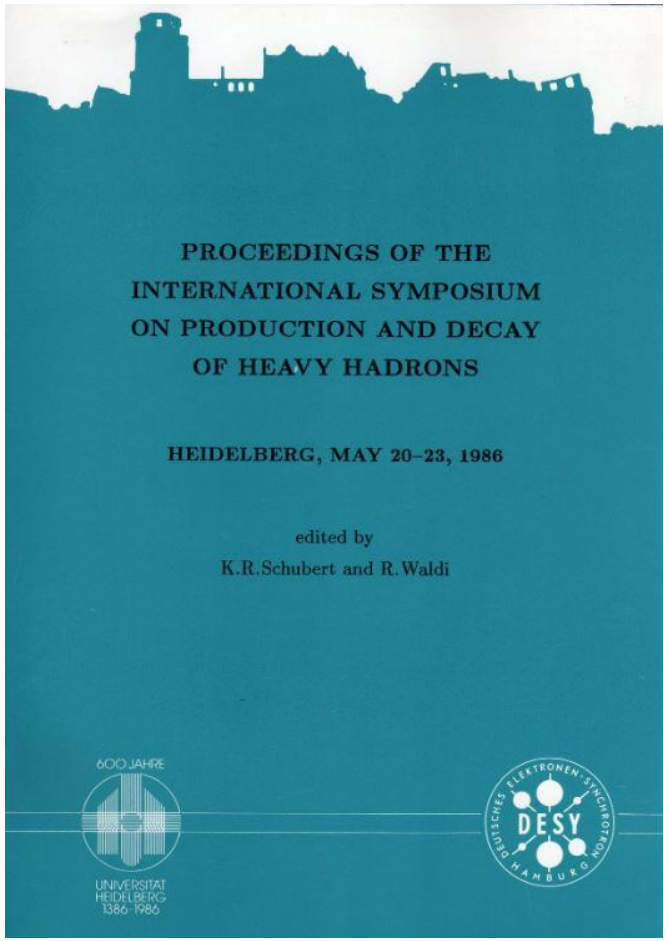
Remembering Sheldon Stone

By Tomasz Skwarnicki
at 20th Conference on
Flavor Physics and CP Violation (FPCP 2022),
University of Mississippi, May 23-27, 2022.

Beginning of Heavy Flavor Conference Series



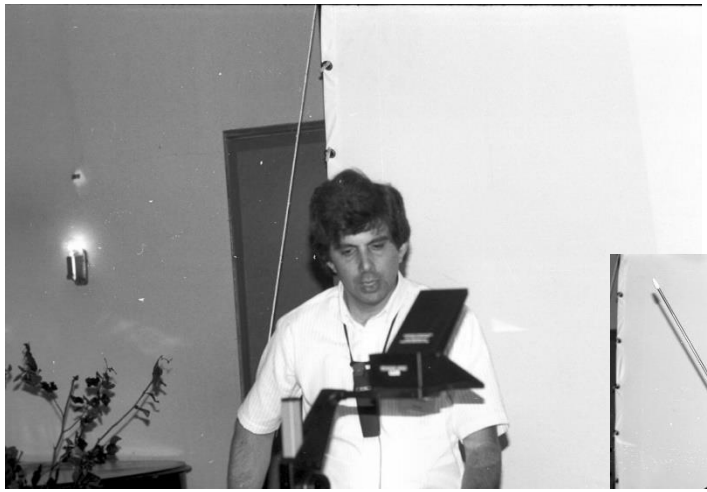
CLEO II, A NEW DETECTOR FOR T PHYSICS

Sheldon Stone
Laboratory of Nuclear Studies
Cornell University
Ithaca, NY 14853

ABSTRACT

I describe here a new detector for use in the T energy region. This detector will replace the existing CLEO detector at the Cornell Electron Storage Ring (CESR).

Electron positron annihilations in the T energy region provide data for investigations of many interesting phenomena including heavy quarkonium transitions, charm meson decays, and B meson decays. Although studies have been underway for about eight years, the most interesting questions have not been answered.[1] Here are examples of interesting physics



Sheldon was born in 1946

Education:

Brooklyn Technical High School, New York City

B.S. Physics, Brooklyn College (1967) Cum Laude

Ph.D. Physics, University of Rochester (1972)

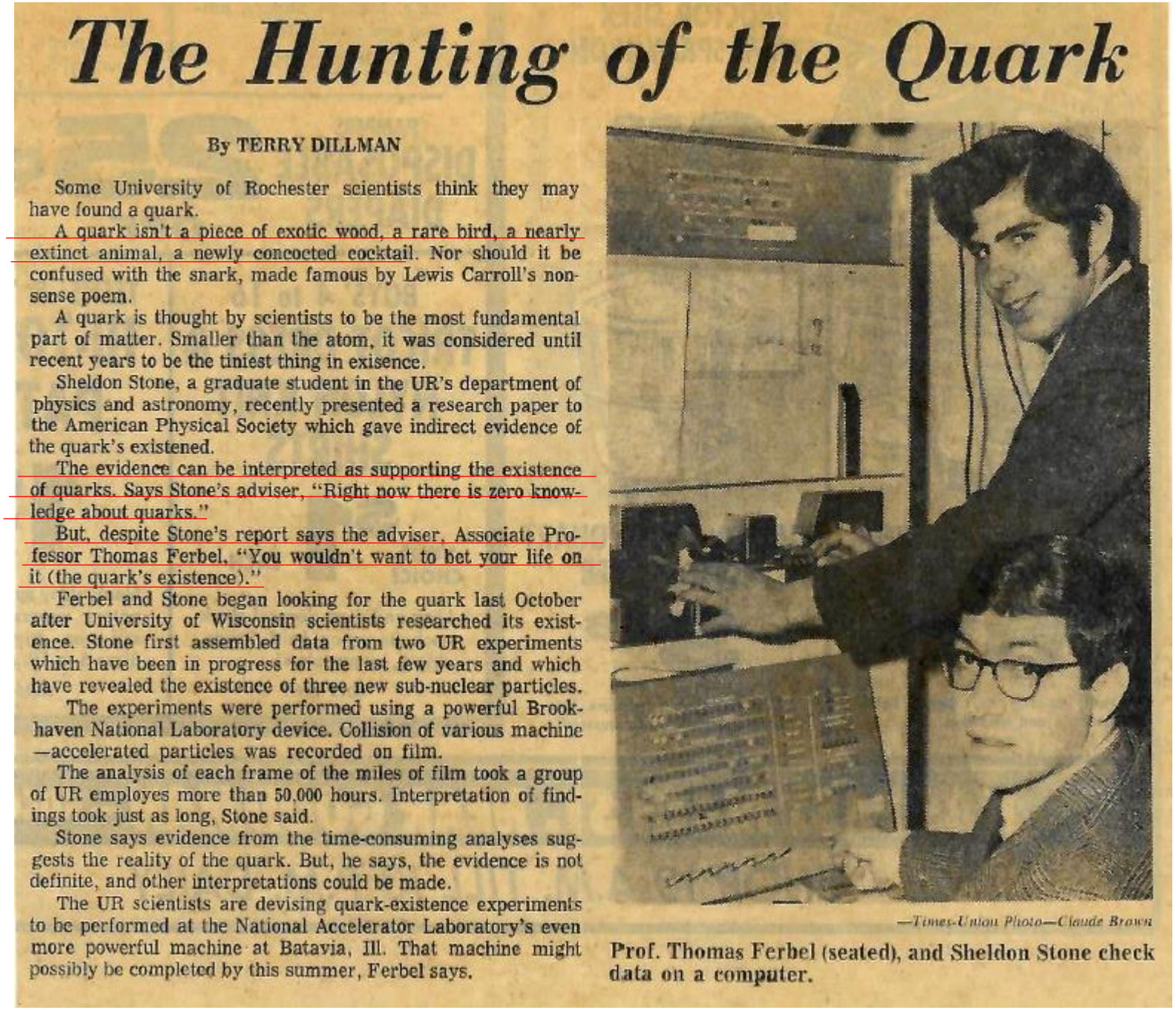
Positions:

1971 - 1973 Research Associate, Vanderbilt University

1973 - 1979 Assistant Professor of Physics, Vanderbilt University (1977-79 on leave at LNS)

1979 - 1991 Senior Research Associate Laboratory of Nuclear Studies, Cornell Univ

1991-2021 Professor, Syracuse University



The Hunting of the Quark

By TERRY DILLMAN

Some University of Rochester scientists think they may have found a quark.

A quark isn't a piece of exotic wood, a rare bird, a nearly extinct animal, a newly concocted cocktail. Nor should it be confused with the snark, made famous by Lewis Carroll's nonsense poem.

A quark is thought by scientists to be the most fundamental part of matter. Smaller than the atom, it was considered until recent years to be the tiniest thing in exisence.

Sheldon Stone, a graduate student in the UR's department of physics and astronomy, recently presented a research paper to the American Physical Society which gave indirect evidence of the quark's existened.

The evidence can be interpreted as supporting the existence of quarks. Says Stone's adviser, "Right now there is zero knowledge about quarks."

But, despite Stone's report says the adviser, Associate Professor Thomas Ferbel, "You wouldn't want to bet your life on it (the quark's existence)."

Ferbel and Stone began looking for the quark last October after University of Wisconsin scientists researched its existence. Stone first assembled data from two UR experiments which have been in progress for the last few years and which have revealed the existence of three new sub-nuclear particles.

The experiments were performed using a powerful Brookhaven National Laboratory device. Collision of various machine —accelerated particles was recorded on film.

The analysis of each frame of the miles of film took a group of UR employes more than 50,000 hours. Interpretation of findings took just as long, Stone said.

Stone says evidence from the time-consuming analyses suggests the reality of the quark. But, he says, the evidence is not definite, and other interpretations could be made.

The UR scientists are devising quark-existence experiments to be performed at the National Accelerator Laboratory's even more powerful machine at Batavia, Ill. That machine might possibly be completed by this summer, Ferbel says.

—Times-Union Photo—Claude Brown

Prof. Thomas Ferbel (seated), and Sheldon Stone check data on a computer.

Early years in CLEO

Internal CLEO-CBX notes (co)authored by Sheldon
[as per documents.classe.cornell.edu]

1982
Charged Kaon Production from $\Upsilon(4S)$ and $\Upsilon(3S)$ with Y. Kubota, R. Wilcke
Proposal for Using the IZ as a dE/dx Device,
Feasibility of a TPC for CLEO with S. Olsen
Data Rate and Sensitivity of B Meson Decay Experiments with B. Gittelman
Proposal for CLEO II Inner Detector
Limits on B Decay to Final States Containing A Psi with D. Kreinick
Charged Kaon and Proton Production at the Upsilon Resonances and Nearby Continuum with Y. Kubota, F. Morrow, R. Wilcke
Observation of B Decays into Specific Final States with D. Kreinick, Y. Kubota, R. Wilcki
The X-Bump Explained with D. Kreinick, A. Snyder

1983
An Approach Toward Understanding K Meson Yields on the $\Upsilon(4S)$
The D^0 Spectrum From B Meson Decay with Y. Kubota
Decay of B Mesons to Psi with D. Kreinick, Y. Kubota, R. Poling, E. H. Thorndike
Measurement of D0 Production from Continuum e+e- Annihilation with Y. Kubota
A New Inner Detector for CLEO with T. Gentile, M. Gilchriese, D. Hartill, H. Kagan, T. Jensen, D. Peterson, A. Silverman
Observation of an F Meson Candidate at 1970 MeV with Y. Kubota
Upper Limits for the decays $B^0 \to \pi^+\pi^-$ and $B^+ \to \rho^0\pi^+$ with Y. Kubota

1984
Reconstructing B Mesons (A CLEO Detector Upgrade Study) with B. Gittelman, Y. Kubota
Two-Body Decays of B Mesons
Theoretical Energy Resolution of the CLEO II CsI Photon Detector with E. Blucher, J. Green, J. Hassard
Stability and Temperature Dependence of CsI-Photodiode System with E. Blucher, Y. Kubota
Progress on the CLEO II CsI Electromagnetic Calorimeter with E. Blucher, B. Gittelman, B. Heltsley, J. Kandaswamy, B. Kowalewski, Y. Kubota, N. Mistry

1985
Radiation Damage of CsI Crystals with E. Blucher, B. Kowalewski
Studies of 175 Cesium Iodide Crystals with A. Bean, E. Blucher, B. Gittelman, S. Gray, B. K. Heltsley, J. Kandaswamy, B. Kowalewski, Y. Kubota, N. Mistry, C. Rippich
Observation of $B^0 \to \psi X$ via $\psi \to \mu^+\mu^-$ with E. Blucher, J. Guida
Exclusive Decays of B Mesons to ψ
Upper Limits on D** Production in Continuum e^+e^- Annihilations
Exclusive Radiative $\Upsilon(1S)$ Decays with E. Blucher, J. Kandaswamy, Y. Kubota
The Reaction $B^0 \to D^0 X$ with N. Katayama, Y. Kubota

Enormous productivity
in physics analysis of CLEO I data
and
in detector design studies
for its upgrade

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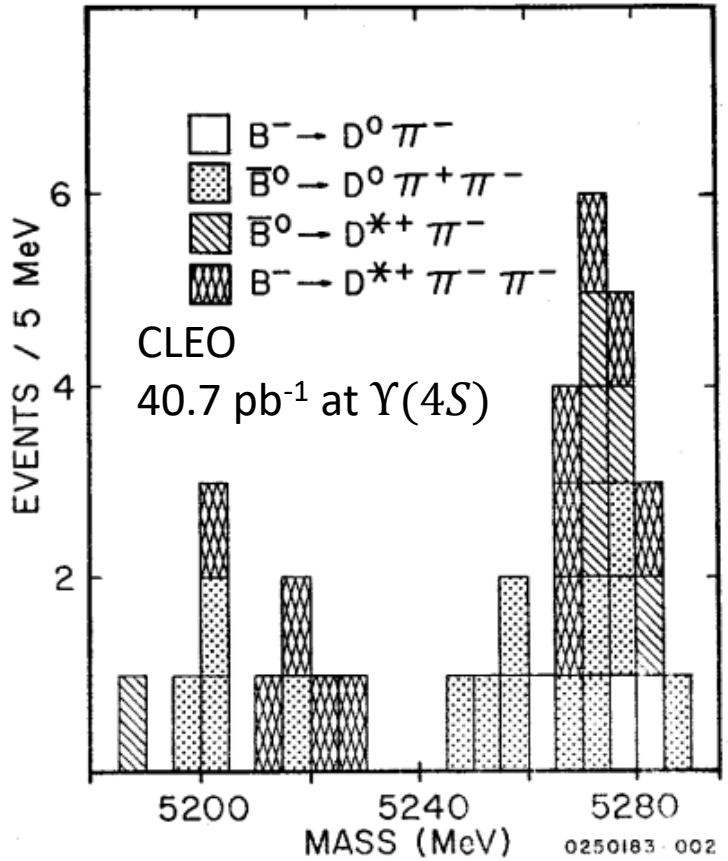
The Reaction $B^0 \to D^0 X$ with N. Katayama, Y. Kubota

First exclusive reconstructions of B mesons

PRL 50, 881 (1983)

Observation on Exclusive Decays Modes of B Flavored Mesons



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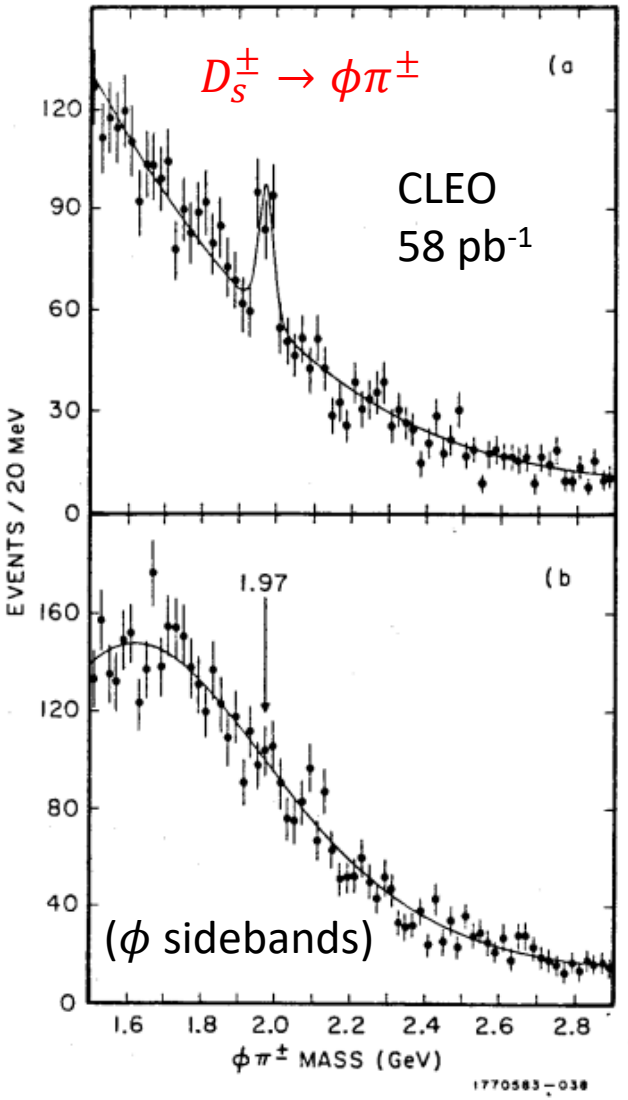
Discovery of $D_s^{\pm}$ Meson

PRL 51, 634 (1983)

Evidence for the F Meson at 1970 MeV



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Sheldon was a leader in proposing a new detector at CESR (CLEO II), which would improve over the ARGUS experiment at DESY and in R&D for CsI(Tl) calorimeter

Sheldon led the design and construction of CLEO-II calorimeter at Cornell (installed 1989)

7800 CsI(Tl) crystals
Photo-diode readout! (inside 1.5T solenoid)
Excellent solid angle coverage (98% of 4π), energy resolution (~4% at 100 MeV) and efficiency

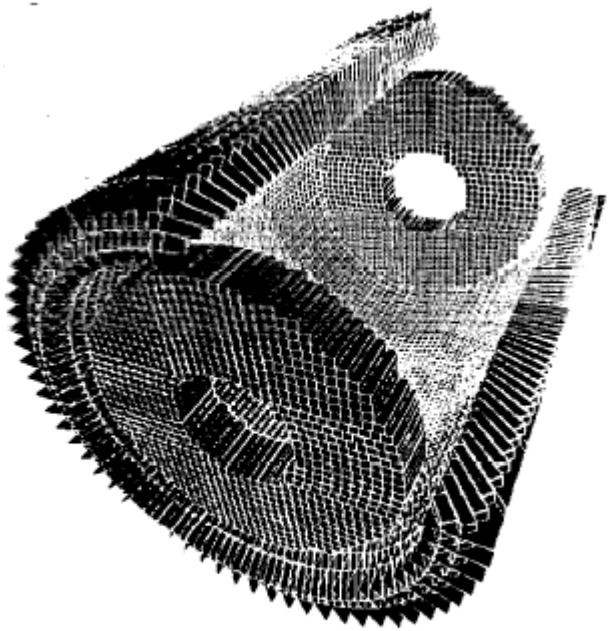
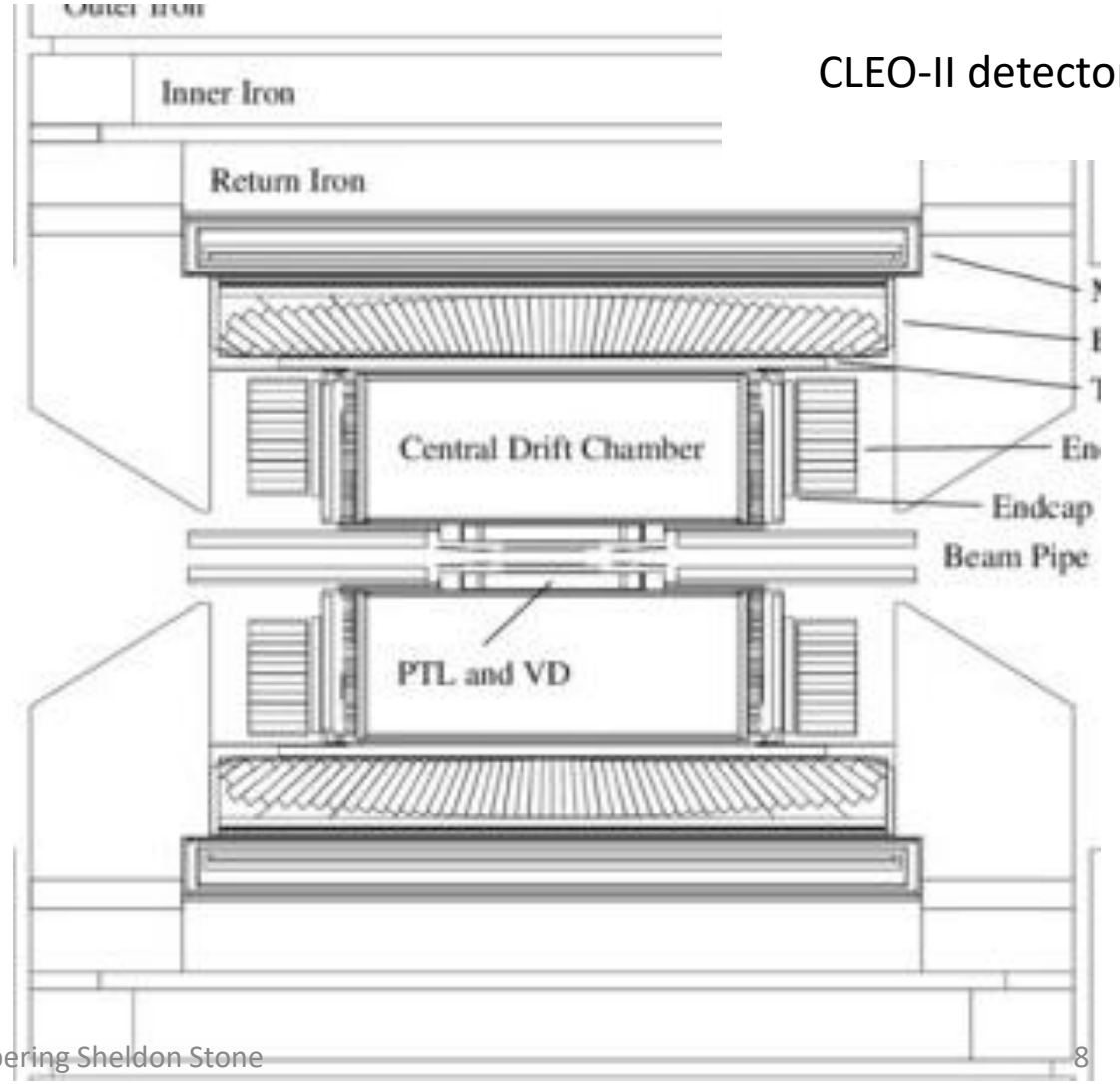


Figure 1: Cut view of the CLEO-II calorimeter. CsI(Tl) crystals and support fins (0.5mm Al) are shown.

CLEO-II detector



This technology became the standard for e^+e^- flavor factories (BaBar,Belle,BESIII)

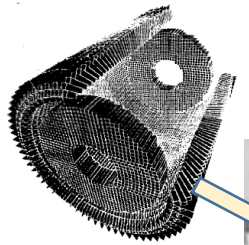
CLEO and CLEO I.5

Internal CLEO-CBX notes (co)authored by Sheldon

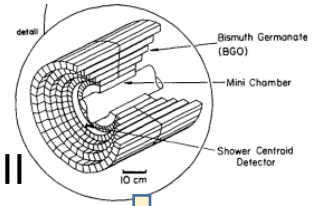
Sheldon was CLEO Analysis Coordinator in 1988/89

Internally, Sheldon was very outspoken concerning experimental priorities

1986
Upper Limits on D**0 Production in Continuum e+e- Annihilations with N. Katayama, Y. Kubota
Additional Information on D**0 with N. Katayama, Y. Kubota
Inclusive B Decays into Charm with E. Blucher, N. Katayama
Continuum Charm Cross-Sections with N. Katayama
Inclusive B Meson Decays into Charm with E. Blucher, N. Katayama
Evidence that the $\Upsilon(4S)$ Decays to $B\bar{B}$ Exclusively with S. Nandi
The $B \to D\pi^-$ Branching Ratio with S. Nandi
Footprints of Charmed Baryons From B Decay with E. Blucher
1987
1988
DBDR,RESIDR and Z0DR Cuts with H.Worden
Guide to Doing Roar Data Analysis with N.Katayama, D.Kreinick, R.Namojoshi
Instructions for Authors of Cleo Publications
1989
Deriving B^0 Semileptonic Branching Ratio from Tagged Events
Conference Package
Kinematic Considerations in π^0 and η Decay with H. Worden
More on P-wave Charmed Mesons with H. Worden
Observation of $\Upsilon(4S)$ Decays Into Non- $B\bar{B}$ Final States Containing ψ's with W-M. Yao
Observation of $\Upsilon(4S)$ Decays into Non- $B\bar{B}$ Final States Containing ψ Mesons with W-M. Yao
1990
Proposal to Study $B\bar{B}^*$ Rates and $b\bar{b}g$ States by taking Data Above the $\Upsilon(4S)$
Proposal to Start $\Upsilon(4S)$ Running - (Report to PAC) with M. Artuso, T. Skwarnicki
Determination of $B(D_s^+ \to \phi\pi^+)$ via Observation of $B(D_s^+ \to \phi e^+\nu)$
Summary of Friday's Lunch Meeting on π^0 Finding
Preliminary CLEO II Results on Radiative Transitions from the $\Upsilon(3S)$ with CLEO collaboration
Initial Performance of the CLEO II CSI Calorimeter with CLEO Collaboration
'Second' Analysis of $B\bar{B}^*$ Scan with T Skwarnicki
Measurement of $B(D^0 \to K^{*-}e^+\nu)$ with V. Jain

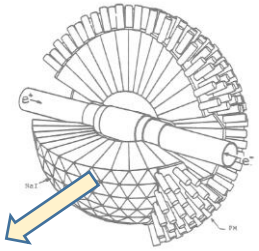


CLEO-II



CUSB-II

Crystal Ball



Sheldon Marina Artuso T.S

Sheldon and Marina move to Syracuse University in 1991
(T.S. moved to Syracuse in 1989)

Many great years together followed…

CLEO II

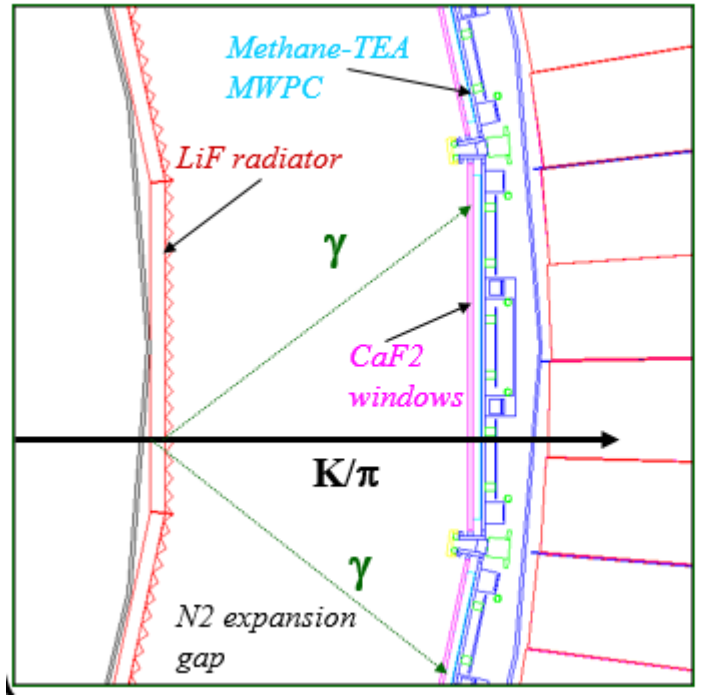
Internal CLEO-CBX notes (co)authored by Sheldon

Golden years of CLEO II
CsI(Tl) calorimeter was a big part of the success

1991
The D* Decay Branching Ratios Measurement with W-M. Yao
Inclusive $\chi_c(2P)$ production in $\Upsilon(3S)$ decay with T. Skwarnicki, H. Worden
Two-body D_s^+ decays containing η, η' or ρ^+ with W.-M. Yao
Observation of $D \to \pi\pi$ decays
Measurement of the D*(2010) branching fractions
The two-body D_s^+ decays: $\eta\pi^+, \eta'\pi^+, \eta\rho^+, \eta'\rho^+$ and $\phi\rho^+$
Determination of V-A dominance in B decays
1992
Exclusive B Decays to D*
Possible Ways of Observing CP Violation at a Symmetric e^+e^- B Factory
1993
Inclusive Decay $B \to \eta X$ with W. He
First Measurement of $\Gamma(D_s^+ \to \mu^+\nu)/\Gamma(D_s^+ \to \phi\pi^+)$ with V. Jain, F. Muheim, S. Playfer
Exclusive B Decays to Charm and Charmonium Final States with T. Browder, K. Honscheid, M. Modesitt, J. Rodriguez, W. Ross, S. Schrenk, G. Zhu
1994
Progress and Plans of the CLEO RICH Group with M. Artuso, *M. Gao,* M. Goldberg, N. Horwitz, R. Mountain, F. Muheim, Y. Mukhin, S. Playfer, Z. Sobolewski
A LiF-TEA Rich for CLEO-III Particle I.D. with M. Artuso, A. Efimov, *M. Gao,* M. Goldberg, D. He, N. Horwitz, G. Moneti, R. Mountain, F. Muheim, Y. Mukhin, S. Playfer, X. Xing, Y. Kubota, M. Momayezi, S. Alam
Monte Carlo Studies of a Novel LiF Radiator for RICH Detectors with A. Efimov, M. Artuso, M.. Gao, R. Mountain, F. Muheim, Y. Mukhin, S. Playfer
1995
Measurement of the Branching Ratio and Form Factor of $\bar{B}^0 \to D^+ l^- \bar{\nu}$ with *M. Gao*
1996
Measurement of the Branching Ratio and Form Factor of $\bar{B}^0 \to D^+ l^- \bar{\nu}$ Updated with *M. Gao*
1997
Improved Measurement of $\Gamma(D_s^+ \to \mu^+\nu)/\Gamma(D_s^+ \to \phi\pi^+)$ with W. He
Beam Tests of the CLEO III LIF-TEA Ring Imaging Cherenkov Detector with M. Artuso, F. Azfar, A. Efimov, S. Kopp, R. Mountain, S. Schuh, T. Skwarnicki, G. Viehhauser, T. Coan, V. Fadeyev, I. Volobouev, J. Ye, S. Anderson, Y. Kubota, A. Smith, E. Lipeles
1999
Performance of the CLEO III LiF-TEA Ring Imaging Cherenkov Detector in a High Energy Muon Beam with M. Artuso, R. Ayad, F. Azfar, A. Efimov, S. Kopp, R. Mountain, G. Majumder, S. Schuh, T. Skwarnicki, G. Viehhauser, J.C. Wang, T. Coan, V. Fadeyev, I. Volobouev, J. Ye, S. Anderson, Y. Kubota, A. Smith, E. Lipeles

Cornell loses the bid for asymmatric B factory but gets funds for CESR/CLEO upgrades (CLEO III)
Syracuse under Sheldon's leadership leads the RICH design and constructions

Sheldon led the construction of CLEO-III RICH at Syracuse (installed in 1999)

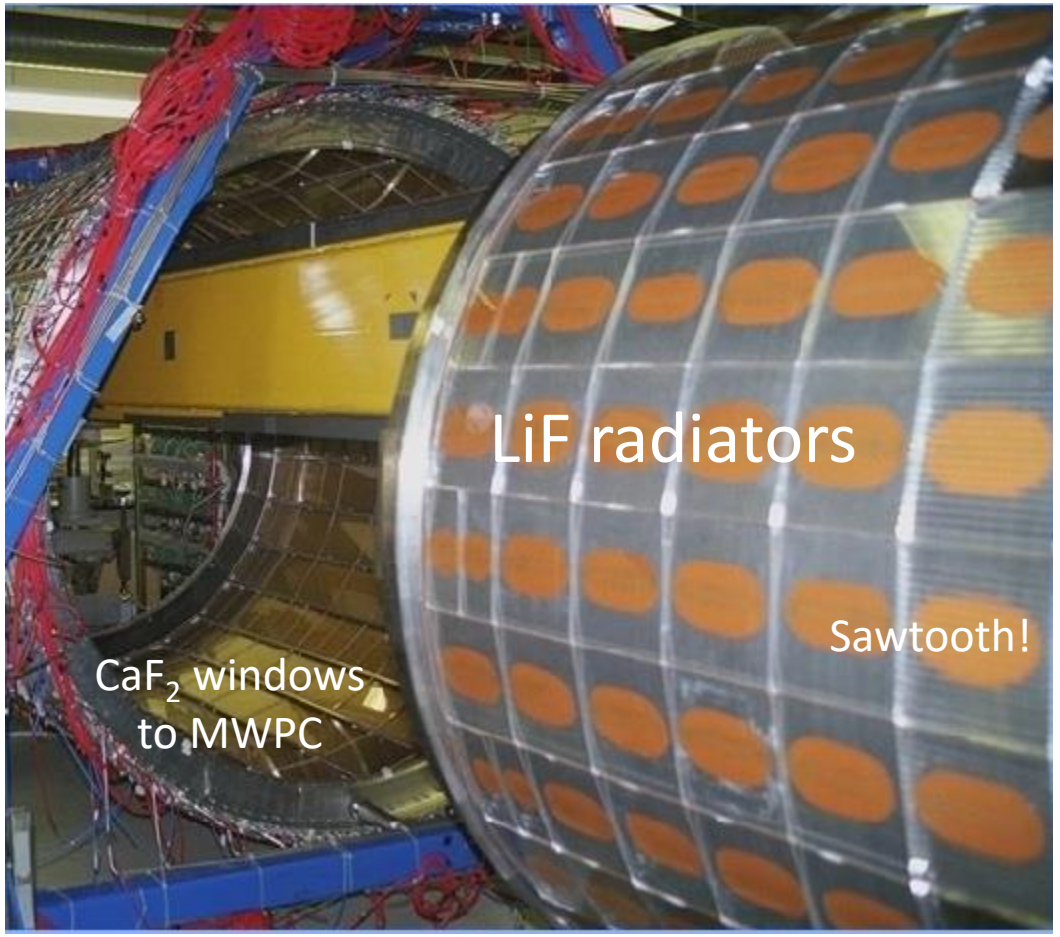


TEA: VUV photons (135-165 nm)

LiF radiators, CaF2 windows

N2 expansion gap (no mirrors)

"Fast" readout - charge induced on pads



The device performed extremely well!

CLEO III

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(co)authored by Sheldon

Physics with CLEO III data

2000

The D* Decay Branching Ratios Measurement with W-M. Yao

Measurement of the relative branching fraction of $\Upsilon(4S)$ to charged and neutral B mesons with S. Schuh

Observation of $B \to D^* \pi^+ \pi^- \pi^- \pi^0$ Decays with R. Ayad, J.C. Wang

Spin-parity Analysis of an $\omega\pi^-$ Enhancement Seen in $\bar{B} \to D\omega\pi^-$ Decays with M. Artuso, J.C. Wang

Using the $\omega\pi^-$ Mass Spectrum in $\bar{B} \to D\omega\pi^-$ Decays to Determine the Mass and the Width of the ϱ' with J.C. Wang

2001

The Case for Upsilon Resonance Running, Now

First Observation of $B^0 \to D^{*0} \pi^+ \pi^- \pi^-$ Decays with J.C. Wang

Possibility of Interesting Physics in $e^+e^- \to \Lambda_b^0 \bar{\Lambda}_b^0$ at CLEO with J.C. Wang

2002

Inclusive η' Production from the $\Upsilon(1S)$ with K. Khroustalev, J.C. Wang

Proposal for a Short Y(5S) Run with CLEO III with J. Lee, I. Shipsey

2003

Observation of a Narrow Resonance of Mass 2.46 GeV/c^2 Decaying to $D_s^{*+}\pi^0$ and Confirmation of the $D_{sJ}^{*+}(2317)$ State with S. Li, J.C. Wang, D. Cinabro, J. Urheim

2004 (CLEO III related)

Studies of e+e- Annihliations between 11.230 to 11.382 GeV in Center-of-Mass Energy with O. Dorjkhaidav

2005 (CLEO III related)

$K^{\pm}\pi^{\mp}$ Decays, RICH Fake Rates, Mixing & Doubly Cabibbo Suppressed Decays with N. Menaa

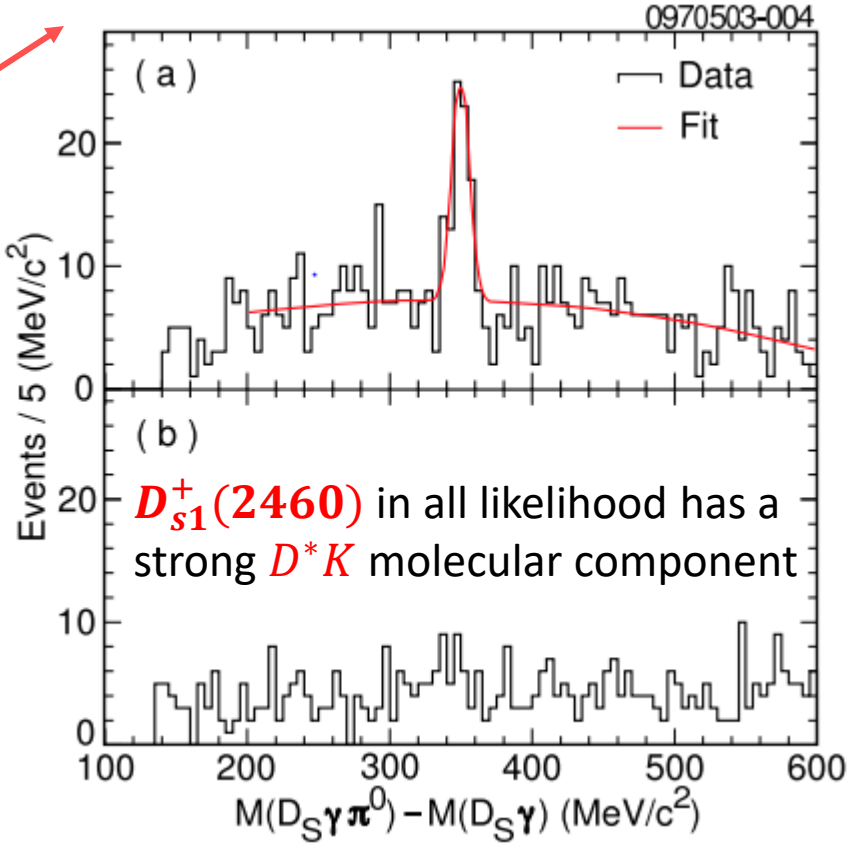
Evidence for $B_s^{(*)}\bar{B}_s^{(*)}$ Production at the $\Upsilon(5S)$ with R. Sia

The CLEO Rich Detector with M. Artuso, R. Ayad, K. Bukin, A. Efimov, C. Boulahouache, E. Dambasuren, S. Kopp, J. Li, G. Majumder, N. Menaa, R. Mountain, S. Schuh, T. Skwarnicki, G. Viehhauser, J.C. Wang, T.E. Coan, V. Fadeyev, Y. Maravin, I. Volobouev, J. Ye, S. Anderson, Y. Kubota, A. Smith

First Evidence and Measurement of $B_s^{(*)}\bar{B}_s^{(*)}$ Production at the $\Upsilon(5S)$ (Update) with R. Sia

Discovery of $D_{s1}^+(2460)$

PRD68 (2003) 032002 [citated 658 times]



$D_{s1}^+(2460)$ in all likelihood has a strong D^*K molecular component

CLEO III

Internal CLEO-CBX notes
(co)authored by Sheldon

2000

The D* Decay Branching Ratios Measurement with W-M. Yao

Measurement of the relative branching fraction of $\Upsilon(4S)$ to charged and neutral B mesons with S. Schuh

Observation of $B \to D^* \pi^+ \pi^- \pi^- \pi^0$ Decays with R. Ayad, J.C. Wang

Spin-parity Analysis of an $\omega\pi^-$ Enhancement Seen in $\bar{B} \to D\omega\pi^-$ Decays with M. Artuso, J.C. Wang

Using the $\omega\pi^-$ Mass Spectrum in $\bar{B} \to D\omega\pi^-$ Decays to Determine the Mass and the Width of the ϱ' with J.C. Wang

2001

The Case for Upsilon Resonance Running, Now

First Observation of $B^0 \to D^{*0} \pi^+ \pi^- \pi^-$ Decays with J.C. Wang

Possibility of Interesting Physics in $e^+e^- \to \Lambda_b^0 \bar{\Lambda}_b^0$ at CLEO with J.C. Wang

2002

Inclusive η' Production from the $\Upsilon(1S)$ with K. Khroustalev, J.C. Wang

Proposal for a Short Y(5S) Run with CLEO III with J. Lee, I. Shipsey

2003

Observation of a Narrow Resonance of Mass 2.46 GeV/c² Decaying to $D_s^{*+}\pi^0$ and Confirmation of the $D_{sJ}^{*+}(2317)$ State with S. Li, J.C. Wang, D. Cinabro, J. Urheim

2004 (CLEO III related)

Studies of e+e- Annihliations between 11.230 to 11.382 GeV in Center-of-Mass Energy with O. Dorjkhaidav

2005 (CLEO III related)

$K^{\pm}\pi^{\mp}$ Decays, RICH Fake Rates, Mixing & Doubly Cabibbo Suppressed Decays with N. Menaa

Evidence for $B_s^{(*)}\bar{B}_s^{(*)}$ Production at the $\Upsilon(5S)$ with R. Sia

The CLEO Rich Detector with M. Artuso, R. Ayad, K. Bukin, A. Efimov, C. Boulahouache, E. Dambasuren, S. Kopp, J. Li, G. Majumder, N. Menaa, R. Mountain, S. Schuh, T. Skwarnicki, G. Viehhauser, J.C. Wang, T.E. Coan, V. Fadeyev, Y. Maravin, I. Volobouev, J. Ye, S. Anderson, Y. Kubota, A. Smith

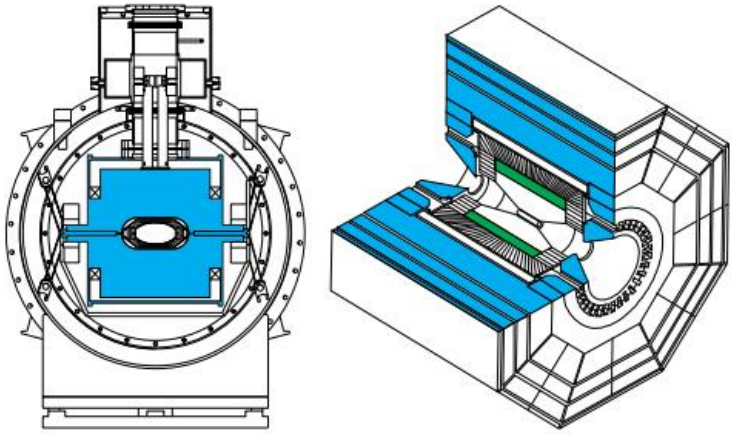
First Evidence and Measurement of $B_s^{(*)}\bar{B}_s^{(*)}$ Production at the $\Upsilon(5S)$ (Update) with R. Sia

B-factories outgun CESR in luminosity
Sheldon pushes for CLEO-III runs off $\Upsilon(4S)$

Sheldon was also instrumental in proposing to repurpose CLEO/CESR to run at charm threshold

CLNS 01/1742
Revised 10/01

**CLEO-c and CESR-c:
A New Frontier of
Weak and Strong Interactions**



Marina headed the CLEO-c task force

CLEO-c

Internal CLEO-CBX notes
(co)authored by Sheldon

2003 CLEO-c starts taking data

2004 (CLEO-c related)

Measurement of $B(D^{\pm} \to \mu^{+}\nu)$ and the Pseudoscalar Decay Constant $f_{D^{\pm}}$ with N. Menaa

An Analysis of the Recent BES Measurement of $B(D^{\pm} \to \mu^{+}\nu)$ with N. Menaa

Proposal to Investigate D_s Running Strategies at CLEO-c with G. Adams, M. Artuso, D. Asner, S. Blusk, R. Briere, C. Boulahouache, T. Coan, D. Cinabro, I. Danko, S. Dytman, N. Menaa, D. Miller, J. Napolitano, A. Ryd, I. Shipsey, T. Skwarnicki, M. Selen, J.C. Wang, J. Wiss

2005 (CLEO-c related)

$K^{\pm}\pi^{\mp}$ Decays, RICH Fake Rates, Mixing & Doubly Cabibbo Suppressed Decays with N. Menaa

Improved Measurement of $B(D^{\pm} \to \mu^{+}\nu)$ and the Pseudoscalar Decay Constant $f_{D^{\pm}}$ with N. Menaa

Measurement of Inclusive Production of η, η' and ϕ Mesons in D^0, D^+ Decays with R. Sia

D_s Run Plan Strategy

2006

An Investigation of $D^+ \to \tau^{+}\nu$ with N. Menaa

Measurement of the Inclusive Production of η, η' and ϕ Mesons in D^0, D^+ and D_s^+ Decays and the First Observation of $D_s^+ \to \eta\pi^{-}\pi^{+}\pi^{+}$ with R. Sia

First Observation of $e^{+}e^{-} \to D_s^{+}D_s^{-}$ Production at 4170 MeV with R. Sia

Measurement of $D^+ \to \mu^{+}\nu$ and the Decay Constant f_{D^+} with N. Menaa

Measurement of $D_s^+ \to \mu^{+}\nu$ and the Decay Constant f_{D_s} with N. Menaa

2007

2008 CLEO-c ends taking data

Search for $D^0 \to pe^{=}$ and $D^0 \to \bar{p}\,e^{\pm}$ with S. Khalil

Measurement of B($D^+ \to \mu^{+}\nu$) and the Pseudoscalar Decay Constant f_{D^+} Using the Full ψ'' Sample with Khalil, S ; Zhang, Liming

Measurement of B($D_s^+ \to$ lepton + neutrino) and the Decay Constant f_{D_s} From 600/pb of Data Near 4170 MeV with Zhang, Liming

2009

A Study of the Semileptonic Decay $D_s^+ \to f_0(980)e^{+}\nu$ with Liming Zhang

Measurement of the Pseudoscalar Decay Constant f_{D_s} Using $D_s^+ \to \tau^{+}\nu$, $\tau^+ \to \rho^{+}\nu$ Decays with Liming Zhang

Sheldon's work on charm meson decay constants was important for verification of applicability of LQCD to calculations of hadronic effects in weak decays

Sheldon was CLEO-c co-spokesman 2007-2008

B physics at hadronic colliders

- Sheldon was among early proponents of B physics to be done at hadronic colliders

"B Physics at the SSC" the talk given at *Superconducting Super Collider: The Project, the Progress, the Physics, Symposium* Corpus Christi, Texas, October 13–17, 1991.

- He became a co-spokesman of the BTeV proposal in 1996

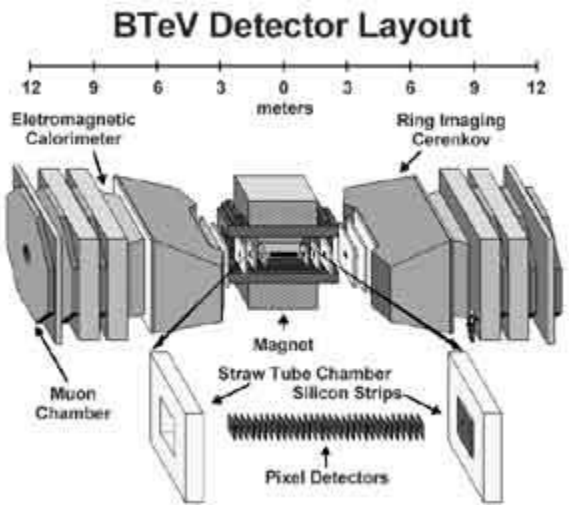
BTeV: An Expression of Interest for a Heavy Quark Program at C0 †

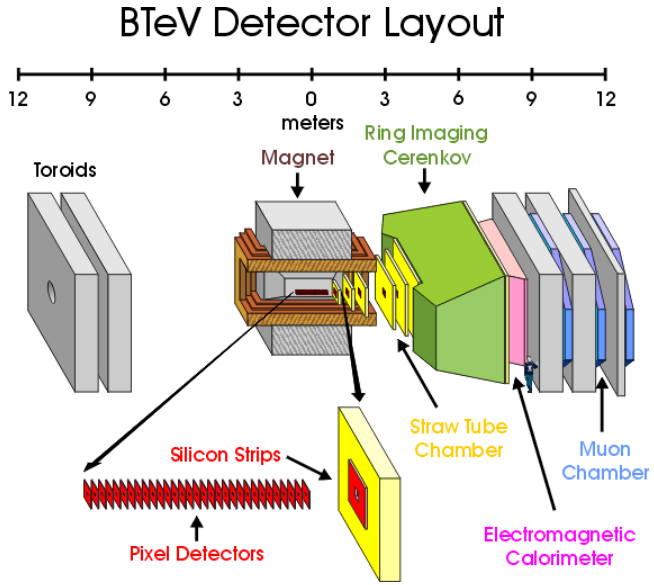
May 18, 1997

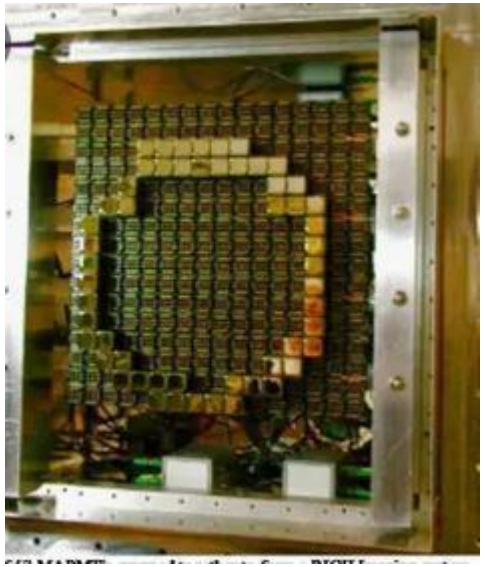
† Spokespersons: Joel Butler and Sheldon Stone

(BTeV collaboration: 170 physicists from 30 institutions)

In 2004







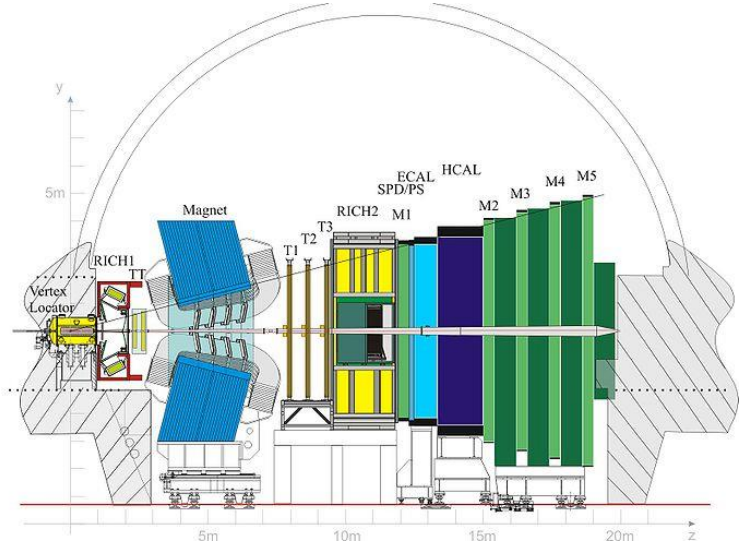
We designed and tested C_4F_8O RICH at Syracuse

The Magnetic Distortion Calibration System of the LHCb RICH1 Detector

A. Borgia[c], W. Cameron[b], A. Contu[d,2], C. D'Ambrosio[a], C. Frei[a], N. Harnew[d], M. John[d], G. Lefeuvre[c,1], R. Mountain[c,*], S. Stone[c], D. Websdale[b], F. Xing[d]

[a] European Organization for Nuclear Research (CERN), CH-1211 Geneva 23, Switzerland
[b] Imperial College London, Physics Department, London SW7 2AZ, UK
[c] Syracuse University, Department of Physics, Syracuse NY 13244, USA
[d] University of Oxford, Denys Wilkinson Building, Oxford OX1 3RH, UK

Syracuse University joins LHCb experiments in 2005



In LHCb Sheldon served:

as LHCb Upgrade Coordinator 2008-2011

and as Deputy Project Leader for Upstream Tracker (Marina Artuso is the Project Leader) 2014-2021

Upstream Tracker installations at CERN for the LHCb Upgrade (2022)

LHCb

Internal LHCb-ANA notes
(co)authored by Sheldon

2010

Measurement of σ(pp→$b\bar{b}$X) at 7 TeV in the forward region with Urquijo, P, Zhang, Liming

Measurement of the $B_s \to J/\psi f_0(980)$ branching fraction with Pal, B, Zhang, L

2011

Analysis of $B_s \to J/\psi(\pi^+\pi^-$ and $K^+K^-)$ and the first observation of $J/\psi f_2'(1525)$ with Pal, B, Zhang, L

Measurement of ϕ_s in $B_s \to J/\psi f_0(980)$ with Pal, B, Zhang, L

Measurement of b-hadron production fractions in 7 TeV centre-of-mass energy pp collisions with Artuso, M, Borgia, A, Urquijo, P, Xing, Zhou, Zhang, L

Combination of ϕ_s measurements from $B_s \to J/\psi\phi$ and $B_s \to J/\psi f_0(980)$ with Cowan, G.,Clarke, P.,Xie, Y.,Needham, M. Fitzpatrick, C., Zhang, L.

Search for Majorana neutrinos in LHCb with Qian, W.

2012

Analysis of the resonant components in $B_s \to J/\psi\pi^+\pi^-$ with Pal, B, Zhang, L

Measurement of ϕ_s in $B_s \to J/\psi\pi^+\pi^-$ decays with Pal, B, Zhang, L

Measurement of the $D_s^+ - D_s^-$ Production Asymmetry with Artuso, M, Borgia, A, Xing, Z, Zhang, L

Measurement of the B_s effective lifetime in the $J/\psi f_0(980)$ final state with Phan, A, Zhang, L

Measurement of the $D^\pm$ production asymmetry in 7 TeV pp collisions with Charles, M., Gibson, V., Gordon, H., Gregson, S ,Xing, Z.

Time integrated measurement of the semileptonic CP violating asymmetry a^s_{ls} with Artuso, M, Borgia, A,Lafferty, G, Webber, A.,Xing, Z, Zhang, L

Tagged time-dependent analysis of $B_s \to J/\psi K^+K^-$ and $Bs \to J/\psi\pi^+\pi^-$ decays with 1.0 fb^{-1} with Aaij, A. et al.

Analysis of the resonant components in $B_s \to J/\psi K^+K^-$ with Pal, B, Zhang, L

Analysis of the resonant components in $B^0 \to J/\psi\pi^+\pi^-$ with Pal, B, Zhang, L

Measurement of the $B^0 \to J/\psi K^+K^-$ branching fraction and search for $B^0 \to J/\psi\phi$ decay with Pal, B, Zhang, L

Searches for CP violation in singly Cabibbo suppressed $D_{(s)}^+$ decays with Charles, M., Gibson, V., Gordon, H., Gregson, S ,Xing, Z.

Sheldon and Liming broke all records of number of LHCb papers published per year as lead proponents

2013

Time integrated measurement of the semileptonic CP violating asymmetry a^s_{ls} with Artuso, M, Borgia, A.,Hadjivasiliou, C, Xing, Z, Zhang, L Webber, A.,Vesterinen, M.

Investigation of B_s and B^0 decays into $J/\psi\pi^+\pi^-\pi^+\pi^-$, and first observations of B_s and $B^0 \to J/\psi f_1(1285)$ decays with Zhang, L

Searches for Majorana neutrinos in $B^- \to \pi^+\mu^-\mu^-$ decay at LHCb with Xing, Z

Measurement of resonant and CP components in $B_s \to J/\psi\pi^+\pi^-$ decay with Zhang, L

Measurement of the Λ_b^0 lifetime in the $J/\psi pK^-$ final state with Pal, B, Zhang, L

LHCb

Internal LHCb-ANA notes
(co)authored by Sheldon

2014

Measurement of the resonant components in $B^0 \to J/\psi\pi^+\pi^-$ decay with Xing, Z, Zhang, L

Measurement of the CP violating phase ϕ_s in $B_s \to J/\psi\pi^+\pi^-$ decays with Zhang, L

Measurement of the CP-violating phase β in $B^0 \to J/\psi\pi^+\pi^-$ decays and limits on penguin effects with Zhang, L

2015

Observation of two new baryonic resonances in the $\Lambda_b\pi^\pm$ systems and precise measurement of $\Sigma_b^\pm$ and $\Sigma_b^{*\pm}$ properties with Gandini, P.

Observation of pentaquark-charmonium states seen in $\Lambda_b \to J/\psi p K^-$ decays with Yuanning, G., Yang, Z., Zhang, L., Yuan X., Jurik, N., Skwarnicki T.

2016

Measurement of the CP violating asymmetry a^s_{ls} with Artuso, M., De Bruyn, K.,Dufour, L., Gersabeck, M., Hadjivasiliou, C., Kelsey, M., Klaver, S., Parkes, C., Stahl, M.

A search for weakly decaying b-flavored pentaquarks with Venkateswaran, A., Zhang, L.

Measurement of $D_s^\pm$ production asymmetry at $\sqrt{s}$=7 and 8 TeV with $D_s^\pm \to K^+K^-\pi^\pm$ decays with Artuso, M., Dufour, L. ,Gersabeck, M.,Kelsey, Matthew J.,Klaver, S.,Parkes, C.,Stahl, M., Van Tilburg, J.,Vesterinen, M.

Measurement of the b quark production cross-section in 7 and 13 TeV pp collisions with Cowan, G. et al.,

2017

Study of the resonant components and CP-violations in $B_s \to J/\psi K^+K^-$ decay in the mass region above the ϕ with Liu, X., Polyakov, I., Wang, M. , Zhang, L.

2018

CP violation in B_s and $B_s \to J/\psi\pi^+\pi^-$ decays with 2015 and 2016 data with Gao, Y., Liu, X., Yang, Z., Zhang, L.

Measurement of b-hadron production fractions in 13 TeV centre-of-mass energy pp collisions with Artuso, M.,Ely, S.,Kelsey, M.,Wilkinson, M.,Davis, A., Zhang, L.

2019

Isospin amplitudes in $\Lambda_b^0 \to J/\psi\Lambda(\Sigma^0)$ and $\Xi_b^0 \to J/\psi\Xi^0(\Lambda)$ decays with Venkateswaran, A. ,Wilkinson, M., Zhang, L.

Measurement of the B_c^- production fraction in 7 and 13 TeV pp collisions with Yuan, X.

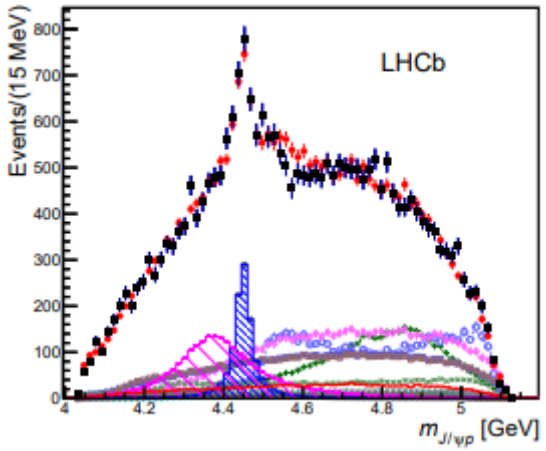
2020

Observation of the suppressed decay $\Xi_c^0 \to \pi^-\Lambda_c^+$ with Wilkinson, M.,

Discovery of $P_c^+ \to J/\psi p$

PRL 115, 072001 (2015)

[1399 citations – most of LHCb papers]



All the other things we miss Sheldon for

- Fun to go out with
- He spoke truth to power:

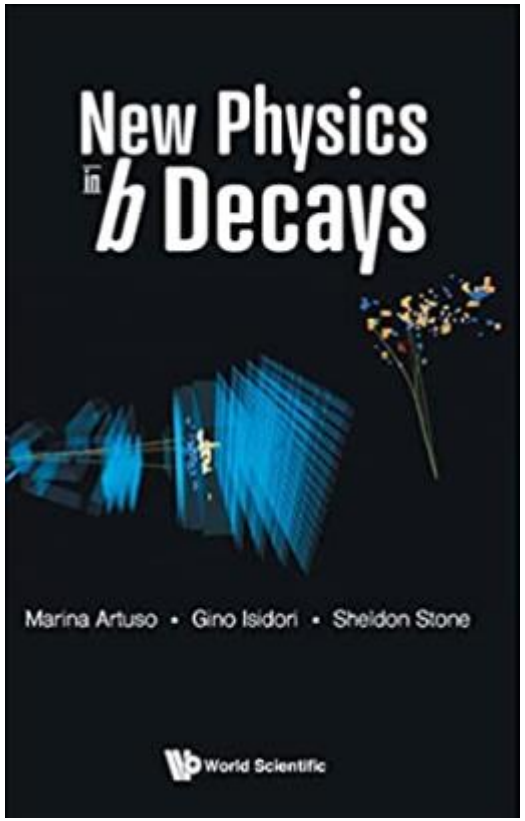
  Fermilab Program Advisory Committee Member 1988-1993

  Member of the Fermilab Research Alliance, LLC Board of Directors 2006-2011
- He was a gifted speaker and communicator:

  Gave over 100 conference/workshop talks
  Lectured at about 10 schools
- He served on countless conference advisory committees (FPCP, RICH,…)

  Organized FPCP2009 at Lake Placid, NY
- He spoke physics:

  to senior and junior people
  to experimentalists and **theorists**
  to analysis and detector people
  to media people
  until the end



(buy it on Amazon)

2019 W.K.H. Panofsky Prize in Experimental Particle Physics Recipient

Citation:

"*For transformative contributions to flavor physics and hadron spectroscopy, in particular through intellectual leadership on detector construction and analysis on the CLEO and Large Hadron Collider beauty experiments, and for the long-standing, deeply influential advocacy for flavor physics at hadron colliders.*"


Geneva 2014


Syracuse 2004


FPCP2009 Taipei


FPCP2015 Nagoya


Firenze 2009


名古屋大学
NAGOYA UNIVERSITY
FPCP2015 Nagoya