**But**

- **Heavy ion physics at SPS started (financed from outside)**





But : continue  $p - pbar$  at SPS  
UA1 and UA2

even providing additional funds

## 1983 Discovery of Z and W



Press conference discovery

Rubbia, van der Meer, Schopper, Gabathuler, Darriulat,



C. Rubbia and S. van der Meer  
Receiving Nobel Prize

# LEP Approval still very painful

**MS afraid that LEP needs would eat into national programmes**

**Long fight about constant budget level:**

**final compromise CHF 617m, lower than proposed**

**Constant budget with Indexation? 'No gentleman agreement'  
(part indexation for material, not for staff), yearly fight**

**Budget was considered unacceptable by SPC  
and Staff Association**

**"LEP is built at the cost of staff; Resign!"**

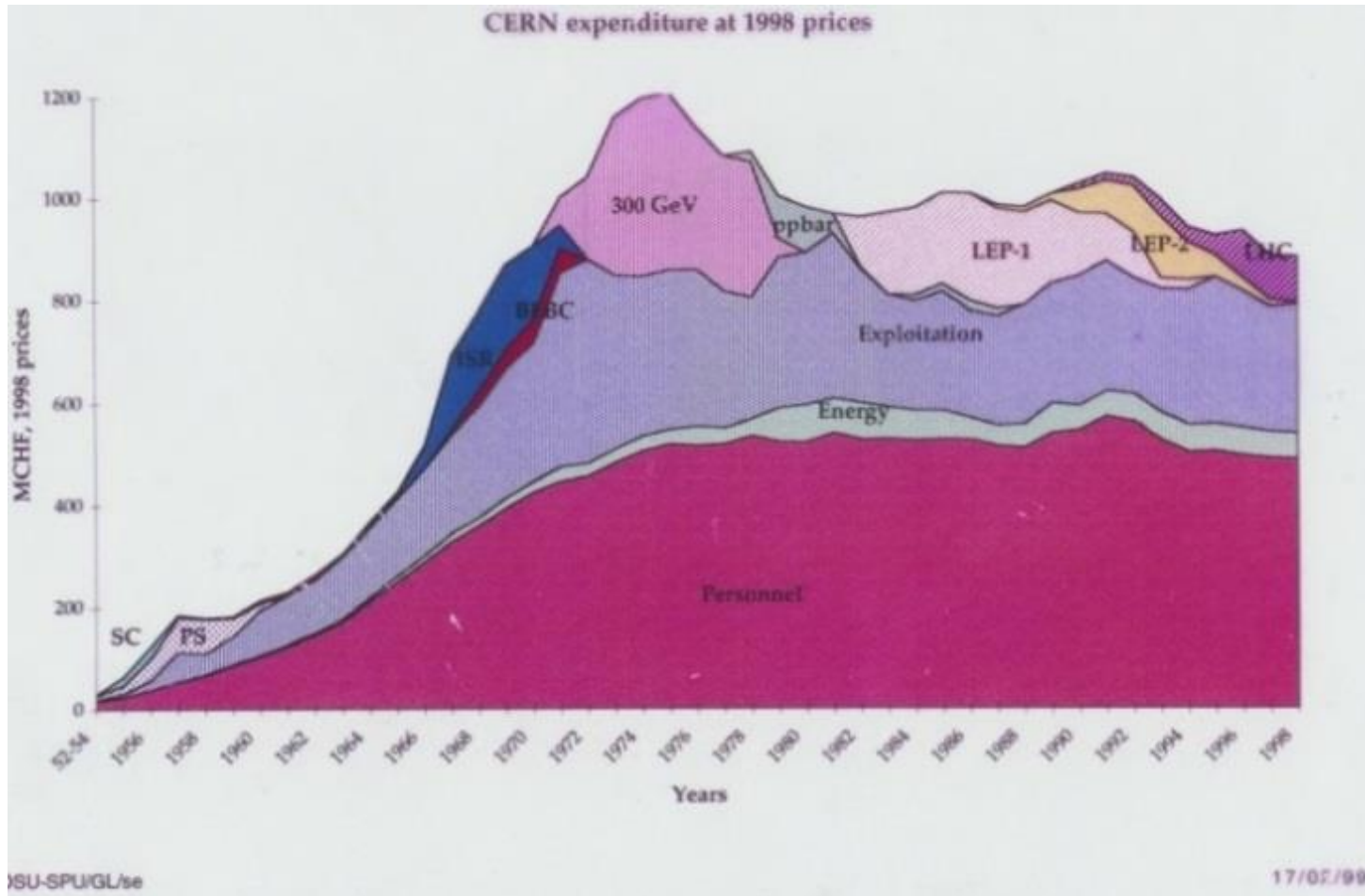
**Council June 1981: 8 MS in favour, 1 ad referendum, 3 internal discussions**

**Special Council : October 1981 unanimous approval**

***Promise of constant budget was decisive for approval***

# Constant budget since 1981 (for ever?)

glorious time up to SPS



Little bumps due to new Member States (Spain, Portugal)

**Appointment of Project Leader:**

**Emilio Picasso**

**not an accelerator expert !?!**

**why: human aspects -> find people in all divisions**

**30 % of staff had to be redeployed !!**



**Regret that he and many others  
cannot be with us today**

# LEP budget management

**Overall Budget control and distribution  
overview by only 3 people (E.P., H.S., Bühler-Broglin)**

**No budgeted allocation for various components,  
ask department leaders: 'build as cheap as possible'**

**Results:**

**components with new technics (magnets, rf, vacuum): cheaper  
conventional material (power, cables, tunnelling): more expensive**

**LEP I was built within (few %) of the approved budget**

**Was possible only thanks to remarkable efficiency,  
dedication and imagination of staff**

# KEY PLAYERS

## LEP project management board

**E.Picasso (Project leader)**

**G.Plass (Deputy)**

**R.Billinge (PS)**

**F.Bonaudi (Infrastructure)**

**C.Bovet**

**H.Laporte (Buildings,tunnel) DG**

**B.de Raad (SPS)**

**H.P.Reinhard (vacuum)**

**L.Resegotti (magnets)**

**W.Schnell (RF system)**

**G.Brianti (Techn.Dir)**

## And many more

**Do not forget all the other staff,  
services, administration,.....**

**All were essential!**

**Very efficient form of management,  
With its essential basis:**

- have confidence in the competence of staff,**
- give them responsibilities**

**Much better than formalised ('modern')  
management (computer) control systems**

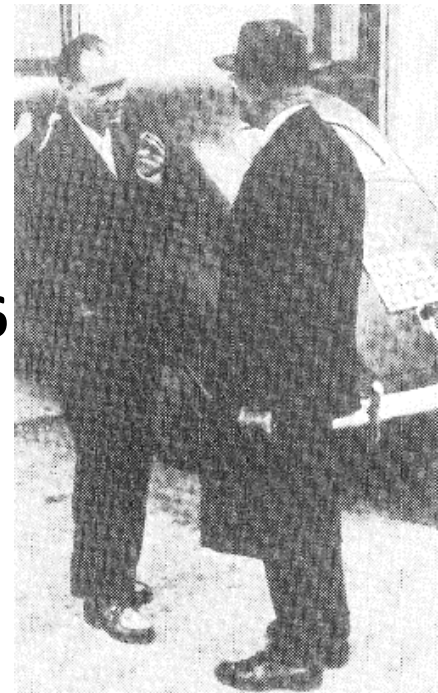
**Beware CERN  
from bureaucratic management fashions  
becoming obsolete after a few years !**

# Dialogue with the population

**Important Problem: change perception of CERN !**  
CERN not known to environment,  
wanted by previous policy (misunderstanding of “N”)  
**about 200 information meetings in French villages**

**public discussions at university GE**  
story **Denis de Rougemont**, Swiss poet,  
Great European  
Founder of Institute of European Culture 1946  
Founding father of CERN

**Understand real motives of opponent**



D. De Rougemont, R. Schuman



## Legal problems for LEP approval:

**CH:** public referendum necessary? No!

Decision by **Jaques Vernet** (Cons.d'Etat)

**courageous decision** on his last day in office



**F:** property owned down to centre of earth  
(≈2000 owners)

Get “declaration d'utilité publique” requires étude d'impact

**Enemies' slogan :** “CERN was in the Pay de Gex,  
now Pay de Gex inside CERN”

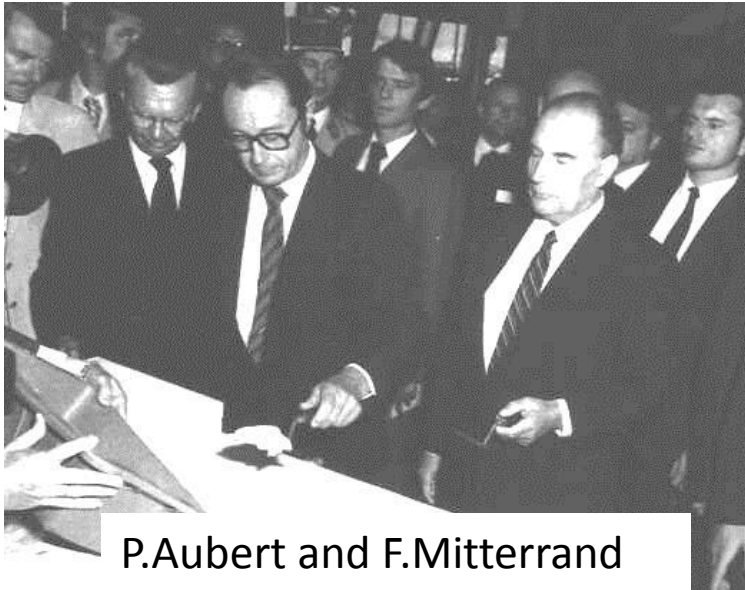
**Other problems:** traffic (100.000 truck loads of rocks),  
Cooling towers spoil views, damage to water supply

**MOST PROBLEMS TODAY FORGOTTEN!**

# Finally LEP construction could start

Ground-breaking 13 September  
1983

getting outside labour!



P.Aubert and F.Mitterrand

Lab visit?



Lunch discussions

## Six Stages of a Project

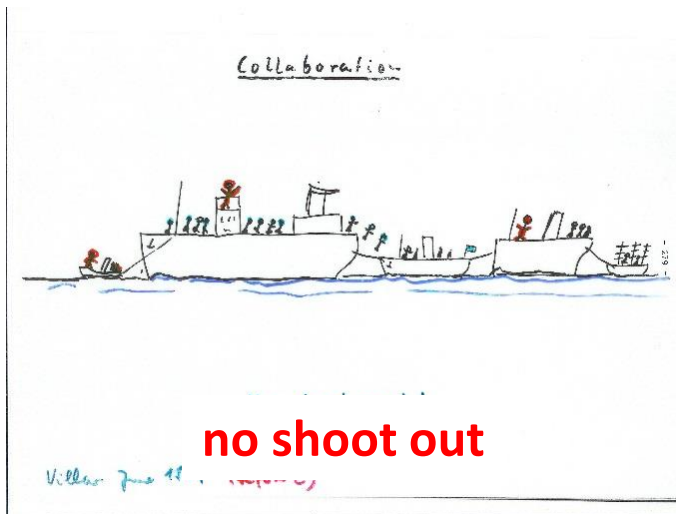
1. Wild enthusiasm
2. Total confusion
3. Complete disillusion
4. Search for the guilty
5. Punishment of the innocent
6. Promotion of the non-participants

With the complement of the Lyf Project Leader  
familis

# LEP experiments

With LEP experiments new epoch started at CERN:

- Financing from outside, also Non-Member States
  - **All scientists interested should be able to participate,**
- Selection procedure: 6 proposals, 4 interaction regions



Marriage market at Villars-sur-Ollon,  
June 1981,  
Club Méditerranée (gentil animateurs)

My imagination of future  
collaborations  
No dominating partners

# 4 LEP experiments approved

**ALEPH, DELPHI, OPAL, L3** (nice names, except L3)

2 **strong** leaders, 2 **democratic** leaders, **would both work?**

**YES !! Democratic style became models for LHC**



Michelini, Amaldi, HS, Laporte, Steinberger  
Later R. Heuer



Sam Ting

**Difficulties:**  
**Contributions in kind,**  
**Components from**  
**various countries must fit**  
**together**  
**and delivered in time**

**Horst Wenninger,**  
**Technical**  
**Coordinator for**  
**Experiments**



# **'EXPERIMENTS' AT LEP AND LHC**

## **- A NEW OF WAY INTERNATIONAL COLLABORATION**

- **'Experiments' International organisations of their own** with several 1000 scientists from many countries
- **Own Budgets several 100 million \$** each
- **No legal hierarchical structure (no legal boss!)**  
Spokesperson, coordination committee, resources committee,
- **Objectives defined bottom-up, consensus seeking**
- **'equal' partners** (no dominating country or group)
- **CERN provides frame for overall coordination**

**A 'Style' Cultivated at CERN over 30 years period**  
**Should be followed by other projects**  
**New way of global cooperation?**

# Abragam Committee

## Review of management of CERN

Chair Anatol Abragam,

members high level industrialists,

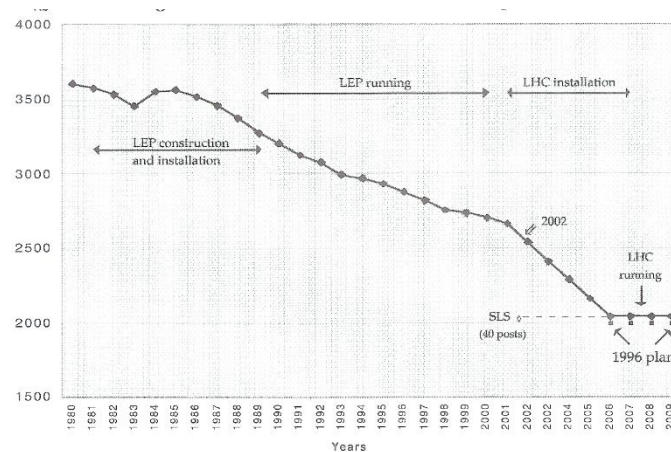
secretary Chris Llewellyn Smith



Did not know each other

**Benedetti (Olivetti): CERN is sclerotic (staff turn over few %)**  
**Main advice: reduce staff by early retirement plan**

**Council decision:**  
**Do it but no money for**  
**Pension Scheme**  
**Decision with longlasting**  
**consequences, still today**



**CERN always plans far ahead !**

## Long Range Planning Committee

**Established by Council in 1985**

**To study the future of CERN after LEP**

**Chair: Carlo Rubbia**

**Subpanel for p-p collider in LEP tunnel**

**Chair: Giorgio Brianti**

**Proposal for LHC in 1987**

**«if decision in 1989...first collisions at LHC by 1995»**



# VIP visits

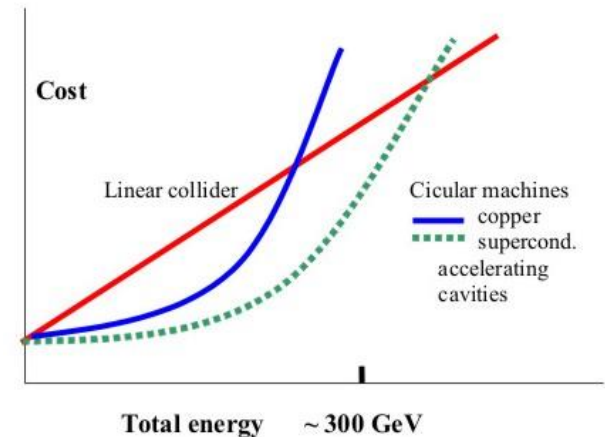
just 3 examples

**Margaret Thatcher** (very charming, well prepared)

“I am here as fellow scientist, not as Prime Minister”

## Questions:

- Why ring and not linear colliders?
- How big will be the next ring?



# Queen Beatrix of Netherlands

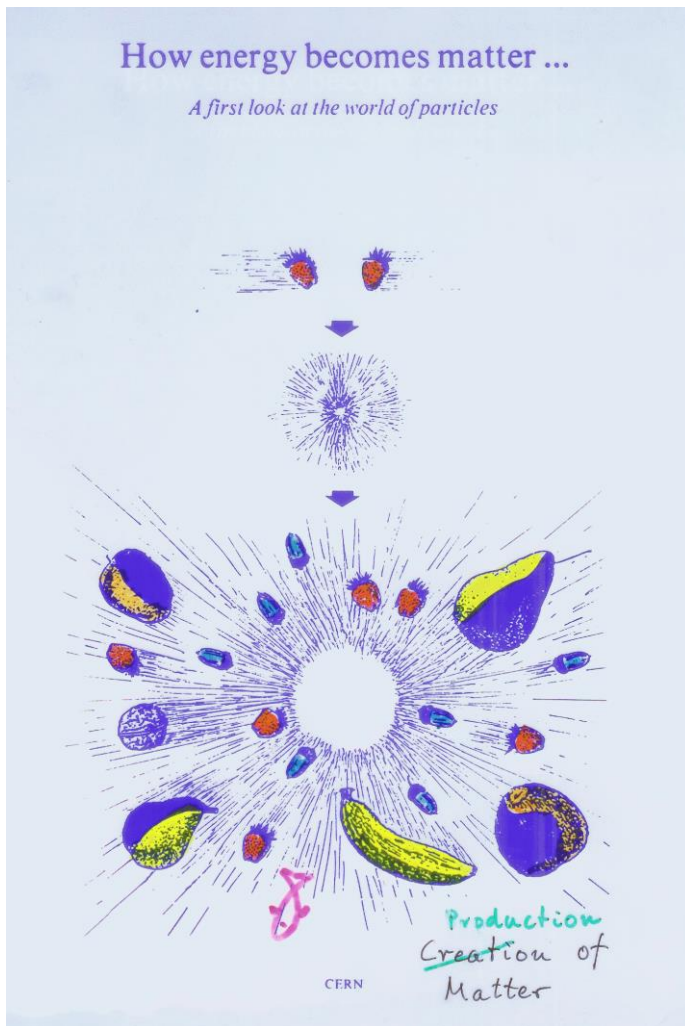
Two experiences at CERN:  
a bad and a good one

**Good one:**  
car accident was settled  
within minutes

**Bad one:**  
Question: Is there a limit to the  
speed of particles?  
Answer: Stupid question!



# Science and religion



Original graph shown to Pope



Visit of Pope Johannes Paulus II at CERN 1983

**Conflict science – religion ? No!**

# Bringing nations together

## Do relations between physicists radiate into politics?

- **CERN – IHEP (Soviet Union) contract 1968**  
Became **Model contract USA- Soviet Union** (*Breshnev-Ford*)
- **Disarmament summit USA - Soviet Union 1985**  
(*Reagan –Gorbachov*) **deadlocked released by dinner at CERN**
- **Help for scientists in trouble**  
(e.g. Orlov, Okun)
- **Foundation of SESAME in Middle East (child of CERN)**  
MS: Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Palestine, Turkey
- **Now CERN recognised by UN,**  
**represented in Scintific Advisory Cammittee**

**Investments at CERN justified by ‘Science for peace’**

# Conclusions

The decade of the 80ies had deep and long-lasting consequences for future of CERN:

- ❖ **Scientific reputation strengthened** Nobel Prize for Z and W
- ❖ **Construction of LEP and tunnel (for LHC)**  
provided basis for long-term future
- ❖ **New culture of international collaboration was born**  
Equal partners, no hierarchical structure, continued at LHC
- ❖ **Strong participation by Non-Member States,**  
first elements for World Laboratory
- ❖ **Constant budget** New policy to finance projects
- ❖ **Opening to environment, changing perception of CERN**

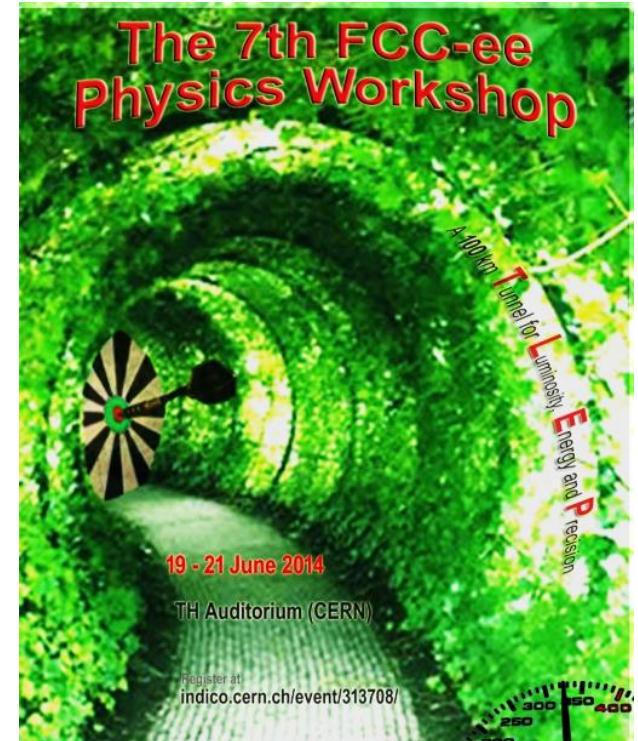
# Far Future of CERN

Next event: 90. anniversary,  
with various upgrades of LHC  
**CERN will still bloom!**

Physicists think in orders  
of magnitude:

**What in 900 years?**

Archaeologists will excavate tunnel!  
What was it used for?  
Street tunnel? No, not straight  
Ring geometry extremely accurate





Compare with Stonehenge:  
astronomical observatory?  
or a place of worship!

**CERN is and will remain a milestone of one of the noblest human cultural activities**

**– exploring the mysteries of nature  
by peaceful worldwide cooperation**

**We all can be happy and proud  
to have participated and contributed to this endeavour**