

# Guido Altarelli: bridging theory with experiment



G. Altarelli Memorial Symposium, CERN, June 10, 2016

Z. Kunszt, ETH, Zurich

## Two seminal papers in the second half of the 1970's

The discovery of the  $J/\Psi$  in 1974 dramatically helped to realise that very likely

- i) QCD is the true theory of strong interactions with weak coupling at short distances (asymptotic freedom)
- ii) the Weinberg-Salam model is the true theory of the weak interactions with left handed quark and left handed lepton doublets and right handed singlets of the weak isospin group.

1. With Giorgio Parisi (1977) “Asymptotic Freedom in Parton Language”. A fundamental input for developing the formalism of the QCD improved parton model.
2. With Keith Ellis and Guido Martinelli (1978) .  
“Large Perturbative Corrections to the Drell Yan Process in QCD”. First calculation of QCD radiative corrections for hadron colliders.



# Quantitative predictions of the SM for collider physics



By the middle of the 1980's Guido has demonstrated that using the QCD improved parton model in conjunction with the parton number densities measured in deep inelastic scattering in principle one can predict the cross sections of any hard scattering processes with NLO accuracy.

# Lets make precise predictions !

A precise prediction for any hard scattering process provides us with new precision tests for the Standard Model and new avenues of searching for new physics (with calculable background ).

To carry out a systematic tests for all the relevant sectors of the Standard Model is a formidable task. It calls for higher energy, new accelerators, better detectors and complex theoretical calculations. Guido got interested in playing leading role in this challenging program and worked together with a large community of theorists and experimentalists at CERN and all over the world. From this period I recall two of his achievements



1. With Riccardo Barberi he worked out a simple effective field theory parametrisation to describe possible new physics effects . It allowed for a model independent analysis of the precision electroweak data.
2. He took leading role in organising five important workshops for the physics at the LHC, LEP1 and LEP2.

# Precision physics at LEP and LHC and roadmap for the discovery of the Higgs boson

## 1. Physics at Future Accelerators

La Thuile (Italy) and Geneva (Switzerland)

7-13 January 1987

## 2. Z PHYSICS AT LEP 1

Geneva (Switzerland)

21 September 1989

## 3. Large Hadron Collider Workshop

Aachen (Germany)

4-9 October 1990

## 4. Physics at LEP 2

Geneva (Switzerland)

19 February 1996

## 5. Standard Model Physics (and more) at the LHC

Geneva (Switzerland)

9 May 2000



CERN 87-07  
Vol. I  
4 June 1987

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**CERN** EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

PROCEEDINGS OF THE  
WORKSHOP ON  
PHYSICS AT FUTURE ACCELERATORS

La Thuile (Italy) and Geneva (Switzerland)  
7 - 13 January 1987

Vol. I

GENEVA  
1987

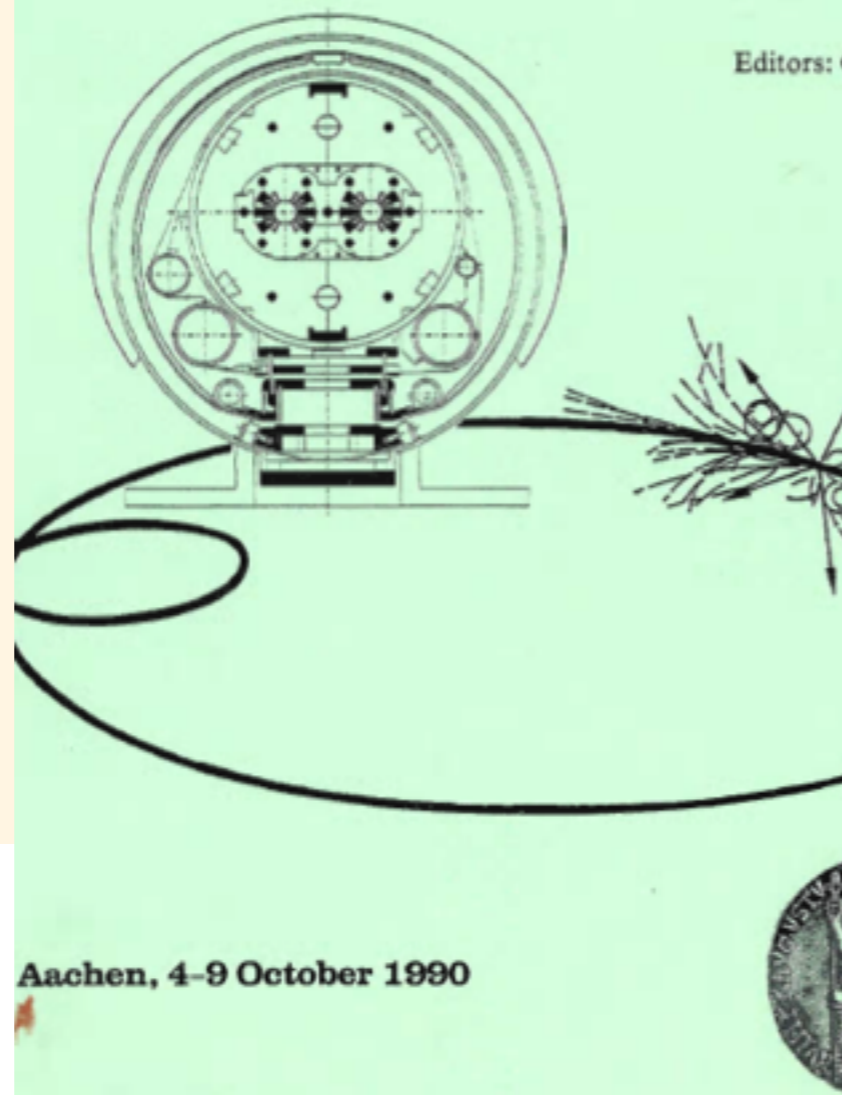
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EUROPEAN COMMITTEE FOR FUTURE ACCELERATORS

# Large Hadron Collider Workshop

PROCEEDINGS

Editors: C



Aachen, 4-9 October 1990

CERN 89-08  
Volume 1  
21 September 1989

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## Z PHYSICS AT LEP 1

Edited by  
Guido Altarelli, Ronald Kleiss and Claudio Verzegnassi

Volume 1: STANDARD PHYSICS

Co-ordinated and supervised by G. Altarelli

GENEVA  
1989

CERN 96-01  
Theoretical Physics and  
Particle Physics Experiments  
Divisions  
19 February 1996  
Vol. 1

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**PHYSICS AT LEP2**

Editors: G. Altarelli, T. Sjöstrand and F. Zwirner

Vol. 1

GENEVA  
1996

CERN 2000-004  
9 May 2000

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**PROCEEDINGS OF THE WORKSHOP ON  
STANDARD MODEL PHYSICS (AND MORE) AT THE LHC**

Editors:

G. Altarelli, M.L. Mangano

GENEVA  
2000

## Personal account

I was convener of selected topics in all the five workshops mentioned above and I could benefit from Guido's wealth of knowledge, his integrity and his human qualities.

He gave clear instructions to the conveners, he created enthusiasm and motivation toward precision tests of the Standard Model and searching for new physics.

He liked to see transparent and accessible answers. If some conflict emerged his great kindness and honesty resolved the issue quickly.

Guido also supported us in Zurich with his advise, evaluations and contributions to our conferences and workshops. He always had time for us. I imagine he offered similar help to many other places in the world.

For me Guido was an outstanding scientist, a colleague, a teacher and a friend who advised me on many occasions. He made a tremendous influence on me. Dear Guido thanks for all.

