



**The Abdus Salam
International Centre for Theoretical Physics**



1854-1

Workshop on Grand Unification and Proton Decay

22 - 26 July 2007

Opening Remarks

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WELCOME TO

ICTP

and to the

WORKSHOP ON

GRAND UNIFICATION

and

PROTON DECAY

Govor Senjanovic'

CO - ORGANIZERS

C. Aulakh ,
K. Babu, B. Bajc, C.K. Jung

A. Melfo , F. Vissani

I must share all the credit
with them. I am even willing to let
them ^{take} ~~take~~ all the blame for anything you may
find wrong with the organization of the
meeting.

No blame, though, on Federica
Delconte, our secretary. She did a
heroic job in putting up with us (and
maybe some of you?).

- Why this meeting?

A. Why not ~~1989~~?

- Why now?

Why not before?

After all, almost 20 years from the last in the series of conferences on Grand unification!

- 1989 Chapel Hill: The 10th and **final** conference on GUT

Why did it stop?

Why do it so many years later?

No experimental evidence -
but that takes time

GRAND UNIFICATION

$$SU(3) \times SU(2) \times U(1) \subseteq G$$

(G₁ × G₂ × ...)
↑
NO U(1)

● MAGNETIC MONOPOLES

$T \nu Q_{em} = 0 \Rightarrow$ charge quantization
 \Rightarrow monopoles

$$10^{17} \text{ GeV} \approx M_m \geq M_{GUT}$$

't Hooft
Polyakov '74

● PROTON DECAY

q - l unification

Pati, Salom
'72, '73

must in SU(5)

Georgi, Glashow
'74

our focus here

~~XXXXXXXXXXXXXXXXXXXX~~

Tanmay Vachaspati

Callan - Rubakov

• $\frac{1}{\Lambda_{QCD}^2}$ (999 l) monopoles
catalyze p decay

stability of pulsars

Freeze, Turne

$$\Phi_m (\text{earth}) \leq 10^{-22} - 10^{-27} / \text{cm}^2 \text{sec}$$

$$(\Phi_m)_{\text{exp}} \leq 10^{-16} / \text{cm}^2 \text{sec}$$

MACRO

gru Jasso

P DECAY

Pati

$$(\tau_p) \geq 10^{33} \text{ yr}$$

Jung

Marchionni

supe - Kamiobande

Manodan

Undagrifia

80's a number of experiments with a
great (false?) promise of discovery

- $M_{\text{GUT}} \simeq 10^{16} \text{ GeV}$

$$\Rightarrow \tau_p = 10^{35} \text{ yr}$$

$$\tau_p \propto M_{\text{GUT}}^4$$

↑
generic $d=6$ gauge
boson mediated

- SUPER SYMMETRY $\sim \text{TeV}$

"NATURALNESS"

$d=5$ p decay through heavy
color triplet fermions T

expect

$$\tau_p \simeq 10^{31} \text{ yr or so}$$

but huge dependence

on m_T , $m_{\tilde{p}}$, $\theta_{\tilde{p}}$

$$\tau_p \propto M_{\text{GUT}}^2 m_{\tilde{p}}^2$$

- New generation of experiments

(although not yet a test
of the theory)

Jung

Marchionni

hope of a discovery:

Marrodon

Undagvika

$10^{34} - 10^{35}$
 $10 - 10^{16}$ yv

- theory: neutrino masses and mixings
offer test of $e-l$ symmetry,
the essence of grand
unification.

- LHC: probe of the effective theory
 $\lesssim \text{TeV}$

RIGHT MOMENT FOR SU

Young people: Now or never

MAIN MOTIVATIONS FOR THE

MEETING

we are still searching for the they

- we need more and we need

young

HAVE FUN

Thank you for being
here and thank you for your
attention