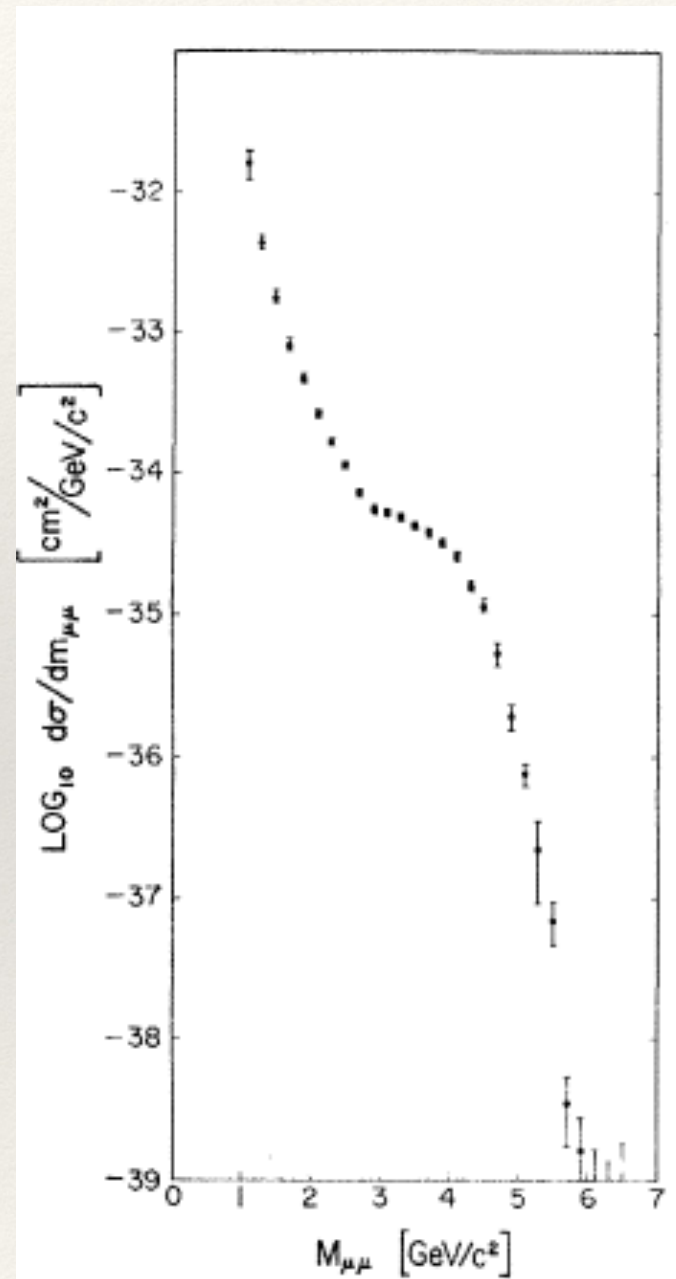

The b-quark at 40

Keith Ellis
IPPPP

Prehistory

- ❖ Lederman et al, PRL 25 1523 were the first to measure massive muon pairs coming from the collision of hadrons, following a suggestion of Lederman and Yamaguchi.
- ❖ They were interested in measuring this to normalise the cross section for W production.
- ❖ This discovery came to be known as “Drell-Yan” process, (quite unfairly)
- ❖ The experiment had low mass resolution on the mass of the muon pairs, ($\sim 15\%$ in the appropriate mass range).
- ❖ In 1974 it was discovered (at SLAC and at Brookhaven) that the reason for the shoulder, was the J/psi observed at low mass resolution.
- ❖ Leon had missed a major discovery.



Oops-Leon

- ❖ Anxious not to miss another discovery the Lederman group mounted another experiment, this time at Fermilab observing electron-positron pairs, with better mass resolution ($\sigma=70\text{MeV}$)

OBSERVATION OF HIGH MASS DILEPTON PAIRS IN HADRON COLLISIONS AT 400 GeV

D. C. Hom, L. M. Lederman, H. P. Paar, H. D. Snyder,
J. M. Weiss, J. K. Yoh
Columbia University, New York, New York 10027*

and

J. A. Appel, B. C. Brown, C. N. Brown,
W. R. Innes, T. Yamanouchi
Fermi National Accelerator Laboratory, Batavia, Illinois 60510

and

D. M. Kaplan
State University of New York at Stony Brook,
Stony Brook, L. I., New York 11794*

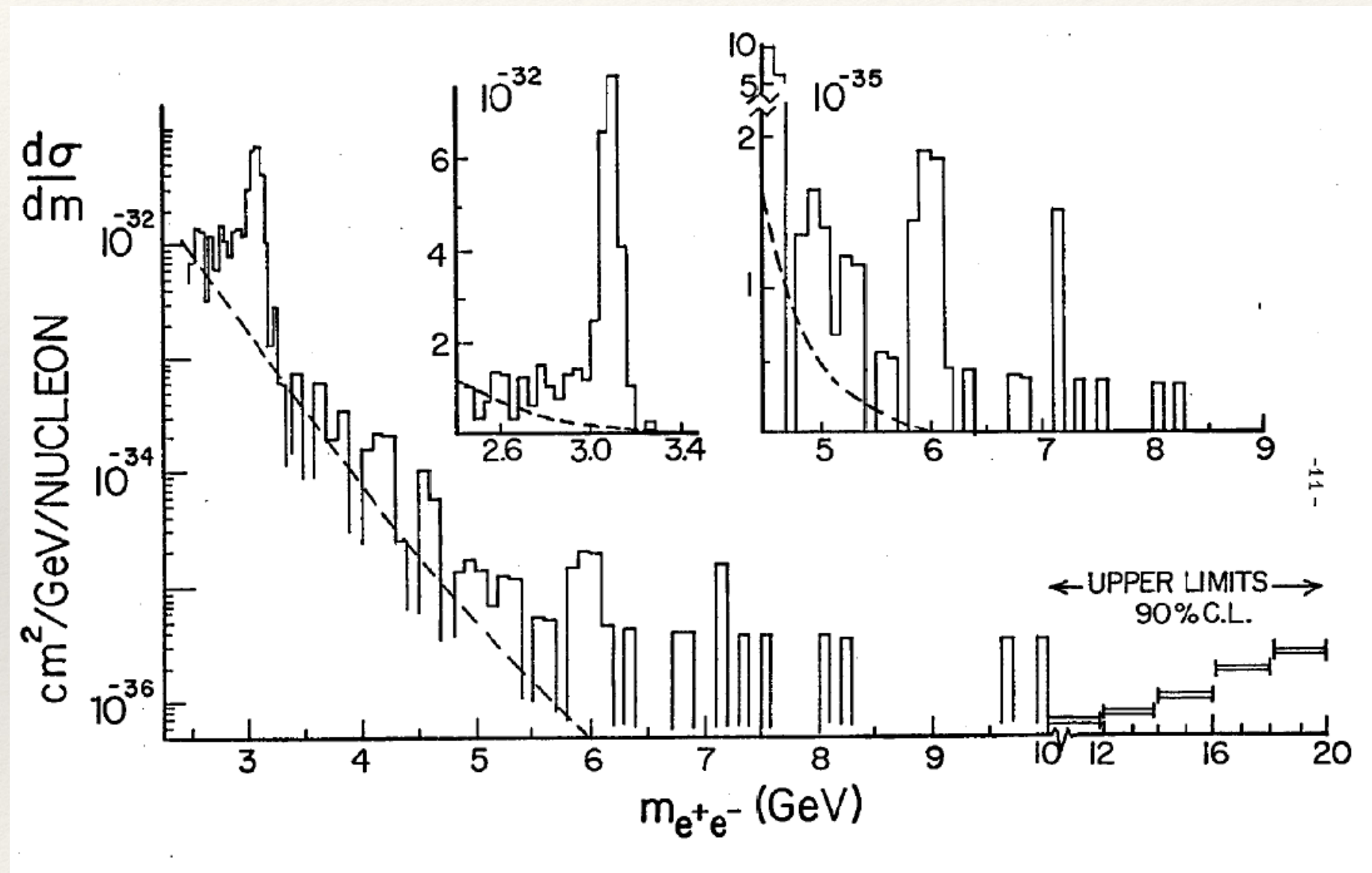
ABSTRACT

We report preliminary results on the production of electron-positron pairs in the mass range 2.5 to 20 GeV in 400 GeV p-Be interactions.

Twenty-seven high mass events are observed in the mass range 5.5-10.0 GeV corresponding to $\sigma = (1.2 \pm .5) \times 10^{-35} \text{ cm}^2$ per nucleon. Clustering of 11 of these events between 5.8 and 6.1 GeV suggests that the data contains at least one new resonance at 5.97 GeV.

Oops-Leon

- ❖ After the bump went away with higher statistics, this state known as the Upsilon, became the Oops-Leon.



The discovery of the Upsilon

Observation of a Dimuon Resonance at 9.5 GeV in 400-GeV Proton-Nucleus Collisions

S. W. Herb, D. C. Hom, L. M. Lederman, J. C. Sens,^(a) H. D. Snyder, and J. K. Yoh
Columbia University, New York, New York 10027

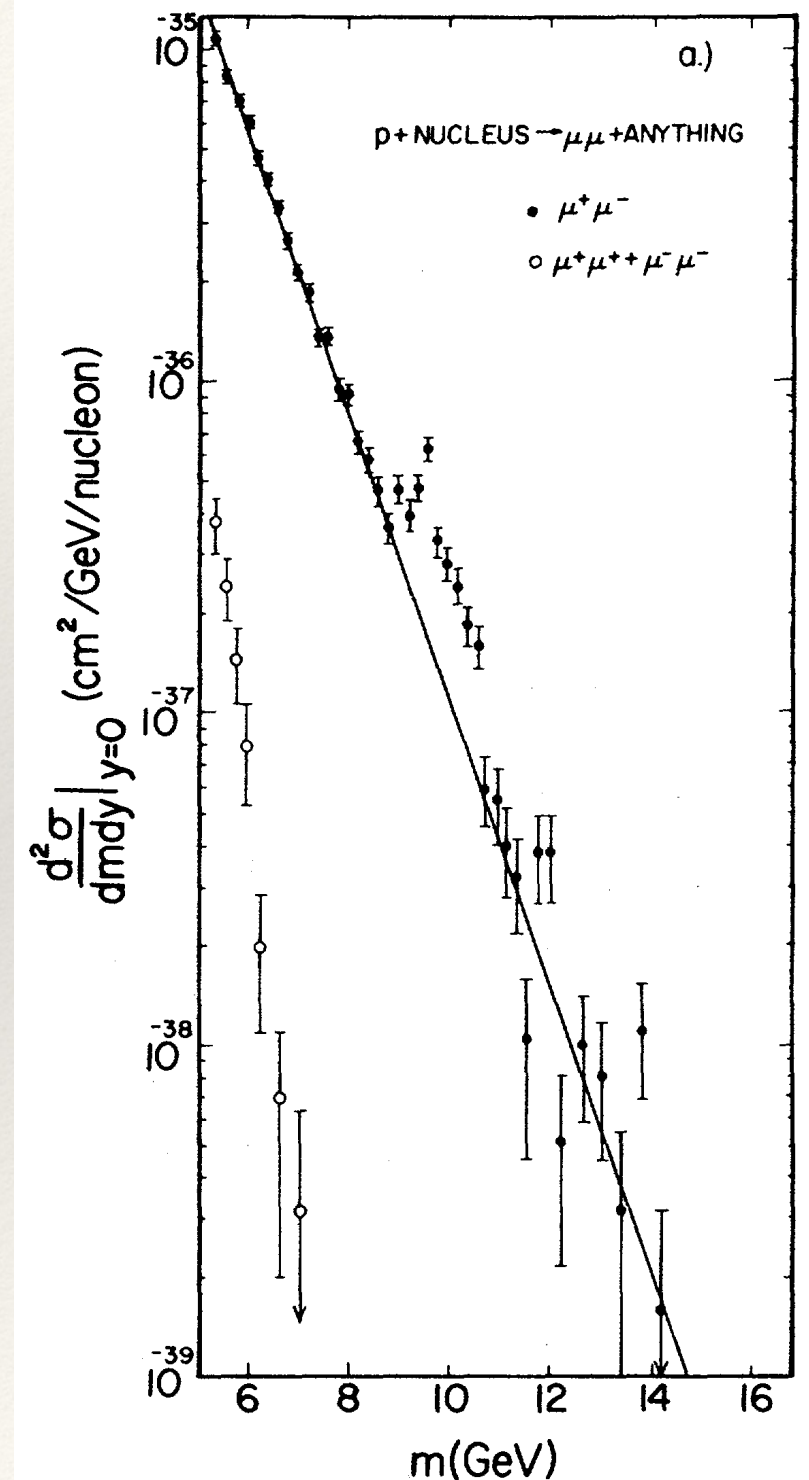
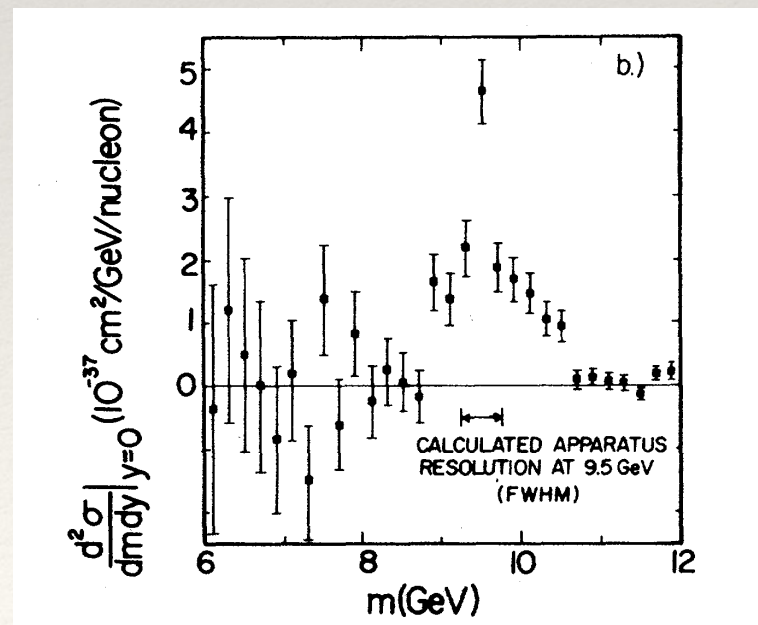
and

J. A. Appel, B. C. Brown, C. N. Brown, W. R. Innes, K. Ueno, and T. Yamanouchi
Fermi National Accelerator Laboratory, Batavia, Illinois 60510

and

A. S. Ito, H. Jöstlein, D. M. Kaplan, and R. D. Kephart
State University of New York at Stony Brook, Stony Brook, New York 11974
(Received 1 July 1977)

- ❖ Subsequently in 1977 the true Upsilon was discovered at 9.5 GeV.



Happy birthday b-quark

- ❖ The subsequent discovery of b-hadrons held other surprises for the field, notably the long-lifetime of the b-hadrons, allowing successful tagging of b-hadrons using vertex-detectors.
- ❖ What is remarkable is that 40 years later we are initiating a new program to study the b-quark in even greater detail at BelleII as well as the continuing program of LHCb
- ❖ We can anticipate that in 2052, we will be still involved in the detailed investigation of the Higgs boson....

Higgs Maxwell Meeting

chaired by Keith Ellis (IPPP)

Wednesday, 8 February 2017 from **10:30** to **18:00** (Europe/London)
at **Royal Society of Edinburgh**
22-26 George St, Edinburgh EH2 2PQ

Description The b-quark at 40

Wednesday, 8 February 2017

10:30 - 11:00	10.30-11.00 <i>Registration & Coffee</i>
11:00 - 11:05	Welcome 5' Speaker: Prof. Keith Ellis (IPPP)
11:05 - 11:50	Prospects for flavour physics with Belle II 45' Speaker: Bostjan Golob (Ljubljana)
12:00 - 12:45	CKM elements from semileptonic B decays 45' Speaker: Paolo Gambino (Turin)
12:45 - 14:00	Lunch
14:00 - 14:45	Status and prospects for flavour physics with LHCb 45' Speaker: Greig Cowan (Edinburgh)
14:55 - 15:40	Lattice results for flavour physics 45' Speaker: Andreas Juettner (Southampton)
15:40 - 16:10	Tea
16:10 - 16:55	Flavour anomalies 45' Speaker: Diego Guadagnoli (Annecy)