

# How New Discoveries Have Been and Will Be Made ?

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1. Test of **Theory** vs. Investigation of  
Experimental **Smoking Gun**
2. Comments on CERN Higgs Candidate

## - Test of Theory -

### ♣ Historical Examples

- Lamb shift, g-2 experiments  $\iff$  Test of QED
- $\text{Co}^{60}\beta^-$  Decay  $\iff$  V-A Theory
- $e(\uparrow\downarrow)+D \rightarrow e'+\text{anything}$   $\iff$  Indirect Evidence for  $Z^0$
- Discovery of  $W^\pm, Z^0$  at CERN  $\iff$  Test of SM

### Discoveries of Heavy Particles after Long Searches

- Historical: W-boson, t-quark
- Future: Higgs? SUSY?

## Future Test of SM Presented at This Meeting

- CDF: Direct Search for  $\tilde{q}, \tilde{g}, \tilde{t}$  and scalars  
 $M_H < 120\text{GeV}(\sim '05), M_H < 190\text{GeV}('05\sim)$
- Belle: Measurements of  $\phi_1, \phi_1$  in B decays  
→ Determination CPV parameters. Unitarity triangle?
- Belle:  $\tau$  Physics → CPV in Lepton sector?  
Rich processes for precision tests ( $\tau \rightarrow \mu\gamma\dots$ ).  
An innovative detector.
- KEK E391a:  $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$ . Another clean test of CPV. 0.1 events in SM.  
BNL KOPIO: 40 events in.  
JHF: several hundred events.
- BNL (E949):  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ ,  $10 \times \text{SM}$ .  
FNAL CKM:  $100 \times \text{SM}$ . SUSY effect  $\sim 10\%$ .

## - Investigations of Experimental Suggestions -

### ♣ Historical Examples

- $\tau - \theta$  Puzzle  $\Rightarrow$  P-violation in W.I.
- Anomalous K-decay interpreted as a Long-range Force  $\Rightarrow$  CP-violation
- $\mu$  Pair bump in pA Scattering  $\Rightarrow$  J-Particle
- Solar neutrino deficiency  $\Rightarrow$  Neutrino astronomy, Neutrino mass

### ♣ FUTURE Possibilities about Higgs-like objects

- CERN Higgs Candidates( $e^+e^- \rightarrow H(115)Z$ ):

Can it be a Technicolor Process,

$$\rho_T \rightarrow \pi_T(=H)X \rightarrow 4\text{jets} ?$$

4-jet:  $\pi_T W(45\%)$ ,  $\pi_T \pi_T(43\%)$ ,  $\pi_T Z(0.3\%)$ ,  
 $WW(5\%)$ .

A REMARK

COHERENT VIEWS ON  
PRECISE SM TEST ↔ DIRECT SEARCH  
IN THE CONTEXT OF “ORIGIN OF MASS  
AND SUPERSYMMETRY”  
ARE BETTER BE ADDRESSED IN THE  
NEXT MEETING.