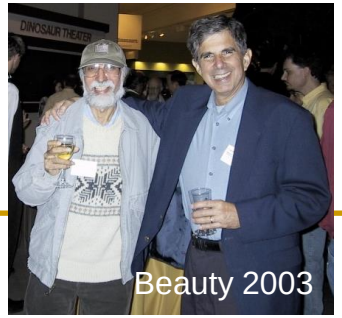
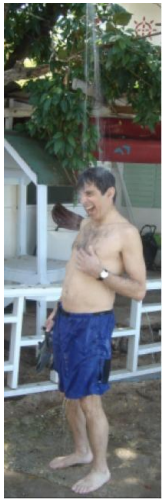


Beauty 2003

Sheldon Stone – a personal appreciation



Guy Wilkinson
University of Oxford

Beauty 2023, Clermont-Ferrand
4th July 2022

With thanks to Marina Artuso, Paula Collins, Franz Muheim and Ian Shipsey.

Prof. Sheldon Stone 1946-2021

Education:

- Brooklyn Technical High School, New York City;
- B.S. Physics, Brooklyn College (1967), Cum Laude;
- PhD, University of Rochester (1972), supervisor Tom Ferbel.

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 tintest 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.

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Always abreast of theory possibilities

Remember, this is well before 1974

Respects the scientific method and process

Uses state-of-the-art technology !

—Times-Union Photo—Claude Brown

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

Prof. Sheldon Stone 1946-2021

Education:

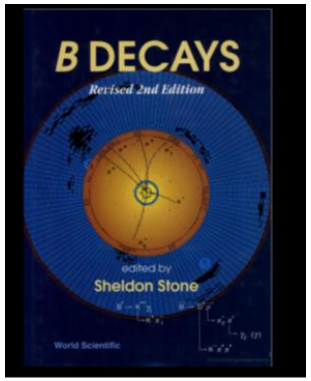
- Brooklyn Technical High School, New York City;
- B.S. Physics, Brooklyn College (1967), Cum Laude;
- PhD, University of Rochester (1972), supervisor Tom Ferbel.

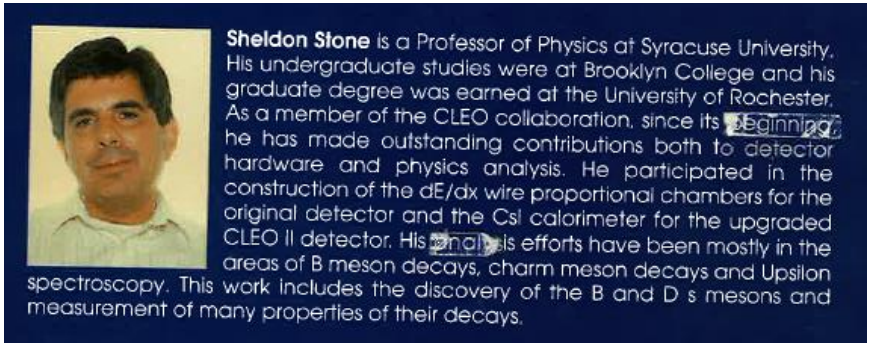
Employment:

- 1971-1973 Research Associate, Vanderbilt University;
- 1973-1979 Assistant Professor of Physics, Vanderbilt University
  (1977-1979 on leave at LNS);
- 1979-1991 Senior Research Associate & Adjunct Professor, Cornell University;
- 1991-2021 Professor, Syracuse University.

Getting to know Sheldon

Sheldon was the one true prophet of B (and flavour) physics. Throughout his career he advocated passionately for the subject. His 'B decays' was a totemic book for those of us trying to write a flavour-based PhD in the 1990s.





I first met Sheldon in person at Beauty 1995 in Oxford…

…but was far too shy to engage with him. Over time, I got to know him through other conferences, as an adversary (BTeV), a colleague (LHCb & CLEO) & a friend. A great privilege !

Sheldon the CLEOn

CLEO was the longest-lived experiment in the history of HEP, and one of the greatest. Sheldon was one of the very few present from the start to the end.

First CLEO publication, 1980

VOLUME 44, NUMBER 17 PHYSICAL REVIEW LETTERS 28 APRIL 1980

Observation of Three Upsilon States

D. Andrews, K. Berkelman, M. Billing, R. Cabenda, D. G. Cassel, J. W. DeWire, R. Ehrlich, T. Ferguson, T. Gentile, B. G. Gibbard,[a] M. G. D. Gilchriese, B. Gittelman, D. L. Hartill, D. Herrup, M. Herzlinger, D. L. Kreinick, D. Larson,[b] N. B. Mistry, E. Nordberg, S. Peggs, R. Perchonok, R. K. Plunkett, J. Seeman, K. A. Shinsky, R. H. Siemann, A. Silverman, P. C. Stein, S. Stone, R. Talman, H. G. Thonemann, and D. Weber
Cornell University, Ithaca, New York 14853

and

C. Bebek, J. Haggerty, J. M. Izen, R. Kline, W. A. Loomis, F. M. Pipkin, W. Tanenbaum, and Richard Wilson
Harvard University, Cambridge, Massachusetts 02138

and

A. J. Sadoff
Ithaca College, Ithaca, New York 14850

and

D. L. Bridges
Le Moyne College and Syracuse University, Syracuse, New York 13210

and

K. Chadwick, P. Ganci, H. Kagan, F. Lobkowicz, W. Metcalf,[c] S. L. Olsen, R. Poling, C. Rosenfeld, G. Rucinski, E. H. Thorndike, and G. Warren
University of Rochester, Rochester, New York 14627

and

D. Bechis, G. K. Chang,[d] R. Imlay,[c] J. J. Mueller, D. Potter, F. Sannes, P. Skubic, and R. Stone
Rutgers University, New Brunswick, New Jersey 08854

and

A. Brody, A. Chen, M. Goldberg, N. Horowitz, J. Kandaswamy, H. Kooy, P. Lariccia,[c] G. C. Moneti, and R. Whitman[f]
Syracuse University, Syracuse, New York 13210

and

M. S. Alam, S. E. Csorna, R. S. Panvini, and J. S. Poucher
Vanderbilt University, Nashville, Tennessee 37235

(Received 15 February 1980)

Three narrow resonances have been observed in e^+e^- annihilation into hadrons at total energies between 9.4 and 10.4 GeV. Measurements of mass spacings and ratios of lepton pair widths support the interpretation of these "Υ" states as the lowest triplet-S levels of the $b\bar{b}$ quark-antiquark system.

PACS numbers: 13.65.+i

We report here on the first results from the CLEO detector at the Cornell Electron Storage Ring (CESR). CLEO is a magnetic detector built around a 1.05-m-radius, 3-m-long solenoid coil producing a magnetic field parallel to the beams (see Fig. 1). Charged particles are observed and their momenta measured over a solid angle of $0.90\times4\pi$ sr in a cylindrical drift chamber occupying most of the field volume. A smaller cylindrical proportional chamber immediately surrounding the beam pipe provides improved resolution along the beam axis. Outside the 0.9-radiation-length thick aluminum solenoid coil are scintillation counters 2.2 m from the beam line (covering

 © 1980 The American Physical Society

Last CLEO publication, 2014

PHYSICAL REVIEW D 89, 072002 (2014)

Updated measurements of absolute D^+ and D^0 hadronic branching fractions and $\sigma(e^+e^-\to D\bar{D})$ at $E_{\rm cm}=3774$ MeV

G. Bonvicini,[1] D. Cinabro,[1] M. J. Smith,[1] P. Zhou,[1] P. Naik,[2] J. Rademacker,[2] K. W. Edwards,[3] R. A. Briere,[4] H. Vogel,[4] J. L. Rosner,[5] J. P. Alexander,[6] D. G. Cassel,[6] R. Ehrlich,[6] L. Gibbons,[6] S. W. Gray,[6] D. L. Hartill,[6] B. K. Heltsley,[6] D. L. Kreinick,[6] V. E. Kuznetsov,[6] J. R. Patterson,[6] D. Peterson,[6] D. Riley,[6] A. Ryd,[6] A. J. Sadoff,[6] X. Shi,[6,*] W. M. Sun,[6] S. Das,[7] J. Yelton,[7] P. Rubin,[8] N. Lowrey,[9] S. Mehrabyan,[9] M. Selen,[9] J. Wiss,[9] J. Libby,[10] M. Kornicer,[11] R. E. Mitchell,[11] D. Besson,[12] T. K. Pedlar,[13] D. Cronin-Hennessy,[14] J. Hietala,[14] S. Dobbs,[15] Z. Metreveli,[15] K. K. Seth,[15] A. Tomaradze,[15] T. Xiao,[15] A. Powell,[16] C. Thomas,[16] G. Wilkinson,[16] D. M. Asner,[17] G. Tatishvili,[17] J. Y. Ge,[18] D. H. Miller,[18] I. P. J. Shipsey,[18,†] B. Xin,[18] G. S. Adams,[19] J. Napolitano,[19] K. M. Ecklund,[20] J. Insler,[21] H. Muramatsu,[21] L. J. Pearson,[21] E. H. Thorndike,[2] M. Artuso,[22] S. Blusk,[22] R. Mountain,[22] T. Skwarnicki,[22] S. Stone,[2] J. C. Wang,[22] L. M. Zhang,[22] P. U. E. Onyisi[23,‡]

(CLEO Collaboration)

[1]*Wayne State University, Detroit, Michigan 48202, USA*
[2]*University of Bristol, Bristol BS8 1TL, United Kingdom*
[3]*Carleton University, Ottawa, Ontario K1S 5B6, Canada*
[4]*Carnegie Mellon University, Pittsburgh, Pennsylvania 15213, USA*
[5]*University of Chicago, Chicago, Illinois 60637, USA*
[6]*Cornell University, Ithaca, New York 14853, USA*
[7]*University of Florida, Gainesville, Florida 32611, USA*
[8]*George Mason University, Fairfax, Virginia 22030, USA*
[9]*University of Illinois, Urbana-Champaign, Illinois 61801, USA*
[10]*Indian Institute of Technology Madras, Chennai, Tamil Nadu 600036, India*
[11]*Indiana University, Bloomington, Indiana 47405, USA*
[12]*University of Kansas, Lawrence, Kansas 66045, USA*
[13]*Luther College, Decorah, Iowa 52101, USA*
[14]*University of Minnesota, Minneapolis, Minnesota 55455, USA*
[15]*Northwestern University, Evanston, Illinois 60208, USA*
[16]*University of Oxford, Oxford OX1 3RH, United Kingdom*
[17]*Pacific Northwest National Laboratory, Richland, Washington 99352, USA*
[18]*Purdue University, West Lafayette, Indiana 47907, USA*
[19]*Rensselaer Polytechnic Institute, Troy, New York 12180, USA*
[20]*Rice University, Houston, Texas 77005, USA*
[21]*University of Rochester, Rochester, New York 14627, USA*
[22]*Syracuse University, Syracuse, New York 13244, USA*
[23]*University of Texas at Austin, Austin, Texas 78712, USA*

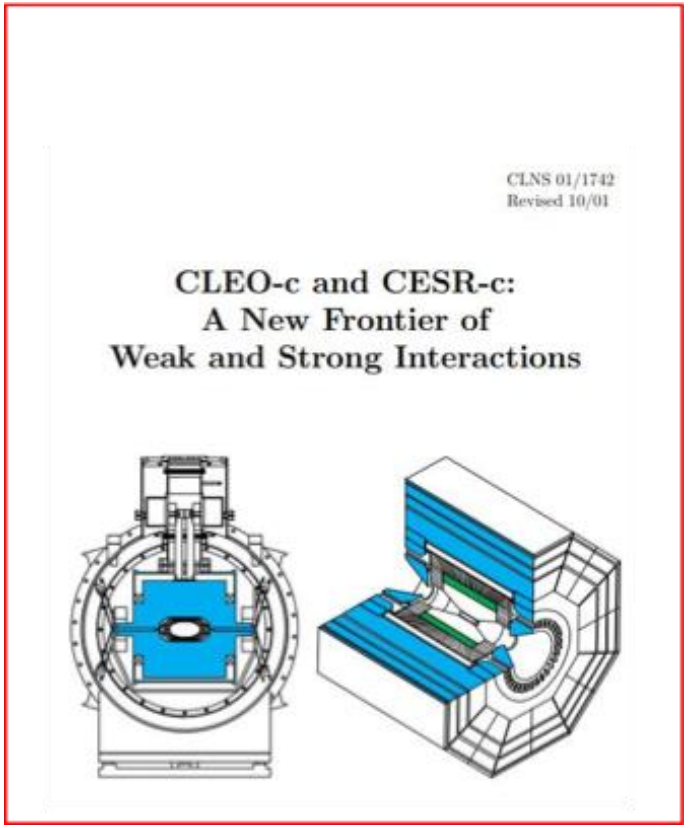
(Received 24 December 2013; published 2 April 2014)

Utilizing the full CLEO-c data sample of 818 pb^{-1} of e^+e^- data taken at the $\psi(3770)$ resonance, we update our measurements of absolute hadronic branching fractions of charged and neutral D mesons. We previously reported results from subsets of these data. Using a double tag technique we obtain branching fractions for three D^0 and six D^+ modes, including the reference branching fractions $\mathcal{B}(D^0\to K^-\pi^+)=(3.934\pm0.021\pm0.061)\%$ and $\mathcal{B}(D^+\to K^-\pi^+\pi^+)=(9.224\pm0.059\pm0.157)\%$. The uncertainties are statistical and systematic, respectively. In these measurements we include the effects of final-state radiation by allowing for additional unobserved photons in the final state, and the systematic errors include our estimates of the uncertainties of these effects. Furthermore, using an independent measurement of the luminosity, we obtain the cross sections $\sigma(e^+e^-\to D^0\bar{D}^0)=(3.607\pm0.017\pm0.056)$ nb and $\sigma(e^+e^-\to D^+D^-)=(2.882\pm0.018\pm0.042)$ nb at a center of mass energy, $E_{\rm cm}=3774\pm1$ MeV.

DOI: 10.1103/PhysRevD.89.072002 PACS numbers: 13.25.Ft

Sheldon the CLEOn

- Discovery of D_s^+;
- First full reconstruction of B^+ and B^0;
- Discovery of B decays to charmonium;
- Study of D^+ and D_s^+ fully leptonic decays;
- Physics Analysis Coordinator in 1998 and co-Spokesperson from 2007-8;
- One of driving forces behind re-birth of CLEO as a 'charm factory' experiment.

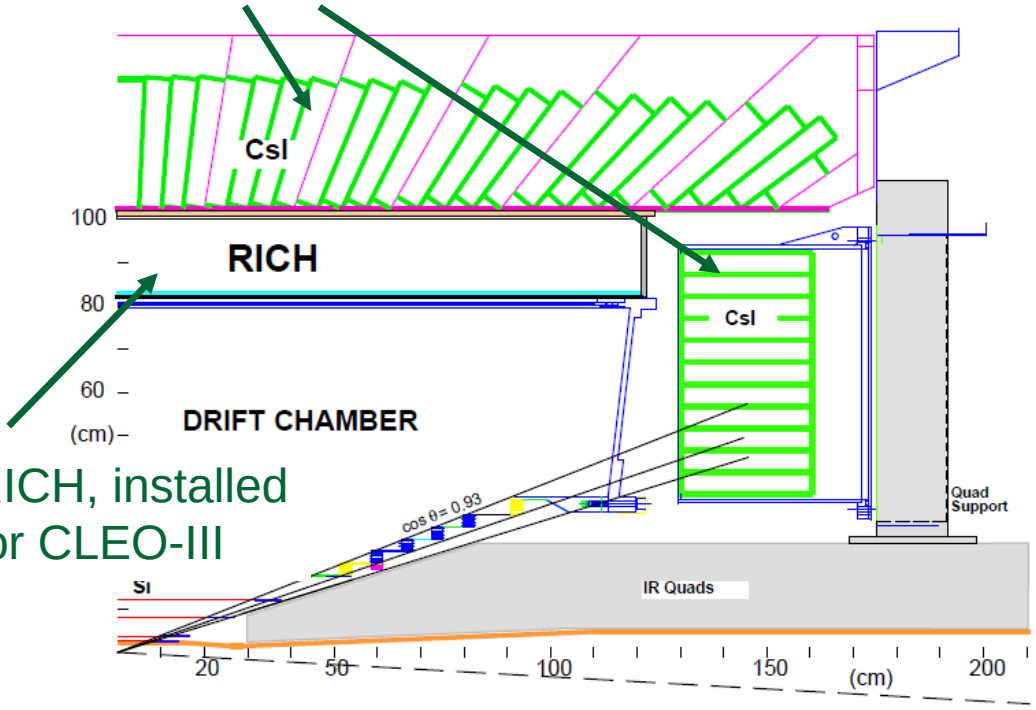


"It's been a blast !" Sheldon, at the time of end of data taking in 2008.

Sheldon the instrumentalist

Sheldon understood the central importance of instrumentation, and was equally adept as a detector physicist as an analyst (not to mention, a highly accomplished phenomenologist). On CLEO, he had major involvement with several subsystems over the lifespan of the experiment, including the drift chamber, calorimeter & RICH.

ECAL, installed for CLEO-II



RICH, installed for CLEO-III

ECAL was first precision calorimeter in a general-purpose magnetic spectrometer

7800 thalium-doped CsI crystals

Barrel: $\frac{\sigma_E}{E}[\%] = \frac{0.35}{E^{0.75}} + 1.9 - 0.1E,$

Endcap: $\frac{\sigma E}{E}[\%] = \frac{0.26}{E} + 2.5,$

[CLEO, NIMA 320 (1992) 66]

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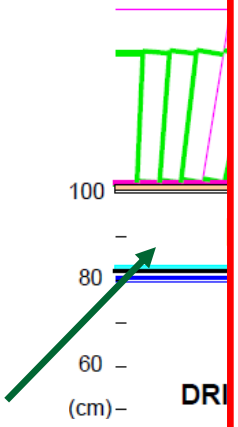
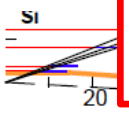
ECAL, ins



RICH, install
for CLEO-III



first precision
a general-purpose
spectrometer

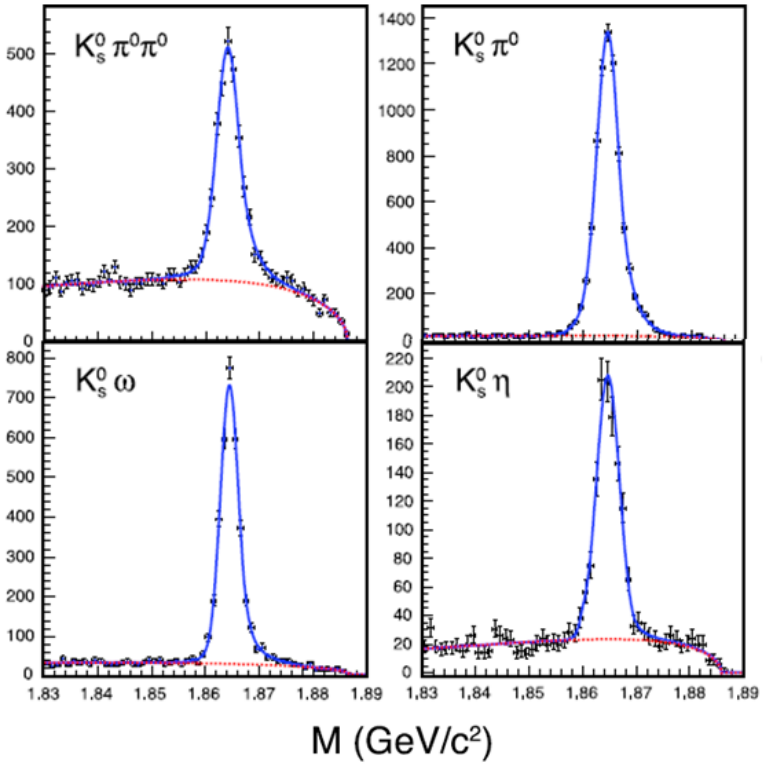
lium-doped
crystals

$$\frac{\sigma_E}{E}\,[\%] = \frac{0.35}{E^{0.75}} + 1.9 - 0.1E,$$

$$\sigma_\phi\,[\text{mr}] = \frac{0.26}{E} + 2.5,$$

MA 320 (1992) 66]

Exquisite resolution for modes involving neutrals.

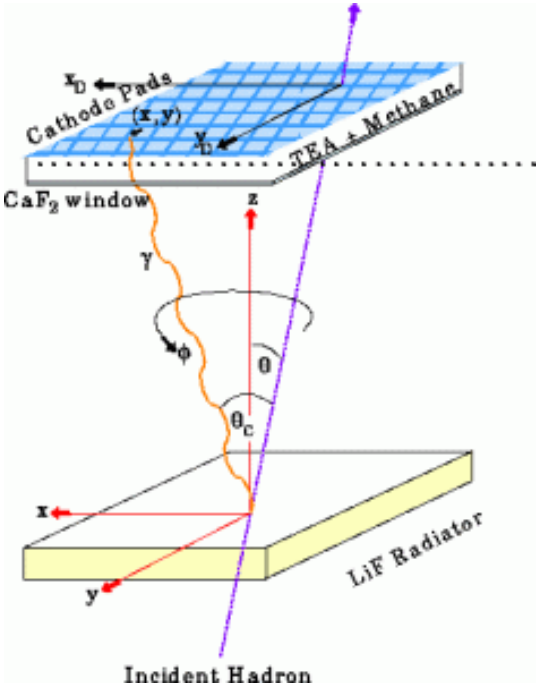


[CLEO, PRD 78 (2008) 012001]

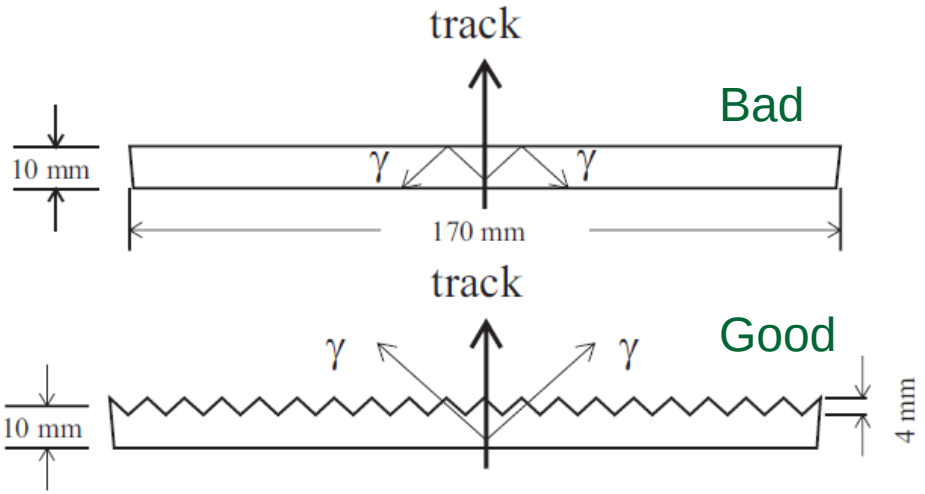
Sheldon the instrumentalist – the CLEO RICH

The CLEO RICH – one of the first truly successful RICH detectors in HEP.

Basic idea – proximity focused, with novel LiF radiator

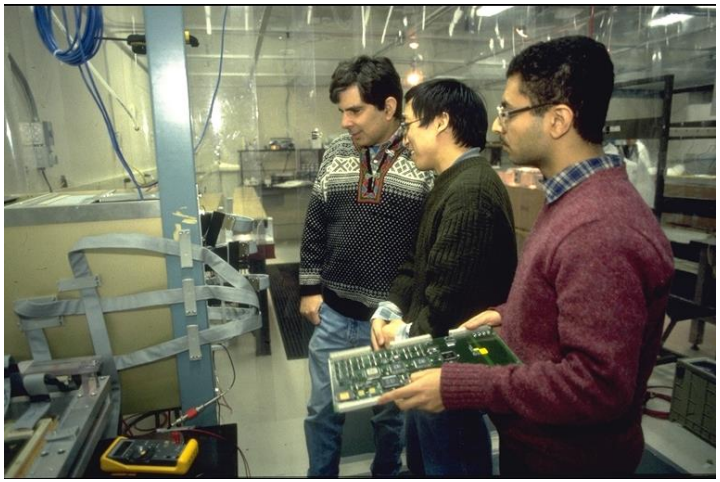


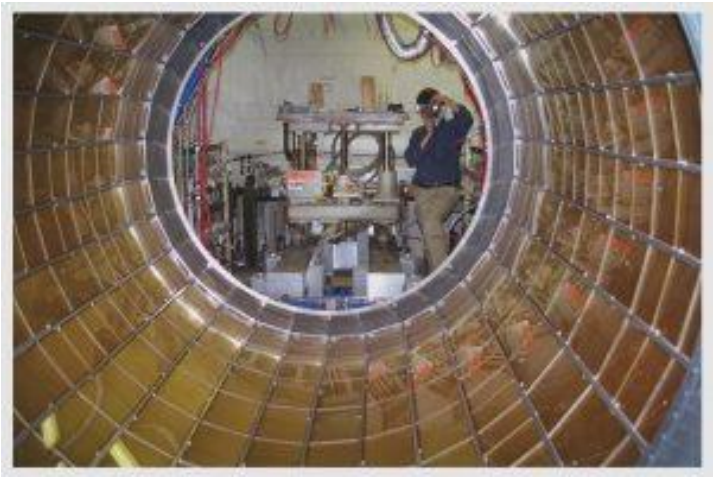
Smart innovations – sawtooth radiator design

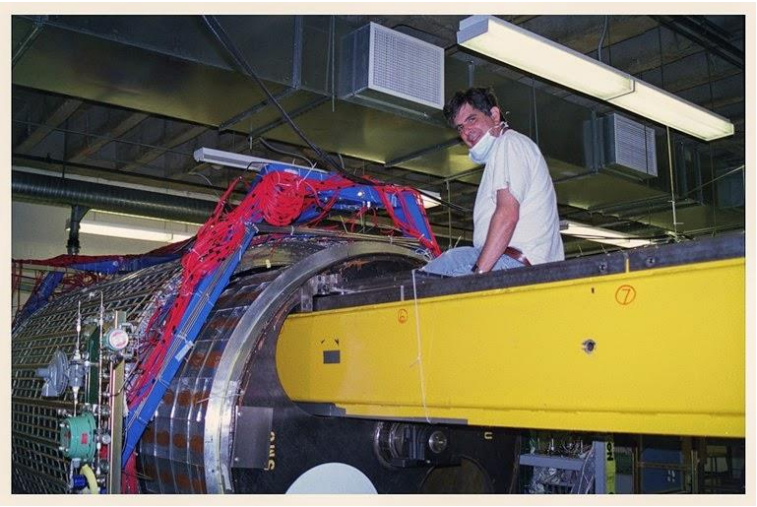


[Artuso *et al.*, NIM A554 (2005) 147]

Sheldon the instrumentalist – the CLEO RICH

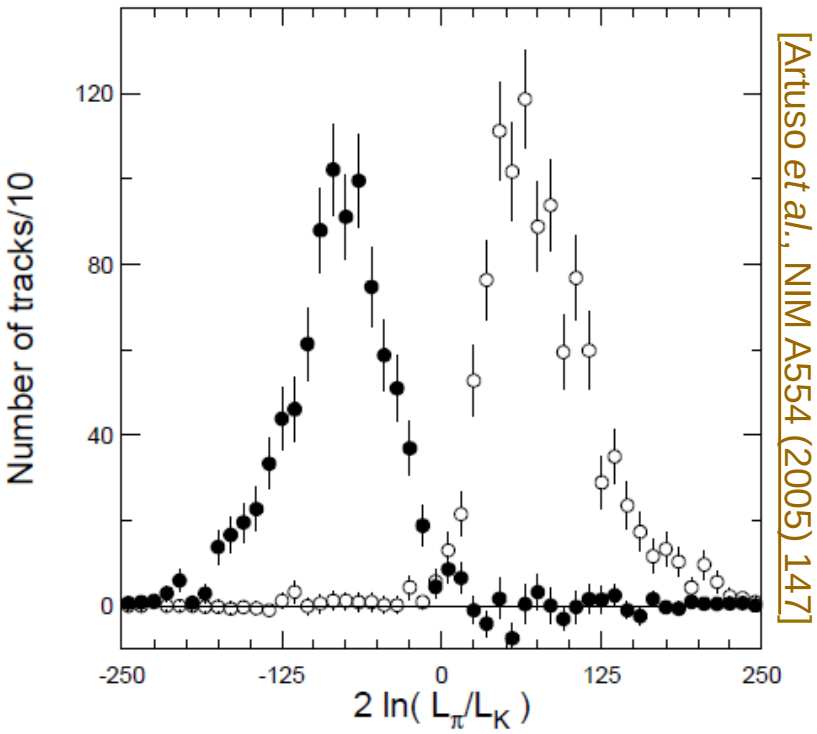






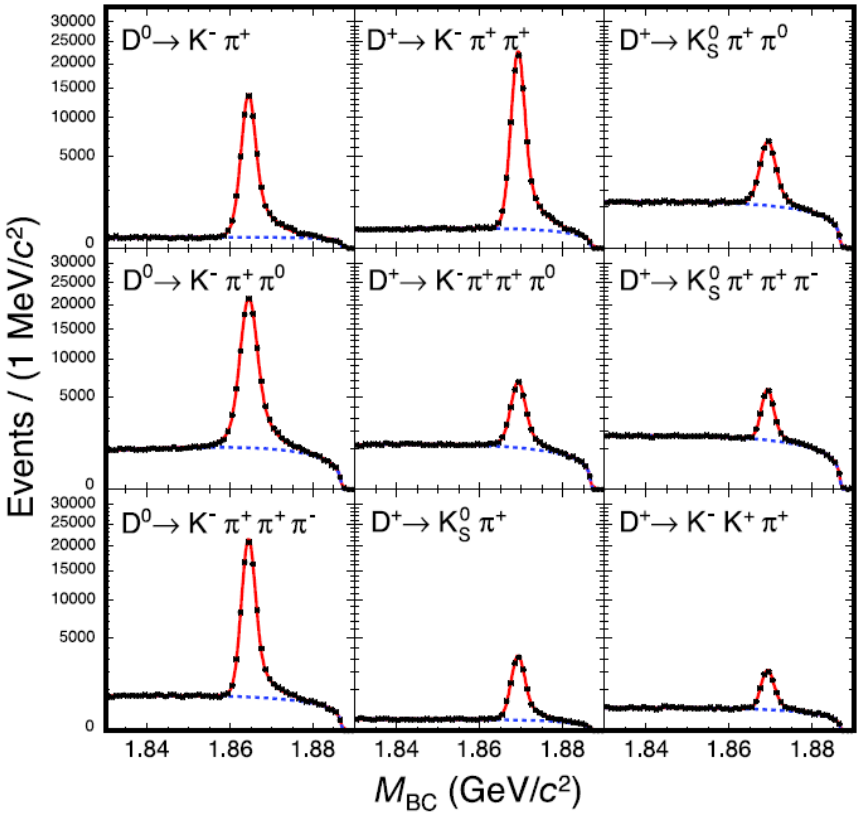
Sheldon the instrumentalist – the CLEO RICH

Excellent π-K separation



[Artuso *et al.*, NIM A554 (2005) 147]

Beautiful, clean signals



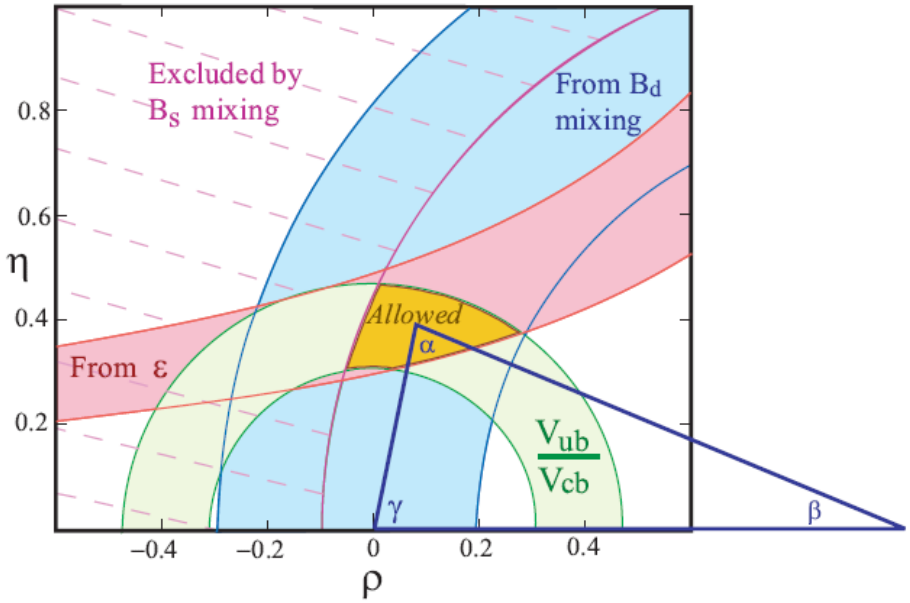
[CLEO, PRD 76 (2007) 112001]

(caveat: not all of these use RICH)

BTeV – a dedicated b-physics experiment at the Tevatron

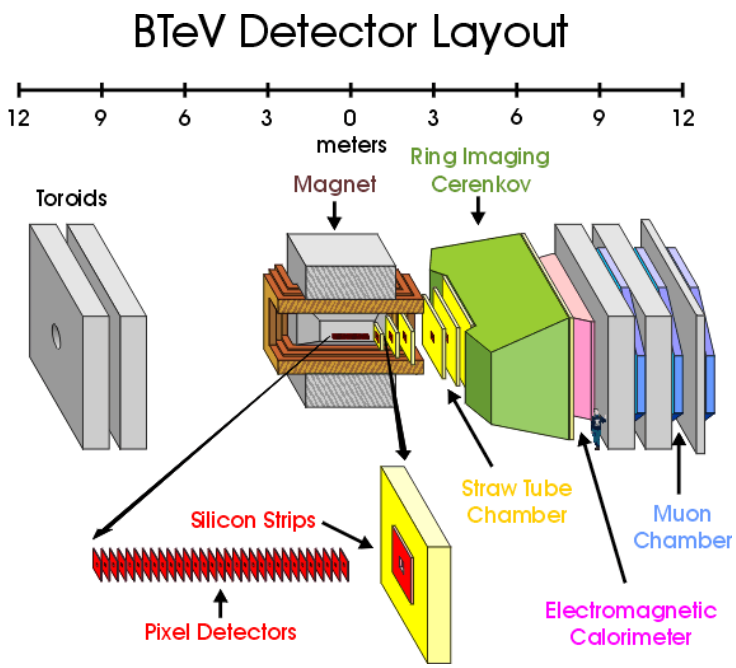
In the 1990s, Sheldon and the Syracuse group, and others, including Joel Butler began to advocate BTeV, a dedicated B-physics experiment at the Tevatron.

Sheldon and Joel, co-SPs of BTeV



The Unitarity Triangle at the time of the BTeV, EoI, Sept 1997.
A very different picture from today !

BTeV – a dedicated b-physics experiment at the Tevatron



BTeV – a two-arm spectrometer, with a central dipole enclosing vertex detector.

Key collider differences w.r.t. LHCb:

- lower ECM, so lower b cross-section;
- 132 ns bunch spacing: more time between collisions, but more pileup per crossing.

Some key differences in approach:

- Pixel, rather than strip vertex detector;
- Vertex detector in earliest trigger stage;
- Crystal calorimeter, with much greater emphasis on physics with neutrals.

BTeV on the march: Sheldon as an adversary

BTeV was a visionary experiment – it had to be, in order to cope with the specific challenges that the Tevatron environment posed for a b-physics detector. (As we will see, the LHCb Upgrade has benefitted from this vision.)

Sheldon was not shy at pointing out the strengths of BTeV:

"Our whole trigger and data acquisition system is a very big advance over what LHCb can do. In addition, we use silicon pixel detectors. They provide better precision tracking than strip detectors."

Fermilab

FERMI NEWS

Volume 27 | April 2004 | Number 4

In This Issue | FermiNews Main Page

Critical Decision: BTeV gets DOE approval

by Kurt Riesselmann

Scientists of the BTeV experiment at Fermilab will be busy for years to come. At the end of February the Director of the Department of Energy's Office of Science, Ray Orbach, gave Fermilab's B Physics at the Tevatron experiment the first DOE stamp of approval. The decision, referred to as Critical Decision Zero (CD-0), designates the project as necessary to accomplish DOE's mission. It allows Fermilab and the BTeV collaboration to develop a conceptual design report and to submit a budget request. Three additional approvals (CD-1, 2, and 3) with regard to technology, cost and schedule are required before construction can begin.

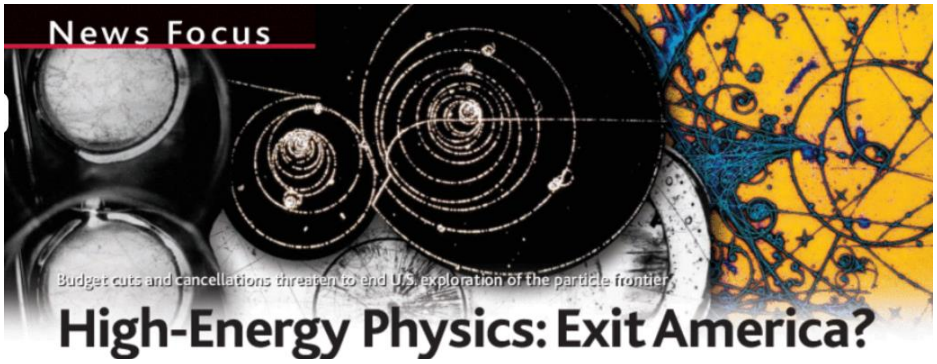
The proposed physics goals were similarly ambitious…

…as well as the emphasis on neutrals, charm physics was given high prominence (*c.f.* LHCb, when this topic was very much a late addition.)

Both LHC-B and BTeV will be able to make what we now consider to be the quintessential measurements in b and charm physics. The sensitivities on the angle γ are estimated to be better than $10°$. It is likely that at least two of the ambiguities in $\sin(2\beta)$ will be resolved. To measure α the reaction $B^o \to \rho\pi$ looks most promising. Here preliminary estimates give BTeV a factor of 50 larger efficiency. [arXiv:hep-ph/0002025]

BTeV is cancelled: Sheldon is undaunted

7th February 2005 – bad news ! BTeV is removed from the President's Budget.



[Science, vol. 208, no. 5718, 2005]

Monday, 7 February, was a grim day for the Fermi National Accelerator Laboratory (Fermilab). "You wake up, you go to a presentation, and you find out you're dead," says Fermilab physicist Joel Butler. Butler is co-spokesperson of an experiment known as BTeV—a multimillion-dollar project that would allow scientists to study the properties of the bottom quark. But that Monday, when the new Secretary of Energy Samuel Bodman took to the podium to announce the department's budget request for 2006, BTeV scientists were horrified to discover that their project had been canceled.

Would Sheldon join BaBar, or become a member of the US CMS community ?

No! Within hours a phone is ringing on a desk in CERN

May 26, 2005

Application for Syracuse University Experimental Particle Physics Group To Join LHCb

M. Artuso, S. Blusk, T. Skwarnicki, and S. Stone
Physics Department
Syracuse University
Syracuse, N.Y. 13244-1130

Meeting new friends – the LHCb years

Syracuse joined LHCb in 2005.

Too late to lead any detector construction, but the group played a full role in analysis software, VELO and RICH alignment and calibration, and HLT computing.

In time, other US NSF groups followed, but none (yet) from DOE particle physics (a decision reminiscent of Dick Rowe of Decca Records in the 1960s: “Guitar groups are on their way out, Mr Epstein”).

Some in the collaboration expecting someone scary and intimidating…

…but found to their surprise that Sheldon was extremely pleasant and reasonable.

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Some in the collaboration expecting someone scary and intimidating…

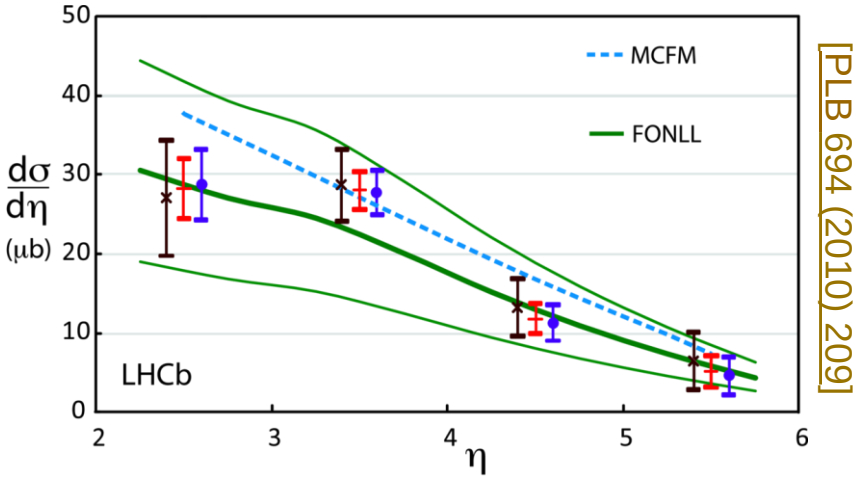
…but found to their surprise that Sheldon was extremely pleasant and reasonable.

OK, not a Teddy Bear, but a *very* nice guy, as well as being a transformative physicist.

Sheldon the analyst

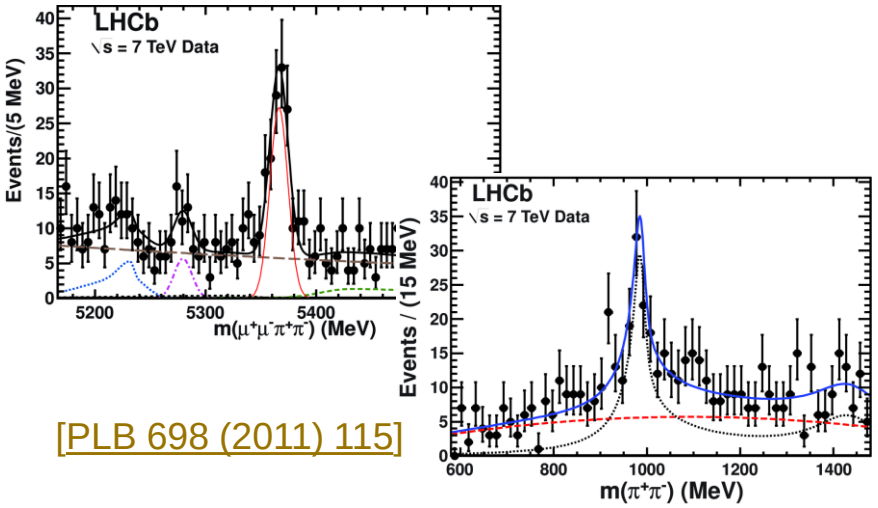
Battle-hardened by years of productivity on CLEO, Sheldon (& Syracuse colleagues) led the way in the early days of LHC, setting an excellent example to those in the collaboration who had not seen data for years (if at all). Two very early examples:

Measurement of $b\bar{b}$ cross section



[PLB 694 (2010) 209]

First observation of $B_s \to J/\psi f_0$



[PLB 698 (2011) 115]

This analysis, was one of the most important of all the early LHC papers and immediately put LHCb on the map.

Established $B_s \to J/\psi\pi\pi$ as a powerful final state for the ϕ_s analysis (almost fully *CP*-odd, in contrast to mixed *CP* of J/ψKK).

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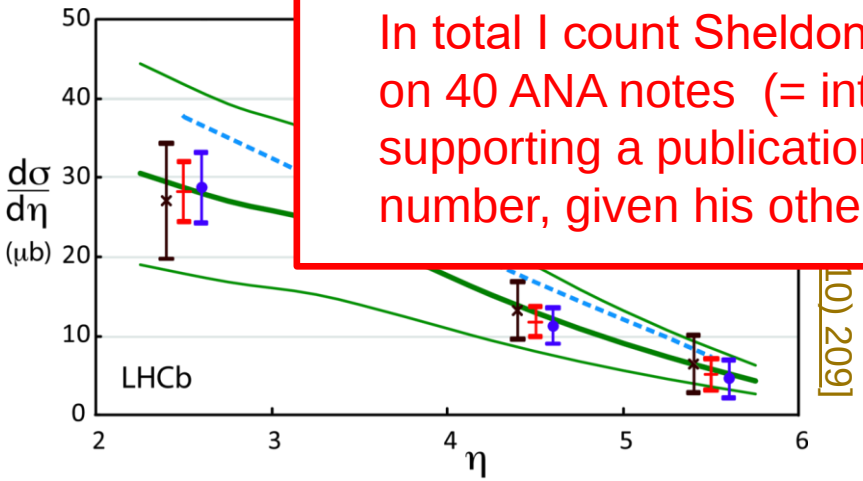

[10) 209]

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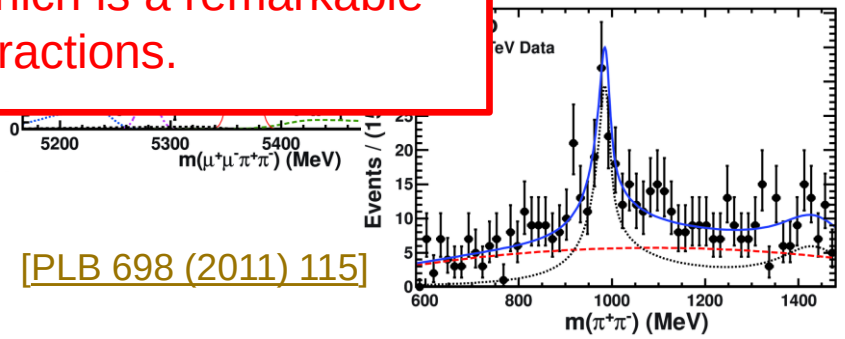

[PLB 698 (2011) 115]

In total I count Sheldon's name as author on 40 ANA notes (= internal documentation supporting a publication), which is a remarkable number, given his other distractions.

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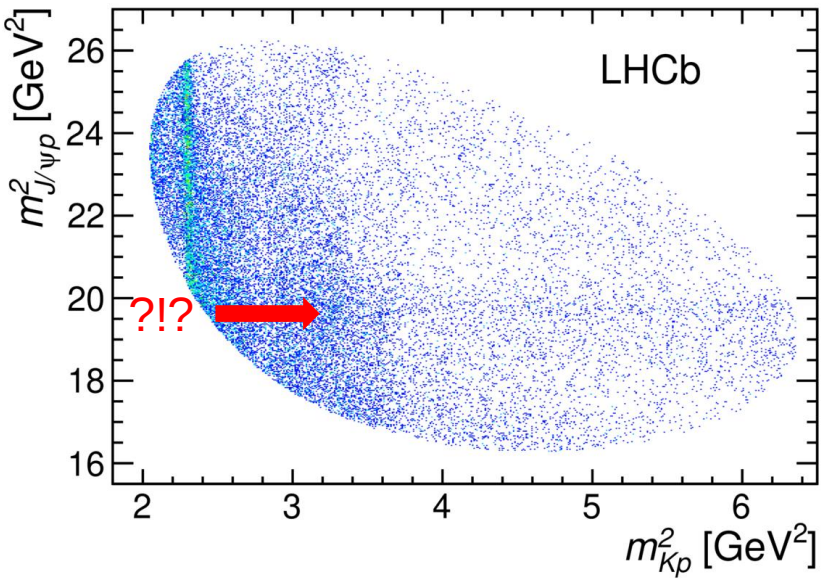
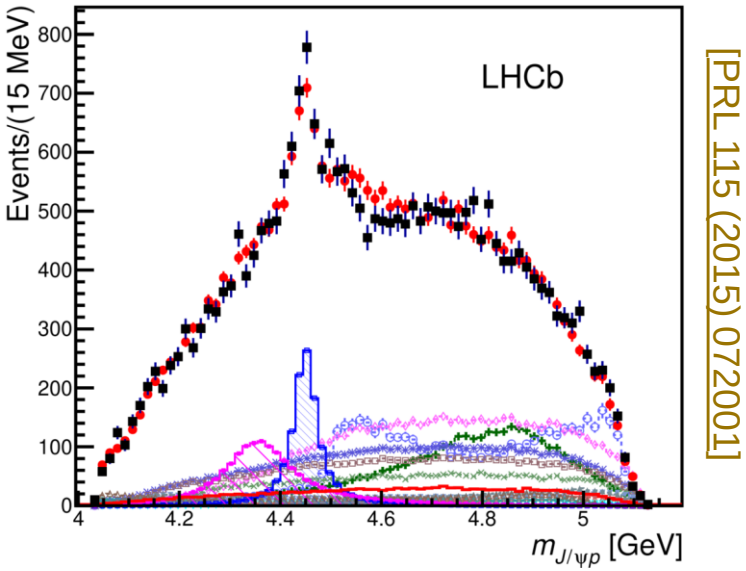
Sheldon the spectroscopist

Despite some hugely important discoveries earlier in his career (*e.g.* D_s^+), Sheldon did not share the enthusiasm shown by some of our colleagues in the hunt for new hadronic states. However, when serendipity knocked on the door…



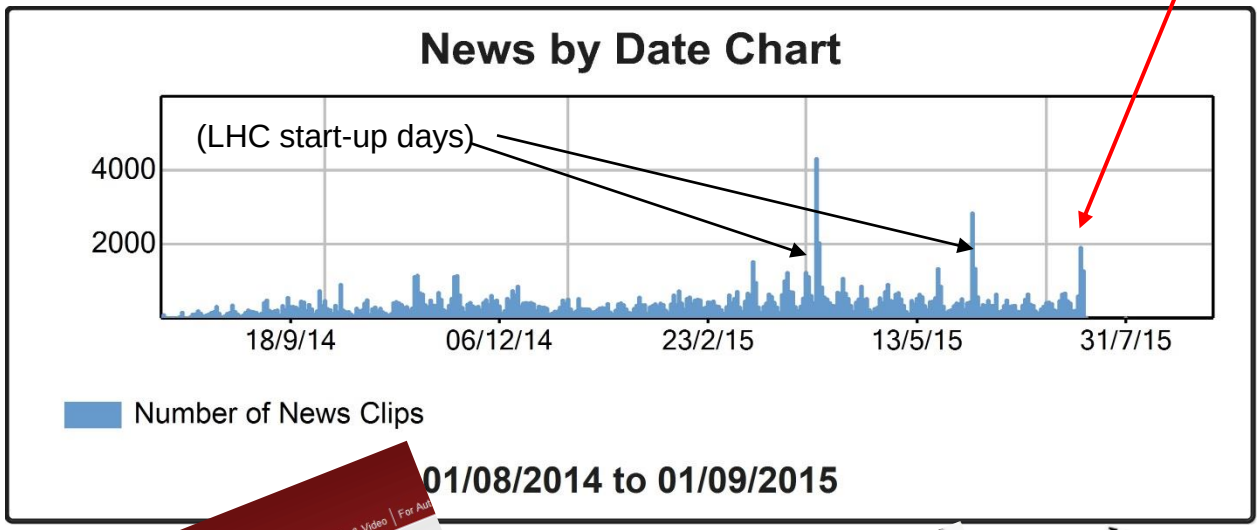


[PRL 115 (2015) 072001]

Of course, other colleagues had central and critical roles in this analysis, but the enterprise benefitted greatly from Sheldon's experience and inimitable approach.

Pentaquark publicity

~2000 news clips on one day, the biggest CERN story of the last year concerning a physics result



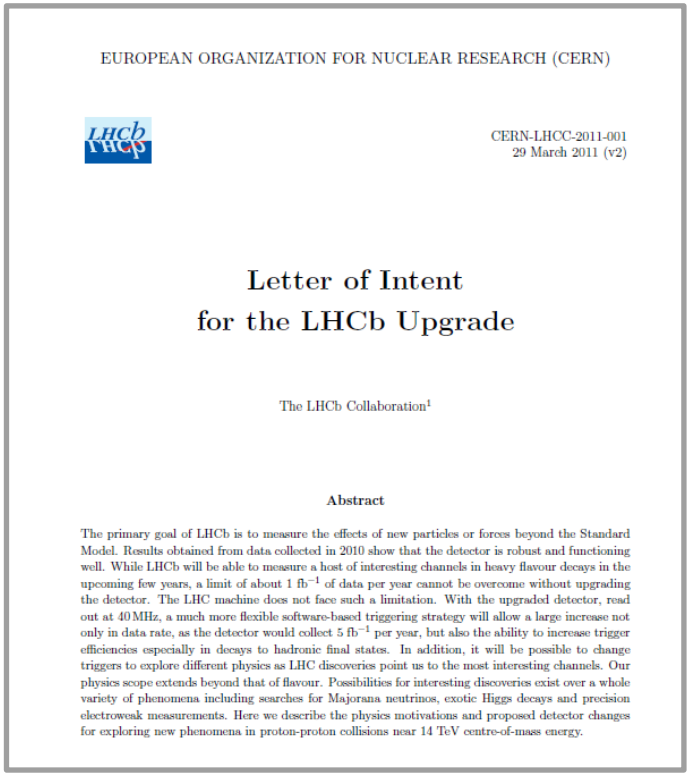
+ great interest in the community

Paper currently has >1500 citations.

Always looking ahead – the LHCb Upgrade

In the years leading up to first collisions, most in the collaboration were content to focus on the initial period of data taking. Not Sheldon. Beginning already in 2006, he was one of the first, and most enthusiastic, advocates of an upgraded detector.

He served as Upgrade Coordinator (2008-11), & without his drive we would have been much slower out of the blocks, and much more conservative in our ambitions.



EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)

CERN-LHCC-2011-001
29 March 2011 (v2)

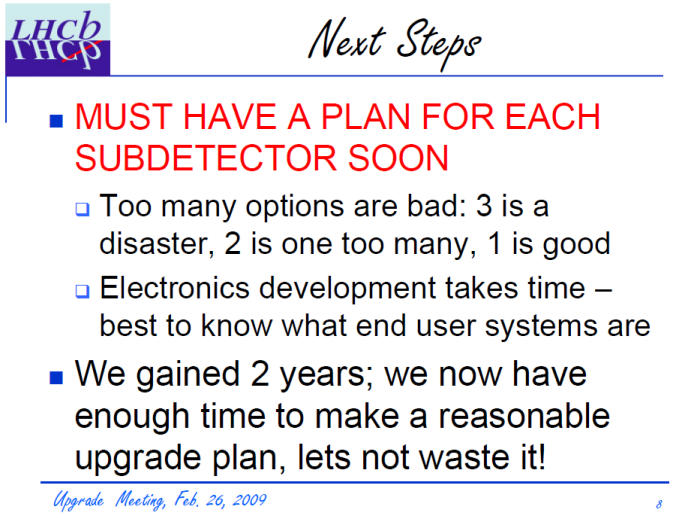
Letter of Intent
for the LHCb Upgrade

The LHCb Collaboration[1]

Abstract

The primary goal of LHCb is to measure the effects of new particles or forces beyond the Standard Model. Results obtained from data collected in 2010 show that the detector is robust and functioning well. While LHCb will be able to measure a host of interesting channels in heavy flavour decays in the upcoming few years, a limit of about 1 fb^{-1} of data per year cannot be overcome without upgrading the detector. The LHC machine does not face such a limitation. With the upgraded detector, read out at 40 MHz, a much more flexible software-based triggering strategy will allow a large increase not only in data rate, as the detector would collect 5 fb^{-1} per year, but also the ability to increase trigger efficiencies especially in decays to hadronic final states. In addition, it will be possible to change triggers to explore different physics as LHC discoveries point us to the most interesting channels. Our physics scope extends beyond that of flavour. Possibilities for interesting discoveries exist over a whole variety of phenomena including searches for Majorana neutrinos, exotic Higgs decays and precision electroweak measurements. Here we describe the physics motivations and proposed detector changes for exploring new phenomena in proton-proton collisions near 14 TeV centre-of-mass energy.

Typical Sheldon focused thinking…



Next Steps

- MUST HAVE A PLAN FOR EACH SUBDETECTOR SOON
  - Too many options are bad: 3 is a disaster, 2 is one too many, 1 is good
  - Electronics development takes time – best to know what end user systems are
- We gained 2 years; we now have enough time to make a reasonable upgrade plan, lets not waste it!

Upgrade Meeting, Feb. 26, 2009 8

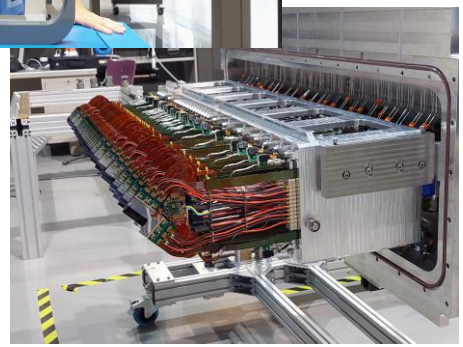
…and seeing even setbacks (here the LHC delayed start) as an opportunity.

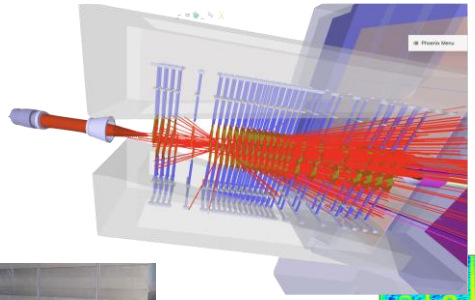
LHCb Upgrade: the spirit of BTeV

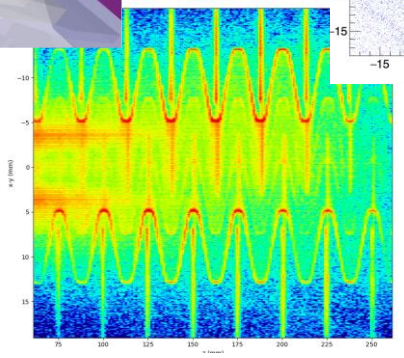
The LHCb Upgrade has many features that were intended for BTeV, for example, a pixel vertex detector & the use of lifetime information at the earliest triggering level.

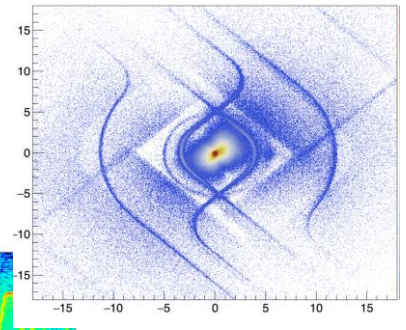
When told of the decision to go with pixels, Sheldon responded characteristically:

> Excellent!
> congratulations, and I am happy that I will continue with the upgrade
>
> sincerely
> sheldon



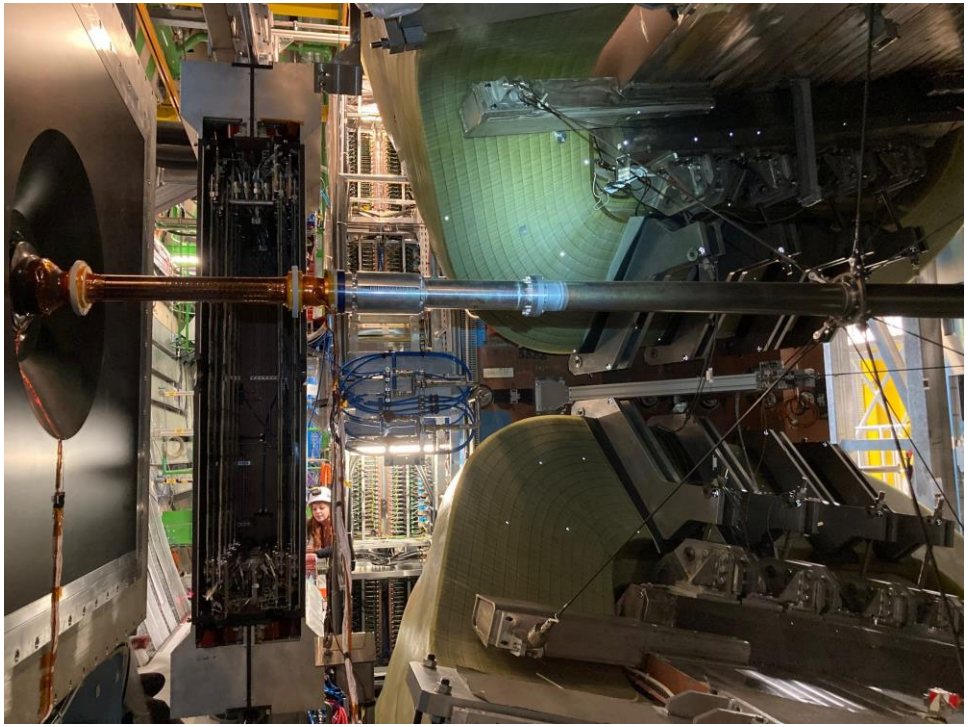






LHCb Upgrade: the Upstream Tracker

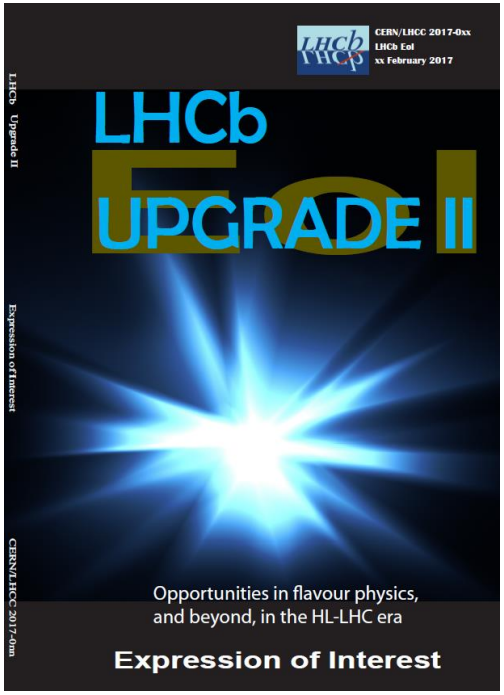
And in the Upgrade, Sheldon, and his US colleagues (led by Marina) took major responsibility for a critical sub-detector: the Upstream Tracker.



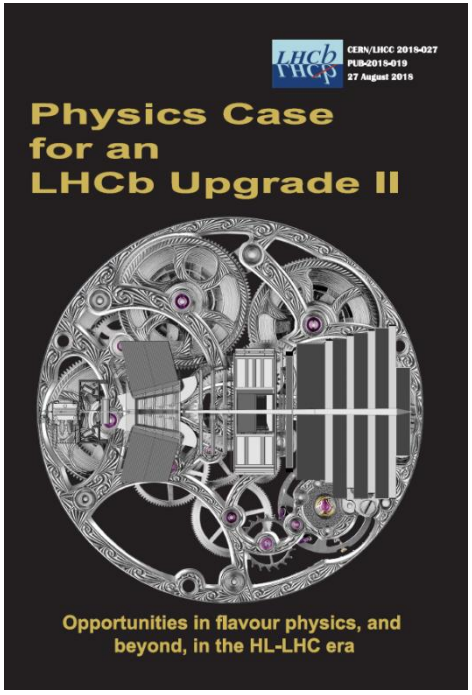
Installed at the start of this year, and now being commissioned !

LHCb Upgrade II

Unsurprisingly, Sheldon was also keener than anyone to initiate steps towards a second Upgrade. He continuously chided the management, telling them that there was no time to waste. He attended all key meetings, however inconvenient for him, he appreciated the detector priorities (*e.g.* fast timing), & lobbied within the US.



[CERN-LHCC-2017-003]



[CERN-LHCC-2018-027]

[CERN-LHCC-2021-012]

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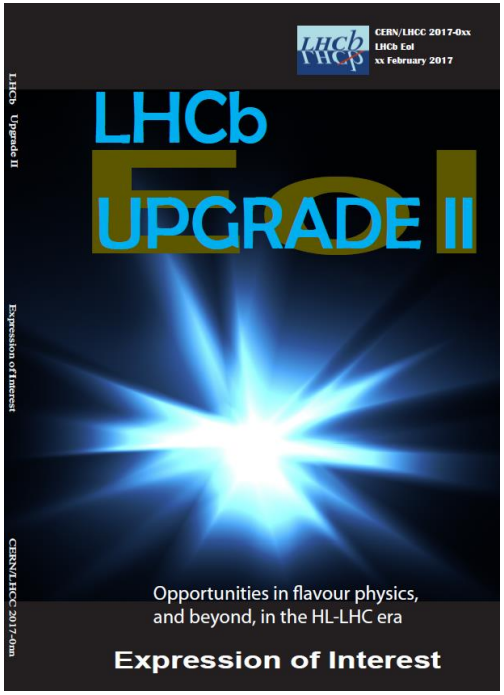

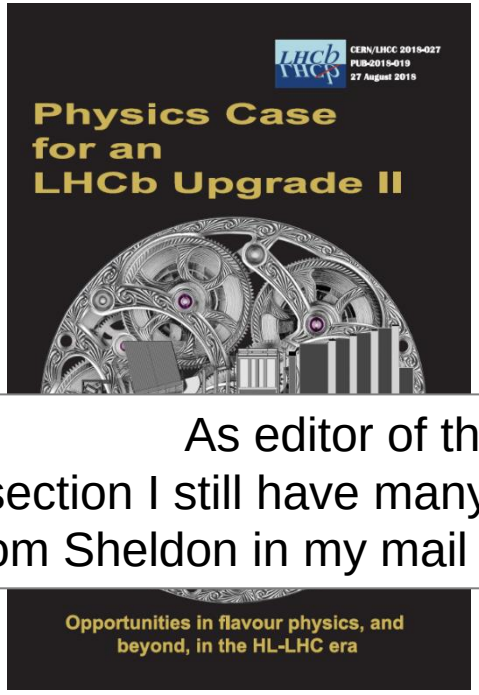

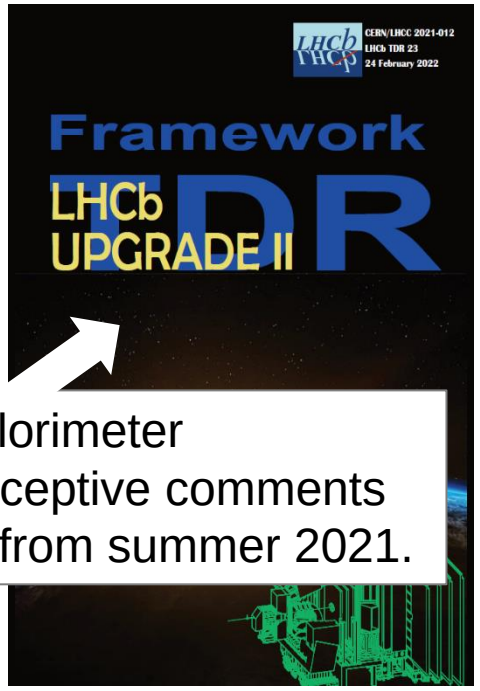

As editor of the calorimeter section I still have many perceptive comments from Sheldon in my mail box from summer 2021.

[CERN-LHCC-2017-003] [CERN-LHCC-2018-027] [CERN-LHCC-2021-012]

LHC

When writing to senior colleagues and funding agencies, Sheldon always knew what he was doing

Unsurprisi … eps towards a second Up … them that there was no tim … nvenient for him, he ap … ed within the US.

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phone (315)-443-5972
fax (315)-443-9103
Email-Internet: Stone@physics.syr.edu

Dec. 11, 2014

Prof. Young Kee Kim
Subcommittee to Advise NSF on Investments in Response to P5 Report

Optimistic, even then

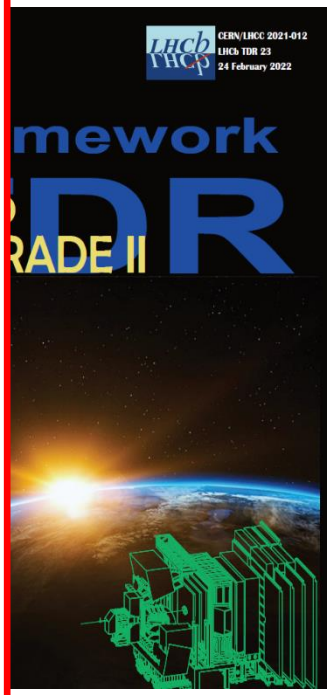
Dear Prof. Kim

This letter is to inform you that the LHCb collaboration is formulating plans for a "Phase II" upgrade to be deployed in the 2023-2025 time frame. The scope of the upgrade is being discussed. Items that appear to give a significant increase in physics reach include increasing the instantaneous luminosity that the detector can accept, and changing some of the detector components, thus allowing much better sensitivity on many channels. Some of these improvements can be accomplished at other times as the open geometry of LHCb allows for incremental improvements. . . . .

Precision studies of beauty and charm decays are well known to probe new physics at high mass scales in the multi-TeV region, and are complementary to direct searches that can be performed by the ATLAS and CMS collaborations. The importance of such studies has been discussed in many forums, e.g. in the P5 report.

Sincerely

Sheldon Stone
Distinguished Professor of Physics
Syracuse University



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…but did you really believe that, Sheldon ?

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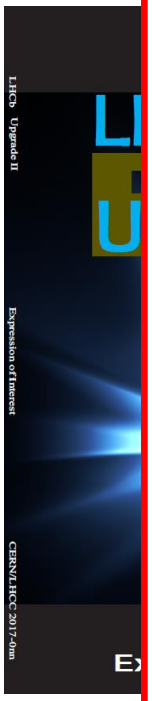

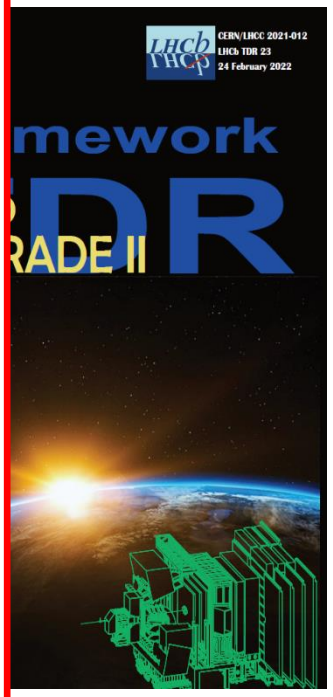

[CERN… …LHCC-2021-012]

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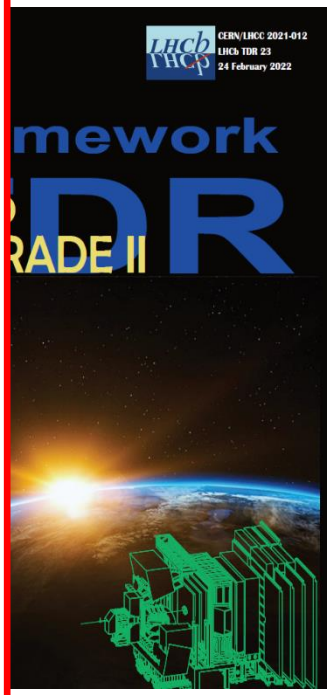

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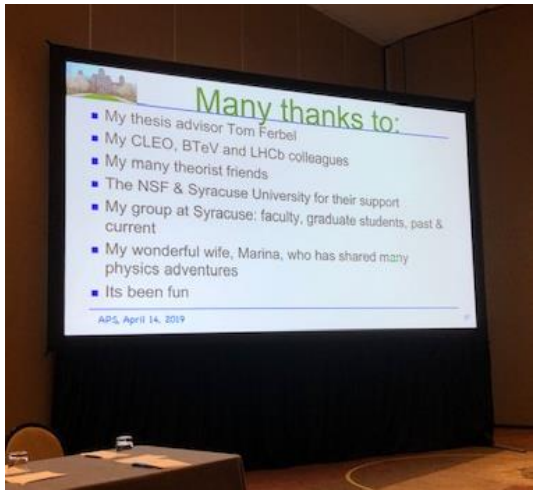
Panofsky Prize, 2019

"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."



[photos courtesy Ian Shipsey]

Sheldon the friend

Surprising news to those who did not know him, but Sheldon was a *kind man*.

(I have many recollections of his patience & the efforts he made for his friends.)

Sheldon's final lesson

SS Sheldon L Stone <slstone@syr.edu>

To: Paula Collins; Guy Wilkinson Fri 10/09/2021 14:04

Hi
Just to inform you that I am in NYC am starting a stem cell transplant on Sunday at Sloan Kettering
Hope things are going well for you

Sincerely
Sheldon

GW Guy Wilkinson

To: Paula Collins; Sheldon Stone <slstone@syr.edu> Fri 10/09/2021 17:19

Cc: Marina Artuso

(echoing good wishes in a message from Paula)

Dear Sheldon,

The same from me. I trust everything will go well and your recovery will be hastened by good news on the RX front.

all the best,

Guy

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To: Guy Wilkinson Fri 10/09/2021 19:27

Thanks, but my job is to make sure RX is correct...

sheldon

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Sheldon was referee of the 'RX' (*i.e.* R_K, R_{K^*} paper)

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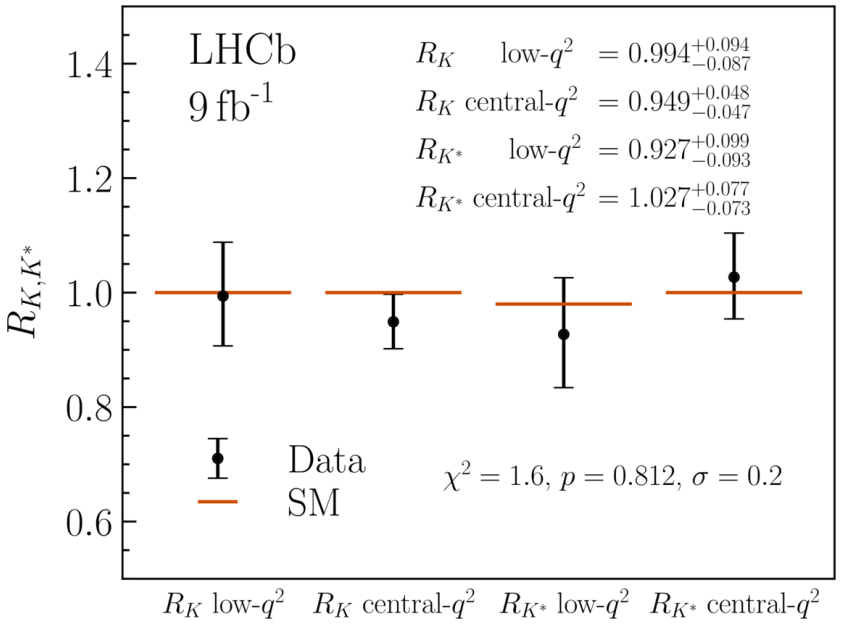

[arXiv:2212.09153]

Good news in experimental science is obtaining the correct result, and it's our task to make sure this happens. Whether it's the result we want, is irrelevant.

Si monumentum requiris, circumspice
(If you seek his monument, look around you)

Heavy-flavour physics today owes an *enormous* amount to Sheldon's drive, insight, vision and tenacity. We can honour his legacy by following his example. Let's work !