

**AIP Conference Proceedings**  
Series Editor: Hugh C. Wolfe  
**Number 93**  
Particles and Fields Subseries No. 27

**Novel Results in Particle Physics**  
(Vanderbilt, 1982)

Edited by  
**R. S. Panvini, M. S. Alam, S. E. Csorna**  
Vanderbilt University

**American Institute of Physics**  
New York 1982

## TABLE OF CONTENTS

### Free Quark Searches

The Search for Fractionally Charged Particles Klaus S. Lackner and George Zweig . . . . .	1
Recent Results from the San Francisco State Quark Search Peter C. Abrams, Kimberly C. Coburn, David C. Joyce, Maureen L. Savage, Frederick Wm. Walters, Betty A. Young, Roger W. Bland, Robert T. Johnson, Christopher L. Hodges. . . . .	15
Search for Free Quarks at PEP S. J. Freedman. . . . .	24
Is Fractional Electric Charge Problematic for QCD? R. Slansky. . . . .	39
Observation of Fractional Charge of $1/3e$ on Matter J. D. Phillips, W. M. Fairbank, C. R. Fisel . . . . .	48
Free Quarks in the Early Universe Jay Orear . . . . .	61

### Theory

Axions: Visible and Invisible Michael Dine. . . . .	66
--	----

### D-Lifetimes

Bubble Chamber Experiments on Charmed Particle Lifetimes R. C. Field . . . . .	77
Measurement of the Lifetimes of the Charmed $D^+$ , $D^0$ and $F^+$ Mesons and $\Lambda_C^+$ Charmed Baryon The Fermilab Experiment 531 Collaboration . . . . .	89
Measurements of Charmed Particle Lifetime with Electronic Techniques G. Bellini . . . . .	105

### Theory

A Composite Model of the Weak Interactions L. F. Abbott. . . . .	121
---	-----

### $e^+e^-$ Collisions

Recent Results from CLEO Paul Avery. . . . .	129
Recent Results from CUSB on Upsilon Spectroscopy P. M. Tuts. . . . .	155
$E^+E^-$ Collisions: Results from PETRA E. Hilger . . . . .	169
Some Recent Results for the MAC Detector at PEP MAC Collaboration: Colorado-Frascati-Northeastern- SLAC-Utah-Wisconsin . . . . .	201
Recent Results from Mark II at PEP D. Schlatter. . . . .	215

Neutrino and Beam Dump Experiments

Prompt Neutrino Production by 400 GeV Proton Interactions  
Firenze-Michigan-Ohio State-Washington-Wisconsin  
Collaboration. . . . . 225

Charm Production Measurements Using Prompt Muons  
Chicago, Caltech, FNAL, Rochester, Stanford  
Collaboration. . . . . 241

Charged Current Neutrino Interactions  
Caltech, Columbia, Fermilab, Rochester, Rockefeller  
Collaboration. . . . . 250

Recent Results on the  $\nu_\mu$  and  $\bar{\nu}_\mu$  Charged Current Cross Sections  
P. Igo-Kemenes . . . . . 269

Anti-Neutrino-Nucleon Charged Current Interaction Cross Sections  
Measured by the Fermilab 15' Ne-H<sub>2</sub> Bubble Chamber in a  
Dichromatic Beam  
Hawaii, LBL, FNAL Collaboration . . . . . 283

Theory

GUTs, SUSY GUTs and Super GUTs  
Mary K. Gaillard . . . . . 291

Proton Decays

The Experimental Aspects of Nucleon Decay  
Marvin L. Marshak . . . . . 305

Nucleon Decay Experiments in Europe  
M. Rollier . . . . . 314

Neutrino Oscillations, Neutrinoless Beta Decay

Neutrino Oscillations, Neutrinoless Double Beta Decay  
F. Boehm. . . . . 321

High Energy  $\bar{p}p$  Collisions

First Results from the CERN-SPS Proton-Antiproton Collider  
M. Yvert. . . . . 339

Further Results from the UA5 Collaboration  
H. L. Mulkens . . . . . 364

Theory

Problems, Puzzles, and Prospects: A Personal Perspective  
on Present Particle Physics  
H. David Politzer . . . . . 375

Conference Program. . . . . 385

List of Participants. . . . . 387