

# Comments on 1990 Peccei Report

- The Problem
- Historical Perspective
- The Peccei Report
- Where do we go from here?

# The Problem

- The problem is real
- The shortage of support/positions for conventional particle theory (CPT) is decades old, but consequences may soon become acute
- Experiment  $\overset{\leftarrow\rightarrow}{\underbrace{\hspace{1em}}}$  CPT  $\overset{\leftarrow\rightarrow}{\underbrace{\hspace{1em}}}$  formal theory  
essential essential
  - Young formal theorists often disconnected from real world
  - Young CPTs often ignore string theory (best game in town; goal of ultimate synthesis)
- Problem at all levels: PDFs, radiative corrections, collider phenomenology, model building, connection to strings
- Problem for field, especially US and for young theorists

- **Several causes**
  - **Formal theory is “more glamorous” or “more fundamental”** (but LEP program couldn't have succeeded without CPT)
  - **One should go for the “best people”** (subjective; “best people” often determined by string theorists; vicious circle; “symphony orchestra with 100 first violins”)
  - **Not enough support from experimenters** (“let the [string] theorists decide”)
  - **In recent years, much experimental effort in hardware or in “easy analyses” that don't require much theory**
  - **Funding agencies don't create positions, they fund proposals**

## Historical Perspective

- **Early days: not much distinction between CPT and formal (except axiomatic field theory); close connection with experiment**
  - '68-'72: S-matrix, bootstrap, current algebra, quarks
  - 1970's: standard  $SU(2) \times U(1)$  model, QCD; theory, phenomenology, [alternative] model building, experimental tests
  - Early 1980's: GUTs; precise QCD, EW

- Late 1980's

- SUSY, Kaluza-Klein, strings
- Separation between formal and phenomenological started to emerge as a real problem
- Major experimental program LEP/SLC required close connection between theory/experiment, but limited effort in US
- SSC on horizon, but clearly not enough people for SM and BSM calculations/physics projections

## The Peccei Report

- Started as grass roots effort via “Bitnet”
  - Not enough people, no funding for large collaborative projects spanning institutions (e.g., PDFs, precision analyses)
  - Initially QCD centered, then spread to electroweak, etc.
  - 1989: DPF Executive Committee (Gilman Chair) established ad hoc (Peccei) Committee

- **Conclusions (1990)**

- National CPT center not feasible (already had ITP, Aspen).
- Expected SSC-lab to fulfill leadership role
- Emphasized collaborative grants
- *Vague* urging of education of graduate students, faculty, emphasizing “balance”

- **Report endorsed by DPF Executive Committee, but *feeling it was too weak***

- I am unaware of any action emerging from report (cf. CTEQ, lack of faculty positions)
- Then SSC was killed, 1993
  - Experimenters went into defensive phase; concentrated on  $B$  physics, LHC planning, Tevatron (reinvigorated)
  - These were good in themselves, but discouraged taking action on CPT
  - Fermilab SUSYphobia until 1996: the theorist's letter
- Situation continued to grow worse
  - Meeting of Bagger-Barish committee at Snowmass, 2000: no new positions in US in precision EW, EW radiative corrections, global  $\nu$  oscillation analyses

## Where do we go from here?

- With start of LHC near, there is a real shortage of theorists
  - LHC expected to be rich discovery machine, with very complicated new physics signals
  - Theorists needed to help experimenters plan, analyze, interpret
  - Needed to interface with formal theorists
  - **Especially serious in US** (may jeopardize leadership role)
  - No analogue of SSC lab in US to be a focal point

- **Possibilities**

- Enlist help of experimenters *and* string theorists
- Young CPTs: don't ignore string theory
- Agencies: consider ability of experimental groups to participate in *physics program* of LHC
- Concrete possibilities: (partially) funded positions at universities? New positions at labs? New center? Earmarked fellowships? Collaborative grants?

- **Reason for optimism: tremendous intellectual opportunities in experiment, fundamental theory, cosmology**